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An updated and annotated list of Indian lizards (Reptilia: Sauria) based on a review of distribution records and checklists of Indian reptiles

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Abstract: Over the past two decades many checklists of reptiles of India and adjacent countries have been published. These publications have furthered the growth of knowledge on systematics, distribution and biogeography of Indian reptiles, and the field of herpetology in India in general. However, the reporting format of most such checklists of Indian reptiles does not provide a basis for direct verification of the information presented. As a result, mistakes in the inclusion and omission of species have been perpetuated and the exact number of reptile species reported from India still remains unclear. A verification of the current listings based on distributional records and review of published checklists revealed that 199 species of lizards (Reptilia: Sauria) are currently validly reported on the basis of distributional records within the boundaries of India. Seventeen other lizard species have erroneously been included in earlier checklists of Indian reptiles. Omissions of species by these checklists have been even more numerous than erroneous inclusions. In this paper, I present a plea to report species lists as annotated checklists which corroborate the inclusion and omission of species by providing valid source references or notes.

Keywords: Checklists, distributional records, India, lizards, Reptiles, review

INTRODUCTION

Plant and animal species survey and observational data are vast resources that provide present day and historical information on geographic distribution. Primary species-occurrence data have wide and varied uses, encompassing virtually every aspect of human life - food, shelter and recreation, art and history, society, science and politics (Chapman 2005a). Species listings or checklists, which contain such primary and compiled species-occurrence data, play a vital role in providing information on the number of species occurring in different regions across different spatial scales (local, regional, national and global). Such species occurrence data, in the form of checklists, have been used for taxonomic and biogeographic studies for hundreds of years (Chapman 2005a). Some of the other uses include conservation planning, reserve selection, climate change studies, agriculture, forestry and fishery, and species translocation studies, to name a few (See Chapman 2005a for a detailed account of the uses of species-occurrence data). Accuracy and precision (*sensu* Chapman 2005b) of the taxonomic and nomenclatural information and the spatial information are important considerations for determination of data quality and validation of the species occurrence data (Chapman 2005b). In this context, the importance of the data quality in the checklist of Indian reptiles - the storehouses of information on the reptilian species occurrence data- hardly needs emphasis.

Among the publications pertaining to reptilian taxonomy and species occurrences in India the works of Malcolm Smith (1931, 1935a, 1943), though more than half a century old, still remains the most important contribution (Das 2003). Over the past two decades many checklists of reptiles of India (Murthy 1985; Murthy 1990; Tikader & Sharma 1992; Das 1997a; Das 2003), sometimes including adjacent countries (Das 1994; Das1996a; Sharma 2002)

have been published. These publications have furthered the growth of knowledge on systematics, distribution and biogeography of Indian reptiles, and the field of herpetology in India in general. The primary objective of these publications, except those providing information of species distribution (for example - Murthy 1985; Tikader & Sharma 1992) and taxonomic development in India (Das 2003), included enlisting the reptilian species occurring in India. However, some of these publications have come under severe criticism (see review by Das 1996b; Pawar 1998), with reservation over the quality of the information presented. Especially the publications of the Zoological Survey of India, which still are followed by many workers in India, have especially been criticized for their failure to follow the changes in the taxonomic and distributional information of species.

An apparent inadequacy of the above-mentioned checklists of Indian reptiles published over the past 20 years is that species with valid distributional records are not differentiated from those with questionable records. While a reference to the taxonomic treatise has been provided (e.g. Das 2003), a valid reference or source for the distribution records corroborating the inclusion and omission of species have not been cited by any of these checklists. It is observed that despite being compilations, neither all of the bibliographic sources referred nor the details on locality records have been provided in most of the checklists (regional, state-wise or national) of Indian reptiles. For example, Vyas (2000) has noted and criticized the absence of source literature within the checklist of Gujarat reptiles provided by Gayen (1999). The failure to acknowledge all the literary sources used for the compilation of the species list is a reproachable attribute of these publications that is tantamount to plagiarism.

In addition to this significant limitation, the distribution records of species pre and post partition of British India have not been distinguished, resulting in erroneous inclusion of many species into the checklist. Incorrect inclusion of species that were not recorded within India, doubtful records and omissions of valid species has also been common. The inclusion or omission of species has not been corroborated with references or notes thereby rendering the information presented unverifiable. As a result, mistakes in species inclusion or omission have been perpetuated, and without any grounds for further verification. I quote Bobrov (2005) to illustrate this point with an example – "*Phrynocephalus reticulatus* was reported in Ladakh (Smith 1935). Later this single and clearly erroneous finding was mentioned in every publication on the herpetofauna of India, Kashmir and Ladakh." If the publications listing them had provided the source literature, it would have provided an opportunity for verification.

Furthermore, the lack of rationale for inclusion and omission of species has resulted in inconsistencies in the lists contributed by the same individual workers. For example Murthy (1985) erroneously included *Dasia grisea* in the list of Indian reptiles, with Andaman & Nicobar Islands as its distributional range. However, the list of reptiles provided by Murthy (1990) rightfully did not include this species. However, it erroneously appeared again in the list provided by Murthy (1994). Similarly Das (1994) & Das (1996a) did not include India in the distributional range of *Phyrnocephalus luteoguttatus*, but it was erroneously listed for India by Das (1997a). However this species was not included in a later list by Das (2003).

A direct consequence of the poor reporting standards of the checklists of Indian reptiles is that the exact number of reptilian species with valid distributional records within India still remains unclear. It has also rendered the information presented unverifiable directly, thereby hindering their further usage. This can be overcome only when checklists justify the inclusion and omission of each species by providing a valid reference/source for distribution records and the taxonomic treatise. The present communication is part of an effort to verify the validity of Indian reptile species listings, based on distributional records and a review of the earlier checklists of the Indian reptiles. In this paper, the species listings have been verified and species have been categorized based on the distributional records. A review of the checklists of Indian reptiles published over the past two decades has also been performed. Finally, a comprehensive list of lizards (Reptilia: Sauria) with valid distribution records in India has been provided along with source literature.

Recent developments (past 6 years) in the taxonomy and species occurrence information on Indian reptiles necessitates an update in the checklists of Indian lizards. Some of the new developments include records of *Hemidactylus persicus* from Gujarat (Vyas et al. 2006) and *Japalura kaulbackii* in Arunachal Pradesh (from Kunte & Manthey 2009). Recent rediscoveries include that of *Japalura sagittifera* from Arunachal Pradesh (from Kunte & Manthey 2009) and *Lygosoma vosmaerii* from Andhra Pradesh (Seetharamaraju et al. 2009). Doubts over the occurrence of *H. karenorum* in India (Zug et al. 2007; Mahony & Zug 2008) and questions on the taxonomic validity of *H. mahendrai* and *H. subtriedrus* had been raised (Zug et al. 2007) and acknowledged by other workers (Giri & Bauer 2008, Giri et al. 2009). The taxonomic revision of genus *Mabuya* (Mausfeld 2002), *Cnemaspis anaikattiensis* (Manamendra-Arachchi et al. 2007), *C. kandiana* (Wickramasinghe & Munindradasa 2007), *Phrynocephalus alticola* (Barabanov & Ananjeva 2007), *Calotes andamanensis* (Krishnan 2008), *Teratolepis fasciatus* (Bauer et al. 2008) and *Dasia halianus* (Wickramasinghe, submitted; Wickramasinghe, pers. comm.) from India have resulted in other changes. Description of new species included those of *Cnemaspis australis*, *C. monticola* and *C. nilagirica* (Manamendra-

Arachchi et al. 2007), *Hemidactylus aaronbaueri* (Giri 2008), *Hemidactylus sataraensis* (Giri & Bauer 2008), *Calotes aurantolobium* (Krishnan 2008), *Hemidactylus treutleri* (Mahony 2009a), *Japalura otai* (Mahony 2009b), and *Hemidactylus gujaratensis* (Giri et al. 2009). These have led to the revision of the list of lizards as provided by Das (2003).

METHODS

The list of lizards (Suborder Sauria) including the families Agamidae, Gekkonidae, Scincidae, Dibamidae, Anguidae, Eublepharidae, Lacertidae and Varanidae has been provided here. This list has been compiled primarily from articles published in scientific journals. I referred ca. 310 publications including technical reports, which formed the primary source for locality records. However reports in newsletters, unpublished reports, personal field observations and personal communications in writing (in lit.) with other herpetologists have also been taken into account. Information on species distribution and taxonomy has been complied from literature published until Sept 2009.

Taxonomic Treatise

The list provided, is at the species level and the taxonomy primarily follows Das (2003). Taxonomy of *Hemidactylus albofasciatus* follows Bauer et al. (2008) and the recognition of *Mabuya* as *Eutropis* follows Mausfeld et al. (2002). The species listed under the Genus *Kaestlea* (= *Scincella*) follows Eremchenko & Das (2004). Validity of the listings has been reviewed for species as provided by the checklist of Indian reptiles (Murthy 1985; Murthy 1990a; Tikader & Sharma 1992; Das 1997a; 2003), including its adjacent countries (Das 1994; Das 1996a; Sharma 2002). The words locality records and distributional records have been used synonymously.

Validity of species listed

Based on the distributional records available, the species have been classified into the following categories and a justification of the treatise has been provided through source literature and comments, wherever applicable.

(i) Species with valid distribution records within India. Distribution/Locality records within Indian limits currently available and have not been questioned by other workers.
(ii) Species reported from the regions politically disputed by India and Pakistan. This category includes species that are reported from politically disputed regions in Kashmir. The category has been created to acknowledge the current political situation in the areas from which we have valid distributional records.
(iii) Species whose distributional records are invalid or questioned. This category includes species for which distribution/locality records within India are available, but have been questioned. Also contains species whose inclusion has not been justified by providing source references/literature or relevant notes.
(iv) Species with unclear locality records. Species for which clear distribution/locality records within India are not available, but included in the checklists.
(v) Species known only from type specimen of unclear origin.
(vi) Species known only from type specimen, the original locality of which is not clear, but listed in earlier checklists.
(vii) Species valid in earlier lists, but omitted in this communication. Species that were earlier valid, but omitted in this communication due to the recent developments in taxonomic and distributional information.

The valid list of lizards in India, as represented by category A and B has separately been listed along with references corroborating their inclusion (Table 1). For the other categories, detailed comments have been provided along with a justification.

Review of the checklists of Indian reptiles

Validity of the species listed in the earlier checklists of India published in the past two decades has been reviewed. Based on existing and current information on their distribution, the following details have been reviewed for each of the publications -

(i) Erroneous inclusion of species without valid records and species whose distribution records were questioned.
(ii) Erroneous inclusion of species with unclear locality records.
(ii) Erroneous inclusion of species known only from type specimen of unknown origin.
(iv) Erroneous omission of valid species.

RESULTS

Validity and categorization of lizard species based on distributional records

The species that fall within the various categories as discussed in the methods section have been provided in the following paragraphs. The consolidated result, represented as the number of species classified under each category has been provided in Table 2. The number of lizard species with valid distributional records from India, including those known from politically disputed regions (PDR) between India and Pakistan (Category A and B respectively), is currently 199. These species have been listed in Table 1 along with a literature source corroborating each species' inclusion. However, in the past two decades, 17 (excluding category F) other species

Table 1. List of Saurid reptilian species with valid distributional records within India (Category A).

	Species	Source
Agamidae		
1	*Bronchocela cristatella* (Kuhl, 1820)	Smith 1935a
2	*Bronchocela danieli* (Tiwari & Biswas, 1973)	Tiwari & Biswas 1973
3	*Bronchocela jubata* Duméril & Bibron, 1837	Stoliczka 1873
4	*Brachysaura minor* (Hardwicke & Gray, 1827)	Günther 1864
5	*Bufoniceps laungwalansis* (Sharma, 1978)	Sharma 1978
6	*Calotes andamanensis* Boulenger, 1891	Krishnan 2008
7	*Calotes aurantolabium* Krishnan, 2008	Krishnan 2008
8	*Calotes calotes* (Linnaeus, 1758)	Smith 1935a
9	*Calotes ellioti* Günther, 1864	Günther 1864
10	*Calotes emma* Gray, 1845	Pawar et al. 2004
11	*Calotes grandisquamis* Günther, 1875	Günther 1875
12	*Calotes jerdoni* Günther, 1870	Günther 1870
13	*Calotes maria* Gray, 1845	Günther 1864
14	*Calotes mystaceus* Duméril & Bibron, 1837	Annandale 1904
15	*Calotes nemoricola* Jerdon, 1853	Günther 1864
16	*Calotes rouxii* Duméril & Bibron, 1837	Günther 1864
17	*Calotes versicolor* (Daudin, 1802)	Günther 1864
18	*Coryphophylax subcristatus* (Blyth, 1860)	Günther 1864
19	*Draco blanfordii* Boulenger, 1885	Biswas 1967
20	*Draco dussumieri* Duméril & Bibron, 1837	Günther 1864
21	*Draco maculatus* Gray, 1845	Pawar 1999
22	*Japalura andersoniana* Annandale, 1905	Smith 1935a
23	*Japalura kaulbackii* Smith, 1937	Kunte & Manthey 2009
24	*Japalura kumaonensis* (Annandale, 1907)	Annandale 1907
25	*Japalura major* (Jerdon, 1870)	Annandale 1907
26	*Japalura otai* Mahony 2009	Mahony 2009b
27	*Japalura planidorsata* Jerdon, 1870	Hora 1926
28	*Japalura sagittifera* Smith, 1940	Kunte & Manthey 2009
29	*Japalura tricarinata* (Blyth, 1854)	Hora 1926
30	*Japalura variegata* Gray, 1853	Günther 1864
31	*Laudakia agrorensis* (Stoliczka, 1872)	Smith 1935a
32	*Laudakia dayana* (Stoliczka, 1871)	Smith 1935a
33	*Laudakia himalayana* (Steindachner, 1867)	Schmidt 1926
34	*Laudakia melanura* Blyth, 1854	Agrawal 1979
35	*Laukadia tuberculata* (Hardwicke & Gray, 1827)	Günther 1864
36	*Mictopholis austeniana* (Annandale, 1908)	Annandale 1908
37	*Otocryptis beddomii* Boulenger, 1885	Smith 1935a
38	*Oriocalotes paulus* Smith, 1935	Smith 1935a
39	*Phrynocephalus theobaldi* Blyth, 1863	Schmidt 1926
40	*Psammophilus blanfordanus* (Stoliczka, 1871)	Smith 1935a
41	*Psammophilus dorsalis* (Gray in: Griffith & Pidgeon, 1831)	Smith 1935a
42	*Ptyctolaemus gularis* (Peters, 1864)	Wall 1908a
43	*Salea anamallayana* (Beddome, 1878)	Smith 1935a
44	*Salea horsfieldii* Gray, 1845	Günther 1864
45	*Sitana ponticeriana* Cuvier, 1844	Schmidt 1926
46	*Trapelus agilis* (Olivier, 1804)	Smith, 1935a
47	*Trapelus megalonyx* Günther, 1864	Prakash 1972
Anguidae		
48	*Ophisaurus gracilis* (Gray, 1845)	Günther 1864

	Species	Source
Chamaeleonidae		
49	*Chamaeleo zeylanicus* Laurenti, 1768	Günther 1864
Dibamidae		
50	*Dibamus nicobaricus* (Fitzinger in Steindachner, 1867)	Tikader & Das 1985
Eublepharidae		
51	*Eublepharis hardwickii* Gray, 1827	Smith 1935a
52	*Eublepharis macularius* (Blyth, 1854)	Smith 1935a
Gekkonidae		
53	*Calodactylodes aureus* (Beddome, 1870)	Beddome 1870
54	*Cnemaspis assamensis* Das & Sengupta, 2000	Das & Sengupta 2000
55	*Cnemaspis australis* Manamendra-Arachchi, Batuvita & Pethiyagoda, 2007	Manamendra-Arachchi et al. 2007
56	*Cnemaspis beddomei* (Theobald, 1876)	Beddome 1870
57	*Cnemaspis goaensis* Sharma, 1976	Sharma 1976
58	*Cnemaspis gracilis* (Beddome, 1870)	Beddome 1870
59	*Cnemaspis heteropholis* Bauer, 2002	Bauer 2002
60	*Cnemaspis indica* Gray, 1846	Smith 1935a
61	*Cnemaspis indraneildasii* Bauer, 2002	Bauer 2002
62	*Cnemaspis jerdonii* (Theobald, 1868)	Smith 1935a
63	*Cnemaspis littoralis* (Jerdon, 1854)	Beddome 1870
64	*Cnemaspis mysoriensis* (Jerdon, 1854)	Smith 1935a
65	*Cnemaspis monticola* Manamendra-Arachchi, Batuvita & Pethiyagoda, 2007	Manamendra-Arachchi et al. 2007
66	*Cnemaspis nairi Inger,* Marx & Koshy, 1984	Inger et al. 1984
67	*Cnemaspis nilagirica* Manamendra-Arachchi, Batuvita & Pethiyagoda, 2007	Manamendra-Arachchi et al. 2007
68	*Cnemaspis ornata* (Beddome, 1870)	Beddome 1870
69	*Cnemaspis otai* Das & Bauer, 2000	Das & Bauer 2000
70	*Cnemaspis sisparensis* (Theobald, 1876)	Smith 1935a
71	*Cnemaspis tropidogaster* (Boulenger, 1885)	Smith 1935a
72	*Cnemaspis wynadensis* (Beddome, 1870)	Beddome 1870
73	*Cnemaspis yercaudensis* Das & Bauer, 2000	Das & Bauer 2000
74	*Cosymbotus platyurus* (Schneider, 1792)	Günther 1864
75	*Crossobamon orientalis* (Blanford, 1875)	Biswas & Sanyal 1977a
76	*Cyrtodactylus adleri* Das, 1997	Das 1997b
77	*Cyrtodactylus fasciolatus* (Blyth, 1860)	Smith 1935a
78	*Cyrtodactylus gubernatoris* (Annandale, 1913)	Smith 1935a
79	*Cyrtodactylus himalayanus* Duda & Sahi, 1978	Duda & Sahi 1978
80	*Cyrtodactylus khasiensis* (Jerdon, 1870)	Smith 1935a
81	*Cyrtodactylus lawderanus* (Stoliczka, 1871)	Smith 1935a
82	*Cyrtodactylus malcomsmithi* (Constable, 1949)	Murthy 1985
83	*Cyrtodactylus mansarulus* Duda & Sahi, 1978	Duda & Sahi 1978
84	*Cyrtodactylus rubidus* (Blyth, 1861)	Stoliczka 1873
85	*Cyrtodactylus stoliczkai* (Steindachner, 1867)	Schmidt 1926
86	*Cyrtopodion aravallensis* (Gill, 1997)	Gill 1997
87	*Cyrtopodion kachhense* Stoliczka, 1872	Smith 1935a
88	*Cyrtopodion montiumsalsorum* (Annandale, 1913)	Duda & Sahi 1977
89	*Cyrtopodion scabrum* (von Heyden in Rüppell, 1827)	Smith 1935a
90	*Geckoella collegalensis* (Beddome, 1870)	Beddome 1870
91	*Geckoella deccanensis* (Günther, 1864)	Günther 1864
92	*Geckoella jeyporensis* (Beddome, 1878)	Smith 1935a
93	*Geckoella nebulosa* (Beddome, 1870)	Beddome 1870
94	*Gehyra mutilata* (Wiegmann, 1834)	Annandale 1904
95	*Gekko gecko* (Linnaeus, 1758)	Stoliczka 1873

	Species	Source
96	*Gekko smithi* Gray, 1842	Annandale 1904
97	*Gekko verreauxi* Tytler, 1865 (1864)	Smith 1935a
98	*Hemidactylus aaronbaueri* Giri, 2008	Giri 2008
99	*Hemidactylus albofasciatus* Grandison & Soman, 1963	Grandison & Soman 1963
100	*Hemidactylus anamallensis* (Günther, 1875)	Günther 1875
101	*Hemidactylus bowringii* (Gray, 1845)	Smith 1935a
102	*Hemidactylus brookii* Gray, 1845	Gleadow 1887
103	*Hemidactylus flaviviridis* Rüppell, 1835	Smith 1935a
104	*Hemidactylus frenatus* Duméril & Bibron, 1836	Stoliczka 1873
105	*Hemidactylus garnotii* Duméril & Bibron, 1836	Smith 1935a
106	*Hemidactylus giganteus* Stoliczka, 1871	Giri et al. 2003
107	*Hemidactylus gracilis* Blanford, 1870	Smith 1935a
108	*Hemidactylus gujaratensis* Giri, Bauer, Vyas & Patil 2009	Giri et al. 2009
109	*Hemidactylus leschenaultii* Duméril & Bibron, 1836	Blanford 1871
110	*Hemidactylus maculatus* Duméril & Bibron, 1836	Günther 1864
111	*Hemidactylus persicus* Anderson, 1872	Vyas et al. 2006
112	*Hemidactylus porbandarensis* Sharma, 1981	Sharma 1981
113	*Hemidactylus prashadi* Smith, 1935	Smith 1935a
114	*Hemidactylus reticulatus* Beddome, 1870	Beddome 1870
115	*Hemidactylus sataraensis* Giri & Bauer, 2008	Giri & Bauer 2008
116	*Hemidactylus scabriceps* (Annandale, 1906)	Smith 1935a
117	*Hemidactylus triedrus* (Daudin, 1802)	Smith 1935a
118	*Hemidactylus treutleri* Mahony 2009	Mahony 2009a
119	*Hemiphyllodactylus aurantiacus* (Beddome, 1870)	Beddome 1870
120	*Hemiphyllodactylus typus* Bleeker, 1860	Beddome 1870
121	*Lepidodactylus lugubris* (Duméril & Bibron, 1836)	Stoliczka 1873
122	*Phelsuma andamenense* Blyth, 1861 (1860)	Stoliczka 1873
123	*Ptychozoon kuhli* Stejneger, 1902	Günther 1864
124	*Ptychozoon lionotum* Annandale, 1905	Pawar & Biswas 2001
Lacertidae		
125	*Acanthodactylus cantoris* Günther, 1864	Günther 1864
126	*Mesalina watsonana* (Stoliczka, 1872)	Smith 1935a
127	*Ophisops beddomei* (Jerdon, 1870)	Beddome 1870
128	*Ophisops jerdoni* Blyth, 1853	Smith 1935a
129	*Ophisops leschenaultii* (Milne-Edwards, 1829)	Smith 1935a
130	*Ophisops microlepis* Blanford, 1870	Smith 1935a
131	*Ophisops minor* Deraniyagala, 1971	Smith 1935a
132	*Takydromus haughtonianus* (Jerdon, 1870)	Smith 1935a
133	*Takydromus khasiensis* (Boulenger, 1917)	Smith 1935a
134	*Takydromus sexlineatus* Daudin, 1802	Smith 1935a
Scincidae		
135	*Ablepharus grayanus* (Stoliczka, 1872)	Smith 1935a
136	*Ablepharus pannonicus* (Fitzinger, 1823)	Sahi & Duda 1986
137	*Asymblepharus ladacensis* (Günther, 1864)	Günther 1864
138	*Asymblepharus himalayanum* (Günther, 1864)	Günther 1864
139	*Asymblepharus sikkimensis* (Blyth, 1854)	Smith 1935a
140	*Barkudia insularis* Annandale, 1917	Annandale 1917
141	*Barkudia melanosticta* (Schneider, 1801)	Ganapati & Nayar 1952
142	*Dasia nicobarensis* Biswas & Sanyal, 1977	Biswas & Sanyal 1977b
143	*Dasia olivacea* Gray, 1839	Stoliczka 1873
144	*Dasia subcaeruleum* (Boulenger, 1891)	Boulenger 1891

	Species	Source
145	*Eurylepis poonaensis* (Sharma, 1970)	Sharma 1970
146	*Eurylepis taeniolatus* Blyth, 1854	Smith 1935a
147	*Eutropis allapallensis* (Schmidt, 1926)	Schmidt 1926
148	*Eutropis andamanensis* (Smith, 1935)	Smith 1935a
149	*Eutropis beddomei* (Jerdon, 1870)	Smith 1935a
150	*Eutropis bibronii* (Gray, 1838)	Smith 1935a
151	*Eutropis carinata* (Schneider, 1801)	Smith 1935a
152	*Eutropis clivicola* (Inger, Shaffer, Koshy & Bakde, 1984)	Inger et al. 1984
153	*Eutropis dissimillis* (Hallowell, 1857)	Smith 1935a
154	*Eutropis gansi* (Das, 1991)	Das 1991
155	*Eutropis innotata* (Blanford, 1870)	Smith 1935a
156	*Eutropis macularia* (Blyth, 1853)	Smith 1935a
157	*Eutropis multifasciata* (Kuhl, 1820)	Annandale 1904
158	*Eutropis nagarjuni* (Sharma, 1969)	Sharma 1971
159	*Eutropis quadricarinata* (Boulenger, 1887)	Murthy 1985
160	*Eutropis rudis* (Boulenger, 1887)	Biswas 1984
161	*Eutropis rugifera* (Stoliczka, 1870)	Stoliczka 1873
162	*Eutropis trivittata* (Hardwicke & Gray, 1827)	Smith 1935a
163	*Eutropis tytlerii* (Tytler in Theobald, 1868)	Stoliczka 1873
164	*Lipinia macrotympanum* (Stoliczka, 1873)	Stoliczka 1873
165	*Lygosoma albopunctata* (Gray, 1846)	Günther 1864
166	*Lygosoma ashwamedhi* (Sharma, 1969)	Sharma 1971
167	*Lygosoma bowringii* (Günther, 1864)	Smith 1935a
168	*Lygosoma goaensis* (Sharma, 1976)	Sharma 1976
169	*Lygosoma guentheri* (Peters, 1879)	Smith 1935a
170	*Lygosoma lineata* (Gray, 1839)	Smith 1935a
171	*Lygosoma pruthi* (Sharma, 1977)	Sharma 1977
172	*Lygosoma punctata* (Gmelin, 1799)	Annandale 1915
173	*Lygosoma vosmaerii* (Gray, 1839)	Seetharamaraju et al. 2009
174	*Novoeumeces schneiderii* Daudin, 1802	Vyas 1998
175	*Ophiomorus raithmai* Anderson & Leviton, 1966	Greer & Wilson 2001
176	*Ristella beddomii* Boulenger, 1887	Smith 1935a
177	*Ristella guentheri* Boulenger, 1887	Smith 1935a
178	*Ristella rurkii* Gray, 1839	Smith 1935a
179	*Ristella travancoricus* (Beddome, 1870)	Beddome 1870
180	*Kaestlea beddomei* (Boulenger, 1887)	Smith 1935a
181	*Kaestlea bilineata* (Gray, 1846)	Smith 1935a
182	*Kaestlea laterimaculata* (Boulenger, 1887)	Smith 1935a
183	*Kaestlea palnica* (Boettger, 1892)	Smith 1935a
184	*Kaestlea travancorica* (Beddome, 1870)	Beddome 1870
185	*Scincella macrotis* (Fitzinger in: Steindachner, 1867)	Smith 1935a
186	*Sepsophis punctatus* Beddome, 1870	Beddome 1870
187	*Sphenomorphus courcyanum* (Annandale, 1912)	Smith 1935a
188	*Sphenomorphus dussumieri* (Duméril & Bibron, 1839)	Beddome 1870
189	*Sphenomorphus indicus* (Gray, 1853)	Wall 1908b
190	*Sphenomorphus maculatus* (Blyth, 1853)	Annandale 1904
191	*Tropidophorus assamensis* Annandale, 1912	Smith 1935a
Uromastycidae		
192	*Uromastyx hardwickii* Gray in Hardwicke & Gray, 1827	Günther 1864
Varanidae		
193	*Varanus bengalensis* (Daudin, 1802)	Annandale 1915

	Species	Source
194	*Varanus flavescens* (Hardwicke & Gray, 1827)	Smith 1935a
195	*Varanus griseus* Daudin, 1803	Smith 1935b
196	*Varanus salvator* Laurenti, 1768	Annandale 1904

Table 2. Family wise categorization of Indian lizard species based on distributional records

Family / Category	A	B	C	D	E	F	Total
Agamidae	47	1	5	1		2	**56**
Anguidae	1						**1**
Chamaeleonidae	1						**1**
Dibamidae	1						**1**
Eublepharidae	2						**2**
Gekkonidae	71	1	4	1	1	7	**85**
Lacertidae	10		1				**11**
Scincidae	58	1	3		1	3	**66**
Uromastycidae	1						**1**
Varanidae	4						**4**
Total	**196**	**3**	**13**	**2**	**2**	**12**	**228**

A - Species with valid distribution records within India
B - Species reported from the regions politically disputed by India and Pakistan
C - Species whose distributional records are invalid or questioned
D - Species with unclear locality records
E - Species known only from type specimen of unclear origin
F - Species that were valid in earlier lists, but omitted in this communication.

without any valid distributional records in India have been included in the various checklists of Indian reptiles. Details of these species falling under the other categories have been provided below, along with comments justifying the treatise.

B. Species reported from the regions politically disputed by India and Pakistan

Agamidae

Laudakia pakistanica Baig, 1989

Comments – Baig and Böhme (1996) described the subspecies *Laudakia pakistanica khani* from Chilas, an area that falls in a region politically disputed by India and Pakistan, in Kashmir. Das (1996a) commented that this species has been reported from politically disputed regions of India & Pakistan.

Gekkonidae

Alsophylax boehmei Szczerbak, 1991

Comments – I have not seen the original species description. I follow the locality records (Skardu, Ladakh) provided by Khan (2002) and Das (1996a). Das (1996a) commented that this species has been reported from politically disputed regions of India & Pakistan.

Scincidae

Asymblepharus tragbulense (Alcock, '1897' 1898)

Comments – I have not seen the original species description. The only known collection of the species was in 1885 from Tragbul Pass, about 50km NW Srinagar, presently in the politically disputed region between India and Pakistan (*fide* Das et al. 1998).

C. Species without valid records and species whose distribution records were questioned, but included in earlier checklist of Indian reptiles

Agamidae

Calotes bhutanensis Biswas, 1975

Comments – No known distribution records from India. Tikader & Sharma (1992) included this species for India.

Laudakia caucasia (Eichwald, 1831)

Comments - Locality records for this species (Kelat & Bolan Pass) provided by Smith (1935a: 221) falls in Balochistan Province in Pakistan and there have been no other reported records within India subsequently. However this species has been included in the list of Indian reptiles provided by Das (1997a; 2003).

Phrynocephalus luteoguttatus Boulenger, 1887

Comments – No known locality records for India but included in the list of Indian reptiles by Das (1997a). I agree with Barabanov & Ananjeva (2007) in not including India in the distributional range of this species.

Phrynocephalus euptilopus Alcock & Finn, '1896' 1897

Comments – Das (1996b) has questioned the report of this species from deserts of Rajasthan (Daniel 1983; Tikader & Sharma 1992; Daniel 2002; Sharma 2002). However, this species was included in earlier checklists (Murthy 1990; Tikader & Sharma 1992; Das 1997a; Sharma 2002) of Indian reptiles. I agree with Bobrov (2005) and Barabanov & Ananjeva (2007) in not including India in the distributional range of this species.

Salea kakhienensis (Anderson, '1878' 1879)

Comments – No known locality records for this species

from India, but has erroneously been included for India in the lists by Das (1994; 1996a; 1997a).

Gekkonidae
Cyropodion fedtschenkoi (Strauch, 1987)
Comments – Das (1996b) questioned the reports of this species from deserts of Rajasthan (Tikader & Sharma 1992; Sharma 1992). No known reports of this species from India.

Cyrtopodion chitralense (Smith, 1935)
Comments - Locality record for this species (Karakal) provided by Smith (1935a: 47) falls in North West Frontier Province of Pakistan and there have been no subsequent reports of this species from India. This species has been listed for India by Das (2003).

Cyrtopodion baturense (Khan & Baig, 1992)
Comments – No valid records of this species from India but listed by Das (1997a).

Teratoscincus microlepis Nikolski, 1899
Comments – No known records of this species from India, but included for India by Murthy (1994).

Lacertidae
Acanthodactylus blanfordii Boulenger, 1918
Comments – No known locality records from India, but included for India by Das (1994; 1996a; 1997a).

Scincidae
Dasia grisea (Gray, 1845)
Comments – No known records of this species from India but included for India by Murthy (1985; 1994).

Scincella reevesii (Gray, 1838)
Comments – No known locality records from India, but included for India by Das (1994; 1996a; 1997a).

Eutropis novemcarinata (Anderson, 1871)
Comments – No known locality records from India, but included for India by Das (1997a; 2003).

D. Species with unclear locality records listed in earlier checklists.
Agamidae
Pseudocalotes microlepis (Boulenger, 1887)
Comments –Smith (1935a: 187) noted that the specimen recorded from Assam (Manipur?) by Annandale were lost. I have not verified if Annandale reported this species in his publications. However, Hallermann & Bohme (2000) did not include India in the distributional range of this species. The presence of this species in India needs confirmation as there have been no other reports and the locality record for the specimen still remains uncertain. However, many lists of Indian reptiles have included this species.

Gekkonidae
Cyrtodactylus pulchellus Hardwicke & Gray, 1827
Comments – No known locality records for this species from India. Das (2003) included this species in his list while denoting that it was not recorded from India specifically, but was cited by Smith (1935a: 38). It has been included in the lists by Das (1994; 1996a; 1997a; 2003). Given that the locality records are not available, the inclusion of this species needs confirmation.

E. Species known only from a type specimen, the original locality of which is not clear, but listed in earlier checklists.
Gekkonidae
Cnemaspis boei (Gray, 1842)
Comments – Known only from the type specimen, the locality record for which is not available (*fide* Smith 1935a: 75), and there have been no subsequent reports. However, Das (1994; 1996a; 1997a; 2003) included this species in the list of Indian reptiles. The presence of this species in India needs confirmation.

Scincidae
Eumeces blythianus (Anderson, 1871)
Comments – The type locality not known, but purchased in Amritsar (*fide* Smith 1935a: 340) and no subsequent reports, but was included in the lists provided by Das (1994; 1997a). The presence of this species in India needs confirmation.

F. Species valid in earlier lists, but omitted in this communication due to the recent developments in taxonomic and distributional information.
Agamidae
Phrynocephalus alticola Peters 1984
Comments – Following the taxonomy proposed by Barabanov & Ananjeva (2007), this species has been treated as a subjective junior synonym of *P. theobaldi*, and not included in this list as a separate species.

Phrynocephalus reticulatus (Eichwald, 1831)
Comments – This species was erroneously reported to occur in Ladakh by Smith (1935a) and following this was included in subsequent checklists of India (Bobrov 2005).

Gekkonidae
Cnemaspis kandiana (Kelaart, 1852)
Comments – Based on taxonomy suggested by Wickremasinghe & Munindradasa (2007), this species is confined to Sri Lanka and populations from India have been relegated to other species.

Cnemaspis anaikattiensis Mukherjee, Bhupathy & Nixon, 2005

Comments – Based on taxonomy suggested by Manamendra-Arachchi *et al.* (2007), this species is considered a subjective synonym of *C. sisparensis*.

Ptyodactylus homolepis Blanford, 1876

Comments – This species was erroneously reported by Sahi & Duda (1985) to occur in Jammu & Kashmir (Bobrov 2005).

Hemidactylus karenorum (Theobald, 1868)

Comments – Following Mahony et al. (2008) who raised doubts over the distribution of this species from India and awaiting confirmation of the only existing record from Cachar (Assam) Smith (1935a: 102), it has not been included in the list of Indian reptiles.

Hemidactylus mahendrai Shukla, 1983

Comments – Following the taxonomic changes suggested by Zug et al. (2007), this species has been treated as a synonym of *H. brookii*, and not included in the list as a separate species.

Hemidactylus subtreidrus Jerdon, 1853

Comments – The taxonomic validity of *H. subtriedrus* had been questioned by some (Zug et al. 2007) and acknowledged by other workers (Giri & Bauer 2008; Giri et al. 2009). As a result, it has not been included in the list of Indian reptiles, awaiting taxonomic clarity.

Teratolepis fasciata (Blyth, 1854 (1853))

Comments – Based on recent taxonomic development, this species has been placed in Genus *Hemidactylus* and suggested a new name, *H. imbricatus* due to homonymy (Bauer et al. 2008). Also, it has been suggested by Bauer et al. (2008) that the reports from India are likely to be erroneous.

Scincidae

Chalcides pentadactylus Beddome, 1870

Comments – The type specimen reported from Beypur, Kerala is lost and its true status needs examination of fresh material (*fide* Smith, 1935a: 350). It has not been reported again since its original description and its presence in India needs confirmation.

Dasia halianus (Haly and Nevill in: Nevill, 1887)

Comments – The Indian *Dasia halianus*, has been taxonomically identified as *Dasia subcaeruleum*, while the distribution of *Dasia halianus* has been reported to be restricted to Sri Lanka (Wickramasinghe, submitted; Wickramasinghe, pers. comm.)

Ophiomorus tridactylus (Blyth, 1853)

Comments – There has been some confusion regarding the taxonomy and distribution, between this species and *O. raithmai*. However, only *O. raithmai* currently occurs in India, while the distribution of this species is limited to Afghanistan and Pakistan (Indraneil Das, *Personal Communication*). The locality records within India available for this species actually pertain to *O. raithmai.*

Review of the checklists of Indian lizards

In the checklists of Indian reptiles published over the past 20 years, the number of omissions of species has been greater than that of erroneous inclusions (Table 3). However, it must be noted that over the years there has been a decrease in the number of such omissions (But see Sharma 2002). Within erroneous inclusions, inclusion of species whose distribution records were invalid or were questioned has been high in lists provided by Das (1997a). The list of species erroneously included or omitted by published checklists is provided in Table 3.

DISCUSSION

Brown (1992) made a plea for standardizing the distributional records of Indian reptiles almost two decades ago. However, drawing a standardized format for publishing species checklists is an important task to be undertaken, in order to verify and validate the species occurrence data and also to prevent perpetuation of mistakes. This is especially true for checklists of regional (different Indian states or protected area checklists for example) and national levels, which are primarily compilations. Annotated lists based on available locality records and justifying the inclusion or omission of species by providing relevant source literature or notes on specimens, could be a good way of validating regional and national level checklists. This would facilitate the possibility of verification of the information presented, thereby ensuring its quality and also duly pay credit to the deserving workers who generated the vouchered or otherwise substantiated records.

Quality of species occurrence data, as derived from species lists, significantly impacts conservation and management considerations. The Conservation Assessment and Management Plan (CAMP) for Indian reptiles (Molur & Walker 1998) which formed the IUCN red list of Indian reptiles used the checklist list provided by Das (1997a) as the starting reference point for the number of reptiles in India. However, Das (1997a) contained many erroneous inclusions and omissions (See Table 3), and the standard of reporting does not provide means to directly verify the quality of information presented. Accurate and precise data on species occurrences are imperative for the assessment of conservation status and drawing management considerations. It is also pivotal for the species occurrence information to be accurate

Table 3. Erroneous inclusion and omission of species in the checklists of Indian reptiles. The references have been arranged chronologically.

Reference	Species without valid records / with questionable records	Species with unclear locality records	Species known only from type specimen of unknown origin	Omission of valid species
Murthy 1985	*Dasia grisea*	*Pseudocalotes microlepis;*		*Bufoniceps laungwalansis; Laudakia melanura; Trapelus megalonyx; Cnemaspis gracilis; C. nairi; C. tropidogaster; Cyrtodactylus mansarulus; Cyrtopodion montiumsalsorum; Gekko verreauxi; Hemidactylus karenorum; H. porbandarensis; Lepidodactylus lugubris; Ablepharus pannonicus; Chalcides pentadactlyus; Lygosoma ashwamedhi; L. pruthi; Eutropis allapallensis; M. clivicola; M. innotata; M. nagarjuni; M. rudis; Novoeumeces schneiderii*
Murthy 1990	*Phrynocephalus euptilopus*	*Pseudocalotes microlepis*		*Trapelus megalonyx; Cnemaspis gracilis; C. nairi; C.tropidogaster; Cyrtodactylus himalayanus; C.malcomsmithii; C. mansarulus; Gekko verreauxi; Lepidodactylus lugubris; Ablepharus pannonicus; Chalcides pentadactlyus; Dasia haliana; Lygosoma ashwamedhi; Eutropis allapallensis; M. clivicola; M. innotata; M. nagarjuni; M. clivicola; Novoeumeces schneiderii*
Tikader & Sharma 1992	*Calotes bhutanensis; Phrynocephalus euptilopus; Cyrtopodion fedtschenkoi*	*Pseudocalotes microlepis*	*Lygosoma vosmaerii*	*Coryphophylax subcristatus; Laudakia melanura; Trapelus megalonyx; Cnemaspis gracilis; C. nairi; C.tropidogaster; Cyrtodactylus himalayanus; C.malcomsmithii; C. mansarulus; Gekko verreauxi; Lepidodactylus lugubris; Ablepharus pannonicus; Dasia haliana; Novoeumeces schneiderii*
Murthy 1994	*Salea kakhienensis; Scincella reevesii; Acanthodactylus blanfordii*	*Cyrtodactylus pulchellus*	*Cnemaspis boei; Eumeces blythianus; Lygosoma vosmaerii*	*Draco maculatus; Trapelus megalonyx; Cnemaspis gracilis; Crossobamon orientalis*
Das 1994	*Phrynocephalus euptilopus; Teratoscincus microlepis; Dasia grisea*			*Laudakia melanura; Trapelus megalonyx; Cnemaspis gracilis; C.tropidogaster; C. mansarulus; C. rubidus; Gekko smithi; Hemidactylus porbandarensis; Lepidodactylus lugubris; Ablepharus pannonicus; Chalcides pentadactlyus; Eutropis allapallensis; M. clivicola; Novoeumeces schneiderii*
Das 1996a	*Salea kakhienensis; Scincella reevesii; Acanthodactylus blanfordii;*	*Cyrtodactylus pulchellus*	*Cnemaspis boei; Lygosoma vosmaerii*	*Draco maculatus; Trapelus megalonyx; Cnemaspis gracilis;Mabuya rugifera*
Das 1997a	*Salea kakhienensis; Laudakia caucasia; Phrynocephalus luteoguttatus; Phrynocephalus euptilopus; Tenuidactylus baturensis; Scincella reevesii; Acanthodactylus blanfordii; Mabuya novemcarinata;*	*Cyrtodactylus pulchellus*	*Cnemaspis boei; Eumeces blythianus; Lygosoma vosmaerii*	*Draco maculatus; Trapelus megalonyx; Crossobamon orientalis; Cyrtopodion montiumsalsorum; Eurylepis poonaensis*
Sharma 2002	*Calotes bhutanensis; Phrynocephalus euptilopus; Cyrtopodion fedtschenkoi*			*Laudakia melanura; Trapelus megalonyx; Cyrtodactylus himalayanus; C.malcomsmithii; C. mansarulus; Gekko verreauxi; Hemiphyllodactylus typhus, Ptychozoon lionotum; Ablepharus pannonicus; Barkudia melanosticta; Dasia haliana; Novoeumeces schneiderii*
Das 2003	*Laudakia caucasia; Cyrtodactylus chitralensis; Mabuya novemcarinata*	*Cyrtodactylus pulchellus*	*Cnemaspis boei*	*Draco maculatus*

for it to be used for further research purposes such as predictions on species distributions, habitat suitability, and threat assessments etc. While there have been global efforts to share and provide free access to species distribution information (Ex. GBIF 2008), the current reporting standards of publications on Indian reptiles (regional and national) actually hinder further usage of the information presented. This could be ameliorated only if individual workers and publishing houses/journals present annotated checklists that contain source literature and details substantiating the inclusion and omission of each species.

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