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SNAKES OF INDAPUR:

DIVERSITY AND AWARENESS

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Diversity and Awareness

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PREFACE

Snake awareness becomes important in order to clear myths about snakes, it helps in understanding how snakes are important for the ecosystem. 'Not all snakes are venomous and not all venoms are deadly', keep this in mind when bitten but snake-phobia is instinctive in human beings. Most of the times, snakes are killed when sighted, irrespective of venomous or non-venomous. This happens mainly due to ignorance. We do not have any statistical data on how many snakes fall victim due to this kind of indiscriminate killing. To avoid such killings, government departments, non-governmental organizations and animal lovers have started snake rescue initiatives in different parts of our country India.

Apart from rescue, snake awareness programmes play a vital role in bringing down the rate of snake bite and mortality. Snake awareness becomes important in order to clear the myths that circulate about snakes; it also helps in understanding how snakes are important for the ecosystem. Moreover, it also helps us in gaining knowledge about the precautions that need to be taken when we encounter snakes. Snake awareness programmes also give us information on the primary measures that need to be taken at the time of snake bite.

- Dr. Rajendra Vishnu Salunkhe

ACKNOWLEDGEMENT

I would like to take this opportunity to express my sincere gratitude to the fascinating creatures of the world, namely snakes, who have provided me with countless opportunities to be withthem. It is a great pleasure in my life to work on the diversity of snakes, and I feel as though Iwas born to worship them, especially when I was caring for injured snakes. I always admire theirdeadly movements.

I extend my heartfelt thanks to Mr. Harshwardhanji Patil, Ex MLA, Corporate Minister, Maharashtra state and Chairman, Indapur Taluka Shikshan Prasarak Mandal, Indapur, for hisaffectionate cooperation. I also want to express my deepest gratitude to my friends and colleagues at Arts, Science & Commerce College, Indapur, for their cheerful blessings.

I am truly blessed to have a supportive family who always encourages me to pursue my passions. I cannot find the right words to express my affection towards my family members, including mybeloved wife Savita, sons Abhishek and Atharv, daughter-in-law Dipti, and granddaughter Yuvradni. Their support has been instrumental in enabling me to undertake such diverse and enthusiastic activities.

- Dr. Rajendra Vishnu Salunkhe

Dedicated to

My Mother Late Pushpalata

and

Aunty (Kaki) Late Babai

INTRODUCTION:

Snakes are intrinsically fascinating, form the important component of biota. Snake, the most important predator, the interaction of which maintains the natural balance in the ecosystem. The advent of man appears to have increased their importance. Unfortunately, people know very little about snakes and due to fear, superstitious and lot of misbeliefs snakes are being killed in large number, though the number of deaths due to snake bites are very less compare to deaths due to road accidents in any village or city. In fact, snake is considered as the most fearful and dangerous creature by people. This attempt is to inculcate 'Snake: Not enemy but a true eco-friend among the society'.

Geographical location of Indapur:

In Maharashtra State, in Pune District there is 13 talukas out of them Indapur is one of the tahsil **(Fig.1**) lies between Latitude $17^0$53' to $18^0$15' N and longitude $74^0$35' to $75^0$8' E., and the average height from mean sea level is 546 m. Indapur is 135 km away from Pune, total geographical area of Indapur is 1487 sq. km (148700 hector), Bhima and Nira rivers are very close to Indapur tahsil. In Maharashtra second largest dam having catchment area i.e. Ujani dam is located 10 km eastwards of Indapur city and backwater extends 48 km towards west upto Daund Tahsil. Out of the total geographical area 80% area comes under irrigation. Under Indapur tahsil 143 villages have been included (Sensus of India,2011). Average rainfall of tahsil is 406 mm.

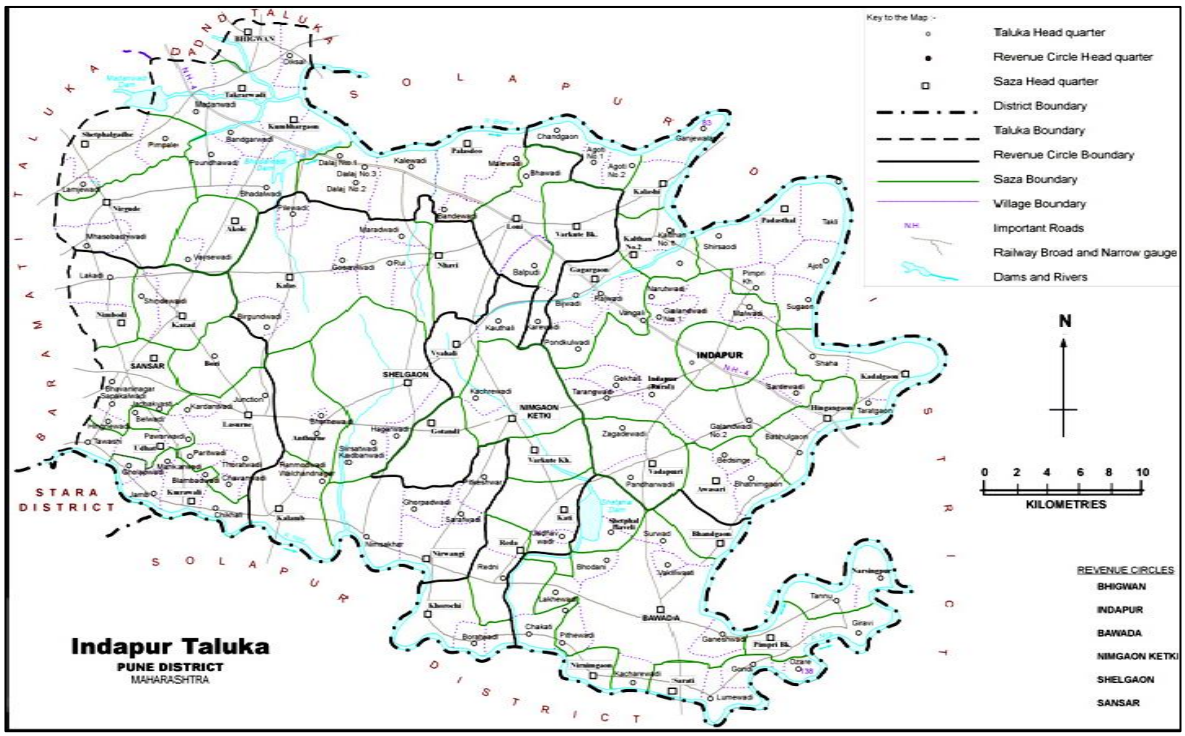


Fig. 1: Indapur Tahsil - Map

Agriculture Sector of Indapur Tahsil:

Total geographical area of Indapur tahsil has been segregated as below:

Total cultivated area: 1,01,543 hector

Forest area: 7,361.8 hector

Uncultivated area: 39,795.2 hector

(Maharashtra Government Socio-economic reference, 2012-13).

Origin of Research Problem:

According to Convention of Biological diversity (CBD, 1992); biological diversity means the variability among living organisms from all sources including interalia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Biodiversity is the fundamental requirement for adaptation and survival and continued evolution of species. Loss of diversity is one of the threats which causes declining the quality of ecosystem. It leads to the extinction of species of plants and animals. The factors that can be attributed to the loss of species and ecosystem are

a) Loss of habitat and fragmentation
b) Introducing exotic / species
c) Pollution
d) Indapur tahsil has 80% agricultural irrigated land and forest area of 7743 hectors, due to such favourable ecological conditions dominated the different types of non venomous, semi venomous and venomous snakes and often cause snake bite cases.

Interdisciplinary Relevance:

The people in society will get scientific knowledge about snake as a result the conservation, protection and awareness will be created. By giving the scientific knowledge the superstitious, misbeliefs about snake will be removed as a result the killing of snake will be reduced. An attitude regarding conservation and protection of wild life will develop among society. For nation, rare snake species the survey of snake in project area will be useful for wild life data fixation. For protection and conservation of rare snake species further measure can be decided. By knowing fatal snake bites, the deaths, anti snake venom necessity can be decided.

Review of Research and Development in the subject:

a) International Status:

As biodiversity is on the national and international agenda this project has an international status. The snake occupies an important position in the food chains and

food webs of a given ecosystem; their conservation is proving vital for that ecosystem, meaning the maintenance of the biodiversity of a particular ecosystem. Thus for the maintenance of the ecological balance of any ecosystem, its biodiversity of snakes should be protected, conserved and propagated. To achieve this, survey of the snake population is most important. Scientific knowledge, information about the snakes, keys to their identification and their vital role in the human life etc., if provided to the community living n these areas as well as to the visitors to these areas will help to lower the killing of the snakes which will help to conserve the snake fauna and hence the biodiversity.

b) National Status:

As the region of Indapur tahsil is rich in flora and fauna with its unique features, the villagers derive several products which are of edible, medicinal occupational value. To continue these professions and the yield from these regions it is important to conserve each and every species of the animals and that of the plants so that the characteristic features of these regions will remain undisturbed to prove a great heritage of live stock of its own kind which is, the national heritage which can attract the learned people in different disciplines from every corner of the world. Thus, the outcomes of this project will introduce the methods for literacy,

Awareness about the biodiversity and its conservation, misbeliefs, if any, among the villagers about the snakes so that killing or destruction of the snake fauna in this region will be lowered, minimized and this will naturally help to improve the biota of this region.

c) Significance of the Study:

- Snake protected zones will be defined.
- Snake protected zones will be declared as snake sensitive areas.
- Efforts will be taken to promote in situ conservation of the snakes. In situ conservation means 'on site conservation'. It is a process of protecting an endangeredspecies in its natural habitat.
- Awareness among the villagers or local communities about the snakes, their importance will be enhanced so that they themselves behave as the friends of the snakes, as the snakes are themselves friends of the human race by several ways.
- To develop snake parks and recreation centers to provide scientific knowledge about the snakes, their importance, and ecological and medical role and to remove fear about the snakesTo prepare a group of nature lovers, who can participate in the efforts to be taken in the process of biodiversity conservation and work voluntarily?

- To attract and motivate NGOs in the involvement of the snake conservation projects.

Objectives of the Project:

- The major aim of this project is to protect the biodiversity of the Indapur tahsil.
- To create awareness among the people with respect to importance of snake in nature and in society.
- To educate the people with reference to scientific knowledge of snake.
- To remove superstitious, misbeliefs of people.
- To suggest proper treatments for snake bites.
- To conserve and protect snake species.
- To prepare and supply updated literature, information about snake to medicinal practitioners and teachers at different levels.
- To educate and aware the people about economic importance of the snake.

Aim of the Project:

- To create awareness among the people with reference to the role and importance of
- Survey different kinds of snakes in project area.
- To educate people with reference to scientific information of snakes inhabited in project area.
- To remove fear, superstitions and misbeliefs about snakes.
- To snakes in nature and human society as well.
- To conserve and protect common and rare snake in project area.
- To suggest scientific treatments foe poisonous snake bites so as to minimize the deaths due to irrelevant, non scientific methods commonly practiced in villages.

Snakes:

The order Squamata of reptiles has two Suborders, the Serpentes or snakes. Snakes can be distinguished from lizards only by a combination of characters. Briefly, these are, the absence of fusion between the two halves of the lower jaw, which are united by ligaments only, and are movable independently; the absence of eyelids, external ear openings, and of limbs. A few primitive forms, however, have vestigial hind limbs.

The elongated body of the snake is remarkably supple and is able to make twisting and other movements impossible for other vertebrate animals. The arrangement of the backbone does not give much latitude for the vertical movements,

and vertical undulatory movements are impossible for snakes. Lateral movements are the typicalsnake movements.

The scales on the body of the snake are imbricate, that is they overlap in the manner of tiles, and patterns which are characteristic of the species. The skin, and the scales on it, are so constructed that stretching is possible to an enormous degree, enabling snakes to swallow large prey. The skin is shed periodically and the shed skin is often unbroken, and maintains its form to a remarkable degree.

The mouth is armed with numerous teeth which are not embedded in sockets. There is a continuous succession of teeth, those that are lost being immediately replaced by successor teeth lying below. The teeth are recurved and serve to hold the prey, and thus assist in swallowing, which is virtually done by the two halves of the jaw alternately 'walking' over the prey and pushing it down the throat. Two types offangs occur in venomous snakes. In the back fanged snakes, the last two or three teethof the upper jaw are large and are grooved. The groove is connected by a duct to thevenom glands. In snakes with fangs in the front of the mouth, such as the cobras, kraits and the vipers, the groove has become a closed canal for the conveyanance of the venom. The forked tongue in snakes is an organ of smell rather than of taste, and serves to collect scent particles by its constant quiver and play. Snakes have no external ear and cannot hear noise carried through the air but they are able to feel, through their jaws, vibrations carried through the substratum. The eye varies in size and effectiveness. In some snakes, including the blind snakes, the eye is hidden beneath a head shield. Ehen visible, the eyes lack lids but have a transparent watchglass-like shield beneath which they move. The pupil may be circular, vertical or horizontal. Depending on the species of snakes, the food varies from insects to large animals. Some feed on other snakes. The majority of snakes lay eggs with a white or yellow parchment-like shell. Parental care in the form of brooding is seen in many instances. Many species are ovoviviparous and give birth to live young.

Etimology:

The English word snake comes from Old English *snaca*, itself from Proto-Germanic *snak-an*-(Germanic *Schnake* "ring like", Swedish *snok* "grass snake"), from Proto- Indo-European root *neg-o*- "to crawl", "to creep", which also gave *sneak* as well as Sanskrit *naga* "snake".The word ousted *adder*, as *adder* went on to narrow in meaning, though in Old English *noeddre* was the general word for snake (Proto-IE).The other term, *serpent*, is from French, ultimately from Indo-European *serp*- (to creep) (Online Etimology, 2014), which also gave Ancient Greek *herpo* "to crawl"Marriam-Webster Online Dictionary, 2014).

REVIEW OF LITERATURE:

The scientific study of fauna in India commenced only in the last quarter of the 18th century, the pioneers of this work were mostly the British. Ancient India has some literature but was in unscientific and not in accepted sense.

With reference to scientific study of snakes, Dr. Patric Russell's (1726-1805) contribution was the first attempt, and he has been described as 'Father of Indian Ophiology'. He studied snakes around Madras, conducted extensive experiments on effect of snake poison on animals and birds. He distinguished between elaphine and viperine snake poison. Albert Gunther published the extensive account of Indian Herpetology in 1864, in his book 'The Reptiles of British', he described 180 snake species. In 1878, Joseph Ewart published a book 'The Poisonous Snakes of India'. George Albert Boulenger published a volume on reptiles in 1890 and was the first person to prepare exhaustive keys for identification of Indian snakes. Malcom A. Smith published a volume of serpents in 1943 and was the landmark of Indian ophiology.

Among the early Indian ophiologist, Mahendra's handbook of the snakes of India, Ceylon, Burma, Bangladesh and Pakistan was published in 1983. He prepared keys for the identification of Indian snakes. K. G. Gharpure published a book 'Snakes of India' in 1935 and was referred as a scientific book. P. J. Deoras published a scientific book 'Snakes of India'(1965) illustrating the general information of snakes and snakes in Indian culture.M.V.Rajendran, the founder member and director of Madras Snake Park, published a book 'Common Indian Snakes' in Tamil language in 1967. Romelus Vittakar a naturalist of Indian and American origin, established a well-known Madras Snake Park has been responsible in a big way in generating public awareness on snakes and their ecological role. He has contributed his knowledge to the scientific journals and also produced documentary films on snakes.

S. K. Talukdar, R. Mathew, T. S. M. Murthy made significant contribution through Zoological Survey of India. Taxonomic, distributional and ecological studies of Indian snakes was conducted by T. S. M. Murthy (1984). Recently valuable contribution of snake knowledge has been conveyed by Dr. R. Kankonkar, former Director of Haffkin Institute, Mumbai for his book 'Sarpa parichay' (1974) and 'Sarp jagat' (2001). J.C. Daniel has given valuable and scientific information in his book

'The Book of Indian Reptiles and Amphibians' published by Bobmay natural HistorySociety and Oxford University press (2010). Rajiv Gandhi Sarpodyan was being established by Neelamkumar Khaire at katraj, Pune rendering the continuous flow of knowledge about snakes to the pupil, he published a very informative scientific book

'Saap' and 'Snakes' in Marathi and English language (2010). Due to his dedication on snakes, I have been motivated in childhood days.

To create awareness about snakes in India as taken as a social activity by various workers. Promising work has been done by the members of Chennai Snake Park, Chennai (Tamilnadu), Bombay natural History Society, Mumbai, Rajiv Gandhi Snake Park, Pune. Through festivals such as Nag Panchami, special ceremony called as 'Nag Puja' has been practiced since many decades in the village Battis Shirala Dist.Satara to irradicate superstitions and misbeliefs about snakes.

MATERIALS AND METHODS:

This project work was conducted at Indapur tahsil of Pune district, Maharashtra state, India, under which 143 villages have been included covering of 1,487 sq km area to work on the diversity of snakes, environmental education and wild life conservation of snakes. Study area covered containing 1,01,534 hector of the total cultivated area, 7,361.8 hector forest area and 39,795.2 hector uncultivated area. The rural and urban habitation and also the scrubland, rocky areas, swamp areas, water bodies, etc. have been considered.

Following materials and methods have been used and adapted to work efficientlyon the project.

Survey, collection and identification of snake species have been carried out in a project area. To study the diversity of snakes and wild life conservation, frequent visits have been carried out in the project area; the snakes were collected and reserved as live specimens, proper identification of snake species were done by taking the help of available literature on snakes. The investigator is a skilled person to handle the various non venomous, semi venomous and venomous snakes. For safe handling of snakes snake hooks have been used and for rescuing of snake from water filled well, the snake tongs have been used. To prevent the snake bite at ankle level ofthe foot jungle shoes can be weared during the survey and collection of snake species. For wild life conservation, the snakes in human habitation were caught time to time whenever received mobile calls of the pupil of Indapur tahsil. Ten wooden-glass boxes were used for the temporary storage of snakes and provision facilitated to feed them with their respective live food such as earthworms, frogs, toads, skinks, lizards, etc. Whenever necessary the photographs have taken and the snake species in rescue bag were taken to the forest office of Indapur, by noting the specifications of thecaught snake species in their register, in presence of forest guide we release the snakespecies in their natural habitat without making any harm to them in the forest area. If necessary, medical treatment such as operative surgery on injured cobra snake, to remove the ectoparasites from the body of rat snakes have been done with the help of veterinary medical practitioner.

Environmental awareness certificate course of training programme 'Snakes: Identification and handling' has been carried out for ten days for sixteen, students and college teachers in the month of February 2013, due to this practice the college. Students have been engaged in collection and identification of snake species. To carry out the environmental awareness programme, lectures and demonstrations were

conducted with the help of audio-visual aids to teachers, students of high schools, college students and the pupil of Indapur tahsil, and villagers during Ganesh festival at the project area. Study of snake bite cases at private and government hospital have been observed.

Tools used:

- For survey, collection and identification of snakes – Collecting bags, snake tongs and snake hooks, wooden-glass boxes.
- Study of snake bite cases from private and government hospitals.
- For preparation of audio-visual materials – Photographic DSLR camera D3200 with i) high power zoom of focal length 55-300 (mm) and maximum aperture f/4.5 (Lens name:- AF-S DX NIKKOR 55-300mm f/4-5.5-5.6G ED VR) and ii) standard zoom of focal length 18-105 (mm) and max. aperture f/3.5 (Lens name:- AF-S DX NIKKOR 18-105mm f/3.5 (Lens name:- AF-S DX NIKKOR 18-105mm f/3.5-5.6G ED VR), and LCD projector for environmental awareness programme. Photographs have taken by PI and some times assessed by my son.
- Displayed a flex at college entrance having mobile numbers and names of expert snake catchers.
- By phone calls of the villagers from project area we reach the respective place as early as possible and catch the snake, bring it to the college, after feeding live food werelease the snake in forest area without making any harm to it.
- To convey the information regarding the different types of venomous, semi venomous and non venomous snakes, sixteen flex boards containing the whole information of snakes have been displayed at college campus.

OBSERVATIONS:

In project area different types of non venomous, semi venomous and venomous snakes have been identified and classified. Identification of live snakes in the projectarea have been made on the basis of colour patterns, habit and behaviour.

Ecological status of snakes:

List of snake species found in project area:

Sr. No.	English Name	Vernacular Name	Scientific Name	Status	Habitat	Remark
1	Brahminy Worm Snake	Wala	*Ramphotyphlops braminus*	NV	Human habitation	Common
2	Beaked Worm Snake	Chanchu Wala	*Grypotyphlops acutus*	NV	Rocky areas, human habitation	Rare
3	Sand Boa	Durkya Ghonas	*Gongylophis conicus*	NV	Arid scrubland	Common
4	Earth Boa	Mandul	*Eryx johnii*	NV	Dry scrubland	Common
5	Ttrinket Snake	Taskar	*Coelognathus Helena helena*	NV	Scrubland, human habitation	Common
6	Montane Trinket Snake	Pahadi Taskar	*Coelognathus helena monticollaris*	NV	Scrubland, human habitation	Common
7	Indian Rat Snake	Dhaman	*Ptyas mucosa*	NV	Through out	Common
8	Banded Racer	Patteri Dhulnagin	*Argyrogena fasciolata*	NV	Grasslands	Common
9	Banded Kukri Snake	Kukri sarp	*Oligodon arnensis*	NV	Rock crevices	Common
10	Common Wolf Snake	Kawadya sarp	*Lycodon aulicus*	NV	Arid regions	Common
11	Barred Wolf Snake	Patteri Kawadya	*Lycodon striatus*	NV	Arid regions	Common

12	Checkered Keelback Water Snake	Wirola	*Xenochrophis piscator*	NV	Ponds, rivers	Common
13	Grass Snake	Gavtya	*Macropisthodon plumbicolor*	NV	Grasslands	Common
14	Gunthur's Racer	Chitrang Naikul	*Coluber gracilis*	NV	Scrubland	Rare
15	Dumeril's Black-headed Snake	Kaltondya	*Sibynophis subpunctatus*	NV	Under logs and stones	Rare
16	Common Cat Snake	Manjrya sarp	*Boiga trigonata*	SV	Arboreal	Common
17	Leith's Sand Snake	Lithicha Reti sarp	*Psammophis leithii*	SV	Grasslands & deserts	Rare
18	Common Krait	Manyar	*Bungarus caeruleus*	V	Human habitation	Common
19	Slender Coral Snake	Powla	*Calliophis melanurus*	V	Under stones & dry leaves	Rare
20	Russell's Viper	Ghonas	*Daboia russelii*	V	Rat holes	Common
21	Saw Scaled Viper	Phurse	*Echis carinatus*	V	Arid, rocky regions	Rare
22	Spectacled cobra	Nag	*Naja naja*	V	Grasslands, old houses	Common

Status: NV=Non venomous, SV=Semi venomous, V=Venomous

Number of non venomous snakes:

Non venomous snakes	No. of snakes caught
Brahminy Worm snake	32
Beaked Worm snake	29
Sand Boa	58
Earth Boa	59
Ttrinket snake	129
Montane Trinket snake	42
Indian Rat snake	531
Banded Racer	47
Banded Kukri snake	65
Common Wolf snake	213
Barred Wolf snake	17
Checkered Keelback Water snake	79
Grass snake	176
Gunthur's Racer	1
Dumeril's Black-headed snake	1
Total	**1479**

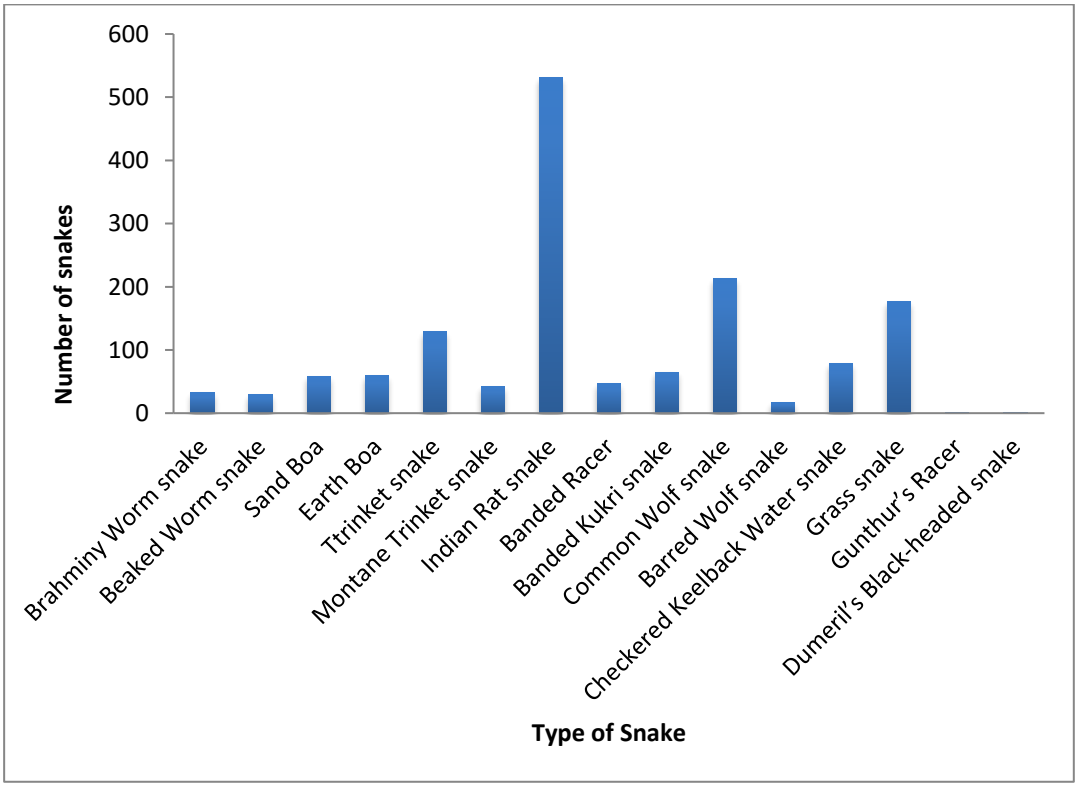


Fig. 1A: Number of non venomous snakes caught

Number of semi venomous snakes caught

Semi venomous snakes	No. of snakes caught
Common Cat snake	33
Leith's Sand snake	1
Total	**34**

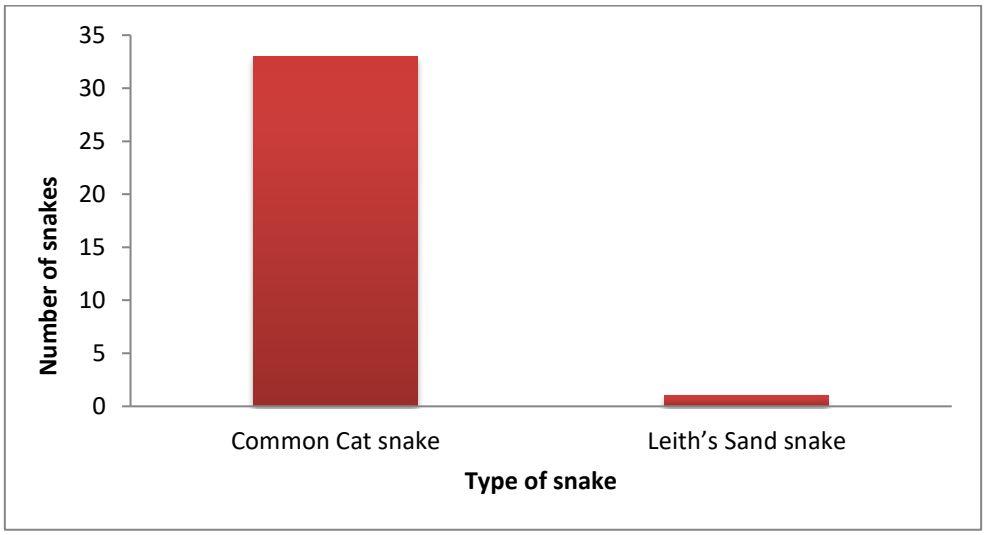


Fig. 1B: Number of semi venomous snakes caught

Number of venomous snakes

Venomous snakes	No. of snakes caught
Common Krait	63
Slender Coral snake	16
Russell's Viper	236
Saw Scaled Viper	11
Spectacled cobra	487
Total	**813**

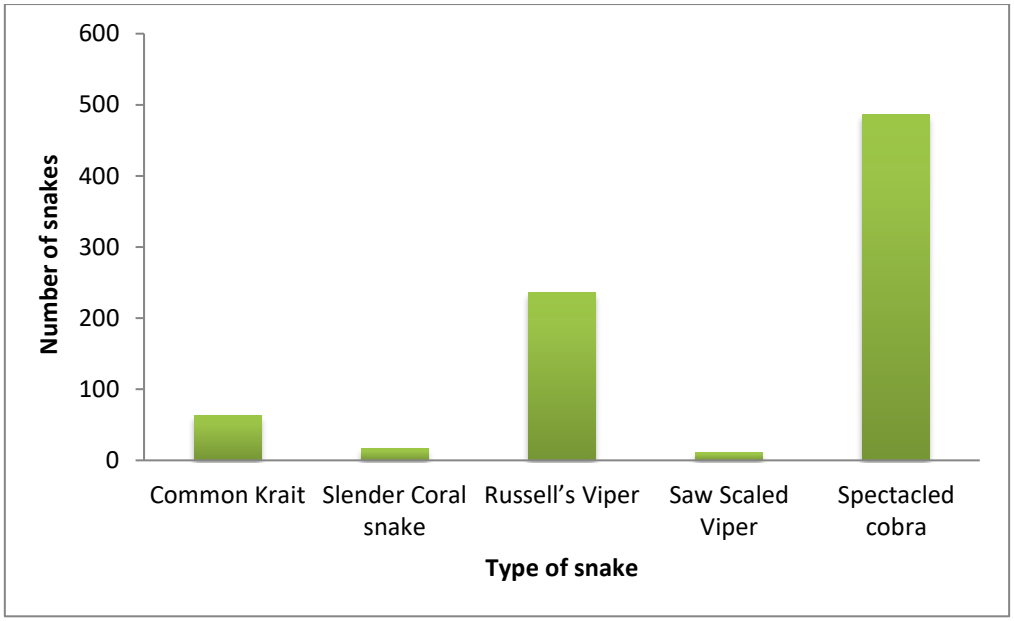


Fig. 1C: Number of venomous snakes caught

Type of snakes	No. of snakes caught
Non-Venomous Snakes	135
Semi Venomous Snakes	4
Venomous Snakes	81

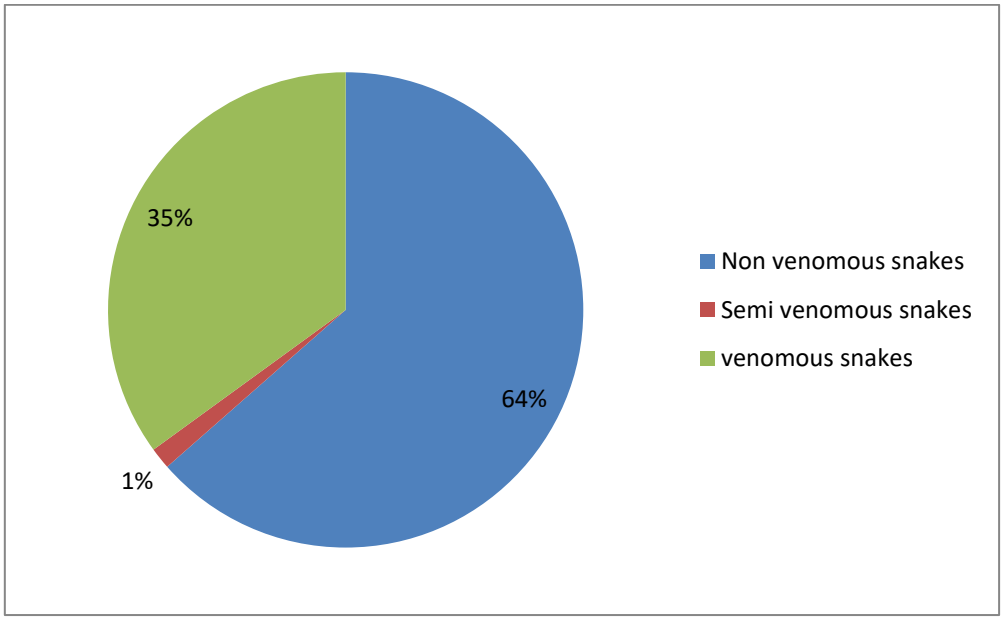


Fig. 1D: Percentage of various snakes caught

RESULTS AND DISCUSSION:

Identification of snakes in the project area:

A) Non Venomous Snakes

1) Common Worm Snake/ Blind Snake/Brahminy Worm Snake -

Ramphotyphlops braminus (Daudin,1803)- (**Fig.2)**

Scientific classification:

Kingdom	:	Animalia
Phylum	:	Chordata
Subphylum	:	Vertebrata
Class	:	Reptilia
Order	:	Sqamata
Suborder	:	Serpentes
Family	:	Typhlopidae
Genus	:	*Ramphotyphlops*
Species	:	*braminus*

- **Local name:** Marathi- Wala
- **Average length:** Grows to about 12.5 cm
- **Identification:** All Typhlops have slender worm-like shape and undifferentiated body scales. Line of division (suture) of the nasal shield touching the preocular shield (shield before eye). Body uniformly cylinder. Head bluntly rounded. Eyes indistinct. Tail very short, ending in a small sharp stiff point. Scales highly polished. One of the smallest snakes in India.
- **Colouration:** Brown or blackish brown above, lighter below.
- **Habitat:** Lives beneath the soil, stones or debris, and is seen only when theseare turned over, or when flushed out of its subterranean burrow by rain.
- **Habits:** Ants, termites, worms and insect eggs.
- **Breeding behaviour:** Oviparous. Lays 3-7 eggs that have the appearance ofrice grains (Khaire N., 2011). It lays eggs or live-bearing. All individuals are female and reproduce unisexually, where the eggs begin cell division without sperm from amale. Upto eight genetically identical female offsprings are produced. (www.flmnh.ufl.edu/herpetology/FL- GUIDE/Ramphotyphlopsbraminus.htm)
- **Characteristics:** A slow mover above ground, it makes vigorous attempts to escape if dislodged from its hiding place, or when handled. Tiny eyes are covered with transluscent scales rendering these snakes almost entirely blind. The eyes cannotform images, but are still capable of registering light intensity.

Brahminy Worm Snake

Under moulting condition

Fig. 2: Brahminy Worm Snake

2) Beaked Worm Snake/ Beaked Blind Snake- *Rhinotyphlops acutus* (Dumeril and Bibron,1844)**- (Fig.3)**

- **Scientific classification:** From kingdom to family same as Blind snake
  Genus- *Rhinotyphlops*
  Species- *acutus*
- **Local name:** Marathi- Chanchu wala
- **Average length-** Grows to the length of 45 cm. Vyas, R. *et al*. (2001), reported that they found a dead *R. acutus* at the road side whose measurements are as: snout to vent length62.392 cm, vent to tip of tail length 0.708 cm, total body length 63.1 cm, and mid-body girth 1.13 cm.
- **Identification-** Has a cylindrical body with smooth scales and its small head has a pointed beak-like tip.
- **Colouration-** These Uropeltidae have light grey or brown with a light brown underside.
- **Habitat-** Prefers to live in the soil or under rotting logs or fallen leaves.
- **Habits-** Earthworms and insects.
- **Breeding behaviour-** Not much is known (Khaire N., 2011).
- **Characteristics-** Diurnal. It is the longest worm snake found in India (Khaire N., 2011). According to Integrated Taxonomic Information System (2007), *Rhinotyphlops acutus* is a harmless blind snake species endemic to peninsular India. No subspecies are currently recognized.

Anterior view **Posterior view**

Fig. 3: Beaked Worm Snake

3) Common Sand Boa- *Gongylophis conicus* (Schneider,1801)**- (Fig. 4)**

- **Scientific classification:** From kingdom to suborder same as Blind snake
- Family - Boidae Subfamily- Erycinae Genus – *Gongylophis* Species - *conicus*
- **Local name:** Marathi- Durkya Ghonas
- **Average length:** 50 cm
- **Identification:** A markedly stout snake; body short and heavy, tail short like file and tapering very rapidly so that it is conical in shape. The body narrows very gradually in both directions, passing almost insensibly into the head with but slight indication of a neck. Head moderately elongated, rounded evenly from side to side; snout long, overhanging the chin; eyes very small; pupil vertically elliptic; iris beautifully speckled with gold, nostrils slit-like and placed high on the snout. The skin is rough on the back owing to the keeled scales; this roughness is very pronounced onthe hinder part of the body and on the tail. At each side just above the vent is a small curved claw-like process directed backwards in the female which indicates thetermination of the rudimentary hind limb. It is well developed in the male.
- **Colouration:** Underparts buff, uniform or with traces of mottling; flanks mottled brown, varying from light brown to deep chocolate; the mottling becomes coarser as it ascends the flanks. Brown with dark brown irregular patches. A dark, irregular strip from eye to gape.
- **Habitat:** Arid scrubland, in villages and also in urban areas.
- **Habits:** Feeds largely on small mammals, particularly rodents. Occasionally itfeeds on lizards, skinks and small birds. It kills its victim by constriction.
- **Breeding behaviour:** It is ovo-viviparous. The female gives birth to 7-9 young ones from July to August (Khaire N., 2011).
- **Characteristics:** Mainly nocturnal. Generally slow moving and shy, it coils and hides its head under the body when disturbed. However, its life is by no means completely subterranean, and a considerable period of it is spent either above the soil or in the most superficial layers, into which light is admitted, and by its stimulus the function of the eye is preserved. It buries itself partially and patiently awaits the chance of a prey coming within reach. When it is provoked, it strikes with a jerky movement. It sheds its skin about four times a year at rather irregular intervals. It canbe mistaken at first glance for either the Indian python, *Python M. molurus*, or the deadly Russell's Viper, *Daboia russelli.*

Pupil vertically elliptic

File-like tail tip

Tail showing partially burrowing habitat

Fig. 4: Common Sand Boa

4) Earth Boa/ Red Sand Boa- *Eryx johnii* (Russell, 1801)- (**Fig. 5)**

- **Scientific classification:** From kingdom to subfamily same as Blind snake
  Genus- *Eryx*
  Species- *johnii*
- **Local name:** Marathi- Mandool
- **Average length:** 75 cm
- **Identification:** Presence of a mental (chin) groove, the pronounced angular ridge on the muzzle, the blunt tail are the key features to distinguish from common sand boa. A stout, heavy and muscular snake, more or less uniform in girth from head to tail with little constriction at the neck. Body scales small and smooth. Head scales little larger than back scales. Muzzle broad with a very pronounced horizontal ridge.Eyes small; pupil vertically elliptical; iris spotted with ruddy gold. Nostril high on the snout. Tail short, stumpy, rounded at its end and in general form very similar to the head.
- **Colouration:** Adults uniform light brown, ruddy-brown, or dark olivaceous brown, or with or without fine dark crossbars. Belly lighter than back and often mottled with black. Young brick-red or sandy-red, back with dark blotches or ruddy-brown crossbars.
- **Habitat:** Dry scrubland, rocky areas and villages.
- **Habit:** Mainly mammalian. Rats, mice and other small rodents are killed by constriction.
- **Breeding behaviour:** Ovo-viviparous, gives birth directly to young ones. Most females give birth to 6-9 young ones during August to September (Khaire N., 2011).
- **Characteristics:** Nocturnal. As its name suggests it prefers to stay in the earth, burrowing in soft soil.
- **Miscellaneous:** In south India, there is an age old belief that the bite or a lickfrom this snake can cause leprosy! A belief in the Punjab is that if it bites anyone, the same person will be bitten on each succeeding anniversary by the same snake, whichwill be visible only to its victim. That the snake had two heads is a belief held all overthe country as the common name suggest. It is also thought that the heads are alternately in action every six months. Snake charmers who carry this species often mutilate the tail, making markings to suggest eyes and cutting a transverse incision atthe tip, which leaves a scar suggesting a mouth.

Head with small eyes

Scars on the body

Young Earth Sand Boa

Rounded Tail end

Fig. 5: Earth Boa

5) Trinket Snake- *Coelognathus helena helena* (Daudin,1803)- (**Fig.6)**

- **Scientific classification:** From kingdom to suborder same as Blind snake
  Family - Colubridae Subfamily- Colubrinae Genus - Coelognathus
  Species – *Helena* Sub-species - *helena*
- **Local name:** Marathi- Taskar
- **Average length:** 70 cm
- **Identification:** Slender and light brown in colour with alternating grey and dark brown bands. Chocolate brown stripes near the tail. Underside scales are white and shiny. There are two dark stripes on the neck, a pointed head and round pupils. Asmall black stripe can be found just behind the eye.
- **Habitat:** Rocky areas, scrubland, near villages and in urban areas.
- **Habit:** Mice, rats, lizards, small birds and their eggs.
- **Breeding behaviour:** Oviparous. It lays eggs from march to May (Khaire N., 2011).
- **Characteristics:** Diurnal as well as nocturnal. Terrestrial and arboreal. Its species name is derived from the legendary Greek queen Helen It is highly active has a very nasty temper and will strike repeatedly if molested. Never appreciates captivity and will resist capture with utmost tenacity until helplessly overpowered. Its bites are often very damaging due to its inward pointing teeth. Feeds mainly on small mammals. It uses its camouflage to stalk its prey and initially disorients its victim with a blitz strike. It then surrounds its prey with its coils and weakens it by biting repeatedly. The victim is finally killed by constriction and swallowed at leisure. It may also prey upon birds, frogs, lizards and other snakes as well but shows a high preference towards small mammals. It is notorious for its voracious appetite. Captive specimens prefer mice and tend to lose interest in lizardsespecially if they remain motionless.

Body with alternating grey and dark brown bands

During egg-laying

Fig. 6: Trinket Snake

6) Montane Trinket Snake- *Coelognathus helena monticollaris* (Shulz, 1992) **(Fig.7)**

- **Scientific classification:** From kingdom to species same as Trinket snake
  Sub species- *monicollaris*
- **Local name:** Marathi- Pahadi taskar
- **Average length:** 100 cm
- **Identification:** Light brown in colour with distinct bands. The latter half of the body has light brown to dark brown stripes. Two dark brown stripes are present onthe neck while one stripe is present just behind the eye. Underside scales are white with black spots.
- **Habitat:** Village and urban areas.
- **Habit:** Rats, lizards, small birds and small mammals.
- **Breeding behaviour:** Oviparous. It lays around 10-15 eggs from march to May (Khaire N., 2011).
- **Characteristics:** Its species name is derived from the legendary Greek queen Helen. Mainly terrestrial, but known to climb trees. Active in the day as well as night. When disturbed, it is known to raise its head and strike with its mouth open wide. It is highly active has a very nasty temper and will strike repeatedly if molested. Never appreciates captivity and will resist capture with utmost tenacity until helplessly overpowered. Its bites are often very damaging due to its inward pointing teeth. Feeds mainly on small mammals. It uses its camouflage to stalk its prey and initially disorients its victim with a blitz strike. It then surrounds its prey with its coils and weakens it by biting repeatedly. The victim is finally killed by constriction and swallowed at leisure. It may also prey upon birds, frogs, lizards and other snakes as well but shows a high preference towards small mammals. It is notorious for its voracious appetite. Captive specimens prefer mice and tend to lose interest in lizards especially if they remain motionless.

Distinct bands on the body

Drinking water

Fig. 7: Montane Trinket Snake

7) Indian Rat Snake- *Ptyas mucosa* (Linnaeus,1758)- **(Fig.8)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake
  Genus- *Ptyas* Species- *mucosa*
- **Local name:** Marathi- Dhaman
- **Average length:** 200 cm, can reach upto 350 cm
- **Identification:** Head rather elongate, eyes large and lustrous, nostrils large, occupying the whole depth of the suture between nasals. Neck distinctly constricted. Body robust, compressed, tapering towards both ends. Tail cylindrical, about one fourth the total length.
- **Colouration:** Dorsally olivaceous brown, sometimes as dark as sepia or light mustard yellow or moss-green or black. Uniform, or scales on the posterior part irregularly margined with black forming a reticulate pattern with a tendency to formcrossbars. Lips and ventral scales margined with black. Belly grayish white, dirty white or yellowish. Skin blackish, dorsally mottled with fawn or whitish transverse streaks, hidden by the scales. In young, however, light bluish grey irregular crossbarsare usually conspicuous anteriorly. Eyes with yellow borders around the pupil.
- **Habitat:** All types of habitat. It is residing in anthills or rat burrows.
- **Habit:** Rats. Also feeds on toads, frogs, lizards and small birds.
- **Breeding behaviour:** Oviparous. The mating season is from March to May. 8-20 eggs are laid after two months (Khaire N., 2011). The eggs hatch after an incubation period of two to three months. An unusual behavior, which has been rarely recorded in any other species of Indian snakes is the 'Combat Dance' between males, which twine around each other on the ground, as well as when half erect, this dance iscommonly mistaken to be the (mythical) 'mating dance' of cobras (Daniel, J.C.,2002).
- **Characteristics:** It is diurnal and is known to climb trees. This extremely swift snake is commonly mistaken for a cobra as it inflates its neck and makes hissing noises when disturbed. Takes readily to water and swims vigorously with the head well above the water. Dives with equal facility. Equally adept at climbing and is oftenseen on trees, and jumps down from a height of 6 m when disturbed. Normally tries to escape when sighted, but if provoked and brought to bay attacks with courage and determination. When infuriated, retracts and slightly erects the head and body into an 'S' shape, compresses the body and with spine arched and the throat markedly pouched, strikes upwards. Often when thus demonstrating, produces a peculiar mewing sound like a cat at bay. It also defecates in self defence.

Anterior View

Attacking Indian Rat snake

Rat snake of 99.5 inches long

Fig. 8: Indian Rat Snake

8) Banded Racer- *Argyrogena fasciolata* (Shaw,1802)- **(Fig.9)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake
- Genus- *Argyrogena*
- Species- *fasciolata*
- **Local name:** Marathi- Patteri Dhulnagin
- **Average length:** 75 cm
- **Identification:** Body elongate, fairly robust, cylindrical, tapering slightly at the neck, more markedly behind. Head usually unmarked, moderately depressed, broadest between eye and neck. Upper jaw projects rather prominently. The snout isslightly pointed while its tail is long and tapering.
- **Colouration:** Brown or olive-brown, varying in intensity from yellowish to a deep rich brown. Belly yellowish-white.
- **Habitat:** Commonly found in grassland, near human habitation and in rocky areas. Prefers to live in rat holes or in rocky crevices.
- **Habit:** Mainly rats.
- **Breeding behaviour:** Oviparous. Female lays around 5-12 eggs between February and March (Khaire N., 2011).
- **Characteristics:** It is a fast moving snake hence is commonly called as 'Racer'. A plucky and aggressive snake when molested, but individual temperamentvaries. Becomes tame in captivity and can be handled without difficulty. When alarmed, erects the forebody and flattens the body behind the neck like a cobra and itis often mistaken for one. In the Konkan region of Maharashtra it is believed to be thefemale of the cobra.

Body with long tapering tail

Smooth scales on the body

Fig. 9: Banded Racer

9) Banded Kukri Snake- *Oligodon arnensis* (Shaw,1802)- **(Fig.10)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake
  Genus- *Oligodon*
  Species- *arnensis*
- **Local name:** Marathi- Kukri sarp
- **Average length:** 33 cm
- **Identification:** Grey or reddish-brown. Cylindrical body, 'V'shaped mark on the head. Eyes have round pupils. Head depressed, snout short and blunt. Tail is shorter in size somewhat compressed basally.
- **Colouration:** Ground colour brown of varying intensity, lighter on the flanks. Occasionally with a ruddy or purplish yint. Back with black bars, narrow but distinctly outlined with whitish or pale yellow. The number of bands or bars on the body vary, may be 30-37. Head with three conspicuous black marks, often narrowly bordered with white or yellow. Anterior mark is crescentic, extending in between the eyes to below them. Median and posterior arrow shaped. Pearly white below, often spotted with black.
- **Habitat:** Anthills, rock crevices, tree hollows, unoccupied houses.
- **Habit:** Eggs of other reptiles. Lizards, skinks, mice.
- **Breeding behaviour:** Oviparous. Female lays 3-9 eggs (Khaire N., 2011).
- **Characteristics:** Shy. Normally does not bite. These snakes get their name from sharp, curved teeth. When alarmed, inflates its body to a remarkable degree and some specimens also flatten the posterior part of the head, making the head more apparent than when normal. Occasionally a specimen may bite instantly resulting in an incised wound caused by its razor sharp kukri-like teeth. The wound is painful forsome time. However, it is a non venomous snake. May believe it to be a venomous common krait.

30-37 black bands on the body

'V' shaped mark on the head

Fig. 10: Banded Kukri Snake

10) Common Wolf Snake- *Lycodon aulicus* (Linnaeus,1758)- **(Fig.11)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake.
  Genus**-** *Lycodon*
  Species**-** *aulicus*
- **Local name:** Marathi- Kavdya sarp
- **Average length:** 30 cm
- **Identification:** A glossy, slender snake with a pear-shaped depressed head. Eyes black, tongue pinkish with white tip. Neck slightly constricted.
- **Colouration:** Colour and markings variable. Reddish-brown or black with glossy smooth scales. Broad white or yellow band on its neck and similar colour bands on the rest of its body those which are lighter towards the tail. Ground colour light brown to dark cigar brown, with yellow crossbars on the body and a collar of thesame colour, or two whitish blotches on occiput. Bars expand on the flanks, confinedto the anterior region of the body. Bars 32-39 in number.
- **Habitat:** Arid regions. It is very commonly found near human habitation in rural and urban areas.
- **Habit:** It prefers lizards but takes any small animal it can overcome. Skinks and frogs are also eaten.
- **Breeding behaviour:** Oviparous. The female lays about 4-12 eggs during March and May (Khaire N., 2011).
- **Characteristics:** Nocturnal. Among snakes, the wolf snake is one that seemsto seek out and profit by a human environment. The common wolf snake is the species most often met with in houses. It climbs vertical walls in search of lizards. Itis the species most often met within houses. It hides during the day in crevices, stones or any other convenient hideout. It readily strikes when provoked. An excellent climber, capable of going up almost smooth vertical surfaces, climbing with the aid ofits ribs and the free borders if its belly shields. The readiness with which it bites and its habit of living in houses make this snake undoubtedly responsible for a large number of snake bite cases in India every year. It is most often confused with the common krait from its identical colour pattern and the long teeth on the upper and lower jaws which are mistaken for fangs.

White or yellow bands lighter towards the tail

Pear-shaped depressed head

Neck slightly constricted

Readily strikes when provoked

Fig. 11: Common Wolf Snake

11) Barred Wolf Snake- *Lycodon stiatus* (Shaw,1802)- **(Fig.12)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake
  Genus- *Lycodon*
  Species- *striatus*
- **Local name:** Marathi- Patteri Kavdya
- **Average length:** 48 cm
- **Identification:** Resemble very closely the common wolf snake. Black coloured slender body having white coloured 25-29 stripes or crossbars, which divide on the sides to enclose triangular spots of the white colour. Scales near the lips as wellas underside are white. Flattened head with black eyes.
- **Habitat:** Terrestrial.
- **Habit:** Lizards and small garden lizards.
- **Breeding behaviour:** Oviparous. Female lays 2-4 eggs in the month of August (Khaire N., 2011).
- **Characteristics:** Nocturnal and timid which hides its head beneath its coils if disturbed. When disturbed, it hides head below the body. This snake looks like the common krait.

25-29 crossbars divide on the sides to enclose triangular spots of white colour

Fig. 12: Barred Wolf Snake

12) Checkered Keelback Water Snake- *Xenochrophis piscator* (Schneider,1799)- **(Fig.13)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake
  Genus- *Xenochrophis*
  Species- *piscator*
- **Local name:** Marathi- Virola, Deewad
- **Average length:** 60 cm
- **Identification:** A fairly robust snake with oval head, having slit-like nostrils and moderately large eyes with round pupils, both with a decidedly upward inclination.
- **Colouration:** It has strongly keeled scales and five rows of black spots on a yellowish or olivaceous background. Number of rows are not constant throughout the body. Head olive-brown with two black streaks, one below and one behind eye. Belly white or yellowish. Generally, the ground colour may be dull green, olive-brown or brown of almost any shade, light or dark. Apart from the black markings, some are speckled, spotted or blotched with red, varying in intensity from salmon or rose pink. This lively ornamentation is almost entirely confined to basal half of scales, seen to best advantage when the snake dilates itself under excitement.
- **Habitat:** Frequents water and is very common in tanks, pools and rivers. In swampy areas, it may be seen away from water.
- **Habit:** Fish, frogs, toads.
- **Breeding behaviour:** Oviparous. Female lays 30-90 eggs in December (Khaire N., 2011).
- **Characteristics:** Diurnal as well as nocturnal. In swampy areas, it may be seen away from water. It is aggressive, attacks with slightly flattened neck when provoked. Strikes rapidly and with great determination, holding on tenaciously. Erects and flattens forebody prior to striking. But temperaments vary and some are very mild. An extremely active snake, capable of jumping clear off the ground and will do so repeatedly if persued. In water it swims nimbly and with vigour, and is a versatile diver. Although it is a non venomous snake it is capable of giving a painful bite.

Checkered pattern of keeled scales

Large eyes with round pupil

Cast skin peeled backward over the body

Fig. 13: Checkered Keelback Water Snake

13) Grass snake/ Green Keelback Snake- *Macropisthodon plumbicolor* (Cantor, 1839)- **(Fig.14)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake
  Genus- *Macropisthodon*
  Species- *plumbocolor*
- **Local name:** Marathi- Gavtya sap
- **Average length:** 55 cm
- **Identification:** A small rather stout snake. Eyes moderately large and green with round pupils. Tail is short.
- **Colouration:** Adults, uniform grass-green above with a few black spots which may show a tendency to form transverse bars. A few small white spots on body; upper lip, chin, throat and belly uniform white or belly may be greenish or plumbeous. Juveniles have a well-defined black chevron on the nape with its angle pointed forwards. Following the chevron is a broad gorget of bright yellow. A black streak from eye to gape.
- **Habitat:** Grasslands, in populated village cities, marshes, arid zones and rocky areas.
- **Habit:** Mostly toads but sometimes also ingest frogs and lizards.
- **Breeding behaviour:** Oviparous. The female lays around 6-16 eggs from march to June (Khaire N., 2011). Grass snake in my captivity laid 17 eggs of uniform size in the month of February.
- **Characteristics:** It is active by night and sometimes by day. It flattens its fore-body when disturbed, but is of shy temperament. A singularly gentle and inoffensive snake, it erects its forebody and flattens its neck like a cobra, hence the Tamil name ‘green cobra’.

Green Keelback snake laid seventeen eggs in the month of February

With its cast **Anterior view** **Juveniles**

Fig. 14: Green Keelback or Grass Snake

14) Gunther's Racer/ Slender Racer- *Coluber gracilis* (Gunther,1862)- **(Fig.15)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake.
  Genus**-** *Coluber*
  Species**-** *gracilis*
- **Local name:** Marathi- Chitrang Naykul
- **Average length:** 30 cm
- **Identification:** Yellowish above, with a series of large round brown spots edged with black, separated by narrow interspaces; these spots become more indistinct on the posterior part of the body, a black cross-band on the snout and three angular dark yellowish-brown with black-edged bands forms 'V' shaped mark on the head with black border; the anterior bands between the eyes, the posterior extending on to the nape. Lateral parts yellowish, with an irregular series of black spots on eachside. Underside is white.
- **Habitat:** Scrubland
- **Habit:** Lizards and small garden lizards.
- **Breeding behaviour:** Oviparous (Khaire N., 2011).
- **Characteristics:** Diurnal. This shy snake looks very beautiful. It is rare snake found only once during the two years of project work.

Scales are darker at head and gradually become pale towards the tail

'V' shaped mark over head with black border

Fig. 15: Gunther's Racer / Slender Racer

15) Dumeril's Black-headed Snake- *Sibynophis subpunctatus* (Dumeril, Bibron and Dumeril, 1854)- **(Fig.16)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake
  Genus- *Sibinophis*
  Species- *subpunctatus*
- **Local name:** Marathi- Kaltondya sap
- **Average length:** 25 cm
- **Identification:** Slender body with black head. Body light-reddish brown with a single line of small black dots.
- **Habitat:** Terrestrial. Found under logs and stones.
- **Habit:** Lizards, skinks and smaller snakes.
- **Breeding behaviour:** Oviparous. Female lays 2-5 eggs (Khaire N., 2011).
- **Characteristics:** Active during the day and night.

Body with a single line of small black spots

Fig. 16: Dumeril's Black-headed Snake

B) Semi Venomous Snakes-

1) Common Indian Cat snake- *Boiga trigonata* (Schneider,1802)- **(Fig.17)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake
  Genus- *Boiga* Species- *trigonata*
- **Local name:** Marathi- Manjrya sap **Average length:** 65 cm
- **Identification:** A small snake with slender, markedly compressed body, neck distinctly constricted, eyes large with mustard yellow iris and vertical pupil.
- **Colouration:** Ground colour yellowish brown, uniform or mottled with darker shades. Dorsally a series of Y-shaped marks which meet at the centre and resemble arrowheads. Lighter or whitish between the arms of each 'Y'. The markings fade before or at the vent. Belly white, rufous or brown-spotted laterally. Head with a pair of lung-shaped brown patches, often bordered with black. A narrow dark streak frombehind eye to gape.
- **Habitat:** Villages and towns, arid and rocky areas. Arboreal. Found on trees, in bushes and also in grasslands.
- **Habit:** Frogs, lizards, small birds and mice.
- **Breeding behaviour:** Oviparous. Female lays around 3-10 eggs in hole and tree hollows (Khaire N., 2011).
- **Characteristics:** A nocturnal snake usually encountered on the move at night. In bushes it coils itself into a little heap, and does not recline with body extended as other snakes do. An excellent climber, it can jump from a good height to the ground. If picked up by the tail, climbs up its own body and bites. Sometimes, when caught by the neck, ejects an evil smelling stream of yellow and white secretion from its anal gland, which has a persistent smell.

  According to Daniel J. C. (2002). This snake has a fang in the back of the mouth,the last two teeth on the upper jaw being set apart from the rest in the form of grooved fangs. The secretion of the parotid gland is lethal to lizards and highly toxic to mice. The snake ready to act offensively on the least provocation. Its striking posture is characteristic. The head and forebody are erected well off the ground and the latter thrown into a figure-of-eight loop, the head being poised in the middle. Prior to striking, the erected part is swayed forwards and backwards, the whole body inflated and deflated, and the tail vibrated briskly. The stroke is delivered with determinationand malice, with jaws fully open and the loops straightened to the utmost. The snakethen retracts to its former attitude and strikes repeatedly.

  The markings and colour bear a close resemblance to the Echis carinata, the saw-scaled viper, but the two species can be easily separated by the absence of head shields in the viper.

2) Leith's Sand Snake- *Psammophis leithii* (Gunther, 1869)- **(Fig.18)**

- **Scientific classification:** From kingdom to subfamily same as Trinket snake
  Genus- *Psammophis*
  Species- *leithii*
- **Local name:** Marathi- Lithicha Reti sap
- **Average length:** 76 cm
- **Identification:** Yellowish body has four dark brown lines from head to tail. The head has an elongated dark mark. The mouth is also elongated and the head is somewhat bigger than the neck. Big eyes with round pupils. Underside is faint yellowish-white with smooth scales.
- **Habitat:** Grasslands and deserts.
- **Habit:** Lizards, garden lizards and small birds (Khaire N., 2011).
- **Breeding behaviour:** Oviparous. Female lays around 4-10 eggs (Khaire N., 2011).
- **Characteristics:** It is a diurnal and is found on the ground as well as trees.

Cat-like eyes with a vertical pupil & brown arrow shaped mark on head

Lifts its head high in air

A child handling the Indian Common Cat snake

Fig. 17: Indian Common Cat Snake

Leith's Sand Snake

Big eyes with round pupil

Four dark brown line fromhead to tail

Fig. 18: Leith's Sand Snake

C) Venomous Snakes-

1) Common Krait- *Bungarus caeruleus* (Schneider,1801)- **(Fig.19)**

- **Scientific classification:** From kingdom to suborder same as Trinket snake
- Family- Elapidae Genus- *Bungarus* Species- *caeruleus*
- **Local name:** Marathi- Manyar
- **Average length:** 100 cm
- **Identification:** The enlarged hexagonal vertebral scales, entire subcaudals, uniformly white belly and the narrow white crossbars on the back, more or less distinctly in pairs, distinguish the species. Body rather long and cylindrical. Neck not evident. Eyes rather small. Scales smooth and shiny. Iris black, pupil indistinguishable. Tail short.
- **Colouration:** lustrous black or bluish black above, with paired narrow white crossbars indistinct or absent anteriorly. In young, the crossbars are well defined andconspicuous, even anteriorly. In mature snakes, the white may be in the form of a series of connected spots with a particularly large spot on the vertebral region. Lowerlip and ventral body surface white.
- **Habitat:** Near human habitation, in marshy, arid and rocky areas. It has been noted to rest in anthills, rat holes, among rocks, etc. during the day.
- **Habit:** Feeds mainly on snakes including other kraits. Occasionally it has been known to eat mice, frogs and even lizards.
- **Breeding behaviour:** Oviparous. The female lays 8-12 eggs during March toMay (Khaire N., 2011).
- **Characteristics:** It is nocturnal and of a placid temperament, biting usually under provocation during the day but alert, active and dangerous at night. Many instances are on record of people sleeping on the ground being bitten when unknowingly rolling on or placing a leg or hand in their sleep on a krait moving nearby.
- **Venom:** Daniel, J.C. (2002) stated that the kraits are among the few snakes whose bite is fatal to man. The poison, secreted by glands in the temporal region of the head, is a clear, amber coloured fluid when freshly secreted. The yield from a snake appears to depend on its condition, and the quantity is not necessarily related to the size of the snake. The secretion yields from 0.2 to 51.4 mg of dries venom. The venom is more toxic than that of the cobra and acts both as a neurotoxin and haemotoxin, paralyzing the respiratory centre, and centres concerned with the lips, tongue, throat and voice and phrenic nerves. The red

blood corpuscles are destroyed,as also the lining of the smaller blood vessels. The major causes of death is asphyxia through paralysis of the respiratory centre. The lethal dose for man is considered to be the secretion equivalent to 1 mg of dried poison. The Krait venom is considered to be 15 times more virulent than the cobra's and krait is one of the deadliest among the poisonous snakes of the world. Daniel J.C. further quoted that the symptoms are a fiery pain at the site of the bite which disappears after some time, later violent abdominal pain, probably due to haemorrahage, and paralysis sets in. The eyelids and lower lip droop and the person is unstable to walk or breathe. Often there is no immediate reaction and the bite is ignored, with fatal results, Polyvalent serum should be injected, preferably intravenously, as soon as possible after the bite. Till medical attention is available, the victim should be kept warm and given hot stimulating drinks. Alcohol should not begiven. Death may result in five to twelve hours after the bite.

White bands in pair deminishing towards the anterior end

Scales of the uppermost row are distinctly enlarged and hexagonal

Fig. 19: Common Krait

2) Slender Coral Snake- *Calliophis melanurus* (Shaw, 1802)- **(Fig. 20)**

- **Scientific classification:** From kingdom to suborder same as Blind snake
  Family- Elapidae
  Genus- *Calliophis*
  Species- *melanurus*
- **Local name:** Marathi- Powala sap
- **Average length:** 35 cm
- **Identification:** Body is brown. Head blunt black with yellow spots. Two black rings are seen on the tail. Underside of body is coral red. Underside of tail is bluish-grey. Eyes are black. Slender body, smooth scales.
- **Habitat:** Mostly on land, under stones and dry leaves.
- **Habit:** Has been recorded to feed on Worm snakes in captivity (Kaire N., 2011).
- **Breeding behaviour:** Oviparous. Female lays 2-7 eggs under dry leaves and stone cavities (Kaire N., 2011).
- **Characteristics:** Nocturnal. When provoked it raises the tail exposing the blue and red colour underneath.

Two black rings on tail

Head blunt black with yellow spots

Underside of body is coral red

Underside of tail is bluish-grey

Fig. 20: Slender Coral Snake

3) Indian Cobra/ Spectacled Cobra/ Binocellate Cobra- *Naja naja* (Linnaeus, 1758) (Fig. 21- 23)

- **Scientific classification:** From kingdom to suborder same as Blind snake
  Family - Elapidae
  Subfamily - Elapinae
  Genus - *Naja*
  Species - *naja*
- **Local name:** Marathi- Nag
- **Average length:** 160 cm and maximum length upto 220 cm
- **Identification:** Cobra can be immediately distinguished from other land snakes by the presence of a small 'cuneate' scale between the 4th and 5th infralabials. Rarely two may be present and very rarely, the cuneate may be absent. The hood is formed by the elongated ribs of the 3rd and the following 27 vertebrae, the 9th on the left and 10th on the right are the longest, the preceding and succeeding ribs shorten progressively, giving an oval outline to the expanded hood (Daniel, J. C., 2002).

  At rest, the ribs lie along the length of the body, the overlying skin is loosely attached. When erect the hood, dorsal skin is stretched, making the hood markings conspicuous, and the head, bent strongly at the atlas vertebra, is carried at the right angles to the hood. The hood when dilated is diagnostic, more so when the markingsare visible. The markings may be absent and in death the hood may not be demonstrable.

  Head depressed with short, rounded snout. Nostrils large, pupil round, an obvious swelling at the temporal region over the underlying venom glands. Head shields glossy, body with a more or less distinct groove down the spine. Ventral scales behind the throat shows black band. Most prominent feature observed is; the erected hood ofany Indian Cobra shows that the skin of the left side of the hood is stretched more lengthwise.
- **Colouration:** Body is yellowish, brownish or black above, with or without a black and white mark on hood, a black and white spot on the inside of the hood with one or two black crossbars below hood.
- **Habitat:** Forests, grasslands, urban areas, around villages. It also resides in anthills and old houses.

- **Habit:** Toads, frogs, mice, small birds. Khaire N.,(2011) noticed that cobra occasionally feed on small snakes. Investigation of Daniel J.C (2002) showed that cobra also feed on other cobras.
- **Breeding behaviour:** Oviparous. Female lays 10-15 eggs between April and May (Khaire N., 2011).
- **Characteristics:** Frquently found near or in water and is a strong swimmer. Usually not aggressive but timid, but occasionally fierce and aggressive when disturbed. Youngs are much more dangerous than adults, being more easily excited and ready to strike repeatedly and with determination. When alarmed, it adopts the well known pose with erect forebody and spread hood. The height to which the forebody is raised is approximately one-third the total length of the snake and forms the effective striking range. While thus poised, the snake sways backwards and forwards, hissing in an explosive manner which is brief and high pitched during inhalation and longer, louder, lower pitched and intermittently explosive during exhalation. The throat is pouched, more so during exhalation and the whole body is inflated. The tongue flickers in and out during inhalation and exhalation. The bite isoften a mere snap, but it sometimes bites and hangs on and the jaws have to be forced open. Occasionally when the snake misses, the poison is ejected as a spray by the thrust of the lunging snake. Usually more active and alert at night, though it hunts for food during the late afternoon and early evening.
- **Venom apparatus and venom:** The venom glands are active from birth. Daniel J. C. (2002) explained in detail the venom apparatus and the venom. Usually two fully operative canaliculated fangs in each side. These are shed singly at intervals. Fangs about 7 mm in length are small compared with viperine fangs, but are more solid. The bore of the fang opens widely at the base and by a small aperture at the tip. The poison glands are analogous to the parotid salivary glands in mammals and havethe shape and size of an almond kernel. The venom is clear, viscid fluid resembling olive oil in appearance and consistency, which solidifies into an amorphous mass. Theamount secreted varies with age, vitality and the temper of the animal and the averagedischarge at a bite is 211 mg dry weight. The poison acts mainly as a neurotoxin and blood and cell destroyer. The neurotoxin paralyses the respiratory centre and is the chief cause of death. Other effects are loss of clotting power of the blood and destruction of red blood cells. The symptoms produced in man start with a stinging orburning pain, accompanied by

swelling and oozing of blood-stained serum. The constitutional effects are are a gradual but rapidly advancing paralysis commencing with the legs; the neck droops, the muscles of the tongue lips and throat are affected and speech becomes difficult. The lower lip falls and allows saliva to dribble, swallowing becomes difficult. Breathing becomes difficult, laborious and finally stops. Other symptoms are vomiting and haemorrhage from the various orfices of the body. The bite of the cobra is not necessarily fatal at all times, depending as it does onthe quantity of the venom injected, the natural resistance of the victim, the condition of the snake and various other factors. Records indicate that cases of recovery from abite are equal to, if not more than, cases of death and there is always hope, however serious the symptoms. The Haffkin Institute's Polyvalent Serum is fully effective even when symptoms are far advanced.

- **Snake charming:** The Indian cobra's celebrity comes from its popularity as a snake of choice for snake charmers. The cobra's dramatic threat posture makes for a unique spectacle as it appears to sway to the tune of a snake charmer's flute. Snake charmers with their cobras in a wicker basket are a common sight in many parts of India only during the Nag Panchami festival. The cobra is deaf to the snake charmer's pipe, but follows the visual cue of the moving pipe and it can sense the ground vibrations from the snake charmer's tapping. Sometimes, for the sake of safety, all the venom in cobra's teeth is removed. The snake-charmers sell the venom at a very high price. In the past Indian snake charmers also conducted cobra and mongoose fights. These gory fight shows, in which the snake was usually killed, are now illegal (Prevention of cruelty to Animals Act 1960).

6 feet long Indian Cobra with hood erected

Indian Cobra with half hood

21 cm long baby Cobra

Head of the Indian Cobra

Fig. 21: Postures of Indian Cobra with hood erected

4) Russell's Viper- *Daboia russelli* (Shaw and Nodder,1797)- **(Fig.24-26)**

- **Scientific classification:** From kingdom to suborder same as Trinket snake.
  Family - Viperidae Subfamily - Viperinae
  Genus **–** *Daboia* Species **-** *russelli*
- **Local name:** Marathi- Ghonas
- **Average length:** 100 cm
- **Identification:** Head covered with small scales and without shields. Body massive, cylindrical, narrowing at both ends, head flat, triangular with short snout, large gold flecked eyes with vertical pupil and large open nostrils. Neck constricted.Belly rounded. Tail short.
- **Colouration:** Ground colour brown of varying shades with three series of large ovate spots, one vertebral and two costal. Spots brown in the centre and margined successively by black and white or buff. The dorsal spots may coalesce and the side spots may be broken up. Smaller spots may occur between the dorsal and side spots. Head with distinct dark patch behind. A dark streak, margined with white, pink or buff behind eye. A dark stripe from eye to lip. A conspicuous white, buff or pink line from gape converges to form a 'V' above snout. Lips white, whitish or pink. Belly white, whitish or yellowish, with a few dark half-moon marks on the margins ofthe anterior ventrals.
- **Habitat:** Arid and shrubbery and rocky areas. Prefers to reside in anthills and rat holes. It is not uncommon in inhabited areas, the attraction being the rodents commensal with man.
- **Habit:** Rats and small mammals.
- **Breeding behaviour:** Ovo-viviparous. Gives birth to around 6-63 young ones during May-July (Khaire N., 2011).
- **Characteristics:** Mainly nocturnal, though sometimes seen during the day. Normally sluggish and does not strike readily unless irritated, when it bites with greatmalice. When disturbed it coils itself and makes readily hissing noise heard like a pressure cooker's whistle. When striking, it hurtles itself forward and may even leavethe ground. The bite may be either snap or the snake may hold on for many seconds. Daniel J.C. (2002) recorded that in captivity, many adults do not feed and was recorded as not having fed for nearly five months.

- **Venom:** Daniel J.C. (2002) reported that the fangs of Russell's Viper attain their maximum size, the largest of Indian vipers; average size is about 16 mm. There are two fangs to a side, with 5 or 6 reserve fangs lying behind. They are movable and can be erected when the mouth opens. The poison glands are small and present a corrugated appearance. The venom is transparent, acidic in reaction and tastes like gum Arabic. When dried, it retains its toxicity indefinitely and is readily soluble in water. The total yield may be about 145 mg and about 72 mg may be injected at a bite, considerably in excess of the 42 mg thought to be the fatal dose for man. The poison acts as a depressor of the vasomotor centre and a destroyer of blood. The blood pressure drops and heart weakens. Red blood corpuscles are destroyed, the clotting power of the blood is reduced and the lining of the blood vessels destroyed, leading to extensive internal haemorrhage with pain and vomiting and bleeding from the body orfices. In experimental animals, massive doses of the venom result in extensive clotting of blood and death in a few minutes, owing to the action of a principle that clots blood and is only active in high concentrations. The symptoms in man are intense burning or stinging pain at the site of the bite, rapid swelling of the area, and constant oozing of a thin bloody serum from the puncture. The pulse becomes rapid and weak, and breathing rapid, irregular, accompanied by muscular weakness, nausea and vomiting. Pupils become dilated and intensive to light. Unconsciousness may result. The skin becomes cold, often bedewed with sweat. Bleeding from body orficesand internal haemorrhage occur. Death from cardiac or respiratory failure or septicaemia may occur in 1 to 14 days or even later. The Haffkine Institute's Polyvalent Serum is an effective antidote to the poison.

  Mallow D. *et al.* (2003) stated that for most humans, a lethal dose is approximately 40-70 mg. In general, the toxicity depends on a combination of five different venom fractions, each of which or less toxic whentested separately. Venom toxicity and bite symptoms in humans vary within different populations and over time. Envenomation symptoms begin with pain at the site of the bite, immediately followed by swelling of the affected extremity. Bleeding is a common symptom, especially from the gums and in the urine, and sputum may show signs of blood within 20 minutes post-bite. There is a drop in blood pressure, and the heart rate falls. Blistering occurs at the site of the bite,

developing along the affected limb in severe cases. Necrosis is usually superficial and limited to the muscles near the bite, but may be severe in extreme cases. Vomiting and facial swelling occur in about one-third of all cases. Kidney failure (renal failure) also occurs in approximately 25-30 percent of untreated bites. Severe disseminated intravascular coagulation also can occur in severe envenomations. Early medical treatment and early access to antivenom can prevent and drastically reduce the chance of developing the severe/potentially lethal complications. Severe pain may last for 2–4 weeks. Locally, it may persist depending on the levelof tissue damage. Often, local swelling peaks within 48–72 hours, involving both theaffected limb and the trunk. If swelling up to the trunk occurs within 1–2 hours, massive envenomation is likely. Discoloration may occur throughout the swollen areaas red blood cells and plasma leak into muscle tissue (Murthy D., 1990).

Russell's Viper

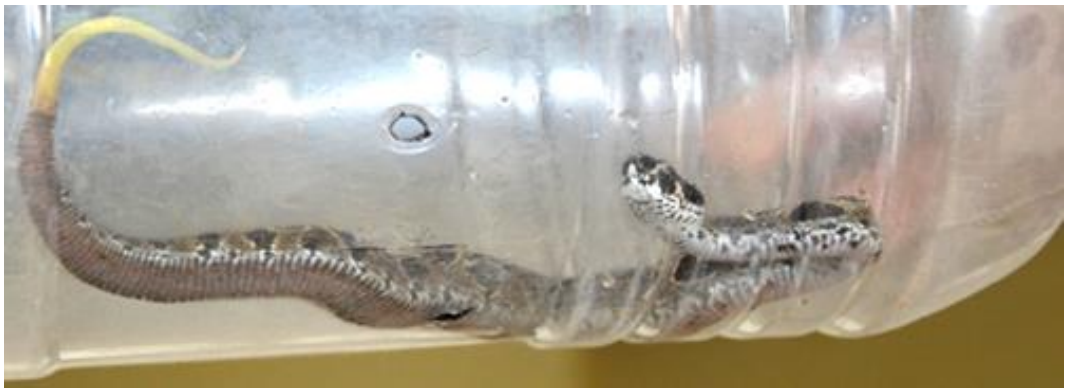
Three rows of dark brown diamond or oval-shaped marks with a white border

When disturbed, put head below the coils of the body

Fig. 22: Russell's Viper in different postures

Large and open nostril

Fang of a Russell's Viper



Baby Russell's Viper has unique yellow coloured hinder part of the trunk & tail

Handling of haemotoxic Russell's Viper safely

Fig. 23: Russell's Viper

5) Saw-scaled Viper- *Echis carinatus* (Schneider, 1801)- **(Fig. 27)**

- **Scientific classification:** From kingdom to subfamily same as Russell's viper
  Genus- *Echis* Species- *carinatus*
- **Local name:** Marathi- Phurse
- **Average length:** 40 cm
- **Identification:** Distinguished from other Indian snakes by the absence of shields on the head, the broad ventrals covering the whole belly and the undivided subcaudal shields. Body cylindrical, short and stout, rough from the serrated flank scales, tapering towards both neck and vent; neck distinctly constricted. Head subovate with short rounded snout. Eyes large, iris golden yellow, pupil vertical. Tailshort.
- **Colouration:** Colour and pattern varies considerably. Pale brown, buff or tawny, with dark brown or even blackish markings in the form of dark edged spots in a vertebral series, connected to a light coloured, inverted U-or V-shaped flank mark enclosing a dark area connected to each other and forming a wavy flank line. A cruciform or trident shaped mark on crown. Whitish below, uniform or spotted with brown.
- **Habitat:** Arid and rocky areas.
- **Habit:** Scorpions, centipeded, skinks, frogs and small mice (Khaire N., 2011).
- **Breeding behaviour:** Ovo-viparous. The female gives birth to 4-8 young ones between July to August (Khaire N., 2011).
- **Characteristics:** An alert little snake, diurnal and nocturnal, is capable of quick movement when necessary. In sandy areas it side winds. Often climbs on to shrubs and other low vegetation. The readiness with which it bites on the smallest provocation and the extremely fast strike makes it a very dangerous reptile. The striking posture is characteristic, a double coil in the form of a figure of 8, with its head in the centre. The coils keep moving against each other and the serrated keels on the flank scales produce a hissing noise by friction amplified by the inflated body acting as a resonator.
- **Venom:** Daniel, J.C. (2002) reported that the fangs of this snake are remarkably long for its size, specimens 380 mm in length having 5 mm long fangs. The almond shaped poison glands are placed behind the eyes. The average yield by weight of dry venom is about 18 mg, with a recorded maximum 71 mg. About 12 mg are injected at a bite, roughly twice the lethal dose for an adult. The venom is said to be five times as toxic as cobra venom, sixteen times as toxic as Russell's viper venom and is very rapidly absorbed. The lethal dose for man is believed to be 5 mg. The yield from snake varies considerably and about 20% of the bite may prove fatal. The poison acts mainly as an anti-coagulant, a destroyer of blood cells

and lining of blood vessels, a cardiac depressor and generally as a depressor to nerve cells. The local symptoms are similar to those of the Russell's viper. The heart is strongly affected through the vasomotor centre in the brain, resulting in a weak pulse and low blood pressure. The venom acts directly on the cardiac muscle also. The blood cells are destroyed and haemorrhage almost inevitably occurs from damaged blood vessels. Death results from heart failure and may occur within 24 hrs or less, or even caused by exhaustion from repeated haemorrhage may occur after a week or two. The Haffkin Institute's Polyvalent Serum is an effective antidote to the poison. It is essential to keep the victim under medical observation, as delayed effects of the poison prove fatal even many days after the bite. The kidneys are often damaged beyond repair.

White spear like white mark on the head, large golden eyes with vertial pupil

Attacking posture

Fig. 24: Saw-scaled Viper

ENVIRONMENTAL AWARENESS

Most of the environmental education programmes now available in the countryard focussed on issues like deforestation, pollution and conservation of the larger mammals and birds. Diverse species of reptiles are found in all types of habitats and many of them live very near to human habitations. Due to many superstitions, myths and false beliefs, people either avoid them or wantonly kill them. In any case, there is little attempt to study the reptiles or understand their ecological significance or protect and conserve them. Among the reptiles, the larger snakes like the cobra and the rat snake have considerable ecological role to play in keeping the rodent population under control and thereby promote the interests of agriculture. It is estimated that 10% to 25 % of India's food crops is destroyed every year by rats, either in the field or as stored grain. Snakes in general and the lizards also control other pests because they eat mostly insects and other small invertebrate injurious to crops. All reptiles thus play an important role in the environment.

For environmental awareness, training programme of certificate course 'Snakes: Identification and handling' has been carried out for ten days for sixteen, students and college teachers in the month of February 2013, due to this practice the college students have been engaged in collection and identification of snake species (Fig.28 & 29). To carry out the environmental awareness programme, lectures and demonstrations were conducted with the help of audio-visual aids to teachers, students of high schools, college students and the pupil of Indapur tahsil, and villagers during Ganesh festival at the project area. The most snake bite cases have been observed dueto Indian Cobra, Krait and Russell's Viper snake. To aware the people from snakes I have initiated lectures with demonstrations for the school and college students and also for the villagers where their activities may bring them into contact with snakes, or where snake removal is an integral part of their work. We offer a power point theory training presentation seminar involving snake identification, snake-bite protocol and management, which includes a practical demonstration with live animals. This course was aimed at people that may come into contact with snakes and other reptiles in the field or for people wanting to learn more on how to handle snakesin a responsible and safe manner. The course can easily be tailored so that each candidate has the opportunity to handle non-venomous and venomous snakes.

Detailed presentation of the snakes likely to be encountered in the area.

With our Principal, colleagues and students

Girls under training

Student with Russell's Viper

Safely handling of Indian Cobra

Trainee with Montane Trinket and Russell's Viper Snake

Fig. 25: Training programme of 'Snakes: Identification and handling'

Conveying the information about the snakes

Girl student with Indian Cobra

Procedure of how to enclose the snake into bag

With Russell's Viper Snake

With college teacher and students- Russell's Viper and Indian Cobra Snake

Fig. 26: Training programme of 'Snakes: Identification and handling'

The snake awareness programme includes:

- How to identify & precautions to take to prevalent snakebites.
- A detailed discussion on the do's and don'ts of what to do when encountering a snakeon site.
- What action to take in case of a snake bite.
- A discussion of snakebite and envenomation, detailing the particular venoms of the venomous snakes found in the area. For this purpose flex boards containing the information with identification keys of individual snakes have been displayed at the entrance of the college campus to get detail knowledge. Also the flex containing mobile numbers of myself and twelve trained teachers and students have been displayed at the college entrance, so that the students of our college and thusultimately the people of Indapur tahsil can immediately contact us in the emergency **(Fig.30).**
- A question and answer session, after the conclusion of the PowerPoint presentation.
- We then proceed to an animal handling demonstration.
- Designated attendees are then shown how to safely pick up a problem snake and remove it to a suitable container for transportation to a place where it no longer presents a problem.
- "Problem" snake encounters are known to create fear which in turn encourages myths, rumors and superstitions affecting the work force morale due to its negative demoralizing influence.
- To answer our most frequently asked question, "What kind of solution can you suggest for problem snakes?' The latest research has indicated that snake awareness training gives the students, staff or residents more confidence when snakes are encountered following the training sessions.
- Snake awareness is not only an Environmental Management issue but is very much ahealth & safety concern. These annual statistics would be something of the distant passed if we humans took the time to understand biodiversity using acceptable environmentally friendly awareness precautionary measures. If you would like more information regarding the seminar, please don't hesitate to contact us.
- Report of Awareness and Training Programme for teachers and students of Chennai Corporation school (2007) revealed that for the past several years, the Chennai Snake Park Trust has been conducting various environmental education programmes for select groups. It was found necessary to extend the training

programme to school teachers and students of Chennai Corporation Schools to promote knowledge on snakes and other reptiles and dispel the erroneous beliefs about them to create awareness about the environment and the significance of reptiles in the environment. Educating the students in these matters will also indirectly result in the education of their parents.

The objectives of these snake awareness programmes are are:

To provide training and awareness in snake behaviour and other occupational Health and safety aspects to increase the knowledge of pupils so as to minimise the likelihood of snakebite.

- To be trained in emergency first aid in the event of snakebite.
- To identify the place snakes hold in the environment.

My methods are a sixty-minute verbal presentation using displays, live exhibits, course participation and questions to obtain the above objectives.

The expected participated outcome is:

- People will be trained in how respond to snake sightings, public enquiries and snakebites.
- People will not place themselves at unnecessary risk where snakes are involved.
- People who may experience anxiety when thinking of snakes or in close approximity of snakes will have this reduced.

Snakes are poikilotherms or ectothermic or cold-blooded animals i.e. they cannot regulate their body temperature internally and must use the outside environment. In winter season when the temperature falls below the normal range, they undergo hibernation, during this time they don't usually eat or move much due to the low temperatures and energy levels of the body. After a long winter in the den or burrow, snakes will get more active as the temperatures rises. At first they will come out to bask in the sun on warm days, but won't go very far from the spot because it is still pretty cold at night and will need to retreat. So when the night time temperatures are consistently safe, they will disperse from the site in search of food. It is at this time people should raise their attention to what they are doing. Because there are few snakes that require your utmost attention towards the like Russell's Viper, Indian Cobra, Saw-scaled Viper and Common Krait. These snakes have gotten a pretty bad reputation over the years because of their attitude and venom.

Upon leaving their winter hideout, snakes will seek shelter just about anywhere they can. So the more "stuff" you have lying around in the yard, the more likely a snake will use it as shelter. And if you have food scraps outside, this will attract otheranimals,

especially rodents, which will attract the snakes. So the best way to avoid an unwanted confrontation is to simply make sure the immediate area around your home is as tidy as possible. Keep the yard trimmed and don't leave things lying around.

Snakes do not want to confront humans. They would prefer if we never even saw them, so they are never going to attack you, unprovoked, and will certainly not chase you. Venomous snakes use their toxic venom for two things: to kill their prey and asself defense. Since this venom is used to capture their prey, it is not in their best interest to use it unless they feel threatened enough to justify it.

Snakes will be active throughout the summer, but what many people don't realize is that snakes can also over-heat very quickly in the mid-summer heat. Because of this they will be more active at night and seek cool places to retreat during the day. This is often the time when people are confronted with snakes that are just tryingto get out of the heat.

By far the most important thing you can do to avoid a potentially serious situation iseducate yourself and be aware of your surroundings. Don't put your fingers anywhere before checking and be careful where you are stepping. And never try and pick up orkill a snake. Most people are bitten as a result of either provoking it or trying to kill it. Remember, they would prefer to avoid a confrontation so if you just respect that, you should be fine.

If you do happen to be the unfortunate victim of a Russell's Viper snake bite, here area few quick tips to remember.

1) Try and remain calm.
2) Remove any tight clothing and accessories (rings, necklaces, etc.). This is to prevent blood flow restriction upon swelling.
3) Get to a hospital as quickly, but safely, as you can.

There is almost a 100% survival rate if you get medical help within a couple of hours.

If you are properly educated and behave accordingly, there is no reason we can't coexist with other wildlife. So this spring and summer, just be aware of the possible presence of other animals, including snakes.

To village people

Awaring the school children

Girl students participated in awareness

At village school

During Ganesh festival

During Navratra festival

Snake Information at college campus

Mobile number of snake rescuers

Fig. 27: Snake awareness programmes

SIGNS AND SYMPTOMS OF A VENOMOUS SNAKE-BITE

According to Khaire N. (2011)

1) **Cobra bite:** The area around the bite starts swelling up within half an hour. The limbs become weak. The eyelids droop and cannot be kept open. Saliva starts dribbling from the mouth. This is accompanied by sweating and vomiting. If untreated, the victim dies of respiratory muscle paralysis **(Fig. 31)**.
2) **Krait bite:** These snakes have smaller fangs. However, the venom is much more potent than that of the cobra. Most of the signs of poisoning are similar to that ofthe cobra bite but there is no burning sensation or swelling at the site. There is often severe pain in the abdomen and in the joints **(Fig. 31)**.
3) **Slender Coral snake:** There is swelling and burning sensation at the site. There is little data on the signs of envenomation by this snake as incidences of its biteare quite rare.
4) **Russell's Viper bite:** There is severe pain and swelling at the site of the bite. Sometimes the affected limb may develop blisters **(Fig. 31)**. The pulse becomes irregular. Often there is bleeding through the nose, urine or via mouth.

Saw-scaled Viper bite: There is burning sensation and the site at the site and this spreads all over the affected limb. There is a feeling of weakness as the victim starts bleeding through the bite wounds, gums and urine.

Indian Cobra – Bite case

Bite case of Common Krait

Bite cases of Russell's Viper snake

Rat snake bite **Snake bite case at hospital**

Fig. 28: Snake bite cases at Government and private hospitals

Fig. 29: Snake habitats near human dwelling

IDENTIFICATION OF VENOMOUS AND NON-VENOMOUS SNAKES

Few non venomous snakes show mimicry of the venomous snakes which lead to the confusion in the identification of snakes properly, this requires the detail study of venomous, semi venomous and venomous snakes **(Fig.33)**.

Arrangement and size of the scales, plates & shields covering the body help in the identification of snakes.

(A) Except one species, all the sea snakes are poisonous and have flattened tail. The head of the sea- snakes is covered with large shields. The non venomous sea snakes have small scales over the heads.

(B) The terrestrial snakes have rounded or cylindrical tails. They may be both venomous or non-venomous :

1. If small scales are present on the belly and back, then it is a non-venomous snake.
2. If the belly scales are not broad enough to extend right across it, then it is a non-venomous snake.
3. If broad plates are covering the entire width of the belly, it is a poisonous or non-venomous snake.
4. If small scales or shields are present on the head and pit lays b/w the eye and the nostril, it is venomous and is a pit viper.
5. If small scales are present on the head, it is venomous and a viper.

6. If dorsal side of the head has both small scales and large shields, the snake may or may not be venomous.
7. If the third supra labial scale touches the eye and the nostril, the snake is cobra or a coral snake. If the neck is with hood and markings, it is cobra. If the neck is without hood and coral spots are present on the belly, it is a coral snake. Both cobra & coral snakes are venomous.
8. If vertebral (scales on the middle of the back) are hexagonal and larger than other scales over the back and the forth infra labial is the largest, it is venomous and a krait.
9. If the snake has small scales and large shields on the head but does not have the characters of cobra, coral snake or krait, then it is a non- venomous snake.

Venomous Common Krait

Non-venomous Common Wolf Snake

Non-venomous Barred Wolf Snake

Non venomous Dumerill's Black-headed snake

Venomous Slender Coral Snake

Venomous Saw-scaled Viper

Semi venomous Indian Cat Snake

Fig. 30: Snake look-alike

What to do in case of a snake-bite?

According to Khaire N. (2011),

The most urgent and important step in the treatment of snake-bite is the timely administration of anti-venom by a trained doctor. However, this may not be possible immediately in all cases. In such circumstances, administering first-aid is very vital.

In the past it was a common practice to make cuts at the site of the bite in order to allow the venom to flow out with the blood. However, as it causes m re harm than good to the patient, under no circumstances should this be attempted. The cuts can be very painful, as well as result in a huge loss of blood. Besides, only a very small amount of venom can flow out and there is a risk of infection

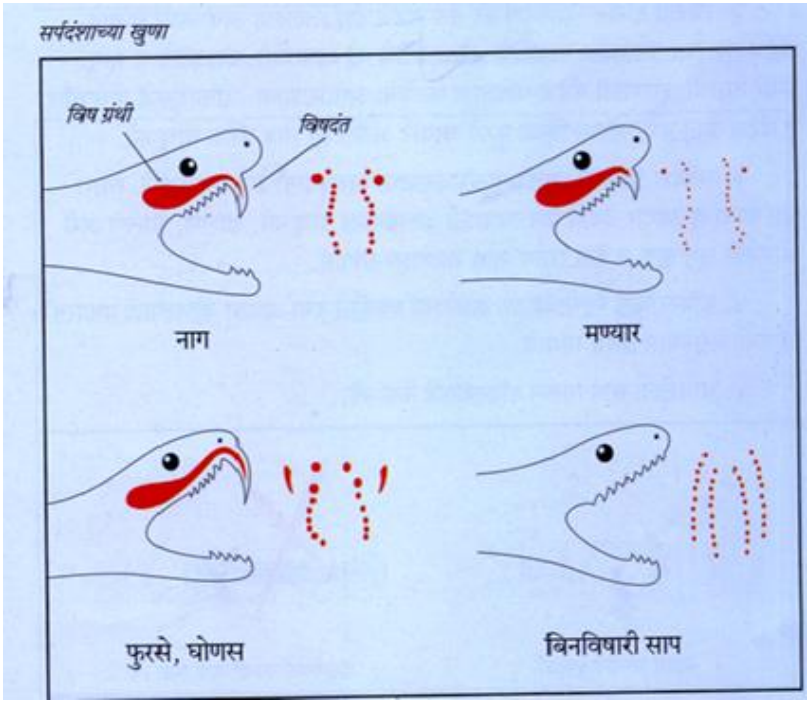


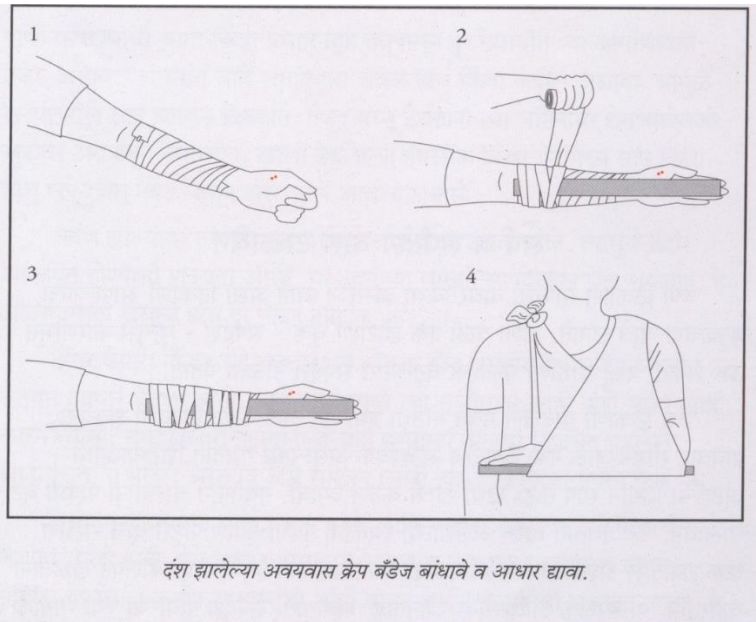
Fig. 31: Snake bites

You may however do the following:

According to Khaire N. (2011),

- Wash the woung thoroughly with water
- Tie a wide crape bandage around the affected limb. If the bandage is not available, tie a long, 4" wide piece of cloth tightly. See that a limb is kept in a fixed position with the help of a supporting plank or any rigid stick, etc. Do not remove thistill you reach the doctor.
- However, do not tie such a bandage in case of viper bite.
- Most victims are very afraid and would need encouragement and moral support. So, reassure him. Keep him warm but do not give any alcohol. Keep him as immobile and as comfortable as possible.

- Inform the doctor if the victim is asthmatic, or is suffering from any major illness or is allergic to any medication, etc.
- Do not kill the snake and take it to the doctor



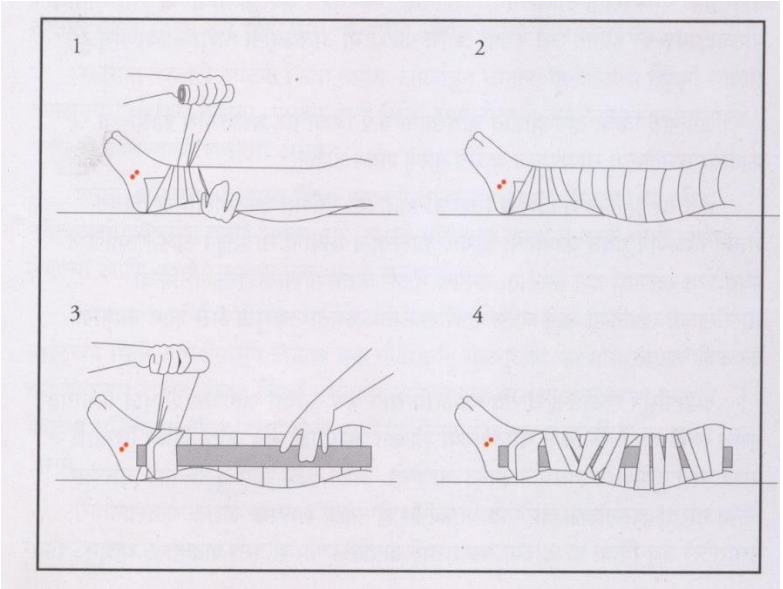


Fig. 32: First aid for snake bite

HOW TO AVOID SNAKE-BITES:

According to Khaire N. (2011),

- Quite often we have to move in areas that are likely to harbor snakes. Even a small mistake can prove to be costly, but by taking simple precautions, one can ensure one's own safety.
- When ambling through the forest, wearing a hat or cap offers protection from bites of tree-dwelling snakes.
- Rock-climbers and trekkers often seek support in rocky crevices as they climb. While doing this, ensure that no creature is lurking within.
- Most snake-bites on the land are result of certain hand movements that may have disturbed the snake. For example, the circular motions of a person cutting grass with a sickle could scare any snake nearby and it may bite that person in self defence. Similarly, one should be careful while gathering fire-woods, as a snake may be lurking beneath the fallen log or wood pile.
- When passing a large rock or a fallen tree trunk always look over it carefully before setting foot on the other side.
- When walking through fields and grassy areas, do not deviate from the path or trail may be present. If no such trail exist and entering the grass is inevitable, ensure that there is no creature lurking there before stepping forward. Always wear shoes; preferably ankle-high ones. In addition to this, one can also wear shin guards while walking through tall grass as the shin and calf are the most likely parts of the bodythat would be accessible to a snake.
- In your home and around it, avoid collecting unused items like bricks, stones, tiles etc. or forming heaps that can invite a snake to take refuge **(Fig.32)**.
- Snakes seek warm hiding places in the winter and cooler places in the summer to escape from the heat. During summer cool places or a water source are hard to come by. So snakes occupy any moist or relatively cool place that they find. Tents setup in a jungle or a washing place at a camp-site offer the ideal refuge. So it is wise to demarcate the bathrooms and toilets in a well-lit area and away from the main tents. Always carry a torch or lantern while moving about in the dark. This makes it easy to spot snakes that may be in your way. Try and hang up all your things in the tent rather than making a pile in a corner. A pair of shoes or a haversack is ideal for a snake or scorpion to hide in.
- Quite often, waste food is carelessly thrown around. This easily attract rats; obviously snakes can follow them too. Dispose of unwanted food far away, preferablyin a pit.

- Ensure that no water collects around the washing area, water tanks, pump house or well so that snakes will not visit there in search of cool place. Wherever possible go for pucca constructions.
- Trim the branches of creepers and trees so that there are not too near your windows. Put up protective netting that will keep out lizards and similar pests. There should be no large gap beneath the door. The mouth of rain water overflow pipes may be covered with a net. Overall, keep the area around the house clean and free of garbage. This will greatly minimize the chances of snakes moving nearby.
- It is a good idea to keep the lower part of the outer wall of the house smooth
- up to a height of at least one meter above the ground. This will ensure that no snake can climb up.
- Water pipes along the wall, electrical cables and so on should be concealed in plaster so that snakes do not get any place to lurk behind them.
- In spite of these precautions you may find yourself face-to-face with a snake in your lifetime. In such a situation, stand still, snakes are provoked by any movement and are more likely to attack in self defence when they spot a moving object. Moreoften than not, a snake will take stock of the situation and leave you unharmed.

WHAT IF A SNAKE ENTERS YOUR HOUSE?

- Do not try to kill the snake; call an experienced snake handler immediately
- Try and keep the snake away from the places where it can hide easily e.g. behind cupboard, amongst unused knick-knacks etc **(Fig. 36)**. Keep an eye on its movement till the snake handler arrives. Meanwhile move your family members andany pets to a safe place.
- If a snake handler is not available do not try to catch yourself. That is the job of an expert. A lot of training goes into it.
- If you want to try and identify the snake, do so from a safe distance. Observe the shape of the head, the colour, shape of the scales and so on. Do not attempt to get close and photograph it or shoot a video film! If possible, try and drive it away out ofthe house and then look up a book and learn more about it.
- In attempting to drive it away, use a long stick, a metal rod with a hook tip, a straightened clothes hanger, a hooked walking stick or an umbrella. Try to lift the snake with the help of the hook holding it away from your body, drop it at a safe distance from human habitation. Never try to pick up a snake by throwing a cloth over it or wearing hand gloves or with the help of forceps. It is extremely dangerous.

Fig. 33: Indian Cobra snake in bathroom outlet and in house

Fig. 34: Moulting stages of Indian Cobra snake

COMMON MISBELIEFS AND SUPERSTITIONS ABOUT SNAKES

According to Khaire N. (2011),

- **Snakes take revenge**
  Snakes do not have a well-developed nervous system and so cannot 'remember' a person or event.
- **Snakes drink milk**
  Milk is a natural food of mammals; it is not so for snakes, as they are reptiles.
- **Snakes have hairs on their body!**
  Body hair is a feature seen only in mammals.
- **Male cobra mate with the female rat snake!**
  Snakes do not cross-breed with the another species of snake.
- **The Vine snake punctures one's skull**
  The human skull is a very hard bone. Neurosurgeons have to use a hammer and chisel to enter into it. The Vine snake is a delicate creature ans as such cannot damage the skull. It is only because it dwells in tees that this misconception may have arisen.
- **The Red Sand Boa has no bones in its body.**
  Snakes are vertebrates. They have between two hundred to four hundred ribs and a spine (vertebral column).
- **A snake sways to the tune of the snake-charmer.**
  Snakes cannot hear as they have no ears, though they can sense vibrations through their bodies. The snake appears to sway, but this is to the charmers movement abd notto the tune.
  This is only due to the instinct of self-defence. Sometimes you may see it trying to bite snake-charmer's instrument.
- **A snake can enter the house at night if one whistles.**
  Snakes are tone-deaf and cannot hear a whistle.
- **The surviving mate of a pair seeks revenge if one of them is killed by a person.**
  Snakes do not have a 'memory' so this is impossible.
- **Some snakes have a mouth at either end of the body.**
  In some snake species like the Sand Boa, the mouth and the tip of the tail look similar.Like all other animals, snakes have only one mouth.
- **Snakes are attracted to the fragrance of the kevada (*Pandanus*) plants.**
  The kevada is a thorny shrub that grows in a clumps and it is quite cool and

shadyunderneath it. Rats come to feed on its cobs. Both these factors are a good reason forthe snakes to be attracted there.

- **Unless the snake turns back upon itself while biting, the venom does nort take effect.**
  The venom fangs are curved towards the inside of the mouth. So, the snake has to struggle quite a bite in trying to extricate them out of the victim's body. In the processit may appear to have turned back on itself or 'sommersaulted'.
- **Neem leaves or chillies taste sweet to the victim of a snake bite.**
  As the snake-bite victim's nervous system is likely to be affected due to neuro-toxicity of the venom, the person may have an overall reduction in his ability to discern taste.
- **Pythons wind themselves around the tree trunk to crush the prey's bones.**
  Pythons kill prey by strangulating it. Its digestive juices are strong enough to digest the prey's bones.

PERCEPTION:

Smell

Snakes use smell to track their prey. They smell by using their forked tongues to collect airborne particles, then passing them to the vomeronasal organ or *Jacobson's organ* in the mouth for examination. The fork in the tongue gives snakes a sort of directional sense of smell and taste simultaneously.They keep their tongues constantly in motion, sampling particles from the air, ground, and water, analyzing the chemicals found, and determining the presence of prey or predators in the local environment (Cogger,1991).

Eye sight

Snake vision varies greatly, from only being able to distinguish light from dark to keen eyesight, but the main trend is that their vision is adequate although not sharp, and allows them to track movements (Reptile Senses: Understanding the World). Generally, vision is best in arboreal snakes and weakest in burrowing snakes. Some snakes, such as the Asian vine snake (genus *Ahaetulla*), have binocular vision, with both eyes capable of focusing on the same point. Most snakes focus by movingthe lens back and forth in relation to the retina, while in the other amniote groups, thelens is stretched. Many nocturnal snakes have slit pupils while diurnal snakes have round pupils.

Infra-red sensitivity

Pit vipers, pythons and some boas have infrared-sensitive receptors in deep grooves on the snout, which allow them to "see" the radiated heat of warm-blooded prey mammals. In pit vipers the grooves are located between the nostril and the eye, in a large "pit" on each side of the head. Other infrared-sensitive snakes have multiple, smaller labial pits lining the upper lip, just below the nostrils (Cogger,1991).

Vibration sensitivity

The part of the body in direct contact with the ground is very sensitive to vibration; thus, a snake can sense other animals approaching by detecting faint vibrations in theair and on the ground (Cogger,1991).

Skin

The skin of a snake is covered in scales. Contrary to the popular notion of snakes being slimy because of possible confusion of snakes with worms, snake skin has a smooth, dry texture. Most snakes use specialized belly scales to travel, gripping surfaces. The body scales may be smooth, keeled, or granular. The eyelids of a snakeare transparent "spectacle" scales, which remain permanently closed, also known as brille. The shedding of scales is called ecdysis (or in normal usage, *molting* or*sloughing*). In the case of snakes, the complete outer layer of skin isshed in one layer. Snake scales are not discrete, but extensions of the epidermis— hence they are not shed separately but as a complete outer layer during each molt, akin to a sock being turned inside out. The shape and number of scales on the head, back, and belly are often characteristic and used for taxonomic purposes. Eye scales visible during the molt of Checkered Keelback snake. Snakes' eyes are covered by their clear scales rather than movable eyelids. Their eyes are always open, and forsleeping, the retina can be closed or the face buried among the folds of the body.

Moulting

Moulting serves a number of functions. Firstly, the old and worn skin is replaced; secondly, it helps get rid of parasites such as mites and ticks. Renewal of the skin by moulting is supposed to allow growth in some animals such as insects; however, this has been disputed in the case of snakes. Molting occurs periodically throughout the snake's life. Before a molt, the snake stops eating and often hides or moves to a safe place. Just before shedding, the skin becomes dull and dry looking and the eyes become cloudy or blue-colored. The inner surface of the old skin liquefies. This causes the old skin to separate from the new skin beneath it. After a few days, the eyes clear and the snake "crawls" out of its old skin **(Fig. 37)**. The old skin breaks near

the mouth and the snake wriggles out, aided by rubbing against rough surfaces. In many cases, the cast skin peels backward over the body from head to tail in one piece, like pulling a sock off inside-out. A new, larger, brighter layer of skin has formed underneath. An older snake may shed its skin only once or twice a year. But a younger snake, still growing, may shed up to four times a year. The discarded skin gives a perfect imprint of the scale pattern, and it is usually possible to identify the snake if the discarded skin is reasonably intact (Scales of Lizards and Snakes, accessed, 2008).

Teeth

Snakes are polyphyodonts with teeth that are continuously replaced.

Venom

Cobras, vipers, and closely related species use venom to immobilize or kill their prey. The venom is modified saliva, delivered through fangs. The fangs of 'advanced' venomous snakes like viperids and elapids are hollow to inject venom more effectively, Venom, like all salivary secretions, is a pre digestant that initiates the breakdown of food into soluble compounds, facilitating proper digestion. Even non venomous snake bites (like any animal bite) will cause tissue damage (Mehrtens J. M., 1987).

The term poisonous snake is mostly incorrect. Poison is inhaled or ingested, whereas venom is injected. Snake venoms are complex mixtures of proteins, and are stored inpoison glands at the back of the head. In all venomous snakes, these glands open through ducts into grooved or hollow teeth in the upper jaw. These proteins can potentially be a mix of neurotoxins (which attack the nervous system), haemotoxins (which attack the circulatory system), hemotoxins, cytotoxins, bungarotoxins andmany other toxins that affect the body in different ways. Almost all snake venom contains *hyaluronidase*, an enzyme that ensures rapid diffusion of the venom (Freiberg,1984).

It has recently been suggested that all snakes may be venomous to a certain degree, with harmless snakes having weak venom and no fangs. Most snakes currently labelled "nonvenomous" would still be considered harmless according to this theory,as they either lack a venom delivery method or are incapable of delivering enough to endanger a human (Fry *et al*., 2006).

Snakes do not ordinarily prey on humans. Unless startled or injured, most snakes prefer to avoid contact and will not attack humans. With the exception of large constrictors, non venomous snakes are not a threat to humans. The bite of a non venomous snake is usually harmless; their teeth are not designed for tearing or inflicting a deep puncture wound, but rather grabbing and holding. Although the

possibility of infection and tissue damage is present in the bite of a non venomous snake, venomous snakes present far greater hazard to humans (Mehrtens J. M., 1987).

Documented deaths resulting from snake bites are uncommon. Nonfatal bites from venomous snakes may result in the need for amputation of a limb or part thereof. Ofthe roughly 725 species of venomous snakes worldwide, only 250 are able to kill a human with one bite. Australia averages only one fatal snake bite per year. In India, 250,000 snakebites are recorded in a single year, with as many as 50,000 recorded initial deaths (Sinha K., 2006).

The treatment for snakebite is as variable as the bite itself. The most common and effective method is through anti venom (or antivenin), a serum made from the venom of the snake. Some anti venom is species specific (monovalent) while some is made for use with multiple species in mind (polyvalent). In the United States for example,all species of venomous snakes are pit vipers, with the exception of the coral snake. To produce anti venom, a mixture of the venoms of the different species of rattle snakes, copperheads, and cottonmouths is injected into the body of a horse in ever-increasing dosages until the horse is immunized. Blood is then extracted from the immunized horse. The serum is separated and further purified and freeze-dried. It is reconstituted with sterile water and becomes anti venom. For this reason, people who are allergic to horses are more likely to suffer an allergic reaction to anti venom (NCBI.nlm.nih.gov, 2013). Antivenom for the more dangerous species like cobras is made in a similar manner in India, South Africa, and Australia, although these anti venoms are species-specific.

Snake charmers

An Indian cobra in a basket with a snake charmer. These snakes are perhaps the most common subjects of snake charmings.

In some parts of the world, especially in India, snake charming is a roadside show performed by a charmer. In such a show, the snake charmer carries a basket that contains a snake that he seemingly charms by playing tunes from his flutelike musical instrument, to which the snake responds. Snakes lack external ears, though they do have internal ears, and respond to the movement of the flute, not the actual noise (International Wildlife encyclopedia).

The Wildlife Protection Act of 1972 in India technically proscribes snake charming on grounds of reducing animal cruelty. Other snake charmers also have a snake and mongoose show, where both the animals have a mock fight; however, this is not verycommon, as the snakes, as well as the mongooses, may be seriously injured or

killed.Snake charming as a profession is dying out in India because of competition from modern forms of entertainment and environment laws proscribing the practice (Bagla P., 2007).

Trapping

The *Irulas* tribe of Andhra Pradesh and Tamil Nadu in India have been hunter-gatherers in the hot, dry plains forests, and have practiced the art of snake catching for generations. They have a vast knowledge of snakes in the field. They generally catchthe snakes with the help of a simple stick. Earlier, the *Irulas* caught thousands of snakes for the snake-skin industry. After the complete ban of the snake-skin industryin India and protection of all snakes under the Indian Wildlife (Protection) Act 1972, they formed the Irula Snake Catcher's Cooperative and switched to catching snakes for removal of venom, releasing them in the wild after four extractions. The venom socollected is used for producing life-saving anti venom, biomedical research and for other bedicinal products. The *Irulas* are also known to eat some of the snakes they catch and are very useful in rat extermination in the villages (Whitakar, R. Captain, A., 2004).

Despite the existence of snake charmers, there have also been professional snake catchers or wranglers. Modern-day snake trapping involves a herpetologist using a long stick with a V- shaped end. Some television show hosts, like Bill Haast, AustinStevens, Steve Irwin, and Jeff Corwin, prefer to catch them using bare hands.

Medical symbols

According to Wilcox, R. A. and Whitham, E. M. (2003), three medical symbols involving snakes that are still used today are Bowl of Hygieia, symbolizing pharmacy,and the Caduceus and Rod of Asclepius, which are symbols denoting medicine in general.

India is often called the land of snakes and is steeped in tradition regarding snakes. Snakes are worshipped as gods even today with many women pouring milk on snakepits (despite snakes' aversion for milk). The cobra is seen on the neck of Shiva and Vishnu is depicted often as sleeping on a seven-headed snake or withinthe coils of a serpent. There are also several temples in India solely for cobras sometimes called *Nagraj* (King of Snakes) and it is believed that snakes are symbols of fertility. There is a Hindu festival called Nag Panchami each year on which day snakes are venerated and prayed too (Deane,1883).

In India there is another mythology about snakes. Commonly known in Hindi as "Ichchhadhari" snakes. Such snakes can take the form of any living creature, but prefer human form. These mythical snakes possess a valuable gem called "Mani", which is

more brilliant than diamond. There are many stories in India about greedy people trying to possess this gem and ending up getting killed.

The ouroboros is a symbol associated with many different religions and customs, andis claimed to be related toalchemy. The ouroboros or oroboros is a snake eating its own tail in a clock-wise direction (from the head to the tail) in the shape of a circle, representing the cycle of life, death and rebirth, leading to immortality.

The snake is one of the 12 celestial animals of Chinese Zodiac, in the Chinese calendar. Many ancient Peruvian cultures worshipped nature (Benson, E., 1972).

Snakes are a part of Hindu worship. A festival, Nag Panchami, in which participants worship either images of or live Nāgas (cobras) is celebrated every year. Most images of Lord Shiva depict snake around his neck. Puranas have various stories associated with snakes. In the Puranas, Shesha is said to hold all the planets of the Universe on his hoods and to constantly sing the glories of Vishnu from all his mouths. He is sometimes referred to as "Ananta-Shesha", which means "Endless Shesha". Other notable snakes in Hinduism are Ananta, Vasuki, Taxak, Karkotaka and Pingala. The term Naga is used to refer to entities that take the form of large snakes in Hinduism and Buddhism.

Snakes have also been widely revered, such as in ancient Greece, where the serpent was seen as a healer. Asclepius carried a serpent wound around his hand, a symbol seen today on many ambulances.

Medicine

The cyto-toxic effect of snake venom is being researched as a potential treatment forcancers (Vyas *et al*., 2012).

Wild life conservation

To carry out the wild life conservation, frequent visits have been carried out in the project area; the snakes were collected and preserved as live specimens, proper identification of snake species were done by taking the help of available literature on snakes. The investigator is a skilled person to handle the various non venomous, semi venomous and venomous snakes. For safe handling of snakes snake hooks have been used and for rescuing of snake from water filled wells, the snake tongs have been used **(Fig. 38)**. To prevent the snake bite at ankle level of the foot, jungle shoes can be used during the survey and collection of snake species.

According to Asa Wright nature Centre, Trinidad, WI; Just the thought of snakes scares most people, with many admitting to have a genuine phobia towards this groupof

reptiles. Such fear has been widely fuelled by combinations of misconceptions, misinformation religious beliefs and outright shared ignorance. Here at the Centre snakes form part of the rich wildlife features (biodiversity) that inhabit the forest and are all protected. While we cannot prompt a new "love" for snakes, it is intended that this article series would clarify common misunderstandings and justify the Centre's overall wildlife conservation effort, starting with its most loathed group. Firstly, it should be clear that all snakes can and do bite (as do most animals), although the greater majority of snakes are non-venomous, meaning that their bite does not contain the naturally produced protein toxin (either hemotoxic or neurotoxic) used for hunting and defence; nor do such non venomous species possess the hollowfront teeth called fangs for injecting venom, but their bite can be painful and dangerous as it contains bacteria which can adversely affect the wound. While all snake bites are to be avoided, most snakes are generally nonaggressive, reclusive and would avoid contact with humans; hence it is the consensus of most experts that recorded attacks from snakes have often occurred when they felt threatened. In the case of venomous species, venom is a resource budgeted by snakes to immobilise their prey specifically as they are limbless creatures (other snakes use specialised skills and constricting to catch prey). It is agreed that this so-called "budgeting" is necessary as venom can temporarily be depleted after "envenomation" (venom beingexpelled into the wound), which would result in subsequent "dry-bite" until venom is replenished. It is very important to note that the potency, dosage of each bite, proteincomposition and type of venom is dependent on a combination of factors including the species of snake, its age, its temperament and how long ago the snake used venomin defence or for hunting.

For wild life conservation, the snakes in human habitation were caught time to time whenever received mobile calls of the pupil of Indapur tahsil. By this activity we have caught 135 non venomous snakes, 4 semi venomous snakes and 81 venomous snakes in the project area **(Fig. 1,1A, 1B and 1C)**. In 2006, I have caught Leith's Sand snake (*Psammophis leithii*) which is a semi venomous snake found once only. Ten wooden-glass boxes were used for the temporary storage of snakes and provision facilitated to feed them with their respective live food such as earthworms, frogs, toads, skinks, lizards, etc **(Fig.39)**. Whenever necessary the photographs have taken and the snake species in rescue bag were taken to the forest office of Indapur, by noting the specifications of the caught snake species in their register and in the presence of forest guide we release the snake species in their natural habitat without making any harm to them in the forest area.

Although there are very few species of animals that are not heading towards extinction, we do have organizations heading towards implementing projects to save these species from being extinct. Though very little can be done towards the naturally decreasing species, some organizations have made great efforts and have shown success in their mission.

One such organization is called Nature Club at Arts, Science and Commerce College, Indapur, Dist. Pune, Maharashtra, India. It is an organization run by myselfand sixteen students under Nature Club; I have dedicated my life to help people, andsnakes at the same time. Located in Indapur, Pune, India, run this organization without any funding from the government. The goal of Nature Club is to educate people on how to save you from fatal snake bites and how to "AVOID KILLING" a snake as that is the first reflux of people. Indapur has 4 deadly species of snakes namely Cobra, Russell's Viper, Common Krait and rarely Saw-scaled Viper. Each ofthese species are very venomous and can easily kill a human within a few hours. Indapur tahsil has recorded four deadly venomous species of snakes namely Indian Cobra, Common Krait, Russell's viper and Saw-scaled Viper, though a Slender Coral snake is venomous butwe have no any record of Coral snake bite from any hospitals of Indapur tahsil. Eachof these species is very venomous and can easily kill a human within a few hours.

Fortunately, the Principal of our College has agreed to provide Nature Club member's phone number to people when they call and complain about a snake in their house. When people call us, we rush to the house and safely captures the snake, lectures the residents on what to do when they see a snake next time, and how to avoid being bitten, and also what to do if you do get bitten by a snake. We then take the snake to his house, examines it, makes sure if the snake has been well fed, not sickor injured and then releases the snakes in the wild. If the snakes need some rehabilitation, we take care of them and release them when we do convince that the snakes are alright. We deal with venomous snakes without being paid for work. But we religiously work day and night and have rescued more than 1000 snakes till now by me and my trained students under the Nature Club. We often conduct corporate sessions on how to handle snakes and how to avoid getting bitten and educate as many people as he could. You see us in the newspapers often with his messages on how to co-exist with these misunderstood reptiles. People spent quite a lot of time with us and our snakes and we just drew the fear of snakes out of people's heart for good. People understand snakes now and they knew that if given a chance to bite or escape, the snake would prefer escaping because they, like other animals, like to preserve their resources like energy,

venom, etc for feeding themselves rather than attacking humans and other animals that they cannot eat.

If necessary, medical treatment such as operative surgery on injured cobra snake,to remove the ectoparasites from the body of rat snakes have been done with the helpof veterinary medical practitioner.

Rare species in the project area:

Non venomous snakes

- Barred Wolf snake (*Lycodon striatus*)
- Gunther's Racer (*Coluber gracilis*)
- Dumeril's Black-headed snake (*Sibynophis subpunctatus*)

Semi venomous snake

- Leith's Sand snake (*Psammophis leithii*)

Rescuing Russell's Viper with the help of rope from well having 70 ft. depth

Two Russell's Viper rescued with the help of rope from well without steps

Fig. 35: Rescue of Russell's Viper Snake

Fig. 36: Feeding the Indian Rat Snake, Indian Cobra, Russell's Viperand Common Krait

VENOMOUS SNAKE

- **Slender Coral snake (*Calliophis melanurus*)**

Barred Wolf snake, Dumeril's Black-headed snake and Slender Coral snake are slender and small snakes cannot be easily found because of their habitat nature while the Leith's Sand snake is somewhat longer than these upto 78 cm.

To protect and conserve these snake species necessary measures has to taken by the NGOs and State Government of Maharashtra or it could go extinct in nature. To some people, conservation of a venomous snake may seem a waste of money, stupid and even negligent. That view is somewhat unique to our culture. Other cultures do not hold such a dark view of snakes. For example, in India, a country where thousands die from snake bite each year, they hold an annual festival to honor the snake becauseit eats mice and rats that eat their crops. Such activities should be taken to conserve the rare species of snakes.

Indian cobra (*Naja naja*) also known as spectacled cobra, Asian cobra or Binocellate Cobra is a species of the genus Naja found in the Indian subcontinent anda member of the 'big four', the four species which inflict the most snakebite in India (Whitakar, Captain A., 2004). This snake is revered in Indian mythology and culture, and is often seen with snake charmers. It is now protected in India under the Indian Wildlife Protection Act (1972).

- Ectoparasites like tick have been removed with the help of forceps from the body of cobra, ran snake and other snakes **(Fig.40)**.
- Operative surgery on spectacled cobra of six sutures conducted with the help of skilled veterinary practitioner. By an accident, the alimentary canal of four feet long spectacled cobra protruded out by the rupture of its abdomen. The medical treatment was provided by washing the protruded alimentary canal by sterilized saline water, thereby embedding the alimentary canal into the abdomen and carried out the operative surgery by removing broken particles of fat body and ruptured skin has been sewed by six sutures. For seven days provided the medical treatment to prevent septic at the operative region and given antibiotics orally along with the food (frog) **(Fig.41)**.
- Due to fight between the two Indian Cobra snakes, they bitten each other; bleeding occurred from the head of one and tail of another snake. Immediately first aid treatment was given and they have been released into the forest area) **(Fig.42)**. Ratsnake injured its vertebral column treated by veterinary practitioner) **(Fig.43)**.
- Many injured snakes have given the proper medical treatment and saved their lives.
- Economy of the Indapur tahsil has been greately dependent on the fruit farming and to avoid bird pests from the farm, the farmers use the fish net to trap the bird pests. When spreaded on the ground, sometimes snakes get entangled in the net) **(Fig.44)**. We have saved the lives of many snakes entangled in the fishing nets which ultimately require the medical treatment to the injured snakes which obviously we provide with the help of veterinary medical practitioner.

To protect and conserve these snake species necessary measures has to taken by the NGOs and State Government of Maharashtra or it could go extinct in nature. To some people, conservation of a venomous snake may seem a waste of money, stupid and even negligent. That view is somewhat unique to our culture. Other cultures do not hold such a dark view of snakes. For example, in India, a country where thousands die from snake bite each year, they hold an annual festival to honor the snake because it eats mice and rats that eat their crops. Such activities should be taken to conserve the rare species of snakes. The people in society will get scientific knowledge about snake as a result the conservation, protection and awareness has to be created. By giving the scientific knowledge the superstitious, misbeliefs about snake will be removed.

CONCLUSION:

'Diversity of Crawlers' is all about the unexplored world of Snakes and their lifestyle; it is a collection of data about different species of snakes. I have tried my best to make people aware about snakes through this collection. I have seen that different people sharing their wrong or incomplete information about snakes to their relatives, friends etc. which inspires me a lot to make this kind of collection but I amsure that by reading seriously this project work you can achieve most of the knowledge in lesser time about snake world and of course you can fight bravely to thefear exist in you about snakes through this collection. Suggestion and healthycriticism for the improvement of this piece of work would be highly appreciated andthankfully acknowledged.

For wild life conservation, the snakes in human habitation were caught time to time during the project work whenever received mobile calls of the pupil of Indapur tahsil. By this activity I have studied 15 types of non venomous snakes, two types of semi venomous snakes and five types of venomous snakes and total number of snakes caught during the project work 135 non venomous snakes, 4 semi venomous snakes and 81 venomous snakes in the project area, exception that in 2006, I have caught Leith's Sand snake (*Psammophis leithii*) which is a semi venomous snake found once only. In project area different types of non venomous, semi venomous and venomous snakes have been identified and classified. Identification of live snakes in the project area have been made on the basis of colour patterns, habit, habitat and the behaviour. Ten wooden-glass boxes were used for the temporary storage of snakes and provision facilitated to feed them with their respective live food such as earthworms, frogs, toads, skinks, lizards, etc. Whenever necessary the photographs have taken and the snake species in rescue bag were taken to the forest office of Indapur, by noting the specifications of the caught snake species in their register and in the presence of forest guide we release the snake species in their natural habitat without making anyharm to them in the forest area.

Rare snake species found in the project area are:

Non venomous snakes

- Gunther's Racer (*Coluber gracilis*)
- Dumeril's Black-headed snake (*Sibynophis subpunctatus*)

Semi venomous snake

- Leith's Sand snake (*Psammophis leithii*)

Venomous snake

- Slender Coral snake (*Calliophis melanurus*)

Most prominent feature observed which was not suggested by any herpetologist is the erected hood of any Indian Cobra snake shows that the skin of the left side of the hood is stretched more lengthwise.

For environmental awareness, training programme of certificate course 'Snakes: Identification and handling' has been carried out for ten days for sixteen, students and college teachers, due to this practice the college students have been engaged in collection and identification of snake species. To carry out the environmental awareness programme, lectures and demonstrations were conducted with the help of audio-visual aids to teachers, students of high schools, college students and the pupilof Indapur tahsil, and villagers during Ganesh festival at the project area. The mostsnake bite cases of Indian Cobra, Krait and Russell's Viper snake have been observed.To aware the people from snakes. We offer a power point theory training presentation seminar involving snake identification, snake-bite protocol and management, which includes a practical demonstration with live animals.

For wild life conservation major steps have been taken. Ectoparasite removal from the body of different snakes, operative surgery on snakes due to injury, rescuing the snakes from bird nets and subsequently treating them by veterinary medical practitioner; such activities have been carried out.

To protect and conserve these snake species necessary measures has to taken by the NGOs and State Government of Maharashtra or it could go extinct in nature. To some people, conservation of a venomous snake may seem a waste of money, stupid and even negligent. That view is somewhat unique to our culture. Other cultures do not hold such a dark view of snakes. For example, in India, a country where thousands die from snake bite each year, they hold an annual festival to honor the snake because it eats mice and rats that eat their crops. Such activities should be taken to conserve the rare species of snakes. The people in society will get scientific knowledge about snakeas a result the conservation, protection and awareness has to be created. By giving the scientific knowledge the superstitious, misbeliefs about snake will be removed. This attempt is to inculcate 'Snake: Not enemy but a true eco-friend among the society'.

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