Abridged Threatened Species Nomination Form

For nominations/assessments under the Common Assessment Method (CAM) where supporting information is available, but not in a format suitable for demonstrating compliance with the CAM, and assessment against the IUCN Red List threat status.

Cover Page *(Office use only for Assessment)*

Species name (scientific and common name)**:**	***Euploea alcathoe enastri*** **Gove Crow Butterfly**
Nomination for (addition, deletion, change)**:**	**deletion**
Nominated conservation category and criteria:	

Scientific committee assessment of eligibility against the criteria:		
This assessment is consistent with the standards set out in Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding.		Yes ☐ No ☐
A.	Population size reduction	•
B.	Geographic range	•
C.	Small population size and decline	•
D.	Very small or restricted population	•
E.	Quantitative analysis	•

Outcome*:*			
Scientific committee Meeting date:			
Scientific committee comments:			
Recommendation:			
Ministerial approval:		*Date of Gazettal/ Legislative effect:*	

Nomination/Proposal summary *(to be completed by nominator)*

Current conservation status				
Scientific name:	*Euploea alcathoe enastri*			
Common name:	Gove Crow Butterfly			
Family name:	Nymphalidae	Fauna ☒	Flora ☐	
Nomination for:	Listing ☐	Change of status/criteria ☐	Delisting ☒	

1. *Is the species currently on any conservation list, either in a State or Territory, Australia or Internationally?* 2. *Is it present in an Australian jurisdiction, but not listed?*	*Provide details of the occurrence and listing status for each jurisdiction in the following table*

Jurisdiction	**State / Territory in which the species occurs**	**Date listed or assessed (or N/A)**	**Listing category i.e. critically endangered or 'none'**	**Listing criteria i.e. B1ab(iii)+2ab(iii)**
International (IUCN Red List)			none	
National (EPBC Act)		2003	Endangered	Criterion 2
State / Territory	1. NT	2012	Near Threatened	
	2. EN	2002	Endangered	B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv)
	3.			

Consistent with Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding, it is confirmed that:	
• this assessment meets the standard of evidence required by the Common Assessment Method to document the eligibility of the species under the IUCN criteria;	Yes ☒ No ☐
Comments:	
• surveys of the species were adequate to inform the assessment;	Yes ☒ No ☐
Comments:	Braby (2010) reported on extensive surveys of potential habitat patches within and adjacent to the known distribution of the species in north-eastern Arnhem Land. These were in conjunction with Indigenous Ranger groups familiar with the country and trained in identification and survey of this butterfly species. Aerial photography and GIS spatial data held by NTG were used to identify potentially suitable patches of spring-fed and riparian evergreen monsoon vine-forest, as were location data for specimen of the larval food-plant, *Parsonia alboflavescens*. Logistic constraints limited surveys to only 46 of more than 100 potential sites identified. Surveys occurred in the dry seasons (June-October) 2006-2008.
• the conclusion of the assessment remains current and that any further information that may have become available since the assessment was completed supports or is consistent with the conclusion of the assessment.	Yes ☒ No ☐

Comments:	

Nominated national conservation status: category and criteria

Presumed extinct (EX) ☐ Critically endangered (CR) ☐ Endangered (EN) ☐ Vulnerable (VU) ☐

None (least concern) ☒ Data Deficient ☐ Conservation Dependent ☐

What are the IUCN Red List criteria that support the recommended conservation status category?	**See species' summary document**

Eligibility against the IUCN Red List criteria (A, B, C, D and E)

*Provide justification for the nominated conservation status; is the species eligible or ineligible for listing against the five criteria. For **delisting**, provide details for why the species no longer meets the requirements of the current conservation status.*

A.	Population size reduction (evidence of decline)	
B.	Geographic range (EOO and AOO, number of locations and evidence of decline)	
C.	Small population size and decline (population size, distribution and evidence of decline)	
D.	Very small or restricted population (population size)	
E.	Quantitative analysis (statistical probability of extinction)	

Summary of assessment information

EOO	9100 km²	AOO	<100 km² using the 2km x 2km grid method	Generation length	unknown

No. locations	11	Severely fragmented	Yes ☐ No ☒ Unknown ☐
No. subpopulations	11	No. mature individuals	unknown

Percentage global population within Australia	100%
Percentage population decline over 10 years or 3 generations	There is no evidence of decline

Threats *(detail how the species is being impacted)*

Threat *(describe the threat and how it impacts on the species. Specify if the threat is past, current or potential)*	Extent *(give details of impact on whole species or specific subpopulations)*	Impact *(what is the level of threat to the conservation of the species)*
Habitat modification through weed invasion, especially introduced pasture grasses (perennial Mission Grass and Gamba Grass). Current and increasing.	Currently a problem near human communities. Has the potential to spread throughout the extensive savannah woodland that is the matrix of the species' AOO.	Currently low
Habitat loss through altered fire regimes (especially when combined with introduced pasture grasses). Current and increasing.	The species' inhabits pockets of coastal monsoon vine-forest and adjacent melaleuca swampland, within a matrix of savannah and tall-open woodland. Fires are carried in the woodland matrix and adversely effect the edges of vine forest and swampland habitat.	Currently low-medium Potentially high
Predation and habitat modification by tramp ants (Yellow Crazy Ants). Not currently recorded from the known distribution (in 2006) but exist on the Gove Peninsula and are spreading. Current and potential.	These ants alter the structure and composition of rainforest vegetation. The ants also prey on invertebrates (especially larvae), resulting significant reductions in invertebrate populations. Potential, not current threat.	Currently nil Potentially high
Habitat disturbance by feral water buffalo and pigs. Current and potential.	Feral buffalo and pigs have been on the Gove Peninsula since the 1980s. Both species disturb and degrade monsoon-forest patches and can influence hydrology.	Numbers of buffalo and pigs are currently relatively low, so impact is currently low
Changed hyrology from local bauxite mining in adjacent woodlands. Current and potential.	Restricted in area to those habitat patches close to proposed mining.	Potentially medium-high
Increased frequency and or intensity of cyclones and sea-level rise resulting from climate change. Predicted.	100% of the distribution is in cyclone-prone habitat and coastal flood-plains.	unknown

Management and Recovery	
Is there a Recovery Plan (RP) or Conservation Management Plan operational for the species?	Yes ☒ No ☐
List all relevant recovery or management plans (including draft, in-preparation, out-of-date, national and	

State/Territory recovery plans, recovery plans for other species or ecological communities, or other management plans that may benefit or be relevant to the nominated species).

- National Recovery Plan For The Gove Crow Butterfly Euploea alcathoe enastri.
- Dhimurru IPA Management Plan 2015-2022.

List current management or research actions, if any, that are being undertaken that benefit the conservation of the species.

- Indigenous Ranger groups in the Dhimurru and Laynhapuy IPAs undertake fire management, feral buffalo and pig management and weed management on the Gove Peninsula.
- CSIRO, Dhimurru Aboriginal Corporation and Rio Tinto program: Yellow crazy ant eradication in north-east Arnhem Land in the Northern Territory in collaboration with Dhimurru (http://www.csiro.au/en/Research/BF/Areas/Managing-the-impacts-of-invasive-species/Managing-pest-ants?ref=/CSIRO/Website/Research/Animals-and-plants/Managing-pests-and-weeds/Managing-pest-ants)

List further recommended management or research actions, if any, that would benefit the conservation of the species. Please ensure that this section addresses all identified threats.

- See actions outlined in the *Evidence on Listing Eligibility and Conservation Actions 2016*.

Nomination prepared by:	
Contact details:	
Date submitted:	05/12/16

If the nomination has been refereed or reviewed by experts, please provide their names and contact details:

Dr Michael Braby, The Australian National Insect Collection, michael.braby@anu.edu.au was consulted in April 2017. See publication by Michael F. Braby (2010) Conservation status and management of the Gove Crow *Euploea alcathoe enastri* (Lepidoptera: Nymphalidae), a threatened tropical butterfly from the indigenous Aboriginal lands of north-eastern Arnhem Land, Australia. *Journal of Insect Conservation* **14:** 535–554.

Summary of subpopulation information *(detailed information to be provided in the relevant sections of the form)*						
Location *(include coordinates)*	Land tenure	Survey information: Date of survey and No. mature individuals	Area of subpopulations	Site / habitat Condition	Threats *(note if past, present or future)*	Specific management actions

Evidence on Listing Eligibility and Conservation Actions 2016

Euploea alcathoe enastri (Gove Crow Butterfly)

Priority: 1. Endemic
Action: Commonwealth to remove from EPBC threatened species listing
Notes: Based on new information since EPBC listing

Taxonomy

Conventionally accepted as *Euploea alcathoe enastri* (Godart 1819) (NYMPHALIDAE)

Nominated Status: **EPBC/CAM,** not listed; **TPWCA,** Near Threatened (B1+2)

Current EPBC Act status: Endangered (B1ab(i,ii,iii,v)+2ab(i,ii,iii,v))
Current TPWC Act status: Near Threatened (B1+2)

Species Information

Description

The Gove Crow Butterfly is a large brown-black butterfly with small white spots at the edge of the wings (Braby 2000). This butterfly has a wingspan of about 7 cm (Wilson 2002). The male is velvet-black above and dark black-brown beneath. The female is paler chocolate-brown.

Distribution

The Gove Crow is a Northern Territory (NT) endemic, restricted to north-eastern Arnhem Land. It was first discovered at Rocky Bay near Yirrkala in 1988 by G. Martin, and was subsequently recorded at three other locations, including Mosquito Creek (Port Bradshaw), near Mount Bonner, and the upper Goromuru River (Fenner 1991, 1992). Surveys carried out during 2006–2008 by Braby (2010) confirm that the subspecies has a limited geographical range (extent of occurrence approximately 9100 km^2) within which it is recorded from 21 sites clustered within 11 locations or subpopulations. Most sites comprise discrete habitat patches that are small in area (<10 ha) within which adults are localised and occur in relatively low abundance.

Adequacy of Survey

Braby (2010) carried out extensive surveys of potential habitat patches within and adjacent to the known distribution of the subspecies in north-eastern Arnhem Land. This was in conjunction with Indigenous Ranger groups familiar with the country and trained in identification and survey of this butterfly subspecies.

Aerial photography and GIS spatial data held by NTG were used to identify potentially suitable patches of spring-fed and riparian evergreen monsoon vine-forest, as were location data for specimen of the larval food-plant, *Parsonia alboflavescens*. Logistic constraints limited surveys to only 46 of more than 100 potential sites identified. Surveys occurred in the dry seasons (June-October) 2006-2008.

Relevant Biology/Ecology

Larval stages of *E. a. enastri* are found associated with several species of vines in the Family Apocynaceae, and the preferred larval food plant appears to be Parsonsia alboflavescens (Braby 2009). This subspecies occurs in patches of mixed paperbark tall open forest with rainforest elements in the understorey and rainforest edge (i.e. the ecotone between evergreen monsoon vine-forest and eucalypt/paperbark woodland). These wet monsoon forest patches are

always associated with permanent creeks or perennial groundwater seepages or springs that form swamplands, usually along drainage lines or flood plains in coastal or near coastal lowland areas.

Males are usually observed within small glades inside the forest or near its boundary with the surrounding savanna woodland. Females are more commonly observed in tall paperbark swampland at the edge of the rainforest (Fenner 1991; L. Wilson pers. Comm.).

Dr Michael Braby has done most of the survey work for the species, with an emphasis on defining the subspecies' distribution and habitat requirements. Typically, numbers of adults seen at a site were small (some sites only one or two, other sites had 10s of adults). He believes the subspecies may breed all year round and is probably long-lived (it is a relatively large butterfly). There may be some movement of individuals between adjacent habitat patches but the subspecies is largely sedentary. He found no evidence of the population undergoing extreme fluctuations.

The subspecies' critical breeding habitats are subject to natural disturbance by both fire and flood, and occasionally cyclonic events. As a consequence, an optimal balance in disturbance regime is probably required to sustain breeding populations.

Unpublished studies (Braby pers. comm.) show that the genetic diversity of *Euploea alcathoe enastri* is considerably higher than in the Queensland or New Guinea subspecies. Structuring of this diversity within the subspecies has not been explored.

Threats

Braby (2010) identified four threats to the habitat of this subspecies. Two major threats operating at a site level are: (1) habitat modification through altered fire regimes; and (2) habitat disturbance by feral animals (buffalo, pig). At the landscape scale, potential threats identified are: (3) habitat loss through invasive species (grassy weeds, yellow crazy ants); and (4) global climate change.

Changes in the frequency, intensity and patchiness of fire in the landscape on the Gove Peninsula may ultimately lead to the demise of the monsoon rainforest patches, the critical habitat of the Gove Crow. Such changes may be exacerbated by the fuel loads supported by exotic invasive grasses such as Mission Grass, which has become established in the town of Nhulunbuy. This grass increases the fuel load normally found in native savannas by 3-5 fold and, as a perennial, pushes the burning season later into the drier, windier time of the year (Panton 1993). Mission Grass carries destructive hot fires into the edges of monsoon rainforest patches, leading to their shrinkage and eventual disappearance. If the rapid spread around Darwin (Kean and Price 2003) is repeated around Nhulunbuy, the resultant increase in intensity of fires on the Gove Peninsula may cause the disappearance of many wet rainforest patches, including those on which the Gove Crow depends.

There is widespread concern that traditional knowledge and land management practices amongst the Yolngu Aboriginal community in north-eastern Arnhem Land are not being passed on from elders to the next generation. This knowledge and management includes an understanding of traditional burning practices – the frequency and seasonal timing of patch burns. It is important that traditional land management practices are maintained on Gove Peninsula: incorrect (excessive) burning will ultimately reduce the extent of the monsoon rainforest patches.

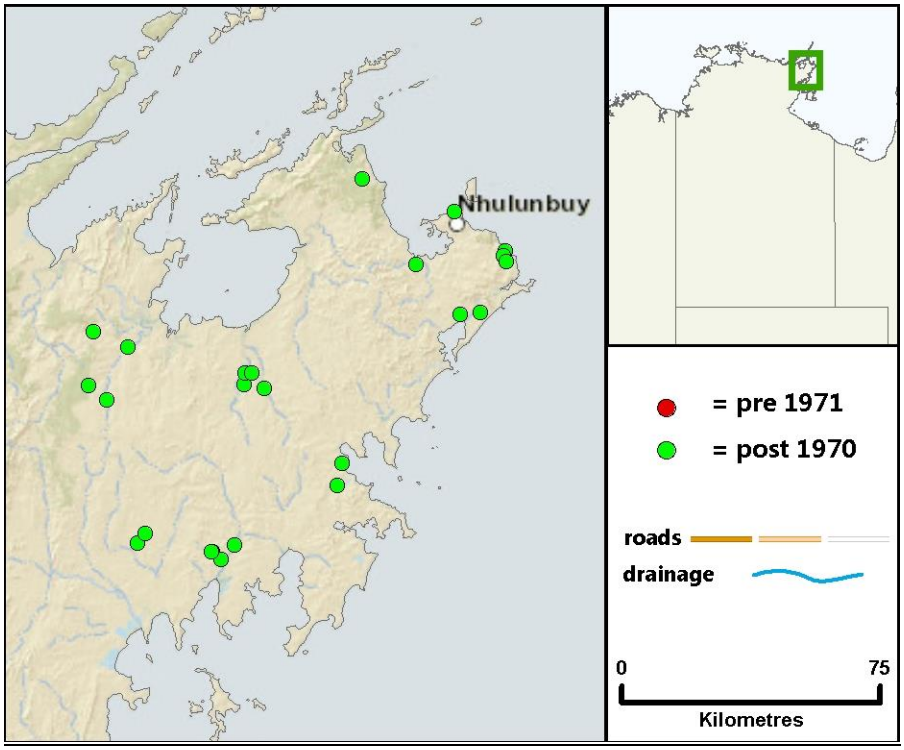
In addition, overland access to Nhulunbuy has been recently upgraded, as has the local network of roads across the Peninsula. The more intensive land use and greater ease of access within this region has led to an increase in the frequency and extent of fires. An increase in fire associated with the road in Central Arnhem Land has already been implicated in the

disappearance of patches of monsoon rainforest similar to that used by the Gove Crow (W. Panton pers. comm.).

Feral animals, particularly Water Buffalo, *Bubalus bubalis*, and to a lesser extent Feral Pig, *Sus scrofa*, occur on the Gove Peninsula. These animals are known to damage or degrade monsoon rainforest patches through their effects on understorey plants, and are thus a potential threat to the integrity of the habitat of the Gove Crow, especially the swamplands adjacent to the monsoon rainforest. The population size and density of buffalo and pigs currently appears to be relatively low, but if increased this could have a negative impact in the long-term.

There are two other potential emerging threats. There are plans to strip mine bauxite in woodland areas close to Gove, a process that will change the hydrology in the local surrounding area, possibly resulting in drying of adjacent habitat patches occupied by the Gove Crow. This will only affect patches close to proposed mining. The second is from climate change resulting in more intense cyclones across the Top End. This area is currently prone to cyclones but more intense cyclones are likely to result in greater damage to habitats on which the Gove Crow depends.

The most influential threats of habitat modification through altered fire regimes and habitat disturbance by feral animals (buffalo, pig). Hence, known sites were grouped into locations (11) on the basis of shared drainage patterns, i.e. catchments of creeks. Since these butterflies are most likely to move / disperse along riparian corridors (not across open savanna woodland), locations also equated to sub-populations.



Assessment of available information in relation to the listing Criteria

Criterion A. Population size reduction (reduction in total numbers) Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	**Endangered Severe reduction**	**Vulnerable Substantial reduction**
A1	**≥ 90%**	**≥ 70%**	**≥ 50%**
A2, A3, A4	**≥ 80%**	**≥ 50%**	**≥ 30%**

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

A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(*a) cannot be used for A3*]

A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

based on any of the following:

(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:
Euploea alcathoe enastri has a limited spatial distribution and is ecologically specialised, but there is no evidence of past decline, either observed or inferred. There may be decline in habitat quality or extent in the future (inferred) if inappropriate fire regimes, land-use intensification, and/or habitat degradation by feral animals continues. The level of reduction is unquantified but is unlikely to be at a substatial rate (higher than the threshold level for Vulnerable (A3)). As a consequence, the subspecies does not meet this criterion for listing as nationally threatened.

Criterion B. 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:
Surveys carried out during 2006–2008 by Braby (2010; pers. comm.) indicate that the subspecies has a limited geographical range (extent of occurrence approximately 9100 km^2) within which it is recorded from 11 locations or subpopulations embracing a total of 21 sites and an area of occupancy of <100 km^2. Most sites comprise discrete habitat patches that are small in area (<10 ha) within which adults are localised and occur in relatively low abundance.

Although *Euploea alcathoe enastri* has a limited spatial distribution and is ecologically specialised, there is no evidence of past decline, either observed or inferred. There may be decline in habitat quality or extent in the future (inferred) if inappropriate fire regimes, land-use intensification, and/or habitat degradation by feral animals continues. The scale and certainty of such a future decline is difficult to establish, based on current evidence.

There is no evidence that the subspecies undergoes extreme fluctuations in numbers or extent (M. Braby pers. comm.).

Based on the evidence presented above, *Euploea alcathoe enastri* has an Extent of Occurrence smaller than the IUCN threshold (B1) for Vulnerable, an Area of Occupancy smaller than the IUCN threshold (B2) for Endangered, and future decline in habitat quality and extent is inferred ((b(iii)). However the subspecies is known from more than ten locations, is not severely fragmented and does not experience extreme fluctuations in numbers or distribution. As a consequence, the subspecies does not meet this criterion for listing as nationally threatened.

Criterion C. 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:
The subspecies is known from 21 patches of rainforest-edge and *Melaleuca* forest habitat. Each patch is <10 ha and numbers of adults flying at any one time in each is small. The total number of mature adults each breeding season is probably smaller than the IUCN threshold for Vulnerable under this criterion.

Although the butterfly has a limited spatial distribution and is ecologically specialised, there is no evidence of past decline, either observed or inferred. There may be decline in habitat quality or extent in the future (inferred) if inappropriate fire regimes, land-use intensification, and/or habitat degradation by feral animals continues. The potential level of decline is unquantified but is unlikely to be at a substantial rate (higher than the threshold level for Vulnerable – C1).

Typically, number of adults seen at each location is small but it is unclear how such numbers are indicative of the total population size at each location. No one subpopulation dominates the whole population and there is no evidence that the subspecies undergoes extreme fluctuations in numbers or extent (M. Braby pers. comm.).

In summary, *Euploea alcathoe enastri* probably has a population size smaller than the IUCN threshold (C) for Vulnerable. There is a potential for future decline; the rate is unquantified but unlikely to exceed the threshold for C1. There are small numbers of adult individuals within subpopulations, possibly below thresholds for C2a(i). However, within the context of invertebrate populations with seasonal cycles and several larval stages, it is not clear that this makes the survival of the population 'precarious'. The subspecies does not meet subcriteria C2a(ii) or C2b.

Consequently, the subspecies does not meet this criterion for listing as nationally threatened.

Criterion D. Number of mature individuals			
	Critically Endangered Extremely low	**Endangered Very Low**	**Vulnerable Low**
D. Number of mature individuals	**< 50**	**< 250**	**< 1,000**
D2. *Only applies to the VU category* Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	**-**	**-**	**D2. Typically: AOO < 20 km^2 or number of locations ≤ 5**

Evidence:
The subspecies is known from 21 patches of rainforest-edge and *Melaleuca* forest habitat. Each patch is <10 km^2 and numbers of adults flying at any one time in each is small. However, the total number of mature adults each breeding season is probably greater than the IUCN threshold for Vulnerable (D). The Area of Occupancy exceeds the threshold for D2, as does the number of locations. As a consequence, the subspecies does not meet this criterion for listing as nationally threatened.

Criterion E. 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:
There has been no such analysis done for the Gove Crow and there are insufficient quantitative data available to do so.

Summary

The conservations status of *Euploea alcathoe enastri* approaches Vulnerable (B1, B2). Braby (2010, pers. comm.) indicated that the subspecies has a limited geographical range (extent of occurrence approximately 9100 km^2) within which it is recorded from 11 locations or subpopulations across a total of 21 sites. Most sites comprise discrete habitat patches that are small in area (<10 ha) within which adults are localised and occur in relatively low abundance. However the subspecies is known from more than ten locations, is not severely fragmented and does not experience extreme fluctuations in numbers or distribution. There are several potential threats including fire, feral herbivores, and habitat change, such that there is an inferred future decline if these threats are not controlled. The subspecies will remain listed in the non-CAM category of Near Threatened in the Northern Territory as it approaches qualifying for Vulnerable under criteria (B1+2).

Conservation Actions

Conservation and Management Priorities

Management priorities are to:
i. control and eradicate Mission Grass, and maintain vigilance against other grassy weeds that have the potential to become serious threats on the Gove Peninsula;
ii. maintain appropriate fire management practices;
iii. develop and maintain a survey, monitoring and eradication program for the yellow crazy ant; and
iv. develop a feral animal survey and control strategy for buffalo and pigs.

The entire distribution of the subspecies is on Indigenous-owned lands. Any long-term conservation management plan of the butterfly and its habitat will largely depend on the cooperation of traditional landowners and involvement of local indigenous ranger groups. Consequently, any management plan must incorporate development and involvement of those local indigenous rangers, education and community awareness, as well as the research and management priorities listed above (Braby 2010).

Survey and Monitoring priorities

Maintain a long-term monitoring program at key sites to detect possible changes in breeding range or abundance, and to measure the impacts of threatening processes.

Information and research priorities

Research priorities are to investigate the basic biology and ecology of the subspecies to determine population attributes such as population size, longevity, movement patterns and Dry season behaviour; breeding and aggregation sites can then be identified and protected.

References cited in the advice

Ackery, P. A., and R. I. Vane-Wright (1984). Milkweed Butterflies: their Cladistics and Biology. British Museum (Natural History), London.

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