New reptile exhibit at the Kamala Nehru Zoological Garden, Kankaria, Ahmedabad, Gujarat
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The Kamala Nehru Zoological Garden (better known as Kankaria Zoo) situated on the outer periphery of the Kankaria Lake in Ahmedabad, was established in 1951, and is spread over an area of 117 Acres, supported by the Ahmedabad Municipal Corporation (AMC). This Zoo boasts about housing a number of animals and birds, including albino and rare species. As time and technology progressed, many enclosures have undergone renovation over the years, but the major full-scale renovation of any type of enclosure began with the reptile section.

Description
The reptile section was located in an oval-shaped area, having a wire mesh for the roof, covered with plants and creepers. The enclosures were very small, and uncomfortable for the comfort of both, the reptiles and the keepers. They were also low in height, and it was difficult for the visitors to see the reptiles housed within. It was approached by a road, gradually sloping down from a height of about 6.7m. supported by sloping retaining walls, covered with natural rockery and a number of large trees growing within. It was also surrounded by enclosures housing birds like Budgerigars (Melopsittacus undulatus).

Preliminary discussions led to an idea of building the new enclosures around the existing ones, and to make use of the level difference of 6.7m by relocating the bird enclosures on top of the reptile enclosures, to be done in two phases. The ideas is to have a building energy efficient, to have a uniqueness of its own, such that it also makes an impact on the sub-conscious minds of the visitors, especially children, and to create minimum disturbance to the existing reptile enclosures. The enclosures also had to comply with the latest norms and recommendations of the CZA (Cental Zoo Authority of India).

Approach towards design
Hence, the building was visualized as a vaulted structure, springing from the external wall of the existing enclosures forming the back of a giant dinosaur, terminating in a flat roof, housing the reptiles below, and the relocated bird enclosures above.

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The entry and exit were from under the head and the tail of the giant dinosaur. The scales of the dinosaur served as ventilation ports for the visitor passage. The dinosaur shape also tells us the tale of the history of evolution of reptiles.

Building design
The building was thus designed to accommodate 18 large sized enclosures, spread over an area of approximately 745 sq.m, the average dimensions of each enclosure being 2.8m. wide, 3.5 m deep and 2.75m high. Provision was also made for two large sized enclosures of size 10.6m. wide, 9m deep, 2.75m high and 6.9m wide, 6.5m deep, 2.75 m high respectively to house Indian Rock Pythons (*Python molurus*) and the Green Anaconda (*Eunectes*).
One enclosure was also to be specially designed for aquatic reptiles, having size 6.7 mt. wide, 3.65m deep and 2.75m high. All the enclosures were sandwiched in between two passages, abutting a wide, curved visitor passage in the front, and another keeper passage in the back. They were “sector-shaped” converging on the center of the curved external wall of the existing enclosures. The main design philosophy was to design a building such that it caters first and foremost to the comfort of the live exhibits/inhabitants (reptiles), then to the comfort of the keepers/ handlers and last but not the least, to the viewing comfort of the visitors.

### Reptile collection list

<table>
<thead>
<tr>
<th>Sr no.</th>
<th>Exhibit</th>
<th>Allotted Enclosure</th>
<th>Enclosure Size</th>
<th>Substrate</th>
<th>Vegetation &amp; Enrichment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Common Monitor Lizard <em>Veranus bengalensis</em></td>
<td>1</td>
<td>Medium</td>
<td>Soil, litter. moss</td>
<td>Creepers, strong weight bearing tree trunks</td>
</tr>
<tr>
<td>2</td>
<td>Water Monitor Lizard <em>Veranus salvator</em></td>
<td>2</td>
<td>Medium</td>
<td>Soil, litter. moss</td>
<td>Larger water body, hiding places and rockery</td>
</tr>
<tr>
<td>3</td>
<td>Common Trinket Snake <em>Coelognathus helena</em></td>
<td>3</td>
<td>Medium</td>
<td>Wood shaving, leaf litter</td>
<td>Small bushes, grass, rock clusters</td>
</tr>
<tr>
<td>4</td>
<td>Indian Rat Snake <em>Ptyus mucosus</em></td>
<td>4</td>
<td>Medium</td>
<td>Dry leaves, soil</td>
<td>Arboreal and grassy habitat, rock clusters</td>
</tr>
<tr>
<td>5</td>
<td>Spectacled Cobra <em>Naja naja</em></td>
<td>5 &amp; 6</td>
<td>Medium</td>
<td>Leaf litter, soil, wood shavings</td>
<td>Bamboo, termite mounds, rock clusters</td>
</tr>
<tr>
<td>6</td>
<td>Russell’s Viper <em>Daboia russelli</em></td>
<td>7</td>
<td>Medium</td>
<td>Dry leaves and grass, soil</td>
<td>Plants and rock clusters</td>
</tr>
<tr>
<td>7</td>
<td>Indian Star Tortoise <em>Geochelon elegans</em></td>
<td>8</td>
<td>Medium</td>
<td>Soil and sand</td>
<td>Shrubs</td>
</tr>
<tr>
<td>8</td>
<td>Indian Rock Python <em>Python molurus</em></td>
<td>9 &amp; 16</td>
<td>Large</td>
<td>Soil, leaf litter</td>
<td>Large water body, river stone clusters, shrubs, large tree trunks/trees</td>
</tr>
<tr>
<td>9</td>
<td>Marsh Crocodile Babies <em>Crocodylus palustris</em></td>
<td>10</td>
<td>Medium</td>
<td>Sand, straw</td>
<td>River bank grass</td>
</tr>
<tr>
<td>10</td>
<td>Common Indian Krait <em>Bungarus caeruleus</em></td>
<td>11</td>
<td>Small</td>
<td>Sand, wood chips, gravel</td>
<td>Shrubs, grass, loose stone piles</td>
</tr>
<tr>
<td>11</td>
<td>Saw Scaled Viper <em>Echis carinatus</em></td>
<td>12</td>
<td>Small</td>
<td>Soil, gravel, bark</td>
<td>Cactii, arid plant species</td>
</tr>
<tr>
<td>12</td>
<td>Common Sand Boa <em>Gongylphys conicus</em></td>
<td>13</td>
<td>Small</td>
<td>Sand, gravel</td>
<td>Rockery, shrubs</td>
</tr>
<tr>
<td>13</td>
<td>Red Sand Boa <em>Eryx johnii</em></td>
<td>14</td>
<td>Small</td>
<td>Sand, gravel</td>
<td>Rockery, shrubs</td>
</tr>
<tr>
<td>14</td>
<td>Green Keelback <em>Macrophistodon plumibicolor</em></td>
<td>15</td>
<td>Small</td>
<td>Sand, gravel</td>
<td>Rocks, shrubs</td>
</tr>
<tr>
<td>15</td>
<td>Checkered Keelback <em>Xenochropis piscator</em> &amp; Indian Flap Shell Turtle <em>Lessemys punctata punctata</em></td>
<td>17</td>
<td>Aquatic</td>
<td>Sand, gravel, pebbles of different sizes, large water body, branches</td>
<td>Shrubs, rock formations</td>
</tr>
</tbody>
</table>
Comfort of the reptiles housed within
This was achieved as follows -
• Providing sufficiently large sized enclosures which provide ample opportunity to create different details in enrichment, being as close to the natural habitat as possible.
• Providing species specific enrichment like land-water ratio, rockery, substrate and vegetation – all of natural materials only.
• Reptiles, being ectotherms, are dependent on the atmospheric temperature to regulate their body temperature. Ahmedabad has a hot, semi-arid climate, with marginally less rain than required for a tropical savanna climate. There are three main seasons: summer, monsoon and winter. Aside from the monsoon season, the climate is extremely dry. The weather is hot from March to June; the average summer maximum temperature is 41°C (106°F), and the average minimum is 27°C (81°F). From November to February, the average maximum temperature is 30°C (86°F), the average minimum is 15°C (59°F), and the climate is extremely dry. Cold northerly winds are responsible for a mild chill in January. The southwest monsoon brings a humid climate from mid-June to mid-September. The average annual rainfall is about 800 millimetres (31 in). The highest temperature recorded is 48.5°C (119.3°F). Hence, the biggest challenge was to design a building such that it could maintain a temperature range between 28°C (82.4°F) to 32°C (89.6°F), throughout the year. This temperature is most conducive for the reptiles. This was achieved by using air coolers, that were connected through a customized ducting system, with strategically placed ventilation. The cooling effect was further enhanced by the shade of the thick canopy of trees that were left to be a part of the building. This also negated the use of costly and energy consuming air-conditioners, thus making the building energy efficient.
• Every enclosure also has a provision for direct sunlight to enter through an opening in the ceiling, to facilitate basking.

Comfort of the Handler/Keeper
The first author (RS), apart from being the Architect of the enclosures, is also an experienced reptile handler. Thus, he is well aware of the difficulty faced by the reptile keepers in different zoos all over the country. Hence, special attention has been given to the keeper section.
• All enclosures are approached by a full-length door, having full view of the space within.
• The height of the enclosures is such that a man can stand fully erect when within.
• The services are designed such that the keeper does not have to enter the enclosures for daily work like draining and refilling the water bodies, working the lights or air coolers.
• The keeper passage is quite wide, well lit and ventilated. It also has ample space for the
keepers to keep their safety equipment, service wheel barrows and personal belongings.

- It is also kept cool and ventilated by the air cooler ducting system and by the shade of the trees growing through it.
- All enclosures have proper information and signage such that even replacement keepers who are not experienced in handling venomous reptiles can safely negotiate their way around.

Visitor / Viewer comfort

- Entry and exit through the head and tail of the dinosaur, create interest and awe.
- Large, 3.7m wide passage, with air-vents at regular intervals in the ceiling.
- The enclosures are designed such that they have been fixed with large, full height, tilted viewing glass. The passage is deliberately designed to be darker than the interiors of the enclosures, thus offering clear, unhindered viewing experience.
- Precise, to-the point, back lit information signage.
- The floor height of the enclosures is determined according to the average height of 5 year old kids.
- The highlight of the enclosures is the aquatic reptile enclosure, that offers a view of the reptiles within and outside the water.
- Well designed safety rail, ensuring proper viewing distance and safety.

Achievements

On 18th July 2015, 18 hatchlings of the Indian Rock Python (Python molurus) hatched in the new enclosures after an incubation period of 60 days. This is by far the highest number and the only incident of hatchlings of the Indian Rock Pythons in captivity in the 64 year old history of Kankaria Zoo!