

# SNAKES OF AMRAVATI DISTRICT INCLUDING MELGHAT, MAHARASHTRA, WITH IMPORTANT RECORDS OF THE INDIAN EGG-EATER, MONTANE TRINKET SNAKE AND INDIAN SMOOTH SNAKE

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## ABSTRACT

A checklist of snakes rescued and seen in Amravati district of Maharashtra from January 1996 to August 2006 is presented. Thirty-two species belonging to six families were recorded. These include important records of *Elachistodon westermanni*, *Coelognathus helena monticollaris*, *Oligodon taeniolatus*, *Eryx johnii*, *Lycodon striatus*, *Lycodon flavomaculatus*, *Calliophis melanurus*, *Boiga forsteni*, *Bungarus sindanus walli*. All the snakes rescued alive were released into suitable habitats.

## KEYWORDS

Amravati, *Coelognathus helena monticollaris*, *Dendrelaphis tristis*, *Elachistodon westermanni*, *Lycodon flavomaculatus*, Melghat, *Oligodon taeniolatus*, snakes.

## ABBREVIATIONS

MTR - Melghat Tiger Reserve; AU - Amravati University Campus (Scrub Forest); H - Inside Houses; R - Residential Areas, in back yards or front yards; G - City Garden, open spaces; F - City Fringes (Scrub Forest and wasteland getting cleared); C - Common; U - Uncommon; E - Rare

D'Abreu (1928) made a comprehensive collection of reptiles for the Central Museum, Nagpur, which provides information on reptiles of Vidarbha in general and Amravati in particular. This paper presents data with annotations of snake species actually found by the authors. Table 1 gives a checklist of snakes of Amravati with data on abundance, maximum length, status and habitat in which they were found. The total number of snakes reflects the abundance of snake species found in Amravati in an urban environment. The findings in Melghat are accidental and no serious attempts were made to explore the herpetofauna of MTR.

## METHODS

A team of eight rescuers attend to phone calls informing them about the occurrence of snakes in residential areas. Collectively both authors attend about 20 calls per day. The snakes are captured using hooked aluminum sticks and immediately put into cloth bags (after Whitaker, 1970). The caught snakes are brought to the residence of one of the authors where the snake's length is estimated by holding its tail against a graduated scale fixed on a wall and the length is read to the nearest inch. However, since the procedure often has to be performed rapidly, the estimation of lengths is not always accurate, especially with venomous snakes. After this the snake is identified with the help of standard reference books. To confirm the identity of a rare or uncommon snake, it is photographed, scale counts are made, and the information is sent to one or more of the herpetologists (mentioned in Acknowledgements). When a snake of any species protected

under Schedule I of the Indian Wildlife (Protection) Act 1972, is captured, a proper 'panchnama' is done and the snake is released in the presence of forest officials. Otherwise, the snakes are immediately translocated to the nearby Pohara Malkhed Reserve Forest at least 5 to 20km away from the city limits. However, the seven live and six dead Indian Egg-eaters rescued from residential areas on the fringe of the city were released 1km away from the place of capture in a similar habitat. A few Indian Rock Pythons *Python molurus molurus* were released into the Melghat Tiger Reserve (MTR).

The geographical expanse of Amravati district is within 20°32'-21°46'N & 76°37'-78°27'E. Snakes found in Melghat Tiger Reserve, were photographed and identified with the help of scale counts. They were not brought to Amravati.

The scientific names of snakes are according to Whitaker & Captain (2004).

## RESULTS

During the study period a total of 18,436 snakes were rescued in Amravati district. All the live snakes were released into the wild. A total of 32 species belonging to six families were found to occur in Amravati district including Melghat Tiger Reserve. Family-wise abundance of species are - Typhlopidae: two species, Boidae: two species, Pythonidae: one species, Colubridae: 19 species, Elapidae: three species, Viperidae: three species. The commonest snake species found in the order of their abundance were: *Ramphotyphlops braminus*, *Lycodon aulicus*, *Ptyas mucosa*, *Xenochrophis piscator*, *Naja naja*, *Bungarus caeruleus*, *Daboia russelii*, *Oligodon arnensis*, *Coelognathus helena helena* and *Argyrogena fasciolata*.

Rare snake species reported here are *Elachistodon westermanni*, *Coelognathus helena monticollaris*, *Oligodon taeniolatus*, *Eryx johnii*, *Lycodon striatus*, *Lycodon flavomaculatus*, *Sibynophis* species, *Dendrelaphis tristis*, *Coronella brachyura*, *Bungarus sindanus walli*.

## Annotations:

### Typhlopidae

1. **Common Worm (Blind) Snake *Ramphotyphlops* (*Typhlops*) *braminus*:** This is a common snake in Amravati. Most of the snakes were rescued from houses or residential areas. A total of 1050 snakes were rescued during the study period. D'Abreu (1928) had collected three specimens of this species at Nagpur and one at Balaghat (now in Madhya Pradesh).

\* See Images on the web at [www.zoosprint.org](http://www.zoosprint.org)

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**2. Beaked Worm (Blind) Snake *Grypotyphlops (Rhinytyphlops / Typhlops) acutus*:** This species is uncommon. Thirty-seven snakes were rescued or recovered. Some were identified from road kills. D'Abreu (1928) had collected three specimens of this species at Nagpur.

#### Boidae

**1. Common Sand (Russell's Earth) Boa *Gongylophis (Eryx) conicus*:** It is a common snake found here. Most of the snakes were rescued from residential areas. Total 270 specimens were rescued till date. D'Abreu had collected two specimens of this species (then called Schneider's Earth Boa) from Nagpur.

**2. Red Sand (John's Earth) Boa *Eryx johnii*:** (Image 1<sup>w</sup>). This is a rare snake here. Only three specimens were caught till date, two in houses and one in the Amravati University Campus. D'Abreu did not find this snake species in Vidarbha. This is probably the first published report of the species from Vidarbha.

#### Pythonidae

**1. Indian Rock Python *Python molurus molurus*:** This is also a rare species here. Only 17 specimens were rescued till date. It is found in city gardens, Amravati University campus as well as in residential areas. The longest specimen measured was 124 inches. It is found all over Vidarbha and D'Abreu (1928) had collected one specimen at Nagpur. The species is threatened and protected under Schedule I of Wildlife (Protection) Act, 1972 of India. Last year we found four juvenile pythons in Amravati University campus, each nearly about 1½ feet in length. Between 11-20 September 2006, we rescued three specimens in eight days, in a 5-km circle radius around Amravati city.

#### Colubridae

**1. Trinket Snake *Coelognathus (Elaphe) helena helena*:** It is a common snake in Amravati. Total 760 snakes were rescued from the city gardens. D'Abreu had collected four specimens of this species (then called Daudin's Coluber *Coluber helena*).

**2. Montane Trinket Snake *Coelognathus helena monticollaris*:** (Image 2<sup>w</sup>). It is rare in the district and found only in Melghat. The second author found only four specimens. The first live individual was found on 12 July 2003, second and third were found on 23 January 2006. The fourth (dead) specimen fell from the clutches of an unknown raptor flying high and had injuries on its head. This species was thought to be endemic to the Western Ghats and is reported from Tamil Nadu, Kerala, Karnataka, Goa and Maharashtra. This is the first record of the species from outside Western Ghats and from Melghat.

**3. Common Rat Snake *Ptyas mucosa*:** It is the commonest snake in Amravati. Totally 3294 snakes were rescued from houses and city gardens; also seen in Melghat. D'Abreu had collected nine specimens of this species from Nagpur.

**4. Common Bronzeback Tree Snake *Dendrelaphis tristis*:** (Image 3<sup>w</sup>). Only two specimen of this species were rescued from city fringes. It is a rare snake in this area. According to Wadatkar (2004) this species is found in central India. D'Abreu

(1928) had collected one specimen of this species (then called Seba's Bronze-back) in Nagpur.

**5. Checkered Keelback *Xenochrophis piscator*:** This is the second commonest snake species in Amravati. A total of 3235 snakes were rescued from houses and city gardens. On 8 March 2006, one gravid female laid 27 eggs. They were incubated in a 'humid box'. After 58 days, the first hatched. D'Abreu (1928) had collected six specimens of this species at Nagpur.

**6. Striped Keel back *Amphiesma stolatum*:** This is a rare snake in Amravati. Only 30 snakes were captured till date, most from city gardens. D'Abreu had collected one specimen of this species (then called Buff-striped Keelback *Rhabdophis stolatus*) in Nagpur.

**7. Green Keelback *Macropisthodon plumbicolor*:** It is uncommon in Amravati. Totally 175 snakes were rescued from city gardens and houses. D'Abreu (1928) had collected eight specimens of this species at Nagpur.

**8. Russell's Kukri Snake *Oligodon taeniolatus*:** This species is very rare here. Only one specimen was found in Melghat Tiger Reserve on 27 May 2006. According to Whitaker (1978) it is found in hills and plains of peninsular and northern India and part of the western Himalayas (Garhwal district).

**9. Common Kukri Snake *Oligodon arnensis*:** It is a common species in Amravati city. A total of 830 snakes were rescued from city gardens and city fringes. D'Abreu (1928) had collected seven specimens of this species (then called the Common Ladderback) in Nagpur.

**10. Common Wolf Snake *Lycodon aulicus*:** It is very common in Amravati. Totally, 3421 snakes were rescued from city gardens and houses. D'Abreu (1928) had collected nine specimens of this species at Nagpur.

**11. Barred (Shaw's) Wolf Snake *Lycodon striatus*:** (Image 4<sup>w</sup>). The snake is rare in Amravati area. Two snakes were found. The authors rescued the first on 25 September 1997 and the second one on 18 August 2006. D'Abreu (1928) had collected a single specimen of this species at Nagpur.

**12. Yellow-spotted Wolf Snake *Lycodon flavomaculatus*:** (Image 5<sup>w</sup>). Thirteen snakes were rescued during the study period from city gardens and residential areas. Ashok Captain and Romulus Whitaker identified the first specimen from Amravati. This species is endemic to India. It is known only from a few places around Western Ghats, viz., Nashik, Pune, Talegaon, Mulshi, Deolali, Dharwad, Sangli, Buldhana and Oudh (Whitaker & Captain, 2004; Captain (1999). D'Abreu (1928) mentioned one record of this species (old name Wall's Wolf Snake) from Buldhana in Berar (now Vidarbha). The Zoological Survey of India has included this species in their checklist of reptiles of Melghat.

**13. Dumeril's Black-headed Snake *Sibynophis subpunctatus*:** (Image 6<sup>w</sup>). It is a rare snake - only four snakes of this species were rescued in the city. It is found in peninsular India and there is one report from Mahu in Madhya Pradesh. D'Abreu (1928) had collected three specimens of this species (then mentioned as Jerdon's Polydont *Polydontophis subpunctatus*) from Nagpur. This species was identified visually. The possibility that this may be *S. sagittarius* cannot be ruled out

without examining more material.

**14. Stout Sand Snake *Psammophis longifrons*:** (Image 7<sup>w</sup>). Rare, only six snakes were rescued from Amravati University campus and the city fringes. The first specimen was collected in 2001. The identification of this snake was done by Ashok Captain and Varad Giri. According to Whitaker (1978), this species is found in Maharashtra and Gujarat, north of Mumbai, in Thane, Dhamanganga districts, Nagpur, Valsad, Bulsar and Panch-Mahal. D'Abreu stated that this species (then called Boulenger's Sand Snake) was "exceedingly rare, a specimen was secured at Nagpur in 1913 and none have been seen since". On the 30 December 2003 near Behali (Melghat) we found one road killed specimen of about 4ft at 1130hr.

**15. Indian Smooth Snake *Coronella brachyura*:** (Image 8<sup>w</sup>). A total of 14 individuals were found during the study period mentioned above in Amravati district. One male specimen was found dead at Karanja Lad, district Washim, Maharashtra (out of study area). Out of these two were found and collected as road kills in the city.

Dates and timings of rescue of 11 specimens in Amravati are as follows: 27 November 2003, 1945hr; 16 September 2004, 0815hr; 20 September 2004, 0920hr; 23 December 2004, 0630hr; 28 December 2004, 0740hr; 12 January 2005, 2120hr; 13 September 2005 (dead); 18 January 2006, 2045hr (two specimens); 19 January 2006, 0930hr; 17 August 2006, 0730hr. One male specimen was found dead at Karanja Lad, district Washim, Maharashtra (out of study area) on 28 February 2006.

The snakes are very agile but did not bite even when caught. The scale count was done and photos were sent to Ashok Captain who confirmed the identity. The Indian Smooth Snake is endemic to India and is known from a few localities in Maharashtra. D'Abreu mentioned, "There is a specimen from Wun (now Wani in Yavatmal district) in Berar (now Vidarbha) in the Indian Museum (No.7335)". It was also reported from Pune, Kurduwadi and Chink hills, Andheri (East) Mumbai, Visapur in Ahmednagar, Nashik in Maharashtra and Bhopal in Madhya Pradesh,

**16. Common Vine (Whip) Snake *Ahaetulla nasuta*:** (Image 9<sup>w</sup>). This is a rare species from Amravati. The first specimen was collected at Karajgaon in 2002. Only three snakes were, one from the city outskirts and two from residential areas. According to Whitaker & Captain (2004) this species is found throughout India. D'Abreu (1928) had collected three specimens of this species (then called The Common Green Whip Snake or Tree Snake *Dryophis mycterizans*) from Nagpur. Another variety of this snake *Ahaetulla nasuta* variety *isabellina* was observed in MTR by one of the authors and Vishal Bhatkar on 24 November 2005.

**17. Common Cat Snake *Boiga trigonata*:** It is a common species here. Totally, 850 snakes were rescued from the city fringes and from residential areas. D'Abreu (1928) mentioned it as a common species growing to a little over 3ft in length. He had collected six specimens of the species from Nagpur.

**18. Forsten's Cat Snake *Boiga forsteni*:** (Image 10<sup>w</sup>). It is an uncommon species found at Kund in Melghat Tiger Reserve. Two specimens found. The first specimen was recorded on 12 December 2003. It is the first record from Melghat Tiger

Reserve. The total length of the first specimen was 1.35m. A second individual was recorded from Akola at Koha.

**19. Banded Racer *Argyrogena fasciolata*:** It is a common snake in Amravati. A total of 780 snakes were rescued from the city gardens. D'Abreu had collected six specimens of this species (old name Fasciolated Rat Snake *Zamenis fasciolatus*) from Nagpur.

**20. Indian Egg-eater *Elachistodon westermanni*:** (Image 11<sup>w</sup>). An unidentified snake was rescued from the outskirts of Amravati city on 20 July 2005 at 2230hr. The scalation and measurements of the specimen found at Amravati are as follows: scales in 19:15:15 rows, smooth. Ventrals: 214; subcaudals: 69; anal undivided. Supralabials: 6 (2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> touching the eye). Total length: 71.05cm (29in).

The measurements and photographs were sent to herpetologists A. Captain, Pune, Dr. S.K. Dutta, Kolkata and Varad Giri, Mumbai. All of them confirmed the snake as being an Indian Egg-eater. The snake was then handed over to the forest department, a proper 'panchnama' was made and it was released nearby to the place from where it was rescued from. Including this specimen, 13 snakes were rescued in Amravati. The species is threatened and is protected under Schedule I of the Wildlife Protection Act (1972) of India. It was not reported for many years and was thought to be extinct.

One specimen was also reported by Captain *et al.* (2005), from Wardha district in Maharashtra, which is adjacent to Amravati district. Two snakes were found in Akola city (Balu Deshmukh, pers. comm.), and two more were rescued at Hinganghat and Selu towns in Wardha district (Gajendra Surkar, pers. comm.).

#### Elapidae:

**1. Indian Cobra *Naja naja*:** It is the commonest venomous species in Amravati. A total of 2105 snakes were rescued and released from houses. D'Abreu (1928) has mentioned it as a common snake growing to 2.1m (7ft) in length.

**2. Common Indian Krait *Bungarus caeruleus*:** It is a common venomous snake species found in Amravati. Totally, 1209 snakes were rescued from houses. D'Abreu (1928) had mentioned that they were fairly common. He had collected seven specimens in Nagpur, one at Kamptee and one at Chandrapur. We found one 1.5m (5ft) long in Shankar Nagar, Amravati that was one of the largest kraits found in the area.

**3. Walls Sind Krait *Bungarus sindanus walli*:** (Image 12<sup>w</sup>). This is a rare venomous species found only twice. The first was rescued on 27 August 2005, it was 1524mm (5ft) long. The second was found in same area on 15 August 2006 its length was about 1m (3.5ft).

**4. Slender Coral Snake *Calliophis melanurus*:** (Image 13<sup>w</sup>). This is a rare venomous snake found here. Only five specimens were rescued from houses. The most recent specimen was rescued on 9 August 2006. It was the largest and measured 35cm (14in). According to Whitaker, this species is found in most of peninsular India and in West Bengal. D'Abreu (1928) mentions it as "Fairly common at Nagpur where it is known as the 'Dhul Nag'. The longest specimen was a little over a foot in length." He collected seven specimens of this species at Nagpur.

Table 1. Snakes of Amravati

	Family & Common Name	Scientific name	Max. Length (inches)	Status	Favourite Haunt
	<b>Typhlopidae</b>				
1	Common Worm Snake	<i>Ramphotyphlops braminus</i>	6	C	H
2	Beaked Worm (Blind) Snake	<i>Grypotyphlops (Rhynchotyphlops) acutus</i>	14	U	H
	<b>Boidae</b>				
1	Common Sand (Russell's Earth) Boa	<i>Gongylophis (Eryx) conicus</i>	38	C	H.
2	Red Sand (John's Earth) Boa	<i>Eryx johnii</i>	24	E	AU, H
	<b>Pythonidae</b>				
1	Indian Rock Python	<i>Python molurus molurus</i>	124	E	R, G, AU
	<b>Colubridae</b>				
1	Trinket Snake	<i>Coelognathus helena helena</i>	48	C	G
2	Montane Trinket Snake	<i>Coelognathus helena monticollaris</i>	23	R	MTR
3	Common Rat Snake	<i>Ptyas mucosa</i>	114	C	G
4	Common Bronzeback Tree Snake	<i>Dendrelaphis tristis</i>	26	E	F
5	Checked Keelback	<i>Xenochrophis piscator</i>	48	C	G
6	Striped Keel back	<i>Amphiesma stolatum</i>	18	E	G
7	Green Keelback	<i>Macropisthodon plumbicolor</i>	19	U	G
8	Russell's Kukri Snake	<i>Oligodon taeniolatus</i>	13	E	MTR
9	Common Kukri Snake	<i>Oligodon arnensis</i>	12	C	G,F
10	Common Wolf Snake	<i>Lycodon aulicus</i>	19	C	G
11	Barred (Shaw's) Wolf Snake	<i>Lycodon striatus</i>	16	E	G
12	Yellow-spotted (Striped) Wolf Snake	<i>Lycodon flavomaculatus</i>	14	E	G
13	Dumeril's Black headed Snake	<i>Sibynophis sp.</i>	18	E	F
14	Stout Sand Snake	<i>Psammophis longifrons</i>	57	E	F, AU, MTR
15	Indian Egg-eater	<i>Elachistodon westermanni</i>	29	E	R, F
16	Indian Smooth Snake	<i>Coronella brachyura</i>	12	E	R
17	Common Vine (Whip) Snake	<i>Ahaetulla nasuta</i>	30	E	R, F, MTR
18	Banded Racer	<i>Argyrogena fasciolata</i>	38	C	G
19	Cat Snake	<i>Boiga trigonata</i>	30	C	R, F
20	Forsten's Cat Snake	<i>Boiga forsteni</i>	60	U	MTR
	<b>Elapidae</b>				
1	Indian Cobra	<i>Naja naja</i>	72	C	H
2	Common Indian Krait	<i>Bungarus caeruleus</i>	60	C	H
3	Wall's Sind Krait	<i>Bungarus sindanus walli</i>	54	R	H, R
4	Slender Coral Snake	<i>Calliophis melanurus</i>	14.5	E	H
	<b>Viperidae</b>				
1	Russell's Viper	<i>Daboia russelii</i>	51	C	H, R
2	Saw-scaled Viper	<i>Echis carinatus</i>	12	U	G
3	Bamboo Pit Viper	<i>Trimeresurus cf. gramineus</i>	16	E	MTR

MTR - Melghat Tiger Reserve; AU - Amravati University Campus (Scrub Forest); H - Inside Houses; R - Residential Areas, in back yards or front yards; G - City Garden, open spaces; F - City Fringes (Scrub Forest and wasteland getting cleared); C - Common; U - Uncommon; E - Rare

### Viperidae:

1. **Russell's Viper *Daboia russelii*:** It a common venomous snake found in Amravati. Totally, 1350 snakes were rescued from houses and residential areas. D'Abreu has mentioned that they are not as common as cobras and kraits. He had collected three specimens for the Nagpur Museum. On 20 June 1998 one gravid female gave birth to 28 babies. She was rescued on 19 June at 1130hr.

2. **Saw-scaled Viper *Echis carinatus*:** It is an uncommon venomous snake in Amravati. A total of 95 snakes were rescued from open spaces and city gardens. An injured female that was rescued later gave birth to three dead offspring. D'Abreu (1928) collected three specimens of this species at Nagpur.

3. **Bamboo Pit Viper *Trimeresurus gramineus*:** (Image 14<sup>w</sup>). It has been found only in MTR. Once it was photographed in the wild in Bhimkund gorge near Chikhaldara in Melghat. But the photos are not of reproducible quality. According to Whitaker (2004), it is usually found above 450m (1480ft) in the Western Ghats, the northern most limit probably being the Dangs in Gujarat. Also recorded from near sea level at

Tamil Nadu and Maharashtra. D'Abreu had collected one specimen of this species (then called Green Pit Viper) from Pachmarhi (Madhya Pradesh). Hence, this is the first report of Bamboo Pit Viper from Melghat in Vidarbha.

### DISCUSSION

The report published by Zoological Survey of India (ZSI, 2005) on fauna of Melghat Tiger Reserve lists a total of 27 species of snakes found in MTR. Out of these we have, in all, described 25 species to be found in either MTR or Amravati. We have not found the following two species (recorded by the Z.S.I.) during the study period: *Typhlops diardii* Diard's Worm Snake and *Psammophis condanarus* Condanarus Sand Snake

The following species collected by D'Abreu (1928) from the Central Provinces (now Madhya Pradesh, Chhattisgarh and Vidarbha) were not found in the study area by the authors. Nomenclature after Whitaker and Captain (2004): *Typhlops porrectus* Slender Worm Snake, *Lycodon travancoricus* Travancore Wolf Snake, *Coluber gracilis* Slender Racer, *Liopeltis calamaria* Lesser Stripe-necked Snake, and *Bungarus fasciatus* Banded



## Krait

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## SPERM WHALE *PHYSETER MACROCEPHALUS* LINNAEUS STRANDING ON THE KANNUR COAST, KERALA STATE, INDIA

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A dead Whale was washed ashore at Keezhunna Kadappuram, about 8km south of Kannur town on 08.ii.2007. From the peculiar barrel-shaped huge head, long rod-shaped lower jaw and the corrugated nature of the body, it was identified as Sperm Whale, *Physeter macrocephalus* Linnaeus. The specimen was an adult female measuring about 9m in length. The local fishermen reported that the whale got stranded and died during a high tide the previous night. The fresh external wounds on the flipper, dorsal side of body and caudal regions, with blood oozing out, suggest the possibility of the whale having got hit with a large fishing boat or ship.

The stranded locality is close to the mouth of Dharmadam river and the coastal waters of this area is relatively shallow. The Green Island (Dharmadam thuruthu), a small island in the littoral area of the coast, is situated about 7km south of the stranding site. The coastal waters around this island is well known for sightings of Common Dolphin (*Delphinus delphis*) and Hump-backed Dolphin (*Sousa chinensis*). Interestingly, there have also been several individual strandings of cetacean species reported around this coast in the past (Mohan, 1999; Palot, 2005; Cheruvat *et al.*, 2006). Stranded Sperm Whales have also been reported from Pondicherry and Gujarat (K. Sathasivam, in litt. 29.ix.2007)

*Physeter macrocephalus* is a circumglobal species frequenting deep waters. Along the Indian ocean, it is reported from India (Andaman and Nicobar Islands, Chennai, Karwar, Kollam, Krusadi Islands, Lakshadweep Islands and Mahabalipuram), Pakistan (Sind and Baluchistan coasts) and Sri Lanka (James & Panicker, 1994; Agrawal & Alfred, 1999).

The Sperm Whale is legally protected under Schedule II of Indian Wildlife (Protection) Act of 1972 and from International Trade under Appendix-I of CITES. International Whaling Commission protects this species from whaling since 1986.

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Snakes of Amravati district including Melghat, Maharashtra, with important records of the Indian Egg-eater, Montane Trinket snake and Indian Smooth snake. The purpose of this study was to investigate the effect of the degree of abduction on shoulder abduction strength. Thirty healthy volunteers with no history of shoulder complaint participated in this study. (More). Cite.