

# Current Status and Distribution of Reptiles of Sindh

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**Abstract:** In Sindh province, total 103 species of reptiles comprising of 42 Lizards, 45 Snakes, 14 Turtles, 1 species each of Tortoise, Crocodile and Gavial has been recorded. 13 key areas for the reptiles have been identified in Sindh along with three important sites viz. Karachi coast, Deh Akro Wildlife Sanctuary and Nara Wetland Complex. Some reptiles are under threat due to large scale exploitation for skin, medicinal use and as food item. Marine Turtles are threatened mainly due to habitat degradation. The common species include Indian Fringe-toad Lizard, Indian Sand Swimmer, Indian Garden Lizard, Sindh Sand Gecko, Desert Monitor and Saw-scaled Viper. Eight species are threatened and 16 species are of special conservation interest and need to be conserved.

**Keywords:** Sindh, status, reptiles, threatened species.

## INTRODUCTION

According to IUCN (2009), there are now 1,677 reptiles species have been included on the IUCN Red List, with 293 added in 2009. In total, 469 are threatened with extinction and 22 are already Extinct or Extinct in the wild. Pakistan has 179 species of reptilian fauna consisting of turtles, tortoises, crocodile, gavial, lizards and snakes [1].

Some useful data on reptiles of Sindh has been collected by Zoological Survey Department, Sindh Wildlife Department, Department of Zoology, University of Karachi, WWF-Pakistan and Halcrow Pakistan (Private), Limited. Although a lot of research work on the reptiles of Sindh has been done but unfortunately most of it is available in the form of reports and unpublished research material. The notable work on the reptiles of Sindh includes [2-33]. The objective of the present study was to investigate the distribution, and population status of reptiles of Sindh.

## MATERIALS AND METHODS

Reptiles seem to be very active after dusk during the summer season. Skinks and Lizards are diurnal in activity and seen most active during mid morning. Certain geckos and snakes are active mostly at night. The following techniques have been employed for collection of data regarding the occurrence and distribution of reptiles.

### Direct Counting

#### One-Hour Plot Searching

At each site a one-hour search was carried out to detect as many reptiles as possible within a circular central zone. This consisted of searching approximately 20 ha for exactly one hour and recording the individuals.

#### Night Observations

Transect Method was applied to record Lizards and Snakes with portable spotlights within each transect of 3 km length.

#### Turning of Stones and Rocks

Reptiles take shelter or hide themselves under the stones or rocks. In the day time surveys, stones or rotten fallen trees were turned over to record the presence of reptiles.

Evidences of finger or footprints, Faecal pellets, tracks, burrows and tunnels were also collected to record the presence of the various species.

Information was also collected from the local wildlife staff and from the communities of the study areas.

Night surveys were also undertaken on the Karachi Coast to record the occurrence of marine turtles particularly during the peak nesting season during July-November.

Crocodile surveys were undertaken in their prime habitats particularly during the winters in December and January. The classification and names of the species in the present work are based on [21].

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## RESULTS

In Pakistan, reptiles are a blend of Palearctic, Indo-Malayan and Ethiopian forms [34]. During the present study total 103 species of reptiles comprising of 41 Lizards, 45 snakes, 14 Turtles, 1 species each of Tortoise, crocodile and Gavial has been recorded in Sindh province. 13 key areas for the reptiles also have been identified. The classification and names of the species in the present work are based on [21].

The representatives of four major groups of living reptiles i.e. Lizards, Snakes, Turtles and Crocodiles are found in Sindh. Thus, the class reptilia is divided into three orders, 22 families and 103 species (Table 1).

**Table 1. Groups of Reptiles of Sindh**

S. No.	Order	Family	No. of Species
1	Chelonia	Dermochelidae	1
2		Cheloniidae	4
3		Trionychidae	4
4		Emydidae	4
5		Testudinidae	1
6	Squamata	Lacertidae	3
7		Gekkonidae	16
8		Scincidae	7
9		Agamidae	9
10		Varanidae	3
11		Uromastycidae	2
12		Chamaeleonidae	1
13		Eublepharidae	1
14		Typhlopidae	2
15		Leptotyphlopidae	2
16		Boidae	3
17		Colubridae	21
18		Elapidae	3
19		Viperidae	2
20		Hydrophiidae	12
21		Crocodilia	Crocodylidae
22	Gavialidae		1
TOTAL			103

The group wise composition of the Reptiles of Sindh is as under:

## Lizards

41 species are known belonging to seven families viz. Gekkonidae, Agamidae, Lacertidae, Scincidae, Chamaeleonidae, Varanidae and Uromastycidae have been recorded. Flat-tail Gecko (*Teratolepis fasciata*), Fan-toad Gecko (*Ptyodactylus homolepis*), Casque Lizard (*Chamaeleo zeylanicus*), Sindh Dutch Snake (*Enhydryis pakistanica*), South Indian Wolf Snake (*Lycodon travancoricus*) and Red bellied Marshy Snake (*Xenochrophis piscator*) are the species restricted to Sindh.

## Snakes

28 species belonging to 7 families have been recorded. 12 species of marine snakes have been recorded belonging to the family Hydrophiidae. Five species of poisonous snakes belonging to the families Elapidae and Viperidae, 28 species of non-poisonous snakes belonging to the families Leptotyphlopidae, Typhlopidae, Boidae and Colubridae have been recorded.

## Turtles and Tortoises

During the study, five species of marine turtles, 8 species of freshwater turtles and 1 species of tortoise have been recorded. As regards the marine turtles, the Leatherback Turtle, Green, Olive Ridley, Hawksbill and Loggerhead Turtles have been recorded from the Sindh and Balochistan coast. Some beaches of Pakistan are the most important nesting grounds of Green Turtle, Olive Ridley and the Loggerhead.

## Crocodile and Gavial

One species of crocodile and 1 species of Gavial has been recorded.

## DISCUSSION

During the present study, we have identified 13 important areas for reptiles of Sindh (Table 2). The main sites have been discussed below:

### Nara Wetland Complex

Situated in Tehsil Nara, district Khairpur, Sindh. The NWC is a complex of about 200 small, medium and large wetlands; some are seasonal but most are permanent. These wetlands are freshwater to brackish to saline. Stretching from the town of Janji in the north to Jamrao Head in the south, these wetlands lie on either side of Nara Canal.

**Table 2. Key Areas of Reptiles in Sindh**

Area	Key Species
Karachi Coast	Marine Turtles and sea snakes.
Nara Wetland Complex, district Khairpur	Marsh Crocodile, Fresh-water Turtles, Gavial
Deh Akro II Wildlife Sacnctuary, distrit Shaheed Benazirabad	Marsh Crocodile
Nagar Parkar area, district Tharparkar.	Indian Chamaeleon
Chotiari Wetland Complex, district Sanghar	Marsh Crocodile, Freshwater Turtles
Haleji Lake, Keenjhar Lake and Sujawal area, district Thatta	Freshwater Turtles, Monitor Lizards, Indian Spiny-tailed Lizard, Marsh Crocodile (Haleji) and Snakes.
Kirthar National Park, district Karachi, Jamshoro and Dadu districts	Lizards, Snakes
Manghopir area, Karachi	Marsh Crocodile
Indus at Sukkur, Guddu and Sujawal	Freshwater Turtles
Khar Centre (KNP), Karachi	Marsh Crocodile

These wetlands along with their aquatic vegetation, reed beds and woodlands are the habitats for a wide variety of mammals, birds, reptiles, amphibians and fishes. Hog Deer, Smooth-coated Otter, Marbled Teal, Fishing Cat and Marsh Crocodile are the key species of the area [35].

The following wetlands are important for supporting Marsh Crocodile: Akhero, Badami, Chhaho, Daysan, Derhan, Dholaho, Ganjo, Harni, Jaari, Kirchan, Nagiopeer, Samabi, Simni, Simno Wahid and Torti Dhands.

#### **Deh Akro-II Wildlife Sanctuary**

Located in Shaheed Benazirabad district, it was declared a wildlife sanctuary in 1988 with the main purpose of protecting the Marsh Crocodile and The Marbled Teal. It spreads over an area of 20,500 ha and forms a complex of four major habitats i.e. deserts, wetlands with the Jamrao Canal and associated marshes and the agricultural lands. There are more than 30 dhands in the area. The important dhands include Chugri, Akhanwari, Allahdinowari, Bolahi, Chimb, Chhach, Drigh, Kharorho, Kharo, Khewari, Kharanda, Laila, Loon Khan, Manki, Sanri, Wasoowari. It was declared as a Ramsar site in 2002.

#### **Karachi Coast**

Pakistan is known to support a large population of Green Turtles nesting primarily at Hawksbay and Sandspit beaches near Karachi [24, 25]. Green Turtle is the main species that nests on the Pakistani Coast. Nesting of Olive Ridley has rarely been observed. While Head Hawksbill, Leatherbacks and Loggerheads have been found washed away by the waves. Recently, nesting of Loggerheads has been reported from Daran area, Jiwani on the Makran Coast

#### **Other Sites**

Some other sites are also important for reptiles such as Chotiari Wetland Complex, Kirthar National Park (Karchat and Khar Centre), Nagar Parkar area, Manghopir area (Karachi), Haleji Lake, Keenjhar Lake, Sujawal area, and Indus at Guddu, Sukkur and Sujawal. The key species of these areas have been outlined.

**Table 3. Protected Reptiles in Sindh**

S. No.	Common name
1	Marsh Crocodile
2	Gavial
3	Monitor Lizards (Bengal Monitor, Desert Monitor, Yellow Monitor).
4	Python
5	Marine Turtles (Green, Olive Ridley, Loggerhead, Hawksbill and Leatherback Turtles).

#### **Status of Reptiles in Sindh**

The common species of reptiles in Sindh include; Indian Fringe-toad Lizard, Indian Sand Swimmer, Indian Garden Lizard, Sind Sand Gecko, Indian Spiny-tailed Lizard, Desert Monitor and Saw Scaled Viper. Eleven species of reptiles cannot be shot, snared or trapped as IUCN Red List, they are totally protected under section 7(i) of the Sindh Wildlife Protection Ordinance 1972 (Table 3). Based on eight species of reptiles are threatened in Sindh (Table 4). Twelve species of reptiles are of special conservation interest (Table 5, Figs. 1-5) and these need to be studied in particular. Six species of reptiles have been recorded to be peculiar/ restricted to Sindh (Table 6). From Sindh, five species of reptiles are included in CITES Appendix 1 (Figs. 6-10), while 6 species have been included in Appendix 2 (Table 7 and 8).

**Table 4. Threatened Reptiles of Sindh**

S. No.	Species name	Status
1	Gavial	Critically Endangered
2	Green Turtle	Endangered
3	Narrow-head Soft shell Turtle	Endangered
4	Indian Soft shell Turtle	Vulnerable
5	Peacock Soft shell	Vulnerable
6	Crowned River Turtle	Vulnerable
7	Olive Ridley	Vulnerable
8	Marsh Crocodile	Vulnerable

**Table 5. Species of Special Concern**

S. No.	Species name
1	Green Turtle
2	Olive Ridley Turtle
3	Indian Spiny-tailed Lizard
4	Indian Monitor
5	Desert Monitor
6	Chameleon
7	Marsh Crocodile
8	Fat-tailed Gecko
9	Indian Python
10	Gavial
11	Indian Softshell Turtle
12	Indian Narrow-headed Softshell Turtle

**Table 6. Species of Reptiles peculiar to Sindh**

S. No.	Common name	Scientific name
1	Flat-tail Gecko	<i>Teratolepis fasciata</i>
2	Fan-toed Gecko	<i>Ptyodactylus homolepis</i>
3	Casque Lizard	<i>Chamaleo zeylanicus</i>
4	Thin-toed Gecko	<i>Cyrtopodion dehakroense</i>
5	Sindhi Ditch Snake	<i>Enhydris pakistanica</i>
6	South Indian Wolf Snake	<i>Lycodon travancaricus</i>
7	Red-bellied Marshy Snake	<i>Xenocrophis piscator</i>

**Table 7. Species of Reptiles Included in Appendix 1 of the CITES**

S. No.	Species name
1	Marsh Crocodile
2	Gavial
3	Indian Python
4	Spotted Pond Turtle
5	Indian Roofed Turtle

**Table 8. Species of Reptiles Included in Appendix 2 of the CITES**

S. No.	Species name
1	Brown River Turtle
2	Dhaman
3	Naja spp
4	Family Boidae (Sand Boas)



**Figure 1:** Olive ridley turtle.



**Figure 2:** Desert monitor.



**Figure 3:** Indian spiny-tailed lizard.

Striped Grass Skink, Common Mole Skink, Orange-tail Skink, 3-toed Sand Swimmer and 3-fingered Sandfish are threatened due to capture for medicinal use. Sindh Dwarf Gecko, Sindhi Ditch Snake, Red-bellied Marsh Snake and Red-spotted Diadem Snake are threatened due to disturbance in their restricted habitats.



**Figure 4:** Chameleon.



**Figure 5:** Indian narrow-headed softshell turtle.



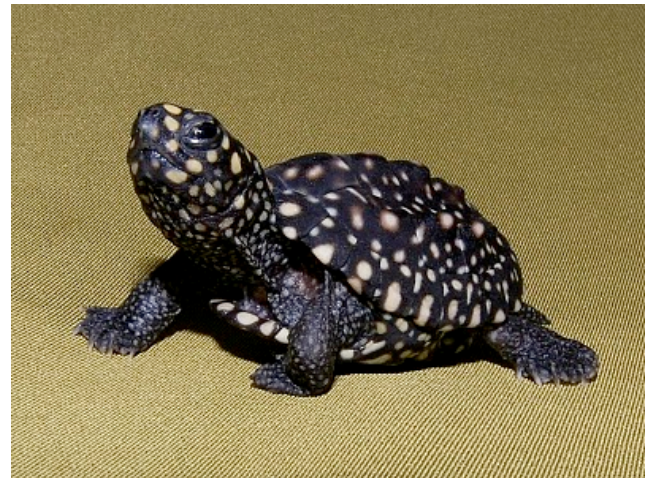
**Figure 6:** Marsh crocodile.



**Figure 7:** Gaviyal.



**Figure 8:** Indian Python.



**Figure 9:** Spotted pond turtle.

Marine turtles are threatened, mainly due to habitat degradation and disturbance. Freshwater Turtles are threatened due to turtle meat trade particularly the soft shell turtles viz. Indian Narrow-headed Softshell Turtle and Peacock Softshell.



Figure 10: Indian roofed turtle.

Monitor Lizards are threatened due to their large scale exploitation for skin trade. Leather of considerable utility and value is produced from Monitor Lizard, *Varanus spp.*, making them as attractive target for hunters. Their large size, the use of open habitat and shallow, conspicuous burrows, have together served to render them particularly vulnerable to persecution. As a result of both hunting and urbanization, some populations of various species have been significantly reduced. Those species with small geographical ranges and most specialized habitat requirement are giving the greatest cause of concern.

Three Monitor species occur in Pakistan. Two of these are widespread; the range of the third is geographically restricted. Unfortunately, this is the species which is the most ardently sought after by the leather dealers. The Bengal Monitor *Varanus bengalensis* is the most widely distributed Monitor in Pakistan, being found in all parts of Sindh where water is permanent. The form in Sindh is *V. b. bengalensis* and is particularly common in Sindh.

The Desert Monitor *Varanus griseus* represented by the subspecies, *V. g. konieczny* and *V. g. caspius* is found over much of the province but is more or less restricted to arid areas with sandy soil.

The third species is the Yellow – headed Monitor *Varanus flavescens*. Its geographic range is the most restricted of the three species, being found only in seasonally flooded forests and marshes in the floodplains of Indus.

All three monitors are protected in Sindh. The skins of Indian Monitor are in great demand. As the skin of Desert Monitor is thin relatively easily torn, hence it is

not liked by the tanners and manufacturers for export. The skin of Yellow – headed Monitor is also in demand but in very small numbers. Monitor Lizards are little used in Pakistan. A few tribal eat the flesh such as Kohli, Bheels, Bagrhi and Thani Jogis; and for medicinal purpose for relief of rheumatic pain. Reproductive organs are used in black magic; skin also used in making drum heads; abdominal fat used as salve for skin infections; oil from the fat used as remedy for hemorrhoids; oil is also used as an aphrodisiac lubricant. The most common use is for the leather industry. A small number is used for colleges and universities as museum specimens and for scientific research. The Indian Monitor Lizard is under threat due to their large scale [36].

Two species of Spiny-tailed lizards are found in Pakistan viz. Baloch Spiny tailed Lizard, *Saara asmussi* (Strauch) and Indian Spiny tailed lizard. *Saara hardwickii* Gray Indian Spiny tailed Lizard prefers sparse grassland and flat desert with moderately dense clay soil. In many areas the meat is eaten, and it is often sold in villages and larger towns; many people in India and Pakistan use the oil as folk medicine. As a result, thousands of them are killed each year. These lizards are also captured for use as dissection material for the students in the colleges and universities.

## CONSERVATION PRIORITIES

There is an urgent need to halt the habitat degradation for the safeguard of marine turtles. Moreover, the commercial exploitation of freshwater turtles, monitor lizards and Spiny tailed lizards needs to be controlled.

## CHECKLIST OF REPTILES OF SINDH

<b>A.</b>	<b>Order Chelonia</b>	
◆	<b>Family Cheloniidae</b>	
1	<i>Caretta caretta</i>	Loggerhead Sea Turtle
2	<i>Chelonia mydas</i>	Green sea turtle
3	<i>Eretmochelys imbricata</i>	Hawksbill Turtle
4	<i>Lepidochelys olivacea</i>	Olive Ridley
◆	<b>Family Dermochelyidae</b>	
5	<i>Dermochelys coriacea</i>	Leatherback Sea Turtle
◆	<b>Family Emydidae</b>	
6	<i>Geoclemys hamiltonii</i>	Yellow Spotted Mud Turtle/ Spotted Pond Turtle
7	<i>Hardella thurjii</i>	Common River Turtle/ Crowned River Turtle
8	<i>Kachuga tecta</i>	Indian Sawback Turtle / Indian Roofed Turtle

9	<i>Kachuga smithii</i>	Brown River Turtle	40	<i>Hemidactylus turcicus</i>	Mediterranean Gecko
◆	<b>Family Testudinidae</b>		41	<i>Teratolepis fasciata</i>	Flat-tail Gecko
10	<i>Geochelone elegans</i>	Star Tortoise	42	<i>Tropicolotes persicus</i>	Sindh Dwarf Gecko
◆	<b>Family Trionychidae</b>		43	<i>Ptyodactylus homolepis</i>	Fan-toed Gecko
11	<i>Aspideretes gangeticus</i>	Indian Softshell Turtle	◆	<b>Family Lacertidae</b>	
12	<i>Aspideretes hurum</i>	Peacock Softshell	44	<i>Acanthodactylus cantoris</i>	Blue-tail Sand Lizard
13	<i>Chitra indica</i>	Narrow-headed Softshell Turtle	45	<i>Mesalina watsonana</i>	Spotted Lacerta
14	<i>Lissemys punctata</i>	Indian Flapshell Turtle	46	<i>Ophisops jerdoni</i>	Rugose Spectacled Lacerta
<b>B.</b>	<b>Order Crocodylia</b>		◆	<b>Family Scincidae</b>	
◆	<b>Family Crocodylidae</b>		47	<i>Chalcides ocellatus</i>	Ocellated Skink
15	<i>Crocodylus palustris</i>	The Muger	48	<i>Eutropis dissimilis</i>	Striped Grass Skink
◆	<b>Family Gavialidae</b>		49	<i>Eutropis macularia</i>	Bronze Grass Skink
16	<i>Gavialis gangeticus</i>	Gharial	50	<i>Eurylepis taeniolatus</i>	Common Mole Skink
<b>C.</b>	<b>Order Squamata</b>		51	<i>Novoeumeces blythianus</i>	Orange-tail Skink
	<b>Sub-order Sauria</b>		52	<i>Ophiomorus raithmai</i>	Tree fringed Sand-fish
◆	<b>Family Agamidae</b>		53	<i>Ophiomorus tridactylus</i>	3-toed Sand Swimmer
17	<i>Brachysaura minor</i>	Short-tail Ground Agama	◆	<b>Family Uromastycidae</b>	
18	<i>Calotes versicolor</i>	Common Tree Lizard	54	<i>Saara hardwickii</i>	Spiny-tail Ground Lizard
19	<i>Laudakia lirata</i>	Yellow-head Spotted Rock Agama	55	<i>Saara asmussi</i>	Seistan Spiny-tailed Ground Lizard
20	<i>Laudakia fusca</i>	Yellow-headed Rock Agama	◆	<b>Family Varanidae</b>	
21	<i>Laudakia melanura</i>	Black Rock Agama	56	<i>Varanus bengalensis</i>	Bengal Monitor
22	<i>Laudakia nupta</i>	Spiny-head Rock Agama	57	<i>Varanus flavescens</i>	Yellow Monitor
23	<i>Trapelus agilis</i>	Common Field Agama/ Brilliant Agama	58	<i>Varanus griseus</i>	Desert Monitor
24	<i>Trapelus megalonyx</i>	Ocellete Ground Agama		<b>Sub Order Serpents</b>	
25	<i>Trapelus rubrigularis</i>	Red throated Ground Agama	◆	<b>Family Leptotyphlopidae</b>	
◆	<b>Family Chamaeleonidae</b>		59	<i>Leptotyphlops blanfordii</i>	Sindh Thread Snake
26	<i>Chamaeleo zeylanicus</i>	Casque Lizard	60	<i>Leptotyphlops macrorhynchus</i>	Beaked Thread Snake
◆	<b>Family Eublepharidae</b>		◆	<b>Family Typhlopidae</b>	
27	<i>Eublepharis macularius</i>	Fat-tailed Gecko	61	<i>Ramphotyphlops braminus</i>	Brahminy Blind Snake
◆	<b>Family Gekkonidae</b>		62	<i>Typhlops ductuliformes</i>	Slender Blind Snake
28	<i>Agamura persica</i>	Persian Spider Gecko	◆	<b>Family Boidae</b>	
29	<i>Bunopus tuberculatus</i>	Tuberculated Desert Gecko	63	<i>Eryx conicus</i>	Chain Sand Boa
30	<i>Cyrtopodion kachhensie</i>	Kachh Spotted Ground Gecko	64	<i>Eryx johnii</i>	Common Sand Boa
31	<i>Cyrtopodion scabrum</i>	Common Tuberculate Ground Gecko	65	<i>Python molurus</i>	Rock Python
32	<i>Cyrtopodion dehakroense</i>	Thin-toed Gecko	◆	<b>Family Colubridae</b>	
33	<i>Crossobamon orientalis</i>	Yellow-tailed Sand Gecko	66	<i>Amphiesma stolatum</i>	Striped Keelback
34	<i>Hemidactylus brookii</i>	Spotted Barn Gecko	67	<i>Argyrogena fasciolata</i>	Banded Racer
35	<i>Hemidactylus flaviviridis</i>	Yellow-belly Common House Gecko	68	<i>Boiga trigonata</i>	Common Cat Snake
36	<i>Hemidactylus frenatus</i>	Waif Gecko	69	<i>Enhydris pakistanica</i>	Sindhi Ditch Snake
37	<i>Hemidactylus leschenaultii</i>	Tree-bark Gecko	70	<i>Lycodon aulicus</i>	White-spotted Wolf Snake
38	<i>Hemidactylus persicus</i>	Persian House Gecko	71	<i>Lycodon striatus</i>	Indus Valley Wolf Snake
39	<i>Hemidactylus triedrus</i>	Blotched House Gecko	72	<i>Lycodon travancoricus</i>	South Indian Wolf Snake
			73	<i>Lytorhynchus paradoxus</i>	Sindh Awl-headed Snake

- |     |                                  |                              |      |   |
|-----|----------------------------------|------------------------------|------|---|
| 74  | <i>Oligodon arnensis</i>         | Banded Kukri Snake           | [4]  | Anwar F. Habitat Management Plan for the proposed Turtle Beech Protected Area: A framework for Action. SHEHRI. (Unpublished Report) 2005; pp. 59.   |
| 75  | <i>Oligodon taeniolatus</i>      | Streaked Kukri Snake         |      |   |
| 76  | <i>Platyceps rhodorachis</i>     | Cliff Racer                  | [5]  | Asrar F. Decline of marine turtle nesting populations in Pakistan. Mar Turtle News 1999; 83: 13-4.  |
| 77  | <i>Platyceps ventromaculatus</i> | Plain's Racer                | [6]  | Auffenberg M. Utilization of monitor lizards in Pakistan. Traffic Bulletin 1989; 11: 8-12   |
| 78  | <i>Psammophis condanars</i>      | Indo Burmese Sand Snake      | [7]  | Auffenberg W, Rahman H, Iffat F, Perveen Z. A study of <i>Varanus flavescens</i> (Sauria Varanidae). Bombay Nat. Hist. Soc 1989; 86: 286-307.   |
| 79  | <i>Psammophis leithii</i>        | Sindhi Ribbon Snake          |      |   |
| 80  | <i>Psammophis schokari</i>       | Saharo-sindian Ribbon Snake  | [8]  | Azam MM, Fakhri S, Saifullah. Some observations on the distribution and abundance of freshwater turtles in the Indus. Rec. Zool. Surv. Pakistan 2003; 16: 46-51.  |
| 81  | <i>Pseudocyclophis persicus</i>  | Dark-head Dwarf Racer        | [9]  | Beg MA, Chaudhry AA, Khan M.S, Chaudry PJ, Hameed Z. Wildlife of Pakistan (in Urdu). Urdu Science Board, Lahore 2005; pp. 270.  |
| 82  | <i>Ptyas mucosus</i>             | Rope Snake/Dhaman            |      |   |
| 83  | <i>Spalerosophis arenarius</i>   | Red-spotted Diadem Snake     | [10] | Fatima F. Distribution and Status of freshwater turtles in Sindh. Ph.D. thesis, Department of Zoology, University of Karachi 2008.  |
| 84  | <i>Spalerosophis diadema</i>     | Blotched Diadem Snake        | [11] | Firdaus, F. Male leatherback strands in Karachi. Mar Turtle News. 1989; 47; 14-5.   |
| 85  | <i>Xenochrophis cerasogaster</i> | Red-bellied Marsh Snake      | [12] | Firdaus F. Some aspects of Bioecological studies of green turtle ( <i>Chelonia mydas</i> ) and olive ridley ( <i>Lepidochelys olivacea</i> ) from Karachi coast (Unpublished Ph.D. Dissertation). Department of Zoology, University of Karachi 1997; pp. 452. |
| 86  | <i>Xenochrophis piscator</i>     | Checkered Keelback           | [13] | Firdaus F, Barkati S, Rahman, S. Hatching and rearing of two species of marine turtles from Karachi, Pakistan. Rec Zool Surv Pak 2009; 19: 55-60.   |
| ◆   | <b>Family Elapidae</b>           |                              |      |   |
| 87  | <i>Bungarus caeruleus</i>        | Common Krait                 |      |   |
| 88  | <i>Bungarus sindanus</i>         | Sindhi Krait                 |      |   |
| 89  | <i>Naja naja</i>                 | Black Cobra                  | [14] | Ghalib SA, Rahman H, Iffat F, Hasnain SA. A checklist of reptiles of Pakistan. Rec.Zoo. Sur. Pakistan. 1981; 8: 37-59.  |
| ◆   | <b>Family Viperidae</b>          |                              |      |   |
| 90  | <i>Daboia russelii</i>           | Russell's Chain Viper        | [15] | Hussain, B. Studies on population status, distribution and environmental impacts on reptiles in the vicinity of Karachi Coast (Unpublished Ph.D. Dissertation), Department of Zoology, University of Karachi 2009.  |
| 91  | <i>Echis carinatus</i>           | Saw-scaled Viper             | [16] | Iffat F. Marine Snakes of Pakistan. Rec. Zool. Surv. Pak. 1988; XI: 1-56.   |
| ◆   | <b>Family Hydrophiidae</b>       |                              |      |   |
| 92  | <i>Enhydrina schistosa</i>       | Beaked Sea Snake             | [17] | Iffat F. MarineTurtles. Zoological Survey Department, Government of Pakistan, Islamabad. IUCN. 2009. Extinction Crisis Continues Apace 2008; pp. 33.  |
| 93  | <i>Hydrophis caeruleus</i>       | Blue-green Sea Snake         | [18] | Javed HI, Rahman H. Status of marsh crocodile ( <i>Crocodylus palustris</i> ) in Sindh. Rec Zool Surv Pakistan 2004; 10: 22-30  |
| 94  | <i>Hydrophis cyanocinctus</i>    | Annulated Sea Snake          | [19] | Khan MZ, Nazia M. Current population status of Diurnal Lizards off Karachi, Pakistan. Russian J Herpetol 2003; 10: 241-4.   |
| 95  | <i>Hydrophis fasciatus</i>       | Small-head Banded Sea Snake  | [20] | Khan MS. Uptodate checklist of amphibians and reptiles of Pakistan. J Nat Hist Wildl 2003; 2: 11-7.   |
| 96  | <i>Hydrophis lapemoides</i>      | Persian Sea Snake            | [21] | Khan MS. Amphibians and reptiles of Pakistan. Krieger Publishing Company Malabar, Florida 2006; pp. 312.  |
| 97  | <i>Hydrophis mamillaris</i>      | Broad-band Sea Snake         | [22] | Khan MZ, Hussain B, Ghalib SA. Current status of reptilian fauna along Karachi coast with special reference to marine turtles. J Nat Hist Wildl 2005; 4: 127-30.  |
| 98  | <i>Hydrophis spiralis</i>        | Yellow Sea Snake             | [23] | Khan MZ, Ghalib SA, Abbas D, Zehra A, Rais M. Survey of marine turtles on Sandy and Rocky beaches of Karachi, Pakistan. (Unpublished Report) 2006; 58 pp.   |
| 99  | <i>Hydrophis ornatus</i>         | Reef Sea Snake               | [24] | Khan MZ, Ghalib SA, Hussain B. Status and new nesting sites of sea turtles in Pakistan. <i>Chelonia Conservation and Biology</i> 2010; 9: 119-23. <a href="http://dx.doi.org/10.2744/CCB-0767.1">http://dx.doi.org/10.2744/CCB-0767.1</a>                     |
| 100 | <i>Lapemis curtus</i>            | Pygmy Sea Snake              | [25] | Khan MZ, Ghalib SA. (eds.) Marine turtles on Sandy and Rocky beaches of Pakistan. LAP Lambert Academic Publishing GmbH & Co., Saarbrücken, Germany 2011.  |
| 101 | <i>Microcephalophis cantoris</i> | Spotted Small-head Sea Snake | [26] | Masroor R. A New Arboreal Species of <i>Cyrtopodion</i> (Squamata: Gekkonidae) from Deh Akro- II Wetland Complex, Sindh, Pakistan. <i>Zootaxa</i> 2009; 2243: 57-67.  |
| 102 | <i>Microcephalophis gracilis</i> | Banded Small-head Sea Snake  |      |   |
| 103 | <i>Pelamis platurus</i>          | Pelagic Sea snake            |      |   |

## REFERENCES

- [1] Rahman H, Iffat F. A revised checklist of Reptiles of Pakistan. Rec Zool Surv Pakistan 1997; 13: 1-17.
- [2] Ahmed A. The distribution and population of crocodiles in the province of Sindh and Balochistan (Pakistan). J Bombay Nat Hist Soc 1986; 83: 220-3.
- [3] Ahmad M. Wildlife of Pakistan (in Urdu), National Language Authority, Pakistan, Islamabad 1998; pp. 504.



- [27] Minton SA, Minton MR. The snake charmers of Sind. Bull. Philadelphia Herp. Soc 1964; 33-8.
- [28] Minton SA. A contribution to the herpetology of West Pakistan. Bull Amer Mus Nat Hist 1966; 134: 127-84.
- [29] Nouree, U, Khan A. Freshwater Turtles of Pakistan: A Preliminary assessment of the status in Punjab and Sindh. A research report submitted to the Ministry of Environment Pakistan Wetlands Program 2007. pp. 22.
- [30] Perveen Z, Auffenberg W. New reptile records for Pakistan. Herp Rev 1988; 19: 61-6.
- [31] Pilche NJ. Strategic Plan for the conservation of marine turtles in Pakistan. IUCN Pakistan. Balochistan Programme Office, Quetta, Pakistan 2010; pp. 32.
- [32] Rahman H. Population structure and behavioral ecology of *Echis carinatus sochukari* in Sindh (Makli, Thatta) (Unpublished Ph.D. Dissertation). Department of Zoology, University of Karachi 1995.
- [33] Rahman H, Ahmad SI. Status of crocodiles at Chotiari Reservoir, District Sanghar, Sindh. Proc Pakistan Congr Zool 2000; 20: 163-80.
- [34] Khan MZ, Hussain B, Ghalib SA, Zehra A, Mahmood N. Distribution, Population status and environmental impacts on reptiles in Manora, Sandspit, Hawkesbay and Cape Monze areas of Karachi coast. Can J Pure Appl Sci 2010; 4: 1053-71.
- [35] Ghalib SA, Rahman H, Khan AR. Observations on the wildlife of Nara Wetland Complex, Tehsil Nara, district Khairpur, Sindh with special reference to waterbirds. Pakistan J Zool. 2006; 38: 21-25.
- [36] Auffenberg W, Rahman H, Iffat F, Perveen Z. Notes on the biology of *Varanus griseus koneiczyi* Mertens (Sauria: Varanidae), Bombay Nat Hist Soc. 1989; 87: 26–36.

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