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Cryptoprocta ferox, Fossa

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Eupleridae

Taxon Name: Cryptoprocta ferox Bennett, 1833

Common Name(s):

- English: Fossa
- French: Cryptoprocte Féroce, Foussa
- Spanish: Gato Fossa De Madagascar

Taxonomic Notes:

After a chequered history of higher taxonomic placement for the the Malagasy carnivores, Bininda-Edmons *et al.* (1999) considered them to form a monophyletic family, the Eupleridae, endemic to Madagascar.

Assessment Information

Red List Category & Criteria:	Vulnerable A2cde+3cde+4cde <u>ver 3.1</u>			
Year Published:	2016			
Date Assessed:	February 21, 2015			

Justification:

Fosa is listed as Vulnerable because it is likely that over the course of the last three generations (taken as 21 years), the population has dropped by more than 30% (and possibly much more) mainly because of habitat loss (given the species' need for extensive forest), exacerbated by widespread hunting, persecution and the effects of introduced carnivores. The rate of habitat loss (very significant in the species' key western forest heartland in the Menabe region) and hunting has increased significantly with the breakdown of governance since the coup d'etat in 2009, leading to increased artisanal mining, increased hunting and increased opportunistic rosewood cutting throughout the species' range, suggesting that there will be a further population drop of 30%, or more, over the next three generations.

Previously Published Red List Assessments

2008 - Vulnerable (VU) - http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T5760A11659657.en

- 2000 Endangered (EN)
- 1996 Vulnerable (VU)
- 1994 Insufficiently Known (K)
- 1990 Insufficiently Known (K)
- 1988 Insufficiently Known (K)

1986 – Vulnerable (V)

Geographic Range

Range Description:

The Fosa is the most widely distributed of the Malagasy carnivores, found throughout western and eastern forests, although it is very scarce in most areas; it is also present, although rare, in forests on the central plateau and in spiny southern forests. It has been recorded from sea-level up to altitudes above 2,500 m asl (2,600 m asl on the Andringitra Massif; Hawkins 2003), but is rare above 1,500 m asl (Goodman 2012). It occurs above the tree-line in montane areas (Goodman 1996).

Country Occurrence:

Native: Madagascar

Distribution Map

Cryptoprocta ferox



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Population

The Fosa is generally a solitary species that is found at low population densities (Hawkins 2003). Density estimates are 0.26 individuals/km² for the Menabe region (Hawkins 1998), and 0.20/km² for Ankarafantsika (Rahajanirina 2003). The maximum estimated population size for the largest protected area in Madagascar (Masoala National Park) is 414 breeding adults, and this is likely to be a substantial overestimate. Metapopulations of more than this may be possible, given the ability of this species to range between forest patches. Connectivity of populations between distant forest fragments is not yet conclusively known.

Densities for the eastern forests are hypothesised by some to be at one-third those of the west, based on photo-trapping and cage trapping efforts throughout the humid forests (L. Dollar pers. comm. 2007). Subjective encounter rate is much higher in the western forests (particularly in Menabe, Bemaraha and Ankarana reserves) than in rainforests (F. Hawkins pers. comm.), but densities could well be similar between dry and humid forests. This is an important point for future investigation. Important determinants of density may include densities of lemur prey species, and levels of hunting.

Gerber et al. (2012) estimated the total Fosa population at between 2,635 (the population estimated to occur in protected areas) and 8,626 adults. Of the upper estimate, 4,476 are estimated to be in 32 populations in rainforest, and 4,150 in 38 populations in dry forest. In their estimation, 95% of the rainforest population occurred in forest blocks north of Andasibe-Perinet; the only protected areas in this region capable of holding more than 300 adult Fosas are Vohidrazana-Zahamena and Makira-Masoala. Around 95% of the dry forest population was in nine large forest blocks, of which only two could hold more than 300 individuals. Gerber et al. (2012) found Fosa densities around Ranomafana National Park to be similar in primary forest (0.12 ± SE 0.05 individuals/km²) and logged forest (0.09 ± SE 0.04), and found the species in forest fragments 2.5 km from intact forest, although not in fragments 15 km from intact forest. In northeast Madagascar, camera trap surveys by Farris (et al. in review a, pers. comm. 2014) found a high probability of occupancy (defined as the probability that a site/forest is occupied by the species of interest while taking into account the variation in detectability of the species across the various sites) of 0.68 ± SE 0.08 for Fosa across the Masoala-Makira landscape. Fosas had similar probabilities of occupancy in non-degraded forest (0.66 SE \pm 0.06) and degraded forest (0.68 SE \pm 0.13). Surveys at one contiguous forest site showed little to no change in Fosa occupancy (0.79 to 0.85) between 2008 and 2013 (trap success [number of captures divided by trap nights multiplied by 100] changed from 3.04 in 2008 to 3.42 in 2013). However, at another survey site, trap success decreased from 7.16 (2011) to 3.43 (2013) over a three-year period (Z. Farris pers. comm. 2014). Fosa occurred in forest fragments at Farankarina managed area, separated by at least 5 km from both Makira and Masoala National Parks, as well as in additional smaller fragmented forest patches. The smallest fragmented forest patch Fosa was recorded in was the 8 km² Farankarina managed area (-15.422, 49.837), which lies at least 5 km from both Masola and Makira forests. Fosa was also observed moving through anthropogenic landscapes.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

The Fosa is active both arboreally and on the ground. Its diet is known to include many animals in forests it inhabits, including lemurs to the size of Diademed Sifaka *Propithecus diadema* (body weight about 3 kg), rodents and reptiles (Rasolonandrasana 1994, S.M. Goodman and L. Dollar pers. comm.

2007, F. Hawkins pers. comm.). Lemurs are frequently caught in trees. The gestation period is six to seven weeks after which between two and four young are born (Hawkins 2003); because infants remain with the mother for the first year, females only breed every other year. Sexual maturity is reached at three or four years of age (Hawkins 2003) and it is maximum known age in captivity is more than 20 years.

In northeast Madagascar, Fosa was camera-trapped in contiguous, non-degraded, fragmented and highly degraded forest sites; perhaps with a lower activity and probability of occupancy in contiguous, core rainforest areas (Farris *et al.* in review a, Z. Farris pers. comm. 2014). In degraded forest, Fosas were often photographed on trails near the forest edge, which they probably used at night to travel to villages to hunt for livestock (Farris and Kelly 2011, Farris *et al.* in review a).

The Fosa is solitary for the majority of the year; however, pairs have often been photographed near the breeding season (October-December). There is record of what appeared to be an adult travelling with a juvenile in May, and another of a very small Fosa (possibly an infant or very early juvenile) in September.

The Fosa is primarily nocturnal with some daytime activity throughout the year (Farris *et al.* in review b). There was strict nocturnality at sites with high human and dog activity, suggesting that these species may influence Fosa activity. There was more day-time activity during the peak breeding season (October-December; Farris *et al.* in review b).

Systems: Terrestrial

Use and Trade

This species is consumed as bushmeat and parts are used in traditional medicine.

Threats (see Appendix for additional information)

The major threats to Fosa are hunting for food and the loss and fragmentation of forest habitat, largely caused by the conversion of forested areas to agricultural land and pasture; selective logging degrades the habitat.

Household surveys (Farris *et al.* in review a) found 99 Fosas reportedly consumed within four villages (144 households were surveyed) from 2005 to 2011 across the Makira Natural Park. Hunting rates were highest in non-degraded forest and were positively associated with Fosa occupancy, meaning that hunters appear to be focusing their efforts in non-degraded forest where Fosa is most abundant. Golden *et al* (in press) report four Fosas hunted in one year at Betampona Strict Nature Reverve, two hunted opportunistically (presumably with dogs). Household interviews conducted by Madagasikara Voakajy (pers. comm. 2014) in the Moramanga region of eastern Madagascar between 2008 and 2009 suggest that 325 (21%) of 1,535 respondents interviewed in 129 villages had eaten Fosa in the preceding year.

Hunting is presumed to have increased significantly in many parts of the species' range since 2009 because of less effective governance and increased social instability following a coup d'etat.

Deforestation and forest disturbance across the range of the Fosa has increased significantly since 2009.

R. Rajaonson (pers. comm. 2014) estimates that deforestation in eastern forest increased from 0.5% per annum in 2005-2010 to 0.94% per annum in 2010-2013. Allnut *et al.* (2009) estimated that in Masoala National Park, annual rates of deforestation in the studied area increased to 1.27% per annum in 2011. High levels of illegal settlement in protected areas, especially around the Bay of d'Antongil, are linked to artisanal mining (for quartz) and logging of rosewood; hunting for food using dogs has increased greatly in these areas as a result. Some villages have seen increases in populations of between 200 and 300% (C. Golden pers. comm. 2014). Around Ranomafana National Park, Fosa is absent from forest fragments more than 15 km from core habitat and is about equally often detected in degraded and primary habitats (Gerber *et al.* 2012)

In western Madagascar, Zinner *et al.* (2014) showed that for central Menabe, one of the most important centres of Fosa distribution, deforestation rates of 0.78 km²/yr in 2003-2006 increased to 1.09 km²/yr in 2006-2008, and to 2.55 km²/yr by 2008-2010. There is ample evidence that the increase continued in 2010-2014, coupled with increased illegal logging and hunting in the core forest areas, which will undoubtedly negatively effect populations of all native carnivores, especially through the increased presence of dogs.

The Fosa also preys on domestic fowl and is consequently killed as a pest by local people. It seems very susceptible to hunting, and is often targeted by groups engaged in collective group hunting (e.g. in the Makira forests) specifically for the purpose of eradication. Its parts are used for medicinal purposes. Competition with introduced carnivores occurs, including predation by feral dog packs. The Fosa seems to be more nocturnal when in the same areas as highly active diurnal people and dogs. High nocturnal activity overlaps with activity of both Small Indian Civet *Viverricula indica* and feral/wild cats, revealing the potential for increased interactions and competition (Farris *et al.* in review b). Many camera-trap photographs of Fosas show animals carrying nooses from make-shift traps, and many show individuals with numerous scars and missing body parts (ears, lips, tails) which reportedly result from locals trying to kill them with machetes when they raid their livestock.

Conservation Actions (see Appendix for additional information)

The Fosa is listed on Appendix II of CITES. It is present in many protected areas throughout Madagascar (such as Kirindy Forest, and Ranomafana, Masaola, and Ankarafantsika National Parks). It is the subject of a successful *ex situ* captive breeding programme. Better protection of little-encroached forests and awareness programmes concerning the value of this species for pest control are needed. This species is not currently protected adequately under national legislation, because there are conflicts within national legislation, as well as within and between local community laws.

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

Threats

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

Threat	Timing	Scope	Severity	Impact Score
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.1. Shifting agriculture	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stre	esses -> 1.1. Ecosyster	n conversion
		1. Ecosystem stresses -> 1.2. Ecosystem degradation		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.1. Intentional use (species is the target)	Ongoing	Majority (50- 90%)	Rapid declines	Medium impact: 7
	Stresses:	2. Species Stress	es -> 2.1. Species mor	tality
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.3. Persecution/control	Ongoing	Majority (50- 90%)	Rapid declines	Medium impact: 7
	Stresses:	2. Species Stresses -> 2.1. Species mortality		tality
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.5. Motivation Unknown/Unrecorded	Ongoing	Majority (50- 90%)	Causing/could cause fluctuations	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		n degradation
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.3. Trend Unknown/Unrecorded	Ongoing	Minority (50%)	Causing/could cause fluctuations	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		n degradation
8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.1. Unspecified species	Ongoing	Whole (>90%)	Rapid declines	High impact: 8
	Stresses:	2. Species Stresses -> 2.3. Indirect species effects -> 2.3.2. Competition		
8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.2. Named species (Canis familiaris)	Ongoing	Whole (>90%)	Rapid declines	High impact: 8
	Stresses:	2. Species Stress	es -> 2.1. Species mor	tality
		2. Species Stress 2.3.2. Competition	es -> 2.3. Indirect spectrum on	cies effects ->

8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.2. Named species (Felis catus)	Ongoing	Whole (>90%)	Rapid declines	High impact: 8
	Stresses:	2. Species Stress 2.3.2. Competitie	es -> 2.3. Indirect spectron	cies effects ->
8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.2. Named species (Viverricula indica)	Ongoing	Whole (>90%)	Rapid declines	High impact: 8
	Stresses:	2. Species Stress 2.3.2. Competition	es -> 2.3. Indirect specton	cies effects ->

Conservation Actions in Place

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

Conservation Actions in Place
In-Place Land/Water Protection and Management
Occur in at least one PA: Yes
In-Place Species Management
Subject to ex-situ conservation: Yes
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
2. Land/water management -> 2.1. Site/area management
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
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
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.2. National level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.3. Sub-national level

Research Needed

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

Research Needed
1. Research -> 1.5. Threats
1. Research -> 1.6. Actions
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.2. Harvest level trends

Additional Data Fields

Distribution
Continuing decline in area of occupancy (AOO): Yes
Extreme fluctuations in area of occupancy (AOO): No
Continuing decline in extent of occurrence (EOO): No
Extreme fluctuations in extent of occurrence (EOO): No
Continuing decline in number of locations: Yes
Extreme fluctuations in the number of locations: No
Lower elevation limit (m): 0
Upper elevation limit (m): 2600
Population
Number of mature individuals: 2635-8626
Continuing decline of mature individuals: Yes
Extreme fluctuations: No
Population severely fragmented: No
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 7

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