

Reptiles of Gujarat, India: Updated Checklist, Distribution, and Conservation Status

Harshil Patel^{1,*} and Raju Vyas²

Abstract. We present a revised checklist of reptiles inhabiting Gujarat, based on historical records and incorporating those from recent fieldwork. A total of 107 reptile species from 62 genera in 23 families was recorded. In addition, records for 23 species of reptiles dubiously or erroneously reported in the literature are discussed and recommended for removal from the Gujarat reptile list. Conservation status, threats, and endemism of recorded species are also discussed.

Keywords. Squamata, Crocodylia, Chelonia, Diversity, Distribution, Endemic, Western India

Introduction

The westernmost state of India, Gujarat (ca. 20.21–24.80°N to 68.16–74.76°E), is one of the most biodiverse regions of the country. The political boundaries encompass a uniquely diverse geographical region that comprises a variety of habitat types, ranging from moist deciduous forests to deserts, and from freshwater wetlands to saline gulfs with mudflats and mangroves. Additionally, most of the major mountain ranges of Peninsular India, such as the Aravalli, Vindhya, and Satpura Ranges, as well as the Western Ghats (Sahyadri), have a terminus in Gujarat, and this, along with other different habitats, creates conditions that support a unique and diverse fauna (Vyas, 2007; Giri et al., 2009; Mirza et al., 2016). Studies on the reptile fauna of Gujarat are comparatively better than those on amphibians, fishes, or invertebrates, but they have lagged behind the progress made on the faunas of birds and mammals (Vyas, 2000a).

Our knowledge of Gujarat reptiles traces back to the 1870s (Stoliczka, 1872; Murray, 1886; Gleadow, 1887; McCann, 1938; Acharya, 1949; Kapadia, 1951; Daniel and Shull, 1963; Sharma, 1982, 2000; Gayen, 1999;

Vyas, 1993, 1998, 2000a, 2007; Patel et al., 2018). However, a majority of these studies were restricted to selected regions of Gujarat and, with few exceptions (Vyas, 2000a, 2007), did not present the reptile fauna for the entire state (Vyas, 2000a). In recent years, several new species have been described and new records published, resulting in a rapid increase in the number of reptiles reported for the state (Vyas, 2000b, 2003, 2004a, 2005, 2017; Vyas and Desai, 2010; Vyas and Patel, 2007, 2013; Vyas and Prajapati, 2012; Vyas and Upadhyay, 2008; Vyas et al., 2006, 2011, 2017; Giri et al., 2009; Patel et al., 2015, 2016; Sharma and Jani, 2015; Mirza et al., 2016, 2018; Joshi et al., 2017; Agarwal et al., 2018). In contrast, some species have been listed as present in Gujarat based on historical records. The combination of new information and old records, some with questionable validity, prompted our reappraisal of Gujarat's reptilian fauna. Here, we provide a list of all reptile species that we have either documented ourselves or that we consider as having been reliably reported in the literature. We also advocate removal of some species dubiously or erroneously reported from Gujarat, pending reliable, correctly identified vouchers.

Study Area

The area of Gujarat State comprises 196,024 km², of which 14,757 km² is covered by forest (FSI, 2017). According to Champion and Seth (1968), the forests of Gujarat are divided into four major types, including 3B – south Indian moist deciduous forest; 4B – swamp forest; 5A – southern tropical dry deciduous forest; and 6B – northern tropical thorn forest. Gujarat has a very

¹ Department of Biosciences, Veer Narmad South Gujarat University, Surat 365007, Gujarat, India.

² 1 - Shashwat Apartment, 23 Anandnagar Society, BPC Road, Alkapuri, Vadodara 390007, Gujarat, India.

* Corresponding author. E-mail: harshilpatel121@gmail.com

strategic location from a biogeographic point of view, as it covers four biogeographic zones of India and 40% of the total biogeographic diversity is represented in this state (Rodgers et al., 2002). The state is administratively divided into 33 districts. For ease of understanding, we have divided the state into five geographical units, based on climatic variation, geology, forest types, soil, and drainage patterns (Figs. 1 and 2). These include (1) South Gujarat: This region is an extension of the northern end of the Western Ghats and can be divided into coastal plains and hilly moist deciduous forest. (2) Central Gujarat: This area is an extension of the western Satpura and Vindhya Ranges (Malwa Plateau) along with some central plains, featuring dry deciduous forest. It receives the drainage water of major rivers, such as the Narmada and Mahi. (3) North Gujarat: This region is an extension of the Aravalli Hills, with a mix of dry deciduous, *Prosopis*, and thorny scrub arid forest. (4) Saurashtra: This unit has the longest coastline of the five regions, and it includes two coastal gulfs with good mangrove forests. It also comprises large forest blocks of dry deciduous and thorny scrub forests alongside of grasslands. (5) Kutch: This is an area with large undulating hills area with scant rain, as well as dry arid

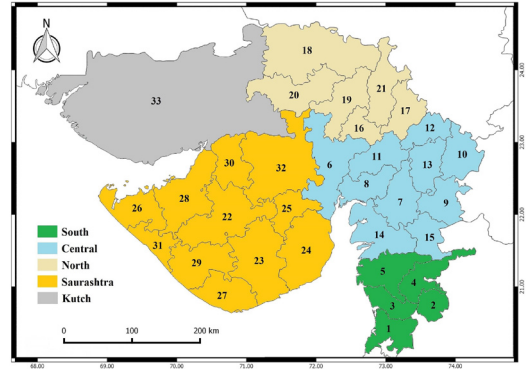


Figure 1. Administrative map of Gujarat State, India. Numbered areas correspond to administrative districts, which are as follows: Valsad (1), Dang (2), Navsari (3), Tapi (4), Surat (5), Ahmedabad (6), Vadodara (7), Anand (8), Chhota Udaipur (9), Dahod (10), Kheda (11), Mahisagar (12), Panchmahal (13), Bharuch (14), Narmada (15), Gandhinagar (16), Aravalli (17), Banaskantha (18), Mehsana (19), Patan (20), Sabarkantha (21), Rajkot (22), Amreli (23), Bhavnagar (24), Botad (25), Devbhoomi Dwarka (26), Gir Somnath (27), Jamnagar (28), Junagadh (29), Morbi (30), Porbandar (31), Surendranagar (32), Kachchh (33). The districts are in turn grouped by the indicated colours into the state's five geographic units.

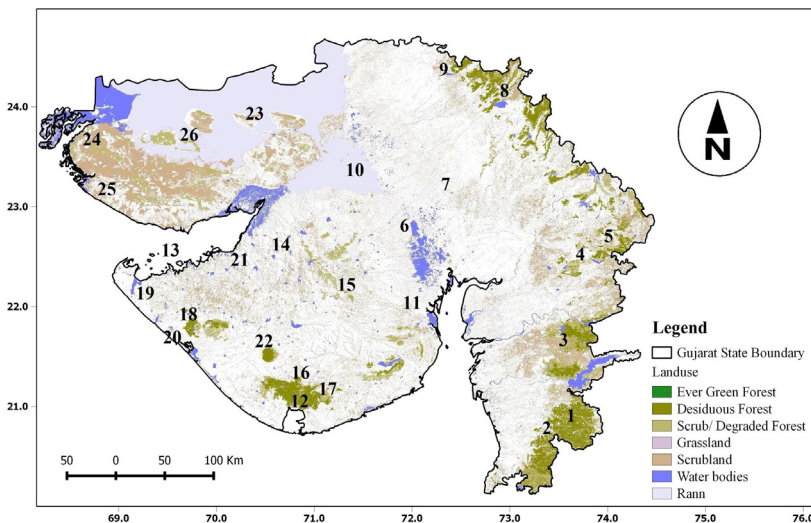


Figure 2. Geographical map of Gujarat State, India. Vegetation cover is indicated by colours, as described in the legend. Numbered areas correspond to Protected Areas [abbreviations include Wildlife Sanctuary (WS) and National Park (NP)], which are as follows: Purna WS (1), Vansada NP (2), Shoolpaneswar WS (3), Jambughoda WS (4), Ratanmahal WS (5), Nalsarowar WS (6), Thol WS (7), Balaram-Ambaji WS (8), Jassore WS (9), Wild Ass WS (10), Valavader NP (11), Gir NP & WS (12), Marine NP & WS (13), Rampara WS (14), Hingolghadh WS (15), Pania WS (16), Mitiyal WS (17), Barda WS (18), Gaga Bustard WS (19), Porbander Bird WS (20), Khijadiya WS (21), Girnar WS (22), Kutch Desert WS (23), Naryan Sarover WS (24), Kutch Bustard WS (25), Chhari-Dhandh WS (26).

and grasslands areas. It is bordered by the Greater and Little Rann of Kachchh¹.

The climate of Gujarat is tropical with three distinct seasons, namely the monsoon (mid-June–October), winter (October–February), and summer (March–mid-June). The southwest monsoon is irregular and erratic. The maximum rain is experienced during July, with occasional showers during November–January and March–May. The average rainfall varies between regions and ranges from 2800 mm in some areas of South Gujarat to as low as 400 mm in Kutch. Temperatures begin to increase beginning in the second half of February. May is the hottest month of the year, with mean daily maximum temperatures reaching > 45°C in Kutch, North Gujarat, and regions of Saurashtra. December is the coldest month of the year with a mean daily maximum temperature near 25°C and a mean minimum of < 10°C. Due to the passage of extratropical storms known as Western Disturbances across northern India during the cold season, spells of colder weather occur and the minimum temperature sometimes drops to about 2°C. The relative humidity is comparatively high in the monsoon season (data derived from the Indian Meteorological Department website, <http://www.imd.gov.in>).

Material and Methods

The present survey includes the scientific literature up to April 2018 and the results from several field surveys in the different regions and territorial extensions of Gujarat conducted from 2012–2017. One of us (RV) has been actively surveying the reptilian fauna of the state for the past three decades. During field surveys, the study area was divided into various regions, and each region was explored on the basis of habitat types and the level of species diversity following Vyas (2004b). Many different techniques, including visual encounter surveys (VESs), pitfall traps, opportunistic collection, and nocturnal road cruising, were employed for data collection. Species encountered were collected,

examined, and photographed in the field and released in the same area, except for selected vouchers to allow further study. All species were carefully identified using diagnostic keys and the available literature (e.g., Smith, 1931, 1935, 1943; Whitaker and Captain, 2004; Lajmi et al., 2016). Nomenclature follows the most recent taxonomic advances (e.g., Deepak et al., 2016; Lajmi et al., 2016; Agarwal et al., 2018; Mirza and Patel, 2018; Purkayastha et al., 2018; Takeuchi et al., 2018; Uetz et al., 2018). Taxa whose identity remains unresolved at the species level are listed with the notation “cf.” before the species name, indicating similarity. The global threat assessment level for each species was obtained from the International Union for Conservation of Nature *Red List* (IUCN, 2018), except for the putative new species. We used the five different regions as defined above for our species listings (for details refer to Fig. 1).

Results

A total of 107 reptile species, belonging to 62 genera and 23 families, were identified for Gujarat (Table 1). We report one non-native species (*Trachemys scripta*) from the state, and as an invasive we did not include it in Table 1. We recorded one species of crocodile (Crocodylidae), nine species of chelonians belonging to five families, 43 species of lizards belonging to seven families, and 54 species of snakes belonging to ten families. Among the chelonians, Cheloniidae (three species) had the highest diversity, followed by Geoemydidae (two species) and Trionychidae (two species). Dermochelyidae and Testudinidae were represented by a single species each. Among lizards, the highest diversity was observed for Gekkonidae (16 species), followed by Scincidae (11 species), Agamidae (seven species), Lacertidae (five species), and Varanidae (two species). Species of Eublepharidae, and Chamaeleonidae also contribute to the species diversity, with each represented by a single species. Snakes were represented by Elapidae (14 species), Viperidae (three species), Typhlopidae (three species), Homalopsidae (two species), Lamprophiidae (two species), Erycidae (two species), Uropeltidae (two species), Pythonidae (one species), Acrochordidae (one species), and Colubridae (24 species), the latter with the highest diversity among snakes.

South Gujarat (75 species) was found to have the highest reptilian diversity among the five regions, followed by Saurashtra (74 species), Central Gujarat (71 species), Kutch (52 species), and North Gujarat (51 species) (Figs. 3, 4). Crocodylians were represented by *Crocodylus palustris*, which was reported from all five

¹ Rann means “desert” in the local language, and Kachchh is the local spelling for Kutch. Kutch includes two salt marsh regions, known as LRK (Little Rann of Kachchh) and GRK (Greater Rann of Kachchh), that form its boundaries on the northern and eastern sides. Rann and Kachchh are local terms now accepted in English similar to Cerrado (grassland) and Pampas (plains) in South America

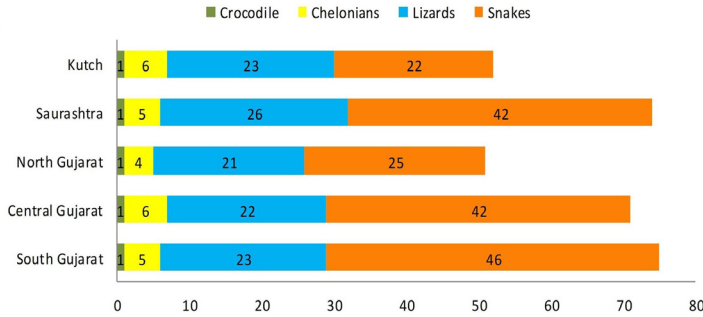


Figure 3. Graph illustrating the species composition in the five major regions of Gujarat.

regions. Among chelonians, the family Dermochelyidae was represented by a single species, *Dermochelys coriacea*, reported from Kutch (in the Gulf of Kutch). The highest diversity of turtles was found in Central Gujarat and Kutch, each with six species. Saurashtra had the highest lizard diversity (26 species) and South Gujarat

accounted for the highest number of snake species (46 species). The family Uropeltidae was reported only from South Gujarat. Gujarat has one endemic genus, the colubrid snake genus *Wallaceophis*, and three endemic species (Fig. 5), including *Hemidactylus gujaratensis* (Gekkonidae), *Ophisops kutchensis* (Lacertidae), and *Wallaceophis gujaratensis* (Colubridae). *Hemidactylus gujaratensis* a spot endemic species from Saurashtra, while *Ophisops kutchensis* occurs in parts of Kutch and Saurashtra. *Wallaceophis gujaratensis* is known from Saurashtra and Central Gujarat.

According to their IUCN status, 72 species (68%) are considered to be of Least Concern (LC), 20 (19%) are listed as Not Evaluated (NE), six (5%) as Vulnerable (VU), five (5%) as Data Deficient (DD), two (2%) as Critically Endangered (CR), and one (1%) as Endangered (EN) (Fig. 6).

Species occurrences need to be verified

We also determined that 23 species belonging to nine families reported in the literature were based on dubious or erroneous records, including historical reports, and need to be corrected.

Turtles.—In his account of reptiles of Kutch, McCann (1938:425) stated that “according to Captain V.C. Steer-Webster *Caretta caretta* comes ashore at Mandvi to breed.” However, there are no reports other than this of *C. caretta* from Gujarat, and without any supporting evidence or a voucher specimen the record of this species cannot be verified and should be removed from the state’s list of reptiles. Sharma (2000) reported *Geoclemys hamiltonii* and *Hardella thurjii* from South and North Gujarat, respectively, without any specimen vouchers or specific locality details but others (Vyas, 2000a, 2007; Patel et al., 2018) did not report these

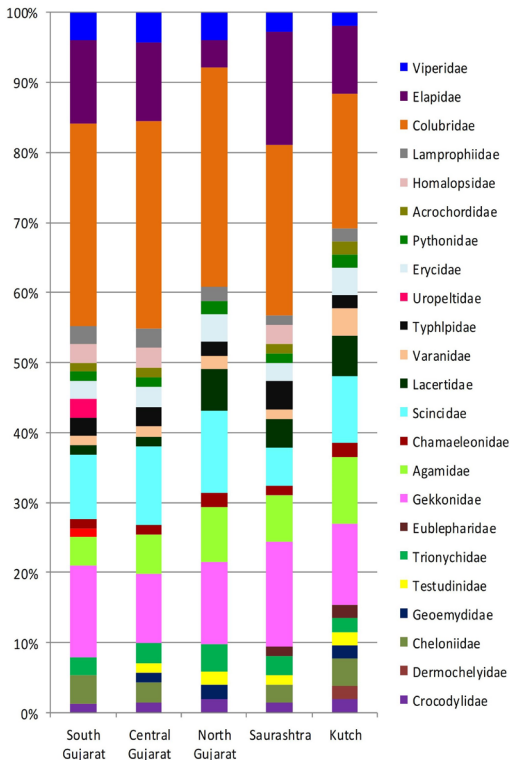


Figure 4. Bar graph showing the reptilian families represented in each of the five major regions of Gujarat State, India.

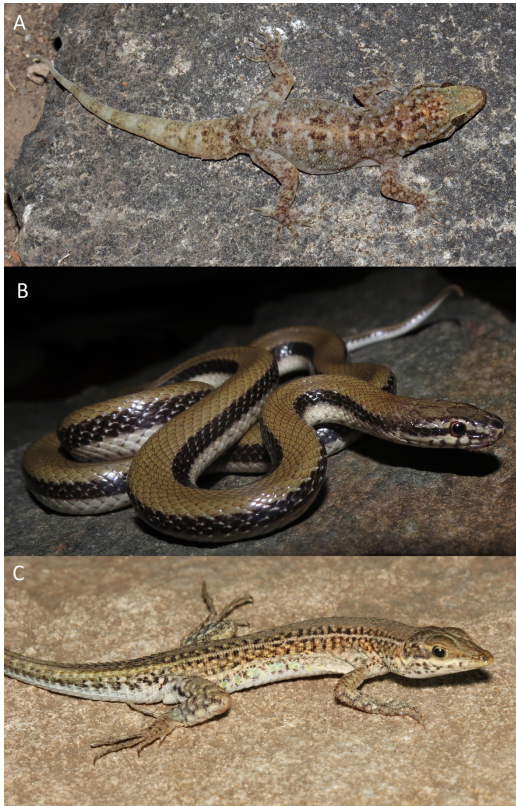


Figure 5. Endemic reptiles of Gujarat State, India. (A) *Hemidactylus gujaratensis* from Mt. Girnar, Junagadh. (B) *Wallaceophis gujaratensis* from Viramgam, Ahmedabad. (C) *Ophisops kutchensis* from Dwarka. Photos by Harshil Patel.

species. As a consequence, we consider both records dubious. *Melanochelys trijuga* was reported to occur in forests of Dangs, South Gujarat (Daniel and Shull, 1963; Vyas and Patel, 1990), but more recently this species has become regionally extinct in Gujarat (Vyas, 2007; Patel et al., 2018). Two turtles, *Nilssononia leithii* and *Pangshura tentoria*, were historically reported from South Gujarat (Bhatt, 1989; Frazier and Das, 1994). However, neither species has been reported since then, and vouchers would be needed to confirm their continued existence in the state.

Lizards.—Vyas (2000a) included *Eumeces schneideri* in the list of reptiles of Gujarat and erroneously cited Stoliczka (1872) as the author reporting it from Kutch. While the habitat in Kutch is suitable for the species, a reliable, recent report is lacking. Datta-Roy et al. (2014) mentioned the existence of a Gujarat specimen

of *Lygosoma vosmaeri* in the collection of the Bombay Natural History Society (BNHS), Mumbai. We inquired about the specimen (BNHS 1975) in question and learned that the locality of its collection is actually unknown (Saunak Pal, pers. comm.). As a consequence, this species should not be included among the reptiles of Gujarat. Auffenberg et al. (1989) suggested a probable distribution of *Varanus flavescens* in Gujarat based on habitat suitability, but there are no confirmed records for the species in the state. Kumar (2009) reported *Varanus salvator* from Nalsarovar, but this species occurs only in parts of northeastern India and on the Andaman and Nicobar Islands (Uetz et al., 2018).

Snakes.—Sharma (2007) included Gujarat in the range of *Myriopholis blanfordi* without any further information. The region of Kutch is suitable for this species but a reliable report is lacking. *Uropeltis ocellata* was reported from the Narmada Valley by Naik et al. (1993) without any voucher. We believe this to be an error because *U. ocellata* is a localized endemic in southern India. In the past, a brown morph of *Ahaetulla nasuta* was erroneously identified as *A. pulverulenta* (Vyas, 1988), so *A. pulverulenta* is not confirmed for Gujarat. Naoroji and Monga (1983) reported *Atrretium schistosum* without further evidence as a prey item of the serpent eagle, *Spilornis cheela*, in Rajpipla, Gujarat. The article lacked additional details on the snakes

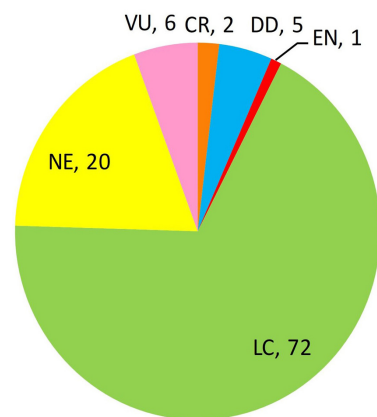


Figure 6. Pie chart illustrating the IUCN conservation status of reptiles of Gujarat, India. Integers indicate the percentage of Gujarat reptiles with the displayed status. Abbreviations include Not Evaluated (NE), Least Concern (LC), Data Deficient (DD), Vulnerable (VU), Endangered (EN), and Critically Endangered (CE).

Table 1. Systematic list of Reptiles of Gujarat State, India with indication of their regional distribution. Abbreviations include SG – South Gujarat, CG – Central Gujarat, NG – North Gujarat, SAU – Saurashtra, and KU – Kutch. An asterisk (*) indicates a species endemic to Gujarat. Species present in each region are denoted using the letter ‘P’.

Sr No	Species	IUCN status	SG	CG	NG	SAU	KU
Turtles							
Family: Geoemydidae							
1	<i>Batagur baska</i> (Gray, 1831)	CR					P
2	<i>Pangshura tecta</i> (Gray, 1831)	LC		P	P		
Family: Testudinidae							
3	<i>Geochelone elegans</i> (Schoepff, 1795)	VU		P	P	P	P
Family: Trionychidae							
4	<i>Lissemys punctata</i> (Bonnaterre, 1789)	LC	P	P	P	P	P
5	<i>Nilssonina gangetica</i> (Cuvier, 1825)	VU	P	P	P	P	
Family: Cheloniidae							
6	<i>Chelonia mydas</i> (Linnaeus, 1758)	EN	P	P		P	P
7	<i>Eretmochelys imbricata</i> (Linnaeus, 1766)	CR	P				
8	<i>Lepidochelys olivacea</i> (Eschscholtz, 1829)	VU	P	P		P	P
Family: Dermochelyidae							
9	<i>Dermochelys coriacea</i> (Vandelli, 1761)	VU					P
Lizards							
Family: Agamidae							
10	<i>Calotes minor</i> (Hardwicke & Gray, 1827)	DD		P	P	P	P
11	<i>Calotes versicolor</i> (Daudin, 1802)	LC	P	P	P	P	P
12	<i>Monilestheris rouxii</i> (Duméril & Bibron, 1837)	LC	P				
13	<i>Psammophilus blanfordanus</i> (Stoliczka, 1871)	LC		P			
14	<i>Saara hardwickii</i> (Gray, 1827)	NE				P	P
15	<i>Sitana spinaecephalus</i> Deepak et al., 2016	LC	P	P	P	P	P
16	<i>Trapelus agilis</i> (Olivier, 1807)	NE			P	P	P
Family: Chamaeleonidae							
17	<i>Chamaeleo zeylanicus</i> Laurenti, 1768	LC	P	P	P	P	P
Family: Gekkonidae							
18	<i>Cyrtodactylus deccanensis</i> (Günther, 1864)	LC	P				
19	<i>Cyrtopodion kachhense</i> (Stoliczka, 1872)	NE				P	P
20	<i>Cyrtopodion scabrum</i> (Heyden, 1827)	LC			P	P	P
21	<i>Cyrtopodion</i> sp.			P			
22	<i>Cyrtodactylus varadgirii</i> Agarwal et al., 2016	NE	P	P		P	
23	<i>Hemidactylus flaviviridis</i> Rüppell, 1835	LC	P	P	P	P	P
24	<i>Hemidactylus frenatus</i> Duméril & Bibron, 1836	LC	P			P	
25	<i>Hemidactylus</i> cf. <i>gleadowi</i> Murray, 1884	NE	P	P	P	P	P
26	<i>Hemidactylus gracilis</i> Blanford, 1870	LC	P				
27	<i>Hemidactylus gujaratensis</i> * Giri et al., 2009	VU				P	
28	<i>Hemidactylus leschenaultii</i> Duméril & Bibron, 1836	LC	P	P	P	P	P
29	<i>Hemidactylus maculatus</i> Duméril & Bibron, 1836	LC	P				
30	<i>Hemidactylus murrayi</i> Gleadow, 1887	NE	P	P		P	
31	<i>Hemidactylus persicus</i> Anderson, 1872	LC			P		

Table 1. Continued.

Sr No	Species	IUCN status	SG	CG	NG	SAU	KU
32	<i>Hemidactylus robustus</i> Heyden, 1827	NE				P	
33	<i>Hemidactylus sahgali</i> Mirza et al., 2018	LC	P	P	P	P	P
	Family: Eublepharidae						
34	<i>Eublepharis fuscus</i> Börner, 1974	LC				P	P
	Family: Lacertidae						
35	<i>Acanthodactylus cantoris</i> Günther, 1864	NE			P	P	P
36	<i>Ophisops beddomei</i> (Jerdon, 1870)	LC	P	P			
37	<i>Ophisops jerdonii</i> Blyth, 1853	LC			P	P	P
38	<i>Ophisops kutchensis</i> * Agarwal et al., 2018	NE				P	P
39	<i>Ophisops pushkarensis</i> Agarwal et al., 2018	NE			P		
	Family: Scincidae						
40	<i>Ablepharus grayanus</i> (Stoliczka, 1872)	NE			P		P
41	<i>Eurylepis taeniolatus</i> Blyth, 1854	NE			P		P
42	<i>Eutropis allapallensis</i> (Schmidt, 1926)	LC	P	P			
43	<i>Eutropis carinata</i> (Schneider, 1801)	LC	P	P	P	P	P
44	<i>Eutropis dissimilis</i> (Hallowell, 1857)	NE		P			
45	<i>Eutropis macularia</i> (Blyth, 1853)	LC	P	P	P	P	P
46	<i>Lygosoma albopunctata</i> # (Gray, 1846)	LC	P	P			
47	<i>Lygosoma guentheri</i> # (Peters, 1879)	LC	P	P	P		
48	<i>Lygosoma lineata</i> # (Gray, 1839)	LC	P	P		P	
49	<i>Lygosoma punctata</i> # (Gmelin, 1799)	LC	P	P	P	P	
50	<i>Ophiomorus raithmai</i> Anderson & Leviton, 1966	LC					P
	Family: Varanidae						
51	<i>Varanus bengalensis</i> (Daudin, 1802)	LC	P	P	P	P	P
52	<i>Varanus griseus</i> (Daudin, 1803)	NE					P
	Snakes						
	Family: Acrochordidae						
53	<i>Acrochordus granulatus</i> (Schneider, 1799)	NE	P	P		P	P
	Family: Uropeltidae						
54	<i>Uropeltis ellioti</i> (Gray, 1858)	LC	P				
55	<i>Uropeltis macrolepis</i> (Peters, 1862)	LC	P				
	Family: Pythonidae						
56	<i>Python molurus</i> (Linnaeus, 1758)	LC	P	P	P	P	P
	Family: Erycidae						
57	<i>Eryx conicus</i> (Schneider, 1801)	LC	P	P	P	P	P
58	<i>Eryx johnii</i> (Russell, 1801)	LC	P	P	P	P	P
	Family: Colubridae						
59	<i>Ahaetulla nasuta</i> (Lacépède, 1789)	LC	P	P		P	
60	<i>Amphiesma stolatum</i> (Linnaeus, 1758)	LC	P	P	P	P	
61	<i>Argyrogena fasciolata</i> (Shaw, 1802)	LC	P	P	P	P	
62	<i>Boiga beddomei</i> (Wall, 1909)	DD	P				
63	<i>Boiga forsteni</i> (Duméril, Bibron & Duméril, 1854)	LC	P	P	P	P	
64	<i>Boiga trigonata</i> (Schneider, 1802)	LC	P	P	P	P	P

Table 1. Continued.

Sr No	Species	IUCN status	SG	CG	NG	SAU	KU
65	<i>Chrysopelea ornata</i> (Shaw, 1802)	LC	P				
66	<i>Coelognathus helena</i> (Daudin, 1803)	LC	P	P	P	P	P
67	<i>Dendrelaphis tristis</i> (Daudin, 1803)	LC	P	P		P	
68	<i>Elachistodon westermanni</i> Reinhardt, 1863	LC	P	P	P	P	
69	<i>Fowlea piscator</i> (Schneider, 1799)	LC	P	P	P	P	P
70	<i>Lycodon aulicus</i> (Linnaeus, 1758)	LC	P	P	P	P	P
71	<i>Lycodon flavomaculatus</i> Wall, 1907	LC	P	P		P	
72	<i>Lycodon striatus</i> (Shaw, 1802)	LC	P	P	P	P	P
73	<i>Oligodon arnensis</i> (Shaw, 1802)	LC	P	P	P	P	P
74	<i>Oligodon taeniolatus</i> (Jerdon, 1853)	LC	P	P	P	P	P
75	<i>Platyceps gracilis</i> (Günther, 1862)	NE	P	P	P		
76	<i>Platyceps ventromaculatus</i> (Gray, 1834)	LC	P	P	P	P	P
77	<i>Ptyas mucosa</i> (Linnaeus, 1758)	LC	P	P	P	P	P
78	<i>Rhabdophis plumbicolor</i> (Cantor, 1839)	LC	P	P	P		
79	<i>Sibynophis subpunctatus</i> (Duméril, Bibron & Duméril, 1854)	LC	P	P		P	
80	<i>Spalerosophis atriceps</i> (Fischer, 1885)	NE			P		P
81	<i>Wallophis brachyura</i> (Günther, 1866)	LC	P	P			
82	<i>Wallaceophis gujaratensis</i> * Mirza et al. 2016	NE		P		P	
Family: Lamprophiidae							
83	<i>Psammodphis leithii</i> Günther, 1869	LC	P	P	P	P	P
84	<i>Psammodphis longifrons</i> Boulenger, 1890	DD	P	P			
Family: Elapidae							
85	<i>Bungarus caeruleus</i> (Schneider, 1801)	LC	P	P	P	P	P
86	<i>Bungarus sindanus</i> Boulenger, 1897	NE				P	P
87	<i>Calliophis melanurus</i> (Shaw, 1802)	LC	P	P		P	
88	<i>Calliophis nigrescens</i> (Günther, 1862)	LC	P				
89	<i>Hydrophis caeruleus</i> (Shaw, 1802)	LC	P	P		P	
90	<i>Hydrophis cantoris</i> Günther, 1864	DD				P	
91	<i>Hydrophis curtus</i> (Shaw, 1802)	LC	P	P		P	
92	<i>Hydrophis cyanocinctus</i> Daudin, 1803	LC	P	P		P	P
93	<i>Hydrophis gracilis</i> (Shaw, 1802)	LC				P	
94	<i>Hydrophis mamillaris</i> (Daudin, 1803)	DD				P	
95	<i>Hydrophis platurus</i> (Linnaeus, 1766)	LC	P	P		P	P
96	<i>Hydrophis schistosus</i> Daudin, 1803	LC	P	P			
97	<i>Hydrophis spiralis</i> (Shaw, 1802)	LC				P	
98	<i>Naja naja</i> (Linnaeus, 1758)	LC	P	P	P	P	P
Family: Homalopsidae							
99	<i>Cerberus rynchops</i> (Schneider, 1799)	LC	P	P		P	
100	<i>Gerarda prevostiana</i> (Eydoux & Gervais, 1837)	LC	P	P		P	
Family: Viperidae							
101	<i>Daboia russelii</i> (Shaw & Nodder, 1797)	LC	P	P	P	P	
102	<i>Echis carinatus</i> (Schneider, 1801)	LC	P	P	P	P	P

Table 1. Continued.

Sr No	Species	IUCN status	SG	CG	NG	SAU	KU
103	<i>Trimeresurus gramineus</i> (Shaw, 1802)	LC	P	P			
Family: Typhlopidae							
104	<i>Indotyphlops braminus</i> (Daudin, 1803)	LC	P	P	P	P	P
105	<i>Indotyphlops porrectus</i> (Stoliczka, 1871)	NE				P	
106	<i>Grypotyphlops acutus</i> (Duméril & Bibron, 1844)	LC	P	P		P	
Crocodiles							
Family: Crocodylidae							
107	<i>Crocodylus palustris</i> (Lesson, 1831)	VU	P	P	P	P	P

These species have now been transferred to genus *Riopa* Gray, 1839 following the recent phylogeny of snake skinks by Freitas et al., 2019.

reported as the prey items of *S. cheela* and we believe there was most likely a misidentification with *Fowlea piscator*, a common species of the region. Wall (1924) mentioned a skin of *Ophiophagus hannah* with an origin in Deesa, Palanpur, North Gujarat. We believe this was most likely from a captive specimen, transported by a snake charmer or other human activities. The nearest confirmed location for the species is Tillari in southern Maharashtra (Yadav and Yankanchi, 2015), nearly 1000 km away. Stoliczka (1872) reported *Psammodon schokari* from Kutch, and this remains the sole report of this species from Gujarat. While the habitat in Kutch and some other regions in North Gujarat is suitable for this species, a fresh voucher is needed to confirm its continued presence in the state. In his account on reptiles of Gujarat, Gayen (1999) considered the possibility that *Hydrophis lapemoides* occurred in the coastal regions but a confirmed report is lacking. *Dendrelaphis pictus*, *Oligodon venustus*, *Psammodon condanarus*, and *Naja oxiana* have been reported in the literature without any vouchers or morphological details (Murray, 1886; Kapadia, 1951; Akhtar and Tiwari, 1991; Patel and Reddy, 1995) and should be removed pending reliable, correctly identified vouchers. Wallach et al. (2014) erroneously included Gujarat in the range of *Boiga cynodon*. This is a Southeast Asian species and does not occur in India (Uetz et al., 2018). Recently, Sharma and Jani (2015) reported *Lycodon travancoricus* from the Vansda National Park, Navsari. The report was based on two images without any morphometric or scalation data. Despite being a common snake throughout its range in the Western Ghats (Zeeshan Mirza, pers. comm.; HP, pers. obs.), this species was not found during the present

or previous studies (Vyas 2004b, 2007; Patel et al., 2018). A fresh voucher specimen is needed to further confirm the occurrence of this species in the state.

Discussion

The present number of reptile species of Gujarat now stands at 131, a number that includes 23 erroneously or dubiously reported species and one non-native species (*Trachemys scripta*), a significant increase for the state (107 in Vyas, 2000a; 114 in Vyas, 2007) (Fig. 7). Of these, the identity of *Cyrtopodion* sp. from Central Gujarat remains unclear and this appears to be a new species, but further sampling and taxonomic studies are necessary to produce a firm assessment (Agarwal et al., 2014).

The Saurashtra region accounts for the highest number of Gujarat endemic species, with all three species reported from Saurashtra. Other than Gujarat endemics, many species are reported from only a single region in Gujarat. *Dermodochelys coriacea*, *Batagur baska*, *Ophiomorus raithmai*, and *Varanus griseus* have been reported only from Kutch. *Hemidactylus gujaratensis*, *H. robustus*, *Indotyphlops porrectus*, *Hydrophis cantoris*, *H. gracilis*, *H. mamillaris*, and *H. spiralis* have been reported only from Saurashtra. *Hemidactylus persicus* and *Ophisops pushkarensis* are reported only from North Gujarat. *Psammodon blanfordianus* and *Eutropis dissimilis* are reported only from Central Gujarat. *Cyrtodactylus deccanensis*, *Hemidactylus gracilis*, *H. maculatus*, *Monilestaurus rouxii*, *Uropeltis ellioti*, *U. macrolepis*, *Boiga beddomei*, *Chrysopylea ornata*, and *Calliophis nigrescens* are reported only

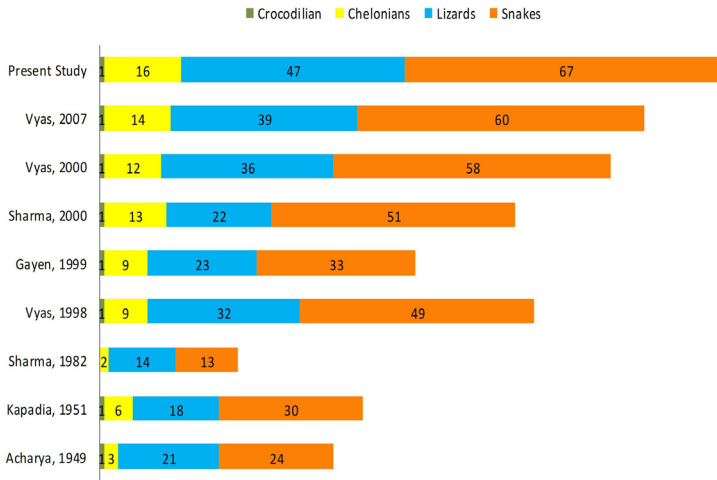


Figure 7. Bar graph showing total number of reptilian species reported during present and previous studies.

from South Gujarat. Recently, Mohan et al. (2018) synonymised *Elachistodon* with *Boiga* based on preliminary molecular phylogeny study. However, their results show that *Boiga* is paraphyletic and a detailed phylogenetic study is underway. For the purposes of the present list, we have retained *Elachistodon* as a distinct genus. Previously, *Platyceps gracilis* was reliably reported from Central Gujarat only (Vyas et al., 2011), but more recently we have received evidence and specimens from South and North Gujarat. The species appears to be distributed throughout the hilly forest belt of eastern Gujarat. Similarly, *Wallophis brachyura* was previously known only from Surat, South Gujarat (Patel et al., 2015) but recently a specimen was collected at Dabhoi, near Vadodara (Central Gujarat). A relict population of *Chrysopelea ornata* was confirmed from the forests of Dangs (Patel et al., 2018); a report from Rajkot (Buch, 1999) appears to be of a specimen introduced in this region by anthropogenic activities, most likely timber transportation. The species *Coelognathus helena* is represented by two subspecies. Whereas *C. h. helena* occurs throughout the state, *C. h. monticollaris* is restricted to the forested regions of South Gujarat (Mohapatra et al., 2016). Similarly, *Echis carinatus* appears to be represented by two subspecies, *E. c. carinatus* distributed throughout the state and *E. c. sochureki* occurring in Kutch and parts of North Gujarat (Whitaker and Captain, 2004). There are few reports of a non-native species, *Trachemys scripta* (Fig. 8) from the state (Munjpura, 2014; Vyas, 2015). It is a well-known pet species and must have been released by or escaped

from pet owners or vendors. A survey is necessary to determine the exact range of *T. scripta* in the state and its effects on the native fauna.

Of the reported 107 reptile species of Gujarat, the Red List status of 20 has not been evaluated or listed, 72 are listed as Least Concern, and five are considered data deficient. The plausible reason for this high aggregate number of species in these three categories could be lack of information on population size, reduction trends, and accurate distribution, both locally for Gujarat but also more generally. Clearly, the status of reptiles in this region lacks detailed studies. We have documented many direct and indirect threats to reptiles, including



Figure 8. Live individual of *Trachemys scripta* from Chikhli, Gujarat, India. Photo by Harshil Patel.

vehicular impact/transportation, habitat destruction and alteration, soil erosion, soil and water pollution, poaching or hunting, destructive agricultural practices, irrigation practices, forest fire, and even consumption as food by local tribal communities. Many of these threats we have reported earlier (Vyas, 2007; Patel et al., 2018), but an impact assessment of each of these threats is necessary to improve conservation policies.

Gujarat supports a high number of reptiles due to its high habitat diversity. While Gujarat accounts for < 6% of the geographical area of India, it includes nearly 20% of the country's known reptilian diversity. Many regions of Gujarat remain largely unexplored in terms of reptilian studies. Studies involving systematic surveys of each region, along with incorporation of detailed taxonomic comparisons, may yield additional reptilian discoveries in Gujarat.

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