CHAPTER 1

INTRODUCTION

Reptiles have played a crucial role in the cultural evolution of man. Loved or loathed by humans, reptiles have had a special relationship with people of the whole world and especially India through the ages. Dating back to the *'Sarisrupas'* of the Vedic literature to the current literature and findings all over the world, reptiles have fascinated man with their body forms, magnificent sizes and lifestyles.

Reptiles have been well depicted and described in many of the mythological works of the ancient civilizations of the world and hence they form an integral part of the cultural heritage. Turtles for instance, are worshipped worldwide and particularly in Southeast Asia; the traditional Chinese men believed that turtle is an eternal creature, the carapace being the *Heaven* and plastron the *Earth*, thus turtles link heaven and earth. Similarly a plethora of ancient literature is available in India depicting different forms of reptiles and their significance in the human society. But even after been so closely linked with the human civilization, our knowledge regarding their lifestyles is far from complete. Although evolutionarily reptiles are one of the early tetrapods and many fossil forms are also known today, still, the complete understanding on phylogeny and biology of the group is lacking.

The evolutionary history of reptiles dates back to the Upper Carboniferous or Pennsylvanian period about 260 million years ago when they are believed to have evolved from some lineage of Urodele amphibians (Owen, 1862; Carroll, 1964; 1969; 1970; Laurin and Reisz, 1995). The oldest known fossil of an amniote i.e. a primitive reptile rather than an advanced amphibian is *Caseneria* (Paton *et al.,* 1999; Monastersky, 1999). Reptiles were the most dominant forms of vertebrate life on earth from 140 to 120 million years ago, when they ruled the Mesozoic Era of the earth history. The Mesozoic Era is hence marked as the 'Age of Reptiles' (Colbert and Morales, 2001). Their maximum and most diversified development occurred during that period. The fossil records show that reptiles were once much more diverse in size and structure than they are today (dinosaurs being the best known examples),

and so there is a tendency to regard today's forms as a mere shadow of their former glory. Since the Linnaean period till date, the evolution and phylogeny of reptiles has ever been a topic of curiosity amongst biologists and even after a plethora of contributions from the workers round the globe (Owen, 1859; 1860; Baur, 1887; Osborn, 1903; Williston; 1917; Romer; 1966; Gaffney, 1980; Gauthier *et al.*, 1988a; 1988b; Benton, 1990a; 1990b; 1991; 1997; Lee, 2001) many of the questions still remain unanswered. As with evolution and phylogeny, the taxonomy of reptiles also underwent a huge revision after Linnaeus (1758). Though most of the reptilian orders were established by the end of the Triassic period and some became extinct by that time (Smith, 1933), presently out of the 19 orders into which the prehistoric reptiles were classified, only 4 orders survive today (Gunther, 1864; Boulenger, 1890; Smith, 1933).

Modern reptiles appeared during the Tertiary period on the geological time scale around 70 million years ago (Carroll, 1994; 2001), although a fractional number and a variety occurred during the Mesozoic Era. The species richness of the extant reptiles accounts for 7,427 species (Cogger *et al.,* 2003) and yet many more awaiting their recognition to science. The number is almost double the mammals known today and not surprisingly, half the number of living reptiles are lizards (Bauer, 2003).

Reptiles are the first true land vertebrates. Their conquest of land is attributed to the evolutionary development of four embryonic membranes that eliminate the need of water for reproduction by providing their embryo with its own aquatic environment and in addition to that a calcareous or parchment like egg shell which prevents desiccation and gives extra protection (Gauthier, 1994; Reisz, 1997). The embryonic membrane amnion forms a fluid-filled sac around the embryo, which cushions it from external disturbance and prevents dehydration. This kind of egg, unlike that of an amphibian, is essentially a closed system, in which all of the embryo's basic needs are met, hence known as a cleidoic egg (Zug *et al.,* 2001).

The word reptile has come from the Greek word 'Reptilia' (Latin 'Repere' meaning 'to creep') which means 'creatures that creep and crawl with the support of their belly'. Linnaeus (1758) in his work "*Systema Naturae*" had classified reptiles along with amphibians in a common class 'Class – III: Amphibia'. Laurenti (1768) formally used the

term 'Reptilia' for the first time for an expanded selection of amphibians and reptiles, basically similar to that of Linnaeus. Therefore, he erected the Class: Reptilia that included the tetrapods that were neither birds nor mammals. This classification remained unaltered almost for a century till Haeckel in 1866 demonstrated that reptiles, birds and mammals shared a common reproductive strategy, the amniotic egg and therefore frogs, salamanders and caecilians were placed unanimously in a separate taxon, Linnaeus' 'Amphibia'. Later Haeckel (1866) also distinguished reptiles, birds and mammals from other tetrapods (amphibians) by placing them in a new taxon that he called 'Amniota' but the name for a taxon was ignored (although the concept was accepted) in many of the subsequent published classifications.

Reptiles were primarily distinguished from birds and mammals by Zittel (1902) in lieu of them being poikilotherms and lacking integumentary features such as feathers and hairs. Owing to their low metabolic rate, they produce less heat than a mammal or a bird of a comparable size and lack of sweat glands renders them helpless with a poor insulation and cooling mechanism (Zug *et al.* 2001). However, basking in the sun and absorbing the heat through the body surface thereby elevating the body temperature sufficient enough to carry out the day to day activities, and moving away from the sun when heat is not needed, is a feature common to nearly all the reptiles. Thus, thermoregulation in reptiles is a behavioural function and not a physiological phenomenon (Zug *et al.* 2001). As majority of the reptiles inhabit the tropical belt, thus thermoregulation is not much of a problem, but for those living in the temperate climates hibernation during winter is essential to keep the life going and similarly, extreme dry seasons of tropics are tided over by aestivation. Thus reptiles operate only within a narrow band of environmental temperature and even within this band, species specific temperatures lie between 20-38° C (68-102° F).

The Linnaean approach of the reptilian classification was based upon the number and position of temporal fenestrae (temporal vacuities). This classification was initiated by Osborn (1903) but was elaborated and popularized by Romer and Parsons (1977). According to this classification, Class Reptilia is divided into four subclasses as follows:

- **Anapsida – Absence of Fenestrae:** Cotylosaurs (Extinct); Chelonians (Extant)
- **Synapsida – One lower Fenestra:** Therapsids or Mammal like reptiles (Extinct)

- **Euryapsida or Parapsida – One upper Fenestra:** Plesiosaurs and Ichthyosaurs (Extinct)
- **Diapsida – Two Fenestra:** Dinosaurs and Pterosaurs (Extinct); Lizards, Snakes and Crocodilians (Extant)

The subsequent classifications that followed in the later twentieth century did not have much use of the subclass taxon and directly dealt with the extant orders, since two of the subclasses namely Synapsida and Parapsida were extinct and only Anapsids and Diapsids survived through the ages. The extant Anapsid reptiles are represented by the chelonians (turtles, terrapins and tortoises), which are primitive reptiles (Romer and Parsons 1977) and form only 4% of the present day living reptiles. The Diapsids represented by lizards, snakes and crocodilians make up the remaining 96% of the extant reptilian fauna.

The zoogeography of reptiles indicates not only their origin and ecological needs but also their spatio-temporal history over the geological time scale. The theory of continental drift is substantiated by the distribution of primitive forms of animal life, for instance, Caecilians of the Family Caecilidae occur in South America, Africa, India and countries in Southeast Asia up to the Philippines (Hofrichter, 2000) and many of the older genera of Indian reptiles have species in the African fauna (Darlington, 1957). However, a complete inventory of the reptilian diversity and richness over the six zoogeographical regions of the world has yet not reached its summit as few new species have been recently recognized (Sharma, 1981; Mukherjee *et al.*, 2005; Bauer *et al.*, 2007), a few are in the process of recognition and many more are still waiting for their recognition to the world.

Being one the most successful group of vertebrates, reptiles have ventured almost all possible habitats in the world except for the Polar Regions and interiors of deserts (Cogger *et al.*, 2003). They exhibit a great diversity in their shape and size, ranging from the massive crocodilians whose body lengths perhaps exceeds 7 m to small geckos measuring less than 100 mm in total length (Cogger *et al.*, 2003). There are three types of body form seen among reptiles. The basic type is the lizard like shape, in which the body is either dorso-ventrally flattened to aid the cursorial or fussorial mode of life or enable the life on wall or tree trunks, thereby facilitating concealment and movement or the body is laterally compressed as an adaptation for the arboreal life. Crocodiles, monitor lizards and geckos are an example to the

former type whereas agamas and chameleons are an example to the latter. In the second type, the body is elongated and cylindrical and limbs may be rudimentary or absent. This form is well depicted in many of the skinks and all the snakes. The third body type is as exhibited by the chelonians, wherein the body is enclosed in a virtually impregnable shell into which they can withdraw their heads and limbs, when danger threatens (Zug *et al.* 2001).

Majority of reptiles are carnivorous and form a major class of vertebrate predators, with very few species known to be herbivorous. They form an important link in every food chain of any given ecosystem. Alligators and Crocodiles are the apex carnivores of the freshwater ecosystem, while freshwater turtles play a key role as the scavengers of the ecosystem. Tortoises being terrestrial are herbivorous and amidst sea turtles certain species are specialist feeders while others are generalist feeders. Lizards and Snakes act as one of the best biological pest control agents as the former being mostly insectivorous in its diet, feeds on many of the insects that are pest to agriculture. The latter is a strict carnivore and also a predator, has 70-80% of its menu comprising of rodents, which are again a huge pest to the granaries, especially in the tropical parts of the world.

REPTILIAN FAUNA – A GLOBAL SCENARIO

All the extant reptiles of the world are grouped into four orders, namely Rhyncocephalia (Tuataras), Crocodilia (Alligators, Crocodiles and Gharial), Chelonians (Turtles, Terrapins and Tortoises) and Squamata (Lizards, Worm Lizards and Snakes). These four orders are further divided into 64 families comprising of 7,427 species being reported till date (Cogger *et al.*, 2003). Table 1.1 shows the family and species account of the reptiles of the world.

Table 1.1 – Status of Reptiles in the World (Cogger *et al.*, 2003)

Order	Families	Species
Crocodilia	3	23
Chelonia	12	250
Squamata		
Sauria	26	4,300
Serpentes	18	2,700
Amphisbaena	4	152
Rhynchocephalia	1	2
Total	**64**	**7,427**

REPTILIAN FAUNA – INDIAN SCENARIO

India is one of the 13 Biodiversity rich countries of the world (Mittermeier and Werner, 1990). With her varied physiography and climate, India harbours immense biodiversity. The 10 biogeographic zones of India covering a land area of 3,060,500 sq km offer reptile habitats ranging from the high Himalayas to the tropical forests, from the shifting sand dunes to mangrove swamps and from seashores to urban centres (Das, 2008). India has almost 200 years of history in studies of 'Herpetology' – the science of the study of amphibians and reptiles. Documentation of India's rich biodiversity began in the mid nineteenth century. A major contribution was done by the Britishers through their voluminous publications under the title of "*Fauna of British India*". Dating from the arrival of the erstwhile British East India Company till date, active research has been conducted on the reptilian fauna of India and the Indian reptile fauna is amongst the richest of the world, with a large number of endemic species and genera, as well as spectacular form that delight the eye (Das, 2008). Of the approximate 530 species of reptiles presently believed to occur in India (within political boundaries), 197 species are endemic, which indicates 44% endemism (BCPP-CAMP, 1997). Of these, 98 species (49.74%) are endemic to the Western Ghats (BCPP-CAMP, 1997), for example genus *Ristella* of skinks and *Salea* of agamids is entirely endemic to southern Western Ghats (BCPP-CAMP, 1997; Das, 1997a; Daniel, 2002). The Family Uropeltidae of the primitive burrowing snakes is exclusive to the Western Ghats and Sri Lanka (BCPP-CAMP, 1997; Das, 1997a; Daniel, 2002). Thirteen reptilian genera occur only in eastern India and have not penetrated further down into the peninsula (BCPP-CAMP, 1997; Das, 1997a; Daniel, 2002). Likewise the island fauna of the Andaman and Nicobar show their Malayan affinity or affinity with other oceanic islands such as the Seychelles (Daniel, 2002). Since the early nineteenth century till date, many herpetologists have contributed to the knowledge of understanding of reptiles of India (Blyth, 1853; Gunther, 1864; Blandford, 1870; Jerdon, 1870; Boulenger, 1890; Annadale, 1915; Brander, 1923; Underwood, 1948; Biswas and Sanyal, 1977; Daniel, 1983; Das, 1992). Das in 1997a prepared the first comprehensive checklist of reptiles of India and reported about 484 species of reptiles with further 24 subspecies under some of the species to occur within the Indian sub-continent. This checklist was critically evaluated by experts and some additions and deletions to this checklist were recommended based upon the experts' views and the final tentative number of reptile taxa in India was worked out to be 530 species, with the lowest

estimate being 500 species (BCPP-CAMP, 1997). Table 1.2 shows the reptile families and species in India.

Table 1.2 – Status of Reptiles in India (Das, 1997a)

Order	Families	Genus	Species
Crocodilia	2	2	3
Chelonia	5	25	32
Squamata			
Sauria	10	57	187
Serpentes	10	76	262
Total	**27**	**160**	**484**

REPTILIAN FAUNA – GUJARAT SCENARIO

Gujarat covers four out of the ten Biogeographic zones of India. Ranging from the deserts of Kutch to the dry deciduous forests of north and central Gujarat and Saurashtra and from the grasslands of Kutch and Saurashtra to the moist deciduous forests of south Gujarat; from the freshwater wetlands to the gulfs and open sea, Gujarat harbours a rich biodiversity. With such a varied physiography, Gujarat is rich in its reptile fauna but still it is a poorly studied group from the western part of the country. In spite of many workers having actively contributed to the knowledge of herpetofauna of Gujarat, the information available is still patchy and incomplete (Stolickza, 1872; Gleadow, 1905; Smith, 1935; McCann, 1938; Kapadia, 1951; Daniel and Shull, 1963; Bhaskar, 1978; Sharma, 1981 and 1982; Daniel, 1983; Vyas, 1988; Vyas and Patel 1990; Naik and Vinod, 1993; Vyas, 1998). Vyas in 1998 prepared a first checklist of reptiles of Gujarat comprising of 91 species and also gave a schematic distribution of the species based upon past records and field surveys. New records for the state were subsequently reported by other workers which added onto this checklist and a final review on the reptiles in Gujarat state was given by Vyas in 2000a (Table 1.3). Presently 107 species of reptiles are reported from Gujarat according to Vyas (2000a), however, few of the reported species need a further confirmation as their sight records are much older and were not reevaluated critically thereafter. No comprehensive checklist of reptiles has been given by any of the herpetologists in the past decade with a critical re-evaluation of the species and their updated distribution for the state of Gujarat. Moreover the past records of the nineteenth century (Stolickza, 1872) and those from the early twentieth century (Gleadow, 1905; McCann, 1938) need a further confirmation. Table 1.4 shows a comprehensive checklist of reptiles and their IUCN status.

Table 1.3 – Status of Reptiles in Gujarat (Vyas, 2000a)

Order	Families	Genus	Species
Crocodilia	1	1	1
Chelonia	5	10	12
Squamata			
Sauria	7	19	36
Serpentes	8	37	58
Total	**21**	**67**	**107**

Table 1.4 – Comprehensive Checklist of Reptiles of Gujarat and their IUCN Status (Vyas, 2000a and BCPP – CAMP, 1997)

Sr. No.	Scientific Name	Common English Name	IUCN Status
Order: Crocodylia – Family: Crododylidae (Crocodiles)			
1.	*Crocodylus palustris*	Marsh Crocodile/Mugger	VU
Order: Chelonia – Family: Dermochelydae			
2.	*Dermochelys coriacea*	Leatherback Sea Turtle	EN
Family: Chelonidae (Marine Turtles)			
3.	*Caretta caretta**	Loggerhead Sea Turtle	EN
4.	*Chelonia mydas*	Green Turtle	EN
5.	*Eretmochelys imbricata**	Hawksbill Sea Turtle	EN
6.	*Lepidochelys olivacea*	Olive ridley Sea Turtle	EN
Family: Bataguridae (Asian Pond Turtles)			
7.	*Kachuga tectum*	Indian Roofed Turtle	LR-nt
8.	*Kachuga tentoria*	Indian Tent Turtle	VU
9.	*Melanochelys trijuga*	Indian Black Turtle	LR-nt
Family: Trionychidae (Softshell Turtles)			
10.	*Aspideretes gangeticus*	Indian Softshell Turtle	VU
11.	*Aspideretes leithii**	Leith's Softshell Turtle	VU
12.	*Lissemys punctata*	Indian Flapshell Turtle	LR-nt
Family: Testudinidae (Land Tortoises)			
13.	*Geochelone elegans*	Indian Star Tortoise	VU
Order: Squamata – Sub-order: Sauria (Lizards)			
	Family: Agamidae (Agamas/Dragons)		
14.	*Brachysaura minor*	Lesser Agama	LR-lc
15.	*Calotes rouxii*	Roux's Forest Lizard	LR-nt
16.	*Calotes versicolor*	Indian Garden Lizard	LR-nt
17.	*Psammophilus blanfordanus*	Blanford's Rock Agama	LR-nt
18.	*Sitana ponticeriana*	Fan-throated Lizard	LR-lc
19.	*Trapelus agilis**	Brilliant Ground Agama	DD
	Family: Chameleonidea (Chameleons)		
20.	*Chameleo zeylanicus*	South Asian Chameleon	VU
	Family: Eublepharidae (Leopard Geckos)		
21.	*Eublepharis fuscus*	Western Indian Leopard Gecko	LR-lc
	Family: Gekkonidae (Geckos)		
22.	*Cyrtopodion kachhensis*	Warty Rock Gecko	DD
23.	*Geckoella collegalensis*	Kollegal Ground Gecko	DD
24.	*Hemidactylus brookii*	Brook's House Gecko	LR-lc
25.	*Hemidactylus flaviviridis*	Yellow-green House Gecko	LR-lc

Sr. No.	Scientific Name	Common English Name	IUCN Status
26.	*Hemidactylus gracilis*	Slender Gecko	VU
27.	*Hemidactylus leschenaultii*	Bark Gecko	LR-lc
28.	*Hemidactylus maculatus*	Spotter Rock Gecko	LR-lc
29.	*Hemidactylus porbandarensis*	Porbandar Gecko	VU
30.	*Hemidactylus triedrus*	Termite Hill Gecko	LR-lc
	Family: Lacertidae (Lacertids)		
31.	*Acanthodactylus cantoris*	Indian Fringe-toed Lizard	LR-nt
32.	*Ophisops beddomei*	Beddome's Lacerta	LR-nt
33.	*Ophisops jerdoni*	Snake-eyed Lacerta	DD
34.	*Ophisops microlepis*	Small-scaled Lacerta	LR-lc
	Family: Scincidae (Skinks)		
35.	*Ablepharus grayanus*	Dwarf Earless Skink	DD
36.	*Eumeces schneiderii*	Orange-tailed Mole Skink	DD
37.	*Eumeces taeniolatus*	Yellow-bellied Mole Skink	DD
38.	*Lygosoma albopunctata*	White-spotted Supple Skink	LR-lc
39.	*Lygosoma guentheri*	Gunther's Supple Skink	LR-nt
40.	*Lygosoma lineata*	Lined Supple Skink	LR-nt
41.	*Lygosoma punctatus*	Spotted Supple Skink	LR-lc
42.	*Mabuya carinata*	Keeled Grass Skink	LR-nt
43.	*Mabuya dissimilis*	Striped Grass Skink	DD
44.	*Mabuya macularia*	Bronze Grass Skink	LR-lc
45.	*Ophiomorus tridactylus*	Indian Sand Swimmer	DD
	Family: Uromastycidae (Spiny Tailed Lizards)		
46.	*Uromastyx hardwickii*	Hardwick's Spiny Tailed Lizard	VU
	Family: Varanidae (Monitor Lizards)		
47.	*Varanus bengalensis*	Bengal Monitor Lizard	VU
48.	*Varanus flavescens**	Yellow Monitor Lizard	VU
49.	*Varanus griseus*	Desert Monitor Lizard	VU
Sub-Order: Serpentes (Snakes)			
	Family: Acrochoridae (Wart Snakes)		
50.	*Acrochordus granulatus*	Western Wart Snake	LR-nt
	Family: Boidae (Boas and Pythons)		
51.	*Eryx conicus*	Common Sand Boa	LR-nt
52.	*Eryx johnii*	Red Sand Boa	LR-lc
53.	*Python molurus*	Indian Rock Python	LR-nt
	Family: Colubridae (Typical Snakes)		
54.	*Ahaetulla nasuta*	Common Vine Snake	LR-nt
55.	*Ahaetulla pulverulenta*	Brown Vine Snake	LR-nt
56.	*Amphiesma stolata*	Buff-striped Keelback	LR-nt
57.	*Argyrogena fasciolatus*	Banded Racer	LR-nt
58.	*Atretium schistosum**	Olive Keelback Water Snake	LR-nt
59.	*Boiga forsteni*	Forstein's Cat Snake	LR-nt
60.	*Boiga trigonata*	Common Indian Cat Snake	LR-lc
61.	*Cerberus rynchops*	Dog-faced Water Snake	LR-nt
62.	*Chrysopelea ornata*	Ornate Flying Snake	LR-nt
63.	*Coluber vnetromaculatus**	Glossy-bellied Racer	LR-lc
64.	*Dendrelaphis pictus**	Painted Bronzeback Tree Snake	VU
65.	*Dendrelaphis tristis*	Common Bronzeback Tree Snake	LR-lc
66.	*Elaphe helena*	Indian Trinket Snake	LR-nt
67.	*Gerarda prevostianus*	Glossy Marsh Snake	LR-nt

Sr. No.	Scientific Name	Common English Name	IUCN Status
68.	*Lycodon aulicus*	Common Wolf Snake	LR-lc
69.	*Lycodon flavomaculatus*	Yellow-spotted Wolf Snake	VU
70.	*Lycodon striatus*	Barred Wolf Snake	LR-nt
71.	*Macropisthodon plumbicolor*	Green Keelback	LR-nt
72.	*Oligodon arnensis*	Banded Kukri Snake	LR-lc
73.	*Oligodon taeniolatus*	Streaked Kukri Snake	LR-nt
74.	*Oligodon venustum**	Black-spotted Kukri Snake	LR-nt
75.	*Psammophis condanarus**	Western Sand Snake	LR-nt
76.	*Psammophis leithii*	Pakistani Ribbon Snake	LR-nt
77.	*Psammophis longifrons*	Stout Sand Snake	LR-nt
78.	*Psammophis schokari**	Afro-Asian Sand Snake	LR-nt
79.	*Ptyas mucosus*	Indian Rat Snake	LR-nt
80.	*Sibynophis subpuctatus*	Collared Black-headed Snake	LR-nt
81.	*Spalerosophis diadema*	Royal Snake	LR-nt
82.	*Xenochrophis piscator*	Checkered Keelback Water Snake	LR-lc
	Family: Elapidae (Cobras, Coral Snakes and Kraits)		
83.	*Bungarus caeruleus*	Common Indian Krait	LR-nt
84.	*Bungarus sindanus*	Sind Krait	DD
85a.	*Calliophis melanurus melanurus*	Common Slender Coral Snake	LR-nt
85b.	*Calliophis melanurus nigrescens*	Black Slender Coral Snake	LR-nt
86.	*Naja naja*	Spectacled Cobra	LR-nt
87.	*Naja oxiana**	Black Cobra	CR
88.	*Ophiophagus Hannah**	King Cobra	LR-nt
	Family: Hydrophidae (Sea Snakes)		
89.	*Enhydrina schistosus*	Hook-nosed Sea Snake	DD
90.	*Hydrophis caerulescens*	Many-toothed Sea Snake	DD
91.	*Hydrophis cantoris*	Cantor's Narrow-headed Sea Snake	DD
92.	*Hydrophis cyanocinctus*	Annulated Sea Snake	DD
93.	*Hydrophis gracilis*	Common Small-headed Sea Snake	DD
94.	*Hydrophis lapemoides**	Persian Gulf Sea Snake	DD
95.	*Hydrophis mamillaris*	Bombay Sea Snake	DD
96.	*Hydrophis spiralis*	Yellow Sea Snake	DD
97.	*Lapemis curtus*	Short Sea Snake	DD
98.	*Pelamis platurus*	Pelagic Sea Snake	DD
	Family: Typhlopidae (Blind Snakes)		
99.	*Ramphotyphlops braminus*	Brahminy Worm Snake	LR-nt
100.	*Rhinotyphlops acutus*	Beaked Worm Snake	LR-nt
101.	*Typhlops porrectus*	Slender Blind Snake	LR-nt
	Family: Uropeltidae (Shieldtailed Snakes)		
102.	*Uropeltis ellioti*	Elliot's Shieldtail	LR-nt
103.	*Uropeltis macrolepis macrolepis*	Bombay Shieldtail	LR-nt
104.	*Uropeltis ocellatus**	Nilgiri Shieldtail	LR-lc
	Family: Viperidae (Vipers and Pit Vipers)		
105.	*Daboia russelii*	Russell's Viper	LR-nt
106.	*Echis carinatus*	Indian Saw-scaled Viper	LR-nt
107.	*Trimeresurus gramineus*	Bamboo Pit Viper	LR-nt

*Confirmation on the presence of the species in Gujarat is required.

As far as the western region of the country is concerned and especially Gujarat much of the major work has been done on the taxonomy of a particular group, new records have been added from time to time or range extension of a particular species have been reported (Annandale, 1912; Bhaskar, 1981a; Sharma, 1981; Vyas 1987a and 1987b, Vyas 1988, Vyas and Jala, 1988, Bhatt; 1989; Verma, 1989; Vyas, 1990; Vyas and Patel, 1992a; Naik and Vinod, 1994; Vyas, 1998; Vyas, 2000a). Lesser emphasis has been laid on the behaviour, ecology and conservation of reptiles in Gujarat. Studies on the understanding of behavioural ecology and conservation of species are limited mainly to the orders Chelonia and Crocodilia (Joseph *et. al,* 1975; Oza, 1975; Fraizer, 1978; Whitaker, 1978a; Chavan, 1979, Bhaskar, 1981a and 1981b; Fraizer, 1989a and 1989b; Bhupathy *et. al,* 1992), as many of the species of order Chelonia are exploited for food or pet trade and hence are protected under schedule I of WPA -1972. Similarly for order Crocodilia, all the three species of Indian crocodilians are schedule I species, as they are exploited for both meat and leather (WPA, 1972).

Squamates (Lizards and Snakes) amongst reptiles are still a poorly studied group. Though snakes have fascinated humans since time immemorial and many herpetologists round the world are working on snakes but considering the Indian scenario, in spite of 'Cobra' being worshipped across the country, still serpents are the animals to which maximum myths and blind beliefs are associated. It is not that these myths prevail only in rural parts of the country, but even the educated society residing in the cities believes in these myths. In fact, tribal communities have a better understanding of these creatures and live in harmony with them. Lizards have been an ignorant group right from the beginning. Lizards dwell in the close vicinity of human and also have few myths associated with them. They are present in houses, gardens, fields and in wilderness, though not having any great acceptance in the human society, however their presence is not much of a botheration to man. Except for few species, lizards are of no commercial value to man, hence their exploitation is much less as compared to their allies. Therefore, rarely any studies are conducted on their ecology and conservation across the country as well as in the state and whatever studies have been conducted so far (Sharma, 1982; Knapp, 2004; Dutta and Jhala, 2007) provide very scanty information on the status of lizards within the state of Gujarat. Hence, the present study was conducted with an objective of highlighting the significance of reptiles in our surroundings, their microhabitat utilization and the ecological services rendered by these cryptic creatures. The study principally focuses on the secretive life of the lesser known reptiles 'Lizards'.

PHYLOGENY OF REPTILES

KINGDOM: Animalia (Metazoa)

↓

SUB-KINGDOM: Eumetazoa

↓

GRADE: Bilateria (Triploblastic and Bilateral Symmetry)

↓

SERIES: Deuterostomia (Blastopore forms the future anus)

↓

PHYLUM: Chordata (Presence of Notochord)

↓

SUB-PHYLUM: Vertebrata (Presence of Vertebral Column)

↓

SUPER CLASS: Tetrapoda (Presence of four limbs)

↓

GROUP: Amniota (Producing Amniotic Egg)

↓

CLASS: Reptilia (Creeping and Crawling creatures with support of their belly)

SUB-CLASS

ANAPSIDA	**SYNAPSIDA**	**PARAPSIDA**	**DIAPSIDA**
No Temporal Fenestrae (Extant)	One Lower Fenestra (Extinct)	One Upper Fenestra (Extinct)	Two Temporal Fenestrae (Extant)

ORDER

CHELONIA	RHYNCOCEPHALIA	SQUAMATA	CROCODILIA
12 Families with 250 species of Turtles, Terrapins & Tortoises	1 Family with 2 species of Tuataras The Oldest known		3 Families with 23 species of Alligators, Crocodiles & Gharial

SUB-ORDER

AMPHISBAENA	SAURIA	SERPENTES
4 Families with 152 species of Worm Lizards	26 Families with 4300 species of Lizards	18 Families with 2700 species of Snakes

OBJECTIVES

Literature review revealed that the previously conducted studies on the reptilian fauna of Gujarat and in particular lizards are very few and that the available information is much patchy and scanty. Lizards play a key role in the environment as one of the best biological pest control agents, since majority of them are insectivorous and keep a check on the insect pest population. Knowledge regarding the occurrence of a given species in a particular habitat is fundamental for understanding the diversity and distribution pattern of lizards. Thus **the first objective of the study was to conduct a qualitative bio-inventory covering the major biogeographic zones of Gujarat, so as to determine the species richness and distribution of lizards (chapter 4).**

Most of the reptile studies from the western part of the country, especially Gujarat are focused on the taxonomic part as mentioned earlier. Studies on behaviour, ecology and conservation of reptiles are also limited to the orders Chelonia and Crocodilia, the members of both these orders being largely aquatic. Emphasis has hardly been laid on Squamates and the studies involving their behaviour, ecology and conservation are also limited (Sharma, 1982; Knapp, 2004; Dutta and Jhala, 2007) providing a very scanty information. Therefore, **the second objective of the current study was to analyze the community structure of lizards vis-à-vis their microhabitat requirements (chapter 5).**

As mentioned earlier lizards are common around human settlements. Ranging from morphology up to molecular level studies have so far been conducted on some of the commonest species like the Northern House Gecko – *Hemidactylus flaviviridis* (Anon, 1916; Anon, 1941; Sanyal and Prasad, 1967; Pilo and Suresh, 1994; Pilo and Kumar, 1995; Shanbhag, 2003; Yadav *et al.* 2008). Common Garden Lizard – *Calotes versicolor* has also been a species of prime interest to many of the herpetologists (Asana, 1931; Sharma, 1990; Sharma, 1991). Species or genera such as *Salea* or *Bufoniceps* have a focused attention onto them because of their endemic status (Das, 2008). Monitor lizards due to their robust look and large size, have gained interest of many biologists, if not in wild then in captivity (Ali, 1944; Auffenberg, 1981; Affenberg and Ipe, 1983; Das, 1989). Also, elusive species such as the Flying Lizards of the genus *Draco* and the Indian Chameleon – *Chameleo zeylanicus* (sole representative of the family Chameleonidae in India), though extremely difficult and rare to sight in the wild, have also attracted many naturalists and biologists (John, 1962;

Anon, 1967; Whitaker, 1978b; Singh *et. al*, 1984; Sugathan, 1984; Singh, 1986; Balachandran and Pittie, 2000). **Hence, the third and the final objective was to study in detail the ecobiology of one the most common and widespread, yet least attended, agamid lizard the Fan-throated Lizard – *Sitana ponticeriana* (chapter 6).**