A preliminary survey on amphibian fauna of Sundarbans Mangrove Forest, Bangladesh

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The Sundarbans, an area of one million hectares, is the largest mangrove forest in the world. About 62% of this forest lies in the southern districts of Bangladesh and the rest 38% lies in the south-east of West Bengal in India (Islam et al., 1999). The Bangladesh Sundarbans represents 44% of the total forested area of the country, which comprises 45% of the country's forest reserves. Very few wildlife species of this forest are extensively studied, not even the amphibians, so, the amphibians of this region are not properly known to many of us.

Unfortunately, no in-depth study or survey has yet been done on the status and distribution of amphibians of Bangladesh (Chowdhury 1996). At first, Hussein and Rahman (1978) studied amphibians of Bangladesh and published a 12 species amphibian list. Next, Khan (1982) and Sarkar & Sarkar (1988) studied the amphibian fauna of the country and published checklist of amphibia, which contained 19 and 23 amphibians, respectively. Chowdhury (1996) studied the amphibians of Bangladesh and identified at least 15 amphibian species. But until now, no extensive study has ever been conducted on the amphibians of Bangladesh Sundarbans.

Study area: Bangladesh Sundarbans represents the largest tracts of productive mangrove forest. It can be grouped into tropical moist forest because it is located at the south of the Tropic of Cancer near the line. The total area of the forest is about 5,770 km², of which 4,016 km² is land and the remaining 1,761 km² is under water, in the form of rivers, canals and creeks (Hussain & Karim, 1994). It lies between 89°00' and 89°55'E longitude and latitude 21°30' and 22°30' N in the southern districts (Bagerhat, Khulna & Satkhira) of the country. This mangrove swamp grows on soil formations of recent origin consisting of alluvial washed down from the Himalaya. The Sundarbans is unique in a number of different ways and that is why it was recently declared as a World Heritage Site. The entire Bangladesh Sundarbans is divided into four ranges, viz. Sarankhola, Chandpali, Khulna and Satkhira. During the present study all the four ranges and the adjacent areas were visited.

Climate: The average annual rainfall increases from west to east of the forest. The mean annual rainfall in the forest varies from about 2000 mm in the east to 1600 mm in the west. 80–85% of annual rainfall occurs during the monsoon season from May to September. The coolest temperatures occur during December-January (23°C) and the warmest at the end of the dry season, May-June (35°C). The mean annual relative humidity varies from 70% to 80%. The pH in river water varies from 6.5 to 8.0 (Karim 1994).

Vegetation: More than 334 species of plants, of which 27 are common trees, are found in the Sundarbans (Karim, 1994). Out of the 50 species of mangrove trees in the world 40 are found in the Sundarbans. The holophytic tree species mainly form the natural vegetation. The forest is more or less open and canopy height is commonly within 10 m from the ground. Three ecological zones, viz., freshwater zone, moderately saline water zone and saline water zone can be distinguished according to salinity and species composition.

Method: A random survey was made in all important water bodies and perennial rivulets and streams. Each possible moist pocket of the forests and the home side and rest house areas were extensively explored during the present study. A total 480 hours (in 60 days, 8 hrs/day) were spent in the field during March-August 1999, consisting of 8 to 15 days in each month. The status such as very common, common, fairly common, few, occasional is based on the standard practices (Khan 1982). The relative abundance of each species was determined in the same procedure. The specimens were identified by using the diagnostic keys, which were given by Boulenger (1890) and Deutil & Bharati (1995). The nomenclatures adopted were from Dutta (1992) and Das & Dutta (1998). Sometimes the species were identified by the pattern of their calling, which is very prominent.

Results and discussion: The Sundarbans is a heavily forested swampy island, subject to periodic inundation, is not a suitable habitat for amphibians. Moreover, the biogeographic and geological condition of the Sundarbans does not support a diverse amphibian fauna. Totally, 8 species from three genera belonging to four families of anuran amphibians were identified during the current study. Two specimens remain unidentified.

List of amphibian fauna of Sundarbans Mangrove Forest, Bangladesh, along with their status is listed below.

- *Bulo melanostictus* Schneider, 1799
  - Very common in east but common in west of the forest.

- *Microhyla ornata* (Dumeril & Bibron, 1841)
  - Few

- *Euphlyctis cyanophlyctis* (Schneider, 1799)
  - Very common

- *Euphlyctis hexadactylus* (Lesson, 1834)
  - Few

- *Hoplobatrachus tigerinus* (Daudin, 1803)
  - Common

- *Limnonectes limnocharis* Bole, 1835
  - Common

- *Rana alticola* Boulenger, 1882
  - Occasional
Polyctenates maculates (Gray, 1834) Commen.  

According to Sarker (1999) and Rashid et al. (1994) *Lepidophyes hexadactyla* is distributed only in the freshwater ponds of the northern portion, along the periphery of the forests. But the present record confirms the presence of at least 20 individuals from a brackish water pond (at Kochikhal rest house area, under Sarankholo range of Sundarbans Forest Division), which is some 80 km. south from the past distribution place. The present distribution place is very close to the Bay of Bengal and the habitat is strongly saline except for some brackish water ponds.

*P. maculates* and *B. melanostictus* distribution is less common in the western portion than from the eastern portion of the forests, possibly due to high salinity, while Rashid et al. (1994) mentioned as widely distributed and very common species respectively.

The high density of human population in Bangladesh, scarcity of natural resources, overexploitation of both timber and wildlife resources and pollution of the water bodies pose threats to Sundarbans systems. So, the amphibians are facing habitat shrinkage and exposed to both aquatic and terrestrial pollutants in the Sundarbans and they are particularly sensitive because of their highly permeable skin, which can rapidly absorb toxic substances (Duellman & Trueb 1986). They are also sensitive to the environmental factors, which even influence their behaviour (Daniels 1991).

We gratefully acknowledge Dr. Simon Kay of the British Council, Dhaka, Bangladesh, who has made a grant of the British Council and the British Petroleum available for this study. IUCN- Bangladesh provided office space, computer facilities, and administrative support. Forest Department, Bangladesh have given us permission to work inside the forest.

References:


The amphibian fauna of Punjab has not been studied in detail. The author studied some aspects of the amphibians and tadpoles as part of the technical programme of the I.C.A.R. funded project (1984–87). Papers on the food spectrum of *Euphyllys cyanophlyctus* and *Bufo stomaticus* have been published elsewhere. The present communication reports the anuran species occurring in Punjab.

The collections were made at random in the fields during day and other "kharif" crops, orchards, nurseries and other reedy bodies of variable dimensions. The collections were made mainly during the day and night hours.

List of Anurans of Punjab

**Family Ranidae**

1. *Tomopterna breviceps* Schneider, 1799. The Indian burrowing frog is a medium sized anuran. 3 adults and one suadult (adult measuring 45–47 mm SVL) were captured from a field near Ludhiana (Punjab) and subadult from village Bilaspur. Due to their nocturnal habit the frogs were found only after 9 p.m.

2. *Euphyllys cyanophlyctus* Schneider, 1799. The skipper frog was regularly collected from the Botanical Garden Tank and Fish Farm Complex Tanks at Punjab Agricultural University Campus, Ludhiana during summer months, of 1984–86. The adult females revealed average SVL 50 mm. This species remains active almost the year round with the possible exception of December to February. However, during these colder months the frogs were sometimes seen squatting in the sun, at the shore line of the tank. The species is aquatic and diurnal in habit. In the shallow muddy ponds the frogs were seen burried in mud with eyes above mud and water level. During mid September the frogs were seen floating in the clean floral rich waters.

The laboratory culture of the frog revealed it to be a voracious feeder taking insects, plant tissue and even dead animals. The frog acts as a scavenger to some extent.

3. *Limnonectes limnocharis* Wiegman, 1835. This streaked frog measured on an average...
The Declining Amphibian Populations Task Force

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An unremarkable office in the Open University (OU) Department of Biological Sciences, UK, is distinguished from many of its counterparts by the brightly-coloured pictures of frogs, toads, salamanders and other bizarre amphibious creatures which adorn its door and walls. This is the home of the Declining Amphibian Populations Task Force (DAPTF), an international organization devoted to scientific investigation of the sometimes catastrophic declines in amphibian populations which have been occurring (and continue to occur) around the world.

Back in 1988, conference papers started to appear reporting these amphibian declines and the herpetological community began a dialogue on the issue which led to the formation of the DAPTF in 1991, in association with the Species Survival Commission. It was originally based in Corvallis, Oregon, USA but in 1994 the office moved to the OU under the directorship of Professor Tim Halliday. DAPTF operates closely in association with the Smithsonian Institution and the World Congress of Herpetology. Its mission is to determine the nature, extent and causes of declines of amphibians throughout the world, and to promote means by which declines can be halted or reversed. Since its move to Britain, the DAPTF has grown into a network of more than 3,000 scientists and conservationists operating through 100 Regional and National Working Groups spread over across of the globe. The DAPTF also operates Working Groups on specific issues such as Atmospheric and Global Change, and Disease and Pathology.

Amphibian declines can be attributed to many causes. By far the most obvious is that of habitat destruction (for example, pond loss), adversely affecting many amphibians around the world simply by denying them a place in which to live and reproduce. The DAPTF is most interested, however, in the amphibian declines which do not have an obvious cause: many declines have occurred in apparently undisturbed, pristine and protected habitats and yet the declines and extinctions recorded have often been as severe as those in urban or industrial areas. Possible causes of these esoteric declines include climate changes (such as elevated UV-B radiation), remote pollution (such as acid rain) and disease outbreaks. In the last few years, DAPTF researchers have discovered evidence to indicate that amphibian declines are most likely being caused by one or more of these factors acting together. In order to facilitate research into this phenomenon and keep amphibian researchers in touch with the latest developments, the DAPTF distributes Seed Grants for the initiation of study projects, and disseminates its findings through the newsletter Froglog.

The year 2001 will be a very important one for the DAPTF. We will be publishing and disseminating the results of our investigations so far. This will take the form of a multi-authored book providing an assessment of our knowledge to date, a compilation of reports from our Working Groups around the world and a CD-ROM database containing information about specific examples of amphibian declines which will become an essential resource for amphibian decline biologists. The CD-ROM utilizes the latest, easy to use database software and will be updated at intervals to remain an up-to-date information resource.

One piece of information which the database will contain is that researchers have recently discovered that declines of frogs as far apart as Panama and Queensland have been caused by a pathogenic fungus which has been spreading through frog habitats in these parts of the world. We are not yet sure if this is a new disease, whether it has been around for a long time and has suddenly started attacking frogs, or whether it has always attacked frogs and there is some other factor (such as suppression of the frogs' immune systems by pollution or climatic changes) which has suddenly turned this fungus into a serious threat to frog populations. Studies into the life cycle and taxonomy of this fungus continue. Similarly worrying examples of amphibian declines can be found in many parts of the world and, as these declines are investigated, we will gradually build up a picture of what is causing them on a global scale. Aside from the loss of biodiversity reflected in the amphibian decline phenomenon, there is every reason to believe that amphibians are good indicators of ecosystem health (because of their life cycle characteristics and permeable skin which make them susceptible to a wide range of environmental problems) and that amphibian declines may merely be a warning of wider environmental problems which have yet to be discovered......
CONSERVATION ASSESSMENT AND MANAGEMENT PLAN WORKSHOP FOR AMPHIBIANS AND REPTILES OF SRI LANKA

26-30 November 1998, University of Peradeniya, Peradeniya, Sri Lanka

Report -- Executive Summary

The diversity of Sri Lankan herpetofauna is among the richest in the world. The fauna is also among the highly threatened forms in the world, thanks to the small size of the island and the various threats acting on them. To assess the status of all the herpetofauna on the island, two attempts were made — one by the IUCN Sri Lanka office, who have assessed the forms according to a criteria derived to fit for the small island, and the other attempt was made in November 1998 by a group of organisations by using the IUCN Red List Criteria. The combined effort by three organisers, three sponsors and three collaborators resulted in a Conservation Assessment and Management Plan workshop held for five days from 26 to 30 November 1998, in the University of Peradeniya, Faculty of Medicine. The Amphibians and Reptiles Research Organisation of Sri Lanka (ARRRS), University of Peradeniya and the Conservation Breeding Specialist Group, Sri Lanka organised the workshop, which was sponsored by the Philadelphia Zoo and Columbus Zoo Conservation Fund. The Conservation Breeding Specialist Group, India assisted externally with organising the workshop and facilitating it. The workshop and the process itself was ratified and supported by the South Asian Reptile and Amphibian Specialist Group, the Declining Amphibian Populations Task Force (DAPTF) and the Declining Amphibian Populations Task Force, South Asia. The Friends of Rare Amphibians of the Western Ghats (FRWAG) and the Wildlife Heritage Trust of Sri Lanka were external collaborators.

Totally, 173 amphibians and reptiles were assessed at the workshop, of which 54 were amphibians. Of the 175 reptiles present on the island, only 119 were assessed in the time available. A total of 35 amphibian and reptile specialists participated in the workshop.

The workshop was based on the Conservation Assessment and Management Plan (CAMP), a workshop process developed by the Conservation Breeding Specialist Group (CBSC) of the Species Survival Commission (SSC) of the World Conservation Union (IUCN). CAMP Workshop is an ideal methodology for involving national or regional specialists to assess the conservation status of a group of taxa, e.g. mammals, birds, algae, etc. Preparation for the CAMP workshop involves identifying specialists on group of taxa to be assessed. Descriptive CAMP material and a set of Biological Information Sheets for species-specific questions are circulated to specialists. The Biological Information Sheet can be copied and filled out before the workshop or posted to the organisers if the specialist cannot attend. At the workshop the participants are divided into convenient-size groups of either taxonomic group or geographical group. The groups are then provided the Taxon Data Sheets on which they record information from the Biological Information Sheets and participating specialists. The Taxon Data Sheet consists of two parts, namely the taxon information and the management recommendations. All participants at the workshop correct the data compiled in each Taxon Data Sheet during the final plenary session.

After the workshop the editors/facilitators undertake a review of the information compiled at the workshop by posting a draft report to all participants for corrections, modifications and for other information not submitted at the workshop. In the case of this CAMP exercise, a group of specialists gathered subsequently and reviewed the data in the draft report before submission.

Their names have been included in the Taxon Data Sheets as reviewers.

The taxon assessments were based on the new IUCN Red List Criteria (1994) developed by the IUCN. The IUCN Red List Criteria have evolved over the last 30 years starting from a subjective perception in Red Data Books to the more sophisticated and objective Red Lists of today. The current categories and criteria ratified by the IUCN Committee in 1994 incorporates principles of population dynamics and conservation biology and is a product of nearly five years of revisions. The 1994 criteria is based on scientific rationale (principles of conservation biology) and has its advantages in being applicable to any taxonomic group, is comparable and is transparent in its applicability.

The 1994 IUCN Red List Criteria was adopted as a tool to assess the amphibians and reptiles of Sri Lanka. The probability of extinction determined the status of a taxon in the wild. The IUCN criteria include categories that determine whether a taxon is threatened, non-threatened, extinct, poorly known or not fit for consideration for evaluation, based on the information available for assessment.

Assessments at the workshops were made from information gathered from all the participating biologists, from their knowledge in the field, including unpublished information of range extensions, sightings, local threats, habitat changes, impact of changing ecology and other important information that does not normally get published but is available. Sources from literature are also sought in compiling this information, and museum records, if available, are included. After the initial compilation of data in a Taxon Data Sheet, the status is derived using guidelines (or criteria) for the degrees of threat and the information is ratified after discussion at an open plenary in the workshop. The information in the Taxon Data Sheet is then typed up and a draft sent to all participants for further review, additions or minor modifications of information.

Amphibians in Sri Lanka are represented in five families, namely, Ichthyophiidae, Ranidae, Bufonidae, Microhylidae and Rhacophoridae. Family Salamandridae or newts are not found on the island. Of the 54 amphibian taxa, 42 valid descriptions are not available at the time of the workshop. Of the 34 amphibian taxa assessed at the workshop, 34 are endemic, meaning their distribution is restricted to only Sri Lanka. Of the remaining 20 taxa, 17 are found on the Indian mainland and the other are found in both the islands, making them considered restricted distribution. The threats faced by many of the Sri Lankan amphibians have resulted in a considerable number of restricted taxa being threatened in the wild. According to the IUCN Criteria, 19 endemic and 2 non-endemic amphibians are threatened to differing degrees and are therefore, Vulnerable, Endangered or Critically Endangered. Most of these assessments are also based on restricted distribution criteria. Threats affecting amphibians in Sri Lanka include pollution, pesticides and human influence changes such as agricultural practices, loss of habitat and fragmentation. Change in climate patterns is also thought to affect amphibians on the island.

Similarly, 87 of the 119 assessed reptiles were categorised as threatened according to the Criteria. Of the 97 endemic reptiles, 74 were assessed as being Vulnerable, Endangered or Critically Endangered. Thirteen of the 22 non-endemics assessed also were found threatened. Of the 175 reptiles only 119 taxa were...
assessed at the workshop. The threats to the reptiles in Sri Lanka are more due to threats that are perceivable such as habitat loss, fragmentation, change in quality of habitat and human population. Pollution and pesticides along with man-made fires are also a threat but do not affect reptiles as much as they do the more sensitive amphibians.

As evidenced by the assessments, much of which was done with limited information, more studies are required to really understand the status of the herpetofauna in the wild, a situation that is common in herpetofauna research in South Asia. Even though most of the assessments are made with reasonable data, or inferences, it is clear that direct observations are lacking. Monitoring of species is extremely rare, and in many cases only sporadic sightings or accidental observations are the sole indicators of a species' existence in a habitat. Various recommendations, therefore were suggested as part of the management planning of this exercise, whereby surveys, monitoring, habitat management, genetic studies, taxonomic studies, limiting factor research, limiting factor management, life history studies, captive breeding and other basic research and management recommendations were made. It was also suggested that this exercise be carried out again in a few years to determine the status of Sri Lanka's herpetofauna after some more information is collected.

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<th>Name</th>
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Houston Toad (Bufo houstonensis) Population & Habitat Viability Assessment

Executive Summary

The Houston toad (Bufo houstonensis Sanders, 1953) is endemic to southeast and central Texas. Six disjunct metapopulations of the Houston toad are currently extant in seven different counties, and a small population occurs in Lavaca County. The toad may occur in Lee, Caldwell and Waller counties. It probably has been extirpated from its historic localities in Harris, Liberty, and Fort Bend counties.

There is a strong correlation between occurrence of the Houston toad and two separate bands of geologic formations, on which the deepest sands in the region occur. Four populations occur on the band of geologic formations (Carizzo, Queen City, Spartan, Reclaw, Wedches) that runs through Bastrop County northeast to Freestone County. Two metapopulations and the Lavaca County population occur on the other band (Willis and Godad) that runs parallel to and southeast of the first band, through Lavaca, Austin, and Colorado counties.

The Bastrop County population is the most robust and appears to be stable at the present time. About 70-100 square miles of potential habitat based on geologic formations and native woodland occurs in this area. Public lands include Bastrop and Buescher State Parks and the Lower Colorado River Authority's land around Lake Bastrop totaling about 6,000 acres.

The size and status of the other populations is unknown. However, these populations occur within areas that appear to provide suitable habitat (based on relatively contiguous deep [> 40 inches], sandy soils and native vegetation) in large enough blocks (20,000-50,000 acres) to support long-term viable populations. The amount of habitat at the Lavaca County site has not been estimated, but appears limited and marginal. Other than the Bastrop County metapopulation, no other population occurs on public land.

Little is known about the toad's activities during the non-breeding season, except that they aestivate/hibernate in sandy soils during some portion of this season. During the breeding season, many toads do not appear to be faithful to certain breeding sites, but rather move from one site to another. These movements between sites provide the basis for genetic and demographic exchange between what may appear to be isolated small populations or satellite populations to a large population. The risk of extinction and viability of this complex of populations (a metapopulation) will depend upon the size of these populations, the rate of exchange between them, the configuration of exchanging populations, and the threats impacting each of the individual units. Individual male toads have been known to move 1400 meters (1.4 km, 0.87 miles) or more between breeding sites (cumulative distance - including back and forth movements). Straight line distance was estimated at approximately 700 meters.

Fifty biologists, managers, government officials, professors, non-government organization representatives, interested private individuals and policy makers attended a Population Habitat Viability Assessment (PHVA) Workshop at the University of Texas, Austin, Texas on 23-25 May, 1994 to assess the current status and trends of the populations of the Houston Toad. The Conservation (formerly Captive) Breeding Specialist Group, of the IUCN/Species Survival Commission was asked to conduct this PHVA Workshop to assist in assessment and subsequent Planning. One purpose was to review data from wild populations as a basis for developing stochastic Population simulation models. These models estimate risk of extinction and rates of genetic loss from interactions of demographic, genetic, and environmental factors as a tool for ongoing management of the species. Other goals included review of the current state of knowledge about habitat requirements, population sizes, role of direct threats (including conflicting land use competition by people) as a factor in the decline of the species, potential role of other threats such as disease and pollution and to discuss research needs and priorities.

The first morning and afternoon consisted of a series of presentations summarizing data on the distribution of populations, genetics, and threats to the Houston Toad. A brief presentation on population biology, the PHVA process, and the use of VORTEX was made as an introduction to the use of the models and the problems associated with small isolated populations. The participants formed four working groups (distribution, threats, habitat requirements and management, and modeling). In the subsequent three days three additional groups (captive breeding / reintroduction, urban land use, and public education / outreach) were established to develop in detail current information, to develop values for use in the simulation models, and to develop management scenarios and recommendations. Stochastic population simulation models were initialized with ranges of values for the key variables to estimate the viability of the population using the VORTEX software modeling package.

During the course of discussions by the working groups a number of recommendations were identified for consideration as research topics. No attempt was made to rank these recommendations in the working groups and support for them is located in the individual report sections. Due to lack of precise distribution and population status knowledge regarding the Houston toad, it is difficult to determine risk associated with each threat throughout the range. Working group consensus was that most of these threats occur throughout the range; however, intensity of each threat varies depending upon location.

Examination of the collective recommendations indicated that several threats inspired recommendations from the majority of the working groups. The need for surveys to determine both the extent of the Houston toad range and the numbers of toads along with determination of what constitutes Houston toad habitat were two of the most repeated recommendations. Education and planning guidelines and a need for a process to work collaboratively on these issues were given high priority. Further investigation into all aspects of resource extraction within Houston Toad habitat was also identified as a high priority.

Recommendations

Population Characteristics Influencing Houston Toad Survival

1. The largest population patches, which serve as the primary source of migrants available for recolonization of empty patches, need to be the primary target of metapopulation management efforts.

2. Houston toad population viability may be enhanced by maintaining populations with subpopulations of relatively large and equal sizes and migration rates of 2% per year or greater between patches. This rate was estimated by simulation with the model.

3. Gradual and sustained reduction (a deterministic threat resulting from land use practices and urbanization) in available habitat increases risk of population extinction.

4. Catastrophes (stochastic threats) reducing survival are a greater threat to population survival, than those reducing reproduction. Growth rate is reduced by more than 75% in scenarios where fire and drought are occurring independently.
compared to those scenarios in which catastrophes are absent. In the absence of catastrophes, the metapopulation is at no risk of extinction under three migration scenarios.

Distribution, Habitat, and Threats
Distribution and mapping recommendations address the need for surveys, preparation of maps, and development of criteria for suitable habitat (using geologic, topographic, and plant community characteristics) which can be mapped. Substantial time was devoted by one of the working groups in assembling this information for Bastrop County on maps. Such information would assist the conduct of surveys on distribution of the toad and the continuing organization of the information as it is collected.

Surveys
1. Conduct additional standardized surveys to determine distribution within habitat patches and establish accuracy of mapping.
2. Conduct surveys in Lee County.
3. Survey priorities for Bastrop County:
   a) Survey areas within appropriate geologic formations and soil types north of the Colorado River. Recent Houston toad surveys in this area have been limited to public lands and power line rights of way. Most of the land outside these areas that fall within the appropriate geologic formations have never been surveyed to determine the presence of toads. Surveys of these areas should be initiated during the 1995 breeding season.
   b) Survey area within appropriate soil type, but outside geologic formations, north of the Colorado River.
   c) Survey area within appropriate geologic formation south of the Colorado River.

Geographic Information System (GIS) Database
4. Undertake mapping work on soil formations. Initiate GIS for Bastrop County at the meeting, for other counties occupied by the Houston toad.
5. Incorporate mapping information into a geographic information system database (GIS). Show land use on a regional scale and orient land use activities to areas outside of toad habitat. Information and cost-sharing between the multiple interested agencies and organizations would be useful.
6. Determine areas of suitable or potential habitat and degree of isolation and inter-connections between and within population patches.

Habitat
7. Characterize preferred toad habitat utilized during activities outside of the breeding season, and develop a habitat description including soil, vegetation, water quality, distance to water, topography, and patch size and shape.
8. Investigate size, shape, depth, location; etc. of pond construction conducive to Houston toad conservation.
9. Investigate restoration techniques for toad habitat in forested and savannah lands.
10. Investigate the role of travel corridors and barriers in the dispersal of toads between population patches and ephemeral habitats.

Threats
11. Estimate probabilities of occurrence, from historical records, of weather cycles, drought and fire. Estimate effects on survival and reproduction of Houston toads.
12. Identify pollutants, including agricultural chemicals, affecting life stages of the Houston Toad and its food resources.
13. Evaluate the effects of fire ants and fire ant control methods on toad populations.
14. Evaluate conditions favoring introductions of other toad species and their effects on Houston toad populations.
15. Monitor populations for disease outbreaks and endemic disease patterns.
16. Evaluate possible effects of UV radiation on Houston toad reproduction and survival.

Land Use Activities
17. Determine effects of fish stocking of ponds on toad populations.
18. Assess effects of current agricultural management practices including chemical applications, prescribed burns, fences, and soil compaction on toad populations.
19. Assess the impact of crop land and orchard operations, timber harvesting methods, and resource extraction on toads and toad habitat; allow evaluation of potential effects of planned land uses on toad habitat.
20. Study combination of prescribed burning with planned grazing systems and other management practices as related to Houston toad habitat.
21. Investigate land modification and urbanization activities that may be compatible with the Houston toad by monitoring known sites where the toad exists in proximity to developed areas.

Management Guidelines
22. Minimize disturbance of soil (including compaction) to prevent introductions and possible competition from other species of toad and impacts of exotic species invasions such as fire ants.
23. Minimize pesticide use and other chemical use in toad habitat.
24. Minimize habitat fragmentation by barriers such as fences and impervious cover.
25. Maximize maintenance and restoration of corridors (including stream side management zones) and use of native plants in landscaping.
26. Maximize use of non-toad habitat for urban development needs through comprehensive planning.

Public Outreach
27. Undertake communication and coalition-building with city and county officials.
28. Develop instructional documents detailing a description of the species, its habitat, and its range in user-friendly language, accompanied by an attractive and clear color photos of the toad. Distribute the documents to schools, chambers of commerce, county extension agents, conservation organizations and professional and civic groups throughout Houston toad range.
29. Develop and provide consistent technical assistance to land owners and planners through resource agency programs. Provide guidance to the public regarding the Houston toad, its ecological requirements, and compliance with the Endangered Species Act.
30. Media contacts should be established. Develop an organized public outreach effort to promote public awareness, understanding, appreciation, and support for the Houston toad recovery efforts. Utilize the public school system as an important component of the public base that is receptive to educational campaigns. A summary guide detailing the contacts and requirements of each educational program should be developed for distribution.
31. Compile and distribute information about economic incentives and assistance programs for landowners and planners to increase their use in assisting to conserve toad habitat. These include alternatives to resource extraction and livestock management systems compatible with Houston toads. Link recovery efforts to other benefits, such as protection of water quality, pine forest community (in Bastrop), the deep sand ecosystem, ecotourism, and community planning.
Book Review

GYMNOPHIONA (AMPHIBIA) OF INDIA: A TAXONOMIC STUDY
R.S. Pillai and M.S. Ravichandran

1999. OCCASIONAL PAPER # 172
RECORDS OF THE ZOOLOGICAL SURVEY OF INDIA
ZOOGOGICAL SURVEY OF INDIA, CALCUTTA. 117 PP.
Price: Rs. 300.00/ $ 20.00/ £ 15.00

This ZSI publication comes at a time when a number of initiatives on amphibian field guides and handbooks are underway or are being planned by the new breed of amphibian biologists in India -- some for specific states while others for a region and some with national handbook aspirations. Gymnophiona is a small group within the evergrowing domain of amphibian taxa of India and South Asia. Just a small proportion of all amphibians in the region belong to the three families of Ichthyophiidae, Uraeotyphlidae and Caeciliidae. But they also constitute one of the most confusing groups -- may be not as difficult as rhacophorids, but tough none the less. This book by the older amphibian biologists in India, the first author an authority on Gymnophiona, is a first step in the right direction of solving some of the complex issues of identification and taxonomy.

The 117-page book provides an insight to this group of liminal amphibians with descriptions, keys and characteristics of all the 21 taxa described until date. Simple line drawings attempt to convey the characteristics in most cases, while some photographs at the end of the book tries to give perspective. Maps on distribution of these forms based on literature is an additional quality of this book, something that is seen more these days with the emphasis given much to the distribution and status of the species in the wild. In addition to all this, five new species have been described along with descriptions for the earlier ones. The fact that such a valuable account has been produced on this small, enigmatic and important group of animals makes up for the delay in publication (the manuscript was submitted in 1994 but published in 1999 and released in 2000). Overall, it is a significant and welcome addition to the growing amphibian literature in the region.

Preface by the authors
Gymnophiona are perhaps the least known of all the larger vertebrate groups of the world, with the possible exception of some orders of deep sea fishes. The subterranean mode of life contributes to their rarity. Caecilians have a very restricted world distribution and even within these areas they occur only in small packets.

Paucity of material is the chief constraint in the caecilian taxonomy. Taylor, a world authority on caecilians in his celebrated work "The Caecilians of the World" states "Most of the specimens that have reached museums are those discovered by chance or accident rather than by three months in Panama searching for reptiles and amphibians. Despite the fact that caecilians were one of their major objectives and Panama has three genera and at least eight species, they obtained only a single specimen. Numerous museums that have sent collectors to various parts of the world have met with similar results. Only in the case of a few species do museums have adequate series. Even when a collector knows an exact geographical locality and an exact habitat of a subterranean species, the digging effort required to discover one may be equivalent to spading up a small garden! I recall numerous times when my own efforts in digging in likely spots have yielded nothing. Rarely enough are the specimens to be taken in numbers. The number of species known from one or two specimens is remarkable!"

The caecilian fauna of India has never been systematically studied. While information on their taxonomy is inadequate, other aspects including their biology and ecology are very imperfectly known. Only eight species of caecilians were known from India till 1960. Seven were added to these by Taylor from 1960 to 1968; the only subsequent addition was by Pillai in 1968. Thus the total number of species of Indian caecilians stood at 16.

The objectives of this study are three fold: bring together all the taxonomic information available on Indian Gymnophiona by studying the preserved materials that lie scattered in various institutions in India; attempt fresh collections to supplement the rather meagre material that is presently available; describe and illustrate existing species, erect new taxa if necessary, document their distribution, and present a treatise on the Indian Gymnophiona at the alpha-taxonomy level. It is hoped that this work shall serve to inspire further research on this ancient and unique group of apodous amphibians. A chapter on "Morphology and Terminology", outlining the external morphological characters which have a bearing on their taxonomy is included here to assist such work.

Paucity of knowledge on the systematics, distribution and habitat requirements of Indian caecilians is a major constraint to any intelligent conservation programmes. Although conservation is not objective here, it is hoped that the present study shall serve as a foundation towards formulation of a conservation policy of Indian Gymnophiona.

This monograph was planned originally to be authored solely by the senior author. However, the contributions made by Dr. M.S. Ravichandran in the compilation of morphological data justified his inclusion as a co-author. Use of first person singular in the text perhaps to be the observations of the senior author during field collections or in museums he has visited for study of caecilian material.
ABSTRACTS

A new species of Rhacophorus (Anura: Rhacophoridae) from the Western Ghats, India
Karthikeyan Vasudevan and Sushil K. Dutta

A new species belonging to the genus Rhacophorus (Rhacophorus pseudomalabaricus sp. nov.) is described on the basis of four specimens collected from the Western Ghats of Tamil Nadu, southern India. It is diagnosed by the following characters: moderate size (mean SLV 52.7 mm); indistinct tympanum; diameter over half of that of eye; fingers two thirds and toes fully webbed; a flap of skin on forearms; a conical flap of skin on heels; dorsal green with leaf venation like markings and webs of fingers yellow-orange. This species resembles closely a congenic species, Rhacophorus malabaricus.

Microhyla shitalil, a new species of Microhylid Frogs (Anura: Microhylidae) from Karnataka, India
Sushil K. Dutta and Prajwa Thay

A new species of Microhyla (Anura: Microhylidae) is described from Biligirirangan Hills in Chamarajanagar District, Karnataka State, south-western India. The new species is compared with congeners from India, Sri Lanka and south-east Asia, that show dilated tips of digits. Microhyla shitalil sp. nov. is distinguished from close relatives within the genus, in possessing the following characters: head wider than long; dilated finger tips; dilated toe tips with median longitudinal groove dorsally, webbing between distal and proximal tarsal tubercles on outer and inner side of fourth toe; two distinct metatarsal tubercles, inner elongated and outer rounded; dorsum smooth, with light brown mid-dorsal marking, venter white; SVL of holotype (a subadult female) 12.0 mm; of four paratypes (all females), 11.0–15.0 mm.

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Checklist of amphibians of Bangladesh

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Family Bufonidae
Toad, Bufo melanoostictus Schneider, 1799 Fairly Common in distribution.

Family Microhyliidae
China frog, Microhyla ornata (Duméril & Bibron, 1841): Few, distribution in wetland and irrigated paddy field.


Climber Frog, Kalyxula pulchra Grey, 1831: Fairly common and widely distributed in hilly deciduous moist forests.

Baloon Frog, Uperodon globulosus (Günther, 1864): Few in plain grassland and Sal forest (Sorex robusta).

Family Ranidae
Skipper Frog, Euphyctis cyanophlumis (Schneider, 1799): common and wider in distribution.

Green Frog, E. hexadactylus (Lesson, 1834): Commercial species, few in freshwater ponds along the fringe of the Sundarbans and endangered nationally.


Cock Frog, Limnonectes limnocharis (Bole & Wiegmam, 1835): Fairly common, wider distribution in the irrigated cultivated land.

Goat Frog, Rana tyleri, Theobald: Few in Sal forests.

Rana temporaria, Günther, 1864: Rare and little known frog.

Family Rhacophoridae
Climber Frog, Rhacophorus maximus Gunther, 1858: Fairly common, wider distribution and hanging foamy nests over bushy water edge.

Climber Frog, R. maculatus: Common than R. maximus and wider distribution in hilly deciduous moist forests.

Some recent papers on amphibian systematics


?? DO YOU HAVE ANY INFORMATION ON THESE DATA DEFICIENT AMPHIBIAN TAXA ??

The species of amphibians with a range in India listed below were categorised as "Data Deficient" (nationally for India or globally if the species was endemic) in the BCPP CAMP Workshop for Indian Amphibians held in Utkal University, Bhubaneswar, Orissa in 1997 and the CAMP workshop for Sri Lankan Amphibians held in Kandy in November 1998. The IUCN Red List criteria were used by the workshops to assess the taxa.

A taxon is categorised Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data is available. In many cases great care should be exercised in choosing between DD and threatened status. If the range of a taxon is suspected to be relatively circumscribed, if a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

As a network activity of DAPTF-SA, the list along with a questionnaire of whether or not any information was known or available with the network members was circulated. Eleven of the 180 members responded, of which seven did not know anything and the rest sent filled in Taxon Data Sheets for a few taxa.

This is another attempt to get the network members more actively involved and hence the list is printed hereunder. Please send us your information on the status of these taxa, or please let us know if you do not have any information for any of them.

Data Deficient amphibia of India
1. Anura kandlii Ravidhandan & Pillai
2. Bufo abalus Ahi
3. Bufo brevirostris Rao
4. Bufo viridis Laurenti
5. Indrana gunu Dubois
6. Indrana tenningoua (Rao)
7. Limnonectes khaseiandes (Anderson)
8. Limnonectes sauriceps (Rao)
9. Megophrys lateralis (Anderson)
10. Nyctibatrachus kempholyensis (Rao)
11. Nyctibatrachus sylvaticus Rao
12. Occellozyga lima (Gravenhorst)
13. Paa hazarensis (Dubois & Khan)
14. Paa minica (Dubois)
15. Paa steinhostignata (Murray)
16. Paa vocina (Stoliczka)
17. Philautus crani Dutta
18. Philautus elegans Rao
19. Philautus flaviventeris (Rouleger)
20. Philautus hassamensis Dutta
21. Philautus kotigaharensis Rao
22. Philautus melanomus Rao
23. Philautus naramensis Rao
24. Philautus nobile (Ahi)
25. Philautus parkeri (Ahi)
26. Philautus swainians Rao
27. Philautus travancoricus (Rouleger)
28. Ramanella anamalatensis Rao
29. Ramanella minor Rao
30. Rana travancoricus Annandale
31. Rhacophorus appeniculatus (Gunther)
32. Rhacophorus calcadensis Ahi
33. Rhacophorus naso Annandale
34. Rhacophorus nigropalmatus Boulenger
35. Scutiger occidentalis Dubois
36. Tayrona haaschana Stoliczka
37. Theloderma asper (Boulenger)
38. Tomopterna leucorynchos Rao
39. Tomopterna parambulkalamana Rao

Data Deficient amphibia of Sri Lanka
1. Adenomus kandianus (Günther)
2. Haplobatrachus tyrrenus Daudin
3. Nannophrys guentheri Bouletier
4. Philautus stictomerus Günther
5. Ichthyophis orthophicatus (Taylor)
Some amphibian websites
Amphibian Conservation Alliance  http://www.frogs.org
Are Frogs Disappearing?  http://www.ednet.ns.ca/educ/museum/mnh/nature/frogs/gone.htm
Frogland  http://allaboutfrogs.org/
FrogWeb  http://www.frogweb.org/
Great Lakes Declining Amphibians Conference  http://www.mpm.edu/collect/gldaabs.html
Poison Frogs  http://www.ttip.nl/~t272198/head.htm
Rivers Outline  http://roi.freenet.columbus.oh.us
Threats to Amphibians  http://rachel.des.ucdavis.edu/Toads/liddon.html
Virtual Frog Dissection Kit  http://george.lbl.gov/vfrog
Zoonet  http://www.mindspring.net/~zoonet/

CURRENT PROJECTS

Ecological Status Survey of Amphibian Fauna of Pacagah in the District Balangir, Orissa.

Dr. D. Mishra (Principal Investigator), H.O.D., Zoology, J. College, Patnagah, Balangir, Orissa 767025, India.

Dr. C.S. Kar (Co-Investigator) Research Officer, Dept. of Forest, Govt. of Orissa.

Western Orissa experiences extreme climatic conditions. In winter the minimum temperature comes to around 7-8°C and in summer the mercury rises to 45-46°C. Extensive studies on amphibians have so far been made by S.K. Dutta and others, who mainly focus on the eastern part of Orissa where climatic conditions are not so extreme. Little information on ecology of amphibians of Western Orissa is available. Therefore, it was thought necessary to undertake this research project which will give some additional informations to the amphibian populations of western Orissa. The Objectives are:

1. To make a detailed ecological status survey of amphibian fauna.
2. To study the population density and abundance of different species according to habitat types.
3. To make detailed study of microhabitats of different species.
4. To study the reproductive behaviour of different species.
5. To assess the present levels of exploitation and various threats if any.

The project will give first hand information on various aspects of amphibian fauna of the locality. Different study sites like crop fields, streams, hills, ponds and forests have been chosen. The project after completion will significantly contribute to the understanding of the status of amphibians in this part of Orissa.

Sri Lanka: August, 2001
World Congress of Herpetology

The 4th World Congress of Herpetology will be held in Sri Lanka, in August, 2001. Apart from being widely considered a tourist paradise thanks to its ancient history, natural beauty, splendid beaches and hospitable people, Sri Lanka is also one of the world's great 'hot spots'. Located not far from the southern tip of India, the 65,000 km² continental island boasts 200+ species of frogs and 150+ species of reptiles.

Details may be viewed on the special Congress web page, www.4wch.com. We urge you to 'pre-register' with us as early as possible by sending us your name and address by mail or e-mail (preferably also through our web page). Pre-registration is free and only expresses an interest on your part to receive further information; it carries no obligation whatsoever. When you pre-register, we will send you a free copy of the 4wch promotional brochure with details of how to register, the call for papers, how to get to Sri Lanka, costs and a variety of special offers available only to Congress participants. We will also send you regular updates regarding the Congress.

Pre-Register Today!

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Congress organizer/director:
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Special thanks to the following organisations for the technical and monetary support provided to run the Declining Amphibian Populations Task Force-South Asia network and in the publication of this Newsletter.