



Consultation Document on Listing Eligibility and Conservation Actions

Saccolaimus saccolaimus nudicluniatus (bare-rumped sheath-tailed bat)

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

- 1) the eligibility of *Saccolaimus saccolaimus nudicluniatus* (bare-rumped sheath-tailed bat) for inclusion on the EPBC Act threatened species list; and
- 2) the necessary conservation actions for the above subspecies.

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.

Contents of this information package	Page
General background information about listing threatened species	2
Information about this consultation process	2
Draft information about the common name and its eligibility for listing	3
Conservation actions for the subspecies	9
References cited	11
Consultation questions	13

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.

Saccolaimus saccolaimus nudicluniatus

bare-rumped sheath-tailed 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

Conventionally accepted as *Saccolaimus saccolaimus nudicluniatus* (De Vis 1905).

Saccolaimus saccolaimus (Temminck 1838) was first described from Java. It comprises five valid subspecies (Simmons 2005) and is distributed widely from the Solomon Islands and tropical Australia to India (Csorba et al., 2008).

The taxonomic status of the two Australian populations of *Saccolaimus saccolaimus* is unresolved. The taxon *S. s. nudicluniatus* was first described from Queensland (as *Taphozous nudicluniatus*, De Vis 1905). Both the Queensland and Northern Territory (including Kimberley) populations are considered as *S. s. nudicluniatus* under the EPBC Act 1999, but Hall et al. (2008) attributed the Northern Territory population to the nominate *S. s. saccolaimus* of Indonesia. Other previous authors have not attributed the Northern Territory population to either subspecies (McKean et al., 1981; Thomson 1991; Duncan et al., 1999; Schulz & Thomson 2007). Including populations outside Australia, the taxon, *nudicluniatus*, has been considered at the species level (De Vis 1905; Troughton 1925; Corbet & Hill 1980; Nowak & Paradiso 1983), the subspecies level (Koopman 1984, 1994; Flannery 1995; Hall et al., 2008), as well as being synonymised with the nominate (e.g. Goodwin 1979). Its extralimital distribution is also unclear. Flannery (1990) attributed those in New Guinea and the Solomon Islands to *nudicluniatus*, but he later (Flannery 1995) considered that this taxon occurred only in Australia and New Guinea, with the form in the Solomon Islands being *S. s. saccolaimus*.

Milne et al. (2009) demonstrated similarity between the two Australian geographic groups using genetic and morphological analyses. Taxonomic work currently underway, using more powerful nuclear markers, is investigating these groups in the context of the entire species complex (K. Armstrong pers. comm., cited in Woinarski et al., 2014) and may shed further light on the taxonomic groupings.

For the treatment here, but recognising the possibility that current taxonomic studies may conclude differently, we consider that only one taxon occurs in Australia (*S. s. nudicluniatus*), with that taxon also occurring beyond Australia (including New Guinea).

Species/Subspecies Information

Description

The bare-rumped sheath-tail bat is a large insectivorous bat, with a head and body length of 81–97 mm and a weight of 48–55 g (Hall et al., 2008). It has reddish-brown to dark brown fur on its back and is slightly paler beneath. It can be distinguished from other Australian sheath-tail bats (Emballonuridae) by the irregular white flecks of fur on its back and the naked rump (Churchill 1998; Menkhorst & Knight 2001), although not all specimens display these features (Hall et al., 2008). A throat pouch is present in males and is rudimentary in females. Compared to individuals from north-eastern Queensland, those from the Northern Territory may be slightly

larger, darker (almost black) on the dorsal fur, with whitish belly fur and lacking the pronounced bare rump (Troughton 1925; McKean et al., 1981; Hall et al., 2008).

Distribution

The bare-rumped sheath-tailed bat is known to occur in north-eastern Queensland and the monsoonal tropics of the Northern Territory (Milne et al., 2009), and is likely to occur in areas of the Kimberley in Western Australia (D. Milne pers. comm., cited in Woinarski et al., 2014). In Queensland, it occurs from Ayr to the Iron Range (Dennis 2012), including Magnetic and possibly Prince of Wales Islands (Schulz & Thomson 2007). Most records are near-coastal, but one record (at Jasper Gorge, Northern Territory) has been found 150 km inland (Milne et al., 2009).

There are relatively few records of the subspecies across this extensive range, either suggesting that the subspecies is rare or it has a fragmented distribution. However, issues relating to its detection currently compromise the precise delineation of the subspecies' range and subpopulations: it is morphologically very similar to the yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*); is difficult to capture as it mostly flies above the canopy; and its echolocation call pattern is difficult to distinguish from freetail bats and other sheath-tail bats within its range.

In 2009, genetic analyses of misidentified specimens of the closely related yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*) held at the Northern Territory Museum increased the species' extent of occurrence in the Northern Territory (Milne et al., 2009). In 2011, morphological analyses of four *S. flaviventris* specimens held at the Western Australian Museum indicated that they had been misidentified and are likely to belong to the species *S. saccolaimus* (Milne pers. comm., 2013). The bare-rumped sheath-tail bat is therefore likely to be distributed through the Kimberley region of Western Australia as far west as Broome, however this has not been confirmed through genetic analyses (Milne pers. comm., 2013).

Identification of diagnostic characters from full spectrum echolocation recordings has led to further records of the bare-rumped sheath-tail bat in new locations in Queensland (Coles et al., 2012). Other potentially useful diagnostic echolocation characters have been reported (Milne et al., 2009; Corben 2010; Ford et al., 2012), but there has not yet been publication of a detailed acoustic comparison of all Australian *Saccolaimus* species (K. Armstrong pers. comm., cited in Woinarski et al., 2014). If a reliable method for separating them acoustically can be developed, there is potential to better define the range and population size of the bare-rumped sheath-tailed bat from new surveys and the re-analysis of previous recordings.

Based on the scarcity of records in the previous 16 years, Duncan et al. (1999) considered that the range had probably declined, although were uncertain about such attribution: 'it is not clear whether the species [bare-rumped sheath-tail bat] still exists in its former range, or whether the range has changed.' However, given the substantial number of recent records, derived largely from more intensive sampling and better diagnostic capability, there is no substantial evidence of any decline in range.

Relevant Biology/Ecology

In Australia, the bare-rumped sheath-tailed bat has been recorded mostly in eucalypt forests and woodlands, generally in near-coastal areas. In Queensland, it is known to be associated with coastal lowland rainforests, and more open forests dominated by *Eucalyptus* or *Corymbia* species interspersed with coastal lowland rainforest.

Overseas, the bare-rumped sheath-tailed bat has been observed roosting in a range of environments, including various hollow-bearing tree species and geological formations, such as caves. However, surveys of caves in Queensland and the Northern Territory have failed to locate this subspecies (Schulz & Thomson 2007). The small number of roosts recorded in Australia have all been found in deep tree hollows of the following species: poplar gum (*Eucalyptus platyphylla*), Darwin woollybutt (*E. miniata*), Darwin stringybark (*E. tetradonta*) and

weeping paperbark (*Melaleuca leucadendra* syn. *leucodendron*) (McKean et al. 1981; Compton & Johnson 1983; Churchill 1998; Murphy 2002; Clague pers. comm. 2013). Hollows in these tree species have also been used as breeding roosts. Such roosts are susceptible to damage by termites and by fire (Churchill 1998; Murphy 2002). Roosts may be used regularly, but individuals may use several roosts, and roost numbers at any site may vary over time (O. Whybird pers. comm., cited in Woinarski et al., 2014).

The subspecies is insectivorous and forages for flying insects above the canopy (Churchill 1998), although beyond Australia Csorba et al. (2008) considered that it forages 'close to the ground'. It has been observed foraging within metres of the canopy in riverine gallery forest and *Melaleuca* dominated swamps in Queensland (C. Clague pers. obs., cited in Woinarski et al., 2014). It is known to fly at altitudes up to and above 400 m and is likely capable of moving long distances (Clague pers. comm. 2015).

Females give birth to a single young, with birth records from Queensland in December and January (Compton & Johnston 1983), and from the Northern Territory from December to about April (Compton & Johnson 1983; Churchill 1998; Milne et al., 2009). Across its global range, the bare-rumped sheath-tailed bat is considered to be an 'adaptable' subspecies, tolerating some level of disturbance (Csorba et al., 2008).

Generation length is assumed to be 3–4 years, derived from a mean of age at sexual maturity (estimated at 1–2 years) and longevity (probably around 5–8 years), but no detailed information is available for this subspecies.

Threats

Threats to the bare-rumped sheath-tailed bat are outlined in the table below (Woinarski et al., 2014).

Threat factor	Consequence rating	Extent over which threat may operate	Evidence base
Habitat loss and fragmentation	Severe	Localised	The preferred habitat (tall eucalypt open forest) is subject to localised development, mostly for horticulture and urban development (Duncan et al., 1999); roost sites in trees have been destroyed during clearing (Compton & Johnson 1983).
Competition for tree hollows by bees and non-native birds	Minor	Minor	Not demonstrated, but possible (Schulz & Thomson 2007). The spread of the Asian honey bee (<i>Apis cerana</i>) in Queensland will increase the competition for hollows in Queensland (Hyatt 2012).
Disease	Unknown	Unknown	Not demonstrated, but possible. Congeners are known to carry the Australian bat Lyssavirus, but the consequences are unknown (Schulz & Thomson 2007; Dennis 2012).
Too frequent burning	Minor	Entire	Not demonstrated, but there are possible impacts on prey abundance and/or availability

			of large hollow trees used for roosting; its preferred open forest habitat has a very high fire frequency.
--	--	--	--

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%
<div style="display: flex; align-items: flex-start;"> <div style="flex: 1;"> <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> </div> <div style="flex: 1; padding-left: 20px;"> <p style="text-align: center;"><i>based on any of the following</i></p> <ul style="list-style-type: none"> (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 </div> </div>			

Evidence:

Previous assessments of the conservation status of the bare-rumped sheath-tail bat in Australia have been constrained by taxonomic uncertainty and lack of information about its distribution and range. A study by Milne et al. (2009) has clarified some taxonomic issues, substantially increased the subspecies' known range, and provided more information on its abundance. However, the population size and population trends of the subspecies remain poorly known.

There are relatively few Australian records of the bare-rumped sheath-tailed bat, especially in Queensland in recent decades (Whybird et al., 2011). However, it is difficult to interpret this meagre information as rarity, as the subspecies is difficult to catch (due to its high flight), and identification was previously constrained by lack of information about call characters that diagnosed it from the more abundant yellow-bellied sheath-tailed bat *S. flaviventris* (Milne et al., 2009).

Reardon et al. (2010) reviewed the status and distribution records, and undertook additional surveys, for ten microchiropteran bat species on Cape York Peninsula (CYP). They noted that most of the priority microbat species on CYP have small and restricted distributions within CYP, and do not appear to face the major threats that typically affect microbats. They further noted that genuine population trends in any species could not be detected, as previous research and monitoring of bats on CYP has been sporadic in time and location.

Habitat loss in some locations can be inferred to have led to, and continue to lead to, some decline in population size which may approach a rate of 10 percent in a three generation period (15 years) (Woinarski et al., 2014).

The data presented above appear to be insufficient to demonstrate if the subspecies is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
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:

Based on the mapping of 20 point records from 1996 to 2016, the extent of occurrence is estimated at 1 171 376 km², and the area of occupancy estimated at 48 km². When point records from the last 50 years are mapped (1996 to 2016; 45 points), the EOO is calculated at 1 536 980 km² and the AOO calculated at 124 km². Point records were 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).

It is difficult to provide a robust estimate of the current EOO or AOO, as there are few records across its wide distribution, and the number and location of tree-roosts suitable for habitat are likely to vary over time. Woinarski et al. (2014) considered that the AOO, which they estimated to be 32 km², is an under-estimate due to limited sampling across the occupied range, and is likely to be greater than 2000 km². The subspecies occurs in more than five locations. A decline in population is inferred from loss of habitat.

The data presented above appear to demonstrate the subspecies is not eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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	High rate 20% in 5 years or 2 generation	Substantial rate 10% in 10 years or 3 generations

	(whichever is longer)	(whichever is longer)	(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
(a) (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. Woinarski et al. (2014) suspect the number of mature individuals to be greater than 10 000. However, only a small number of roost sites have been found in Australia. Churchill (1998) noted a record of 40 individuals in one tree roost, and Milne et al. (2009) noted another tree roost containing about 100 individuals. A tree roost noted in Cairns in 2012 contained at least 77 individual bats during peak occupation (C. Clague pers. comm., cited in Woinarski et al., 2014). The number of roost sites and average number of individuals per roost site across the subspecies' distribution cannot be reliably estimated.

The data presented above appear to be insufficient to demonstrate if the subspecies is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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:

Although there is no robust estimate of population size, considering the subspecies' wide distribution, the number of mature individuals is very likely to be greater than 1000 (see also Criterion 3).

The data presented above appear to demonstrate the subspecies is not eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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 there are insufficient data to demonstrate if the subspecies is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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 bare-rumped sheath-tail bat is currently listed as Critically Endangered under the EPBC Act under Criterion 1. 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. Its range is larger than previously thought, and there is no evidence of a substantial, severe or very severe population size reduction.

However, the population size and population trends of the subspecies are poorly known, and there are no robust estimates of extent of occurrence or area of occupancy. It is rarely encountered and there are few known records; it may be very rare, or more common due to difficulties in detectability. Considering its habitat requirements, the population may be declining due to habitat loss. Given the uncertainty in the assessment and the suspected population trajectory, there appears to be insufficient evidence to demonstrate that the bare-rumped sheath-tail bat is no longer eligible to be listed as Critically Endangered under the EPBC Act.

Inclusion of the bare-rumped sheath-tail bat in the Critically Endangered category may be contributing to its survival, as the EPBC Act requires project proponents to refer a proposal for assessment if it may have a significant impact on a threatened species/subspecies. Where necessary, the Department has issued conditions requiring proponents to avoid, minimise or mitigate impacts on the bare-rumped sheath-tail bat.

Delisting the subspecies will remove the requirement to implement recovery actions under the *National recovery plan for the bare-rumped sheath-tail bat* *Saccolaimus saccolaimus nudicluniatus* (Schulz & Thomson 2007), which have resulted in improved knowledge of the subspecies to help guide its recovery. Without the continuation of research and monitoring activities, including the identification of roosting sites which require protection, the subspecies may further decline.

Conservation Actions

Recovery Plan

A national recovery plan for the subspecies *S. s. nudicluniatus* was developed in 2007 (Schulz and Thomson 2007). It includes objectives to:

- develop more effective detection techniques (including obtaining echolocation reference calls) and undertake systematic surveys to enable a more comprehensive assessment of distribution, population size, status and habitat preferences
- increase protection of known roosts both on and outside reserved lands;
- better determine roosting requirements and document foraging requirements of the subspecies, including potential seasonal and distributional differences and the identification of threatening processes;
- establish monitoring sites to investigate population trends in the subspecies; and
- clarify the taxonomic status of the subspecies.

Some of these objectives have been achieved, most notably some clarification of its taxonomic status (Milne et al., 2009; K. Armstrong pers. comm., cited in Woinarski et al., 2012), the characterisation of diagnostic echolocation calls (C. Clague pers. comm., cited in Woinarski et al., 2012); and more intensive sampling in Cape York Peninsula to improve knowledge of its

distribution and status (Reardon et al., 2010). However, no roosts are currently protected from known threatening processes.

Primary Conservation Actions

1. Assess distribution and population size.
2. Manage threats to secure or increase overall population size.

Conservation and Management Priorities

There is no specific management targeted at the bare-rumped sheath-tailed bat. Parts of its range are included in conservation reserves, where fire management is a priority.

There is no monitoring program specifically for the bare-rumped sheath-tailed bat. However, there is increased survey and monitoring effort prompted by attempts to resolve the conservation status of poorly-known bat species (e.g. Reardon et al., 2010) and by requirements for environmental impact assessments.

Recent advances in resolving diagnostic features in its echolocation calls have increased the capability to monitor this subspecies using broadband bat detectors, although diagnosis from other *Saccolaimus* species may still not be entirely unambiguous (K. Armstrong pers. comm., cited in Woinarski et al., 2014). It is not readily caught in harp traps or mist nets set below the canopy. Its use of large trees in forested areas (rather than caves) as roosting sites limits the ability to monitor populations at fixed large roosts. However, if located, roost trees can be monitored by regular stag watches to provide reliable counts of colony size at dusk emergence.

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

Theme	Specific actions	Priority
Active mitigation of threats	Constrain extensive tree clearing in areas occupied by this subspecies; and/or ensure mature trees and corridors are retained	Medium
	Reduce the frequency, extent and intensity of controlled burns	Low-medium
Captive breeding	N/a	
Quarantining isolated populations	N/a	
Translocation	N/a	
Community engagement	Involve Indigenous ranger groups in survey, monitoring and management	Low-medium

Survey and Monitoring priorities

Theme	Specific actions	Priority
Survey to better define distribution	Undertake fine-scale sampling to identify and circumscribe important subpopulations (and roost sites), and assess the population size of these	Medium-high
	Undertake broad-scale surveys to assess distribution and abundance	Medium
Establish or enhance monitoring program	Design an integrated monitoring program across its range, and at known roost sites	Medium-high
	Implement an integrated monitoring program linked to an assessment of management effectiveness	Medium

Information and Research priorities

Theme	Specific actions	Priority
Assess relative impacts of threats	Identify the extent to which suitable roost sites are limiting population size	Medium
	Identify the population-level responses to a range of fire regimes, and model population viability across all fire scenarios (including consideration of fire impacts on roost site availability)	Medium
	Assess the impact of recently invading insects that may interfere with hollow use (notably Asian honey bees)	Medium
	Assess population-level impacts of clearing on the availability of roost sites	Low-medium
	Examine patterns of persistence or occurrence in now fragmented habitat	Low-medium
Assess effectiveness of threat mitigation options	Assess the extent to which tree and/or corridor retention may allow for persistence of this subspecies in modified landscapes	Medium
	Assess the efficacy and impacts of management options to reduce fire frequency, extent and intensity	Low-medium
Resolve taxonomic uncertainties	Undertake genetic studies to establish the subspecies' relationships with extralimital forms (Reardon et al. 2010); currently being undertaken by K. Armstrong	Medium
Assess habitat requirements	Investigate seasonal and spatial patterning of foraging habitat use	Medium
	Characterise roost (and maternity) site requirements	Medium
Assess diet, life history	Investigate key dietary components	Low-medium
	Assess the extent to which food availability may be affected by fire regimes	Low-medium

References cited in the advice

- Armstrong, K. N. (2011). The current status of bats in Western Australia. In *The biology and conservation of Australasian bats* (eds B. Law, P. Eby, D. Lunney, and L. Lumsden), pp. 257-269. Royal Zoological Society of New South Wales, Sydney.
- Churchill, S. (1998). *Australian Bats*. Reed New Holland, Sydney.
- Coles, R. B., Britton, A., Boonman, A. & Clague, C. I. (2012). Discovery of a highly unusual alternating call frequency pattern used by the echolocating emballonurid bat, *Saccolaimus saccolaimus* during foraging. Abstracts from the 15th Australasian Bat Society Conference, Melbourne, 11-13th April 2012. *Australasian Bat Society Newsletter* 38, 35.

- Compton, A., & Johnston, P. M. (1983). Observations on the sheath-tailed bat, *Taphozous saccolaimus* Temminck (Chiroptera: Emballonuridae), in the Townsville region of Queensland. *Australian Mammalogy* 6, 83-87.
- Corben, C. (2010). Acoustic identification of *Saccolaimus*. Presentation at the 14th Australasian Bat Society conference, Darwin, Northern Territory, 12–14 July 2010.
- Corbet, G. B., & Hill, J. E. (1980). *A world list of mammalian species*. British Museum (Natural History), London.
- Csorba, G., Bumrungsri, S., Francis, C., Helgen, Bates, P., Heaney, L., Balet, & Thomson, B. (2008). *Saccolaimus saccolaimus*. In 'IUCN red list of threatened species.' Viewed 22 May 2012. Available on the internet at: <http://www.iucnredlist.org>.
- Dennis, A. J. (2012). Bare-rumped sheath-tail bat, *Saccolaimus saccolaimus nudicluniat*. In *Queensland's threatened animals* (eds L. K. Curtis, A. J. Dennis, K. R. McDonald, P. M. Kyne and S. J. S. Debus), p. 396. CSIRO Publishing, Collingwood.
- Department of the Environment (DotE) (2015). *Area of Occupancy and Extent of Occurrence for Saccolaimus saccolaimus nudicluniat*. Unpublished report, Australian Government Department of the Environment, Canberra.
- De Vis, C. W. (1905). Bats. *Annals of the Queensland Museum* 6, 36-40.
- Duncan, A., Baker, G. B., & Montgomery, N. (1999). *The action plan for Australian bats*. Environment Australia, Canberra.
- Flannery, T. F. (1990). *Mammals of New Guinea*. Robert Brown & Associates, Carina.
- Flannery, T. F. (1995). *Mammals of the South-west Pacific and Moluccan islands*. Reed, Sydney.
- Ford, G., Thomson, B., & Macdonald, S. (2012). The ongoing challenge of characterising the echolocation calls of a rare tropical bat. Presentation at the 15th Australasian Bat Society Conference, Melbourne, Australia, 11-13 April 2012.
- Goodwin, R. E. (1979). The bats of Timor: systematics and ecology. *Bulletin of the American Museum of Natural History* 163, 72-122.
- Hall, L. S., Thomson, B. G., & Milne, D. J. (2008). Bare-rumped Sheath-tailed Bat *Saccolaimus saccolaimus*. In *Mammals of Australia*. Third edition. (Eds S. van Dyck & R. Strahan), pp. 475-476. Reed New Holland, Sydney.
- Hyatt, S. (2012). Asian Honey Bee (*Apis cerana javana*) in Cairns, Far North Queensland: foraging, nesting and swarming behaviour. Report of field observations April 2007-September 2011. Department of Employment, Economic Development and Innovation, Brisbane.
- Koopman, K. (1984). Taxonomic and distributional notes on tropical Australian bats. *American Museum Novitates* 2778, 1-48.
- Koopman, K. F. (1994). Chiroptera: systematics. In *Handbook of Zoology*. Volume 8, Part 60. Walter de Gruyter, Berlin.
- McKean, J. L., Friend, G., & Hertog, A. L. (1981). Occurrence of the sheath-tailed bat *Taphozous saccolaimus* in the Northern Territory. *Northern Territory Naturalist* 4, 20.
- Menkhorst, P. & Knight, F. (2001). *A field guide to the Mammals of Australia*. Oxford University Press, Victoria.

- Milne, D. J., & Pavey, C. R. (2011). The status and conservation of bats in the Northern Territory. In *The biology and conservation of Australasian bats* (eds B. Law, P. Eby, D. Lunney, & L. Lumsden), pp. 208-225. Royal Zoological Society of New South Wales, Sydney.
- Milne, D. J., Jackling, F. C., Sidhu, M., & Appleton, B. J. (2009). Shedding new light on old species identifications: morphological and genetic evidence suggest a need for conservation status review of the critically endangered bat *Saccolaimus saccolaimus*. *Wildlife Research* 36, 496-508.
- Murphy, S. 2002. Observations of the 'Critically Endangered' Bare-rumped Sheath-tail Bat *Saccolaimus saccolaimus* Temminck (Chiroptera: Emballonuridae) on Cape York Peninsula, Queensland. *Australian Mammalogy* 23, 185-187.
- Nowak, R. M., & Paradiso, J. L. (1983). *Walker's Mammals of the World*. Johns Hopkins University Press, Baltimore.
- 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.
- Schulz, M., & Thomson, B. (2007). *National recovery plan for the bare-rumped sheath-tail bat Saccolaimus saccolaimus nudiclunatus*. Queensland Environmental Protection Agency, Brisbane.
- 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. (1991). *A field guide to bats of the Northern Territory*. Conservation Commission of the Northern Territory, Darwin.
- Troughton, E. Le G. (1925). A revision of the genera *Taphozous* and *Saccolaimus* (Chiroptera) in Australia and New Guinea, including a new species, and a note on two Malayan forms. *Records of the Australian Museum* 14, 313-341.
- Whybird, O. J., Tully, P. J., Clague, C. I., & Coles, R. B. (2011). Live report of the critically endangered Bare-rumped Sheath-tail Bat (*Saccolaimus saccolaimus*) in north Queensland, Australia. *Australasian Bat Society Newsletter* 37, 20-21.

Other sources cited in the advice

- Clague, C. (2015). Personal communication by email, 7 March 2015. Queensland Department of Agriculture and Fisheries.

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 km²) 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?