



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

***Bruguiera hainesii* (Haines's orange mangrove)**

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

- 1) the eligibility of *Bruguiera hainesii* (Haines's orange mangrove) for inclusion on the EPBC Act threatened species list in the Critically Endangered category; and
- 2) the necessary conservation actions for the above species.

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

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

Responses are to be provided in writing either by email to:
species.consultation@environment.gov.au

or by mail to:

The Director
Species Information and Policy Section
Biodiversity Conservation Division
Department of the Environment and Energy
PO Box 787
Canberra ACT 2601

Responses are required to be submitted by 20 July 2018

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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 and Energy.

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.

The Commonwealth, state and territory governments have agreed to collaborate on national threatened species assessments using a common assessment method. Your response may be provided to state and territory government agencies and scientific committees as part of this collaboration. Information about the common assessment method is available on the department's website at: <http://www.environment.gov.au/biodiversity/threatened/cam>

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.

Privacy notice

The Department will collect, use, store and disclose the personal information you provide in a manner consistent with the Department's obligations under the *Privacy Act 1988* (Cth) and the Department's Privacy Policy.

Any personal information that you provide within, or in addition to, your comments in the threatened species assessment process may be used by the Department for the purposes of its functions relating to threatened species assessments, including contacting you if we have any questions about your comments in the future.

Further, the Commonwealth, State and Territory governments have agreed to share threatened species assessment documentation (including comments) to ensure that all States and Territories have access to the same documentation when making a decision on the status of a potentially threatened species. This is also known as the '[common assessment method](#)'. As a result, any personal information that you have provided in connection with your comments may be shared between Commonwealth, State or Territory government entities to assist with their assessment processes.

The Department's Privacy Policy contains details about how respondents may access and make corrections to personal information that the Department holds about the respondent, how respondents may make a complaint about a breach of an Australian Privacy Principle, and how the Department will deal with that complaint. A copy of the Department's Privacy Policy is available at: <http://environment.gov.au/privacy-policy>

Your details

Name:

Organisation (if applicable):

Phone:

Email:

Bruguiera hainesii

Haines's orange mangrove

Taxonomy

Conventionally accepted as *Bruguiera hainesii* C.G.Rogers (CHAH 2017).

Studies of Haines's orange mangrove in Malaysia indicate that the species is a hybrid of *Bruguiera cylindrica* and *Bruguiera gymnorhiza* (Ono et al., 2016). Similar studies have not been undertaken for the Australian population in Cairns (N Duke 2017, pers comm). If a hybrid species is distinct or produces viable propagules it is considered a species for the purposes of the EPBC Act and is eligible for inclusion in the list of threatened species. Haines's orange mangrove has both of these characteristics (Cooper et al., 2016).

Species Information

Description

Haines's orange mangrove, family Rhizophoraceae, is a tree that grows to 18 m and is evergreen in Australia (Cooper et al., 2016). It has well developed buttresses that are mostly triangular (Cooper et al., 2016). It is distinguished from other *Bruguiera* taxa by its intermediate sized mature flower buds (18-22 mm long), on 3-flowered inflorescences, petals that are longer than 5 mm (8.5-10 mm long), with 9-11 calyx lobes (sepals or outermost non reproductive parts of the flower) (Cooper et al., 2016).

Distribution

In Australia, Haines's orange mangrove is known from one population adjacent to Trinity Inlet in the Cairns region (Cooper et al., 2016). This area is in the Wet Tropics IBRA bioregion (ALA 2017).

Globally, the species is sparsely distributed and occurs in Indonesia, Malaysia, Thailand, Myanmar, Philippines, Papua New Guinea, Singapore (Duke et al., 2010) and the Solomon Islands (Cooper et al., 2016). It has a very limited patchy distribution (Duke et al., 2010c).

The diversity of mangrove species decreases poleward from the equator (N Duke 2017, pers comm). Haines's orange mangrove may be discovered between its lowest latitude occurrences in Asia and its highest latitude occurrences in Cairns along the eastern coast of Cape York. Factors that influence this trend in the global distribution patterns of mangroves include global temperature gradients, global climate gradients and global dispersal mechanisms (Duke et al., 1998).

Distribution of putative parent species

Haines's orange mangrove is a putative hybrid of *B. cylindrica* and *B. gymnorhiza* (Ono et al., 2016). *Bruguiera gymnorhiza* is the more common of the two species occurring along the coast between Darwin and north-east New South Wales (ALA, 2017). Globally, it occurs in east Africa, the Middle East, south Asia and Pacific Islands (Duke et al., 2010b). *Bruguiera cylindrica* occurs between the Torres Strait and Cairns (ALA 2017). Globally, it occurs in southern Asia (Duke et al., 2010a).

In Australia these two species have an overlapping extent of 42 500 km² on the coast between the Torres Strait and Cairns (DoEE 2017). These figures are not a surrogate for the extent of occurrence or area of occupancy of Haines's orange mangrove, but may indicate the extent of suitable habitat to survey for further populations of the species.

Relevant Biology/Ecology

In Australia Haines's orange mangrove occurs in the landward mangrove zone where it is inundated only by very high tides (Cooper et al., 2016). It co-occurs with *Aegiceras corniculatum*, *B. cylindrica*, *B. gymnorhiza* and *Xylocarpus granatum* (Cooper et al., 2016). Globally, the species is found in the intermediate estuarine zone in the high intertidal region (i.e. back mangrove areas) (Robertson and Alongi 1992, cited in Duke et al., 2010c).

In Australia, flowers have been recorded in January, February and March; mature germinants were observed as scarce in February and March (Cooper et al., 2016). Maturity may be reached at 2-3 years (DoEE 2016). It may be pollinated by sunbirds (Nectariniidae) (Noske 1993). The species has very low rates of regeneration and germination (Duke et al., 2010c).

Threats

In Australia, the known population of Haines's orange mangrove is threatened by habitat loss and climate change.

Table 1 – Threats impacting Haines's orange mangrove in approximate order of severity of risk, based on available evidence.

Threat factor	Threat type and status	Evidence base
Habitat loss		
Urban and associated infrastructure development	known	Suitable habitat in relation to tide height has been lost to development in the immediate surrounding area over the past 50 to 60 years (DoEE 2016). The land where the species occurs could be rezoned potentially leading to further loss. Maintenance of power lines and clearing beneath the lines could result in tree numbers being reduced (DoEE 2016). Incidental threats associated with urban development include degradation associated with increased human visitation and weed invasion. Flood mitigation works could alter the hydrology and cause tree numbers to be reduced (DoEE 2016).
Climate change		
Rising sea levels	potential	With a rising sea-level, the habitat requirements of the species will be disrupted, and the species will suffer mortality at present locations. It may re-establish at higher elevations in areas that were previously landward zones (Ellison 2005, cited in Duke et al., 2010c). If sea-level rise continues, there will be continued mortality and re-establishment of the species (Duke et al., 2010c). As the species is slower to reproduce than other mangrove species (Duke et al., 2010c) and much of the area surrounding the Australian population is developed, it may not cope well with rapid changes in sea level.

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

Criterion 1. Population size reduction (reduction in total numbers)

Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

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

Evidence:

No long term monitoring of the species has been undertaken: the oldest Australian voucher specimen was collected in 2016 (CHAH 2018).

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 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:

In Australia, the single known population of Haines's orange mangrove has an extent of occurrence of less than 4 km² and an area of occupancy of 4 km². These figures are based on inferring the extent of occurrence of the single known location. The area of occupancy was calculated using the 2x2 km grid cell method. Haines's orange mangrove is extremely rare: a wide selection of estuaries in northern Australia have been reasonably well-surveyed by

Dr Norman C Duke and other botanists, and no other populations of Haines's orange mangrove have been recorded (DoEE 2016).

The species distribution is not severely fragmented. It has a mobile pollinator (sunbirds) (Noske 1993), mobile abiotic propagule dispersal (the ocean) and suitable habitat for dispersal within a distance that propagules can be expected to be capable of dispersing.

The species is known to occur at one location in Australia (Cooper et al., 2016).

Declines are projected in the number of mature individuals based on the risk of threats in the immediate area of the population (DoEE 2016). Threats to the species include habitat loss from urban and associated infrastructure development and climate change. Suitable habitat in the immediate surrounding area has been lost over the past 50 to 60 years (DoEE 2016).

Maintenance of power lines and clearing beneath the lines could see the tree numbers reduced (DoEE 2016).

There is no evidence of extreme fluctuations of distribution or abundance of the species.

The data presented above appear to demonstrate that the species is **eligible for listing as Critically Endangered** under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

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

Evidence:

In Australia, Haines's orange mangrove is known from a single population of about 49 plants (Cooper et al., 2016). Thirty-five of the plants have been observed with flowers and are considered to be mature and two of the plants are larger trees (greater than 30 cm diameter at breast height) (DoEE 2016). This is based on direct observations of the patch (DoEE 2016).

Evidence presented in criterion 2 indicates that the species is projected to undergo declines in the number of mature individuals.

There are less than 50 mature individuals in the single population and 100% of mature individuals occur in the single population.

There is no evidence of extreme fluctuations of abundance of the species.

The data presented above appear to demonstrate that the species is **eligible for listing as Critically Endangered** 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
D2 ¹ Only applies to the Vulnerable category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time	-	-	D2. Typically: area of occupancy < 20 km ² or number of locations ≤ 5

¹ The IUCN Red List Criterion D allows for species to be listed as Vulnerable under Criterion D2. The corresponding Criterion 4 in the EPBC Regulations does not currently include the provision for listing a species under D2. As such, a species cannot currently be listed under the EPBC Act under Criterion D2 only. However, assessments that demonstrate eligibility for listing under other criteria may include information relevant to D2. This information will not be considered by the Committee in making its assessment of the species' eligibility for listing under the EPBC Act, but may assist other jurisdictions to adopt the assessment outcome under the [common assessment method](#).

Evidence:

Evidence presented in criterion 3 indicates that the species has an extremely low number of mature individuals.

Evidence presented in criterion 2 indicates that the species has a restricted area of occupancy and number of locations.

The data presented above appear to demonstrate that the species is **eligible for listing as Critically Endangered** 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:

The Committee is not aware of a population viability analysis having been undertaken. The purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Conservation Actions

Recovery Plan

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

Primary Conservation Actions

Protect the known population from habitat loss. Survey for the species between the Torres Strait and Cairns.

Conservation and Management Priorities

Habitat loss disturbance and modifications

- Protect and prevent impacts to habitat critical to the survival of the species in the planning, construction and post construction phases of developments. Important components of this action are:
 - ensuring robust field surveys are undertaken, which account for the species' detectability, to identify the habitat areas that are critical to the survival of the species, including habitat that may become critical in the future as sea level rises.
 - educating stakeholders in the application of the assessment and approval process under the EPBC Act and their obligations under the Act to avoid significant impacts to the Haines's orange mangrove.
- Negotiate and implement conservation agreements or establish reserves to protect Haines's orange mangrove habitat. If reserves or conservation agreements are difficult to establish, the focus of conservation of the species should be protecting the species habitat from development.
- Ensure land managers and town planners are aware of the species' occurrence and provide protection measures against key and potential threats.

Translocation

- Using habitat suitability modelling as guidance, identify suitable sites for the establishment of additional populations in the wild. Relevant policies should be referred to for guidance for undertaking translocations (e.g. Vallee et al., 2004). Translocation should not pre-empt extensive surveys of potential range and risks associated with genetic pollution should be carefully considered prior to any translocation project. At this stage, translocation is just about planning: action is predicated on knowing more of the range of the species.

Survey and Monitoring priorities

- Develop habitat suitability models to determine the ecological/environmental indices responsible for the distribution of the Haines's orange mangrove, and how it may change due to sea level rise. Data may be gathered from populations outside of Australia.
- Using habitat suitability modelling as guidance, undertake surveys in suitable habitat and potential habitat to locate any additional occurrences. Surveys should be undertaken on private and public land. Sightings of the species should be reported to the Queensland Government WildNet Team via email on WildNet@science.dsitia.qld.gov.au
- Monitor the population dynamics and health of the known population (including other species of plants in the patch), including propagule production, recruitment and mortality.

Information and Research priorities

- Undertake seed germination and/or vegetative propagation trials to determine the requirements for successful establishment.
- Research is required to determine the:
 - Demographics of the species – abundance, life-span, reproductive age, size-class distribution, mortality and recruitment, etc.
 - Feasibility of salvage and translocation of the species, including techniques to maximise translocation success.
 - Genetic composition of reproductive output to improve understanding of sustainability of hybrid populations.
 - Feasibility of international conservation effort for the species.

References cited in the advice

- Cooper WE, Kudo H & Duke NC (2016). *Bruguiera hainesii* C.G.Rogers (Rhizophoraceae), an endangered species recently discovered in Australia. *Austrobaileya* 9(4): 482-487.
- Duke N, Ball M & Ellison J (1998). Factors influencing biodiversity and distributional gradients in mangroves. *Global Ecology & Biogeography Letters*, 7(1), 27-47.
- Duke N, Kathiresan K, Salmo III SG, Fernando ES, Peras JR, Sukardjo S & Miyagi T (2010a). *Bruguiera cylindrica*. *The IUCN Red List of Threatened Species 2010*: e.T178840A7623394.
- Duke N, Kathiresan K, Salmo III SG, Fernando ES, Peras JR, Sukardjo S & Miyagi T (2010b). *Bruguiera gymnorhiza*. *The IUCN Red List of Threatened Species 2010*: e.T178803A7610926.
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- Noske RA (1993). *Bruguiera hainesii*: another bird-pollinated mangrove? *Biotropica*, 25(4), 481-483.
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- Vallee L, Hogbin T, Monks L, Makinson B, Matthes B & Rossetto M (2004). *Guidelines for the translocation of threatened plants in Australia - Second Edition*. Canberra, ACT: Australian Network for Plant Conservation.

Other sources cited in the advice

- ALA (Atlas of Living Australia) (2017). *Atlas of Living Australia*. Available on the Internet: <https://www.ala.org.au/>
- CHAH (Council of Heads of Australasian Herbaria) (2017). *Australian Plant Name Index*. Available on the Internet: <https://biodiversity.org.au/nsl/services/apni>
- CHAH (Council of Heads of Australasian Herbaria) (2018). *Australian Virtual Herbarium*. Available on the Internet: <http://avh.chah.org.au/>

DoEE (Department of the Environment and Energy (2016). *Threatened Species Nomination Form, 2015/16 Nomination Period, Bruguiera hainesii*. Nomination form provided by a member of the public.

DoEE (Department of the Environment and Energy (2017). *Extent of occurrence and area occupancy of Bruguiera hainesii and potential distribution*.

Duke N (2017). Personal communication via email, July 2017. Professorial Research Fellow, Mangrove Hub, TropWATER - Centre for Tropical Water and Aquatic Ecosystem Research, James Cook University.

Collective list of questions – your views

SECTION A GENERAL

1. Is the information used to assess the nationally threatened status of the species robust? Have all the underlying assumptions been made explicit? Please provide justification for your response.
2. Can you provide additional data or information relevant to this assessment?
3. Have you been involved in previous state, territory or national assessments of this species/subspecies? If so, in what capacity?
4. Is the species a hybrid in Australia?
5. Is there any information of the impact of pond apple on the species?

PART 1 – INFORMATION TO ASSIST LISTING ASSESSMENT

SECTION B DO YOU HAVE ADDITIONAL INFORMATION ON THE ECOLOGY OR BIOLOGY OF THE SPECIES? (If no, skip to section C)

Biological information

6. Can you provide any additional or alternative references, information or estimates on longevity, average life span and generation length?
7. Do you have any additional information in the ecology or biology of the species not in the current advice/plan?

SECTION C ARE YOU AWARE OF THE STATUS OF THE TOTAL NATIONAL POPULATION OF THE SPECIES? (If no, skip to section D)

Population size

8. Has the survey effort for this taxon been adequate to determine its national adult population size? If not, please provide justification for your response.
9. Do you consider the way the population size has been derived to be appropriate? Are there any assumptions and unquantified biases in the estimates? Did the estimates measure relative or absolute abundance? Do you accept the estimate of the total population size of the species? If not, please provide justification for your response.

10. If not, can you provide a further estimate of the current population size of mature adults of the species (national extent)? Please provide supporting justification or other information.

If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of possible subspecies numbers, and also choose the level of confidence you have in this estimate:

Number of mature individuals is estimated to be in the range of:

- 1–50 51–250 251–1000 >1000 >10 000

Level of your confidence in this estimate:

- 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
- 31–50% - more than a guess, some level of supporting evidence
- 51–95% - reasonably certain, information suggests this range
- 95–100% - high level of certainty, information indicates quantity within this range
- 99–100% - very high level of certainty, data are accurate within this range

SECTION D ARE YOU AWARE OF TRENDS IN THE OVERALL POPULATION OF THE SPECIES? (If no, skip to section E)

11. Does the current and predicted rate of decline used in the assessment seem reasonable? Do you consider that the way this estimate has been derived is appropriate? If not, please provide justification of your response.

Evidence of total population size change

12. Are you able to provide an estimate of the total population size during the early 1990s (*at or soon after the start of the most recent three generation period*)? Please provide justification for your response.

If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of possible subspecies numbers, and also choose the level of confidence you have in this estimate.

Number of mature individuals is estimated to be in the range of:

- 1–50 51–250 251–1000 >1000 >10 000

Level of your confidence in this estimate:

- 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
- 31–50% - more than a guess, some level of supporting evidence
- 51–95% - reasonably certain, information suggests this range
- 95–100% - high level of certainty, information indicates quantity within this range
- 99–100% - very high level of certainty, data are accurate within this range

13. Are you able to comment on the extent of decline in the species/subspecies' total population size over the last approximately 50 years? Please provide justification for your response.

If, because of uncertainty, you are unable to provide an estimate of decline, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of decline, and also choose the level of confidence you have in this estimated range.

Decline estimated to be in the range of:

- 1–30% 31–50% 51–80% 81–100% 90–100%

Level of your confidence in this estimated decline:

- 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
- 31–50% - more than a guess, some level of supporting evidence
- 51–95% - reasonably certain, suggests this range of decline
- 95–100% - high level of certainty, information indicates a decline within this range
- 99–100% - very high level of certainty, data are accurate within this range

14. Please provide (if known) any additional evidence which shows the population is stable, increasing or declining.

SECTION E ARE YOU AWARE OF INFORMATION ON THE TOTAL RANGE OF THE SPECIES? (If no, skip to section F)

Current Distribution/range/extent of occurrence, area of occupancy

15. Does the assessment consider the entire geographic extent and national extent of the species/subspecies? If not, please provide justification for your response.
16. Has the survey effort for this species/subspecies been adequate to determine its national distribution? If not, please provide justification for your response.
17. Is the distribution described in the assessment accurate? If not, please provide justification for your response and provide alternate information.
18. Do you agree that the way the current extent of occurrence and/or area of occupancy have been estimated is appropriate? Please provide justification for your response.
19. Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the extent of occurrence and/or area of occupancy.

If, because of uncertainty, you are unable to provide an estimate of extent of occurrence, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of extent of occurrence, and also choose the level of confidence you have in this estimated range.

Current extent of occurrence is estimated to be in the range of:

- <100 km² 100 – 5 000 km² 5 001 – 20 000 km² >20 000 km²

Level of your confidence in this estimated extent of occurrence

- 0–30% - low level of certainty/ a bit of a guess/ not much data to go on
- 31–50% - more than a guess, some level of supporting evidence
- 51–95% - reasonably certain, data suggests this range of decline
- 95–100% - high level of certainty, data indicates a decline within this range
- 99–100% - very high level of certainty, data is accurate within this range

If, because of uncertainty, you are unable to provide an estimate of area of occupancy, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of area of occupancy, and also choose the level of confidence you have in this estimated range.

Current area of occupancy is estimated to be in the range of:

- <10 km² 11 – 500 km² 501 – 2000 km² >2000 km²

Level of your confidence in this estimated extent of occurrence:

- 0–30% - low level of certainty/ a bit of a guess/ not much data to go on
- 31–50% - more than a guess, some level of supporting evidence
- 51–95% - reasonably certain, data suggests this range of decline
- 95–100% - high level of certainty, data indicates a decline within this range
- 99–100% - very high level of certainty, data is accurate within this range

SECTION F ARE YOU AWARE OF TRENDS IN THE TOTAL RANGE OF THE SPECIES? (If no, skip to section G)

Past Distribution/range/extent of occurrence, area of occupancy

20. Do you consider that the way the historic distribution has been estimated is appropriate?
Please provide justification for your response.
21. Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the former extent of occurrence and/or area of occupancy.

If, because of uncertainty, you are unable to provide an estimate of past extent of occurrence, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of past extent of occurrence, and also choose the level of confidence you have in this estimated range.

Past extent of occurrence is estimated to be in the range of:

- <100 km² 100 – 5 000 km² 5 001 – 20 000 km² >20 000 km²

Level of your confidence in this estimated extent of occurrence

- 0–30% - low level of certainty/ a bit of a guess/ not much data to go on
- 31–50% - more than a guess, some level of supporting evidence

- 51–95% - reasonably certain, data suggests this range of decline
- 95–100% - high level of certainty, data indicates a decline within this range
- 99–100% - very high level of certainty, data is accurate within this range

If, because of uncertainty, you are unable to provide an estimate of past area of occupancy, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of past area of occupancy, and also choose the level of confidence you have in this estimated range:

Past area of occupancy is estimated to be in the range of:

- <10 km² 11 – 500 km² 501 – 2000 km² >2000 km²

Level of your confidence in this estimated extent of occurrence:

- 0–30% - low level of certainty/ a bit of a guess/ not much data to go on
- 31–50% - more than a guess, some level of supporting evidence
- 51–95% - reasonably certain, data suggests this range of decline
- 95–100% -high level of certainty, data indicates a decline within this range
- 99–100% - very high level of certainty, data is accurate within this range

PART 2 – INFORMATION FOR CONSERVATION ADVICE ON THREATS AND CONSERVATION ACTIONS

SECTION G DO YOU HAVE INFORMATION ON THREATS TO THE SURVIVAL OF THE SPECIES? (If no, skip to section H)

22. Do you consider that all major threats have been identified and described adequately?
23. To what degree are the identified threats likely to impact on the species/subspecies in the future?
24. Are the threats impacting on different populations equally, or do the threats vary across different populations?
25. Can you provide additional or alternative information on past, current or potential threats that may adversely affect the species/subspecies at any stage of its life cycle?
26. Can you provide supporting data/justification or other information for your responses to these questions about threats?

SECTION H DO YOU HAVE INFORMATION ON CURRENT OR FUTURE MANAGEMENT FOR THE RECOVERY OF THE SPECIES? (If no, skip to section I)

27. What planning, management and recovery actions are currently in place supporting protection and recovery of the species/subspecies? To what extent have they been effective?
28. Can you recommend any additional or alternative specific threat abatement or conservation actions that would aid the protection and recovery of the species/subspecies?

29. Would you recommend translocation (outside of the species' historic range) as a viable option as a conservation actions for this species/subspecies?

SECTION I DO YOU HAVE INFORMATION ON STAKEHOLDERS IN THE RECOVERY OF THE SPECIES?

30. Are you aware of other knowledge (e.g. traditional ecological knowledge) or individuals/groups with knowledge that may help better understand population trends/fluctuations, or critical areas of habitat?

31. Are you aware of any cultural or social importance or use that the species has?

32. What individuals or organisations are currently, or potentially could be, involved in management and recovery of the species/subspecies?

33. How aware of this species are land managers where the species is found?

34. What level of awareness is there with individuals or organisations around the issues affecting the species/subspecies?

a. Where there is awareness, what are these interests of these individuals/organisations?

b. Are there populations or areas of habitat that are particularly important to the community?

PART 3 – ANY OTHER INFORMATION

35. Do you have comments on any other matters relevant to the assessment of this species?