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South Asian amphibians: taxonomy, diversity and conservation status

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The global conservation crisis facing amphibians requires regional taxonomic-based assessments of conservation status. The current and probable future needs for captive-breeding facilities in zoos and other institutions are revealed by the number, habitat and life-cycle types of threatened candidate species in the region. The geopolitical region of South Asia is home to four biodiversity hotspots with very high faunal, floral and fungal diversity. A total of 348 amphibians is currently described from the eight countries of the region, and India and Sri Lanka show very high amphibian diversity. In this paper, I compare and contrast the first regional amphibian biodiversity assessments from 1997 with more recent assessments. This includes a checklist of all amphibians in the region, with new taxonomic information added, especially from the Global Amphibian Assessment. A summary of amphibian biodiversity statistics, the kinds of threats facing amphibians and the current status of species in South Asia is given. Twenty species are Extinct, 26 Critically Endangered, 66 Endangered, 26 Vulnerable, 11 Near Threatened, 30 Least Concern and 77 Data Deficient. The cooperation and contributions of the more than 250 amphibian biologists, academics, taxonomists, amateurs, photographers and educators in the Amphibian Network of South Asia (ANSA) were essential for the assessments and this comparative study. The successful model of a networking principle and activities of the ANSA are also discussed. The role of chytridiomycosis in species declines is unknown owing to a lack of surveys on the presence of chytrid fungus *Batrachochytrium dendrobatidis*. Although most of the threatened and Extinct species are anurans, the bush frog group of frogs seems to be the most speciose and also the most threatened group owing to highly restricted distributions. The *Philautus* genus would be an ideal group to breed in captivity owing to its direct development cycle.

Key-words: amphibian; Amphibian Network of South Asia; conservation; diversity; GAA; networking; South Asia; taxonomy.

INTRODUCTION

The global amphibian extinction crisis is driving a worldwide movement to prevent

extinction (see the Amphibian Ark: AArk, <http://www.amphibianark.org/>). In order to prevent amphibian extinctions, captive-breeding programmes must be established in zoos and other institutions. The efficient implementation of such programmes requires that the degree of threat to a species is a major factor when selecting candidates for conservation measures. The number of species in need of captive-breeding programmes, currently and in the future, is an essential parameter for superstructure planning and strategic management. The selection of candidate species must be based on good taxonomic knowledge backed up by adequate surveys carried out by all those who work with amphibians (see the Global Amphibian Assessment: GAA, <http://www.globalamphibians.org/>; IUCN, 2007). Besides an inventory of species, successful captive-breeding programmes are also dependent on life-history knowledge, particularly about reproduction, for individual species (Browne & Zippel, 2007; Browne *et al.*, 2007). South Asia is providing a model for the extensive use of networking principles to gather an increasing amount of both taxonomic and life-stage information. This increased knowledge about taxonomy, ecology and life-history traits, gained through networking, enables better conservation management to integrate at both the *in situ* and *ex situ* levels.

From 1997 to 2007 the volume of research, publications and general interest in amphibians has grown rapidly in South Asia, particularly in India and Sri Lanka. This reflects a regional increase in research into taxonomy

and that more field studies are being carried out. The first major assessment of the biodiversity of amphibians in one country was carried out in India in 1997 through a Conservation Assessment and Management Plan (CAMP) workshop, a process developed by the Conservation Breeding Specialist Group [CBSG: SSC/IUCN (Species Survival Commission of The World Conservation Union); Ellis & Seal, 1996]. At that workshop the status of 202 known Indian amphibian species was assessed according to the 1994 IUCN Red List Criteria and Categories (version 2.3; Molur & Walker, 1998). This was followed by a similar process to assess the status of 54 known Sri Lanka amphibian species in December 1998 (de Silva *et al.*, 2000). The two workshops were very successful owing to the networking activities of amphibian biologists through the Amphibian Network of South Asia (ANSA). ANSA made it possible to use the information and results from the work carried out by 65 amphibian biologists, all of whom participated in the two 5 day CAMP workshops held in India and Sri Lanka, to generate a comprehensive assessment of the taxonomic and conservation status of the amphibians in both countries (Molur & Walker, 1998; de Silva *et al.*, 2000).

The amphibian diversity in South Asia, including in Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, has been assessed through the consensus of participating researchers. While Sri Lanka and India had reasonable numbers of enthusiastic individuals and organizations participating, the other countries of South Asia had few participants. In fact, Afghanistan, Bhutan and Pakistan have not recently produced a single authoritative amphibian researcher.

This paper compares historical information on amphibian fauna in South Asia by country and the recently published GAAs (IUCN *et al.*, 2006) (<http://www.globalamphibians.org/>). The earlier published checklists of amphibians identified 22 species in Bangladesh (IUCN Bangladesh, 2000), seven in Bhutan (Das & Palden, 2001), 202 in India

(Molur & Walker, 1998), one in Maldives (Das, 2001), 59 in Nepal (Shrestha, 2001), 25 in Pakistan (Baig, 2001) and 54 in Sri Lanka (de Silva *et al.*, 2000). In all these checklists, inconsistencies resulting from ambiguities in taxonomy, and non-uniformity of methods, identification tools and techniques, were observed. Since 1997, these inconsistencies have been rectified and the CAMP/GAA process has attempted to establish a standard. In 2002, a 5 day assessment workshop, which was a combination of the CAMP workshop process and the GAA process [collaboration between Zoo Outreach Organisation (ZOO)/CBSG South Asia and the SSC/IUCN/Conservation International – Centre for Applied Biodiversity Science], was organized to assess the status of all the amphibians of South Asia. Preliminary research and cooperation between field researchers from South Asia greatly increased our knowledge of amphibians in the region. Table 1 gives an overall breakdown of species within each country in South Asia, as per IUCN *et al.* (2006), listing the number of country endemics and their global status. The number of non-endemics in each country is also listed.

STATUS OF SOUTH ASIAN AMPHIBIANS

As per GAA records (IUCN *et al.*, 2006), 285 amphibian species are endemic to South Asia, with 256 species endemic to only a single country and 29 species endemic but with a distribution ranging more than one country within the region. Indian endemics constitute 54% of the overall endemics in South Asia, followed by 30% of Sri Lankan endemics. Nepal has 4% endemics, while Afghanistan, Bangladesh, Bhutan and Pakistan have only one endemic species each; multi-country endemics constitute the remaining 10%. The statistics show a major improvement in the knowledge of amphibian biodiversity in the region over the last decade. Many species have been described, especially in India and Sri Lanka, since 1997, with a corresponding increase in the biogeographic knowledge of species distributions all over South Asia.

	AFGHANISTAN	BANGLADESH	BHUTAN	INDIA	MALDIVES	NEPAL	PAKISTAN	SRI LANKA	SOUTH ASIA MULTI-COUNTRY	SOUTH ASIA OVERALL
Total number of endemics	1	1	1	155	0	10	1	87	29	285
Extinct	0	0	0	1	0	0	0	19	0	20
Critically Endangered	1	0	0	14	0	0	0	11	0	26
Endangered	0	0	0	30	0	0	0	36	0	66
Vulnerable	0	0	0	19	0	2	0	5	3	26
Near Threatened	0	0	0	5	0	2	0	4	2	11
Least Concern	0	0	0	17	0	2	1	10	23	30
Data Deficient	0	1	1	69	0	4	0	2	1	77
Number of non-endemic species	5	31	6	85	1	36	17	15	63	63
Total number of species	6	32	7	240	1	46	18	102	92	348

Table 1. Country-wise amphibian species numbers with global status for endemics as per Global Amphibian Assessments IUCN *et al.* (2006).

These factors, supported by taxonomic revisions, have resulted in a substantial increase in knowledge about the taxonomy, diversity and conservation of amphibians in South Asia. Sri Lanka leads the rest of South Asia with a species composition knowledge increase of 88% since 1997, followed by Bangladesh (45%) and India (19%). Owing to taxonomic rearrangements and revalidations, Pakistan and Nepal have a reduced species composition compared with the 2001 checklists.

There has been almost no systematic study of amphibians in Bhutan, Pakistan and Afghanistan. Although there have been a few attempts by researchers in Bangladesh to document species compositions, there are no dedicated amphibian specialists in that country. In contrast to the other South Asian countries, there is a healthy synergism between Sri Lankan and Indian amphibian taxonomists and field biologists in documenting new species through new discoveries, range extensions or taxonomic revalidations.

The differences in the status of amphibians between the assessments over the last decade (CAMP workshops in India and Sri Lanka, see Molur & Walker, 1998; de Silva *et al.*, 2000) to the CAMP/GAA workshop in 2002 (IUCN *et al.*, 2006) reflect the progress of studies of amphibians in the region. While 59% of the Indian endemic amphibians were assessed as threatened and 21% as Data Deficient in 1997 (Molur & Walker, 1998), the GAA assessments indicate a reduction in threatened endemic species to 40%, but an increase in Data Deficient species to 44%. In amphibian studies, increased confidence in assessing the conservation status of species does not directly correspond to increased knowledge. For example, more caecilians are categorized as Data Deficient in the GAA when compared with the earlier assessment. Detailed life history and distribution studies are high research priorities to deal with conservation needs. Taxonomic revalidations while providing a better picture of species composition have increased the uncertainty of the veracity of findings of previous research. Discoveries of many previously

unknown species and recent taxonomic revisions have questioned the validity of published species distribution records. Many species in the literature or those represented only by museum specimens appear to be Extinct, including those from Sri Lanka where 19 species were categorized as Extinct. Many of these Extinct species have only been described in the last 3–5 years from museum specimens and extensive field work over many years in several areas of Sri Lanka have not yielded live or recently dead specimens.

Recent new descriptions of species from Sri Lanka and India are mainly from the family Rhacophoridae. Fifty-one species of *Philautus* have been described with 44 from Sri Lanka and seven from India since the 2002 CAMP/GAA workshop, and several more are in the process of being described. There have also been five new caecilian species described since 2002 with several more in the process of being described. Other amphibians have received less attention than *Philautus* and caecilians. However, three species of anuran have been described in India since 2002.

In common with many other groups, there is a shift to molecular phylogenetic studies as a taxonomic tool to establish species status. The recent taxonomic and nomenclatural revisions of amphibians in South Asia (Frost *et al.*, 2006) provide a major reassignment of species and their classification. Tables 2 and 3 list all species, as recognized by Frost *et al.* (2006) and Frost (2007), occurring in South Asia. Presently the GAA does not follow Frost (2007), therefore the analysis provided in the text above and in Table 1 has been made using the previous taxonomy as accepted by the GAA. However, to provide a contemporary perspective, Frost (2007) is used for the checklist of amphibians of South Asia in Tables 2 and 3. Before Frost *et al.* (2006), the number of recognized amphibian families in the region was ten, and this was revised to 15 on completion of the 'amphibian tree of life'. Taxonomic revisions have also increased the number of genera from 42 to 60 (Frost *et al.*, 2006). Frost *et al.* (2006) consider the newly discovered *Nasikabatrachus sahyadrensis* as

belonging to the Sooglossidae family rather than to the Nasikabatrachidae family originally proposed by Biju & Bossuyt (2003).

The generic composition of South Asian amphibian families is listed in Table 4. The family Bufonidae has three newly created genera to accommodate several *Bufo* species. Frost *et al.* (2006) also propose that all the *Bufo* species in South Asia should eventually be transferred to other genera. Members of the Ranidae are now included in five families, namely Dicroglossidae, Micrixalidae, Nyctibatrachidae, Ranidae and Ranixalidae. Several species within the older Ranidae have been allotted or transferred to genera other than *Rana* by earlier workers.

DEFICIENCIES IN RESEARCH

The deficiencies in amphibian research in South Asia listed by Molur & Walker (1998) are still apparent today. There is limited access to museum specimens beyond the region owing to prohibitive travel costs and there are few working taxonomists in the region, although several biologists opportunistically work with species descriptions. In some instances museum specimens within the region are either not preserved properly or are lost. Several of the species described by Rao (1937) from southern Karnataka were considered as Data Deficient at the CAMP/GAA owing to the loss of all type specimens from the Bangalore University museum and the lack of valid neotypes. There is also a paucity of ecological and reproductive knowledge for most species to enable efficient captive-breeding programmes to be run.

PROTECTION

Amphibians have been identified for protection by the Indian Wildlife (Protection) Act (1972 amended in 2004). The Himalayan newt *Tylotriton verrucosus* and freshwater *Rana* species have been placed under these protection schedules. However, in India there is an increased need for national legislation and protection of species of other families, especially those whose distribution is restricted to regions of high human

SPECIES	GLOBAL DISTRIBUTION
BUFONIDAE	
1 <i>'Bufo' atukoralei</i> Bogert & Senanayake, 1966	endemic to Sri Lanka
2 <i>'Bufo' beddomii</i> (Günther, 1875)	endemic to Western Ghats, India
3 <i>'Bufo' brevirostris</i> (Rao, 1937)	endemic to Western Ghats, India
4 <i>'Bufo' hololius</i> (Günther, 1875)	endemic to Western Ghats and Eastern Ghats, India
5 <i>'Bufo' kotagamai</i> Fernando, Dayawansa & Siriwardhana, 1994	endemic to Sri Lanka
6 <i>'Bufo' koyayensis</i> (Soman, 1963)	endemic to Western Ghats, India
7 <i>'Bufo' parietalis</i> (Boulenger, 1882)	endemic to Western Ghats, India
8 <i>'Bufo' scaber</i> Schneider, 1799	endemic to India and Sri Lanka
9 <i>'Bufo' silentvalleyensis</i> Pillai, 1981	endemic to Western Ghats, India
10 <i>Adenomus dasi</i> Manamendra-Arachchi & Pethiyagoda, 1998	endemic to Sri Lanka
11 <i>Adenomus kandianus</i> (Günther, 1872)	endemic to Sri Lanka
12 <i>Adenomus kelaartii</i> (Günther, 1858)	endemic to Sri Lanka
13 <i>Ansonia ornata</i> Günther, 1875	endemic to Western Ghats, India
14 <i>Ansonia rubigina</i> Pillai & Pattabiraman, 1981	endemic to Western Ghats, India
15 <i>Bufoides meghalayanus</i> (Yazdani & Chanda, 1971)	endemic to northeastern India
16 <i>Duttaphrynus microtypanum</i> (Boulenger, 1882)	endemic to Western Ghats, India
17 <i>Duttaphrynus noellerti</i> (Manamendra-Arachchi & Pethiyagoda, 1998)	endemic to Sri Lanka
18 <i>Pedostibes kempfi</i> (Boulenger, 1919)	endemic to northeastern India
19 <i>Pedostibes tuberculosus</i> Günther, 1876	endemic to Western Ghats, India
20 <i>Pseudepidalea latastii</i> (Boulenger, 1882)	endemic to South Asia (India, Pakistan)
21 <i>Pseudepidalea pseudoraddei</i> Mertens, 1971	endemic to Pakistan
CAECILIIDAE	
22 <i>Gegeneophis carnosus</i> (Beddome, 1870)	endemic to Western Ghats, India
23 <i>Gegeneophis danieli</i> Giri, Wilkinson & Gower, 2003	endemic to India
24 <i>Gegeneophis fulleri</i> (Alcock, 1904)	endemic to northeastern India
25 <i>Gegeneophis krishni</i> Pillai & Ravichandran, 1999	endemic to Western Ghats, India
26 <i>Gegeneophis madhavaorum</i> Bhatta & Srinivasa, 2004	endemic to India
27 <i>Gegeneophis nadkarnii</i> Bhatta & Prashanth, 2004	endemic to India
28 <i>Gegeneophis ramaswamii</i> Taylor, 1964	endemic to Western Ghats, India
29 <i>Gegeneophis seshachari</i> Ravichandran, Gower & Wilkinson, 2003	endemic to India
30 <i>Indotyphlus battersbyi</i> Taylor, 1960	endemic to Western Ghats, India
31 <i>Indotyphlus maharashtraensis</i> Giri, Wilkinson & Gower, 2003	endemic to India
DICROGLOSSIDAE	
32 <i>Allopaia hazarensis</i> (Dubois & Khan, 1979)	endemic to South Asia (India and Pakistan)
33 <i>Chrysopaa sternosignata</i> (Murray, 1885)	endemic to South Asia (Afghanistan, India, Pakistan)
34 <i>Euphyctis ghoshi</i> (Chanda, 1991)	endemic to northeastern India (Manipur)
35 <i>Euphyctis hexadactylus</i> Lesson, 1834	endemic to South Asia (Bangladesh, India, Sri Lanka, possibly in Nepal)
36 <i>Fejervarya andamanensis</i> (Stoliczka, 1870)	endemic to Andaman & Nicobar Islands, India
37 <i>Fejervarya assimilis</i> (Blyth, 1852)	endemic to Pakistan
38 <i>Fejervarya brevipalmata</i> (Peters, 1871)	endemic to Western Ghats, India
39 <i>Fejervarya frithi</i> (Theobald, 1868)	endemic to Bangladesh
40 <i>Fejervarya greenii</i> (Boulenger, 1905)	endemic to Sri Lanka
41 <i>Fejervarya keralensis</i> (Dubois, 1981)	endemic to India (Western Ghats and Narmada Valley, Madhya Pradesh)
42 <i>Fejervarya kirtisinghei</i> (Manamendra-Arachchi & Gabadage, 1996)	endemic to Sri Lanka
43 <i>Fejervarya murthii</i> (Pillai, 1979)	endemic to Western Ghats, India
44 <i>Fejervarya mysorensis</i> (Rao, 1922)	endemic to Western Ghats, India
45 <i>Fejervarya nepalensis</i> (Dubois, 1975)	endemic to South Asia (India, Nepal)
46 <i>Fejervarya nicobariensis</i> (Stoliczka, 1870)	endemic to Nicobar Island, India
47 <i>Fejervarya nilagirica</i> (Jerdon, 1854)	endemic to Western Ghats, India

- 48 *Fejervarya orissaensis* (Dutta, 1997) endemic to Orissa, India
 49 *Fejervarya parambikulamana* (Rao, 1937) endemic to Western Ghats, India
 50 *Fejervarya pierrei* (Dubois, 1975) endemic to South Asia (India, Nepal)
 51 *Fejervarya rufescens* (Jerdon, 1854) endemic to Western Ghats, India
 52 *Fejervarya sauriceps* (Rao, 1937) endemic to Western Ghats, India
 53 *Fejervarya syhadrensis* (Annandale, 1919) endemic to South Asia (Bangladesh, India, Nepal, Pakistan, possibly in Myanmar)
 54 *Fejervarya teraiensis* (Dubois, 1984) endemic to South Asia (India, Nepal)
 55 *Hoplobatrachus crassus* (Jerdon, 1854) endemic to South Asia (Bangladesh, India, Nepal, Sri Lanka)
 56 *Hoplobatrachus tigerinus* (Daudin, 1802) endemic to South Asia (Afghanistan, Bangladesh, India, Nepal, Pakistan)
 57 *Ingerana charlesdarwini* (Das, 1998) endemic to Andaman Islands, India
 58 *Limnonectes khasianus* (Anderson, 1871) endemic to India
 59 *Limnonectes mawlyndipi* (Chanda, 1990) endemic to India
 60 *Limnonectes mawphlangensis* (Pillai & Chanda, 1977) endemic to Nepal
 61 *Minervarya sahyadris* Dubois, Ohler & Biju, 2001 endemic to Western Ghats, India
 62 *Nannophrys ceylonensis* Günther, 1869 endemic to Sri Lanka
 63 *Nannophrys guentheri* Boulenger, 1882 endemic to Sri Lanka
 64 *Nannophrys marmorata* Kirtisinghe, 1946 endemic to Sri Lanka
 65 *Nanorana annandalii* (Boulenger, 1920) endemic to South Asia (India, Nepal); possibly in Bhutan and China
 66 *Nanorana ercepeae* (Dubois, 1974) endemic to Nepal
 67 *Nanorana minica* (Dubois, 1975) endemic to South Asia (India, Nepal); possibly in China
 68 *Nanorana mokochungensis* (Das & Chanda, 2000) endemic to India
 69 *Nanorana rarica* (Dubois, Matsui & Ohler, 2001) endemic to Nepal
 70 *Nanorana rostandi* (Dubois, 1974) endemic to Nepal
 71 *Nanorana vicina* (Stoliczka, 1872) endemic to South Asia (India, Pakistan)
 72 *Occidozyga borealis* (Annandale, 1912) endemic to South Asia (Bhutan, India)
 73 *Ombryna sikimensis* (Jerdon, 1870) endemic to South Asia (India, Nepal); possibly present in Bangladesh, Bhutan and China
 74 *Sphaerotheca dobsoni* (Boulenger, 1882) endemic to peninsular India
 75 *Sphaerotheca leucorhynchus* (Rao, 1937) endemic to Western Ghats, India
 76 *Sphaerotheca rolandae* (Dubois, 1983) endemic to South Asia (India and Sri Lanka)
 77 *Sphaerotheca strachani* (Murray, 1884) endemic to Pakistan

HYNOBIIDAE

- 78 *Paradactylodon mustersi* (Smith, 1940) endemic to Afghanistan

ICHTHYOPHIIDAE

- 79 *Ichthyophis beddomei* Peters, 1879 endemic to Western Ghats, India
 80 *Ichthyophis bombayensis* Taylor, 1960 endemic to Western Ghats, India
 81 *Ichthyophis garoensis* Pillai & Ravichandran, 1999 endemic to northeastern India
 82 *Ichthyophis glutinosus* (Linnaeus, 1754) endemic to Sri Lanka
 83 *Ichthyophis husaini* Pillai & Ravichandran, 1999 endemic to northeastern India
 84 *Ichthyophis longicephalus* Pillai, 1986 endemic to Western Ghats, India
 85 *Ichthyophis malabarensis* Taylor, 1913 endemic to Western Ghats, India
 86 *Ichthyophis peninsularis* Taylor, 1960 endemic to Western Ghats, India
 87 *Ichthyophis pseudangularis* Taylor, 1965 endemic to Sri Lanka
 88 *Ichthyophis orthoplicatus* Taylor, 1965 endemic to Sri Lanka
 89 *Ichthyophis sikkimensis* Taylor, 1960 endemic to South Asia (India, Nepal)
 90 *Ichthyophis subterrestris* Taylor, 1960 endemic to Western Ghats, India
 91 *Ichthyophis tricolor* Taylor, 1960 endemic to Western Ghats, India
 92 *Uraeotyphlus malabaricus* (Beddome, 1870) endemic to Western Ghats, India
 93 *Uraeotyphlus menoni* Annandale, 1913 endemic to Western Ghats, India
 94 *Uraeotyphlus narayani* Seshachar, 1939 endemic to Western Ghats, India
 95 *Uraeotyphlus oxyurus* (Duméril & Bibron, 1841) endemic to Western Ghats, India
 96 *Uraeotyphlus interruptus* Pillai & Ravichandran, 1999 endemic to Western Ghats, India

MEGOPHRYIDAE

- 97 *Scutigera bhutanensis* Delorme & Dubois, 2001 endemic to Bhutan
 98 *Scutigera nepalensis* Dubois, 1974 endemic to Nepal
 99 *Xenophrys robusta* (Boulenger, 1908) endemic to northeastern India

MICRIXALIDAE

- 100 *Micrixalus elegans* (Rao, 1937) endemic to Western Ghats, India
 101 *Micrixalus fuscus* (Boulenger, 1882) endemic to Western Ghats, India
 102 *Micrixalus gadgili* Pillai & Pattabiraman, 1990 endemic to Western Ghats, India
 103 *Micrixalus kottigeharensis* (Rao, 1937) endemic to Western Ghats, India
 104 *Micrixalus narainensis* (Rao, 1937) endemic to Western Ghats, India
 105 *Micrixalus nudis* Pillai, 1978 endemic to Western Ghats, India
 106 *Micrixalus phyllophilus* (Jerdon, 1854) endemic to Western Ghats, India
 107 *Micrixalus saxicola* (Jerdon, 1854) endemic to Western Ghats, India
 108 *Micrixalus silvaticus* (Boulenger, 1882) endemic to Western Ghats, India
 109 *Micrixalus swamianus* (Rao, 1937) endemic to Western Ghats, India
 110 *Micrixalus thampii* Pillai, 1981 endemic to Western Ghats, India

MICROHYLIDAE

- 111 *Kaloula assamensis* Das, Sengupta, Ahmed & Dutta, 2005 endemic to India
 112 *Kaloula taprobanica* Parker, 1934 endemic to South Asia (Bangladesh, India and Sri Lanka)
 113 *Melanobatrachus indicus* Beddome, 1878 endemic to Western Ghats, India
 114 *Microhyla chakrapanii* Pillai, 1977 endemic to Andaman & Nicobar Islands, India
 115 *Microhyla karunaratnei* Fernando & Siriwardhane, 1996 endemic to Sri Lanka
 116 *Microhyla rubra* (Jerdon, 1854) endemic to South Asia (Bangladesh, India and Sri Lanka)
 117 *Microhyla sholigari* Dutta & Ray, 2000 endemic to Western Ghats, India
 118 *Microhyla zeylanica* Parker & Osman-Hill, 1949 endemic to Sri Lanka
 119 *Ramanella anamalaiensis* Rao, 1937 endemic to Western Ghats, India
 120 *Ramanella minor* Rao, 1937 endemic to Western Ghats, India
 121 *Ramanella montana* (Jerdon, 1854) endemic to Western Ghats, India
 122 *Ramanella marmorata* Rao, 1937 endemic to Western Ghats, India
 123 *Ramanella nagaoui* Manamendra- Arachchi & Pethiyagoda, 2001 endemic to Sri Lanka
 124 *Ramanella obscura* (Günther, 1864) endemic to Sri Lanka
 125 *Ramanella palmata* Parker, 1934 endemic to Sri Lanka
 126 *Ramanella triangularis* (Günther, 1876) endemic to Western Ghats and Eastern Ghats, India
 127 *Ramanella variegata* (Stoliczka, 1872) endemic to South Asia (India and Sri Lanka)
 128 *Uperodon globulosus* (Günther, 1864) endemic to South Asia (Bangladesh, India, Nepal)
 129 *Uperodon systema* (Schneider, 1799) endemic to South Asia (India, Nepal, Sri Lanka)

NYCTIBATRACHIDAE

- 130 *Lankanectes corrugata* (Peters, 1863) endemic to Sri Lanka
 131 *Nyctibatrachus aliciae* Inger, Shaffer, Koshy & Bakde, 1984 endemic to Western Ghats, India
 132 *Nyctibatrachus beddomii* (Boulenger, 1882) endemic to Western Ghats, India
 133 *Nyctibatrachus deccanensis* Dubois, 1984 endemic to Western Ghats, India
 134 *Nyctibatrachus humayuni* Bhaduri & Kripalani, 1955 endemic to Western Ghats, India
 135 *Nyctibatrachus hussaini* Krishnamurthy, Reddy & Gururaja, 2001 endemic to Western Ghats, India
 136 *Nyctibatrachus kempholeysensis* (Rao, 1937) endemic to Western Ghats, India
 137 *Nyctibatrachus major* Boulenger, 1882 endemic to Western Ghats, India
 138 *Nyctibatrachus minor* Inger, Shaffer, Koshy & Bakde, 1984 endemic to Western Ghats, India
 139 *Nyctibatrachus petraeus* Das & Kunte, 2005 endemic to India
 140 *Nyctibatrachus sanctipalustris* Rao, 1920 endemic to Western Ghats, India
 141 *Nyctibatrachus sylvaticus* Rao, 1937 endemic to Western Ghats, India
 142 *Nyctibatrachus vasanthi* Ravichandran, 1997 endemic to Western Ghats, India

RANIDAE

- 143 *Amolops chakratensis* Ray, 1992 endemic to India

- 144 *Amolops formosus* (Günther, 1876) endemic to South Asia (Bangladesh, India, Nepal); possibly also in Bhutan and China
 145 *Amolops gerbillus* (Annandale, 1912) endemic to India; possibly present in Bangladesh, Nepal, China and Myanmar
 146 *Amolops jaunsari* Ray, 1992 endemic to India (Uttaranchal)
 147 *Amolops nepalicus* Yang, 1991 endemic to Nepal
 148 *Clinotarsus curtipes* (Jerdon, 1854) endemic to Western Ghats, India
 149 *Hydrophylax chalconotus* (Schlegel, 1837) endemic to Nicobar Islands (India)
 150 *Hydrophylax malabaricus* (Tschudi, 1838) endemic to India
 151 *Hylarana tytleri* Theobald, 1868 endemic to South Asia (Bangladesh, India, Nepal)
 152 *Pterorana khare* Kiyasetuo & Khare, 1986 endemic to northeastern India
 153 *Sylvirana aurantiaca* (Boulenger, 1904) endemic to South Asia – India and Sri Lanka
 154 *Sylvirana chitwanensis* (Das, 1998) endemic to Nepal
 155 *Sylvirana garoensis* (Boulenger, 1920) endemic to northeastern India
 156 *Sylvirana gracilis* (Gravenhorst, 1829) endemic to Sri Lanka
 157 *Sylvirana temporalis* (Günther, 1864) endemic to South Asia (India and Sri Lanka)

RANIXALIDAE

- 158 *Indirana beddomii* (Günther, 1876) endemic to Western Ghats, India
 159 *Indirana brachytarsus* (Günther, 1876) endemic to Western Ghats, India
 160 *Indirana diplosticta* (Günther, 1876) endemic to Western Ghats, India
 161 *Indirana gundia* (Dubois, 1986) endemic to Western Ghats, India
 162 *Indirana leithii* (Boulenger, 1888) endemic to Western Ghats, India
 163 *Indirana leptodactyla* (Boulenger, 1882) endemic to Western Ghats, India
 164 *Indirana longicrus* (Rao, 1937) endemic to Western Ghats, India
 165 *Indirana phrynoderma* (Boulenger, 1882) endemic to Western Ghats, India
 166 *Indirana semipalmata* (Boulenger, 1882) endemic to Western Ghats, India
 167 *Indirana tenuilingua* Rao, 1937 endemic to Western Ghats, India

RHACOPHORIDAE

- 168 *Aquixalus naso* (Annandale, 1912) endemic to India; possibly in China
 169 *Chiromantis cherrapunjiae* (Roonwal & Kripalani, 1966) endemic to northeastern India
 170 *Chiromantis dudhwaensis* (Ray, 1992) endemic to India
 171 *Chiromantis shyamrupus* (Chanda & Ghosh, 1989) endemic to India
 172 *Chiromantis simus* (Annandale, 1915) endemic to north-eastern India
 173 *Philautus abundus* Manamendra-Arachchi & Pethiyagoda, 2005 endemic to Sri Lanka
 174 *Philautus adpersus* (Günther, 1872) endemic to Sri Lanka
 175 *Philautus alto* Manamendra-Arachchi & Pethiyagoda, 2005 endemic to Sri Lanka
 176 *Philautus annandalii* (Boulenger, 1906) endemic to South Asia (India, Nepal); possibly present in Bangladesh, Bhutan, China and Myanmar
 177 *Philautus asankai* Manamendra-Arachchi & Pethiyagoda, 2005 endemic to Sri Lanka
 178 *Philautus auratus* Manamendra-Arachchi & Pethiyagoda, 2005 endemic to Sri Lanka
 179 *Philautus beddomii* (Günther, 1876) endemic to Western Ghats, India
 180 *Philautus bobingeri* Biju & Bossuyt, 2005 endemic to India
 181 *Philautus bombayensis* (Annandale, 1919) endemic to Western Ghats, India
 182 *Philautus caeruleus* Manamendra-Arachchi & Pethiyagoda, 2005 endemic to Sri Lanka
 183 *Philautus cavirostris* (Günther, 1869) endemic to Sri Lanka
 184 *Philautus chalazodes* (Günther, 1876) endemic to Western Ghats, India
 185 *Philautus charius* Rao, 1937 endemic to Western Ghats, India
 186 *Philautus cuspis* Manamendra-Arachchi & Pethiyagoda, 2005 endemic to Sri Lanka
 187 *Philautus decoris* Manamendra-Arachchi & Pethiyagoda, 2005 endemic to Sri Lanka
 188 *Philautus dimbullae* (Shreve, 1940) endemic to Sri Lanka
 189
 190 *Philautus dubius* (Boulenger, 1882) endemic to north-eastern India
 191 *Philautus eximius* Shreve, 1940 endemic to Sri Lanka
 192 *Philautus extirpo* Manamendra-Arachchi & Pethiyagoda, 2005 endemic to Sri Lanka
 193 *Philautus femoralis* (Günther, 1864) endemic to Sri Lanka
 194 *Philautus fergusonianus* (Ahl, 1927) endemic to Sri Lanka
 195 *Philautus flaviventris* (Boulenger, 1882) endemic to Western Ghats, India

196	<i>Philautus folicola</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
197	<i>Philautus frankenbergi</i> Meegaskumbura & Manamendra-Arachchi, 2005	endemic to Sri Lanka
198	<i>Philautus fulvus</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
199	<i>Philautus garo</i> (Boulenger, 1919)	endemic to north-eastern India
200	<i>Philautus glandulosus</i> (Jerdon, 1854)	endemic to Western Ghats, India
201	<i>Philautus graminirupes</i> Biju & Bossuyt, 2005	endemic to India
202	<i>Philautus griet</i> Bossuyt, 2002	endemic to India
203	<i>Philautus hallidayi</i> Meegaskumbura & Manamendra-Arachchi, 2005	endemic to Sri Lanka
204	<i>Philautus halyi</i> Boulenger, 1904	endemic to Sri Lanka
205	<i>Philautus hoffmanni</i> Meegaskumbura & Manamendra-Arachchi, 2005	endemic to Sri Lanka
206	<i>Philautus hoipolloi</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
207	<i>Philautus hypomelas</i> (Günther, 1876)	endemic to Sri Lanka
208	<i>Philautus jerdonii</i> (Günther, 1876)	endemic to India
209	<i>Philautus kempiae</i> (Boulenger, 1919)	endemic to northeastern India
210	<i>Philautus leucorhinus</i> (Lichtenstein & Martens, 1856)	endemic to Sri Lanka
211	<i>Philautus limbus</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
212	<i>Philautus lunatus</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
213	<i>Philautus luteolus</i> Kuramoto & Joshy, 2003	endemic to India
214	<i>Philautus macropus</i> (Günther, 1869)	endemic to Sri Lanka
215	<i>Philautus malcolmsmithi</i> (Ahl, 1927)	endemic to Sri Lanka
216	<i>Philautus microdiscus</i> (Annandale, 1912)	endemic to north-eastern India
217	<i>Philautus microtypanum</i> (Günther, 1858)	endemic to Sri Lanka
218	<i>Philautus mittermeieri</i> Meegaskumbura & Manamendra-Arachchi, 2005	endemic to Sri Lanka
219	<i>Philautus mooreorum</i> Meegaskumbura & Manamendra-Arachchi, 2005	endemic to Sri Lanka
220	<i>Philautus namdaphaensis</i> Sarkar & Sanyal, 1985	endemic to north-eastern India
221	<i>Philautus nanus</i> (Günther, 1869)	endemic to Sri Lanka
222	<i>Philautus nasutus</i> (Günther, 1869)	endemic to Sri Lanka
223	<i>Philautus nemus</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
224	<i>Philautus nerostagona</i> Biju & Bossuyt, 2005	endemic to India
225	<i>Philautus ocellaris</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
226	<i>Philautus oxyrhynchus</i> (Günther, 1872)	endemic to Sri Lanka
227	<i>Philautus papillosus</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
228	<i>Philautus pleurotaenia</i> (Boulenger, 1904)	endemic to Sri Lanka
229	<i>Philautus ponmudi</i> Biju & Bossuyt, 2005	endemic to India
230	<i>Philautus poppiae</i> Meegaskumbura & Manamendra-Arachchi, 2005	endemic to Sri Lanka
231	<i>Philautus popularis</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
232	<i>Philautus procax</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
233	<i>Philautus regius</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
234	<i>Philautus reticulatus</i> (Günther, 1869)	endemic to Sri Lanka
235	<i>Philautus rugatus</i> (Ahl, 1927)	endemic to Sri Lanka
236	<i>Philautus rus</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
237	<i>Philautus sanctisilvaticus</i> Das & Chanda, 1997	endemic to India
238	<i>Philautus sarasinorum</i> (Müller, 1887)	endemic to Sri Lanka
239	<i>Philautus schmarda</i> (Kelaart, 1854)	endemic to Sri Lanka
240	<i>Philautus semiruber</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
241	<i>Philautus shillongensis</i> Pillai & Chanda, 1973	endemic to north-eastern India
242	<i>Philautus signatus</i> (Boulenger, 1882)	endemic to Western Ghats, India
243	<i>Philautus silus</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
244	<i>Philautus silvaticus</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
245	<i>Philautus simba</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
246	<i>Philautus similipalensis</i> Dutta, 2003	endemic to Sri Lanka

247	<i>Philautus sordidus</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
248	<i>Philautus</i> sp. nov. 'Amboli Forest'	endemic to Sri Lanka
249	<i>Philautus</i> sp. nov. 'Athirimala'	endemic to Sri Lanka
250	<i>Philautus</i> sp. nov. 'Eravikulam NP'	endemic to Sri Lanka
251	<i>Philautus</i> sp. nov. 'Kalpatta'	endemic to Sri Lanka
252	<i>Philautus</i> sp. nov. 'Munnar'	endemic to Sri Lanka
253	<i>Philautus</i> sp. nov. 'Munnar 2'	endemic to Sri Lanka
254	<i>Philautus</i> sp. nov. 'Tholpetti Forest'	endemic to Sri Lanka
255	<i>Philautus steineri</i> Meegaskumbura & Manamendra-Arachchi, 2005	endemic to Sri Lanka
256	<i>Philautus stellatus</i> (Kelaart, 1853)	endemic to Sri Lanka
257	<i>Philautus stictomerus</i> (Günther, 1876)	endemic to Sri Lanka
258	<i>Philautus stuarti</i> Meegaskumbura & Manamendra-Arachchi, 2005	endemic to Sri Lanka
259	<i>Philautus temporalis</i> (Günther, 1864)	endemic to Sri Lanka
260	<i>Philautus terebrans</i> Das & Chanda, 1998	endemic to Eastern Ghats, India
261	<i>Philautus tinniens</i> (Jerdon, 1854)	endemic to Western Ghats, India
262	<i>Philautus travancoricus</i> (Boulenger, 1891)	endemic to Western Ghats, India
263	<i>Philautus tuberothumerus</i> Kuramoto & Joshy, 2003	endemic to India
264	<i>Philautus variabilis</i> (Günther, 1858)	endemic to Sri Lanka
265	<i>Philautus viridis</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
266	<i>Philautus zal</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
267	<i>Philautus zimmeri</i> (Ahl, 1927)	endemic to Sri Lanka
268	<i>Philautus zorro</i> Manamendra-Arachchi & Pethiyagoda, 2005	endemic to Sri Lanka
269	<i>Polypedates cruciger</i> Blyth, 1852	endemic to Sri Lanka
270	<i>Polypedates eques</i> Günther, 1858	endemic to Sri Lanka
271	<i>Polypedates fastigo</i> Manamendra-Arachchi & Pethiyagoda, 2001	endemic to Sri Lanka
272	<i>Polypedates insularis</i> Das, 1995	endemic to Great Nicobar Islands, India
273	<i>Polypedates longinasus</i> (Ahl, 1927)	endemic to Sri Lanka
274	<i>Polypedates maculatus</i> (Gray, 1833)	endemic to South Asia – Bangladesh, India, Nepal and Sri Lanka
275	<i>Polypedates pseudocruciger</i> Das & Ravichandran, 1998	endemic to Western Ghats, India
276	<i>Polypedates taeniatus</i> (Boulenger, 1906)	endemic to South Asia (Bangladesh, India, Nepal,); possibly present in Bhutan
277	<i>Polypedates zed</i> (Dubois, 1987)	endemic to central and eastern Nepal
278	<i>Rhacophorus calcadensis</i> Ahl, 1927	endemic to Western Ghats, India
279	<i>Rhacophorus lateralis</i> Boulenger, 1883	endemic to Western Ghats, India
280	<i>Rhacophorus malabaricus</i> Jerdon, 1870	endemic to Western Ghats, India
281	<i>Rhacophorus namdaphaensis</i> Sarkar & Sanyal, 1985	endemic to north-eastern India
282	<i>Rhacophorus pseudomalabaricus</i> Vasudevan & Dutta, 2000	endemic to Western Ghats, India
283	<i>Rhacophorus variabilis</i> (Jerdon, 1854)	endemic to Western Ghats, India
284	<i>Theleiderma moloch</i> (Annandale, 1912)	endemic to India
SOOGLOSSIDAE		
285	<i>Nasikabatrachus sahyadrensis</i> Biju & Bossuyt, 2003	endemic to India

Table 2. Amphibians endemic to South Asia. Nomenclature and taxonomy following Frost (2007); checklist following IUCN *et al.* (2006).

impact. The Western Ghats is home to two endemic families of amphibians [Micrixalidae (one genus, 11 species) and Ranixalidae (one genus, ten species)] and three other families that are almost unique to the region [Caeciliidae (two genera, four species), Ichthyophiidae (two genera, 12 species) and Nyctibatrachidae (one genus, 11 species)]. In

total, 90 endemic Western Ghats amphibian species require habitat and habitat-quality protection. Several other restricted species occurring in other biogeographic zones of high human impact, such as the Eastern Ghats, north-eastern India, Himalaya, the Terai and the islands of Andaman and Nicobar, need urgent and immediate conservation

SPECIES	SOUTH ASIA DISTRIBUTION
BUFONIDAE	
1 <i>'Bufo' olivaceus</i> Blanford, 1874	Pakistan, possibly in Afghanistan
2 <i>'Bufo' stomaticus</i> (Lutken, 1862)	Afghanistan, Bangladesh, India, Nepal, Pakistan, possibly in Bhutan
3 <i>'Bufo' stuarti</i> Smith, 1929	India
4 <i>Duttaphrynus himalayanus</i> (Günther, 1864)	India, Nepal, Pakistan, possibly present in Bangladesh, Bhutan
5 <i>Duttaphrynus melanostictus</i> (Schneider, 1799)	Bangladesh, Bhutan (possibly present), India, Nepal, Pakistan, Sri Lanka
6 <i>Ingerophrynus macrotis</i> Boulenger, 1887	India
7 <i>Pseudepidalea surda</i> (Boulenger, 1891)	Pakistan, possibly in Afghanistan
DICROGLOSSIDAE	
8 <i>Euphlyctis cyanophlyctis</i> (Schneider, 1799)	Afghanistan, Bangladesh, India, Nepal, Pakistan, Sri Lanka, possibly in Bhutan
9 <i>Fejervarya cancrivora</i> (Gravenhorst, 1829)	Andaman & Nicobar Islands (India)
10 <i>Fejervarya limnocharis</i> (Gravenhorst, 1829)	Bangladesh, Bhutan (possibly present), India, Pakistan, Sri Lanka
11 <i>Fejervarya nicobariensis</i> (Stoliczka, 1870)	this should be removed from nonendemic
12 <i>Limnonectes doriae</i> (Boulenger, 1887)	Andaman & Nicobar Islands (India)
13 <i>Limnonectes kuhlii</i> (Tschudi, 1838)	India
14 <i>Limnonectes laticeps</i> (Boulenger, 1882)	India, possibly present in Bangladesh and Bhutan
15 <i>Limnonectes shompenorum</i> Das, 1996	Great Nicobar Islands (India)
16 <i>Nanorana blanfordii</i> (Boulenger, 1882)	India, Nepal
17 <i>Nanorana liebigii</i> (Günther, 1860)	Bhutan, India, Nepal
18 <i>Nanorana parkeri</i> (Stejneger, 1927)	Nepal, possibly in Bhutan, India and Pakistan
19 <i>Nanorana polunini</i> (Smith, 1951)	Nepal, possibly in Bhutan and India
20 <i>Occidozyga lima</i> (Gravenhorst, 1829)	Bangladesh, India, possibly in Nepal
21 <i>Sphaerotheca breviceps</i> (Schneider, 1799)	Bangladesh (possibly present), India, Nepal, Pakistan, Sri Lanka, Myanmar
HYLIDAE	
22 <i>Hyla annectans</i> (Jerdon, 1870)	India
MEGOPHRYIDAE	
23 <i>Leptobrachium smithi</i> Matsui, Nabhitabhata & Panha, 1999	India
24 <i>Scutigera boulengeri</i> (Bedriaga, 1898)	Nepal, possibly in Bhutan and India
25 <i>Scutigera nyingchiensis</i> Fei, 1977	India, Nepal, Pakistan, possibly in Bhutan
26 <i>Scutigera sikimensis</i> (Blyth, 1854)	India, Nepal, possibly in Bhutan
27 <i>Xenophrys boettgeri</i> (Boulenger, 1899)	India
28 <i>Xenophrys kempii</i> (Annandale, 1912)	India
29 <i>Xenophrys major</i> (Boulenger, 1908)	India
30 <i>Xenophrys parva</i> (Boulenger, 1893)	Bangladesh, Bhutan, India, Nepal
31 <i>Xenophrys wuliangshanensis</i> (Ye & Fei, 1995)	India, China; presumably in intervening Myanmar
MICROHYLIDAE	
32 <i>Kalophrynus interlineatus</i> Blyth, 1855 (elevated to full species by Matsui <i>et al.</i> , 1996)	India, China, Vietnam, Laos, Cambodia, Myanmar, Thailand
33 <i>Kaloula baleata</i> (Müller in van Oort & Müller, 1833)	Andaman Islands (India)
34 <i>Kaloula pulchra</i> Gray, 1831	Bangladesh, India
35 <i>Microhyla berdmorei</i> (Blyth, 1856)	Bangladesh, India, possibly in Bhutan
36 <i>Microhyla heymsoni</i> Vogt, 1911	Andaman & Nicobar Islands (India)
37 <i>Microhyla ornata</i> (Dumeril & Bibron, 1841)	Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka
38 <i>Micryletta inornata</i> (Boulenger, 1890)	Andaman Island (India)
RANIDAE	
39 <i>Amolops marmoratus</i> (Blyth, 1855)	Bangladesh, Bhutan (inferred), India, Nepal
40 <i>Amolops monticola</i> (Anderson, 1871)	India, Nepal, possibly present in Bhutan
41 <i>Huia livida</i> (Blyth, 1855)	India (?)
42 <i>Humerana humeralis</i> (Boulenger, 1887)	India, Nepal

43	<i>Hylarana erythraea</i> (Schlegel, 1837)	Bangladesh, India, Nepal
44	<i>Hylarana taipehensis</i> (Van Denburgh, 1909)	Bangladesh, India (?)
45	<i>Nasirana alticola</i> (Boulenger, 1882)	Bangladesh, India, possibly Nepal
46	<i>Pelophylax ridibundus</i> (Pallas, 1771)	Afghanistan, Pakistan
47	<i>Sylvirana leptoglossa</i> (Cope, 1868)	Bangladesh, India
48	<i>Hylarana nicobariensis</i> (Stoliczka, 1870)	India, Philippines, Bali, Thailand
49	<i>Sylvirana nigrovittata</i> (Blyth, 1856)	India, possibly Bangladesh
50	<i>Huia chloronota</i> (Günther, 1876)	India, China, Vietnam
51		
52	<i>Amolops viridimaculatus</i> (Jiang, 1983)	India, Yunnan, China, Vietnam; possibly in adjacent Myanmar and Laos
RHACOPHORIDAE		
53	<i>Aquixalus bisacculus</i> (Taylor, 1962)	India
54	<i>Chiromantis doriae</i> (Boulenger, 1893)	India
55	<i>Chiromantis vittatus</i> (Boulenger, 1887)	India
56	<i>Philautus andersoni</i> (Ahl, 1927)	India, possibly Bangladesh
57	<i>Rhacophorus taronensis</i> Smith, 1940	India, China
58	<i>Polypedates leucomystax</i> (Gravenhorst, 1829)	Bangladesh, India, Nepal, possibly Bhutan
59	<i>Polypedates megacephalus</i> Hallowell, 1861	India, China, Vietnam, Thailand; presumably also in adjacent Myanmar and Laos; introduced on Okinawa I., Japan
60	<i>Polypedates taeniatus</i> (Boulenger, 1906)	Bengal region (Bihar, India and Bangladesh) to Assam and southern Nepal – seems endemic species
61	<i>Rhacophorus appendiculatus</i> (Günther, 1858)	India
62	<i>Rhacophorus bipunctatus</i> Ahl, 1927	Bangladesh, India
63	<i>Rhacophorus maximus</i> Günther, 1858	Bangladesh, India, Nepal, possibly Bhutan
64	<i>Rhacophorus tuberculatus</i> (Anderson, 1871)	India, possibly Nepal
65	<i>Theلودerma asperum</i> (Boulenger, 1886)	India, possibly Bangladesh, Bhutan and Nepal
SALAMANDRIDAE		
66	<i>Tylotriton verrucosus</i> Anderson, 1871	India, Nepal, possibly in Bhutan

Table 3. Amphibians not endemic to South Asia. Nomenclature and taxonomy following Frost (2007); checklist following IUCN *et al.* (2006).

FAMILY	NO. OF GENERA	GENERIC NAMES
Bufonidae	8	<i>Adenomus</i> , <i>Ansonia</i> , 'Bufo', <i>Bufoides</i> , <i>Duttaphrynus</i> , <i>Ingerophrynus</i> , <i>Pedostibes</i> , <i>Pseudepidalea</i>
Caeciliidae	2	<i>Gegeneophis</i> , <i>Indotyphlus</i>
Dicroglossidae	13	<i>Allopaa</i> , <i>Chrysopaa</i> , <i>Euphlyctis</i> , <i>Fejervarya</i> , <i>Hoplobatrachus</i> , <i>Ingerana</i> , <i>Minervarya</i> , <i>Nannophrys</i> , <i>Nanorana</i> , <i>Occidozyga</i> , <i>Ombrana</i> , <i>Limnonectes</i> , <i>Sphaerotheca</i>
Ichthyophiidae	2	<i>Ichthyophis</i> , <i>Uraeotyphlus</i>
Megophryidae	3	<i>Leptobranchium</i> , <i>Scutigera</i> , <i>Xenophrys</i>
Micrixalidae	1	<i>Micrixalus</i>
Microhylidae	7	<i>Kalophrynus</i> , <i>Kaloula</i> , <i>Melanobatrachus</i> , <i>Microhyla</i> , <i>Micryletta</i> , <i>Ramanella</i> , <i>Uperodon</i>
Nyctibatrachidae	2	<i>Lankanectes</i> , <i>Nyctibatrachus</i>
Ranidae	11	<i>Amolops</i> , <i>Clinotarsus</i> , <i>Huia</i> , <i>Humerana</i> , <i>Hylarana</i> , <i>Hydrophylax</i> , <i>Nasirana</i> , <i>Pelophylax</i> , <i>Pterorana</i> , <i>Rana</i> , <i>Sylvirana</i>
Ranaxalidae	1	<i>Indirana</i>
Rhacophoridae	6	<i>Aquixalus</i> , <i>Chiromantis</i> , <i>Philautus</i> , <i>Polypedates</i> , <i>Rhacophorus</i> , <i>Theلودerma</i>
Sooglossidae	1	<i>Nyctibatrachus</i>
Hynobiidae	1	<i>Paradactylodon</i>

Table 4. Generic representation of South Asian amphibian families according to Frost (2007).

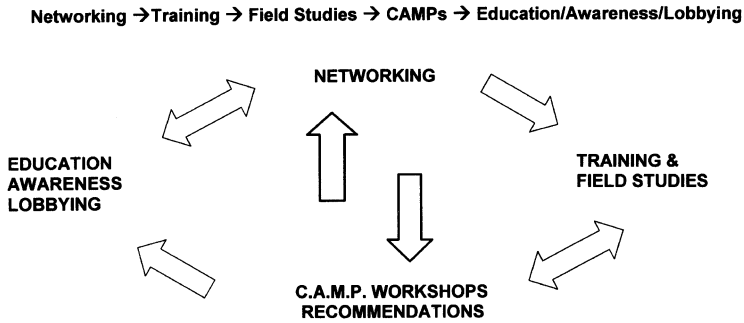


Fig. 1. Flow diagram of conservation networking principle in South Asia (based on Walker, 2006).

measures including protection and captive-breeding programmes.

CONSERVATION NETWORK

In the past there was limited communication between biologists working in different fields, such as taxonomy and ecological studies. Driven by conservation concerns, the practice of networking not only brought these fields together but also brought other stakeholders and communities into active participation in amphibian conservation. See Fig. 1 for a flow diagram of the interactions involved in the networking principles developed in the South Asia region. The details of networking and its impact on conservation action in South Asia have been detailed by Walker (2000). The flow diagram on networking is based on the Conservation Action Model developed in 2000 by Walker (2006).

Taxonomic networks have now become an established and effective framework in the functioning of ZOO and the Wildlife Information & Liaison Development (WILD) Society in India. The first networks to begin were for amphibian and invertebrate researchers, students and enthusiasts early in 1995. Since then experience in creating and maintaining these networks has seen a proliferation of taxonomic network initiatives for other lesser-known fauna in the region, including reptiles, rodents, insectivores, lagomorphs, bats and primates. The emphasis

and extent of these networks have depended on the motivation of coordinators and funding. The success of these networks is evident from several 'firsts' for the world, developed, practiced and promoted in South Asia.

The ANSA was the first taxonomic network to be initiated in 1995 by ZOO as a conservation component of the then Captive Breeding Specialist Group, India (CBSG, India). As part of CBSG's processes to link *ex situ* and *in situ* conservation efforts within ZOO for lesser-known fauna and flora, a quick survey was conducted to establish the number of amphibian researchers, students, enthusiasts, conservationists and naturalists in India. Only ten amphibian biologists replied from India and Sri Lanka. However, this figure was known to be unrepresentative of workers involved in the study of amphibians who had not appeared in the popular media or published in high-profile peer-reviewed journals. This motivated the establishment of a network and within a year an additional 100 amphibian workers were identified. The network expanded and now has 250 plus members. ANSA was contacted to represent the Declining Amphibian Populations Task Force in South Asia in 1997, and is currently revisiting the network memberships and updating the database of members, activities and field data. The Co-chairs of ANSA are currently appointed as Co-chairs of the South Asian regional network of the Amphibian Specialist Group.

ANSA ACTIVITIES

Activities of the network include organizing training workshops for taxonomy, field studies, ecological studies and methodologies. Outreach programmes use education-packet development and distribution, teacher training and booklets for all ages and target audiences. Network and technical information exchange occurs through: (1) the publication of *FrogLeg* newsletter; (2) the distribution of assessments as field notes; (3) encouraging networkers to compile species updates; (4) the management of a contemporary species and status database for amphibians of the region; (5) identifying critical areas of research and conservation needs in the region; (6) raising funds for training and action in all these areas. One such project was to document the presence of chytrid fungus in South Asian amphibians and to develop suitable actions to prevent this infection and to conserve the affected populations. ANSA also works closely with global organizations, such as the Amphibian Specialist Group and the Amphibian Ark, to develop, promote and execute conservation strategies both *in situ* and *ex situ*.

CONCLUSION

It appears that only about 50% of the biodiversity of amphibians in South Asia has been discovered. However, there is increasing habitat loss and fragmentation, which are rapidly depleting amphibian populations. Groups like *Philautus* are proving to be highly restricted in total occupied area, range and distribution, and many newly described species are also following this pattern. Very few species have been described from disturbed habitats, indicating a diminished species composition when compared with the original habitat. An analysis of the available habitat information could indicate the probable number of species lost over time as a result of habitat loss. The *Philautus* genus seems like an ideal group to initiate a conservation-breeding programme in responsible zoos and institutes in South Asia given the

need and also the relative ease owing to their direct development mode of reproduction.

Chytrid fungus has not been reported from South Asia. However, this does not mean the fungus is absent or has no significant impact, but that there is no research on chytrid being carried out in the region. Considering the pressure on amphibians in the region, and the number of Extinct or threatened species, it is imperative that chytrid studies are prioritized and a suitable action plan put in place.

There are many other factors that affect biodiversity studies and conservation that are beyond the scope of this paper. Amphibians across the region suffer from the unsustainable practices of rampant habitat destruction. Many amphibians are already Extinct and countries in the region and the international community should jointly address the problems of a lack of research and a lack of conservation action.

It is highly imperative that global organizations seek inputs from regional networks for scientific information, to facilitate decision making, help identify the regional needs, promote communication and cooperation, and provide for the accurate attribution of images and text. Past practice has seen the exclusion of some workers from authorship on papers to which they made a substantial contribution. The most efficient management of conservation projects needs strong, consistent and active networks at the regional, national and regional/country level. Regional/country networks provide a powerful method by which to increase the number of recognized and directly contributing workers in the global amphibian conservation effort.

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