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A review of the updated checklists of the amphibians and reptiles of Pakistan: Present and prehistoric

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Abstract
This paper presents annotated and updated checklists of recent and updated information on the herpetofauna of Pakistan, encompassing both extant and extinct taxa. The presenting checklists mentioned all species (243 species, 104 genera, and 27 families of extant herpetofauna, including 24 anuran amphibian species, belonging to 4 families) that have been recorded, so far, from Pakistan in major works of herpetology. In comparison, the reptilian fauna consists of 219 species/subspecies, including 2 species of crocodiles, 15 species of turtles and tortoises, 119 species of Sauria, and 83 species of snakes belonging to 23 families. Four species of amphibians and 33 species of reptiles are endemic to Pakistan. Recent herpetological collections have added several new taxa to the previously compiled herpetofauna of Pakistan. Separate checklists of prehistoric reptiles (50 taxa) for both dinosaurs (26 taxa) and non-dinosaurian taxa (24 taxa) are also presented here. Pakistan is the home of all three living reptile orders: Crocodylia, Testudines, and Squamata. Apart from living herpetofauna, the exposures of the Vitakri Formation in the Vitakri dome proved to be a graveyard that yielded a large number of bone assemblages and also hosted numerous skeletal fragments and their assemblages.

Keywords: Checklists, Extant, Fossil records, Herpetofauna, Pakistan.

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Introduction

Pakistan is located at the junction of three major zoogeographic regions: The Palearctic (Mediterranean sub-region), the Oriental (Indian sub-region), and the Ethiopian (East African sub-region), which has undoubtedly contributed significantly to the shaping of its reptilian fauna today (1). Due to its wide range of longitudes (60° 52' to 75° 22' E) and latitudes (24° to 37° N), the northern region has sub-zero temperatures and experiences various climatic conditions due to its highest peaks: The Himalayas, the Hindu Kush, and the Karakoram. The south, southeastern, and southwestern regions experience temperatures of up to 50°C due to the presence of major deserts, including Thal, Thar, and Cholistan. Pakistan's land area comprises 56% arid regions, 23.8% semi-arid areas, 16.1% highland (Alpine) terrains, and 3.6% mesophilic zones with dry winters (2). The country is home to a variety of species from diverse habitats, including the expansive Baluchistan Plateau (3-6). Major works on herpetology in the Indian subcontinent have documented various amphibian and reptile species from regions within Pakistan (7-15). Additionally, recently described and recorded species from Pakistan are included in this body of work (16-33).

The country is also poor in amphibians compared to India and Southeast Asian countries due to its widespread aridity. Pakistan's bioregions are divided into 15 types based on soil,

vegetation, and climate conditions: 1. Alpine dry and cold deserts; 2. Himalayan dry coniferous forests; 3. Himalayan moist temperate forests; 4. Hill ranges of Baluchistan; 5. Higher ranges of Baluchistan; 6. Sub-Tropical and dry deciduous forests; 7. Semi-evergreen and dry temperate shrub forest and subtropical pine forest; 8. Mixed and sub-tropical dry deciduous forests; 9. Riverine tracts; 10. Temporary seepage zones; 11. Swamps and lakes; 12. Sub-Tropical thorn forests; 13. Hills, natural dunes in the Thar, Thal, and Cholistan Deserts; 14. Intertidal and Littoral zone; 15. Offshore area and islands (34).

There are 7,481 species of amphibians worldwide. Many amphibian species are globally threatened and are perhaps most known for their threatened status. The latest works on the taxonomy of amphibians in Pakistan were done by Muhammad Sharif Khan in different parts of the country (35). Reptiles are represented here by all four extant categories (Sauria, Serpentes, Testudines, and Crocodilia) (Tables 1 & 2). Twenty-four species of anuran amphibians belonging to the four cosmopolitan families Bufonidae, Microhylidae, Dicroglossidae, and the wide-ranging Tibeto-Himalayan family Megophryidae have been recorded in Pakistan (35) (Tab. 2). Amphibians are an important evolutionary link between terrestrial and aquatic environments and are divided into three groups: Anura (frogs and toads), Gymnophiona (caecilians), and Caudata (urodeles) (37). Pakistan has reported twenty-four amphibian species belonging to the order Anura, four of which are endemic to the country (Tab. 3).

Reptiles and amphibians of India and Pakistan were first described by George Albert Boulenger (12) and later revised by Hamilton Smith (13), Mertens (37), and Minton (38), who made important reports on Pakistani herpetofauna. Recent advances in systematics and phylogenetic analysis techniques, with DNA sequencing from mitochondrial transcription, have gained more attention for commonalities between taxonomic categories separating or amalgamating classical groups (36). The updated list of reptiles includes 14,369 taxa, including 12,263 species (In the March 2024 release) and 2,106 subspecies (Peter Uetz /Reptile Database Newsletter, 2024) (39). The currently updated checklist from Pakistan presents 243 species of herpetofauna, including 24 species of amphibians, 2 crocodilian, 15 chelonian, 119 of lacertilians, and 83 species of serpents belonging to 27 families recorded from Pakistan (Tables 1 & 2). Four species of amphibians and 33 species of reptiles are endemic to Pakistan (Tables 3 & 4). Extreme regions of temperature and precipitation were developed in the Indo-Gangetic plains. The belt of dryness prevailing in western Eurasia extended onto the subcontinent, leading to the invasion of species. These species are established in subtropical temperate climates with low rainfall and invade vast tracts of arid grasslands of the Cholistan and Thar deserts (41). Thus, the present-day Sahara-Sindian desert belt scenario was established from the North African region, and the Central and Southeast Asian herpetofauna were exchanged, populating the current desert habitats in Pakistan (20).

During the Oligocene, the geology, hydrology, and seasonal changes of the subcontinent were well known. The Himalayas' floods inundated Tethys Lake, situated between the Himalayas and the Indian subcontinent, replacing it with the salt range plateau and the Indo-Ganges plain. The annual elevation differences across the subcontinent led to explosive monsoon rains. Since the Pleistocene, glaciers and melting ice have controlled the rise and fall of sea levels, creating new routes for plants and animals from East, West, and Southeast Asia to traverse and colonize new areas across the subcontinent (42). We also present up-to-date checklists of the prehistoric herpetofauna of present-day Pakistan. These checklists include all recognized named taxa and their families of herpetofauna. Pakistan appeared on the world dinosaur map for the first time in the early 2000s. Approximately 400 bones have been found in the upper shale layer of the true Maastrichtian Vitakri Formation, which is the base of the titanosaur group. Pakistan is a unique country, with 15 species of titanosaurs recorded in a small area. Muhammad Sadiq Malkani made the first discovery of a dinosaur fossil (*Brohisaurus kirthari*) from Pakistan in 2003 at the Sangyali site of Vitakri Dome (Barkhan District of Baluchistan). *Pakisaurus balochistani* was the first titanosaur reported from Pakistan in 2004, while *Imrankhanshaheen masoombushrai* was the last titanosaur reported from Pakistan in August 2024 (43). Many taxa are known so far, and most of them were discovered, collected, studied, and published by Muhammad Sadiq Malkani, Director of the Geological Survey of

Pakistan. All the fossils found to date are kept at the Geological Survey of Pakistan (GSP) in Quetta, Pakistan, except for those that were sent to the University of Michigan in the United States for preparation. The Vitakri site in Pakistan is considered a paradise for dinosaurs due to the abundance of dinosaur fossils (16, 44-76). The middle and lower Siwalik Groups of the Potwar Plateau (Miocene, 18 to 3.5 Ma) are a continuous fluvial sequence that preserves a dense fossil record of snakes, representing 12 taxa and morphotypes, including *Python sp.*, *Acrochordus dehmi, Gansophis potwarensis gen. & sp. nov., Bungarus sp., Chotaophis padhriensis, gen. & sp. nov.*, and *Sivaophis downsi* gen. & sp. nov. (72). Separate checklists of these discovered and described prehistoric reptiles, both dinosaurian (26 taxa) and non-dinosaurian taxa (24 taxa), are presented here (Tables 5 & 6).

Checklists of Herpetofauna of Pakistan

Table 1. An updated checklist of extant species of herpetofauna of Pakistan.

Groups		No. of families	No. of genera	No. of Species
Amphibian		4	12	24
Chelonii		5	13	15
Crocodilia		2	2	2
Sauria	Lizards	2	8	32
	Geckkos	2	15	48
	Lacertidae	1	4	16
	Scincidae	1	8	17
	Uromastidae	1	1	2
	Varinadae	1	1	4
Serpents		8	39	83
Total		27 families	104 genera	243 species

Table 2. List of species of herpetofauna of Pakistan (Khan, 2002, 2004, 2006, 2010, 2016; Ali *et al.,*2018).

Family	Genera	Species
Bufonidae	*1.* *Duttaphrynus* (Frost *et al.,* 2006)	*1.* *Duttaphrynus olivaceus* (Blanford, 1874) *2.* *Duttaphrynus stomaticus* (Lütkin, 1862) *3.* *Duttaphrynus himalayanus* (Günther, 1864) *4.* *Duttaphrynus melanostictus hazarensis* (Khan, 2000)
	2. *Pseudepidalea* (Frost et. al., 2006)	*5.* *Bufotes latastii* (Boulenger, 1882) *6.* *Pseudepidalea baturae* (Stöck, Schmid, Steinlein, and Grosse, 1999) *7.* *Pseudepidalea pseudoraddei* (Mertens, 1971) *8.* *Pseudepidalea siachinensis* (Khan, 1997) *9.* *Pseudepidalea surda* (Boulenger, 1891) *10.* *Pseudepidalea zugmayeri* (Eiselt and Schmidtler, 1973)
Megophryidae	3. *Stutiger* (Theobald, 1868)	*11.* Scutiger nyingchiensis (Fei, 1977)
Microhylidae	4. *Microhyla* (Tschudi, 1828)	*12.* *Microhyla ornata* (Duméril and Bibron, 1841)
	5. *Uperodon (*Dúmeril and Bibron, 1841)	*13.* *Uperodon systoma* (Schneider, 1799)
Dicroglossidae	6. *Allopaa* (Ohler and Dubois, 2006)	*14.* *Allopaa barmoachensis* (Khan and Tasnim, 1989) *15.* *Allopaa hazarensis* (Dubois and Khan, 1979)
	7. *Chrysopaa*	*16.* *Chrysopaa sternosignata* (Murray, 1885)

	8. *Euphlyctis*	*17.* *Euphlyctis cyanophlyctis cyanophlyctis* (Schneider, 1799) *18.* *Euphlyctis cyanophlyctis microspinulata* (Khan, 1997) *19.* *Euphlyctis cyanophlyctis seistanica* (Nikolsky, 1900)
	9. *Fejervarya (*Bolkay, 1915)	*20.* *Fejervarya limnocharis* (Boie, 1834) *21.* *Fejervarya syhadrensis* (Annandale, 1919)
	10. *Hoplobatrachus (*Peters, 1863)	*22.* *Hoplobatrachus tigerinus* (Daudin, 1802)
	11. *Nanorana (*Günther, 1896)	*23.* *Nanorana vicina* (Stoliczka, 1872)
	12. *Sphaeroteca (*Duméril and Bibron, 1841)	*24.* *Sphaeroteca breviceps* (Schneider, 1799)
Chelonidae	13. *Caretta* (Rafinesque, 1814)	*25.* *Caretta caretta* (Linnaeus, 1758)
	14. *Chelonia* (Brongniart, 1800)	*26.* *Chelonia mydas* (Linnaeus, 1758)
	15. *Erytmochelys (*Fitzinger, 1843)	*27.* *Eretmochelys imbricata* (Linnaeus, 1766)
	16. *Lepidochelys* (Fitzinger, 1843)	*28.* *Lepidochelys olivacea* (Eschscholtz, 1829)
Dermochelyidae	17. *Dermochelys (*Blainville, 1816)	*29.* *Dermochelys coriacea* (Vandelli, 1761)
Testudinidae	18. *Testudo* (Linnaeus, 1758)	*30.* *Testudo horsfieldii* (Gray, 1844)
	19. *Geochelone (*Fitzinger, 1835)	*31.* *Geochelone elegans* (Schopff, 1795)
Geoemydaidae	20. *Geoclemys* (Gray, 1856)	*32.* *Geoclemys hamiltonii* (Gray, 1831)
	21. *Hardella (*Gray, 1870)	*33.* *Hardella thurjii (*Gray, 1831)
	22. *Pangshura (*Gray, 1869)	*34.* *Pangshura smithii* (Gray, 1863) *35.* *Pangshura tectum* (Bell & Gray, 1831)
Trionychidae	23. *Nilssonia (*Gray, 1872)	*36.* *Nilssonia gangeticus* (Cuvier, 1825) *37.* *Nilssonia hurum* (Gray, 1831)
	24. *Chitra (*Gray, 1844)	*38.* *Chitra indica* (Gray, 1831)
	25. *Lissemys (*Smith, 1931)	*39.* *Lissemys punctata andersoni (*Webb, 1980)
Crocodylidae	26. Crocodylus (*Laurenti, 1768)*	*40.* *Crocodylus palustris (*Lesson, 1831)
Gavialidae	27. *Gavialis (*Oppel, 1811)	*41.* *Gavialis gangeticus* (Gmelin, 1789)
Agamidae	28. *Brachysaura (*Blyth, 1856)	*42.* *Brachysaura minor* (Hardwicke and Gray, 1827)
	29. *Calotes (*Cuvier, 1817)	*43.* *Calotes versicolor versicolor* (Daudin, 1802) *44.* *Calotes versicolor farooqi (*Auffenberg and Rehman, 1995) *45.* *Calotes farooqi*
	30. *Japalura (*Gray, 1853)	*46.* *Japalura kumaonensis* (Annandale, 1907)
	31. *Laudakia (*Gray, 1845)	*47.* *Laudakia agrorensis* (Stoliczka, 1872)

			48. *Laudakia fusca* (Blanford, 1876) *49.* *Laudakia lirata* (Blanford, 1874) *50.* *Laudakia melanura melanura (*Blyth, 1854) *51.* *Laudakia melanura nasiri (*Baig, 1999) *52.* *Laudakia nupta nupta* (de Filippi, 1843) *53.* *Laudakia nupta fusca* (Blanford, 1876) *54.* *Laudakia nuristanica* (Anderson and Leviton, 1969) *55.* *Laudakia pakistanica pakistanica* (Baig, 1989) *56.* *Laudakia pakistanica auffenbergi (*Baig and Böhme, 1996) *57.* *Laudakia pakistanica khani (*Baig and Böhme, 1996) *58.* *Laudakia tuberculata* (Hardwicke and Gray, 1827)
	32.	*Paralaudakia (*Baig *et al.,* 2012)	*59.* *Paralaudakia badakshana* (Anderson & Leviton, 1969) *60.* *Paralaudakia caucasia caucasia* (Eichwald, 1831) *61.* *Paralaudakia himalayana) himalayana* (Steindachner, 1867) *62.* *Paralaudakia microlepis* (Blanford, 1874)
	33.	*Phrynocephalus (*Kaup, 1825)	*63.* *Phrynocephalus clarkorum* (Anderson and Leviton, 1967) *64.* *Phrynocephalus euptilopus (*Alcock and Finn, 1896) *65.* *Phrynocephalus luteoguttatus (*Boulenger, 1887) *66.* *Phrynocephalus maculatus (*Anderson, 1872) *67.* *Phrynocephalus ornatus (*Boulenger, 1887) *68.* *Phrynocephalus scutellatus (*Olivier, 1807)
	34.	*Trapelus (*Cuvier, 1816)	*69.* *Trapelus agilis agilis* (Olivier, 1804) *70.* *Trapelus agilis pakistanensis (*Rastegar-Pouyani, 1999) *71.* *Trapelus megalonyx (*Günther, 1864) *72.* *Trapelus ruderatus baluchianus* (Smith, 1935 *73.* *Trapelus rubrigularis (*Blanford, 1876)
Chamaeleonidae	35.	*Chamaeleo (*Laurenti, 1768	*74.* *Chamaeleo zeylanicus (*Laurenti, 1768)
Eublepharidae	36.	*Eublepharis (*Gray, 1827)	*75.* *Eublepharis macularius* (Blyth, 1854)
Gekkonidae	37.	*Agamura (*Blanford, 1874)	*76.* *Agamura persica* (Duméril, 1856)
	38.	*Microgecko (*Nicholsky, 1907)	*77.* *Microgecko tanishpaensis* (Masroor *et al.,* 2020)
	39.	*Altigekko* (Khan, 2003)	*78.* *Altigekko baturensis* (Khan and Baig, 1992) *79.* *Altigekko boehmei* (Szczerbak, 1991) *80.* *Altigekko brachykolon* (Crysko, Rhman, Auffenberg, 2007) *81.* *Altigekko stoliczkai* (Steidachner, 1869)
	40.	*Bunopus (*Blanford, 1874)	*82.* *Bunopus tuberculatus (*Blanford, 1874)
	41.	*Crossobamon (*Boettger, 1888)	*83.* *Crossobamon lumsdeni* (Boulenger, 1887) *84.* *Crossobamon maynardi* (Smith, 1933)

			85. Crossobamon orientalis (Blanford, 1876)
	42.	*Cyrtopodion* (Fitzinger, 1843)	*86. Cyrtopodion agamuroides* (Nikolsky, 1900) *87. Cyrtopodion baigii* (Masroor, 2008) *88. Cyrtopodion beleaense* (Nazaraov, Annanjeva, Papenfuss, 2011) *89. Cyrtopodion kachhense kachhense* (Stoliczka, 1872) *90. Cyrtopodion kachhense ingolbyi* (Khan, 1997) *91. Cyrtopodion kohsulaimanai* (Khan, 1991) *92. Cyrtopodion montiumsalsorum* (Annandale, 1913) *93. Cyrtopodion potoharensis* (Khan, 2001) *94. Cyrtopodion scabrum* (Heyden, 1827) *95. Cyrtopodion watsoni* (Murray, 1892)
	43.	*Hemidactylus* (Oken, 1817)	*96. Hemidactylus brookii* (Gray, 1845) *97. Hemidactylus flaviviridis* (Rüppell, 1835) *98. Hemidactylus frenatus* (Schlegel, 1836) *99. Hemidactylus leschenaultii* (Duméril and Bibron, 1836) *100. Hemidactylus persicus* (Anderson, 1872) *101. Hemidactylus triedrus* (Daudin, 1802) *102. Hemidactylus turcicus* (Linnaeus, 1758) *103. Hemidactylus robustus* (Heyden, 1827)
	44.	*Indogekko* (M. S. Khan, 2003)	*104. Indogekko fortmunroi* (Khan, 1993) *105. Indogekko indusoani* (Khan, 1980) *106. Indogekko rhodocaudus* (Baig, 1998) *107. Indogekko rohtasfortai* (Khan and Tasnim, 1990)
	45.	*Mediodactylus* (Szczerbak and Golubev, 1977)	*108. Mediodactylus walli* (Ingoldby, 1922) *109. Mediodactylus dehakroense* (Masroor 2009)
	46.	*Ptyodactylus* (Goldfuss, 1820	*110. Ptyodactylus homolepis* (Blanford, 1876)
	47.	*Rhinogekko* (de Witte, 1973)	*111. Rhinogekko femoralis* (Smith, 1933) *112. Rhinogekko misonnei* (de Witte, 1973)
	48.	*Siwaligekko* (Khan, 2003)	*113. Siwaligekko battalensis* (Khan, 1993) *114. Siwaligekko dattanensis* (Khan, 1980) *115. Siwaligekko mintoni* (Golubev and Szczerbak, 1981)
	49.	*Teratolepis* (Günther, 1870)	*116. Teratolepis fasciata* (Blyth, 1853)
	50.	*Teratoscincus* (Strauch, 1863)	*117. Teratoscincus microlepis* (Nokolsky, 1899) *118. Teratoscincus scincus keyserlingii* (Strauch, 1863)
	51.	*Tropiocolotes* (Peters, 1880)	*119. Tropiocolotes depressus* (Minton and Anderson, 1965) *120. Tropiocolotes persicus persicus* (Nikolsky, 1903) *121. Tropiocolotes persicus euphorbiacola* (Minton, Anderson, and Anderson, 1970)
Lacertidae	52.	*Acanthodactylus* (Wiegmann, 1834)	*122. Acanthodactylus blanfordii* (Boulenger, 1918) *123. Acanthodactylus cantoris* (Günther, 1864) *124. Acanthodactylus micropholis* (Blanford, 1874)
	53.	*Eremias* (Wiegmann, 1834)	*125. Eremias acutirostris* (Boulenger, 1887) *126. Eremias aporosceles* (Alcock and Finn, 1896)

			*127. Eremias cholistanica (*Baig and Masroor 2006) *128. Eremias fasciata (*Blanford, 1874) *129. Eremias persica (*Blanford, 1874 *130. Eremias scripta* (Strauch, 1867) *131. Eremias kakari* (Masrror *et al.,* 2020) *132. Eremias killasaifullahi* (Masroor *et al.,* 2020) *133. Eremias rafiqi* (Masroor *et al.,* 2022)
	54.	*Mesalina (*Gray, 1838)	*134. Mesalina brevirostris* Blanford, (1874) *135. Mesalina watsonana* (Stoliczka, 1872)
	55.	*Ophisops (*Ménétriés, 1832)	*136. Ophisops elegans (*Ménétriés, 1832) *137. Ophisops jerdonii (*Blyth, 1853)
Scincidae	56.	*Ablepharus (*Fitzinger, 1823)	*138. Ablepharus grayanus* (Stoliczka, 1872) *139. Ablepharus pannonicus* (Fitzinger, 1823)
	57.	*Chalcides (*Laurenti, 1768)	*140. Chalcides ocellatus* (Forskål, 1775)
	58.	*Eurylepis (*Blyth, 1854)	*141. Eurylepis taeniolatus taeniolatus* (Blyth, 1854)
	59.	*Lygosoma (*Hardwick & Gray, 1827)	*142. Lygosoma punctata* (Linnaeus, 1766)
	60.	*Eutrophis (*Fitzinger, 1843)	*143. Eutrophis dissimilis* (Hallowell, 1860) *144. Eutrophis macularia* (Blyth, 1853)
	61.	*Novoeumeces (*Griffith, Ngo, & Murphy, 2000)	*145. Novoeumeces blythianus* (Anderson, 1871) *146. Novoeumeces indothalensis* (Khan and Khan, 1997) *147. Novoeumeces schneiderii zarudnyi* (Nikolsky, 1900) *148. Novoeumeces cholistanensis* (Masroor, 2009)
	62.	*Ophiomorus (*Duméril and Bibron, 1839)	*149. Ophiomorus blanfordi (*Boulenger, 1887) *150. Ophiomorus brevipes* (Blanford, 1874) *151. Ophiomorus raithmai (*Anderson and Leviton, 1966) *152. Ophiomorus tridactylus* (Blyth, 1853)
	63.	*Scincella (*Mittleman, 1950)	*153. Scincella himalayana* (Günther, 1864) *154. Scincella ladacensis* (Günther, 1864)
Uromastidae	64.	*Saara (*Gray, 1845)	*155. Saara asmussi* (Strauch, 1863) *156. Saara Hardwickii* (Gray, 1827)
Varanidae	65.	*Varanus (*Merrem, 1820)	*157. Varanus bengalensis* (Daudin, 1802) *158. Varanus flavescens* (Hardwicke and Gray, 1827) *159. Varanus griseus caspius* (Eichwald, 1831) *160. Varanus griseus koniecznyi* Mertens, 1954
Leptotyphlopidae	66.	*Leptotyphlops (*Fitzinger, 1843)	*161. Leptotyphlops blanfordii* (Boulenger, 1890) *162. Leptotyphlops macrorhynchus* (Jan, 1862)
Typhlopidae	67.	*Ramphotyphlops (*Fitzinger, 1843)	*163. Ramphotyphlops braminus* (Daudin, 1803)
	68.	*Indotyphlops (Typhlops)* (Oppel, 1811)	*164. Indotyphlops ahsanuli (*Khan, 1999) *165. Indotyphlops diardii platyventris (*Khan, 1998) *166. Indotyphlops ductuliformes (*Khan, 1999) *167. Indotyphlops madgemintonae madgemintonae (*Khan, 1999) *168. Indotyphlops madgemintonae shermanai (*Khan, 1999)
Boidae	69.	*Eryx (*Daudin, 1803)	*169. Eryx conicus* (Schneider, 1801) *170. Eryx johnii* (Russell, 1801)

			171. Eryx tataricus speciosus Zarevsky, 1915
	70.	*Python (*Daudin, 1803)	*172. Python molurus* (Linnaeus, 1758)
Colubridae	71.	*Amphiesma (*Duméril, Bibron and Duméril, 1854)	*173. Amphiesma platyceps* (Blyth, 1854) *174. Amphiesma sieboldii* (Günther, 1860) *175. Amphiesma stolatum* (Linnaeus, 1758)
	72.	*Argyrogena (*Werner, 1924)	*176. Argyrogena fasciolata* (Shaw, 1802)
	73.	*Boiga (*Fitzinger, 1826)	*177. Boiga melanocephala* (Annandale, 1904) *178. Boiga trigonata* (Schneider, 1802)
	74.	*Coluber (*Linnaeus, 1758)	*179. Coluber karelini karelini* (Brandt, 1838) *180. Coluber karelini mintonorum (*Mertens, 1969)
	75.	*Dendrelaphis (*Boulenger, 1890)	*181. Dendrelaphis tristis* (Daudin 1803)
	76.	*Mintonophis (*Murphy & Voris 2014)	*182. Mintonophis pakistanicus* (Mertens, 1959) (*Enhydris pakistanica (*Mertens, 1959)
	77.	*Hemorrhois (*Boie, 1826)	*183. Hemorrhoids ravergieri (*Ménétriés, 1832)
	78.	*Lycodon (*Boie, 1826)	*184. Lycodon aulicus aulicus* (Linnaeus, 1758) *185. Lycodon striatus striatus* (Shaw, 1802) *186. Lycodon striatus bicolor* (Nokolsky, 1903) *187. Lycodon travancoricus* (Beddom, 1870) *188. Lycodon mackinnoni* (Wall, 1906)
	79.	*Lytorhynchus (*Peters, 1862)	*189. Lytorhynchus maynardi (*Alcock and Finn, 1896) *190. Lytorhynchus paradoxus* (Günther, 1875) *191. Lytorhynchus ridgewayi (*Boulenger, 1887)
	80.	*Natrix (*Laurenti, 1768)	*192. Natrix tessellata* (Laurenti, 1768)
	81.	*Oligodon (*Boie, 1827)	*193. Oligodon arnensis* (Shaw, 1802) *194. Oligodon taeniolatus* (Jerdon, 1853)
	82.	*Platyceps (*Blyth, 1860)	*195. Platyceps rhodorachis rhodorachis* (Jan, 1865) *196. Platyceps rhodorachis ladacensis* (Anderson, 1871) *197. Platyceps rhodorachis kashmirensis (*Khan and Khan, 2000) *198. Platyceps ventromaculatus. bengalensis* (Khan and Khan, 2000) *199. Platyceps ventromaculatus ventromaculatus (*Gray and Hardwicke, 1834) *200. Platyceps ventromaculatus indusai (*Khan and Khan, 2000)
	83.	*Psammophis (*Fitzinger, 1826)	*201. Psammophis condanarus* (Merrem, 1820) *202. Psammophis leithii (*Günther, 1869) *203. Psammophis lineolatus* (Brandt, 1838) *204. Psammophis schokari* (Forskål, 1775)
	84.	*Pseudocyclophis (*Boettger, 1888)	*205. Pseudocyclophis persicus* (Anderson, 1872)
	85.	*Ptyas (*Fitzinger, 1843)	*206. Ptyas mucosus mucosus* (Linnaeus 1758)
	86.	*Sibynophis (*Fitzinger, 1843)	*207. Sibynophis sagittarius* (Cantor, 1839)
	87.	*Spalerosophis (*Jan, 1865)	*208. Spalerosophis arenarius* (Boulenger, 1890) *209. Spalerosophis diadema diadema* (Schlegel, 1837) *210. Spalerosophis schirazianus* (Jan, 1865)

	88. *Telescopus (*Wagner, 1830)	*211. Telescopus rhinopoma* (Blanford, 1874)
	89. *Xenochrophis (*Günther, 1864)	*212. Xenochrophis cerasogaster* (Cantor, 1839) *213. Xenochrophis piscator piscator* (Schneider, 1799) *214. Xenochrophis sanctijohannis* (Boulenger, 1890)
Elapidae	90. *Bungarus (*Daudin, 1803)	*215. Bungarus caeruleus caeruleus* (Schneider, 1801) *216. Bungarus sindanus sindanus (*Boulenger, 1847 *217. Bungarus sindanus razai (*Khan, 1985
	91. *Naja (*Laurenti, 1768)	*218. Naja naja* (Linnaeus, 1758) *219. Naja oxiana* (Eichwald, 1831)
Hydrophidae	92. *Astrotia (*Fisher, 1856)	*220. Astrotia stokesii* (Gray, 1846)
	93. *Enhydrina (*Gray, 1849)	*221. Enhydrina schistosa* (Daudin, 1803)
	94. *Hydrophis (*Latreille, 1802)	*222. Hydrophis caerulescens* (Shaw, 1802) *223. Hydrophis cyanocinctus* (Daudin, 1803) *224. Hydrophis fasciatus* (Schneider, 1799) *225. Hydrophis lapemoides* (Gray, 1849) *226. Hydrophis mamillaris* (Daudin, 1803) *227. Hydrophis ornatus* (Gray, 1842) *228. Hydrophis spiralis* (Shaw, 1802)
	95. *Lapemis (*Gray, 1835)	*229. Lapemis curtus* (Shaw, 1802)
	96. *Microcephalophis (*Lesson, 1834)	*230. Microcephalophis cantoris* (Günther, 1864) *231. Microcephalophis gracilis* (Shaw, 1802)
	97. *Pelamis (*Daudin, 1803)	*232. Pelamis platurus* (Linnaeus, 1766)
	98. *Praescutata (*Wall, 1921)	*233. Praescutata viperina* (Ph. Schmidt, 1852)
Viperidae	99. *Daboia (*Gray, 1842)	*234. Daboia russelii russelii* (Shaw and Nodder, 1797)
	100. *Echis (*Merrem, 1820)	*235. Echis carinatus astolae (*Mertens, 1969) *236. Echis carinatus pyramidum* *237. Echis carinatus multisquamatus (*Cherlin, 1981) *238. Echis carinatus sochureki (*Stemmler, 1964)
	101. *Eristicophis (*Alcock and Finn, 1896)	*239. Eristicophis macmahonii (*Alcock and Finn, 1897)
	102. *Pseudocerastes (*Boulenger, 1896)	*240. Pseudocerastes bicornis (*Wall, 1913) *241. Pseudocerastes persicus* (Duméril & Bibron, 1854)
	103. *Macrovipera (*Reuss, 1927)	*242. Macrovipera lebetina obtusa* (Dwigubsky, 1832
Crotalidae	104. *Gloydius (*Hoge and Romano-Hoge, 198)	*243. Gloydius himalayanus* (Günther, 1864)

Table 3. List of endemic Amphibian species of Pakistan (http://www.reptile-database.org/)

S. No.	Species	Order-Family	Common name
1	*Bufotes pseudoraddei*	(Anura - Bufonidae)	Swat Green Toad
2	*Bufotes zugmayeri*	(Anura - Bufonidae)	Baloch Green Toad
3	*Allopaa barmoachensis*	(Anura - Dicroglossidae)	Kashmir Torrent Frog
4	*Sphaerotheca strachani*	(Anura - Dicroglossidae)	Pakistan Bullfrog

Table 4. List of endemic Reptilian species of Pakistan (http://www.reptile-database.org/)

S. No.	Species	Order-Family	Common name
1	*Laudakia pakistanica*	(Squamata Sauria - Agamidae)	Pakistan Rock Agama
2	*Trapelus rubrigularis*	(Squamata Sauria - Agamidae)	Red-throated Agama

3	*Altiphylax baturensis*	(Squamata Sauria - Gekkonidae)	Batura Glacier Gecko
4	*Altiphylax mintoni*	(Squamata Sauria - Gekkonidae)	Plump Swati Gecko
5	*Cyrtodactylus battalensis*	(Squamata Sauria - Gekkonidae)	Battle Plump Gecko
6	*Cyrtodactylus dattanensis*	(Squamata Sauria - Gekkonidae)	Plump Banded Gecko
7	*Cyrtopodion baigii*	(Squamata Sauria - Gekkonidae)	Baig's Tuberculated Rock Gecko
8	*Cyrtopodion belaense*	(Squamata Sauria - Gekkonidae)	
9	*Cyrtopodion fortmunroi*	(Squamata Sauria - Gekkonidae)	Fort Munro Sandstone Gecko
10	*Cyrtopodion indusoani*	(Squamata Sauria - Gekkonidae)	Soan Sandstone Gecko
11	*Cyrtopodion kohsulaimanai*	(Squamata Sauria - Gekkonidae)	Sulaiman Range Gecko
12	*Cyrtopodion montiumsalsorum*	(Squamata Sauria - Gekkonidae)	Salt Range Gecko
13	*Cyrtopodion potoharense*	(Squamata Sauria - Gekkonidae)	Potwar Gecko
14	*Cyrtopodion rhodocauda*	(Squamata Sauria - Gekkonidae)	Red-tailed Sandstone Gecko
15	*Cyrtopodion rohtasfortai*	(Squamata Sauria - Gekkonidae)	Rohtas Sandstone Gecko
16	*Hemidactylus gleadowi*	(Squamata Sauria - Gekkonidae)	Gleadow's House Gecko
17	*Hemidactylus kushmorensis*	(Squamata Sauria - Gekkonidae)	Kushmore's House Gecko
18	*Mediodactylus brachykolon*	(Squamata Sauria - Gekkonidae)	Short-limbed Bent-toed Gecko
19	*Mediodactylus walli*	(Squamata Sauria - Gekkonidae)	Chitral Gecko
20	*Microgecko depressus*	(Squamata Sauria - Gekkonidae)	Mountain Dwarf Gecko
21	*Eremias cholistanica*	(Squamata Sauria - Lacertidae)	Cholistan Desert lizard
22	*Ptyodactylus homolepis*	(Squamata Sauria - Phyllodactylidae)	Pakistan Fan-fingered Gecko
23	*Eumeces cholistanensis*	(Squamata Sauria - Scincidae)	Cholistan Striped Skink
24	*Eumeces indothalensis*	(Squamata Sauria - Scincidae)	Thal Skink
25	*Platyceps noeli*	(Squamata Serpentes - Colubridae)	Brahui Racer
26	*Platyceps sindhensis*	(Squamata Serpentes - Colubridae)	Sindh Racer
27	*Mintonophis pakistanicus*	(Squamata Serpentes - Homalopsidae)	Sindh River Mud Snake
28	*Indotyphlops ahsanai*	(Squamata Serpentes - Typhlopidae)	Ahsan's Blind Snake
29	*Indotyphlops madgemintonae*	(Squamata Serpentes - Typhlopidae)	Madge Minton's Blind Snake
30	*Calotes farooqi*	(Squamata Sauria - Agamidae)	Farooq's Garden Lizard
31	*Microgecko tanishpaensis*	(Squamata Sauria - Gekkonidae)	Tarishpa's Dwarf Gecko
32	*Eremias kakari*	(Squamata Sauria - Lacertidae)	Kakar's Race runner
33	*Eremias killasaifullahi*	(Squamata Sauria - Lacertidae)	Killa Saifullah's Race runner

Table 5. List of prehistoric reptilian taxa (Dinosaurian taxa) of present-day Pakistan.

Group	Family	Taxa
Titanosauriform		*1. Brohisaurus kirthari,* Malkani (2003)
Poropuchia (Titanosaurian Sauropods)	Gspsauridae	2. *Gspsaurus pakistani,* Malkani (2014a) 3. *Maojandino alami,* Malkani (2015a) 4. *Ikqaumishan smqureshi,* Malkani (2023b) 5. *Imrankhanshaheen masoombushrai,* Malkani (2024a) *6. Isisaurus colberti,* Jain and Bandyopadhyay (1997)
	Saraikimasoomidae	7. *Saraikimasoom vitakri,* Malkani (2014a) 8. *Nicksaurus razashahi,* Malkani (2015a)
	Balochisauridae	9. *Balochisaurus malkani,* Malkani (2004) 10. *Qaikshaheen masoomniazi* Malkani (2023b, 2024)

		11. *Marisaurus jeffi,* Malkani (2004)
	Pakisauridae	12. *Pakisaurus balochistani,* Malkani (2004) 13. *Khanazeem saraikistani* Malkani (2022) 14. *Imrankhanhero zilefatmi* Malkani, (2024, 2023b) 15. *Sulaimanisaurus gingerichi,* Malkani (2004) 16. *Khetranisaurus barkhani,* Malkani (2004)
Theropodous dinosaurs	Vitakrisauridae	17. *Vitakridrinda sulaimani,* Malkani (2004) 18. *Vitakrisaurus Ssaraiki,* Malkani (2010) 19. *Shansaraiki insafi,* Malkani (2022)
	Noasauridae	*20. Saraikisauris minhui,* Malkani (2013)
Ichno taxa of dinosaurs	Ornithopaonia	*21. Malakhelisauroperus mianwali,* Malkani (2021a) *22. Pashtosauroperus zhobi,* Malkani (2021a)
	Sauropaonia	*23. Chiltansauroperus nicki,* Malkani (2021a) *24. Dgkhansauroperus, maarri* Malkani (2021) Malkani et al, (2018)
	Theropaonia	*25. Samanadrindaoperus surghari,* Malkani (2014, 2021a) *26. Himalayadrindaoperus potwari,* Malkani et al, (2018) Malkani, (2021a)

Courtesy: (16), (44), (53), (55), (68)

Table 6. List of present-day Pakistan's prehistoric reptilian taxa (Non-dinosaurian).

Group	Taxa
Geoemydidae (Hard-shelled turtles)	*1. Pangshura tatrotia,* Walter and Tyler (2010) *2. Melanochelys sivalensis,* Garbin *et al.* (2020)
Trionychidae (Softshell Marine turtle)	3. *Drazinderetes tethyensis,* Head *et al.* (1999)
Eucrocodiles	*4. Asifcroco retrai,* Malkani (2015b)
Crocodiles	5. *Induszalim bala*, Malkani (2014b) 6. *Pabwehshi pakistanensis,* Wilson *et al.,* (2001) 7. *Sulaimanisuchus kinwai,* Malkani (2021a, 2010) 8. *Mithasaraikistan ikniazi* Malkani, (2021b) 9. *Khuzdarcroco zahri,* Malkani (2019, 2015c) 10. *Sakhibaghoon khizari* Malkani *et al.* (2022)
Pterosaur (Flying Reptiles) bone taxa	*11. Imrankhanuqab qaeddiljani,* Malkani (2023a)
Pterosaur (Flying Reptiles) Ichno taxa	*12. Anmolpakhiperus alleni,* Malkani (2021a)
Plesiosaur (Marine Reptiles)	*13. Zahrisaurus kilmoolai,* Malkani (2019)
Python snake	*14. Erycinae infinite,* Head (2005) *15. Acrochordus dehmi,* Hoffstetter (1964) *16. Gansophis potwarensis,* Head (2005) *17. Wadanaang kohsulaimani,* Malkani (2023, 2021b) *18. Python sp., Hoffstetter (1964)*
Bungarus snake	*19. Natricinae indeterminate,* Head (2005) *20. Chotaophis padhriensis,* Head (2005)
Madtsoiid snake	*21. Gigantophis sp.,* Rage *et al.* (2014)
Colubroidae	*22. Gansophis potwarensis,* Head (2005) *23. Chotaophis padhriensis,* Head (2005) *24. Sivaophis downsi,* Head (2005)

Courtesy: (64); (65); (66); (71)

Conclusion

The primary objective of this review study is to provide recent and updated information on the herpetofauna of Pakistan, encompassing both extant and extinct taxa. The above checklists mentioned all species that have been recorded, so far, from Pakistan in major works of herpetology. Some species that have been recently described and recorded from Pakistan are also included in this article in addition. The diversity and distribution of reptiles are dependent on climatic conditions and the geographical position of any region. Pakistan is the home of all three living reptile orders: Crocodylia, Testudines, and Squamata. The country's diverse climate, vegetation, and soils form a variety of biotopes that support a very diverse reptile fauna. The arid climate of Pakistan makes it less favorable for amphibian fauna to thrive. It is challenging to determine precisely which portion of reptile populations is experiencing a significant decline. That is why baseline studies are necessary to establish the conservation status of these taxa in any region. Sufficient and significant collections of reptilian fossils have been gathered, so far, after 25 years of the first dinosaur discovery in Pakistan. Some complete and some nearly complete titanosaur sauropod limb bones from Pakistan, as well as some complete bones from India, are sufficient for comparison. Although complete fossil skeletons are rare in Pakistan, many fossils (out of 400 documented fossil bones recorded) provide sufficient evidence to serve as the basis for more than two dozen dinosaurian species, through comparisons and tests. The exposures of the Vitakri Formation in the Vitakri dome proved to be a graveyard that yielded a large number of bone assemblages and also hosted numerous skeletal fragments and their assemblages. Despite the lack of a direct impact, many isolated fossils are found at the surface; however, the lack of repetition, consistency, and overall morphological coherence suggests that the evidence is not directed at their direct organization. Many of these assemblages became the source of holotypes for most titanosaur sauropods and vitasaurid theropods.

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