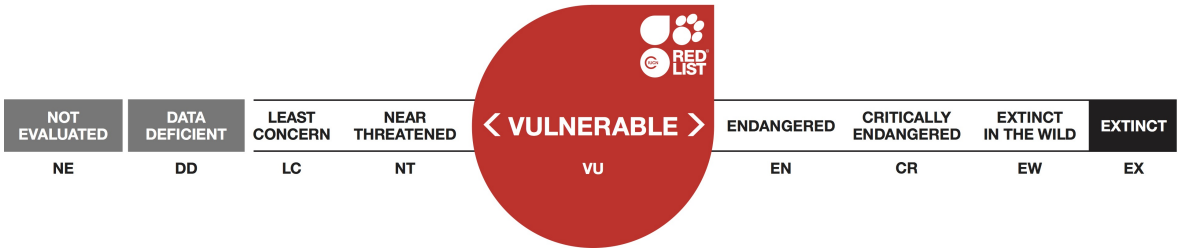
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Crocodylus palustris, Mugger

Assessment by: Choudhury, B.C. & de Silva, A.



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Reptilia	Crocodylia	Crocodylidae

Taxon Name: *Crocodylus palustris* Lesson, 1831

Common Name(s):

- English: Mugger, Broad-snouted Crocodile, Marsh Crocodile, Muggar
- French: Crocodile des Marais, Crocodile paludéen, Crocodile palustre
- Spanish: Cocodrilo del Marjal, Cocodrilo Marismeño

Assessment Information

Red List Category & Criteria: Vulnerable A2cd ver 3.1

Year Published: 2013

Date Assessed: June 30, 2009

Justification:

A past population decline of 30% over three generations (75 years) has been inferred due to direct observations of declines in abundance, reductions in range and habitat quality and extirpation from part of the range. These declines, due to threats such as habitat destruction and illegal poaching, are now thought to have stopped with populations generally stable or recovering. Total global population estimated at less than 8,700 non-hatchlings and overall stable and increasing although continuing decline is reported in some areas, populations are restricted between drainages, regions and countries and not in contact- therefore fragmented and no single population estimated to be more than 1,000 mature individuals. An assessment of Vulnerable under criterion A2cd has therefore been made for *Crocodylus palustris*.

Previously Published Red List Assessments

1996 – Vulnerable (VU)

1994 – Vulnerable (V)

1990 – Vulnerable (V)

1988 – Vulnerable (V)

1986 – Vulnerable (V)

1982 – Vulnerable (V)

Geographic Range

Range Description:

This species is found in India, Sri Lanka, Pakistan, Nepal and possibly from Bangladesh, its range extends

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westwards into eastern Iran. The species has become locally extinct over large parts of its range, and viable populations only occur in protected areas (Santiapillai and Silva 2001). This has led to severe fragmentation of the population across its range. India and Sri Lanka retain the major populations. In India it is reported present in 15 of India's 28 states from Kerala and Tamil Nadu in the south, in the lowlands of east and west sides of the peninsula in Karnataka, Goa, and Orissa and through much of the Ganges drainage. Significant populations occur in the middle Ganges (Bihar and Jharkand), Chambal river (Rajastan and Madhya Pradesh) and in Gudgerat. In Sri Lanka approximately half the known population occurs within protected areas including Wilpatu and Yala National parks and the Jaffna peninsula.

The last recorded sighting of this species is Myanmar occurred in 1867-68 suggesting that this species is probably extinct there (Van Dink 1993 in Ross 1998). The species is extinct in the wild in Bangladesh (Cox and Rahman 1994) and represented only in very small captive populations. The species was last seen in Bhutan in the 1960s (Whitaker and Andrews 2003).

This species is known to occur up to 420 m above sea level.

Country Occurrence:

Native: India; Iran, Islamic Republic of; Nepal; Pakistan; Sri Lanka

Possibly extinct: Bangladesh

Regionally extinct: Bhutan; Myanmar

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Distribution Map



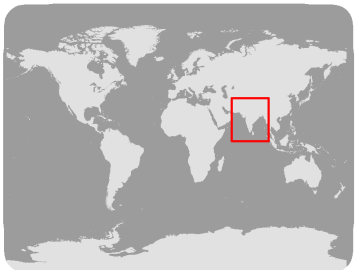
Crocodylus palustris

NE DD LC NT VU VULNERABLE EN 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

The species status was evaluated during an international workshop in Colombo, Sri Lanka in May 2013 at which over 40 regional experts and field researchers contributed current data and observations.

In 1989, the overall population size was estimated to be between 2,000-3,000 individuals (Whitaker and Whitaker 1989). Populations declined in the past, but in the current three generation period (approximately 1938 to present) populations in India and Sri Lanka were generally stable or recovering but decline continues in Pakistan, Iran, Nepal and the species is extirpated from Bangladesh and Myanmar. Although adequate survey data are lacking, existing records indicate that populations, while generally small and isolated, are widespread. The current global wild population is estimated at 5,700 to 8,700 non-hatchlings (data collected at the Colombo workshop 2013; see Table 1 in Supplementary Material). Field researchers and knowledgeable local experts consider numbers to be generally stable or increasing in the major remaining range in India and Sri Lanka

Bangladesh: Cox and Rahman (1994) reported *C. palustris* to be extinct in the wild, and only two wild Muggers were known to live in community ponds. However, S.M.A. Rashid (pers. comm.) reported 40 adult and 28 hatchling Muggers in captivity in seven zoos in 2009. Forty captive adult *C. palustris* (8 males:32 females) were obtained from the Madras Crocodile Bank Trust (India) in June 2005 (Andrews 2005).

Bhutan: Muggers are considered to have become extinct in Bhutan in the 1960s. A captive breeding programme was initiated at Phuentsholing and some individuals were reportedly released in the Manas River, but no detailed information is available. The released crocodiles were not monitored, and so their fate is unknown. In the past there have been sporadic sightings of *C. palustris* in the Bado, Manas, Sunkosh Torsa,Raidak and the Puna Tsongchu River, but there have been no recent records (Whitaker and Andrews 2003).

India: Muggers are reported from 15 States and the wild population is tentatively estimated as 3,021 to 4,287 non-hatchlings (Whitaker and Andrews 2003; R.Whitaker pers.comm. Colombo workshop 2013; see Table 1 in Supplementary Material). Numbers of non-hatchling Mugger in National Chambal Sanctuary (India) have apparently increased from 105 to 226 in 16 years (R.K.Sharma, data collected for the Madhya Pradesh Forest Department; Sharma *et al*. 1995). Human-Mugger conflict has been reported from different parts of the country (Whitaker 2007, 2008), indicating possible increases in population and/or Mugger reaching larger sizes.

Iran: Muggers are known from the drainages, small dams,artificial ponds and the natural ponds along the Sarbaz and Kajou Rivers, which join together to form the Bahokalat River in Sistan and Balochistan Provinces close to the Pakistan border. Recent surveys in the Nahang River area along the Pakistan border suggest that *C. palustris* is more widely distributed than previously considered. Mobaraki (unpublished data) estimated 200-300 *C. palustris* following a survey undertaken in 2007.

Pakistan: About 600 *C. palustris* are estimated to exist in four major wetland systems of Sindh, including a man-made lake (Javed and Rehman 2004, WWF unpublished 2007-2009 reports). Small populations are sparsely spread in Balochistan rivers, mainly near estuaries (Javed and Rehman 2004, Rehman 2007). These populations are considered to be vulnerable and diminishing, mainly due to drought and

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alteration of habitat (e.g. construction of dams). The species is reported to be extinct in the Punjab Province (Chaudhry 1993). Recent surveys undertaken in Sindh in 2006-09 (Masroor unpublished data) and 2008-09 (Chang unpublished data) may shed more light on status once they are available. More than 150 individuals are held in captivity in five facilities (four in Sindh and one in Punjab).

Nepal: The results of a 1993 survey indicated that the Muggers were restricted to isolated populations, primarily in protected habitats. Small numbers of individuals were known or suspected from the Mahakali, Nala, Karnali, Babai, Rapti,Narayani and Koshi River systems. Modification of habitat by river disruption and damming, and mortality in fisheries operations were major problems (McEachern 1994). Andrews and McEachern (1994) estimated 200 wild *C. palustris* in Nepal in 1993.

Myanmar: Van Dink (1993) reported that the last record of *C. palustris* in Myanmar was in 1867-68 and that the species was probably extinct there.

Sri Lanka: Approximately 2,400 to 3,500 individuals are estimated to exist in the wild, of which more than half are concentrated in several National Parks (e.g. Wilpattu, Yala, Bundala). Muggers are also found in many 'tanks' or man-made reservoirs in the dry plains of the island. Overall, numbers are thought to be increasing and human-crocodile conflicts are widely reported. In other areas, *C. palustris* is threatened by rapid agricultural and industrial developments (Whitaker and Whitaker 1989).

For further information about this species, see Supplementary Material.

Current Population Trend: Stable

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

This species is found in freshwater habitats including, rivers, lakes, reservoirs, hill streams, village ponds and man made tanks. It may also be found in coastal saltwater lagoons. This species is a hole-nesting species.

The Mugger is a hole-nesting species, with egg-laying taking place during the annual dry season. Females become sexually mature at approximately 1.8-2 m, and lay 25-30 eggs (Whitaker and Whitaker 1989). Nests are located in a wide variety of habitats, and females have even been known to nest at the opening of, or inside, their burrow (B.C. Choudhury pers. comm.). In captivity, some Muggers are known to lay two clutches in a single year (Whitaker and Whitaker 1984), but this has not been observed in the wild. Incubation is relatively short, typically lasting 55-75 days (Whitaker 1987). Whitaker and Whitaker (1989) provide a good review of the behaviour and ecology of this species.

Like a number of other crocodilians, *C. palustris* is known to dig burrows. Whitaker and Whitaker (1984) referred to Mugger burrows in Sri Lanka and India (Gujarat and South India) and noted that yearling, sub-adult and adult Mugger all dig burrows. In Iran they are sometimes known to dig two burrows close to each other, which may be used by one or more crocodiles (Mobaraki 2002). These burrows are presumably utilized as an effective refuge from hot daytime ambient temperatures. These burrows play a critical role in the survival of crocodiles living in harsh environments (Whitaker *et al*. 2007), allowing them to avoid exposure to excessively low and high temperatures (<5ºC and >38ºC respectively) for long periods of time, which may be lethal (Lang 1987). Mugger are known to undertake long-distance overland treks in Gir (India) (Whitaker 1977), Sri Lanka (Whitaker and Whitaker 1979) and Iran

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(Mobaraki and Abtin 2007). Some Muggers are killed while crossing roads in Iran (Mobaraki and Abtin 2007).

Systems: Terrestrial, Freshwater

Use and Trade (see Appendix for additional information)

Eggs are taken by humans and the species is also poached in small numbers for its skin and meat as well as its use in medicine.

Threats (see Appendix for additional information)

This species was threatened by habitat destruction due to agricultural and industrial expansion, entanglement and drowning in fishing equipment, egg predation by humans, illegal poaching for skin and meat and the use of body parts in medicine. Crocodiles were often treated as pests to inland fisheries and killed whenever possible (Santiapillai and Silva 2001). There are increasing incidents of human conflict with this species and this is due to encroachment by humans into the species' natural habitats (B.C. Choudhury pers. comm.).

Conservation Actions (see Appendix for additional information)

This species is listed under CITES Appendix I. Management of the species is largely based on the legal protection of wild populations and captive breeding for restocking natural populations. Between 1978-1992 in India, a total of 1,193 captive bred individuals have been used to restock populations in 28 protected areas (Ross 1998). However, in 1994 due to overcrowding in captive centres, the production of new offspring was ceased by the Indian Government. Protection is moderately effective in protected areas in India, Sri Lanka, and Iran.

Education and public awareness into the importance of crocodiles to their habitats is needed (Santiapillai and Silva 2001), and continued monitoring of the populations is required.

Credits

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External Resources

For Supplementary Material, and 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?
5. Wetlands (inland) -> 5.1. Wetlands (inland) - Permanent Rivers/Streams/Creeks (includes waterfalls)	-	Suitable	-
5. Wetlands (inland) -> 5.5. Wetlands (inland) - Permanent Freshwater Lakes (over 8ha)	-	Suitable	-
5. Wetlands (inland) -> 5.7. Wetlands (inland) - Permanent Freshwater Marshes/Pools (under 8ha)	-	Suitable	-
5. Wetlands (inland) -> 5.13. Wetlands (inland) - Permanent Inland Deltas	-	Suitable	-
9. Marine Neritic -> 9.8. Marine Neritic - Coral Reef -> 9.8.4. Lagoon	-	Suitable	-
15. Artificial/Aquatic & Marine -> 15.1. Artificial/Aquatic - Water Storage Areas (over 8ha)	-	Suitable	-
15. Artificial/Aquatic & Marine -> 15.2. Artificial/Aquatic - Ponds (below 8ha)	-	Suitable	-

Use and Trade

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

End Use	Local	National	International
Food - human	Yes	Yes	No
Medicine - human & veterinary	Yes	Yes	No
Wearing apparel, accessories	Yes	Yes	No
Establishing ex-situ production *	No	No	No

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	Unknown	Unknown	Unknown
	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	Unknown	Unknown	Unknown
	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 -> 2.1.4. Scale Unknown/Unrecorded	Ongoing	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.4. Scale Unknown/Unrecorded	Ongoing	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem 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	Unknown	Unknown	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.3. Persecution/control	Ongoing	Unknown	Unknown	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale)	Ongoing	Unknown	Unknown	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality		

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
Successfully reintroduced or introduced beningly: Yes
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
4. Education & awareness -> 4.1. Formal education

Research Needed

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

Research Needed
3. Monitoring -> 3.1. Population trends

Additional Data Fields

Distribution
Upper elevation limit (m): 420
Population
Number of mature individuals: 5700-8700
Continuing decline of mature individuals: No
Extreme fluctuations: No
Population severely fragmented: Yes
Extreme fluctuations in subpopulations: No
All individuals in one subpopulation: No
Habitats and Ecology
Generation Length (years): 25

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