

**SURVEY OF HUMAN/CROCODILE
CONFLICT IN INDIA, MAHARASHTRA
STATE, DECEMBER 2007**

by

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Introduction

As per the agreement between the Madras Crocodile Bank Trust and the UNDP/GEF SGP, a survey of human/crocodile conflict incidence was carried out at main reported sites of conflict in southern Maharashtra by the Project Head of “Community based participation in mitigation of human-crocodile conflict in India”.

The Krishna River and its tributaries in Sangli and Kolhapur Districts, southern Maharashtra have a breeding population of mugger crocodiles *Crocodylus palustris*, which have caused attacks on humans and livestock in recent years. A list of conflict sites was provided by the Maharashtra Forest Department. This is a report on incidence of human/crocodile conflict, compensation paid and water-body use by local people. An area-specific Action Plan was developed in collaboration with frontline Forest Department staff, villagers at conflict sites, local NGOs and interested residents, and is presented here.

Methodology

A survey of human-crocodile conflict in Sangli/Kolhapur Districts of Maharashtra was carried out between 15th – 18th December, 2007 (Appendix 1 gives a detailed schedule). Travel to conflict sites from the Sangli base was by collaborating NGO's and Forest Department vehicles. Upon reaching a conflict site, residents were interviewed and the proforma's filled out. Only a token number of residents interviewed had their names taken, and other unrecorded residents ranged between 4 – 15 people. Details of conflict sites, including major landmarks, sites of crocodile capture (for translocation), release sites, crocodile nests and other important features were recorded on a Garmin Etrex GPS.

It should be noted that much of the detailed conflict information was related to human injury/fatality, and little information was reported on the injury/fatalities of livestock, though noted where it was known to occur. Conflict sites were visited along with State Forest Department personnel and local NGO's, a complete listing is given in Appendix II. Compensation amounts, sex and age of conflict victims, socio-economic information, circumstances of attack were collected as per the proforma in Appendix III.

Extents of the Krishna river and its tributaries visited (Warma and Kadavi) were acquired from unsupervised classification and subsequent class separation of satellite imagery (band 5 of Landsat's Enhanced Thematic Mapper which depicts the land/water interface well, and NASA's Shuttle Radar Topology Mission), and represent conditions on 24th November 2001 when the image was captured, a similar season to when the current survey was done. River courses were digitized (traced) from the imagery, and waypoints collected on this trip are plotted in Figure 1. This is primarily to complement outdated topographic map information on water-sheds, streams, rivulets, at and adjacent to conflict

sites, and to acquire up-to-date information on connectivity between the different water-bodies.

Results

Sandari and Digras Wadi Villages, 15th December 2007:

At Sandari on the Warma River (Krishna tributary) no attacks on humans were reported. Two crocodiles were captured at Sandari, following complaints by villagers, and translocated to Chandoli Dam on 12th March 2006 and November 2007. The total village population is about 7,000 people. There is no direct usage of the river, apart from the use of diesel pumps to water sugar-cane. Elders interviewed said they had never seen crocs on the Warma River in the past and the general assumption was that these two crocodiles came from the Chandoli Dam, which is connected to the Warma River via the Krishna. Interviewed residents were Rajendra Anmaso Koli and Yeswanta Maruti Atulkar, among others.

Digras Wadi is located about ½ kilometer from the Krishna River and one fatal human attack was recorded here in 2003. Village population is only about 100 people, with farming sugarcane and turmeric the major occupation. Sand mining occurs on a large scale on this part of the Krishna River, as well as fishing with nets (by outside communities). With a bore-well as a source of drinking water, there is no usage of the Krishna River by villagers, except for grass cutting on the banks to feed about 100 cattle which are now always tied and stall fed (grazing cattle was stopped after attacks). Five to six mugger are regularly seen basking on the river bank in this area. Villagers are aware that crocs are protected.

The fatal attack reported occurred on 29th April 2003 at 1600 hrs, on a boy aged 7, Aniket Rajaram Kadam. Compensation of Rs.100,000 was given to the father. Approximate size of the crocodile was 10 feet. The attack occurred when the boy was standing two feet deep in the river washing. Once seized he reportedly tried to fend off the crocodile, opening its jaws with his hands. Witnesses to the attack were his uncle (Mahadev D. Kadam) who tried to open the crocs jaws with his hands, and nephew (Amit Suresh Kadam). Aniket's body was only recovered the next day. Subsequently a crocodile nest was discovered by the villagers and eggs destroyed, perhaps in retaliation. A cage trap was placed near the attack site for one week by the Forest Department in an unsuccessful attempt to capture the mugger responsible for the attack. Interviewed resident was the father of the victim, Rajaram Nabiraj Kadam and others.

Chandoli Dam, 16th December 2007: Constructed in 1976, Chandoli Dam within Chandoli National Park (309 Sq km) is at the junctions of Sangli, Kolhapur, Satara and Ratnagiri Districts. It is the release site for approximately 30 crocodiles caught on the Krishna River and its Tributaries within Sangli/Kolhapur Districts (Figure 2). Aerial extent is about 28 km squared, and this dam is uninhabited by people, being a National Park. At Chandoli Dam, we visited the croc release sites, in addition to a now flooded

nesting site. Egg shells had been observed here previously. Both release sites were adjacent to the levee created for the dam, and were located adjacent to the north and south extents of the levy respectively (Figure 3).

On the way to the dam we were shown a nest site at Sarud (Kolhapur District, Showadi Tasil) along the Kadavi River, which hatched on 31st May 2007. 26 eggs were observed then, of which all hatched and were photographed by Dr S.R. Patil of the NGO Vasundhara (Plate 1). Tunnels were reported at low water level time (May) by residents.

Dhawali, Chopadewadi, Analkhop, Bhilawadi, 17th December 2007: Dhawali Village is located about 3 kilometers from the Krishna River. This village had no reports of humans or livestock being attacked by crocs. Total population here is about 3,500 people, and water from the Krishna is used here for irrigation, drinking, bathing, and washing clothes. The number of live-stock was estimated at 3,000-4,000. Livestock were stall-fed, with fodder and in addition to the usual sugarcane crop there are a number of fish-culture ponds.

Two mugger entered a fish-culture pond on 22nd October 2005. One of these went back to the Krishna River by itself and the other animal was caught and released at Chandoli Dam. Given that this was the first time crocs were seen in the area, it is believed to be a stray incidence. Although not available for comment, the owner of the fish ponds believed the crocs had eaten all his fish and had tried to claim compensation from the Forest Department. There were no reports of humans or livestock being attacked by crocs in the past. People interviewed here didn't know crocs were protected. Residents interviewed were Allisar Patan, Dilip Patil, and Akash Waghmare, among others.

Chopadewadi Village is located about ½ a kilometer from the Krishna River, and is the site of a single non-fatal attack. It has a population of about 1500 people. Krishna water is used for drinking (water is pumped from the river, purified, and drunk), bathing, washing clothes, washing cattle, etc. The number of cattle was estimated at 3,000. Villagers reported almost no grazing, with fodder for cattle coming from their own land. Villagers reported dogs, calves being taken by crocodiles in the past.

A single non-fatal attack was reported by the victim, Ratnaprabha Naiku Yadav, a lady aged 35 years. Compensation of INR 15,000 was given. Size of the crocodile was estimated at 4 – 5 feet by her. The attack occurred at 930 hrs on 19th May 2005. Damage caused was a lost left toe, and a laceration on her left calf (Plates 2 & 3). According to her, she was washing clothes facing away from the river with a group of 4-5 women who were also facing away. She also noted that the river was muddy at that time. Her sister in law Anandi Sadashiv Yadav (age 55) and Bharti Dinkar Mane (age 41) were witness to the attack.

The victim agreed with the enclosed bathing ghat concept (see Plate 4), and others were concerned about cattle bathing, possibility of translocating crocodiles to Chandoli Dam, and the fact that they hadn't seen crocs here up until about 25 years ago. Here

people regularly see crocs basking between 1100 – 1600. Nest sites/eggs were not mentioned, but interviewed residents have seen hatchlings with mother near the bank, and a mother leading her hatchlings to water following nest excavation. A group of four ladies washing clothes at the water edge (Plate 5) were questioned about their awareness of crocs in the river, comprising 1 migrant laborer (from Karnataka) who had come for the sugar-cane harvest, and three locals. The migrant laborer was unaware of crocs, while all the three locals were aware, and felt comfortable as long as they were washing clothes in a group. The local ladies interviewed were Savita Sudhakar Tarap, Saika Suresh Chavan, and Ashvini Hanmat Chonan. Other locals interviewed here were Sivaji Vishnuyadav, Vittalnirutti Mani, Baburao Ramchandra Yadav, several residents with whom we had a question/answer session to dispel myths about crocodiles, and the conflict victim. Some of these residents were aware that crocs were protected while others were not.

Analkhop is a village located about 1.5 kilometers from the Krishna River, and the site of a fatal attack. The population consists of about 7,000 people. Dependence on the water body was maximal, with it being used for bathing, washing clothes, cattle, etc. Water is pumped from the River and used following purification. Live stock (about 14,000) is mainly stall fed with fodder from their own land. Villagers were unaware of any attacks on livestock/pets.

A single fatal attack occurred on a 22 year old man, Sunil Pandurang Bhosale, on 16th March 2007, at 2030. His father received INR 200,000 in compensation. According to interviewed residents, he had a habit of stealing food and money from ceremonial floating devices let loose on the river at dark by the villagers. On the day of his death, he had swum out to try and do this again when he was attacked. No one witnessed the attack. Following the attack, people stopped going up to chest deep in water, and instead began using small circular boats (“parsals”) made out of large vessels used to process jaggery (Plate 6). Community awareness of how to live alongside crocs here has resulted also in people from one side of the bank warning others if crocs are seen (Plate 7) on the opposite bank, the river is about 150 meters wide here. Interviewed residents here were S.S. Ranjane and others.

Bhilawadi is a village about a kilometer from the Krishna River, and is the site of a single fatal attack. Population here is about 5,000 people. The main occupation here is farming. People depend on the Krishna for water (purified and used), bathing, clothe washing, cattle bathing, etc. There are about 10,000 cattle and 300 dogs, with very little grazing occurring (cattle mainly stall fed). People here knew crocs were protected. Around one or two calves and dogs were reportedly killed within the last 4 – 5 years.

One fatal attack here occurred 11th September 2003 at 1400 hrs, on a man named Ram Chandra and aged 50 years. Compensation was given to his son, Rahul Ramchandra Nalwadade, of INR 200,0000. The croc was estimated at being around 12 feet long, and first caught Ram Chandra on the thighs, then stomach (Plate 8). He was net fishing at the time in thigh deep water. The croc swam with the body for a while, and villagers got into parsals and started beating the water with sticks and shouting. The body was recovered

the next day. Witnesses to this attack were Ram Chandra's son, Rahul, and Subhash Nathuram Apte, a local resident.

Interviewed residents believe crocs consider humans easy prey, and fishing had reduced following the fatal attack. They also fished from the parsal now with nets (both ¼ “ and 2” mesh nylon nets) rather than in the water, and don't go alone to the river. Someone now is designated a look-out, and after 1200 hrs no-one goes on the riverbanks. Residents reported 10 – 15 crocs in the area. Villagers were interested in getting enclosed bathing ghats constructed. Rahul Ramchandra Nalwadade, the victim's son, was the source of information on this village and circumstances of his father's death.

Discussions with Forest Department, Police Department, and local NGOs, 18th December 2007;

i. A meeting was held with the Additional Superintendent of Police, Shri Sunil Kohle, regarding the procedures followed in the event of human-crocodile conflict. The protocol currently followed was first for the police constable, village revenue officer (Talathi), or Village Guard (Kotwal) to report to the nearest Forest Officer within 48 hours. It was also confirmed that police representatives/gram panchayats could play a role in the protection of caged-bathing ghats and warning signboards to prevent mis-use/damage.

ii. A second meeting was held with front-line staff from the Forest Department, NGOs, and the Press to present findings of this survey and to discuss workable mitigation measures. It was universally agreed that the section of the Krishna River containing Dhavali, Chopadewadi, Analkhop, and Bhilawadi were the areas to concentrate on given their recent fatal attacks and strong dependence on the river. A pamphlet used by the Parks and Wildlife Commission of the Northern Territory, Australia, (for educating people there about living with saltwater crocs) was adopted as a general layout for the education program. The responsibility of necessary additions, editing, is to be done at MCBT and translation into Marathi by the River Valley Expedition Society based in Sangli. In addition 3-4 caged in bathing ghats are being designed by Nadaf Sahib (Range Forest Officer, Tasgon Range) in consultation with the Wildlife Warden and others, and these may have warning boards attached to them. Another area where boards should be put up is at potential conflict sites without caged bathing ghats (see Plate 9 & 10 for examples).

Conclusions.

1. Average distance between the village in question and the Krishna/Warna River during the present survey was 1416 meters (range between 500 – 3000 meters), fatal attacks on humans occurred in 3/6 of the sites visited (50 %), and non-fatal attacks occurred in 1/6 of the sites visited (16 %). Detailed information was given by victims/onlookers with regards to the circumstances in the case of fatal/non-fatal human attacks, but the loss of live-stock (reported at Chopadewadi & Bhilawadi) seemed a natural and accepted consequence of living along-side crocodiles. Attacks occurred from March – May, with one of the translocated crocs caught in October during floods.
2. There is a need to do a projection of the crocodile population increases in Sangli/Kolhapur Districts for the next 10 – 20 years from now, largely due to recruitment and subsequent dispersal from Chandoli Dam and the Krishna River. The possibility of crocodile utilization in the future (i.e. collection of eggs from the wild and rearing animals in captivity for skins), taking into consideration the local inhabitants and how they can benefit should be investigated. Crocodile egg collection and rearing the young for skins and meat is a proven conservation/management strategy that can guarantee crocodile survival, provide local income and community benefits. It is essential that conflict/potential conflict affected villages get on the side of crocodiles, given their importance to fisheries and role as scavengers.
3. There is an excellent network of Forest Department personnel, NGO's such as Vasundhara and River Valley Expeditions, and concerned residents located around the conflict sites. The Deshbakht Anandrao Balwantrao Naik College of which Dr S.R. Patil is the Principal of are enthusiastic about initiating studies on the crocodiles here, such as social and basking behavior studies (daily and seasonal variation), studies on the Krishna tributary river mouths for seasonality, fish spawning, temperature, concentrations of crocs and birds, and continued monitoring of human/crocodile conflict. Studies on the movement of translocated crocodiles are important, especially since it is suspected that crocs are homing back to sites of capture from Chandoli Dam.
4. An Action Plan for Sangli and Kolhapur Districts incorporating sign boards and educational pamphlets and this portion of the Action Plan will be funded by the UNDP/GEF Project. Designs for caged bathing ghats are being developed with the concerned stake-holders, and 2-3 models will be funded by this Project. These will be replicable at other locations of human/crocodile conflict.

Acknowledgements

I would like to firstly thank Shri Mazumdar, PCCF (Wildlife), Maharashtra, for giving me permission to carry out this survey. The people who accompanied me on this work are listed in Appendix 1 and are thanked for a variety of reasons, from providing transport in their personal vehicles, providing food and accommodation, scanning and Xeroxing records and pictures, translating from Marathi to English at the conflict sites, and even rescuing my clip-board from the Forest Department Museum near Chandoli Dam. Their friendship and comrade made this survey a pleasant and worthwhile trip. I also of course thank interviewed residents at the villages, some of who had lost their kin in croc attacks.

The ETM + and SRTM data used to prepare Figure 1 were provided by the Global Land Cover Facility. I would also like to extend my gratitude to my mother, Zahida Whitaker, and brother, Samir Whitaker, for their help in my last minute hectic equipment/essential items purchase at Bangalore and hearty support and encouragement for this trip.

Appendix I. SCHEDULE OF MAHARASHTRA HUMAN-CROCODILE CONFLICT TRIP

14th December, 2100; left from Bangalore for Miraj Railway Station, Sangli District

15th December, 1230; reached Miraj station

15th December 1430 – 1800; visited conflict sites Sandari and Digras Wadi

16th December, 0730 – 2000; visited Chandoli dam (release site for crocs captured from Krishna River), and nesting bank at same

17th December 0730 – 2030; visited conflict sites Dhavali, Chopadewadi, Analkhop, and Bhilawadi.

18th December 1100 – 1145; meeting with concerned Forest Department, NGOs, individuals, in the office of the Addnl. Superintendent of Police

18th December 1200 – 1315; meeting with concerned Forest Department, NGOs, individuals, at Sangli Forest Rest House for deputation of work and responsibility for mitigation measures (education program and enclosed bathing ghats).

18th December 1400; left from Sangli for Miraj Railway Station for return trip to Bangalore

Appendix II. PEOPLE AND ORGANIZATIONS MET

X	Name	Occupation	Organization
1	Abhijeet Jadav	Student	Vasundhara
2	Abhijeet Patil	Snake Catcher	Vasundhara
3	Ajit Shridar Patil	Industrialist/Nature Lover	-
4	Alok Shendhage	ACF (Wildlife), Kolhapur	Forest Department
5	Annaso Sankpal Mandoor	Launch Driver	Forest Department
6	Appasaheb Katkar	Forest Guard	Forest Department
7	Ayyaj Babsosutr	Dairy milk production	Sakarwade
8	B.D. Sheikh	Forester	Forest Department
9	Burngee Sahib	Vehicle Driver	Forest Department
10	Deepak Jadav	Student	Vasundhara
11	Dr Harshad	Doctor	Off-shore Medical Officer on Oil rig
12	Gyansingh Patil	Chief Executive Engineer, Chandoli Dam	Irrigation Department
13	Karan Nilakhe	Student (PG)	Blue Cross volunteer
14	Kiran Sahib	Animal welfare activist	PETA
15	Mandar Gaikwad	Student (PG)	-
16	Nadaf Sahib	Range Forest Officer (Tasgon Range)	Forest Department
17	Paswan Patil	-	River Valley Organization
18	Pradeep Sutar	Journalist	Indian Express
19	Sambhaji Pawace	Forest Guard	Forest Department
20	Sayli Gaikwad	Student (Engineering)	-
21	Shinkander Majid Kokane	Forest Guard	Forest Department
22	Suhas Patil	-	River Valley Organization
23	Sumit Patil	Student	Vasundhara
24	Sunil D. Patil	Vehicle Driver	Forest Department
25	Sunil Kohle	Additional Superintendent of Police	Police Department
26	Suresh Gaikwad	Wildlife Warden	Forest Department
27	Tabrez Daud Khan	Snake Catcher	River Valley Organization

Appendix III. MULTI PURPOSE FORM FOR COLLECTION OF DATA FROM HUMAN/CROCODILE CONFLICT LOCATIONS.

MULTI PURPOSE FORM FOR COLLECTION OF DATA FROM HUMAN/CROCODILE CONFLICT LOCATIONS.

Date:

Time start:

Time end:

A. Identification details

i. Name of the village:

ii. Type of water body (dam/river/lake/estuary):

iii. Distance of the village from the water body:

B. Profile of residents

i. Interviewed Resident name (s):

ii. No. of people in the village (male/female):

iii. Occupation:

iv. Educational status

S. No.	Below metric (N)	Metric (N)	H.Secondary (N)	Degree and above (N)
1				
2				
3				
4				
5				
6				

C. Dependence on water body

i. Source of drinking water:

ii. Number of live stock/pets (cattle/dog/goat/cat):

iii. If you have live-stock, how do you feed the animals (stall feeding, grazing, or both)?

iv. If stall fed, where does the fodder come from (own land, forest, or both):

v. If grazed, where do livestock go for grazing (near water-body, near forest area, or both)?

vi. Have crocodiles or any other wild animals attacked your livestock/pets?

vii. Dependence on water body (drinking water, bathing & washing clothes, washing of household materials, cattle bathing, etc):

vii. Time of utilization of water body: (0500-1000 hs, 1000-1300 hs, 1300 – 1600 hs, 1600 – 1830 hs, other):

viii. Do you have your own water-source available? (yes/no);

D. Crocodile conflict

i. Any incidence of crocodile attack? (Humans, livestock/pets, other)?

E. Details of attack(s)

Date	Time	Area (GPS location; note NA if entered in Log book)	Name of victim	Age	Male/female

iii. Damage caused by attack:

iv. Compensation obtained (yes/no):

v. Approximate size of crocodile (small/medium/huge):

vi. Reason for attack (Victim's account):

vii. Awareness about crocodile behavior (good/normal/nil):

Viii. Do you go fishing (yes/no, if yes, specify mode of fishing):

viii. Have you seen crocodiles in the wild? (Yes/no):

ix. How do you avoid crocodiles now?

X. Are you thinking of evacuating from here because of this problem? (Yes/no):

xi. Would you prefer construction of a well/rain-water harvesting as an alternative source of drinking water? (Yes/no):

xii. Do you know that crocodiles are protected? (Yes/no):

xiii. How can this problem be solved?

F. Housing and infrastructure

i. Roof type (reed hut/tiled/asbestos/other):

ii. Wall type (mud/brick/reed/bamboo/other):

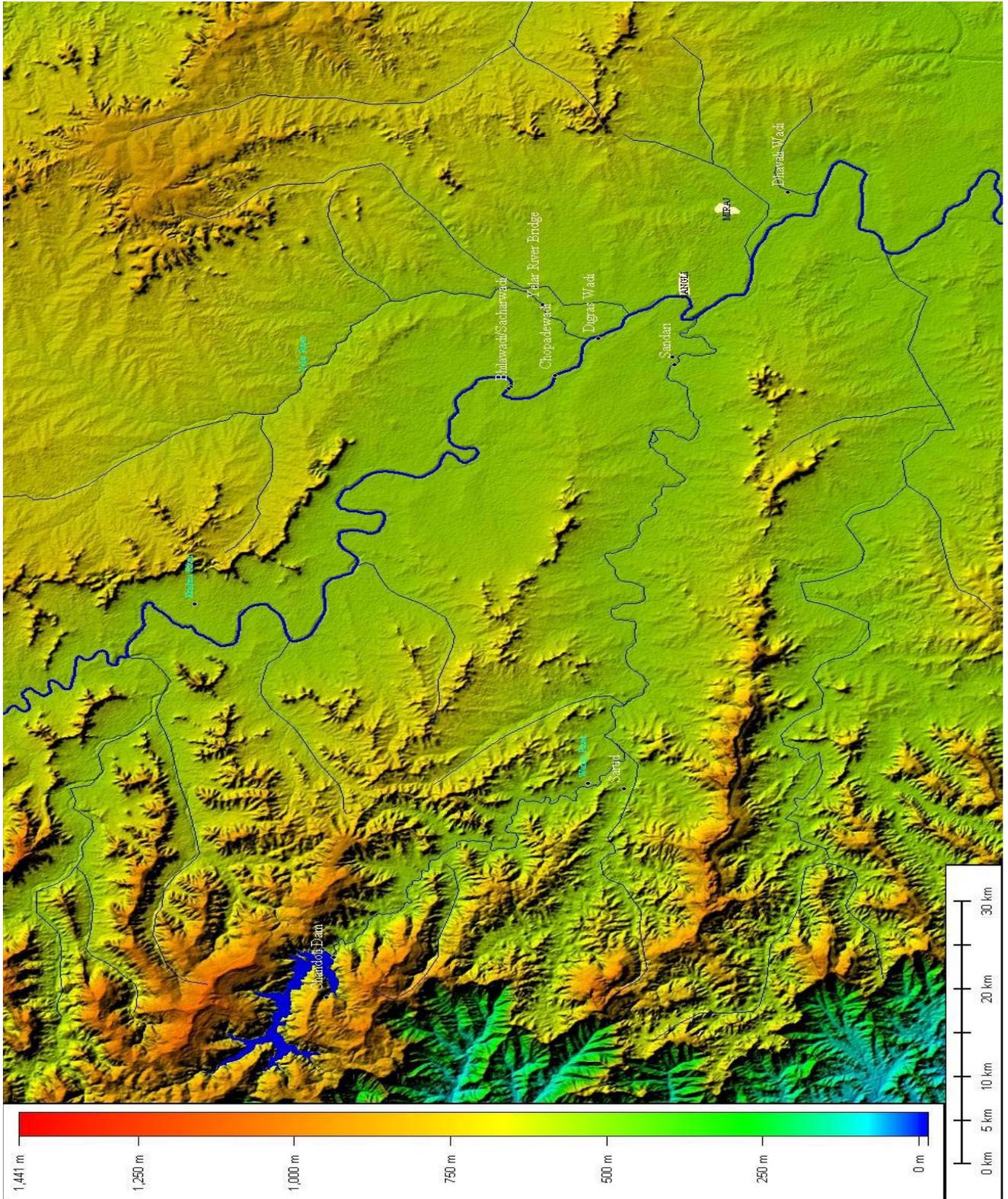


Figure 1. Map of Sangli and Kolhapur Districts showing conflict sites visited and Chandoli Dam, release site for translocated crocodiles. From the map it is evident that conflict sites and the dam are interconnected by river.

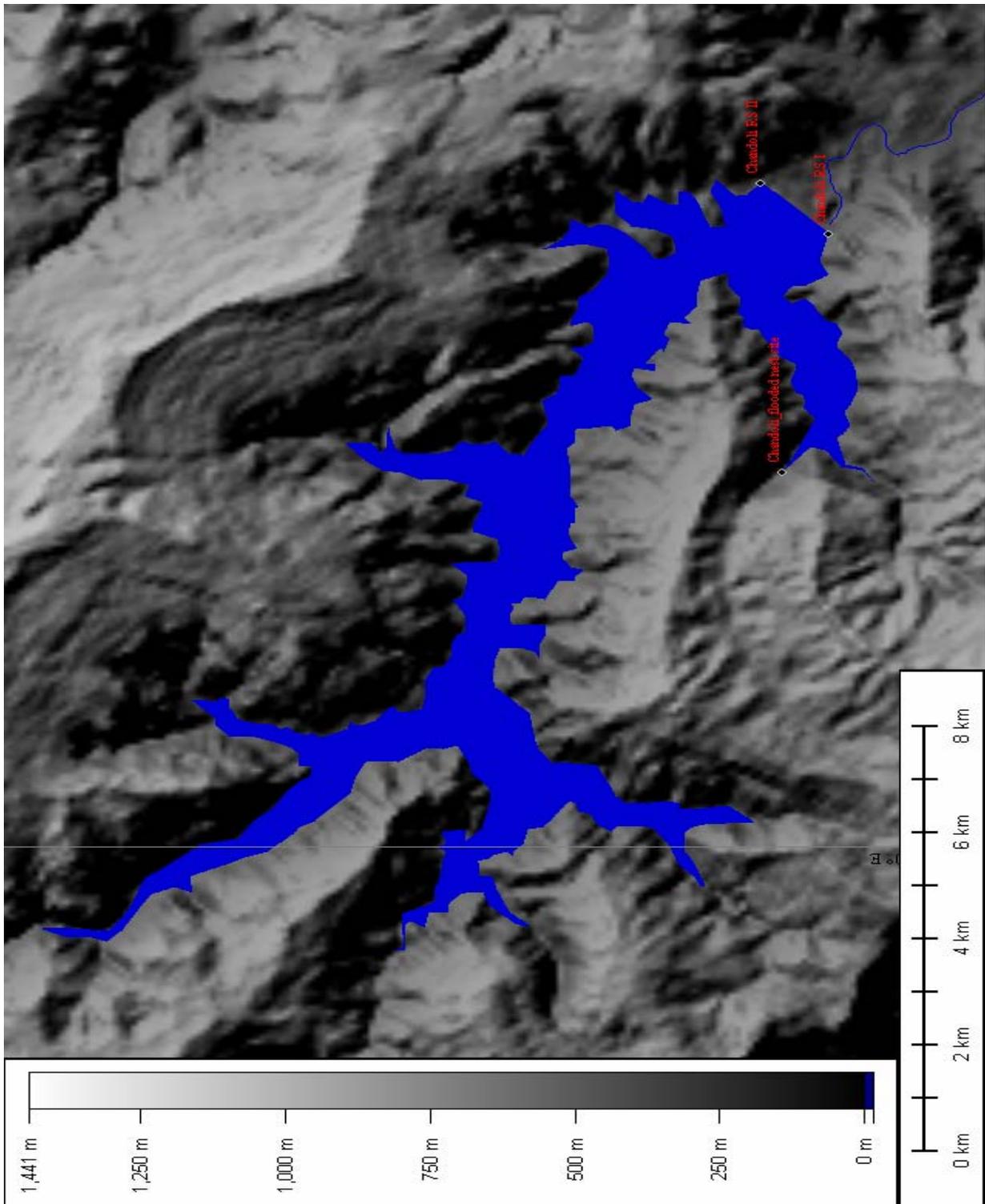


Figure 2. Close up view of Chandoli Dam, within Chandoli National Park. There is no human habitation here.



Figure 3. Release sites of crocs translocated from Krishna River and tributaries at Chandoli Dam

PLATES

1. Mugger nest hatching at Sarud, Kadavi River (Kolhapur District, Showwadi Tasil) on 31st May 2007. Photo by Dr S.R. Patil, President, Vasundhara
2. Ratnaprabha Naiku Yadav, with left toe amputated by croc at Chopadewadi. Photo by Dr Harshad
3. Ratnaprabha Naiku Yadav with laceration on calf, Chopadewadi. Photo by Dr Harshad
4. Enclosed bathing ghat at Mandariya on the Borkhandi River, Rajasthan. Photo by Tarun Nair
5. Women washing clothes nearby conflict site at Chopadewadi. Photo by Dr Harshad
6. Using “parsal” boats at Bhilawadi to search for Ram Chandra’s body. Photo provided by Nadaf Sahib, Range Forest Officer, Tasgon Range.
7. Krishna River at Chopadewadi, woman on far right of opposite bank was warning us about a croc on our side of the river. Photo by Nikhil Whitaker
8. Body of Ram Chandra of Bhilwadi following recovery; note lacerations at thigh and chest. Photo provided by Nadaf Sahib, Range Forest Officer, Tasgon Range.
9. Warning sign to swimmers about saltwater crocodiles in Australia.
10. Warning sign at Mandariya on the Borkhandi River, Rajasthan. Photo by Tarun Nair

