CHAPTER 4

DIVERSITY, DISTRIBUTION AND CONSERVATION STATUS OF LIZARDS IN GUJARAT, WESTERN INDIA

"Lizards are the Windows to the Evolution of Diversity"

Eric R. Pianka and Laurie J. Vitt (2003)

INTRODUCTION

Lizards with no doubt are the most numerous amongst all the extant reptiles. They have also fascinated many herpetologists, who then dedicated their research in revealing the facts of lizards' life. Eric Pianka, a dedicated herpetologist and popularly known as the "Lizard Man", mentioned in one of his works (Pianka, 1967) that "Lizards are simply spectacularly beautiful terrestrial fish". Few others (Badger and Netherton, 2006) may differ with Pianka for comparing lizards with fishes, but they surely agree that lizards are certainly beautiful.

Lizards today occupy almost all landmasses except Antarctica and some Arctic regions of North America, Europe and Asia. The group's existence dates back to about 140 million years ago when fewer than 800 species of dinosaurs existed, as compared to 4,300 extant lizard species and numerous fossil forms available today. Lizards have survived the extinctions that occurred at the end of the Cretaceous period, 65 million years ago (Bauer, 2003). Other reptiles that survived the mass extinctions – chelonians, crocodilians and tuataras have not evolved into so many different forms as diversified as the lizards. Snakes are indeed, the only other large group of living reptiles that evolved from lizards, and therefore it may be said that more than 95 percent of living reptiles are the descendents of the early lizards (Bauer, 2003). Thus, when Greene (1997) in his book depicted snakes as evolutionary mysteries in nature, Pianka and Vitt (2003) proposed and projected lizards as the windows to the evolution of diversity. Arguably being the most diverse of all the vertebrates, their body sizes show a vast variation ranging from a small gecko, *Sphaerodactylus parthenopion* – Monito Gecko with the total length of 34 mm (1½ in, wt: 0.12 g; the smallest of all the lizards and also the smallest reptile), to the monsters of Komodo Islands, *Varanus komodensis* – Komodo Dragon with the total body length reaching maximally up to 310 cm (10¼ ft) and weighing up to 165 kg (Bauer, 2003). Although being so diverse in their form and size, giant lizards exceeding 1 m (3¼ ft) in total

length are only handful. Few species have total lengths that exceed 30 cm (1 ft), while the rest majority species barely cross the body length of 30 cm (1 ft). One possible reason that could be attributed to the key success of lizards over the globe is their small size (Pough *et al.,* 1998; Zug *et al.,* 2001). As small sizes offer less competition over the resources, may it be food or shelter, therefore, a given geographical region can support a greater diversity of smaller animals than it can of large animals.

Also related to their small size, most lizards have limited ability to spread geographically (Pianka and Vitt, 2003). Mountain ranges and expanses of water, such as rivers, lakes and seas, are significant barriers for lizards and have promoted speciation, resulting in many forms that occur only in a small geographical area (Bauer, 2003). Thus, with respect to species diversity, there are 4,300 extant species of lizards grouped into 420 genera within 26 families and many more, still awaiting their recognition to science (Bauer, 2003).

Lizards and their evolutionary offshoots – the snakes and amphisbaenians – are the members of Order: Squamata, or "Scale Reptiles" and are representatives of diapsid reptiles. The lineage leading to lizards – the "Lepidosauromorpha" or "Reptiles with overlapping scales", diverged from the other lineage of diapsids during the Permian period, 285 to 245 million years ago (Schmidt and Inger, 1957; Pough *et al.,* 1998; Zug *et al.,* 2001; Bauer, 2003; Pianka and Vitt, 2003). Lizards, as a whole are also closely related to the Sphenodontia or Tuataras, represented by two species found only in New Zealand and truly the 'Living Fossils' amongst the vertebrates and both these groups share few features in common (Bauer, 2003). However, lizards differ from tuataras by possessing a skull that is highly mobile as against the primitive diapsid skull of tuataras and also they possess hemipenis which is lacking in tuataras. Presence of limbs (though few limbless forms also occur), movable eyelids and external ear openings separate lizards from snakes and amphisbaenians as well.

Traditionally grouped under Sub-order: Lacertilia (now Sauria) of Order: Squamata, Gunther (1864) described saurians through the following characters *"Anterior ribs generally joined to a sternum. Tail more or less long. Jaws toothed; the mandibles united in front by an osseous suture. Limbs generally four, sometimes rudimentary or not visible externally. Eyelids generally present. Integuments with scale like folds or osseous scutes or granular."* Thereafter, thoroughly examining all the morphological and anatomical features, Smith in

1935 put forth a comprehensive technical definition of lizards as follows: *"The Sauria, or Lizards may be defined as reptiles with movable quadrate bones, with the right and left halves of the mandible united by suture, a transverse anal opening with paired copulatory organs, a cloacal bladder, a pectoral and pelvic arch, or at least vestiges of them, and with the anterior end of the brain-case never completely closed. The majority have the body covered with horny epidermal scales, possess well-developed limbs, and have eyes with movable eyelids."* Though some lizards have acquired elongated limbless bodies giving them a snake like appearance, they still can be distinguished from snakes by a set of following characters. In addition to the presence of movable eyelids and the tympanum, as in lizards, snakes possess mandibular rami connected by a ligament; show no trace of pectoral arch; eye covered with an immovable transparent disc; tongue comparatively long, bifid and sheathed at its base and the anterior end of the brain-case is completely closed (Smith, 1935). Thus, with these shared characters between the groups and the set of differing characters, Squamates became the most diverse of all the extant reptiles.

Diversity in the living world has always been a matter of curiosity amongst biologists. Biologists have discovered, described and given names to about 1.5 million of the many millions of species of plants, animals and microorganisms that exist at present (Cogger *et al.* 2003). Similarly, herpetologists worldwide have tried to evaluate the diversity of various taxa of amphibians and reptiles and have enriched our knowledge through time by additions of new records. As mentioned earlier that lizards are the most diverse of all the higher vertebrates, their diversity accounted for about 2,500 species in the early half of the twentieth century (Smith, 1935) and just on the turn of the century their diversity is almost doubled with 4,300 extant species been reported so far (Bauer, 2003). A review of the literature revealed significant contributions from many herpetologists across the globe, enhancing our knowledge of reptilian diversity since the nineteenth century till date (Garman, 1884; Murray, 1884; Stejneger, 1904; Boulenger, 1906; Stejneger, 1907; Annadale, 1912; Goodrich, 1916; Smith, 1922a and 1922b; Schmidt, 1927; Loveridge, 1947; Minton, 1962; 1966; Khan, 1972; Frazer, 1983; Khan and Ahmed, 1987; Auffenberg and Rehman, 1991; Khan, 1991; Bauer and Gunther, 1992; Tikader and Sharma, 1992; Bauer and Russell, 1995; Vyas, 1998; 2000a; Kluge, 2001; Das, 2003; Giri and Bauer, 2006; Bauer *et al.,* 2006; Bauer *et al.,* 2008). Although sufficient published work is available, especially for the Saurian diversity from the Southeast Asia i.e. regions of the Indian Sub-continent (Hardwicke and Gray, 1827; Gray, 1834; Boulenger, 1885; Boulenger, 1890; Borner, 1976; 1981; Nader and Jawdat, 1976; Grismer, 1988; 1991; Greer, 1991; Manamendra-Arachchi *et*

al., 2007; Zug *et al.*, 2001), however the Indian scenario in terms of taxonomy towards the end of the twentieth century and the beginning of the twenty first century is still poor (Das, 1991; Mukherjee *et al,*. 2005; Giri, 2008, Giri and Bauer, 2008). Moreover, the information on taxonomic and ecological studies on reptiles from the western part of the country, especially from Gujarat is much scanty (Sharma, 1981; Vyas and Patel, 1992b; Vyas, 1998b; Vyas, 2000c; 2003; 2004; 2005; 2006; Giri *et al.*, 2009). Gujarat is very diverse in its biogeography (Chapter 2) and offers a broad spectrum of habitats for its spectacular fauna; even then its herpetofauna remains poorly explored. Vyas (1993) made a taxonomic compilation of snakes of the state; however no such work is available for lizards that are a more common reptile, found amidst human populations. The lack of such a study again indicates the ignorance that this group of reptiles has always received. Therefore, the current chapter presents the species richness and a taxonomic inventory of lizards for the state of Gujarat.

STUDY AREA

As mentioned in chapter 3 a reconnaissance survey was conducted in the major part of the state except for the south Gujarat region, since covering this vast expanse, without diluting the very aim, was not possible in a stipulated academic tenure. The objective was to cover all the major terrestrial biomes (Protected Areas, Reserve Forests or Unspecified Areas) and thoroughly explore each of the biome of its saurian diversity. A list of the surveyed regions and the sampling sites therein is listed in Table 4.1, for the biogeography details of the site refer chapter 2.

Table 4.1 – List of the Regions and the Sampling sites therein

Sr. No.	Name of the Region	Sampling Sites
1.	Kutch	Bara, Kunothiya Dawn, Lakhpat, Naliya, Narayan Sarovar, Tera
2.	North Gujarat	Jessore Sloth Bear Sanctuary, Balaram-Ambaji Wildlife Sanctuary
3.	Central Gujarat	Jambughoda Wildlife Sanctuary, Kevdi Forest – Chhota Udepur, Pavagadh Hill Forest, Ratanmahal Wildlife Sanctuary, Shoolpaneshwar Wildlife Sanctuary, Vadodara Rural, Vadodara Urban
4.	Saurashtra	Dhrangadhra Wild Ass Sancturay, Dwarka and Bet Dwarka, Girnar Hill Forest, Gir PA (only periphery), Khijadiya Birds Sanctuary, Velavadar NP, Victoria Park – Bhavanagar

MATERIALS AND METHODS

FIELD STUDIES

Visual Encounter Survey (VES) as proposed by Crump, (1971) was primarily used to prepare a checklist of lizards for the state. Active combing operations were also done in all the seasons to document the lizards, as many of the species are highly cryptic and reveal their presence only when disturbed. Moreover, the combing operations also helped analyze the micro-habitat requirements of different species. Lizards in different sites were sampled and a complete checklist for the state was prepared. The surveys were conducted during day and night times, so as to cover diurnal as well as nocturnal species. Thorough searches were made in all the seasons and all the possible habitats (small bushes, leaf litter, tree barks, hutments and houses, old and ruined houses, monuments etc.) that lizards could occupy were explored for their presence. Small rocks, boulders and fallen logs were upturned and examined for the presence of the species. Hand-capturing method (Blomberg and Shine, 1996) was used for those species that could not be identified in the field. They were brought to the laboratory and carefully studied for their taxonomic characters. Identification of the species was done using standard monographs (Gunther, 1864; Boulenger, 1890; Smith, 1935; Daniel, 2002 and Das, 2008). Nomenclature presented herein is after Das, (1997a).

RESULTS

SPECIES RICHNESS

The extensive field surveys across the state covering majority of the regions and the sampling sites therein (Table 4.1), for the period of one year (2006) including all the seasons, revealed the presence of 30 species of lizards. These 30 species were grouped under 15 genera and 8 families. As all the study sites were thoroughly explored for their saurian diversity and each of the species were critically examined for its distribution status, thereby an updated distribution of the recorded species of lizards across the state is as presented in the Table 4.2. Family Gekkonidae was the most dominant and accounted for 37 % of the total species richness, followed by families Agamidae and Scincidae that accounted for 17 % of the total richness while family Chamaeleonidae, Eublepharidae and Uromastycidae were represented only by one species for each family (Fig. 4.1). Families Agamidae, Gekkonidae and Scincidae were found to be cosmopolitan in distribution whereas families Eublepharidae and Uromastycidae were restricted to Kutch and Saurashtra regions only (Table 4.2). Family Chamaeleonidae represented by a single species, *Chamaeleo zeylanicus* was found to be

cosmopolitan in distribution and reported occupying all the arid and semi-arid regions across the country including Gujarat (Daniel, 2002; Das, 2008). Members of family Lacertidae in the current study were recorded only from Kutch (Table 4.2), but the available literature also reveals their occurrence in parts of Saurashtra (Sharma, 1982) and central Gujarat (Vyas, 2003). Family Varanidae was represented by two species *Varanus bengalensis* and *Varanus griseus*, the former exhibited its distribution throughout the state while the latter had its range restricted to the desert of Kutch and arid parts of north Gujarat (Table 4.2).

TAXONOMY, PHYLOGENY AND BIOGEOGRAPHY

Modern lizards are represented in three major lineages, the Iguania, Gekkota and Autarchoglossa (Bauer, 2003). These three lineages are further subdivided into a total of 19 families of extant lizards across the globe. Of these 19 families of lizards, 10 families are known to occur in India and 8 families are reported from Gujarat. The remaining two families that do not occur in Gujarat or in the western India are family Anguidae, restricted to northeast India and family Dibamidae, comprising of Worm Lizards, so far reported only from one island of Nicobar. In the current study members of all the 8 families were recorded from various sites across the state of Gujarat. Although each lineage has a variety of morphological features common to its component families, the diversity in body form and biological characteristics within any one of the lineages is staggering. Therefore, looking into the evolution and biogeography of each of the three major lineages, one can authoritatively say that lizards are the most diverse vertebrates and are widely distributed on this planet.

Iguania

The iguanians include the agamids, chamaeleons, pleurodont iguanians and spiny-tailed lizards that are fully limbed and visually well oriented. They use their large tongues to capture prey and gather food. Prey is usually ambushed rather than pursued, exceptions are spiny-tailed lizards, which being herbivorous forage over short distances. Crests, fans and dewlaps are common morphological features in this group. Iguanid lizards are chiefly New World relatives of agamids and chamaeleons and are absent from major part of Old World except for the five species occurring on the oceanic islands of Fiji and Tonga in the Pacific and seven species inhabiting Madagascar, where agamids are absent (Bauer, 2003). In the current study family Agamidae was represented by five species while family

Chamaeleonidae as mentioned earlier has got only one member in the Asian part i.e. *Chamaeleo zeylanicus*. Family Uromastycidae that includes the spiny-tailed lizards has recently been separated from Agamidae based upon the molecular analysis of their mitochondrial genes (Bohme, 1982) and was recorded with a single species occurring in Gujarat. The details of these families and their respective species are dealt ahead in this chapter.

Gekkota

The gekkotan lineage is represented by only three extant families, the Eublepharidae, Gekkonidae and Pygopodidae. Gekkotans are mostly nocturnal, and the replacement of movable eyelids by a fixed transparent spectacle, characterizes most species of this group. Pygopodids or commonly called as flap-footed lizards are strikingly dissimilar in overall appearance to their other two allies in that they possess extremely long bodies and reduced limbs and thus remarkably resemble snakes. In the due course of evolution their forelimbs have been lost entirely, whereas hind limbs are invariably, just small, flattened flaps lying close to the cloaca. Pygopodidae members are by and large endemic to the Australian region and one species is restricted to New Guinea (Bauer, 2003). The other two families of the gekkotan lineage namely the Eublepharidae and Gekkonidae are widespread in their distribution, occurring in all the continents except for Antarctica. In the present study, family Eublepharidae was represented by only one species while Gekkonidae was the most dominant group and was represented by 11 species. The details of both these families and their respective species are dealt with further in this chapter.

Autarchoglossa

The Autarchoglossans are a complex group compared to the other two lineages. Few generalities can be applied to the group as a whole, but many species have osteoderms (bony plates) in the skin, and most rely heavily on chemical cues in their environment (Bauer, 2003). These lizards are mostly terrestrial, burrowing or living among rocks and due to the complexities of this lineage, Autarchoglossa is further divided into two subgroups namely the **Anguimorpha** and the **Scincomorpha.** The Anguimorphs are represented by five distinct types (i.e. five families) that include the anguids, beaded lizards, the earless monitor, true monitors and knob-scaled lizards. The anguids belong to family Anguidae which is largely distributed in the northern hemisphere (Bauer, 2003). Beaded lizards represent family

Helodermatidae, these are the only venomous lizards in the world and the family is restricted to the arid parts of New World (Bauer, 2003). The Bornean Earless Monitor is the sole representative of the family Lanthanotidae which occurs in the northern part of the island of Borneo. Family Varanidae includes the true monitor lizards and these are the giants of the lizard world. Varanids are strictly an Old World group, occurring throughout Asia, Africa and Australia (Bauer, 2003). The knob-scaled lizards are the members of family Xenosauridae, the family includes two genera, widely separated geographically and perhaps not particularly closely related to one another (Bauer, 2003). Genus *Xenosaurus* of Xenosauridae occurs in the varied habitats of wilderness in New World while the second genus *Shinisaurus* is known only from few isolated localities of Guanxi province, southern China (Bauer, 2003). In the present study the Anguimorpha subgroup of the lineage Autarchoglossa was represented only by the family Varanidae with two species, details of which are dealt further in this chapter. The second subgroup Scincomorpha is even more diverse than the Anguimorpha and therefore the relationships among this lineage have not been fully studied. The Scincomorphs account for nearly half the species of all lizards and the families included are Cordylidae, Dibamidae, Lacertidae, Scincidae, Teiidae, Gymnopthalmidae, and Xantusiidae. The family Cordylidae is restricted only to Africa whereas family Dibamidae, the least well-known among lizards is distributed through Southeast Asia, the Philippines, and the islands of the Indo-Australian archipelago (Bauer, 2003). The family Lacertidae, sometimes referred to as the "true lizards" is again strictly an Old World group, while family Teiidae, though remarkably similar in appearance to the lacertids, is geographically complementary to lacertids by having the distribution only in the New World (Bauer, 2003). Microteiid lizards and night lizards of the families Gymnopthalmidae and Xantusiidae respectively are again the New World lizards found in the varied habitats across both the Americas (Bauer, 2003). The family Scincidae containing more than 1,300 species of skinks is the largest of all lizard families and is cosmopolitan in distribution. In the current study families Lacertidae and Scincidae were recorded from the study area, the details of which are dealt further in this chapter.

Family – Agamidae

Commonly called as Agamas, Agamids or Dragons, the family occurs strictly in Old World and the distribution is continuous unlike the Iguanids that have markedly discontinuous distribution (Smith, 1935). In the present study Agamids were found to be the second largest

group in terms of species richness. A total of five species grouped in four genera were recorded from the entire study area. All the species were critically evaluated for their distribution, activity, and habit and habitat preference. Agamids are mostly arboreal but some species are also ground or rock dwelling. In the current study *Calotes versicolor* and *Calotes rouxii* were found to be arboreal, *Brachysaura minor* and *Sitana ponticeriana* were the ground dwelling forms and *Psammophilus blandfordanus* was found among rocks. As a general rule agamids are diurnal but again exceptions are there and in the present study except for *Brahcysaura minor*, rest all agamids were found to be diurnal. *Brachysaura minor* is reported to crepuscular or nocturnal and during the field surveys this lizard was frequently encountered active in the late evenings and nights and also during the day. *Brachysaura minor* is perhaps the only crepuscular or nocturnal agamid in India.

Family – Chamaeleonidae

A single species *Chamaeleo zeylanicus* occurs in the drier regions of southern Asia and is the sole representative of an otherwise essentially Afro-Madagascan family. The species was found to be arboreal in habit and entirely diurnal in activity. It is perfectly adapted for its arboreal lifestyle with the opposable and fused digits, a highly prehensile tail and the eyes that are capable of moving independently of each other. Their excellent camouflaging ability makes them extremely difficult to site and along with their long eversible tongue, they are the most successful ambush predators.

Family – Eublepharidae

The members of this family are fat-tailed geckos or leopard geckos represented by three species in India, namely *Eublepharis fuscus, Eublepharis macularis* and *Eublepharis hardwickii. E. fuscus* and *E. macularis* occur in the arid parts of western India while *E. hardwickii* in known from the drier parts of eastern India. In the present study only *Eublepharis fuscus* was recorded from the rocky areas in the desert of Kutch. The species was found in the scrub and rocky biotope and was nocturnal in its activity. Unlike agamids and chamaeleons, this family has its distribution in New World too.

Family – Gekkonidae

The family is most commonly found in human dwellings and includes a great diversity of geckos. Gekkonidae is cosmopolitan in distribution occurring widely across the globe, habitats ranging from the cities to undisturbed forests, scrubs and desert dunes. In the present

study geckos were the most dominant group with maximum of 11 species grouped under three genera being reported from the state. Geckos are primarily nocturnal in habit and with no exceptions, all the reported species in the current study were also found active during nights. Though a majority of the species were found to be arboreal i.e. living in houses, hutments, ruined houses and monuments, few species occurred among rocky habitats *viz. Cyrtopodion kachhensis, Hemidactylus gujaratensis* and *Hemidactylus maculatus,* ground dwellers were represented by *Geckoella collegallensis, Hemidactylus brookii* and *Hemidactylus triedrus,* while one species was chiefly found on the tree barks, *Hemidactylus leschenaultii.*

Family – Lacertidae

As mentioned earlier that this family is strictly an Old World group and includes primarily lizards of colder, open areas of Europe and central Asia, relatively few species making it to India and the greatest diversity is found in the deserts of western India. In the present study four species of lacertids grouped in two genera were recoded entirely from the desert of Kutch. Lacertids are entirely ground dwellers in habit and diurnal in activity.

Family – Scincidae

Scincidae is the largest of all the lizard families and like Gekkonidae, is cosmopolitan is distribution. The members of this family, commonly called as skinks are highly secretive in their habits. They are entirely terrestrial or fussorial and hide amidst the leaf litter. The group is diurnal in activity. In the present study, five species of skinks were recorded belonging to two genera.

Family – Uromastycidae

This family has been separated from agamids (Bohme, 1982) and includes the spiny-tailed lizards. Being an offshoot from the family Agamidae, Uromastycidae is also restricted to Old World. Only one species is known to occur in India and was recorded in the present study too. Unlike other lizards that are predominantly insectivorous, spiny-tailed lizards are largely herbivorous in diet and are known to live in colonies. They are terrestrial in habit and make a burrow for the shelter. Activity is entirely diurnal. In the present study the species was reported only from the arid parts of Kutch and Saurashtra.

Family – Varanidae

Varanidae as mentioned earlier is again strictly an Old World group and in India is represented by four species, of which two species were recorded from Gujarat namely *Varanus bengalensis* and *Varanus griseus*. Monitor Lizards, as commonly they are called, are largely terrestrial in habit however *Varanus bengalensis* was found to scan the tree heights up to few meters. By and large Varanids are diurnal in activity, however a few times they were also encountered in the late evenings but never in the nights.

Gujarat being so diverse in the biogeography has poorly been explored for its Herpetofauna. Moreover, lizards though being the most diverse and commonest of the reptiles have always been neglected. A testimony to this is the identification key to snakes, a less common reptile than lizard, generated by Vyas (1996). Though, he has contributed many additions to the knowledge of lizards, an identification key to the lizards of Gujarat is left unattempted. Hence, efforts were made to develop an identification key to the lizard families and species occurring in the state of Gujarat.

STATUS AND CONSERVATION MEASURES

A region's biodiversity is considered to be unique and richest, if the number of endemics in that region is more. As far as the degree endemism is concerned, though having a varied biogeography, Gujarat is relatively poor in terms of endemic species. In the current study only one species *Hemidactylus porbandarensis* described by Sharma (1981) was found to be a local endemic species. Three other species could be considered as regional endemics and were found to be endemic to the arid region. These include *Cyrtopodion kachhensis, Uromastyx hardwickii* and *Varanus griseus*. These have their distribution outside Gujarat, extending to the desert of western Rajasthan and further to the arid parts of Pakistan. The newly described species of gecko from Gujarat, *Hemidactylus gujaratensis* (Giri *et al.*, 2009) is currently reported only from the Girnar forest of Saurashtra, but the species cannot be considered as endemic to Gujarat since a personal communication with one of the author revealed that they have just described this gecko as a new species, however its status and distribution has yet not been evaluated and the species might occur in similar other habitats within the state or even outside the state of Gujarat. Figure 4.3 depicts the proportion of endemic and non-endemic species occurring within Gujarat.

Conservation oriented measures, especially for lizards in India are lacking. The possible reason could be that, except for the members of *Varanus sp.* and to a certain extent *Uromastyx hardwickii*, other Indian lizards are not commercially exploited. The exploitation activities of even these species are not much pronounced and have escaped the highlight from the media, unlike the full fledged reptile harvesting industry that is well functional in many of the Asian countries and especially the Southeast Asian Countries. Published literature and popular articles on reptile trade in India are largely restricted to the crocodilian species (Braziatis, 1989; Singh, 1993). However, there are hardly any records available for lizards. During the field surveys while gathering the secondary data we were informed that few nomad communities like 'Vagharis' are known to consume the meat of varanids but whether they are involved in trading the hide to the leather industry could not be known. The same Vaghari community and few other nomadic tribes are also known to catch *Uromastyx hardwickii* from their burrows and consume its meat and in addition, they also extracted oil from the fat laden spiny tails of these animals, as the oil is believed to have some aphrodisiac property. Other than varanids and spiny-tailed lizards, rests of the species occurring in Gujarat are of no commercial value. On the contrary, lizards have been very important models in studying Zoology, like *Calotes versicolor* has been an ideal model for dissection across the country to study the morphology and anatomy of reptiles, whereas *Hemidactylus flaviviridis* and *Mabuya carinata* have served as experimental models to reveal the mechanisms of epimorphic regeneration. Table 4.4 depicts the upgraded checklist of lizards with their IUCN status.

DISCUSSION

Literature review revealed a presence of 39 species of lizards belonging to 8 families and 19 genera. Since the south Gujarat region remained untouched in the present as mentioned earlier, the species restricted to this region are not included in recorded species' list. According to Vyas (2000b), the list of lizards for the state accounted for 36 species grouped under 19 genera and 8 families. Although new records were subsequently added for the state thereafter (Vyas, 2003; Vyas *et. al.,* 2006; Giri, *et. al.,* 2009), the checklist was never upgraded for the past decade. Therefore, in the current study an upgraded checklist of lizards of Gujarat, based upon the field surveys and reviewed literature is presented herein Table 4.3. Apart from the direct sightings, the species that have been included in the list from reviewed literature, a few marked with '*' need a confirmation of their record within the

state limits. The records of these '*' marked species are very old, almost century ago and since then till date none of the herpetologists in the state have given any authentic records for the occurrence of these species in Gujarat. Hence according to the upgraded checklist (Table 4.3) families Gekkonidae and Scincidae are equally dominant with same number of species in both the families and the proportion of diversity accounting for 31 %. The next dominant family was observed to be Agamidae with the proportional diversity of 15 % whereas families Chamaeleonidae, Eublepharidae and Uromastycidae were recorded to have only one species in each of the family. Figure 4.2 shows the percentile diversity of lizards within the Gujarat state.

As far as the ancient records are concerned, particularly to be mentioned are the records of certain skinks namely *Ablepharus grayanus, Eumeces schneiderii, Eumeces taeniolatus* and *Ophiomorus tridactylus* by Stoliczka (1872) from Kutch, need a thorough confirmation. *Ablepharus grayanus*, *Eumeces taeniolatus* and *Ophiomorus tridactylus* were also recorded by McCann (1938) but the later surveys conducted by Sharma (1982) and Vyas (2002) did not record any of these skinks from Kutch. These species were even not recorded in the present study and interestingly, *Ophiomorus tridactylus* is essentially a sand dune species, as its common name goes Indian Sand-swimmer, however during the surveys conducted in the entire of the Kutch desert, one never encountered any sand dune habitats and hence possibility of occurrence of this species within Gujarat is nil. Although Das (2008) reported occurrence of another sand dwelling skink namely *Ophiomorus raithmai* – Indian Sandfish in Gujarat, but the confirmation of occurrence of both these species of genus *Ophiomorus* in Gujarat is strongly recommended. The records by Stoliczka (1872) and McCann (1938) have been given prior to independence and perhaps at that time the political boundaries were not correctly/clearly defined and the Rann of Kutch had its extension further into Pakistan and the whole of the area was known as the 'Cutch Province' or 'Cutch State' and this could be the reason for these skinks to be recorded from Kutch area.

Similarly, Murray (1884) has recorded *Trapelus agilis* – Brilliant Agama from Kutch but, thereafter there has been no record of occurrence of this species from Kutch and therefore it is strongly believed that *Trapelus agilis* does not have its distribution in Gujarat. Another agamid that was found to be a regional endemic to the arid biotope, *Brachysaura minor* has also underwent some taxonomic rearrangements in its generic name. Smith (1935) had

classified this species under genus *Agama* naming it *Agama minor,* later on the generic name was changed to *Laudakia* and that got widely published as *Laudakia minor* (Das, 1997a; Daniel, 2002). After critically evaluating the species it was finally reverted back to its old genus *Brachysaura* by Manthey and Schuster (1999). *Brachysaura* genus was suggested way back in the nineteenth century by Blyth (1853; 1856), and the species being monotypic to the genus *Brachysaura,* has been therefore restored back to the name *Brachysaura minor* as given by Blyth (1856). Spiny-tailed lizards have long been along with agamids under family Agamidae. Theobald in 1868 had suggested to group genera *Uromastyx* and *Liolepis* into a separate family 'Uromastycidae', however, his scheme of classification was not widely accepted then, until Bohme (1982) reviewed back the family status as Uromastycidae. Even then the separation of the family Uromastycidae was not widely accepted and based upon molecular data (Honda *et al.,* 2000), the family was still considered as a subgroup under Agamidae. Further, evaluating the molecular data from the genus *Liolepis* Aranyavalai *et al.*, (2004) again suggested the occurrence of the separate family Uromastycidae. In spite of the fact that the results presented by Aranyavalai *et al.*, (2004) were accepted by many of the workers (Grismer *et al.,* 2007; Das, 2008) the separate existence of the family Uromastycidae is still a topic of debate amongst the reptile taxonomists.

Like the spiny-tailed lizards and their new family Uromastycidae, leopard geckos of the family Eublepharidae were also under taxonomic disarray for a long period of time. Leopard geckos or Fat-tailed geckos, as commonly they are called were earlier classified along with other geckos under family Gekkonidae, though leopard geckos markedly differ from other geckos by a key phenotypic character of possessing fleshy movable eyelids as against the immovable transparent spectacle in other geckos. Boulenger (1885) had grouped leopard geckos into a separate family Eublepharidae, however that was not agreeable to many and the family was considered as subfamily Eublepharinae under family Gekkonidae (Gadow, 1901; Smith, 1935; Underwood, 1948; Anderson and Leviton, 1966; Nader and Jawdat, 1976; Singh, 1984; Baloutch and Thireau, 1986), till Grismer (1988) revealed the phylogeny of eublepharine geckos and restituted the existence of the separate family Eublepharidae. Smith (1935) had described two species of eublepharids from India namely *Eublepharis hardwickii* and *Eublepharis macularis*. The former is known to occur from Chhota Nagpur plateau extending further in the east to Orissa and adjacent parts of West Bengal, while the latter has its range across the arid parts of western India and also from Punjab in the north to

Pune in the south. Further, enriching our knowledge on the systematics of southwest Asian lizards, Borner (1976) reported occurrence of two subspecies of the species *Eublepharis macularis* namely *Eublepharis macularis macularis* and *Eublepharis macularis fuscus*. The systematic status of *Eublepharis macularis fuscus* was then resolved by Das (1997b) and this subspecies was elevated to the level of species now known as *Eublepharis fuscus*, through critical examination of certain morphological characters that differ from *Eublepharis macularis*. Therefore the specimens collected from the Kathiawar peninsula, Gujarat and few localities from Maharashtra, that were deposited as holotypes with the museum of BNHS or ZSI, were reexamined and the species was confirmed as *Eublepharis fuscus* and not *Eublepharis macularis* (Das, 1997b). Grismer (1988) has suggested allopatry between these two western Indian species of eublepharids and the distribution pattern revealed that the Rann of Kutch acts as a barrier for both the southern populations of *E. macularis* (on the eastern bank of the Indus, southeastern Pakistan) and northern populations of *E. fuscus* (in Kathiawar peninsula, Gujarat state, western India) (Das, 1997b). Although now established that the eublepharine member occurring in Gujarat is *Eublepharis fuscus*, the status of *E. macularis* remains unevaluated for the Gujarat region and hence the possibility of occurrence of *Eublepharis macularis* in some parts of Kutch adjacent to the border areas close to Pakistan cannot be ruled out.

As far as the largest lizard family is concerned, family Scincidae, the commonly encountered members belonged to genera *Lygosoma* and *Mabuya*. Both these genera are cosmopolitan in their distribution. The molecular evidences suggested monophyly of the Asian members of the group *Mabuya* and thereby all the Indian members of the lygosomine scincid genus *Mabuya* were transferred to genus *Eutropis* by Mausfeld and Schmitz (2003). We also adopted the change in the nomenclature and included the same in the upgraded checklist as presented herein Table 4.3. Genus *Eutropis* (= *Mabuya*) is relatively species rich with nearly 28 members in India and other parts of south Asia (Utez, 2009). Although several of the Indian species of *Eutropis* appear to be narrow endemics with limited ranges, others have broad distributions (Tikader and Sharma, 1992). Even for the most common and widespread species of *Eutropis*, comprehensive range data and morphological variations are lacking and moreover several species have been diagnosed based on variable and nebulous characters (Mirza *et al.*, 2010). One of the species described based upon such variable characters is *Eutropis allapallensis* (= *Mabuya allpallensis*), the Allapalli Grass Skink. This species was

described based on a single specimen collected from Allapalli forest, near Chanda, eastern Maharashtra by Schmidt (1926). Smith (1935) considered *Eutropis allapallensis* (= *Mabuya allapallensis*) as a variant form of *Eutropis macularia* (= *Mabuya macularia*) and placed it in the synonymy of *Eutropis macularia.* The only strong character distinguishing these two species is the presence of fused fronto-parietals in *Eutropis allapallensis*. Based upon Sharma's descriptions (1973, 1976), Das *et al.,* (2007) gave the following diagnostic characters for *Eutropis allapallensis,* "fronto-parietals fused; prefrontals not in contact; temporal scales smooth; preanals not enlarged; and gular regions not flame scarlet." Based upon all these characters Vyas (2004) also reported the occurrence of *Eutropis* (= *Mabuya*) *allapallensis* from Gujarat. However, Mirza *et al.,* (2010), through their extensive field surveys in different parts of Maharashtra and after examining a good number of specimens of *Eutropis allapallensis*, found that barring the character of fused fronto-parietals, rest of the diagnostic characters are highly variable and inaccurate to show the two forms distinct and support Smith's (1935) argument of uniting the two species. Therefore based upon their investigations, Mirza *et al.,* (2010) strongly proposed *Eutropis allapallensis* to be considered as a junior synonym of *Eutropis macularius.* Since the species is reported only from the south Gujarat region and was not recorded in the present study, at the moment we consider *Eutropis allapallensis* as a distinct form but the study on the sympatry of these two species *Eutropis allapallensis* and *Eutropis macularius* is recommended. Moreover, molecular studies to confirm the status of these two Indian scincid lizards are strongly warranted.

Auffenberg *et al.,* (1989) reported occurrence of *Varanus flavescens* – Yellow Monitor Lizard from Gujarat. But Tikader and Sharma (1992), Daniel (2002) and Das (2008) have reported the range of the species in the Gangetic Plains, from Punjab to Bengal and therefore the record by Auffenberg *et al.,* (1989) could be an erratic record and needs a confirmation. In the present study also *Varanus flavescens* was never encountered in any of the parts of Gujarat and it is considered that the species does not have its distribution in Gujarat.

Looking into the conservation scenario of lizards in Gujarat, Figure 4.4 shows the conservation status of lizards in Gujarat, as evaluated through the Conservation Assessment and Management Plan (C.A.M.P.) workshop conducted under the Biodiversity Conservation Prioritization Project (BCPP), jointly organized by the Zoo Outreach Organization and Conservation Breeding Specialist Group (CBSG) in 1998. It was evident from the BCPP-

CAMP report (1998), that the only species of lizard which is under a taxonomic debate, *Eutropis allapallensis*, was reported to be endangered from Gujarat. 28 % of the species are Data Deficient, which clearly indicates lack of knowledge on the ecology and biology of these species. In addition to this 10 % of the species have never ever been evaluated for their status, which again indicates huge lacunae in the knowledge regarding these species. Therefore, considering the diversity of lizards in Gujarat and the quantum of available literature, one can infer that lizards have always received ignorance from humans, biology of majority of the species is not known and their status remains unevaluated for more than a decade.

Table 4.2 Checklist of Lizards recorded in the Present Study and their Updated Distribution within Gujarat State

Sr. No.	Scientific Name	Distribution within Gujarat State
	Agamidae	
1.	*Brachysaura minor*	Scrublands & Grasslands of Kutch & in Saurashtra recorded from Velavadar NP, scrublands around Palitana and from the state of Jasdan in Rajakot
2.	*Calotes rouxii*	Forests of Central & South Gujarat (From southeastern part of Vadodara district through eastern Narmada district, down south Surat, Dangs, Navsari and Valsad)
3.	*Calotes versicolor*	All the parts of the state excepts interiors of the Rann
4.	*Psammophilus blandfordanus*	Forests of Central Gujarat (From eastern parts of Panchmahal distrct through Dahod, forests of Vadodara district, down south to Shoolpaneshwar WLS in district Narmada)
5.	*Sitana ponticeriana*	All the parts of the state except interiors of the Rann
	Chamaeleonidae	
6.	*Chamaeleo zeylanicus*	All the parts of the state except interiors of the Rann
	Eublepharidae	
7.	*Eublepharis fuscus*	Scrublands of northwestern part of Kutch district & in Saurashtra recorded from Scrublands of Jamnagar, Barda forest in Porbandar, Gir PA in Junagadh & state of Jasdan & other scrublands in Rajkot.
	Gekkonidae	
8.	*Cyrtopodion kachhensis*	Scrublands and rocky patches in Kutch district
9.	*Geckoella collegalensis*	Gir PA, Vansda NP Navsari and forests of Dangs district
10.	*Hemidactylus brookii*	All the parts of the state except interiors of the Rann
11.	*Hemidactylus flaviviridis*	All the parts of the state except interiors of the Rann
12.	*Hemidactylus frenatus*	Coastal inhabitant areas of Jamnagar and on four islands of Marine NP, Jamnagar
13.	*Hemidactylus gujaratensis*	A new gecko species currently recorded only from Girnar Forest of Junagadh
14.	*Hemidactylus leschenaultii*	Forests of Central & South Gujarat (From Panchmahal through Dahod, Vadodara, Narmada, Bharuch, Surat, Dangs, Navsari and Valsad)
15.	*Hemidactylus maculatus*	Forests of South Gujarat; District Dangs
16.	*Hemidactylus persicus*	Jessore WLS in Banaskantha district & old and ruined houses in village Tera of Kutch district
17.	*Hemidactylus porbandarensis*	An Endemic species to Gujarat, recorded from coastal areas of Porbandar district
18.	*Hemidactylus triedrus*	Scrublands of Kutch & Saurashtra (Bhavnagar, Jamnagar, Junagadh and Rajkot districts)

Sr. No.	Scientific Name	Distribution within Gujarat State
	Lacertidae	
19.	*Acanthodactylus cantoris*	Entire of the Kutch & coastal areas of Jamnagar, Porbandar and Junagadh district
20.	*Ophisops beddomei*	Scrub hill-forests of Kutch and Ratanmahal WLS in Dahod district of central Gujarat
21.	*Ophisops jerdoni*	Kutch & Parts of Saurashtra (Bet Dwarka, Dwarka, Mithapur & Okha in Jamnagar, Barda forest in Porbandar, Ranavav, Somnath & Veraval in Junagadh & parts of Rajkot
22.	*Ophisops microlepis*	Kutch & Parts of Saurashtra (Bet Dwarka, Dwarka, Mithapur & Okha in Jamnagar & parts of Rajkot)
	Scincidae	
23.	*Lygosoma albopunctata*	Forests of North Gujarat and Gir PA in Junagadh
24.	*Lygosoma lineata*	Forests of Central & South Gujarat (From southeastern Vadodara through Narmada, Bharuch, Surat, down south to Dangs, Navsari and Valsad)
25.	*Lygosoma punctata*	All the parts of the state except interiors of the Rann
26.	*Eutropis carinata*	All the parts of the state except interiors of the Rann
27.	*Eutropis macularis*	All the parts of the state except interiors of the Rann
	Uromastycidae	
28.	*Uromastix hardwickii*	Scrublands and Grasslands in Kutch, on the periphery of the Greater Rann in Kutch & parts of Little Rann in Surendranagar district, Saurashtra
	Varanidae	
29.	*Varanus bengalensis*	All the parts of the state except interiors of the Rann
30.	*Varanus griseus*	Kutch and arid parts of North Gujarat

Table 4.3 Updated Checklist of Lizards of Gujarat State

Sr. No.	Scientific Name	Common Name	Reference#
	Agamidae		
1.	*Brachysaura minor*	Lesser Agama	Stolickza, 1872
2.	*Calotes rouxii*	Roux's Forest Lizard	Daniel & Shull, 1963
3.	*Calotes versicolor*	Indian Garden Lizard	
4.	*Psammophilus blandfordanus*	Blandford's Rock Agama	Vyas, 2000
5.	*Sitana ponticeriana*	Fan-throated Lizard	
6.	*Trapelus agilis**	Brilliant Agama	Murray, 1886
	Chamaeleonidae		
7.	*Chamaeleo zeylanicus*	South Asian Chamaeleon	Stolickza, 1872
	Eublepharidae		
8.	*Eublepharis fuscus*	Western Indian Leopard Gecko	Daniel, 1983
	Gekkonidae		
9.	*Cyrtopodion kachhensis*	Warty Rock Gecko	Stolickza, 1872
10.	*Geckoella collegalensis*	Kollegal's Ground Gecko	Vyas, 1998b
11.	*Hemidactylus brookii*	Brook's House Gecko	Gleadow, 1887
12.	*Hemidactylus flaviviridis*	Yellow-green House Gecko	Murray, 1886
13.	*Hemidactylus frenatus*	Asian House Gecko	Vyas, 2005
14.	*Hemidactylus gracilis*	Slender Gecko	Gleadow, 1887
15.	*Hemidactylus gujaratensis*		Giri *et al.*, 2009
16.	*Hemidactylus leschenaultii*	Bark Gecko	Murray, 1886
17.	*Hemidactylus maculatus*	Spotted Rock Gecko	Acharya, 1949
18.	*Hemidactylus persicus*		Vyas *et al.*, 2006
19.	*Hemidactylus porbandarensis*	Porbandar Gecko	Sharma, 1981
20.	*Hemidactylus triedrus*	Termite-hill Gecko	Stolickza, 1872
	Lacertidae		
21.	*Acanthodactylus cantoris*	Indian Fringed-toed Lizard	Gleadow, 1887
22.	*Ophisops beddomei*	Beddome's Lacerta	Vyas, 2003
23.	*Ophisops jerdoni*	Snake-Eye Lacerta	Stolickza, 1872
24.	*Ophisops microlepis*	Small-scaled Lacerta	Stolickza, 1872
	Scincidae		
25.	*Ablepharus grayanus**	Dwarf Earless Skink	Stolickza, 1872
26.	*Eumeces schneiderii**	Indian Mole Skink	Stolickza, 1872
27.	*Eumeces taeniolatus**	Eastern Yellow-bellied Mole Skink	Stolickza, 1872
28.	*Lygosoma albopunctata*	White-spotted Supple Skink	Acharya, 1949
29.	*Lygosoma guntheri*	Gunther's Supple Skink	Acharya, 1949

Sr. No.	Scientific Name	Common Name	Reference#
30.	*Lygosoma lineata*	Lined Supple Skink	Naik & Vinod, 1994
31.	*Lygosoma punctata*	Spotted Supple Skink	
32.	*Mabuya allapallensis*	Allapalli Grass Skink	Vyas, 2004
33.	*Mabuya carinata*	Keeled Grass Skink	Stolickza, 1872
34.	*Mabuya dissimilis*	Stiped Grass Skink	Vyas & Patel, 1992a
35.	*Mabuya macularis*	Eastern Bronze Skink	Boulenger, 1890
36.	*Ophiomorus tridactylus**	Indian Sand-swimmer	Stolickza, 1872
	Uromastycidae		
37.	*Uromastix hardwickii*	Hardwick's Spiny-tailed Lizard	Gunther, 1864
	Varanidae		
38.	*Varanus bengalensis*	Bengal Monitor	Stolickza, 1872
39.	*Varanus griseus*	Desert Monitor	Boulenger, 1890

*Confirmation is required for the occurrence of these species in Gujarat
#Reference is the first record provided for the distribution of species in Gujarat state

Table 4.4 Updated Checklist of Lizards of Gujarat State and their IUCN Status (BCPP – C.A.M.P., 1998)

Sr. No.	Scientific Name	Common Name	IUCN Status
	Agamidae		
1.	*Brachysaura minor*	Lesser Agama	LR-lc
2.	*Calotes rouxii*	Roux's Forest Lizard	LR-nt
3.	*Calotes versicolor*	Indian Garden Lizard	LR-nt
4.	*Psammophilus blandfordanus*	Blandford's Rock Agama	LR-nt
5.	*Sitana ponticeriana*	Fan-throated Lizard	LR-lc
6.	*Trapelus agilis**	Brilliant Agama	DD
	Chamaeleonidae		
7.	*Chamaeleo zeylanicus*	South Asian Chamaeleon	VU
	Eublepharidae		
8.	*Eublepharis fuscus*	Western Indian Leopard Gecko	LR-lc
	Gekkonidae		
9.	*Cyrtopodion kachhensis*	Warty Rock Gecko	DD
10.	*Geckoella collegalensis*	Kollegal's Ground Gecko	DD
11.	*Hemidactylus brookii*	Brook's House Gecko	LR-lc
12.	*Hemidactylus flaviviridis*	Yellow-green House Gecko	LR-lc
13.	*Hemidactylus frenatus*	Asian House Gecko	VU
14.	*Hemidactylus gracilis*	Slender Gecko	DD
15.	*Hemidactylus gujaratensis*		
16.	*Hemidactylus leschenaultii*	Bark Gecko	LR-lc
17.	*Hemidactylus maculatus*	Spotted Rock Gecko	LR-lc
18.	*Hemidactylus persicus*		
19.	*Hemidactylus porbandarensis*	Porbandar Gecko	VU
20.	*Hemidactylus triedrus*	Termite-hill Gecko	LR-lc
	Lacertidae		
21.	*Acanthodactylus cantoris*	Indian Fringed-toed Lizard	LR-nt
22.	*Ophisops beddomei*	Beddome's Lacerta	LR-nt
23.	*Ophisops jerdoni*	Snake-Eye Lacerta	DD
24.	*Ophisops microlepis*	Small-scaled Lacerta	LR-lc
	Scincidae		
25.	*Ablepharus grayanus**	Dwarf Earless Skink	DD
26.	*Eumeces schneiderii**	Indian Mole Skink	DD
27.	*Eumeces taeniolatus**	Eastern Yellow-bellied Mole Skink	DD
28.	*Lygosoma albopunctata*	White-spotted Supple Skink	LR-lc
29.	*Lygosoma guntheri*	Gunther's Supple Skink	LR-nt
30.	*Lygosoma lineata*	Lined Supple Skink	LR-nt
31.	*Lygosoma punctata*	Spotted Supple Skink	LR-lc
32.	*Mabuya allapallensis*	Allapalli Grass Skink	EN

Sr. No.	Scientific Name	Common Name	IUCN Status
33.	*Mabuya carinata*	Keeled Grass Skink	LR-nt
34.	*Mabuya dissimilis*	Stiped Grass Skink	DD
35.	*Mabuya macularis*	Eastern Bronze Skink	LR-lc
36.	*Ophiomorus tridactylus**	Indian Sand-swimmer	DD
	Uromastycidae		
37.	*Uromastix hardwickii*	Hardwick's Spiny-tailed Lizard	VU
	Varanidae		
38.	*Varanus bengalensis*	Bengal Monitor	VU
39.	*Varanus griseus*	Desert Monitor	VU

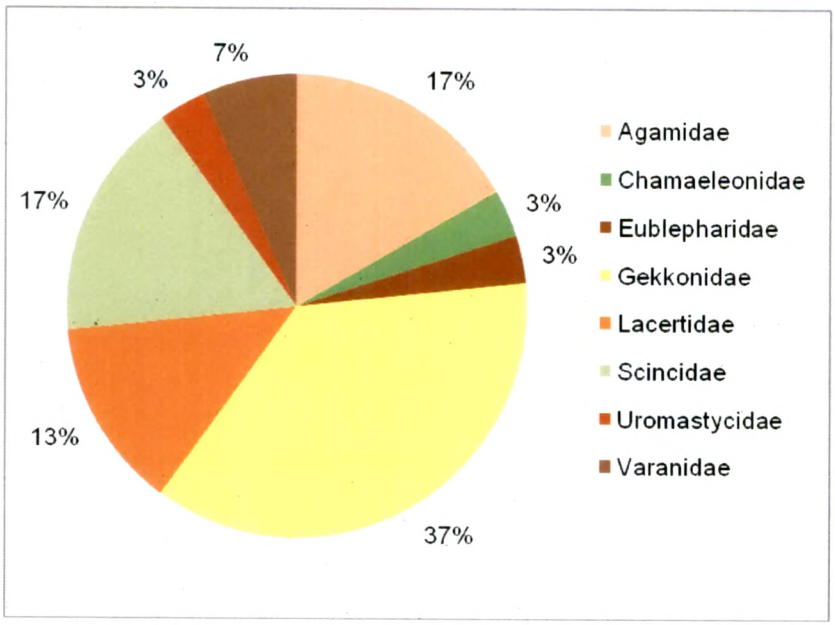


Figure 4.1 Species composition within the Families as observed in the present study

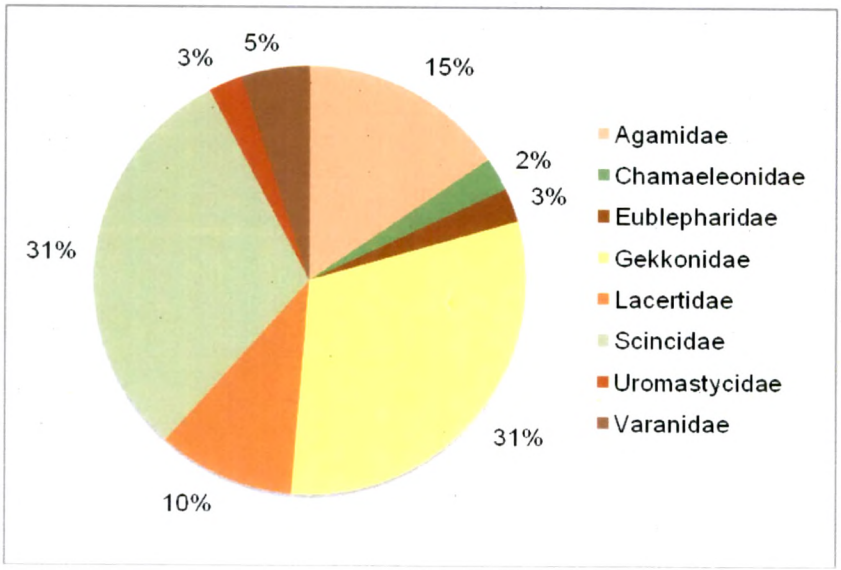


Figure 4.2 Species composition within the Families as reported in the literature

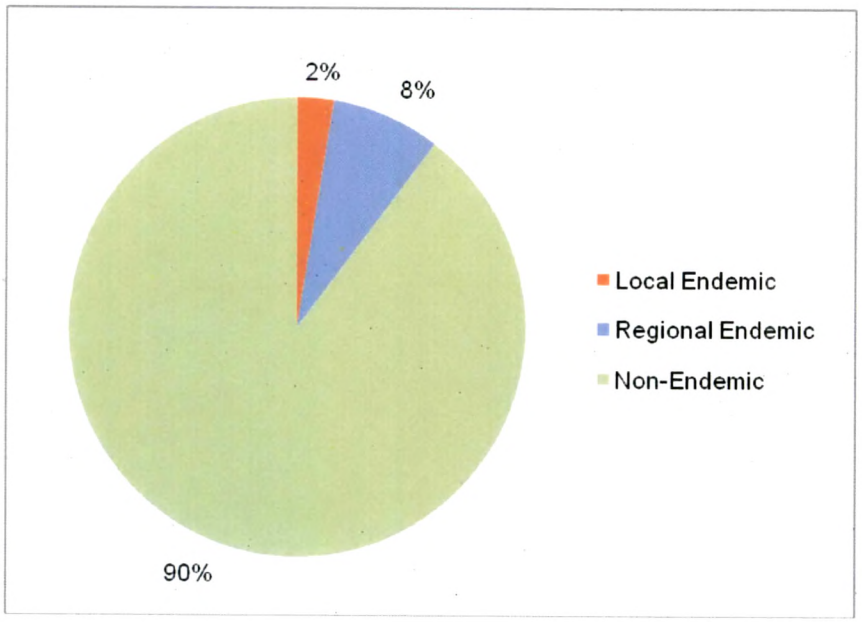
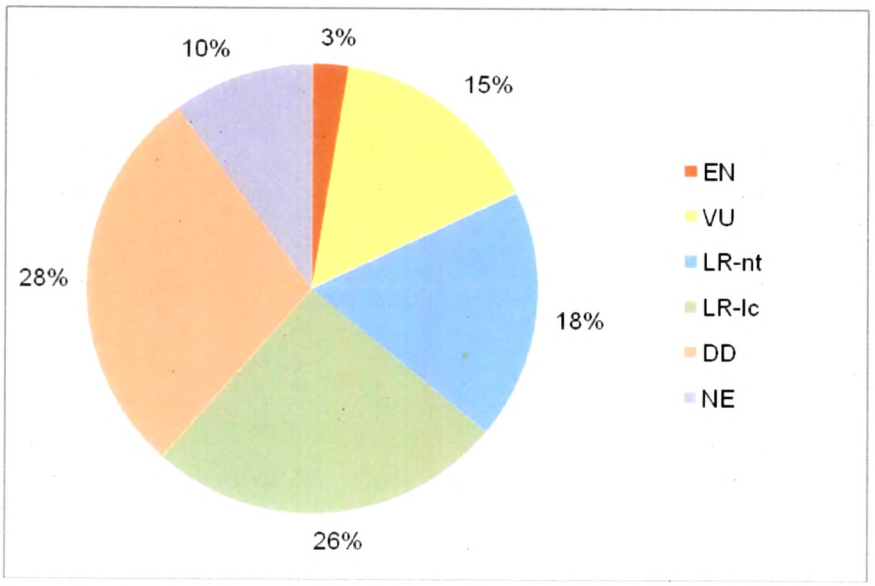


Figure 4.3 Percentage of Endemic and Non-endemic Lizard species in Gujarat



(EN – Endangered, VU – Vulnerable, LR-nt – Lower Risk – near threatened, LR-lc – Lower Risk – least concern, DD – Data Deficient, NE – Not Evalutated)

Figure 4.4 Conservation Status of Lizards in Gujarat (BCPP – C.A.M.P., 1998)

TAXONOMIC KEY TO THE LIZARD FAMILIES AND SPECIES OF GUJARAT

Character Code	Morphological feature of the Lizard	(Character Code)/Family
(1)	Body dorsoventrally compressed	(2)
	Body laterally compressed	(6)
	Body cylindrical or roughly rounded and elongated	(7)
(2)	Head depressed with granular scales	(3)
	Head elongated with granular scales	(4)
	Head rectangular with flat scales	(5)
(3)	Eyelids movable	Eublepharidae
	Eyelids immovable	Gekkonidae
(4)	Nostrils close to the eye or midway between eye and snout	Varanidae
(5)	Nostrils very close to the tip of snout; tail with dorsal transversal rows of long spinous scales	Uromastycidae
(6)	Head with elevated median casque; digits fused and opposable; tail prehensile	Chamaeleonidae
	Head rectangular; no casque; body scales flat and keeled; tail as long as or longer than body	Agamidae
(7)	Scales rough and keeled; tail much longer than body; digits long; ventral scales distinctly larger than dorsal scales	Lacertidae
	Scales smooth; keeled or non-keeled; tail as long as or little longer body length; digits short; dorsal and ventral body scales about equal in size	Scincidae
	Family: Agamidae (5 Genera, 6 Species)	
(1)	Body laterally compressed; hind limbs with four digits	*Sitana ponticeriana*
	Body laterally compressed; hind limbs with five digits	(2)
(2)	A distinct median dorsal crest of pointed elevated scales; extending up to the tail	(3)
	Median dorsal crest composed of few slender erect points not extending up to tail	(4)
	Median dorsal crest inconspicuous	(5)
	No fold in front of the shoulder; two well separated spines above the tympanum; 35-52 mid body scales	*Calotes versicolor*
(3)	A long fold in front of the shoulder extending nearly across the throat; two slender spines on each side of the back of the head; no spine behind the supercilium; no white spot below the eye	*Calotes rouxii*

Character Code	Morphological feature of the Lizard	(Character Code)/Family
(4)	Body more or less depressed; fold in front of the shoulder; gular sac absent	(6)
	Body more or less depressed; fold in front of the shoulder; gular sac present or absent	(7)
(5)	No preanal or femoral pores; 80 to 100 mid body scales distinctly keeled and imbricate; a small spine behind the super ciliary edge	*Psammophilus blandfordanus*
(6)	Tail length exceeds body length; males with callous preanal scales	*Trapelus agilis*
	Tail length equals or slightly less than body length; males without callous preanal scales	*Brachysaura minor*
	Family: Chamaeleonidae (1 Genus, 1 Species)	
(1)	Body laterally compressed; head with elevated median casque; scales rounded and tubular; digits fused and opposable; tail prehensile	*Chamaeleo zeylanicus*
	Family: Eublepharidae (1 Genus, 1 Species)	
(1)	Body covered with uniformly enlarged dorsal tubercles; smooth median scansors on the toes; single broad pale dorsal band and eight postnasals bordering nasal	*Eublepharis fuscus*
	Family: Gekkonidae (3 Genera, 11 Species)	
(1)	Digits not dilated; digits cylindrical and sub-digital lamellae undivided	(2)
	Digits entirely dilated, more or less depressed; sub-digital lamellae divided	(5)
(2)	Back with longitudinal series of large and prominent subtrihedral tubercles	(3)
	Back with small granular scales; complete absence of enlarged dorsal tubercles	(4)
(3)	Digits long, slender and inferiorly with a more or less distinct transverse plates; sub-caudals small, irregular and arranged in two rows	*Cyrtopodion kachhensis*
(4)	Digits short; sub-digital lamellae moderately developed; tail shorter than the body length; males without pores; back with dark paired rounded spots	*Geckoella collegalensis*
(5)	Dorsum with keeled enlarged tubercles, arranged in regular rows	(6)
	Enlarged dorsal tubercles present or absent; if present, rounded and smooth and irregularly arranged	(11)

Character Code	Morphological feature of the Lizard	(Character Code)/Family
(6)	Sub-digital lamellae in straight transverse series; 11-13 under the fourth toe	(7)
	Sub-digital lamellae in oblique series; 7-14 under the fourth toe	(8)
(7)	Males possess only femoral pores; numbering between 19 to 25	*Hemidactylus maculates*
	Males with only preanal pores	(9)
(8)	Distinctly enlarged dorsal tubercles; 7-10 sub-digital lamellae under fourth toe; back with clearly defined pattern of dark cross bars	*Hemidactylus triedrus*
	Enlarged dorsal tubercles; 8-10 lamellae under fourth toe; males with 7 to 12 preano-femoral pores; back patterned with dark spots	*Hemidactylus brookii*
(9)	Back with 14 to 16 longitudinal series of keeled or subtrihedral tubercles; 8-10 lamellae under first toe; 12-14 lamellae under fourth toe; 9 to 13 large sized preanal pores	*Hemidactylus persicus*
	Back with longitudinal series of more or less oval strongly keeled tubercles; 6 preanal pores in males	(10)
(10)	Back with 10 or 12 longitudinal series of more or less oval strongly keeled tubercles; 5 lamellae under first toe and 8 or 9 lamellae under fourth toe	*Hemidactylus gracilis*
	Back with 16 or 17 longitudinal series of more or less oval strongly keeled tubercles; 5 or 6 lamellae under first toe and 9 or 10 lamellae under fourth toe	*Hemidactylus porbandarensis*
(11)	Enlarged dorsal tubercles present; males with preano-femoral pores	(12)
	Enlarged dorsal tubercles absent; males with preano-femoral pores	(13)
(12)	Dorsum with 12 to 14 rows of irregularly arranged, flattened to weakly conical tubercles; 10-11 lamellae beneath the fourth toe; males with 12 to 14 femoral pores	*Hemidactylus gujaratensis*
(13)	Dorsal scales smooth and granular; tail with enlarged tubercles on sides; males with preano-femoral pores	(14)
	Dorsal scales smooth and granular; tail with enlarged tubercles above; males only with femoral pores	(15)
(14)	9-10 sub-digital lamellae under fourth toe; 28 to 36 preano-femoral pores in male	*Hemidactylus frenatus*
	11-14 sub-digital lamellae under fourth toe; 15 or less preano-femoral pores in males	*Hemidactylus flaviviridis*
(15)	9-11 subdigital lamellae under fourth toe; males with 12 to 19 femoral pores	*Hemidactylus leschenaultii*

Character Code	Morphological feature of the Lizard	(Character Code)/Family
	Family: Lacertidae (2 Genera, 4 Species)	
(1)	Nostrils in contact with first supralabial (touching)	(2)
	Nostril not in contact with first supralabial (not-touching)	(3)
(2)	Digits fringed laterally; femoral pores present, 26-36 dorsals across the mid body	*Acanthodactylus cantoris*
(3)	Upper head shields rugose, keeled and striated; lower eyelid fused with upper eyelid with a large transparent disc	(4)
	Upper head shields smooth	(5)
(4)	Single fronto-nasal, 28-35 scales round the mid body	*Ophisops jerdoni*
	Fronto-nasals two or three, 26-32 scales round the body	*Ophisops beddomei*
(5)	Snout elongated, more or less pointed, as long as breadth of the head across the eyes; 56-60 scales round the mid body	*Ophisops microlepis*
	Family: Scincidae (5 Genera, 12 Species)	
(1)	Body serpentine; limbs short and vestigial	(2)
	Body not markedly serpentine; limbs well developed	(7)
(2)	Limbs short or weakly developed or vestigial; pentadactyl	(3)
	Limbs short and vestigial; four fingers and four toes	*Lygosoma lineata*
	Limbs short and vestigial; both fingers and toes three	*Ophiomorus tridactylus*
(3)	Limbs more or less developed; digits five; eyelids immovable with large transparent disc; ear hidden	*Ablepharus grayanus*
	Limbs short or vestigial; pentadactyl; eyelids well developed and movable; ear opening distinct tympanum deeply sunk	(4)
(4)	Lower eyelid scaly	(5)
	Lower eyelid with an undivided transparent disc	(6)
(5)	26-28 smooth scales round the body; flanks black-spotted	*Lygosoma albopunctata*
(6)	24-28 scales round the body; 62-76 scales down middle of back	*Lygosoma punctata*
	24-26 scales round the body; 87-100 scales down middle of back	*Lygosoma guentheri*

Character Code	Morphological feature of the Lizard	(Character Code)/Family
(7)	Eyelids well developed and movable; lower eyelid scaly	(8)
	Eyelids well developed and movable; lower eyelid scaly or with or without an undivided, more or less transparent disc	(9)
(8)	3 to 5 pairs of nuchals; no post-nasals; 26-30 scales round the body	*Eurylepis schneideri*
	4 or 5 pairs of nuchals; a single post-nasal present; 21-33 scales round the body	*Eurylepis taeniolatus*
(9)	Lower eyelid with an undivided, more or less transparent	(10)
	Lower eyelid scaly	(11)
(10)	34-38 scales round the body; dorsals with 2 or 3 strong keels	*Eutropis dissimilis*
(11)	Post-nasal present or absent	(12)
	Post-nasal absent	(13)
(12)	28-30 (32, 34) scales round the body; dorsal with 5, 7 or 9 strong keels; 12 to 17 lamellae under the fourth toe; the leg reaches to the wrist or the axilla; fronto-parietals separate	*Eutropis macularis*
	Fronto-parietals united into a single shield	*Eutropis allapallensis*
(13)	30-34 scales round the body; dorsals with 3, 5 or 7 keels; 14 to 18 lamellae under the fourth toe; the leg reaches to the wrist or the elbow	*Eutropis carinata*
	Family: Uromastycidae (1 Genus, 1 Species)	
(1)	Back or dorsum with uniform granular scales; tail with smaller caudal spines; 20 to 24 in a whorl at the base of the tail	*Uromastyx hardwickii*
	Family: Varanidae (1 Genus, 2 Species)	
(1)	Tail compressed with a median dorsal ridge	2
	Tail round; ridge slightly seen in the middle of the tail; nuchal scales conicals	*Varanus griseus*
(2)	Nuchal scales keeled	*Varanus bengalensis*

DESCRIPTION OF LIZARD SPECIES RECORDED IN THE PRESENT STUDY

(For further technical details on the description, refer Smith, 1935)

1. Lesser Agama (Figure 4.5a – Juvenile; Figure 4.5b)

Scientific Name	*Brachysaura minor* Hardwicke & Gray, 1827
Family	Agamidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Rare
Diet	Seeds, beetles, grasshoppers, earwigs and spiders
Activity	Crepuscular or Nocturnal
Stratum	Terrestrial
Size	90 mm SVL

Description, Habit and Habitat:

A pot-bellied, ground-dwelling lizard from western and central Kutch. Head large; body stout; scales keeled, dorsals larger than the ventrals; a distinct nuchal crest, comprising of single scale; two groups of spines above tympanum; throat fold present; dorsum olive, with three rows of dark brown, light-edged spots; yellowish cream ventrally; juveniles olive or pinkish brown, with dark brown band between eyes. Inhabits scrub forests and plains. This was the only crepuscular and nocturnal agamid recorded in the study. Sluggish, generally found sitting on stones. When alarmed, they emit a squeak. Known from the western and central parts of the peninsula. Distribution within Kutch includes Kutch and parts of Saurashtra. (Figure 4.7).

2. Roux's Forest Lizard (Figure 4.6a – Juvenile; Figure 4.6b)

Scientific Name	*Calotes rouxii* Dummeril & Bibron, 1837
Family	Agamidae
IUCN Status	LR-nt (Lower Risk – Near Threatened)
Local Status	Common
Diet	Beetles, bugs, grasshoppers, earwigs, ants, termites and spiders
Activity	Diurnal
Stratum	Arboreal
Size	80 mm SVL

Description, Habit and Habitat:

A common forest-dwelling lizard from the plains and mid-hills of the Western Ghats. Head rather small; two slender spines on each side of the head; dark fold in front of the shoulder; throat reddish orange in both sexes; upper lip with white or cream spot. Inhabits lowlands

and the mid-hills, within deciduous and semi-evergreen forests. Distribution in Gujarat is along the hill forest of south eastern districts (Figure 4.8)

3. Indian Garden Lizard (Figure 4.9a – Juvenile; Figure 4.9b)

Scientific Name	*Calotes versicolor* Daudin, 1802
Family	Agamidae
IUCN Status	LR-nt (Lower Risk – Near Threatened)
Local Status	Common
Diet	Beetles, bugs, grasshoppers, earwigs, ants, termites, spiders and occasionally unripe seeds of certain plants
Activity	Diurnal
Stratum	Arboreal
Size	140 mm SVL

Description, Habit and Habitat:

The most abundant and widespread lizard, found in parks and gardens as human commensal. Head rather large; scales on the body pointing backwards and upwards; two separated spines above tympanum; coloration variable. Males exceed females in size, as well as showing swollen cheeks and longer dorsal spines. Distribution is cosmopolitan for the entire state (Figure 4.11).

4. Blandford's Rock Agama (Figure 4.10a – Adult (non-breeding)

Scientific Name	*Psammophilus blandfordanus* Blandford, 1870
Family	Agamidae
IUCN Status	LR-nt (Lower Risk – Near Threatened)
Local Status	Uncommon
Diet	Beetles, bugs, grasshoppers, earwigs, ants, termites and spiders
Activity	Diurnal
Stratum	Arboreal
Size	110 mm SVL

Description, Habit and Habitat:

A large-headed, pugnacious, rock-dwelling lizard from central provinces, Eastern Ghats, Travancore as far south as Trivandrum. Body robust, flattened; no dorsal crest; scales uniform keeled and imbricate; a deep fold in front of shoulder; 80-100 scales around the middle of the body; dorsum of adult males brown, a dark brown or black stripe along the side of the body; belly pale yellow. During breeding season, the upper parts of the body of adult males become bright orange; the undersurfaces a contrasting intense black (Figure

4.10b). The species is known from the hill forests of central Gujarat bordering the eastern boundary of the state (Figure 4.12)

5. Fan-throated Lizard (Figure 4.13a)

Scientific Name	*Sitana ponticeriana* Cuvier, 1829
Family	Agamidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Common
Diet	Ants, termites, beetles, bugs and other smaller insects
Activity	Diurnal
Stratum	Terrestrial
Size	40-50 mm SVL

Description, Habit and Habitat:

A fast, bipedal lizard from open areas that is capable of running on its hind limbs, with its tail raised. Snout rather acute; tympanum present; hind limbs elongated, with only four toes; scales keeled; femoral pores absent; tail long and slender; dewlap large, projecting in males; gular fold absent; dorsum brown, with dark brown, black edged, diamond-shaped marks; mouth-lining dark blue; dewlap develops a blue coloured streak along its mid-ventral edge. A common lizard of scrub forests, sea beaches and the edges of the arid regions. Distribution is cosmopolitan for the entire state (Figure 4.13b).

6. South Asian Chamaeleon (Figure 4.14a)

Scientific Name	*Chamaeleo zeylanicus* Laurenti, 1768
Family	Chamaeleonidae
IUCN Status	VU – Vulnerable
Local Status	Rare
Diet	Beetles, bugs, grasshoppers, lepidopterans and dipteran insects
Activity	Diurnal
Stratum	Arboreal
Size	175 mm SVL

Description, Habit and Habitat:

A single species of this amazing lizards is found in India. Head with a distinct casque; eye ball covered with skin, leaving a tiny aperture; scales on body enlarged, tuberculate; a low, serrated dorsal crest extending to prehensile tail; fingers and toes opposable. Arboreal, inhabiting shrubs and trees. These lizards have a remarkable capacity to change body colour,

from green to yellow, with spots or bands. Distribution is cosmopolitan for the entire state (Figure 4.14b).

7. Western Indian Leopard Gecko (Figure 4.15a)

Scientific Name	*Eublepharis fuscus* Das, 1997 after Blyth, 1854
Family	Eublepharidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Rare
Diet	Crickets, grasshoppers, beetles, dragonflies, antlions, scorpions and other lizards
Activity	Crepuscular
Stratum	Terrestrial
Size	120 mm SVL

Description, Habit and Habitat:

A stout lizard, with a large head, snout bluntly pointed; distinct fleshy eyelids; enlarged smooth tubercles on dorsum; deep axillary pockets; femoral pores absent; digits slender; lamellae under toes entire, smooth; subcaudals enlarged; dorsum of adults light brown or drab, with a single, broad band between the nuchal loop and caudal constriction; darker variegations within the pale bands on body and neck. Restricted to the plains on the west coast of India, from southern Gujarat to Maharashtra and possibly central Karnataka state. In Gujarat the species occurs in Kutch and Saurashtra (Figure 4.15b).

8. Warty Rock Gecko (Figure 4.16a)

Scientific Name	*Cyrtopodion kachhensis* Stoliczka, 1872
Family	Gekkonidae
IUCN Status	DD – Data Deficient
Local Status	Locally Common
Diet	Unknown; presumably small insects
Activity	Nocturnal
Stratum	Rocky Habitat
Size	40 mm SVL

Description, Habit and Habitat:

A rock-dwelling, warty gecko from the dry western part of the country. Head fairly large; snout blunt; eyes large with vertical pupils; head scales small wit larger tubercles; body flattened; fingers and toes slender; dorsal tubercles small, smaller than those on the sides, in longitudinal series that are separated by 3-5 rows of smaller granules; blunt spines on tail, comprising lateral rows of scales. Dorsum light brown or grey, with small irregularly

arranged dark spots; belly cream. Indian records are only from western Rajasthan and Gujarat states. In Gujarat the species occurs only in western parts of Kutch. (Figure 4.16b).

9. Kollegal Ground Gecko (Figure 4.17a)

Scientific Name	*Geckoella collegalensis* Beddom, 1870
Family	Gekkonidae
IUCN Status	DD – Data Deficient
Local Status	Rare
Diet	Termites, ants, crickets and ground beetles
Activity	Crepuscular
Stratum	Terrestrial
Size	50 mm SVL

Description, Habit and Habitat:

A dainty, colourful, ground-dwelling gecko from the plains of western peninsular India. Body stout, cylindrical covered with small granular scales; scales on belly overlapping; tail short, tapering, regenerated tail turnip shaped; dorsum with five pairs of large dark brown spots in addition to three pairs on head; tail with eleven dark brown blotches. Inhabits deciduous and scrub forests. Widely distributed from Gir forest in Gujarat state, south through Maharashtra, Karnataka, Kerala and Tamil Nadu states, from the foothills of the Western Ghats. In Gujarat the species is so far reported from Gir forest in Saurashtra and from the forests of south Gujarat. (Figure 4.17b).

10. Brook's House Gecko (Figure 4.18a)

Scientific Name	*Hemidactylus brookii* Gray, 1845
Family	Gekkonidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Common
Diet	Beetles, bugs, crickets, moths and other small insects
Activity	Nocturnal
Stratum	Terrestrial, occasionally low walls in human habitation
Size	58 mm SVL

Description, Habit and Habitat:

A common, rough-skinned gecko from northern India. Head oval; head scales small; body flattened; with granular scales and rows of tubercles; tail plump with spine-like tubercles on dorsum; dorsum dark brown to light grey, with dark spots usually arranged in goups; belly cream. Inhabits parks, gardens, houses as well as open forests. Its loud 'chuk-chuk-chuk' call

is commonly heard after dark. Distributed in northern India; also Pakistan and introduced populations have been found on Borneo, West Africa, southern China and the West Indies. In Gujarat, it is a widespread species occurring throughout the state (Figure 4.18b).

11. Yellow-green House Gecko (Figure 4.19a)

Scientific Name	*Hemidactylus flaviviridis* Ruppell, 1835
Family	Gekkonidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Common
Diet	Beetles, bugs, crickets, flies, moths, termites and spiders
Activity	Nocturnal
Stratum	Arboreal
Size	90 mm SVL

Description, Habit and Habitat:

A common house gecko from northern India, this is a smooth-textured, large-growing species, scuttling behind pelmets and photo frames at the first sign of danger. Head oval; head scales small; body flattened; dorsum lacking tubercles; tail sometimes with two pairs of rows of tubercles; males with fewer than 15 preano-femoral pores; dorsum pale grey at night to olive by day, when they may show dark cross-bars; belly light yellow. Widespread species in north and central India. The species occurs throughout the state of Gujarat (Figure 4.19b).

12. Asian House Gecko (Figure 4.20a)

Scientific Name	*Hemidactylus frenatus* Schlegel in Dummeril & Bibron, 1836
Family	Gekkonidae
IUCN Status	VU - Vulnerable
Local Status	Uncommon
Diet	Beetles, bugs, crickets, flies, moths, termites and spiders
Activity	Nocturnal
Stratum	Arboreal
Size	60 mm SVL

Description, Habit and Habitat:

A small but loud house gecko, widespread in Peninsular India. Head large, dorsal scales smooth; lack of webbing in fingers and toes; skin; sides of tail showing enlarge tubercles; no flaps of skin along the sides of body and at back of hindlimbs; males showing 28-36 preano-femoral pores; dorsum grayish brown, sometimes with darker markings; a brown streak, with a light edge on top, runs along the side of the head, sometimes continuing along the side of

the body; belly unpatterned cream. Its call is a series of 4-5 loud, staccato notes. In Gujarat the species is so far reported from parts of Jamnagar district (Figure 4.20b).

13. A new rock-dwelling gecko from Gujarat (Figure 4.21a)

Scientific Name	*Hemidactylus gujaratensis* Giri *et al.*, 2008
Family	Gekkonidae
IUCN Status	Not Evaluated
Local Status	Locally Common
Diet	Unknown, presumably insects
Activity	Nocturnal
Stratum	Rock-dwelling
Size	65 mm SVL

Description, Habit and Habitat:

Being a newly described species in the year 2009, nothing much is known about the species. For further details refer Giri *et al.*, 2009. So far the holotype has been described only from the Girnar forest of Junagadh district (Figure 4.21b)

14. Bark Gecko (Figure 4.19a)

Scientific Name	*Hemidactylus leschenaultii* Dummeril & Bibron, 1836
Family	Gekkonidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Common
Diet	Beetles, bugs, crickets, flies, moths, termites and spiders
Activity	Nocturnal
Stratum	Arboreal
Size	84 mm SVL

Description, Habit and Habitat:

A large growing, smooth-textured house gecko from Peninsular and western India. Head large; body robust; tail depressed its lateral edge spinose; scales small; males with 12-19 femoral pores; dorsum pale grey, with dark grey or black, wavy cross-bars; belly unpatterned cream or grey. It inhabits wooded country and often seen on large tree trunks. Widespread from West Bengal, south to Tamil Nadu, and also the dry northern parts of Sri Lanka and eastern Pakistan. However, in Gujarat the species is reported from central and south Gujarat (Figure 4.22b).

15. Spotted Rock Gecko (Figure 4.23a)

Scientific Name	*Hemidactylus maculatus* Dummeril & Bibron, 1836
Family	Gekkonidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Uncommon
Diet	Beetles, bugs, crickets, flies, moths, termites, spiders and other geckos
Activity	Nocturnal
Stratum	Rock-dwelling
Size	115 mm SVL

Description, Habit and Habitat:

A large rock-dwelling gecko from the low hills of Peninsular India. Snout pointed; forehead with large scattered scales; ventrals smooth; dorsum greyish brown, with black blotches that may be confused to form wavy bars; belly unpatterned cream. Inhabits rocky outcrops, including caves and cracks in boulders. Restricted to the foothills of the Western Ghats, from Dangs in Gujarat, up to the Tirunelveli and Shevaroy Hills of Tamil Nadu and also Sri Lanka. In Gujarat the species is only known to occur from Valsad and Dangs district in the southern part of the state (Figure 4.23b).

16. Persian House Gecko (Figure 4.24a)

Scientific Name	*Hemidactylus persicus* Anderson, 1872
Family	Gekkonidae
IUCN Status	Not Evluated
Local Status	Uncommon
Diet	Unknown, presumably insects
Activity	Nocturnal
Stratum	Arboreal
Size	66 mm SVL

Description, Habit and Habitat:

A medium sized gecko known from the drier parts of north western India. Head moderate; snout obtusely pointed, about as long as the distance between eye and the tympanum; snout covered with rounded convex scales, largest over the canthal region; back of head with minute granules intermixed with larger tubercles; back with small granules intermixed with large, rounded, keeled, or subtrihedral tubercles arranged in 14-16 fairly longitudinal series; belly with smooth, rounded imbricate scales; tail with small, irregular, more or less pointed scales and series of 6 or 8 large pointed tubercles; males with 9-13 preanal pores. Light brown or greyish above, with dark spots, sometimes arranged transversely; a dark streak on

the sides of the head; dirty white below. The species is far reported only from the dry deciduous forests of north Gujarat and parts of Kutch (Figure 4.24b).

17. Porbandar Gecko (Figure 4.25a)

Scientific Name	*Hemidactylus porbandarensis* Sharma, 1982
Family	Gekkonidae
IUCN Status	VU – Vulnerable
Local Status	Locally Common
Diet	Unknown presumably insects
Activity	Nocturnal
Stratum	Arboreal
Size	40 mm SVL

Description, Habit and Habitat:

This was the only local endemic lizard from Gujarat. For details refer Sharma, 1981. Nothing much is known on the habits and biology of the species. The species is endemic to the coastal areas of Porbandar district in Gujarat state (Figure 4.25b).

18. Termite-hill Gecko (Figure 4.26a)

Scientific Name	*Hemidactylus triedrus* Dummeril & Bibron, 1836
Family	Gekkonidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Uncommon
Diet	Ants, termites, beetles, crickets and grasshoppers
Activity	Nocturnal
Stratum	Terrestrial
Size	80 mm SVL

Description, Habit and Habitat:

A beautiful, banded gecko. Head large; indistinct lateral skin fold present; dorsum with 16-18 rows of large, convex tubercles; dorsum yellowish olive, with three large brown, saddle-like patches, edged with black; head with yellow stripes from behind eye and across nape; belly unpatterned cream. Inhabits open forests and scrubland. Widespread in the Indian peninsula and also known from Sri Lanka and eastern Pakistan. In Gujarat, the species is known from Kutch and Saurashtra (Figure 4.26b).

19. Indian Fringed-toed Lizard (Figure 4.27a)

Scientific Name	*Acanthodactylus cantoris* Gunther, 1864
Family	Lacertidae
IUCN Status	LR-nt (Lower Risk – Near Threatened)
Local Status	Rare
Diet	Ants, beetles, crickets and grasshoppers
Activity	Diurnal
Stratum	Terrestrial
Size	70 mm SVL

Description, Habit and Habitat:

A lizard from sand dunes and other arid areas with sparse vegetation. Body large, slender, tail long; eyelids movable; lower eyelid translucent; lateral scales small; ventral scales smooth; toes long, fringed; dorsum of adults are reddish brown or grey. A swift moving lizard from dry rocky, sandy or alluvial soil, including sea beaches. It excavates shallow burrows in such habitats. Known from Jammu and Kashmir and north western states of India, as well as Pakistan and Afghanistan. In Gujarat, the species is widely distributed in the arid regions of Kutch and also occurs along the coastal scrubland of Saurashtra (Figure 4.27b).

20. Beddome's Lacerta (Figure 4.28a)

Scientific Name	*Ophisops beddomei* Jerdon, 1870
Family	Lacertidae
IUCN Status	LR-nt (Lower Risk – Near Threatened)
Local Status	Uncommon
Diet	Unknown, presumably small insects
Activity	Diurnal
Stratum	Terrestrial
Size	34 mm SVL

Description, Habit and Habitat:

This is a tiny swift lizard from dry deciduous hill forest or grasslands. Upper head-shields are large, strongly keeled and striated; dorsal scales subequal, rhomboidal, nearly as large as the caudal, in oblique longitudinal series converging towards the vertebral line; 26-32 scales round the middle of the body; males with 8-13 femoral pores; olive brown, golden or greyish above, with a single light coloured streak on each lateral side; below yellowish-white. Widely occurring in north and central India, the range extending up to Baluchistan and in the

west and Madras in south. In Gujarat, the species is reported from Kutch and certain hill forests of central Gujarat (Figure 4.28b).

21. Snake-eyed Lacerta (Figure 4.29a)

Scientific Name	*Ophisops jerdoni* Blyth, 1853
Family	Lacertidae
IUCN Status	DD – Data Deficient
Local Status	Common
Diet	Ants, beetles, caterpillars, grasshoppers, termites and spiders
Activity	Diurnal
Stratum	Terrestrial
Size	45 mm SVL

Description, Habit and Habitat:

An inhabitant of dry, rocky terrain, this lizard avoids sandy habitats. Slender-bodied; head with large scales; limbs well developed; forehead scales rough; dorsal scales smooth or weakly keeled; femoral pores present in both sexes; fringes on toes absent; dorsum brown or olive, darker on the sides; a white or yellow stripe along the side of the head, from eye to base of tail; another from upper lip to base of hindlimbs; belly white. This species is known to bask communally and conceals itself under stones. Known from Punjab, Rajasthan and Gujarat states of western India, and also adjacent regions of Pakistan. Distribution within Gujarat is in open scrublands and grasslands in Kutch and Saurashtra (Figure 4.29b).

22. Small-scaled Lacerta (Figure 4.30a)

Scientific Name	*Ophisops microlepis* Blandford, 1870
Family	Lacertidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Common
Diet	Ants, beetles, caterpillars, grasshoppers, termites and spiders
Activity	Diurnal
Stratum	Terrestrial
Size	65 mm SVL

Description, Habit and Habitat:

A tiny lizard frequenting sandy and moderately rocky ground with low brushwood. Snout elongate, more or less pointed; upper head-shields smooth; dorsal scales rhomboidal, subequal except the outermost rows, in oblique longitudinal series converging towards the vertebral line; 56-66 scales round the body; males with 12-16 femoral pores; olive-greenish

or brownish above; a light dorso-lateral stripe starts from behind the eye and extends up to the base of the tail; ventral side is greenish-white. A widespread species from arid parts India, its distribution in Gujarat is limited to the scrublands of Kutch and Saurashtra (Figure 4.30b).

23. Lined-supple Skink (Figure 4.31a)

Scientific Name	*Lygosoma lineata* Stoliczka, 1872
Family	Scincidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Common
Diet	Ants, beetles, termites and other small insects
Activity	Diurnal
Stratum	Terrestrial
Size	53 mm SVL

Description, Habit and Habitat:

An uncommon semi-fossorial skink, from hilly regions. Small sized skink; body elongate; head indistinct from the body; limbs weaker and each one with four digits only and the outer toe being absent; golden brown above and on the sides, with darker dots forming longitudinal lines; belly lighter. Species is known from central and peninsular hills in India. In Gujarat, the species is known from the central and southern hill forests (Figure 4.31b)

24. Spotted Supple Skink (Figure 4.32a)

Scientific Name	*Lygosoma punctata* Gray, 1845
Family	Scincidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Uncommon
Diet	Ants, beetles, termites and other small insects
Activity	Diurnal
Stratum	Terrestrial and Fossorial
Size	85 mm SVL

Description, Habit and Habitat:

A semi-fossorial, match-stick, thin skink with tiny limbs, it is frequently seen as it scuttles over leaf litter and frequently enters houses. Body elongate; head scarcely distinct from neck; lower eyed with a transparent disc; ear-opening rounded; scale smooth; tail rather thick, rounded, tapering to a narrow point; dorsum bronzy brown, with 4-6 rows of black spots, the lateral one more distinct; abroad cream stripe along the body; belly unpatterned

cream. Relatively common in hills and plains. Widespread in India, also Sri Lanka, Bangladesh and Pakistan. The species is widely distributed in the state of Gujarat (Figure 4.32b).

25. Keeled Grass Skink (Figure 4.33a)

Scientific Name	*Eutropis carinata* Schneider, 1801
Family	Scincidae
IUCN Status	LR-nt (Lower Risk – Near Threatened)
Local Status	Common
Diet	Crickets, caterpillars, beetles, earthworms, other arthropods and small vertebrates
Activity	Diurnal
Stratum	Terrestrial and Fossorial
Size	125 mm SVL

Description, Habit and Habitat:

The commonest skink. Body robust; lower eyelid scaly; dorsal scales with 3-8 keels; ventral scales smooth; dorsum bronzy brown or olive, with a yellow lateral bands; a broad, chocolate brown band on top; belly cream or yellow. Inhabits rainforests, deserts, scrub forests and parks and gardens of cities. Frequently seen basking or foraging in open areas. Widespread in India and Sri Lanka. The species is widely distributed in the state of Gujarat (Figure 4.33b).

26 Bronze Grass Skink (Figure 4.34a)

Scientific Name	*Eutropis macularia* Dummeril & Bibron, 1839
Family	Scincidae
IUCN Status	LR-lc (Lower Risk – Least Concern)
Local Status	Common
Diet	Beetles and grasshoppers
Activity	Diurnal
Stratum	Terrestrial and Fossorial
Size	mm SVL

Description, Habit and Habitat:

A small, forest skink, widespread in the plains and hills of India. Body slender; dorsal scales with 5-9 keels; dorsum bronzy brown, with or without spots, side darker, spotted with white, especially in juveniles and males, brown or grey in females; belly unpatterned cream; breeding males with bright red lips in flanks. Besides India, this species occurs in Sri Lanka,

Pakistan, Nepal, Bangladesh, Bhutan to mainland South-east Asia. The species is also widely distributed in the state of Gujarat (Figure 4.34b).

27. Hardwicke's Spiny-tailed Lizard (Figure 4.34a)

Scientific Name	*Uromastyx hardwickii* Gray, 1827
Family	Uromastycidae
IUCN Status	VU – Vulnerable
Local Status	Locally Common
Diet	Variety of xerophytes and insects
Activity	Diurnal
Stratum	Terrestrial and Fossorial
Size	175 mm SVL

Description, Habit and Habitat:

A heavy-tailed lizard. Body depressed, lacking a crest and throat sac; tail thick at base, short, depressed, covered with large, spinose scales; dorsum yellowish brown; belly cream. Inhabits deserts and scrub forests. Distributed in western India, including Gujarat and Rajasthan, also eastern Pakistan. A large numbers are caught for its valuable fat. In Gujarat, the species occurs in the both Little as well as Greater Rann of Kutch (Figure 4.35b).

28. Bengal Monitor Lizard (Figure 4.36a)

Scientific Name	*Varanus bengalensis* Gunther, 1864
Family	Varanidae
IUCN Status	VU – Vulnerable
Local Status	Common
Diet	Variety of insects and spiders, snails, crabs, frogs, small mammals, birds, lizards and snakes
Activity	Diurnal
Stratum	Terrestrial and Semi-arboreal
Size	580 mm SVL

Description, Habit and Habitat:

A medium-sized Monitor; snout somewhat elongated; nostrils nearer the eye than the snout-tip; nostril an oblique slit; nuchal scale rounded; crown scales larger than nuchal scales; mid-ventral scales smooth; tail flattened; snout unpatterned; belly cream lacking dark vertical 'V' shaped marks extending through sides of belly. Inhabits a variety of habitats, from semi-desert and scrub to evergreen forest and plantations. Widespread in India; the range of species extends from Afghanistan to Myanmar and includes Pakistan, Sri Lanka, Bangaldesh and Nepal. In Gujarat, the species occurs uniformly throughout the state (Figure 4.36b).

29. Desert Monitor Lizard (Figure 4.37a)

Scientific Name	*Varanus griseus* Daudin, 1803
Family	Varanidae
IUCN Status	VU – Vulnerable
Local Status	Rare
Diet	Beetles, lizards, small rodents, birds, snakes and eggs of bird and reptiles
Activity	Diurnal
Stratum	Terrestrial
Size	525 mm SVL

Description, Habit and Habitat:

A medium-sized species of monitor from deserts and other arid region. Snout depressed; nostril an oblique slit, nearer to eye than tip of snout; nuchal scale conical; crown scales larger than nuchal scales; ventral scales smooth; tail rounded or only slightly compressed; dorsum brown, snout lacking black bars; belly yellow. Inhabits deserts, semi-deserts and scrub forests. Distributed over the north-western part of India, including Rajasthan state. The range of species extends from the Middle East, through Pakistan, to north-western India. In Gujarat, the species occurs in arid regions of north Gujarat and Kutch (Figure 4.37b).


Figure 4.5a


Figure 4.5b


Figure 4.6a

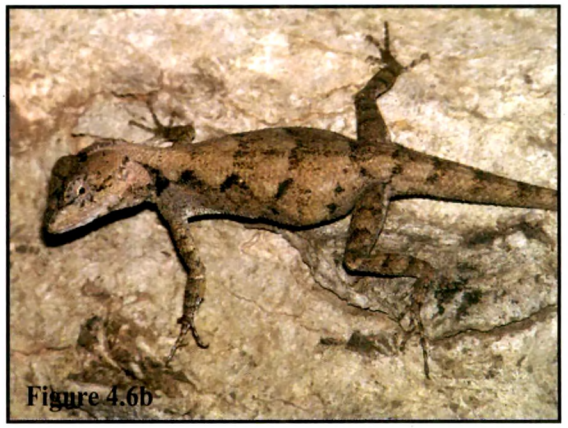


Figure 4.6b

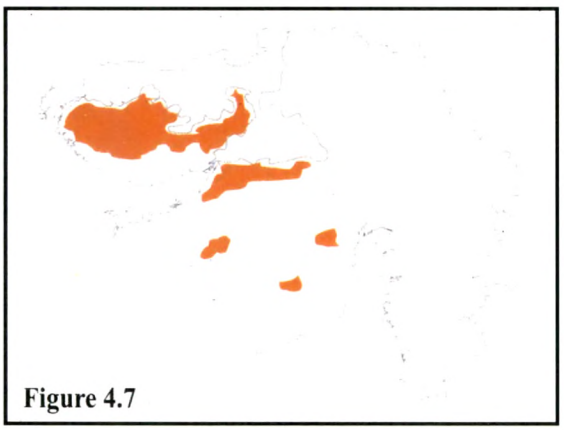


Figure 4.7


Figure 4.8

Fig 4.5a – *Brachysaura minor* (Juvenile)

Fig 4.5b – *Brachysaura minor* (Adult)

Fig 4.6a – *Calotes rouxii* (Juvenile)

Fig 4.6b – *Calotes rouxii* (Adult)

Fig 4.7 – Distribution of *Brachysaura minor*

Fig 4.8 – Distribution of *Calotes rouxii*

Figure 4.9a

Figure 4.9b

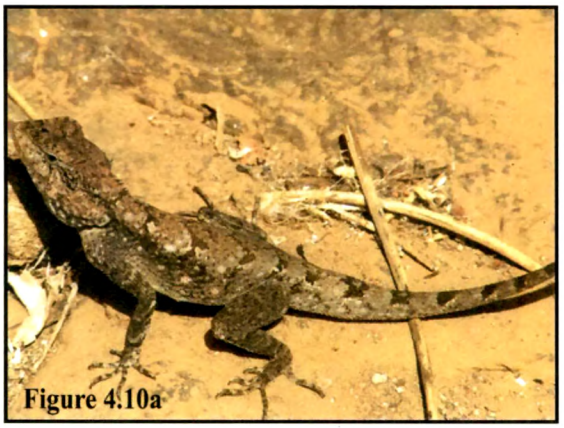


Figure 4.10a

Figure 4.10b

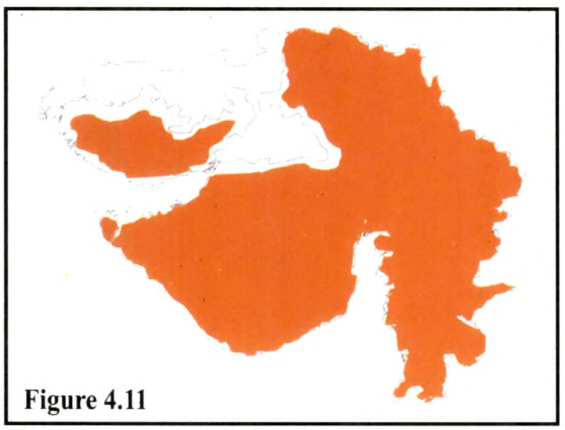


Figure 4.11

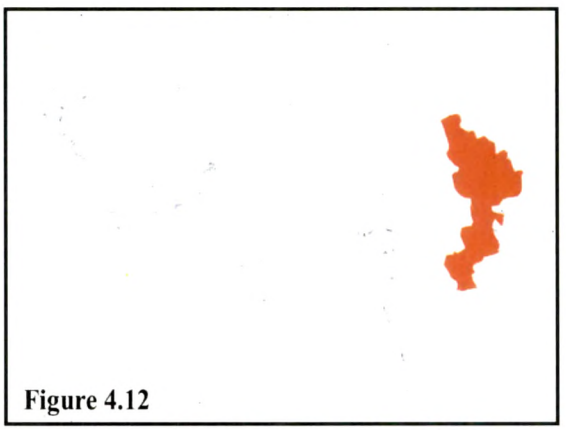


Figure 4.12

Fig 4.9a – *Calotes versicolor* (Juvenile)

Fig 4.9b – *Calotes versicolor* (Adult)

Fig 4.10a – *Psammophilus blandfordanus* (Adult male – Non breeding)

Fig 4.10b – *Psammophilus blandfordanus* (Adult male – Breeding)

Fig 4.11 – Distribution of *Calotes versicolor*

Fig 4.12 – Distribution of *Psammophilus blandfordanus*

Figure 4.13a

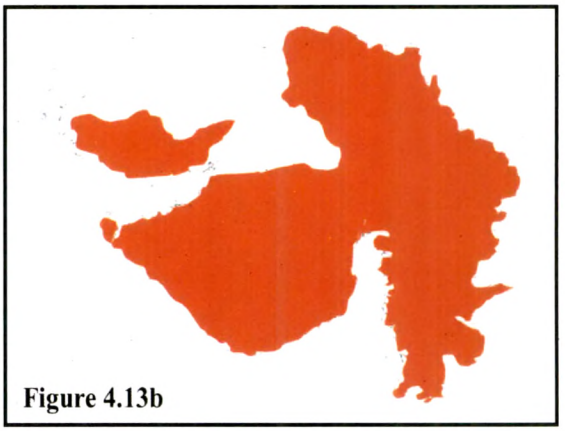


Figure 4.13b

Figure 4.14a

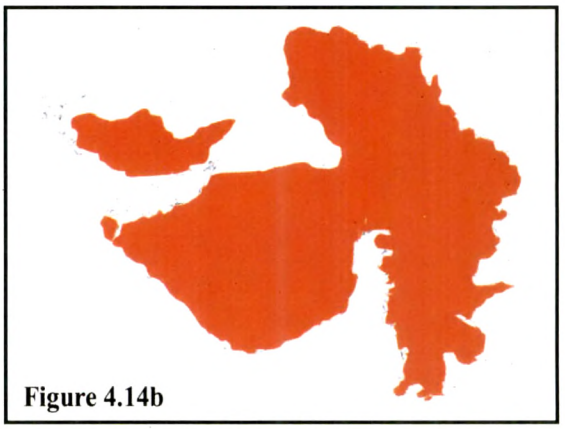


Figure 4.14b

Figure 4.15a

Figure 4.15b

Fig 4.13a – *Sitana ponticeriana*

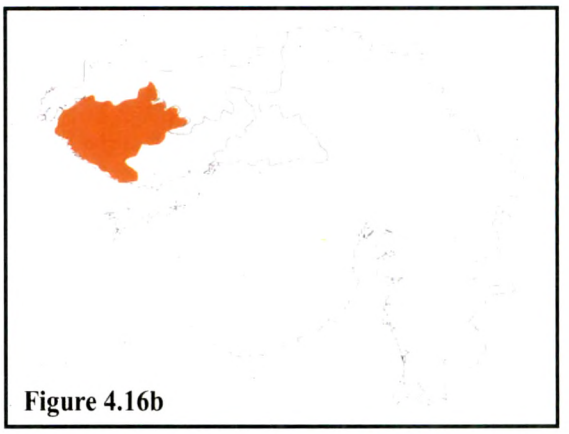
Fig 4.14a – *Chamaeleo zeylanicus*

Fig 4.15a – *Eublepharis fuscus*

Fig 4.13b – Distribution of *Sitana ponticeriana*

Fig 4.10b – Distribution of *Chamaeleo zeylanicus*

Fig 4.15b – Distribution of *Eublepharis fuscus*



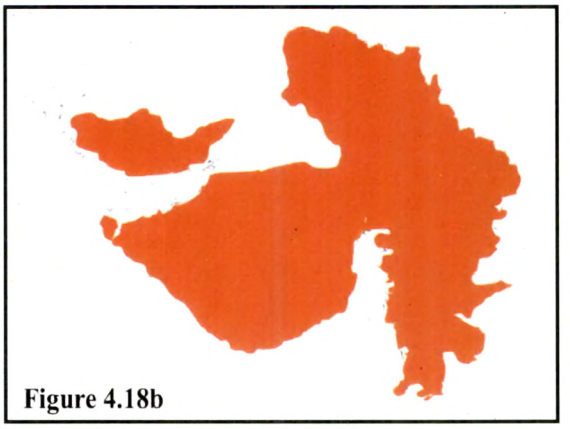


Fig 4.16a – *Cyrtopodion kachhensis*

Fig 4.17a – *Geckoella collegalensis*

Fig 4.18a – *Hemidactylus brookii*

Fig 4.16b – Distribution of *Cyrtopodion kachhensis*

Fig 4.17b – Distribution of *Geckoella collegalensis*

Fig 4.18b – Distribution of *Hemidactylus brookii*


Figure 4.19a

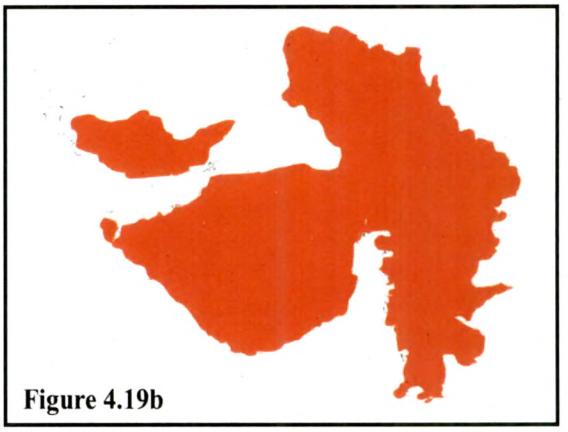


Figure 4.19b


Figure 4.20a


Figure 4.20b


Figure 4.21a


Figure 4.21b

Fig 4.19a *Hemidactylus flaviviridis*

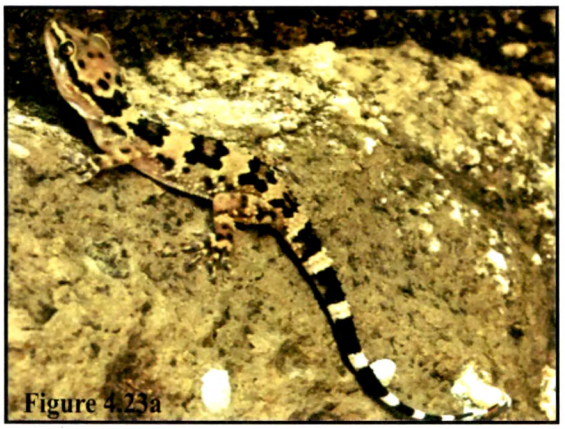
Fig 4.20a *Hemidactylus frenatus*

Fig 4.21a *Hemidactylus gujaratensis*

Fig 4.19b Distribution of *Hemidactylus flaviviridis*

Fig 4.20b Distribution of *Hemidactylus frenatus*

Fig 4.21b Distribution of *Hemidactylus gujaratensis*



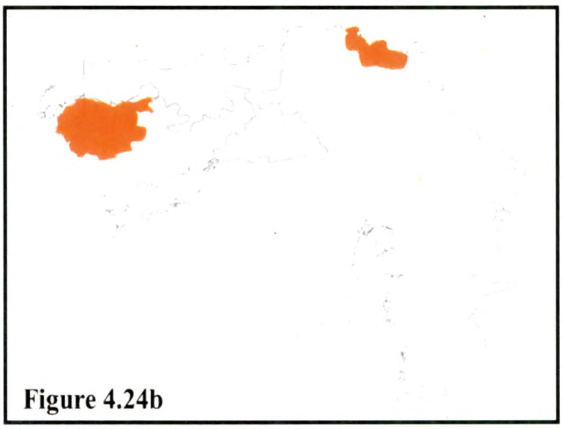


Fig 4.22a *Hemidactylus leschenaultii*

Fig 4.23a *Hemidactylus maculatus*

Fig 4.24a *Hemidactylus persicus*

Fig 4.22b Distribution of *Hemidactylus leschenaultii*

Fig 4.23b Distribution of *Hemidactylus maculatus*

Fig 4.24b Distribution of *Hemidactylus persicus*

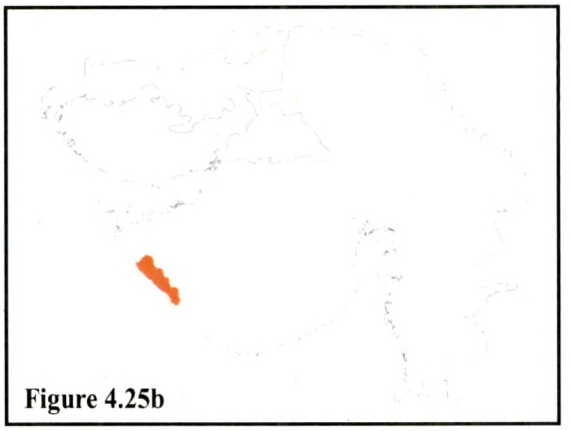


Fig 4.25a *Hemidactylus porbandarensis*

Fig 4.26a *Hemidactylus triedrus*

Fig 4.25b Distribution of *Hemidactylus porbandarensis*

Fig 4.26b Distribution of *Hemidactylus triedrus*

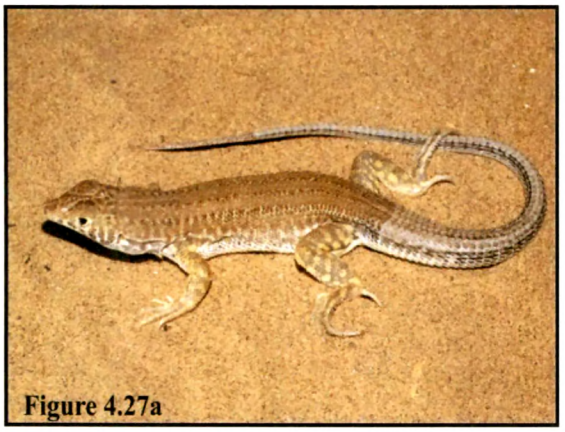


Figure 4.27a

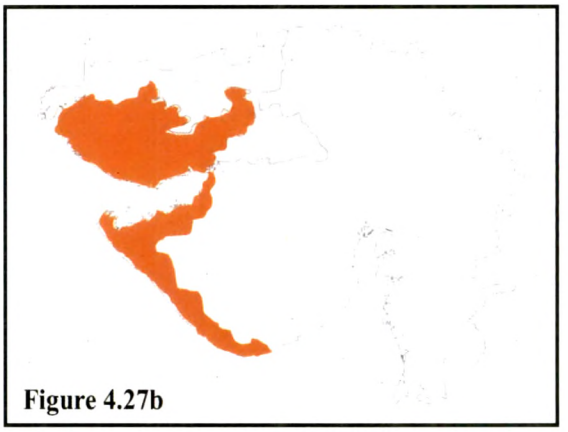


Figure 4.27b


Figure 4.28a

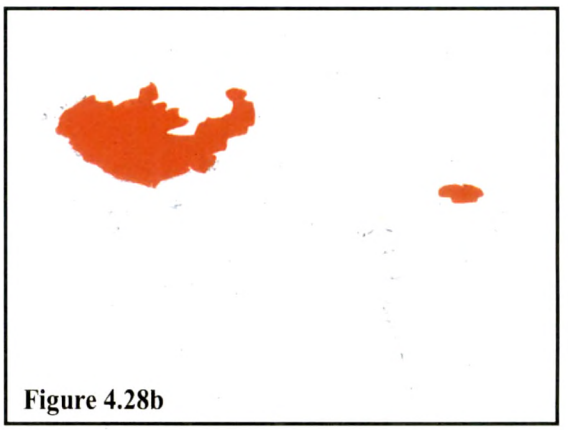


Figure 4.28b


Figure 4.29a

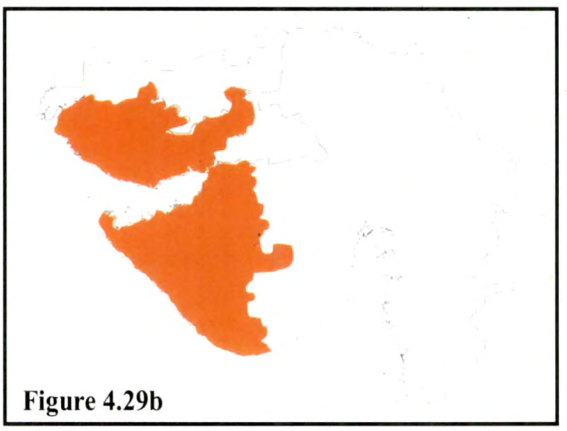


Figure 4.29b

Fig 4.27a *Acanthodactylus cantoris*

Fig 4.28a *Ophisops beddomei*

Fig 4.29a *Ohpisops jerdoni*

Fig 4.27b Distribution of *Acanthodactylus cantoris*

Fig 4.28b Distribution of *Ophisops beddomei*

Fig 4.29b Distribution of *Ohpisops jerdoni*


Figure 4.30a

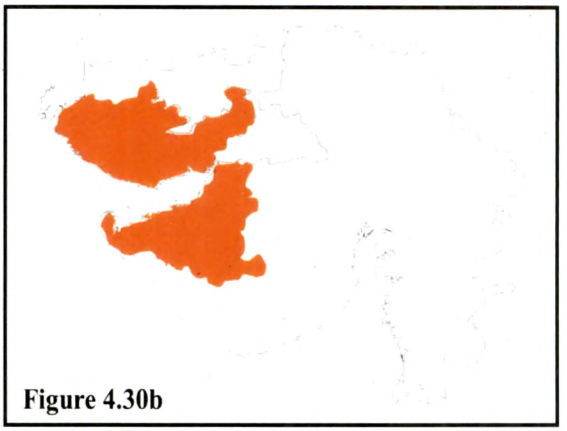


Figure 4.30b


Figure 4.31a

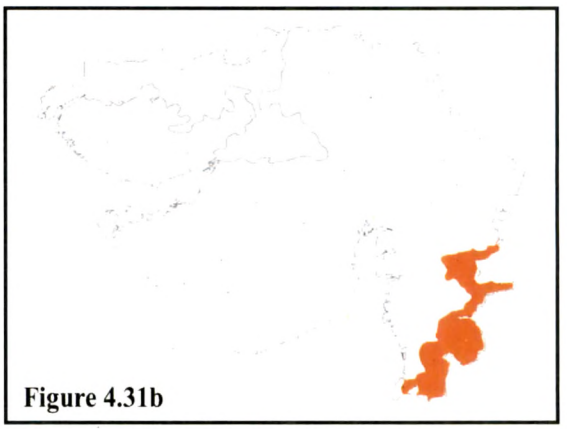


Figure 4.31b


Figure 4.32a

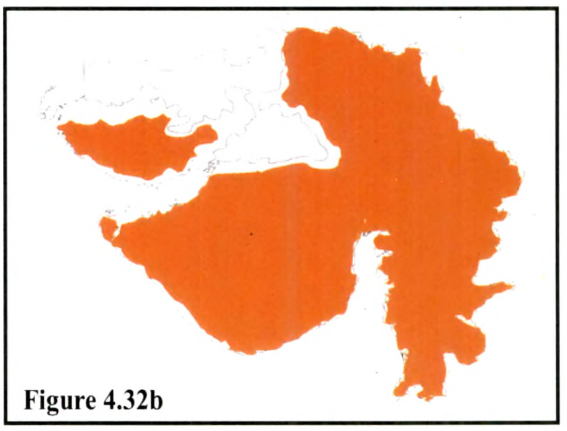


Figure 4.32b

Fig 4.30a *Ophisops microlepis*

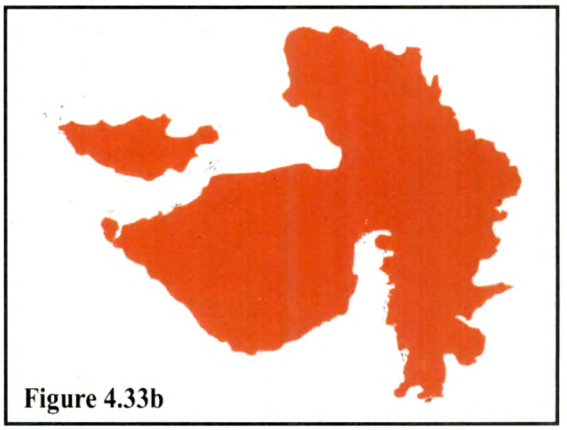
Fig 4.30b Distribution of *Ophisops microlepis*

Fig 4.31a *Lygosoma lineata*

Fig 4.31b Distribution of *Lygosoma lineata*

Fig 4.32a *Lygosoma punctata*

Fig 4.32b Distribution of *Lygosoma punctata*



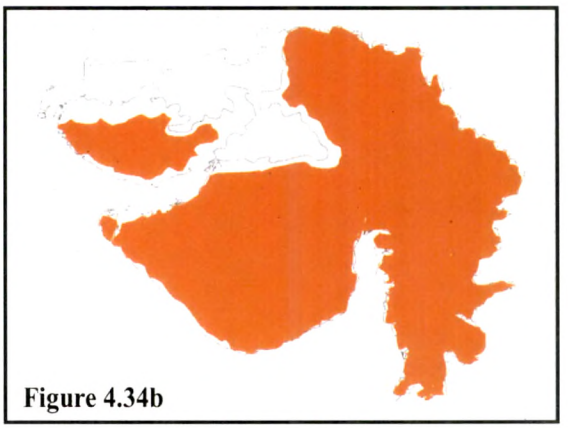


Fig 4.33a *Eutropis carinata*

Fig 4.33b Distribution of *Eutropis carinata*

Fig 4.34a *Eutropis macularia*

Fig 4.34b Distribution of *Eutropis macularia*


Figure 4.35a


Figure 4.35b

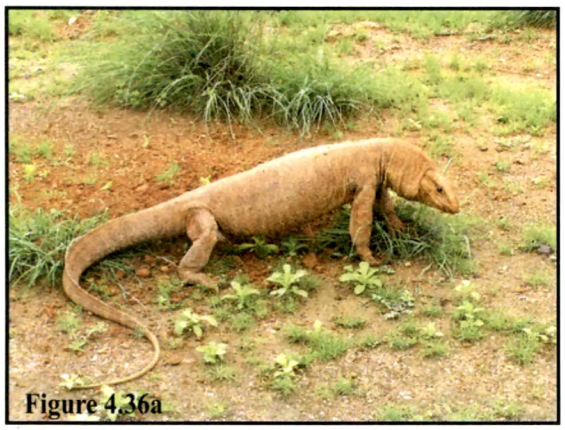


Figure 4.36a

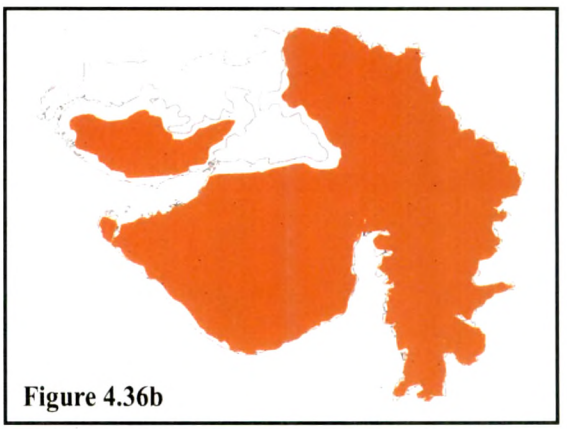


Figure 4.36b


Figure 4.37a

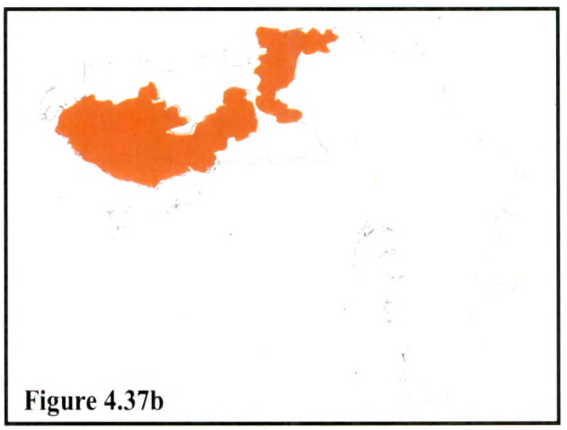


Figure 4.37b

Fig 4.35a *Uromastyx hardwickii*

Fig 4.35b Distribution of *Uromastyx hardwickii*

Fig 4.36a *Varanus bengalensis*

Fig 4.36b Distribution of *Varanus bengalensis*

Fig 4.37a *Varanus griseus*

Fig 4.37b Distribution of *Varanus griseus*