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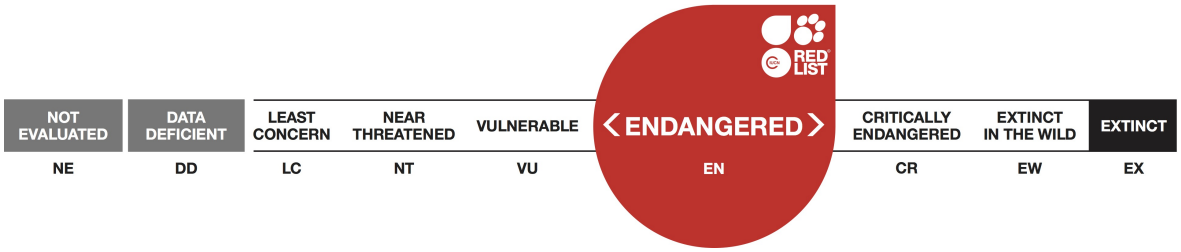
Brachylophus bulabula, Fiji Banded Iguana

Assessment by: Fisher, R., Grant, T. & Harlow, P.



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Reptilia	Squamata	Iguanidae

Taxon Name: *Brachylophus bulabula* Fisher, Harlow, Edwards & Keogh, 2008

Synonym(s):

- *Brachylophus fasciatus*

Common Name(s):

- English: Fiji Banded Iguana, Central Fijian Banded Iguana, Fijian Banded Iguana

Taxonomic Source(s):

Keogh, J.S., Edwards, D.L., Fisher, R.N. and Harlow, P.S. 2008. Molecular and morphological analysis of the critically endangered Fijian iguanas reveals cryptic diversity and a complex biogeographic history. *Philosophical Transactions of the Royal Society Biological Sciences* 363(1508): 3413-3426.

Taxonomic Notes:

Prior to analysis by Keogh *et al.* (2008), all the banded iguanas were lumped as a single species. The Fiji Banded Iguana (*Brachylophus bulabula*) is now recognized as distinct from the Lau Banded Iguana (*Brachylophus fasciatus*). Most previous references pertaining to iguanas in central Fiji are now attributed to *B. bulabula*. Morphological data from recent surveys suggest there may be more than one taxa within the *bulabula* group. On two islands north of Vanua Levu (Mali and Cikobia), iguanas show marked variation in adult body size and some scale counts when compared to southern populations, for example, Makodroga and Kadavu. However, more samples and DNA analysis is needed to develop detailed comparisons (R. Fisher and P. Harlow pers. comm. 2011).

Assessment Information

Red List Category & Criteria: Endangered A2bce+4bce ver 3.1

Year Published: 2012

Date Assessed: June 19, 2012

Justification:

Fiji Banded Iguanas have experienced significant declines of at least 50% in the last few decades. This species is not secure on any of the remaining islands where it occurs. Population surveys have shown iguanas to be very rare over most of their presumed range. Local extinctions have occurred on several islands, particularly where alien mongooses have been introduced in recent years. At the present rate of habitat fragmentation and loss, it is predicted the iguana will experience additional declines. Continued range expansion of the newly introduced larger species of mongoose is expected on Viti Levu, creating an additional predatory threat to this species.

Geographic Range

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Range Description:

Fiji Banded Iguanas are found primarily on wet islands in the central parts of Fiji. On the two largest islands, there are at least two credible reports in the last few years of this iguana still being found on Viti Levu in extremely remote central forest areas. The introduced Small Asian Mongoose (*Herpestes javanicus*) seldom, if ever, penetrates to these remote forest areas (Olson *et al*. 2006). There are no reliable reports from Vanua Levu, however, and they are assumed to be extirpated. There are multiple reports of iguanas being captured in towns and suburban areas; however, it is believed these are escaped pets brought in by visiting Fijians from outer islands and are not part of a viable population. If iguanas still persist on Viti Levu, it is possible there are multiple fragmented subpopulations on this island based on the area of remaining suitable habitat.

Currently it is believed iguanas persist only on several of the next largest islands in the south central area (for example, Kadavu, Ovalau, and Gau) and only two islands north of Vanua Levu (Mali and Cikobia). It is likely that iguanas have been extirpated from several islands north of Vanua Levu (for example, Macuata-i-Wai, Druadrua, and Tutu) and at least one island south of Viti Levu (Beqa), since extensive recent surveys have failed to confirm their presence and on some of these islands there is no suitable habitat remaining for iguanas (R. Fisher pers. comm).

Iguanas are expected to occur up to 500 m above sea level, although they have only been recently observed below 200 m.

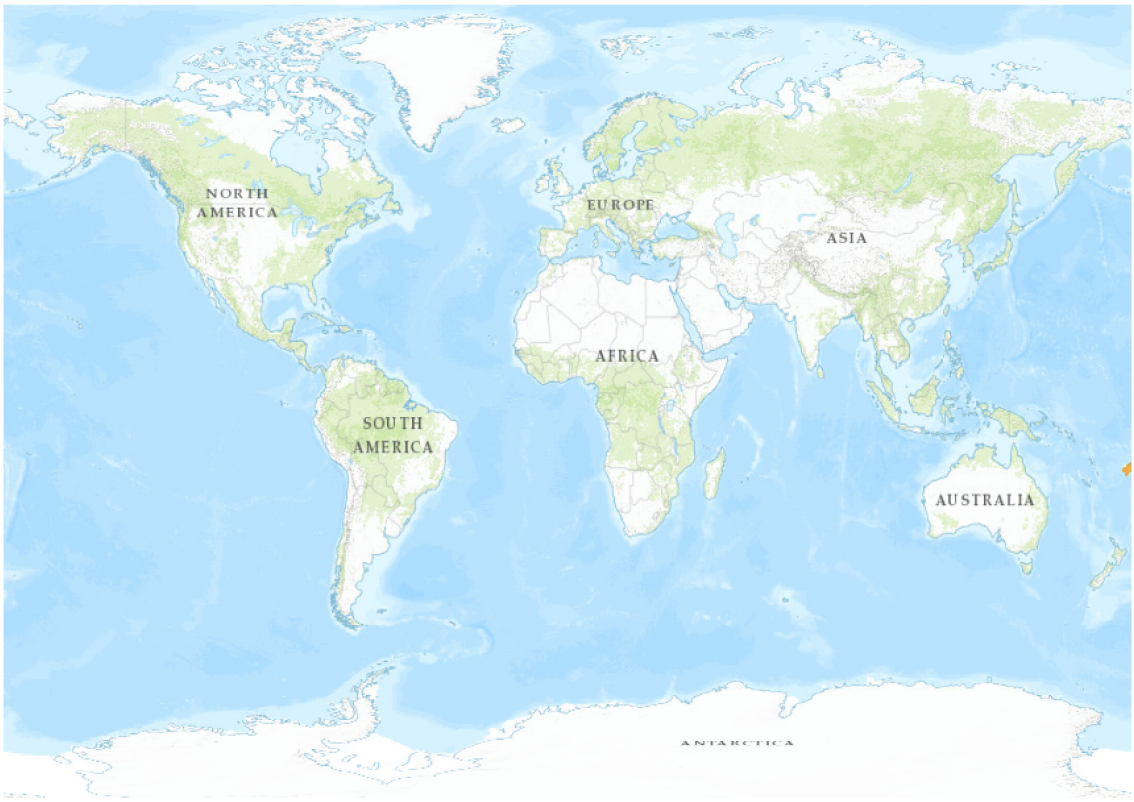
The iguanas found on Efate Island, Vanuatu, are a non-native population introduced from central Fiji and released by a reptile dealer in the 1960s (Bauer 1988). Molecular DNA analysis has shown this population to be B. bulabula and has its origins from both Ovalau and Kadavu Islands (Keogh *et al*. 2008).

Country Occurrence:

Native: Fiji

Introduced: Vanuatu

Distribution Map



0 8,000
kilometer

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

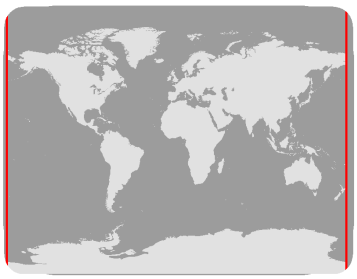
Brachylophus bulabula

NE DD LC NT VU **EN** ENDANGERED CR EW EX

Range

Extant (resident)

Compiled by:
IUCN (International Union for Conservation of Nature)



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

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Population

Despite extensive surveys north of Vanua Levu, Fiji Banded Iguanas have been found only on two islands: Mali (6.71 km²) and Cikobia (15.0 km²). Verbal reports and old records indicated that iguanas were once numerous on several other islands in this area, as well as the islands around Viti Levu. Two examples of very recent extirpations are on Beqa (near Viti Levu) and Druadrua (near Vanua Levu) where Small Asian Mongoose was introduced within the last 40 years. Prior to mongoose introduction, iguanas were common according to the local inhabitants (R. Fisher unpublished data).

Many more islands remain to be surveyed, but it is clear from the work to date that iguanas remain on at least 10 islands, and are broadly estimated to comprise an extent of occurrence between 4,000-10,000 km². The area of occupancy is likely to be closer to 4,000 km² or less, but without a true estimate of their numbers in the forest patches on Viti Levu, potential distribution can only be inferred from the size of suitable habitat disregarding the likely presence of predators. The area of habitat where iguanas are known is continuing to degrade in quality and size.

A recent population size has only been estimated for iguanas on Makogai and Makodroga, where approximately 6,000 iguanas occur on these two islands. These islands likely represent the largest remaining populations for this iguana and are currently mongoose-free, although Pacific Rats (*Rattus exulans*) are present on both islands and cats are on Makogai. It is not known if these populations can be considered stable. The species has been declining in recent years on islands where forest clearing continues, invasive alien species are present, and as mongoose are introduced to new islands. Currently, mongooses are found on 13 islands in Fiji (Morley 2004) and will undoubtedly spread to additional islands. A future population decline is predicted for this iguana if current rates of habitat loss and degradation continue.

Although the majority of the Fiji Banded Iguana population was lost over a hundred years ago with the introduction of the Indian Mongoose on the two largest islands (Viti Levu and Vanua Levu), decline of the remaining population in the last 30-45 years is estimated at greater than 50%. There is continued pressure from proposed mining in primary forest, an increase in the practice of forest burning, logging, and agriculture expansion, forest fragmentation, and invasive alien species. It is projected the remaining iguana populations will be further reduced by an additional 30-40% over the next 40 years.

Current Population Trend: Decreasing

Habitat and Ecology **(see Appendix for additional information)**

The Fiji Banded Iguana lives in both wet and dry forest, but wetter forests contain preferred plant species. Iguanas are sometimes found in marginal habitats of non-native plants, native hibiscus, and degraded forest around resorts and also along ocean margins, but always where trees are at least six metres in height. The highest densities of this iguana were found on Makodroga in relatively low dry forest, but this habitat is not typical for most islands where they still occur.

As with most iguanas, this species is herbivorous, although a comprehensive study of its diet in the wild has never been studied as it is so rare. They are assumed to prefer the same food plants as the better studied *Brachylophus vitiensis*, as many or most of these same plants occur on the islands occupied by *B. bulabula*. All the *Brachylophus* iguanas are very difficult to observe during the day and occupy the

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highest levels of the tree canopy on the islands.

In captivity, these iguanas are reproductive at three years of age and have lived for 25 years or more. However, in the wild they are probably not reproductive until age four and the mean generation length is more likely to be 10-15 years based on field data for *B. vitiensis*. They lay an average of five eggs per clutch. This lizard is a small iguana with a maximum snout-to-vent length of 19 cm.

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

Fiji Banded Iguanas have not been legally exported since the 1970s. However, there is an occasional illegal trade in smuggled iguanas, as they can sometimes be found for sale online, though this trade has unknown current conservation impact. It is known that a few captive iguanas were recently stolen from Kula Eco Park (a private Fijian zoo and wildlife breeding facility on Viti Levu). Most of the captives currently in Europe are reportedly sourced from the introduced population on Efate Island, Vanuatu, and trade from Vanuatu has reportedly ceased.

Although they were found in prehistoric middens (Worthy and Anderson 2009) and Gibbons (1984) cited reports of consumption of *Brachylophus* species in the 1800s, Fiji Banded Iguanas are no longer hunted or eaten.

Threats (see Appendix for additional information)

Mongoose, Black Rats (*Rattus rattus*), and feral cats (*Felis catus*) are the main mammalian predators threatening the persistence of iguanas and are capable of causing local extinctions in a relatively short time period. A second species of mongoose has recently been identified in Fiji and is now found on Viti Levu at least (Veron *et al*. 2010). The impact from this much larger Indian Brown Mongoose (*Herpestes fuscus*) is not known and its distribution on Viti Levu has not been determined yet. It is possibly better able to invade the remnant primary forest. Free-ranging domestic goats (*Capra aegagrus*) are an important concern on many of the smaller islands as they also browse the plants most important to iguanas, and effectively remove these plants from the habitat. Also, intentionally-set fires are used to round up the goats, further enhancing the transition to grassland and inhibiting native forest regeneration.

Even in the absence of goat herding, forest burning is widespread and is increasingly one of the biggest threats to iguana habitat and their persistence. Continued deforestation on the small islands where iguanas remain is predicted to cause local extinctions over the next 40 years. Even the larger islands of Kadavu and Ovalau are experiencing significant forest loss through burning and fragmentation (R. Fisher pers. obs. and Google Earth).

Additional threats to the native forests include further development of urban and village areas, plantation agriculture, and logging. Mining is proposed on several islands and positioned right in the middle of large expanses of native forests, which will lead to fragmentation and degradation of these habitats. Continued development of tourism resorts, on the smaller islands in particular, have significant impacts on these habitats, possibly leading to losses of entire iguana populations.

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The impact of the recent introduction and spread of the invasive alien Common Green Iguana (*Iguana iguana*) in Fiji are not yet known for this species but have been shown to have significant detrimental effects everywhere they have been introduced (Thomas *et al*. 2011). Eradication for this invasive now appears unlikely, and it is possible the Green Iguana will continue to spread to other well-forested islands despite eradication efforts. Green Iguanas are vastly more fecund and aggressive than native iguanas and may have significant effects on remnant small island populations. At minimum, this introduction has caused considerable confusion in the local education programmes aimed at protection of Banded Iguanas versus eradication of the Green Iguanas, since juveniles of the latter appear superficially similar.

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Although they were found in prehistoric middens (Worthy and Anderson 2009) and Gibbons (1984) cited reports of consumption of *Brachylophus* species in the 1800s, Fiji Banded Iguanas are no longer hunted or eaten.

Conservation Actions **(see Appendix for additional information)**

There are no conservation measures in place for the Fiji Banded Iguana and they are not known to occur in any protected areas, although it is possible they are still present in large forest preserves on Viti Levu Island. Designation of national park status for Makogai and Makodroga Islands would protect the habitat on these islands and greatly benefit this iguana.

Further research surveys are needed to determine population size of iguanas on the larger islands and the status of any potential subpopulations on the two largest, Viti Levu and Vanua Levu. Further study is also needed on population trends, life history traits, habitat conversion trends, and analysis of threats from invasive alien species. Genetic analysis needs to be completed to determine if there are additional undescribed species within this taxon.

Education programmes for the local community need to continue to stress the importance of the role of iguanas in the ecosystem, its value for protection, and the differences between native and invasive Green Iguanas. Within the conservation community, education and awareness are needed to better inform people about the differences between this species and the recently separated Lau Banded Iguana, *Brachylophus fasciatus*, as much of the literature regarding banded iguanas in Fiji still refers to *B. fasciatus* in name, regardless of which species the information actually pertains to.

All of the *Brachylophus* iguanas are protected from international trade by Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A Conservation Action Plan is badly needed for this species as no specific conservation actions have been designed or implemented to ensure its survival. The confusion with *Brachylophus fasciatus*, and the assumption that they occur on many islands, significantly under-represents the threats to this

species.

Credits

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External Resources

For Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.5. Forest - Subtropical/Tropical Dry	-	Suitable	Yes
1. Forest -> 1.6. Forest - Subtropical/Tropical Moist Lowland	-	Suitable	Yes
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	-	Suitable	Yes
3. Shrubland -> 3.5. Shrubland - Subtropical/Tropical Dry	-	Unknown	-
3. Shrubland -> 3.6. Shrubland - Subtropical/Tropical Moist	-	Unknown	-
0. Root -> 6. Rocky areas (eg. inland cliffs, mountain peaks)	-	Unknown	-
14. Artificial/Terrestrial -> 14.6. Artificial/Terrestrial - Subtropical/Tropical Heavily Degraded Former Forest	-	Marginal	-

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
Food - human	Yes	Yes	No
Pets/display animals, horticulture	No	No	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
1. Residential & commercial development -> 1.2. Commercial & industrial areas	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
1. Residential & commercial development -> 1.3. Tourism & recreation areas	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		

2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.2. Small-holder farming	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.2. Wood & pulp plantations -> 2.2.1. Small-holder plantations	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.2. Wood & pulp plantations -> 2.2.2. Agro-industry plantations	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.2. Small-holder grazing, ranching or farming	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
3. Energy production & mining -> 3.2. Mining & quarrying	Future	Minority (50%)	Slow, significant declines	Low impact: 3
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Whole (>90%)	Rapid declines	High impact: 8
8. Invasive & other problematic species & genes -> 8.1. Invasive non-native/alien species -> 8.1.2. Named species (Herpestes javanicus)	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
8. Invasive & other problematic species & genes -> 8.1. Invasive non-native/alien species -> 8.1.2. Named species (Capra aegagrus)	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
8. Invasive & other problematic species & genes -> 8.1. Invasive non-native/alien species -> 8.1.2. Named species (Rattus rattus)	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		

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8. Invasive & other problematic species & genes -> 8.1. Invasive non-native/alien species -> 8.1.2. Named species (Felis catus)	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
8. Invasive & other problematic species & genes -> 8.1. Invasive non-native/alien species -> 8.1.2. Named species (Iguana iguana)	Future	Minority (50%)	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		
8. Invasive & other problematic species & genes -> 8.1. Invasive non-native/alien species -> 8.1.2. Named species (Herpestes fuscus)	Unknown	Minority (50%)	Slow, significant declines	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions in Place
In-Place Research, Monitoring and Planning
Action Recovery plan: No
Systematic monitoring scheme: No
In-Place Land/Water Protection and Management
Conservation sites identified: Yes, over entire range
Occur in at least one PA: Unknown
Percentage of population protected by PAs (0-100): 1-10
Area based regional management plan: No
Invasive species control or prevention: No
In-Place Species Management
Successfully reintroduced or introduced beningly: No
Subject to ex-situ conservation: No
In-Place Education
Included in international legislation: Yes
Subject to any international management/trade controls: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
1. Land/water protection -> 1.2. Resource & habitat protection
2. Land/water management -> 2.2. Invasive/problematic species control
3. Species management -> 3.3. Species re-introduction -> 3.3.1. Reintroduction
4. Education & awareness -> 4.3. Awareness & communications
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level
5. Law & policy -> 5.1. Legislation -> 5.1.3. Sub-national level
5. Law & policy -> 5.2. Policies and regulations
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.1. Taxonomy
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
2. Conservation Planning -> 2.1. Species Action/Recovery Plan
2. Conservation Planning -> 2.2. Area-based Management Plan
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 100-4000
Continuing decline in area of occupancy (AOO): Yes
Extreme fluctuations in area of occupancy (AOO): No
Estimated extent of occurrence (EOO) (km^2): 4000-10000
Continuing decline in extent of occurrence (EOO): Yes
Extreme fluctuations in extent of occurrence (EOO): No
Number of Locations: 6-10

Distribution
Continuing decline in number of locations: Yes
Extreme fluctuations in the number of locations: No
Lower elevation limit (m): 1
Upper elevation limit (m): 500
Population
Continuing decline of mature individuals: Yes
Extreme fluctuations: No
Population severely fragmented: No
No. of subpopulations: 6-10
Continuing decline in subpopulations: Yes
Extreme fluctuations in subpopulations: No
All individuals in one subpopulation: No
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 10-15

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