New reptile exhibit in Kanpur Zoological Park, Kanpur, India

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Kanpur Zoological Park is spread in an area of 76.56 hectares of a reserve forest on the right bank of river Ganges having 1307 wildomestic animals/birds and reptilians of 116 species in its collection. Kanpur Zoological Park also has a jungle safari of 36 hectares in its premises with a natural lake. The park which is enriched with several high rising trees is a part of erstwhile lush green Allen forest. It was opened for the public on 4 February 1974. The zoo is categorized as "Medium Zoo" by the Central Zoo Authority of India. However, now it fulfills all the standards led down by the Central Zoo Authority for a large zoo. The zoo has an impressive collection of indigenous and exotic mammals, birds, fishes and reptiles. Many enclosures have been renovated owing to advent of technology and new standards in due course of time. However, since 2013 major changes occurred in the zoo with the construction of walk-through-aviary, pheasantry, aviary, birds of prey, fox, wolf, wild boar enclosures and reptile section for mugger, gharial, turtles and distinctive reptile house.

Snakes are member of class Reptilia belonging to order Squamata. Infraorder Serpentes is represented by around 2750 species living in different parts of the world, of which around 275 species (10%) are found in India (Nasir *et.al* 2016).

On the earth the first reptile appeared in the Upper Carboniferous period. Most scientist agreed that snakes evolved from burrowing lizards, but the ''missing link'' still has to be found to substantiate such a theory. According to John Marais (1997) species of snakes are distributed throughout most of the world. They are found in a wide variety of habitats, from deserts to tropical rain forests and the depths of ocean. Snakes show some specific characters like hibernation, scales, ecdysing, defense (color for concealment, mimicry, warning colors) and cannibalism. However, awareness about the snakes is very little as far as general community is concerned and most of the time snakes are killed due to unawareness and mistaken identity. Keeping above factors in view the Kanpur Zoological Park authorities decided to display the snakes in the reptile house to acquaint and educate the masses about them and their importance for the maintaining the ecological balance.

While designing the building following points were considered (Hawkins and Willemsen, 2004):

Space: The animal should not be restricted in movement.

A den of Indian Rock Pythons at Kanpur Zoo. Photo: Jitesh Pandey

Enclosure of Indian Cobra. Photo: Swati Gupta

Spatial familiarity: Moving around objects like furniture, water bowls etc. causes more investigatory behaviour.

Temperature: Variation and gradients of temperature in an enclosure are important to provide choice. Multiple substrate heating sources on timers that are switched on and off on a regular basis provide more variation.

Light: Another key variable that can interact with temperature is light. For indoor enclosures captives are exposed to a light regime that may include some ambient light as well as artificial light.

Water: Water quality, water source and water may need frequent change because of need for aquatic feeding, aquatic urination, defecation etc.

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List of reptiles housed in the serpentarium

S.N.	Species	Enclosure assigned	Enclosure Size	Enrichment inside the enclosures
1.	Indian black cobra (*Naja naja*)	Enclo.1	Small	Sand, soil, water body, plant, leaf litter, wooden logs, rock clusters
2.	Russell's viper *(Daboia russelli*)	Enclo.2	Small	Sand, soil, dry leaves, grass, plants and rock clusters, water body
3.	Indian black cobra (*Naja naja*)	Enclo.3	Small	Sand, soil, plants, rockery, water body
4.	Bamboo pit viper (*Trimeresurus graneus)*	Enclo.4	Medium	Sand, soil, plants, rockery, water body
5.	Indian rock python (*Python molurus)*	Enclo.5	Large	Wood log, soil, rockery, hiding places, leaf litter, large water body, wood log, rockery, hiding places
6.	Indian rock python *(Python molurus)*	Enclo.6	Large	Wood log, soil, rockery, hiding places, leaf litter, large water body
7.	Common sand boa (*Gongylophys conicus)*	Enclo.7	Medium	Sand, soil, rockery, shrubs
8.	Red boa (*Eryx johnii)*	Enclo.8	Small	Sand, shrubs, soil
9.	Checkered keelback (*Xenochropis piscator)*	Enclo.9	Small	Sand, soil, large water body, branches, rock formation
10.	Rat Snake (*Ptyus mucosus)*	Enclo.10	Small	Sand, soil, wood log, water body

View of Indian rock python exhibit. Photo: Swati Gupta

Details of the Serpentarium building

The reptile house of Kanpur Zoological park is 'U' shaped having ventilators partially covered with the fibre sheets on the top and mosquito net all around for free inflow of sunlight and air. The enclosures have been designed and constructed according to the norms set by Central Zoo Authority of India.

The building is spread over an area of approximately 541.71 sq. mt., the dimensions of each of the six small enclosures are 20 sq. mt. and two medium sized enclosures are 25 sq.mt. The building can accommodate 10 large sized enclosures; Provision is also made for two large sized enclosures of 40 sq. m. to house Indian Rock Pythons (*Python molurus)* and other large species of snake. Every enclosure also has specially designed water body. The enclosures are encircled by keeper gallery and visitors' gallery. The visitors' gallery makes the inner circle and is 3.3 meters wide with a total length of 42.25 meters. The 1.5 meters wide keeper's gallery makes the outer circle of approx. 55 meters. The enclosures are especially designed for filling of water body and drainage without the access of keepers inside.

Enrichment

The newly constructed serpent building of the zoo is reptile friendly; every enclosure is maintained according to the species specific enrichment like vegetation, rockery, water trough and hiding places and has been provided as per their behaviour, thus making the enclosures conducive for the snakes. Every enclosure has been provided with the facilities to make the inside temperature suitable (28-32°C) for the snakes.

The climate of the Kanpur city is highly flexible and temperature ranges between 0 °C to 45° C. During the summer temperature ranges from 38–45° C and in winter 0-10°C. Therefore, it is difficult to maintain temperature and humidity for the housed snakes**.** The temperature of the reptile house is maintained by using small exhaust in every enclosure as well as one bigger exhaust at entrance and exit doors covering three enclosures in each side. In remaining four enclosures for the access of the fresh air is taken care by the fresh air fans fitted on the roof. The cooling effect is further supported by covering the roof of the serpentorium building with khas (*Vetiver zizinoides*) mats and continuous water sprinkling through sprinkler on the mats. During the summer (May to July) these sprinklers work throughout the

View of common sand boa enclourse. Photo: Swati Gupta

Visitors' gallery with signages. Photo: Swati Gupta

day and during springs (July-Sept.) run only twice a day. The technique is nature friendly and avoids costly energy consuming air conditioner, thus makes the building thermo controlled. Every enclosure of the serpent house also has the provision for direct sunlight to enter through an opening on ceiling to facilitate basking. The enclosures have sumptuous wooden and rockery substrate for their leisure and comfort besides helping the snakes for ecdysis.

Few substrates are placed near the heat source and few distantly as per their convenience. Basal heat system is also created by using low voltage bulb, covered by the earthen pot for the coiling of snakes all around them to maintain their body temperature accordingly. One or two branched woody logs are also placed in the enclosure for the resting of snakes and is so arranged for the visitors to have clear visibility of the snakes. These substrates and retiring place in the enclosure also encourage their locomotive behaviour.

In the two enclosures of Indian rock pythons caves are made by using rocks, sand and logs and in the two enclosures of sand and red boas sufficient soil, sand and gravels have been provided to encourage their natural habits. These shelters help the snakes feel protected while still being visible to caretaker and visitors. It also helps for hibernation, breeding, egg laying and hatching purposes. Every enclosure of serpent building has water body (shallow or deep pools) in tapering pattern that makes the enclosure's landscape more interesting and helps in raising the humidity level as and when required. Plantation and soil inside the enclosure further enunciates humidity. Moisture, texture and temperature gradients of the site play a role in the selection of the hatching site. It is also essential to provide the proper substrate and conditions for potentially gravid females. This also helps to avoid retaining of the eggs which may sometimes lead to egg bound condition and eventual fatality. The above described enrichments also facilitate the females to deposit and cluster their eggs at the suitable spot. To measure the temperature and humidity of every enclosure two digital thermometers have been fixed one at front and the other on the back wall.

Cleaning schedule of the enclosures

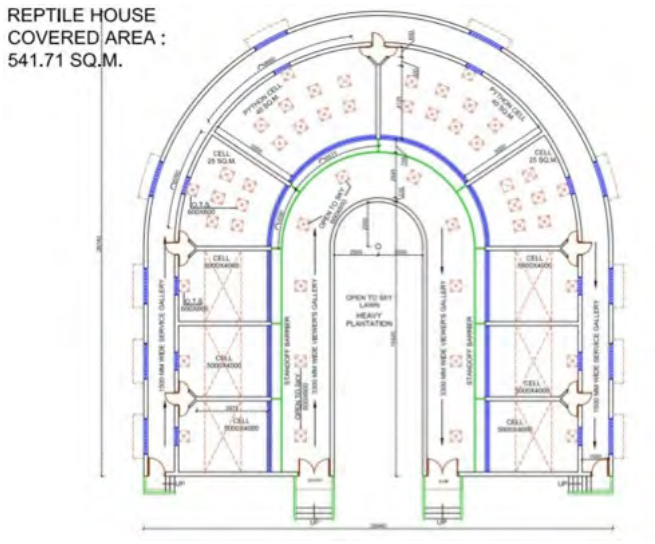
All enclosures have sand and soil mixed strata in which 75% soil and 25% sand is found. The upper crust of these strata is removed every fortnight. A unique phenomenon of shedding of skin is found in reptiles this shaded skin which may have attached parasites are also removed from the enclosure as and when found. The water is changed daily.

Facilities for the keepers

All enclosures are approached by a full-length door, having full view of the space within. All the enclosures have double door entrance for the keepers to reduce the chances of attack. The outer door is made of iron while inner door have glass and peeping windows. The height of the enclosures is such that a man can stand fully erect when within. The keeper's gallery is 1.5 metre wide and well ventilated. It also has sufficient space to keep the safety equipments etc. A pair of gumboots, stick, leather jacket and cap for the both keeper and sweeper is also provided by the zoo administration for their safety. Few airy wooden rescued boxes are also available in the keeper gallery for the rescued snakes. A first aid box with all requisites is also available in the keeper's gallery.

Facilities for the visitors

The outer area of the serpent house is surrounded by lawns and lush green plants. These lawns have been developed with architecturally made benches by zoo authority for the comfort of visitors. The signages are displayed for the visitors where detailed information about the snakes, does and don'ts and precautions are described emphatically. A well maintain 3.3 meter wide viewer's pathway is fitted with fans on the side wall to avoid suffocation. To maintain



Reptile House

Front view of Reptile House with separate entrance and exit. Photo: Swati Gupta

distance between visitors and housed animals every enclosure has a stand-off barrier. The enclosures are furnished by toughened glass to make the clear visibility, beautiful painting on side and rear walls exaggerate the beauty of enclosures and provide a feeling of natural habitat.

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Announcement

4th Indian Biodiversity Congress (IBC 2017)
Pondicherry University Convention Centre
10-12 March 2017

The 4th IBC is scheduled at Pondicherry University, Puducherry, in the eastern coastal town during March 10-12, 2017, with a National Seminar, Biodiversity Expo, Civil Society Meet, Children's Conclave on Biodiversity, National Photography Competition and Documentary Film Festival.

Sub-themes: Climate change and Biodiversity

1. Biodiversity characterisation and documentation
2. Marine Biodiversity
3. Biodiversity of Puducherry
4. Agro-biodiversity and poverty alleviateion
5. Ecosystem services and development
6. Livestock biodiversity
7. Biodiversity conservation and sustainable utilization through technology
8. Medicinal plant conservation and sustainable utilization
9. Biodiversity education & extension
10. Culture, indigenous technical knowledge and local traditional practices related to biodiversity
11. Policy legislature and biodiversity strategies
12. Urban landscaping

Call for papers

The Congress includes keynote addresses, plenary lectures and oral/poster presentations. The focal theme will have only invited presentations and panel discussion by experts. Papers can be submitted for all the other themes. Oral presentations of contributed papers are limited to 10 minutes including discussion.

Important deadlines

Submission of abstracts: 15 January 2017
The paper may be submitted online through www.indianbiodiversity.co.in or email: biodiversitycongress@gmail.com.

Registration of one of the authors is mandatory before 15 February 2017 for inclusion of the accepted abstract in book of abstracts. There will not be any spot registration for paper presentation.

Address for Communication

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