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SPECIES RICHNESS AND ENDEMICITY OF THE HERPETOFAUNA OF SOUTH AND SOUTHEAST ASIA

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ABSTRACT. — *S*outhern and Southeast Asia, extending from Pakistan to islands on the Sunda Shelf of the Indo-Malayan Archipelago and the Philippines, are home to a highly diverse herpetofauna. Based on the ecoregional classification presented in Wikramanayake et al. (2002) and a species listing database from 2000, we analyse herpetofaunal distribution, while taking into account the uneven survey efforts in different ecoregions. Larger ecoregions that are adequately sampled show greater species richness, contain more diverse topography and support a mosaic of habitat subtypes. In contrast, some of the smaller ecoregions are restricted to a specific habitat type. A latitudinal gradient in species diversity is evident and the ecoregions of the highest species richness straddle the equator, presumably for their tropical rainforests, aseasonal climate, high precipitation, and complex vegetation. Rainforests of lowlands and low elevation regions are richest in species richness, due to structural complexity and climatic conditions. Examples of vicars are evident in insular-insular or continental-insular comparisons of assemblages, many being the presumed result of Pleistocene sea level lowering. Endemicity is high on islands, waif dispersal selectively biased towards certain large species of reptiles, although amphibians are excluded. Herpetofaunal communities in different rainforest ecoregions share relatively few species: the same genera are usually present, but represented by different species. In many cases, these species are restricted-range or locally endemic species. The herpetofauna of monsoon forests is relatively similar within mainland Southeast Asia, but the herpetofaunal species inhabiting two mountain sites in close proximity can be remarkably different. A majority of regionally endemic species inhabit rainforest ecoregions, and particularly montane areas. A number of regional endemics inhabit monsoon forest or specialised habitats (caves, open rivers or swamps), but tend to occur locally at spots across a wide geographic range. Knowledge of the taxonomy of the region's herpetofauna remains poor, but sufficient to indicate regions of high conservation value, as well as priority areas for survey. Reptiles and amphibians are also known to be of value as indicator species for habitat quality and to for learning the earth's evolutionary and biogeographic processes.

KEY WORDS. — amphibians, reptiles, Asia, biogeography, ecoregions

INTRODUCTION

Though the Earl of Cranbrook has specialised in the fields of mammalogy and zooarchaeology of Southeast Asia, his contributions to herpetology should not be forgotten. We are aware of three papers on the topic (Medway, 1974, 1975; Medway & Marshall, 1975). Two of these dealt with the herpetofauna of the New Hebrides, now Vanuatu, in the South Pacific, collected during the Royal Society/Percy Sladen Expedition in 1971. The third (Medway, 1975) discussed the functional role of the patagium of the Southeast Asian gliding geckos (*Ptychozoon*). An early report covered herpetofauna of the University of Malaya's Ulu Gombak Field Study Centre (Medway, 1966), listing 18 lizard species.

Herpetological material from an early hominid site finds mention in Medway (1958); while reporting the (mostly mammalian) bone remains from the Niah Caves of Sarawak, this paper describes freshwater turtle remains from the greatest depth excavated, and discusses the habits of local turtles and monitor lizards, and how they can be snared by indigenous hunters. In a chapter from a volume dealing with the vertebrate faunas on two sides of Wallace's Line, he also uses herpetological examples (Cranbrook, 1981), concluding, for amphibians, that along the Lesser Sundas "there is progressive deletion of the Sundaic fauna, and a compensatory enrichment with Papuasian species, in which the Lombok Straits does not mark a transition any more decisive than that between other pairs of neighbouring islands", and that, for reptiles, these Straits are an "even less significant barrier" than for amphibians.

Reflecting on his brief field herpetological forays, Cranbrook wrote recently: "The New Hebrides (now Vanuatu) proved my only venture into herpetology. Lacking native ground mammals (only bats present, plus inevitable rats, I suppose), the islands were crawling with small skinks of great variety. That variety has since been enlarged by later taxonomists. Adrian Marshall and I plunged about catching these lively things by hand, until (towards the end of our trip) the local students from the Agricultural College who were supposed to be learning from us (!) said, "Why don't you use blowpipes and mud pellets, like we do?" Our catch improved enormously, including the strange skink of the foreshore that foraged among boulders on rocky beaches. When I got back to UK, I found that it had been collected previously, but was still undescribed. And so I suddenly found myself invited to join the World Congress of Herpetology, serve as President of the British Herpetological Society, etc. But that was the beginning and the end of my herpetological career".

Cranbrook was joint leader of the Royal Geographical Society–Universiti Brunei Darussalam Rainforest Expedition, in Brunei Darussalam, in 1992–1993, and co-edited a popular work (Cranbrook & Edwards, 1994), in which the sections on amphibians and reptiles were by Das (1994). Cranbrook also acts as an international advisor to Universiti Malaysia Sarawak and is able to discuss topics of mutual interest with the university's research staff, such as biodiversity, biogeography, and zooarchaeology.

Mainland South Asia, continental and insular Southeast Asia, together comprising the Oriental Realm, form a fascinating region in which to study species diversity, ecology, and evolution of tropical herpetofaunas. In this paper, South Asia is taken to comprise the political entities of Bangladesh, Bhutan, India (including the Andaman and Nicobar Archipelagos), Maldives, Nepal, Pakistan, and Sri Lanka; Southeast Asia comprising Myanmar, Thailand, Lao PDR, Vietnam, Cambodia, Peninsular Malaysia, East Malaysia, the western Indonesian islands of the Sunda Shelf (excluding western New Guinea's Papua Province), the Philippines, Brunei Darussalam, and Singapore. Together, these are divisible into 124 ecoregions (Wikramanayake et al., 2002; see also Olson et al., 2001; Figs. 1, 2). While Southeast Asian forests are mostly tropical or subtropical (with some temperate montane ecoregions), South Asia includes vegetational extremes from thorn scrub to rainforests.

This area is inhabited by at least 900 described species of reptiles and 700 described species of amphibians. Estimates of herpetofaunal species richness continue to change. Research occasionally eliminates a species from the regional fauna list when it is realised that a form thought to represent a valid species is synonymous with another species, or when a regional record of a species known to inhabit another area is shown to be based on misidentified or erroneously labelled specimens. More frequently, though, research adds more species to the regional faunal list, by discovering entirely new species, documenting range extensions of species from adjoining regions, and when detailed taxonomic studies newly recognise groups of cryptic species among what were previously considered variable single species. Dozens of new species have been described in recent years; a single paper (Inger et al., 1999) described no fewer than six new frog species. Another (Pethiyagoda & Manamendra-Arachchi, 1998) reported the discovery of nearly 150 new species from the island nation of Sri Lanka. Consequently, species richness numbers in this paper should be considered underestimates of the overall species richness figures for any region. The total number of described species of amphibians at present exceeds those of all other land vertebrates, the pattern of accretion revealing that the known fauna will continue to grow in the decades to come (Glaw & Köhler, 1998). This would, on one hand, place greater importance on the protection of natural habitats, on the other, increase the conservation burden, steering conservation action away from species to landscapes and ecosystems.

Even more tentative are attempts to estimate the herpetofauna species richness of particular ecoregions. Herpetofaunal research in South and Southeast Asia has not received the degree of attention that mammals and birds have had, and much of the research has been alpha taxonomic in nature. Intensive field surveys have rarely been carried out and have been published even more rarely. Those studies that were carried out took place mostly in India, Sri Lanka, Thailand and Malaysia, with few in Singapore, Indonesia, Vietnam, and Myanmar. However, there are indications that the situation is slowly changing.

With such a fragmentary data set, determining which species are national or ecoregional endemic species is fraught with uncertainty. Several species were or are only known from a single specimen, and as such immediately qualify for endemic status. But in a few cases, additional specimens have been found at distant locations, suggesting that they are very inconspicuous, rare, or both, rather than restricted to a very small geographical area. In many cases, though, species of reptiles and especially amphibians are indeed highly restricted in their distribution, but may be locally abundant where they occur, and are not found in nearby areas of apparently equivalent habitat by researchers specifically searching for them.

MATERIAL AND METHODS

Based on published records (those relevant for the archipelagic portion listed in Das, 1998; those from southern Asia are in Das, in prep), locality data associated with museum specimens (see Acknowledgements) and personal observations, an attempt was made to estimate minimum species diversity and endemicity of reptiles and amphibians in the ecoregions of South and Southeast Asia (see Figs. 1, 2). These estimates are presented in Table 1.

OBSERVATIONS AND DISCUSSION

The species richness and endemicity figures show a number of interesting trends but need to be interpreted with considerable caution. Foremost among the concerns is the effect of uneven survey efforts in different ecoregions. For example, the very low recorded species diversity of the Chin Hills-Arakan Yoma montane rainforests (eight species) contrasts greatly with the

A

B

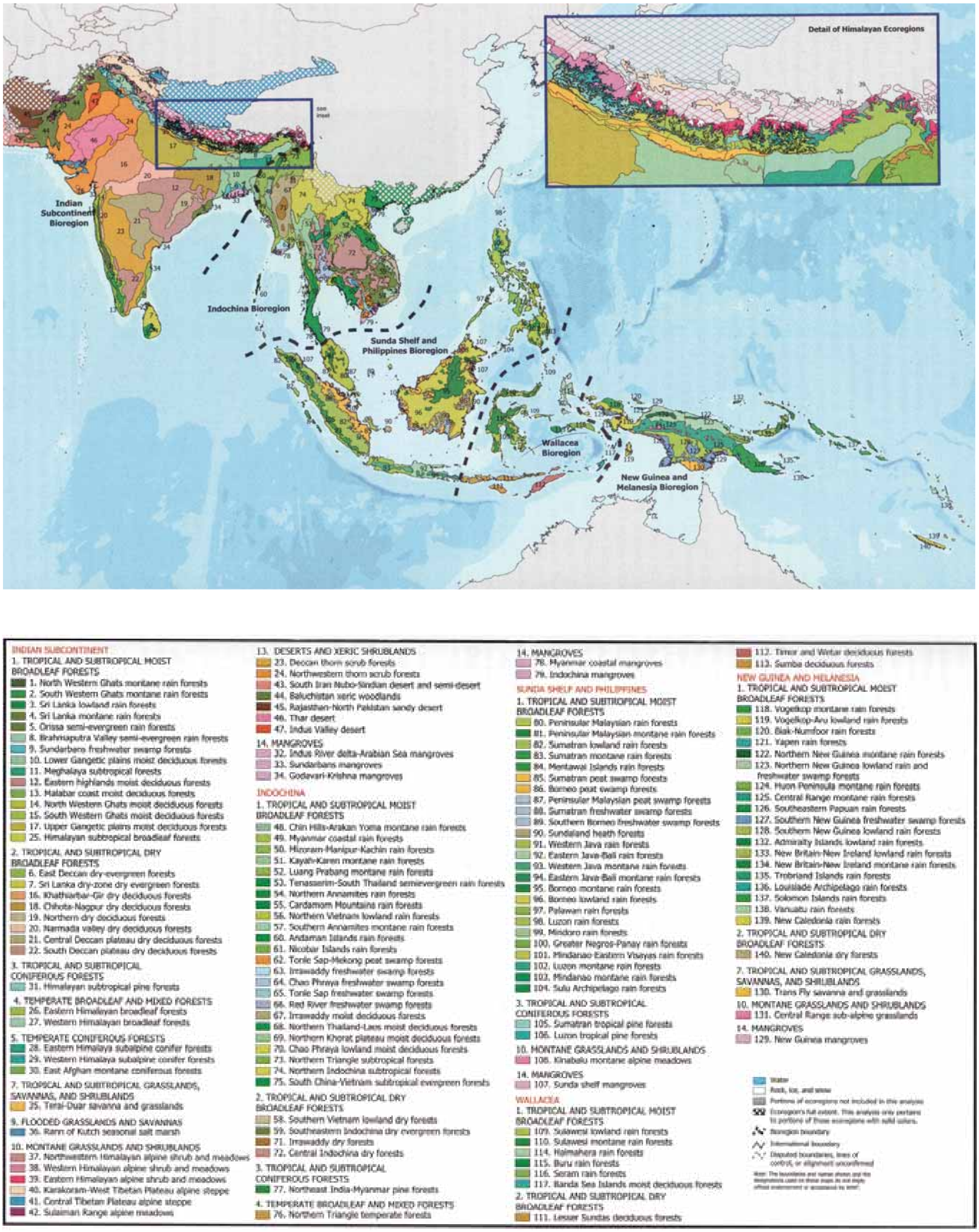

Fig. 1. Terrestrial ecoregions of the Indo-Pacific: A, map showing the terrestrial ecoregions of the Indo-Pacific. Inset: The Himalayan ecoregions; B, figure legends to regions with the Indo-Pacific. From *Terrestrial Ecoregions of the Indo-Pacific* (Wikramanayake et al., 2002). © Island Press, 2002, reproduced with permission.

recorded diversity in the Kayah-Karen montane rainforests (181 species). This extreme difference is hardly a measure of different biological richness but simply reflects that the Chin Hills have barely been surveyed for herpetofauna while the Kayah-Karen montane rainforest ecoregion contains several of the best-surveyed sites in Southeast Asia. One can confidently predict that careful surveys of these ecoregions will show that the herpetofauna diversity is as rich as that of structurally similar forest regions elsewhere in mainland Southeast Asia. As another example, only four amphibian species have been recorded from the Sunderbans freshwater swamps, much lower than in most urban areas adjacent to this specific ecoregion.

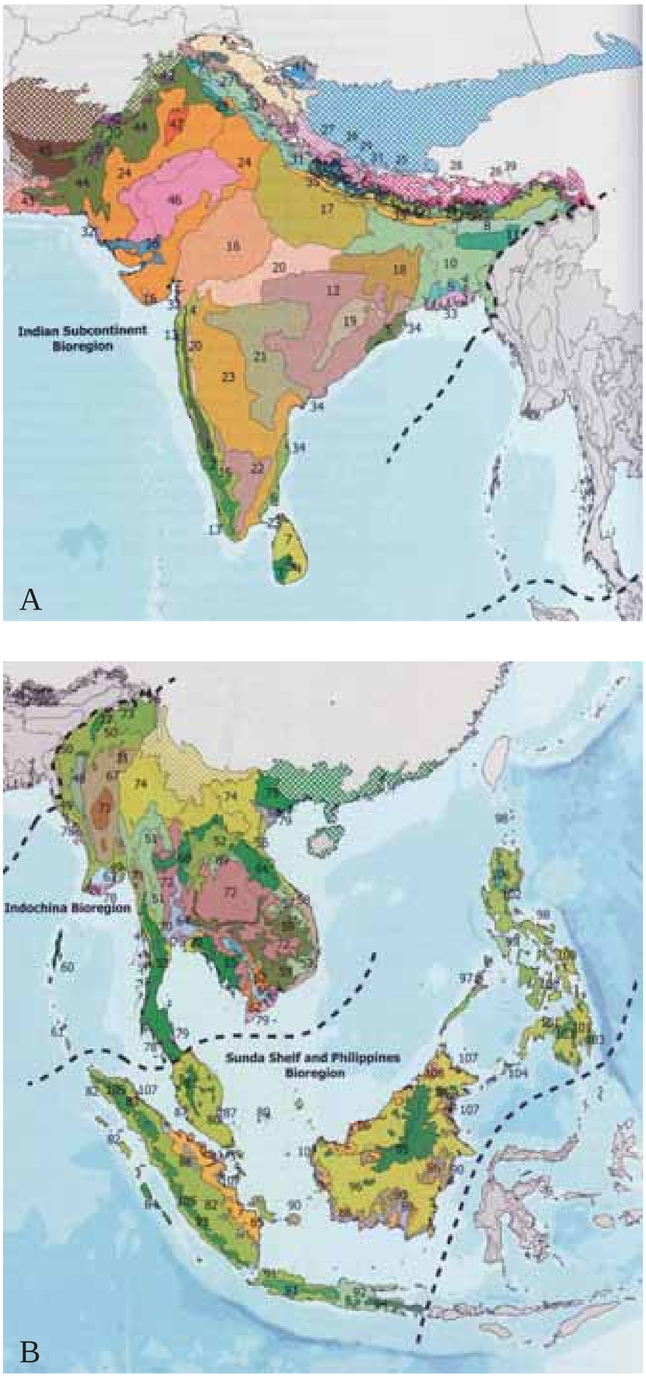

Fig. 2. Terrestrial ecoregions of the Indo-Pacific: A, the western portion, covering southern Asia; B, the eastern portion, covering Southeast Asia. From *Terrestrial Ecoregions of the Indo-Pacific* (Wikramanayake et al., 2002). © Island Press, 2002, reproduced with permission.

There is also an effect of ecoregion size on its species richness: very large ecoregions contain more diverse topography and frequently contain a mosaic of specific habitat subtypes such as riverside gallery forest, wetlands or cliffs. This logically increases the number of species whose range extends into these large ecoregions. In contrast, several of the smaller ecoregions contain only a specific habitat type. The smaller ecoregions dominated by a single habitat type, such as montane pine forest, freshwater and peat swamp forests or mangrove forest, are predictably least diverse in their herpetofauna. A latitudinal gradient in species diversity is evident as one moves from high latitudes to low (after considering the effect of certain unique ecosystems of high species diversity), as a result of positional variables, such as geophysical features and altitude. The ecoregions of the highest species richness straddle the equator, presumably since these regions support tropical rainforests, with an aseasonal climate, high precipitation, and complex vegetation structures. Species diversity gradients within or along ecoregions remain unanalysed, although along the Himalayas and its southern flanks, several ecoregions of high species richness and endemicity of the herpetofauna occur. Altitudinal gradient in species diversity is somewhat better understood, with the greatest amphibian and reptile species diversity observed between 914–1,829 m, followed by altitudinal ranges between 1,829–2,743 m (data from Waltner, 1973). Thus, altitudes between 0–3,000 m support the highest herpetological diversity in the Himalayas. Higher (>2,750 m) altitudes do support montane specialists (e.g., *Scutiger*), in addition to those co-occurring at lower altitudes (e.g., *Clinotarsus alticola* and *Nanorana vicina*) and some that are human commensals (e.g., widespread species of the genera *Duttaphrynus*, *Microhyla*, *Spaerotheca*, and *Euphlyctis*).

Nevertheless, certain trends emerge from the data set when survey intensity and other factors are taken into account. Richest in species are the rainforest types of lowland (up to 200 m asl) and other low elevation (including foothills and low hills, 200–900 m asl) regions, both tropical and subtropical. Their structural complexity, inclusion of a mosaic of habitat types, and climatic conditions favouring small, moisture-sensitive ectothermic vertebrates, provide numerous niches for herpetofaunal species. Seasonally dry evergreen forest, deciduous forest, and temperate forest types pose higher levels of climatic stress, and the total diversity declines, particularly among the amphibians. The Central Indochina dry forest ecoregion appears not to fit with this trend, although from a herpetofaunal perspective the difference between seasonal and dry forest types is one of degree (the length of a dry period) rather than the qualitative difference between rain forest and seasonal forest (occurrence of a dry period). Aridity also correlated negatively with amphibian species diversity, and the ecoregions to the west, including the Baluchistan xeric woodlands and the Rajasthan-North Pakistan sandy deserts have low numbers of species.

Table 1. Species diversity and occurrence of endemic species of amphibians and reptiles in ecoregions of South and Southeast Asia. See text for cautionary notes on interpretation of numbers. Cut off year for entries is 2000.

Name of Ecoregion	Ecoregion Number	Reptile Species Richness	Reptile Endemicity	Amphibian Species Richness	Amphibian Endemicity
Sri Lanka montane rain forests	4	61	55	250	200
Sri Lanka lowland rain forests	3	47	28	250	200
West Borneo rain forests	101	183	12	112	18
Northeast Borneo rain forests	99	18 3	21	107	19
Sumatra rain forests	82	183	0	75	3
Southwest Borneo rain forests	97	164	2	84	10
Indochina mangroves	79	166	20	71	18
Tenasserim-South Thailand semi-evergreen rain forests	53	170	21	62	16
East Borneo rain forests	98	153	5	62	0
Northern Triangle subtropical forests	73	147	31	60	28
Borneo peat swamp forests	87	132	0	51	0
Kayah-Karen montane rain forests	51	127	18	54	13
Visayas Islands rain forests	104	143	97	36	25
Sumatra peat swamp forests	86	135	1	42	0
Southern Borneo freshwater swamp forests	90	127	1	49	0
Sumatra freshwater swamp forests	89	133	0	42	0
Sundaland heath forests	91	124	1	48	1
Borneo montane rain forests	96	121	9	50	1
South Western Ghats montane rain forests	2	103	92	66	58
Luzon rain forests	102	123	85	46	36
Mindanao rain forests	105	120	73	40	28
Sumatra montane rain forests	83	121	11	39	4
Western Java rain forests	92	119	2	34	3
Philippines moist semi-deciduous forests	84	111	66	37	24
Central Range montane rain forests	131	69	12	79	20
Himalayan subtropical pine forests	31	109	46	37	0
Peninsular Malaysia rain forests	80	100	26	45	16
Sulawesi lowland rain forests	115	106	10	26	2
Irrawaddy moist deciduous forests	67	89	17	29	1
Eastern Java-Bali rain forests	93	90	0	27	0
Luang Prabang montane rain forests	52	78	5	32	4
Northwestern thorn scrub forests	24	99	27	10	0
Western Java montane rain forests	94	81	3	26	2
Sri Lanka dry-zone dry evergreen forests	7	81	47	19	4
Assam hills subtropical forests	11	62	16	35	13
Palawan moist deciduous forests	109	75	27	21	10
Southeastern Indochina dry evergreen forests	59	80	16	14	0
Cardamom Mountains rain forests	55	73	12	20	5
Irrawaddy dry forests	71	68	7	22	1
Sulu Archipelago rain forests	110	68	29	20	12
Palawan rain forests	100	66	19	21	9
Eastern Java-Bali montane rain forests	95	66	2	21	1
South Western Ghats moist deciduous forests	15	66	30	18	14
Sulawesi montane rain forests	116	60	4	20	4
Mentawai Islands rain forests	85	64	2	14	1
Mindoro rain forests	103	59	30	16	10
Myanmar coastal rain forests	49	71	19	4	1
Red River freshwater swamp forests	66	59	16	16	1
Halmahera rain forests	120	62	12	12	5
Irrawaddy freshwater swamp forests	63	60	8	14	0
Central Indochina dry forests	72	46	6	26	9
Malabar coast moist deciduous forests	13	51	14	20	6
North Western Ghats montane rain forests	1	18	10	50	46

Table 1. Cont'd.

Name of Ecoregion	Ecoregion Number	Reptile Species Richness	Reptile Endemicity	Amphibian Species Richness	Amphibian Endemicity
Lower Gangetic plains moist deciduous forests	10	53	12	15	0
Mizoram-Manipur-Kachin rain forests	50	54	6	14	0
Lesser Sundas deciduous forests	117	53	13	14	4
East Deccan dry evergreen forests	6	51	4	13	0
Timor and Wetar deciduous forests	118	55	16	7	7
North Western Ghats moist deciduous forests	14	50	18	9	6
Orissa semi-evergreen rain forests	5	44	14	15	1
Baluchistan xeric woodlands	44	54	19	4	2
Seram rain forests	122	50	6	7	0
Deccan thorn scrub forests	23	44	11	12	0
Southern Annamites montane rain forests	57	36	10	19	14
Upper Gangetic plains moist deciduous forests	17	47	11	7	0
Southern Vietnam lowland dry forests	58	46	9	6	1
Rajasthan-North Pakistan sandy desert	45	51	15	0	0
Banda Sea islands moist deciduous forests	123	50	8	1	1
Luzon freshwater swamp forests	108	37	17	13	7
Peninsular Malaysia montane rain forests	81	42	14	8	2
Andaman Islands rain forests	60	40	16	9	3
Terai-Duar savanna and grasslands	35	34	15	15	0
South Deccan plateau dry deciduous forests	22	41	7	8	1
Eastern Deccan plateau moist deciduous forests	12	38	5	11	1
Khathiar-Gir dry deciduous forests	16	45	5	4	1
Central Deccan plateau dry deciduous forests	21	32	3	9	0
Sunderbans freshwater swamp forests	9	38	4	2	0
West Tibetan Plateau alpine steppe	40	33	17	6	0
Chao Phraya freshwater swamp forests	64	31	5	8	0
Northern Indochina subtropical forests	74	27	7	11	6
Chota-Nagpur dry deciduous forests	18	30	1	5	0
Northern Vietnam lowland rain forests	56	26	1	8	3
Northern Annamites rain forests	54	25	3	7	3
Sumba deciduous forests	119	26	3	6	3
Tonle Sap freshwater swamp forests	65	20	1	12	0
Mindanao montane rain forests	107	7	5	21	16
Myanmar coastal mangroves	78	26	4	2	0
Peninsular Malaysia peat swamp forests	88	20	0	8	2
Sunda shelf mangroves	113	27	0	1	0
Buru rain forests	121	25	0	2	0
Luzon tropical pine forests	112	15	5	11	8
Narmada valley dry deciduous forests	20	21	4	4	1
Thar desert	46	21	4	2	0
Western Himalayan broadleaf forests	27	19	8	1	0
Sunderbans mangroves	33	17	1	3	0
Eastern Himalayan alpine shrub and meadows	39	17	5	2	4
Bay of Bengal mangroves	34	15	2	3	9
Brahmaputra Valley semi-evergreen rain forests	8	6	0	12	2
Western Himalayan alpine shrub and meadows	38	6	4	10	0
Nicobar Islands rain forests	61	10	1	6	0
Luzon montane rain forests	106	6	4	8	7
Eastern Himalayan broadleaf forests	26	4	1	10	4
Tonle Sap-Mekong peat swamp forests	62	11	4	1	0
Northwestern Himalayan alpine shrub and meadows	37	6	3	5	87
Orrisa dry deciduous forests	19	9	0	2	0
Northern Thailand-Laos moist deciduous forests	68	8	4	1	0
Chin Hills-Arakan Yoma montane rain forests	48	8	2	0	0

Table 1. Cont'd.

Name of Ecoregion	Ecoregion Number	Reptile Species Richness	Reptile Endemicity	Amphibian Species Richness	Amphibian Endemicity
Northern Triangle temperate forests	76	1	0	5	0
Northeast India-Myanmar pine forests	77	2	0	3	1
Rann of Kutch seasonal salt marsh	36	2	1	2	1
Himalayan subtropical broadleaf forests	25	2	1	2	0
Kinabalu montane alpine meadows	114	0	0	4	0
Eastern Himalayan subalpine conifer forests	28	2	1	1	0
Indus River delta-Arabian Sea mangroves	32	2	0	1	0
East Afghan montane coniferous forests	30			2	1
Sulaiman Range alpine meadows	42	2	0	0	0
Central Tibetan Plateau alpine steppe	41	1	0	0	0
Sumatra tropical pine forests	111	0	0	0	0
Western Himalayan subalpine conifer forests	29	2	1	0	0
South Iran Nubo-Sindian desert and semi-desert	43	0	0	0	0
Indus Valley desert	47	0	0	0	0
Northern Khorat Plateau moist deciduous forests	69	57	20	2	2
Chao Phraya lowland moist deciduous forests	70	103	45	17	13
South China-Vietnam subtropical evergreen forests	75	103	17	45	13

At the species level there is also a sharp distinction between evergreen rainforest ecoregions and ecoregions defined by seasonal vegetation types. Few species inhabit both groups of ecoregions, and those that do are generally larger, robust, and predatory species such as some monitor lizards (*Varanus bengalensis*, *V. nebulosus*, and *V. salvator*), cobras (*Naja kaouthia*, *N. naja*, *N. sumatrana*, and *Ophiophagus hannah*), ratsnakes (*Ptyas* and *Elaphe* species) as well as a number of human commensal species that were originally associated with riverbanks and other high-impact disturbed habitats.

Between ecoregions, the similarities of different herpetofaunal communities can be remarkable. A detailed survey of the herpetofauna at a site in the Irrawady Moist Deciduous Forest (Zug et al., 1999) specifically remarked how similar the species composition was to that at a site located in the transition zone between the Southeastern Indochina Dry Evergreen Forest and the Central Indochina Dry Forest (Inger & Colwell, 1977). The two sites shared the majority of their species, and several of the species represented at only one of the sites had close relatives occurring at the other site.

Examples of vicars (here implying phylogenetically close species) or ecological equivalent species (those that do not share a common ancestor) are evident in insular-insular or continental-insular comparisons of herpetofaunal assemblages. Examples include *Dopasia gracilis* on the Asian continent and *D. buettikoferi* on Borneo, among the saurians and *Stoliczkia khasiensis* on the Asian continent and *S. borneensis* on Borneo, among the serpents. One is tempted to list a number of species pairs such as these, with representatives on the Sunda islands and on mainland Southeast Asia genetically separated at present by extensive stretches of saltwater. Many such cases are the result of Pleistocene sea level lowering (Donn et al., 1962; Bartlett & Barghoorn, 1973; Inger & Voris, 2001). Sea level changes have been shown to be responsible for present-day distribution of island communities of snakes (How & Kitchener, 1997). In cases of closely-situated land masses that straddle different biogeographic sub-regions, representations of specific ecological forms may belong to different lineages (Das, 1999). Endemicity is high on islands too, waif dispersal selectively biased towards certain large species (e.g., pythons and monitor lizards), while amphibians, with their sensitive skins, are excluded. However, large continental islands (such as Borneo, Sumatra, and Java) have their own amphibian faunas, with many endemics.

Herpetofaunal communities in different rainforest ecoregions, in contrast, share fewer species: the same genera are usually present, but represented by different species. In many cases, these species are restricted-range or locally endemic species. Clearly, the stable environment of evergreen forests combined with the physical isolation of the mountain areas that are nearly always cloaked by some type of permanently moist forest, has led to extensive evolution and speciation. This, together with the effects of expansion, contraction, and isolation of species ranges as vegetation type and cover, climate and sea level changed over geological time, gave rise to a remarkable contrast: The herpetofaunal community of a monsoon forest type is relatively similar whether it is located in Myanmar, Thailand or southern Vietnam, while the herpetofaunal species inhabiting two mountain sites separated by only a few hundred kilometers are usually remarkably different.

Predictably, the majority of regionally endemic species inhabit the rainforest ecoregions, and particularly the montane areas. The proportion of local endemics is particularly high in the Southern Annamite Montane Rainforest, the Northern Indochina Subtropical Forests and the Southern China–Vietnam Subtropical Evergreen Forests, where local endemics represent between 20–40% of the total herpetofaunal richness. While total species richness is higher in the Peninsular Malaysian Rainforest, the percentage and actual number of endemic species is actually lower. A number of regional endemic species inhabit monsoon forest or specialised habitat types such as caves, open rivers or swamps, but such species tend to show localised distributions.

It is also noteworthy that the proportion of endemic species to the total fauna is higher among amphibians than among reptiles. Within groups, the numbers and proportion of restricted-range endemic species are particularly high among caecilians, megophryid frogs, the rhacophorid genus *Philautus* and the South Asian *Pseudophilatus*, *Rhacophorus* and *Theloderma*, *Cnemaspis* and *Cyrtodactylus* geckos, *Lygosoma*, *Larutia*, *Isopachys* and other skinks, *Ceratophora*, *Japalura*, *Pseudocalotes*, *Lyriocephalus*, *Salea*, and *Dibamus* lizards, and *Amphiesma*, *Enhydris*, *Macrocalamus*, *Opisthotropis*, and *Oligodon* snakes. Most of these groups are associated with evergreen forest types; notable exceptions are the *Enhydris* species which inhabit lowland wetlands and the *Isopachys*, *Sepsophis*, and *Barkudia* species which are restricted to seasonal dry lowlands including coastal vegetation.

Knowledge of the taxonomy of tropical and subtropical Asian reptiles and amphibians remains imperfect, and much work remains to be done before the total species diversity is approximately known. Accurate mapping of the distribution of all species is even further from complete, and may never be fully understood as natural habitats have been impacted to varying degrees throughout the region. Nevertheless, the limited data available at present are sufficient to indicate regions of high conservation value, as well as pointing at priority areas for field survey work. Almost incidentally, it is also becoming obvious that reptiles and particularly amphibians are of great value as indicator species to assess habitat quality and to elucidate evolutionary and biogeographic processes. In summary, South and Southeast Asia will thus continue to be a fascinating region to study diversity, ecology, and the evolution of reptiles and amphibians for many decades to come.

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