



## Galapagos vertebrates: endangered status and conservation actions

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Categorization of species on the Red List is useful for conservationists and managers to prioritize their efforts and actions regarding species and ecosystems that are endangered with extinction<sup>1</sup>.

In Galapagos, **109** endemic and native vertebrate species have been recorded, of which **13** are considered

Extinct. Seven of the extinct species are known from records of live specimens, while the remaining six are only known from the fossil record<sup>2</sup> (Table 1). The only species Extinct in the Wild (EW) is the giant land tortoise of Pinta, *Geochelone abingdoni*, whose sole survivor is known as Lonesome George.

**Table 1.** Extinct vertebrate species.

Order	Common name	Scientific Name	Island	Record	
				Fossil	Living
Reptile	Rábida gecko	<i>Phyllodactylus sp</i>	Rábida	x	
	Fernandina giant tortoise	<i>Geochelone phantastica</i>	Fernandina		x
	Floreana giant tortoise	<i>Geochelone elephantopus</i>	Floreana	x	x
	Rábida giant tortoise	<i>Geochelone wallacei</i>	Rábida	x	x
	Santa Fe giant tortoise	<i>Geochelone sp.</i>	Santa Fe		x
Mammal	Rábida rice rat	<i>Nesoryzomys sp 1</i>	Rábida	x	
	Isabela rice rat	<i>Nesoryzomys sp 2</i>	Isabela	x	
	Isabela rice rat	<i>Nesoryzomys sp 3</i>	Isabela	x	
	Santa Cruz giant rat	<i>Megaoryzomys curioi</i>	Santa Cruz	x	
	Isabela giant rat	<i>Megaoryzomys sp</i>	Isabela	x	
	Galapagos rice rat	<i>Oryzomys galapagoensis</i>	San Cristóbal	x	x
	Santa Cruz rice rat	<i>Nesoryzomys indefessus</i>	Santa Cruz - Baltra	x	x
	Santa Cruz rice rat	<i>Nesoryzomys darwini</i>	Santa Cruz	x	x

Source: Steadman et al (1991)

The number of species in an endangered category may change over time for a variety of reasons, such as a change in taxonomic classification, a change in status or origin, discovery of new species or fossils, and new assessments (Table 2, Fig. 1, Annex).

The principal causes for extinction of species on the Red List are:

- habitat loss and/or fragmentation;
- arrival of introduced species that are predators or disease vectors, or that compete for habitat or food;

- introduction of agents of infection, via air or sea, that pose a major risk factor that could lead to extinction of species, as occurred in Hawaii with the introduction of avian malaria;
- hunting, still occurring on Isabela, which can affect both reptiles and birds;
- increased tourism (without precautionary measures), population growth and political-economic pressure;
- global warming and its large-scale impacts on natural processes, with potentially serious consequences for existing populations.

The findings of the latest assessment are alarming, both because of the number of species now on the Red List and their threat category, and because of the problems they face. Among endangered fauna, birds have the greatest potential for extinction<sup>3</sup>.

Of the 109 endemic and native species of vertebrates, six became extinct prior to the arrival of humans in the Galapagos and seven became extinct after humans arrived.

**Table 2.** Number of vertebrate species per threat category (1999-2007).

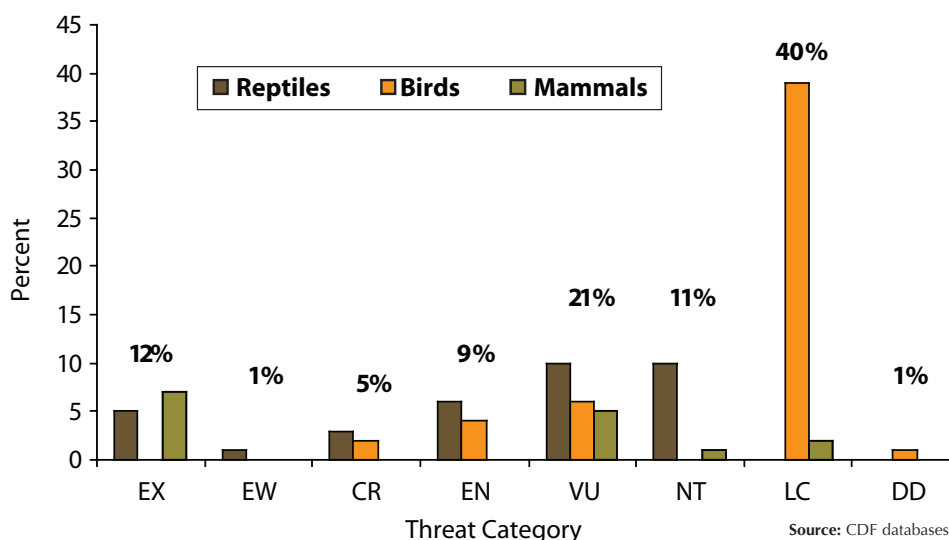
Year	Order	No. taxa of species evaluated	IUCN Threat Category							
			EX	EW	CR	EN	VU	NT	LC	DD
1999*	All Vertebrates	112	10	1	4	12	38	5	42	
2007**	Reptiles	37	5	1	3	6	11	11	0	0
	Birds	56	0	0	2	4	7	0	42	1
	Mammals	16	8	0	0	0	5	1	2	0
	All Vertebrates	109	13	1	5	10	23	12	44	1

Source: \*Data taken from Snell *et al* (1999). \*\* Includes species and endemic and native subspecies accepted by the CDF.

**Notes**

Symbols Legend: **EX** = Extinct, **EW** = Extinct in the Wild, **CR** = Critically Endangered, **EN** = Endangered, **VU** = Vulnerable, **NT** = Near Threatened, **LC** = Least Concern, **DD** = Data Deficient.

**Figure 1.** Percent of endemic and native vertebrate species by threat category, 2007



Source: CDF databases.

**Note**

Symbols Legend: **EX** = Extinct, **EW** = Extinct in the Wild, **CR** = Critically Endangered, **EN** = Endangered, **VU** = Vulnerable, **NT** = Near Threatened, **LC** = Least Concern, **DD** = Data Deficient.

## REPTILES

In 1965, the CDF initiated the program for captive rearing of **giant tortoises** (*Geochelone* spp.) on Santa Cruz Island. In 1968, with the establishment of the Galapagos National Park Service (GNPS), it became a collaborative program between the two organizations. The first tortoise populations in the program were from the islands of Pinzón, Española, and Santiago. The program grew to include other populations, including those from Wolf, Cerro Azul, and Sierra Negra volcanoes on Isabela; and the islands of San Cristóbal and Santa Cruz. To date, **4,049** land tortoises have been repatriated to these eight populations. The success of the program has resulted in the recovery of some populations (Santiago and Española) to the extent that they were moved from Critically Endangered to Endangered. The populations on San Cristóbal, Santa Cruz, and Cerro Azul Volcano are currently catalogued as Vulnerable. However, two tortoise populations remain Critically Endangered due to the threat from black rats (*Rattus rattus* – Pinzón Island) and humans (Sierra Negra Volcano on southern Isabela).

Raising and repatriating tortoises and land iguanas in captivity has resulted in certain species moving to less threatened categories.

The **land iguana** (*Conolophus subcristatus*) is in the Vulnerable category<sup>4</sup>. Its main threats are introduced species, primarily dogs (*Canis familiaris*), wild cats (*Felis catus*), and humans. In 1931 and 1932, Captain Allan Hancock and zoologist Cy Perkins transferred approximately 70 iguanas from Baltra to North Seymour, which saved the population as the resident population on Baltra became extinct sometime between 1938 and 1958, when Baltra was used as a US military base. In 1975, the CDF and the GNPS established an iguana rearing center in Santa Cruz. Adult iguanas from Santa Cruz (Cerro Dragón, Cerro Montura, and Conway Bay) and Isabela (Cartago Bay) were taken to the center for subsequent reproduction, and rearing and repatriation of juvenile iguanas to their places of origin. In 1979, the first pair of adult iguanas from North Seymour was transferred to the center and the first 35 juvenile iguanas were repatriated to Baltra in June 1991. Repatriations to Cartago Bay began in 1982, with the release of the first 39 juveniles. The first 53 juveniles were released at Cerro Dragón on Santa Cruz in 1987. The CDF and the

GNPS also initiated a semi-captive program for land iguanas on the Venecia islets (close to Cerro Dragón) by transferring adult iguanas to these islets. With successful reproduction, the juvenile iguanas were then captured and repatriated to their places of origin. The first 11 juveniles were transferred from Venecia to Conway Bay on Santa Cruz in 1985. To date, 1,136 iguanas have been repatriated to their places of origin.

## BIRDS

The **Galapagos penguin**, *Spheniscus mendiculus*, is distributed along the coasts of Fernandina and Isabela and the northern coast of Floreana. The **flightless cormorant**, *Phalacrocorax harrisi*, is found on the coasts of Fernandina and Isabela. Both species are catalogued on the IUCN's Red List as Endangered<sup>1</sup>. The threats include introduced species, such as dogs, cats, and rats (*Rattus* spp)<sup>5</sup>; global warming, which can worsen the effects of the El Niño phenomenon and affect their reproductive rate<sup>6</sup>; uncontrolled fishing with nets<sup>1</sup>; oil and fuel spills, and plastic garbage. As part of the conservation for these species, the CDF and the GNPS conduct annual censuses of both populations. Both species have stable populations, with a rising trend since 1999, although the Galapagos penguin population is still below the population high recorded in the 1970s.

The **Galapagos albatross**, *Phoebastria irrorata*, is listed as Vulnerable by the IUCN<sup>1</sup>, and there is pressure to move it to Critically Endangered\*. In 2002, the population was about 35,000<sup>7</sup>. Albatross nest on Española. From January to March they roam the Pacific Ocean off the coasts of southern Ecuador and northern Peru. They are threatened by global warming, since the El Niño phenomenon affects reproduction due to the resulting food shortage<sup>8</sup>, by fishing in waters near the mainland<sup>9,10</sup>, and by oil pollution from fishing boats<sup>1</sup>. At present, there is contact with the Ministries of the Environment and Foreign Affairs of Ecuador to ensure the protection of this species in the territorial waters of Peru.

Among all the endangered fauna, birds have the greatest potential for extinction. Both the number of species on the Red List and the problems they face are alarming.

\* In 2007 the status of the Galapagos albatross was changed to CR, Critically Endangered. This change is not reflected in the tables and figures of this article.

The **mangrove finch**, *Camarhynchus heliobates*, is in the Critically Endangered category. The population, with an estimated 50 breeding pairs, is currently restricted to two patches of mangroves on western Isabela<sup>1</sup>. The main threats include introduced species such as wasps (*Polistes versicolor*), rats, cats, ants (*Solenopsis* spp.)<sup>1</sup>, and the parasitic fly, *Philornis downsi*, whose larvae suck blood from baby birds. There are also avian diseases that may affect this species. Anthropogenic threats include climate change and potential impacts from tourism. The two sites have been visitor sites for decades, although they are seldom visited. The mangrove finch project began in 2006. Its goals and objectives include determining the status of the population, threats, reproductive success, capture-recapture, and captive rearing and reintroduction. The numbers confirm that the population status is critical.

The **Floreana mockingbird**, *Nesomimus trifasciatus*, is in the Endangered category. It became extinct on Floreana Island in 1880. Its extinction is attributable to predation by dogs and feral cats, nest predation by black rats, and the disappearance of the cactus, *Opuntia megasperma*, caused by goats (*Capra hircus*)<sup>1</sup>. The Floreana mockingbird is now only found on two islets near Floreana, Gardner-by-Floreana and Champion<sup>1</sup>. The introduced species that affected them on Floreana have not yet arrived on either islet. Since 2003, annual monitoring of this species and surveys to detect introduced species have been conducted. Monitoring is very important, even more so when there is a declining trend in the number of individuals.

The **Galapagos flamingo**, *Phoenicopterus ruber*, also lives in the Bahamas, Greater Antilles, Yucatán, and northwestern Colombia. In Galapagos, there are approximately 320–550 individuals. This is the world's smallest population and is listed as Endangered on the Red List for birds in Ecuador<sup>1</sup>. It is threatened by introduced animals, such as cats, pigs (*Sus scrofa*), goats, rats, and the frog, *Scinax quinquefasciatus*, which reduce the critical habitat for reproduction, transmit disease, and destroy nests, eggs, and hatchlings. The El Niño phenomenon affects food resources, causes flooding of their habitat, and results in decreased reproduction. Humans also affect the flamingo lagoons

by depositing garbage and rubble or by landfill. The GNPS and the CDF have conducted an annual census of the population since 1967. This population is stable.

## MAMMALS

The **Galapagos sea lion**, *Zalophus wollebaeki*, is found throughout the archipelago. Since 1997, twelve breeding colonies have been monitored. The number of pups recorded during breeding seasons shows a recovery in terms of reproductive success, following the 50% population decrease<sup>12</sup> during the El Niño phenomenon of 1997-1998. In the last few years, new problems have arisen for this species, such as diseases that mainly affect their offspring. An eye parasite, *Phylophthalmus zalophi*, related to a high incidence of conjunctivitis and eye secretions in sea lion breeding colonies, primarily during the hot season of the year, was discovered in 2002.

Of the 12 endemic rodent species recorded in Galapagos, only four currently exist.

Of the 12 **endemic rodent** species recorded in the Galapagos, only four currently exist (Annex). The recently extinct species (*Nesoryzomys* spp. and *Oryzomys galapagoensis*) may have been impacted by introduced species such as rats (due to competition for habitat and food, predation, and introduction of infectious agents), and cats (due to predation). The causes for the extinction of endemic rats prior to the arrival of humans are unknown, but they are assumed to have been natural. The four species of rodents still present are threatened by introduced rats, primarily on Santiago. Although no *Rattus rattus* or other exotic species have been registered in the zones where the other three endemic rat species live, they may eventually arrive. For this reason, the GNPS and the CDF monitor rat presence/absence on these islands.

Annex. List of endemic and native vertebrate species by their Threat Category.

Class	Common name	Scientific Name	Threat Category
REPTILES	Giant land tortoise of Floreana	<i>Geochelone elephantopus</i>	EX <sup>c</sup>
	Giant land tortoise of Fernandina	<i>Geochelone phantastica</i>	EX <sup>c</sup>
	Giant land tortoise of Santa Fe	<i>Geochelone sp</i>	EX <sup>c</sup>
	Giant land tortoise of Rábida	<i>Geochelone wallacei</i>	EX <sup>c</sup>
	Rábida gecko	<i>Phyllodactylus sp.</i>	EX <sup>c</sup>
	Giant land tortoise of Pinta	<i>Geochelone abingdoni</i>	EW <sup>b</sup>
	Galapagos snake	<i>Antillophis slevini</i>	CR <sup>b</sup>
	Giant land tortoise of Pinzón	<i>Geochelone ephippium</i>	CR <sup>b</sup>
	Giant land tortoise of Sierra Negra Volcano	<i>Geochelone guntheri</i>	CR <sup>b</sup>
	Galapagos snake	<i>Alsophis biserialis</i>	EN <sup>b</sup>
	Galapagos snake	<i>Antillophis steindachneri</i>	EN <sup>b</sup>
	Giant land tortoise of Santiago	<i>Geochelone darwini</i>	EN <sup>b</sup>
	Giant land tortoise of Española	<i>Geochelone hoodensis</i>	EN <sup>b</sup>
	Giant land tortoise of Darwin Volcano	<i>Geochelone microphyes</i>	EN <sup>b</sup>
	Giant land tortoise of Cerro Azul volcano	<i>Geochelone vicina</i>	EN <sup>b</sup>
	Marine iguana	<i>Amblyrhynchus cristatus</i>	VU <sup>b</sup>
	Land iguana	<i>Conolophus pallidus</i>	VU <sup>b</sup>
	Land iguana	<i>Conolophus subcristatus</i>	VU <sup>b</sup>
	Giant land tortoise of Wolf Volcano	<i>Geochelone becki</i>	VU <sup>b</sup>
	Giant land tortoise of San Cristóbal	<i>Geochelone chathamensis</i>	VU <sup>b</sup>
	Giant land tortoise of Santa Cruz	<i>Geochelone nigrita</i>	VU <sup>b</sup>
	Giant land tortoise of Alcedo Volcano	<i>Geochelone vandenburghi</i>	VU <sup>b</sup>
	Lava lizard	<i>Microlophus bivittatus</i>	VU <sup>b</sup>
	Lava lizard	<i>Microlophus duncanensis</i>	VU <sup>b</sup>
	Lava lizard	<i>Microlophus grayii</i>	VU <sup>b</sup>
	Galapagos snake	<i>Philodryas hoodensis</i>	VU <sup>b</sup>
	Marine turtle	<i>Chelonia mydas</i>	NT <sup>b</sup>
	Lava lizard	<i>Microlophus albemarlensis</i>	NT <sup>b</sup>
	Lava lizard	<i>Microlophus delanonis</i>	NT <sup>b</sup>
	Lava lizard	<i>Microlophus habelii</i>	NT <sup>b</sup>
	Lava lizard	<i>Microlophus pacificus</i>	NT <sup>b</sup>
	Native gecko	<i>Phyllodactylus barringtonensis</i>	NT <sup>b</sup>
	Native gecko	<i>Phyllodactylus baurii</i>	NT <sup>b</sup>
Darwin gecko	<i>Phyllodactylus darwini</i>	NT <sup>b</sup>	
Galapagos gecko	<i>Phyllodactylus galapagensis</i>	NT <sup>b</sup>	
Native gecko	<i>Phyllodactylus gilberti</i>	NT <sup>b</sup>	
Native gecko	<i>Phyllodactylus leei</i>	NT <sup>b</sup>	
BIRDS	Mangrove finch	<i>Camarhynchus heliobates</i>	CR <sup>a</sup>
	Galapagos petrel	<i>Pterodroma phaeopygia</i>	CR <sup>a</sup>
	San Cristóbal mockingbird	<i>Nesomimus melanotis</i>	EN <sup>a</sup>
	Floreana mockingbird	<i>Nesomimus trifasciatus</i>	EN <sup>a</sup>
	Flightless cormorant	<i>Phalacrocorax harrisi</i>	EN <sup>a</sup>
	Galapagos penguin	<i>Spheniscus mendiculus</i>	EN <sup>a</sup>
	Galapagos hawk	<i>Buteo galapagoensis</i>	VU <sup>b</sup>
Medium tree finch	<i>Camarhynchus pauper</i>	VU <sup>b</sup>	

Class	Common name	Scientific Name	Threat Category
BIRDS	Lava gull	<i>Larus fuliginosus</i>	VU <sup>a</sup>
	Galapagos rail	<i>Laterallus spilonotus</i>	VU <sup>a</sup>
	Española mockingbird	<i>Nesomimus macdonaldi</i>	VU <sup>a</sup>
	Galapagos albatross*	<i>Phoebastria irrorata</i>	VU <sup>a</sup>
	Galapagos martin	<i>Progne modesta</i>	VU <sup>a</sup>
	Galapagos pintail duck	<i>Anas bahamensis galapagoensis</i>	LC <sup>a</sup>
	Brown noddy	<i>Anous stolidus galapagensis</i>	LC <sup>a</sup>
	Great blue heron	<i>Ardea herodias cognata</i>	LC <sup>a</sup>
	Short-eared owl	<i>Asio flammeus galapagoensis</i>	LC <sup>a</sup>
	Striated heron	<i>Butorides striata sundevalli</i>	LC <sup>a</sup>
	Woodpecker finch	<i>Camarhynchus pallidus</i>	LC <sup>a</sup>
	Small tree finch	<i>Camarhynchus parvulus</i>	LC <sup>a</sup>
	Large tree finch	<i>Camarhynchus psittacula</i>	LC <sup>a</sup>
	Warbler finch	<i>Certhidea olivacea</i>	LC <sup>a</sup>
	Dark-billed cuckoo	<i>Coccyzus melacoryphus</i>	LC <sup>a</sup>
	Swallow-tailed gull	<i>Creagrus furcatus</i>	LC <sup>a</sup>
	Yellow warbler	<i>Dendroica petechia aureolla</i>	LC <sup>a</sup>
	Magnificent frigate bird	<i>Fregata magnificens magnificens</i>	LC <sup>a</sup>
	Great frigate bird	<i>Fregata minor</i>	LC <sup>a</sup>
	Common moorhen	<i>Gallinula chloropus</i>	LC <sup>a</sup>
	Large cactus finch	<i>Geospiza conirostris</i>	LC <sup>a</sup>
	Sharp-beaked ground finch	<i>Geospiza difficilis</i>	LC <sup>a</sup>
	Medium ground finch	<i>Geospiza fortis</i>	LC <sup>a</sup>
	Small ground finch	<i>Geospiza fuliginosa</i>	LC <sup>a</sup>
	Large ground finch	<i>Geospiza magnirostris</i>	LC <sup>a</sup>
	Cactus finch	<i>Geospiza scandens</i>	LC <sup>a</sup>
	Oyster-catcher	<i>Haematopus palliatus galapagoensis</i>	LC <sup>a</sup>
	Black-necked stilt	<i>Himantopus mexicanus</i>	LC <sup>a</sup>
	Galapagos flycatcher	<i>Myiarchus magnirostris</i>	LC <sup>a</sup>
	Paint-billed crake	<i>Neocrex erythrops</i>	LC <sup>a</sup>
	Galapagos mockingbird	<i>Nesomimus parvulus</i>	LC <sup>a</sup>
	Yellow-crowned night heron	<i>Nyctanassa violacea pauper</i>	LC <sup>a</sup>
	Madeiran storm petrel	<i>Oceanodroma castro</i>	LC <sup>a</sup>
	Galapagos storm petrel	<i>Oceanodroma tethys tethys</i>	LC <sup>a</sup>
	Brown pelican	<i>Pelecanus occidentalis urinator</i>	LC <sup>a</sup>
	Red-billed tropicbird	<i>Phaethon aethereus</i>	LC <sup>a</sup>
	Flamingo	<i>Phoenicopterus ruber</i>	LC <sup>a</sup>
	Vegetarian finch	<i>Platypiza crassirostris</i>	LC <sup>a</sup>
	Galapagos shearwater	<i>Puffinus subalaris</i>	LC <sup>a</sup>
	Vermilion flycatcher	<i>Pyrocephalus rubinus</i>	LC <sup>a</sup>
Sooty tern	<i>Sterna fuscata</i>	LC <sup>a</sup>	
Nazca booby	<i>Sula granti</i>	LC <sup>a</sup>	
Blue-footed booby	<i>Sula nebouxii excisa</i>	LC <sup>a</sup>	
Red-footed booby	<i>Sula sula</i>	LC <sup>a</sup>	
Common barn owl	<i>Tyto alba punctatissima</i>	LC <sup>a</sup>	

\* In 2007 the status of the Galapagos albatross was changed to CR, Critically Endangered. This change is not reflected in the tables and figures of this article.



Class	Common name	Scientific Name	Threat Category
BIRDS	Galapagos dove	<i>Zenaida galapagoensis</i>	LC <sup>a</sup>
	Great egret	<i>Ardea alba</i>	LC <sup>d</sup>
	Elliot's storm petrel	<i>Oceanites gracilis galapagoensis</i>	DD <sup>a</sup>
MAMMALS	Santa Cruz rice rat	<i>Nesoryzomys darwini</i>	EX <sup>a</sup>
	Santa Cruz giant rice rat	<i>Megaoryzomys curioi</i>	EX <sup>c</sup>
	Isabela giant rice rat	<i>Megaoryzomys sp.</i>	EX <sup>c</sup>
	Santa Cruz rice rat	<i>Nesoryzomys indefessus</i>	EX <sup>c</sup>
	Rábida rice rat	<i>Nesoryzomys sp.1</i>	EX <sup>c</sup>
	Isabela rice rat	<i>Nesoryzomys sp.2</i>	EX <sup>c</sup>
	Isabela rice rat	<i>Nesoryzomys sp.3</i>	EX <sup>c</sup>
	Galapagos rice rat	<i>Oryzomys galapagoensis</i>	EX <sup>c</sup>
	Fernandina rice rat	<i>Nesoryzomys fernandinae</i>	VU <sup>a</sup>
	Santiago rice rat	<i>Nesoryzomys swarthy</i>	VU <sup>a</sup>
	Santa Fe rice rat	<i>Oryzomys bauri</i>	VU <sup>a</sup>
	Galapagos sea lion	<i>Zalophus wollebaeki</i>	VU <sup>a</sup>
	Galapagos fur seal	<i>Arctocephalus galapagoensis</i>	VU <sup>a</sup>
	Fernandina rice rat	<i>Nesoryzomys narboroughi</i>	NT <sup>a</sup>
	Galapagos red bat	<i>Lasiurus borealis brachyotis</i>	LC <sup>a</sup>
Hoary bat	<i>Lasiurus cinereus</i>	LC <sup>a</sup>	

Source: <sup>a</sup> IUCN 2007. <sup>b</sup> Red Book for Ecuador. <sup>c</sup> Steadman *et al.* (1991). <sup>d</sup> CDF 2007.

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