Applied Research and Conservation of the **Herpetofauna in Bangladesh**

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AHM Ali Reza
Ph.D. Candidate
Natural Resources Management
Texas Tech University
Lubbock, Texas 79409, USA
Homepage: www.wildreza.com

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SUMMARY

Using traditional means, DNA analysis, and GIS technology, I am working to produce an updated list of the herpetofauna of Bangladesh, investigate their pattern of richness and population status in different habitat types in the country, and study their bio geographical relations. In addition to the visual encounter survey, I also used different trapping techniques to maximize the number and diversity of individuals encountered. Animals and DNA samples were collected for depositing in Bangladeshi and international collections for further research in future. In the summer of 2006 and 2007, I selected seven permanent sampling sites in different forest types of Bangladesh and three sites in the urban and suburban areas. During this time, I recorded 85 species of amphibians and reptiles which included at least 15 new species which have not previously been recorded from Bangladesh and few of them were believed to be endemic to the neighbouring countries.

Six scientific papers have been published in international peer reviewed journals and few others are under preparation. I offered on-hand training for at least five graduate students from Jahangirnagar University to conduct herpetological study in different forest habitats in Bangladesh. Two technical presentations were delivered to different community groups for conservation awareness on the herpetofauna of Bangladesh. I was invited to discuss the importance of conservation and my work on the Bangladeshi herpetofauna by one of our most popular national television channels in Bangladesh. My work has also been widely published in national daily newspapers and magazines to make country people more aware of the conservation of this most neglected group of animals. As a final output of the project, I am now working on my Ph.D. Dissertation and hopeful to be finished by the end of 2009.

INTRODUCTION

Situated in tropical Asia, Bangladesh is a global biodiversity hotspot, containing a unique and highly diverse biota in a wide range of poorly unexplored habitats. Roughly, 22 species of amphibians and 126 species of reptiles[1] have been documented from the country (IUCN Bangladesh 2000), but survey effort has been limited, mostly conducted over 100 years ago. Among 131 reported species of inland reptiles and amphibians of Bangladesh, 112 (85%) are facing conservation threats of various kinds[2] and more than 43% are categorized by the IUCN Bangladesh as 'Data Deficient', indicating lack of even basic information. Rapidly escalating human demands for natural resources are causing population, species, and ecosystems to disappear at an alarming and unprecedented rate and becoming a conservation concern to Bangladesh. The current species list, produced by the IUCN Bangladesh in 2000, was prepared broadly based on collections made by the British researchers a century back. The country has neither a natural history museum[3] nor a long-term biodiversity conservation strategic plan for the future.

1 The number of herpetofaunal species has gone way up than list produced by IUCN-Bangladesh in 2000.

2 *IUCN categorized them as Critically Endangered (CR), Endangered (EN), and Vulnerable (VU).*

3 Bangladesh does have a National Museum but do not have a Natural History Museum.

Thus, this mainly Muslim, impoverished, overpopulated, and poorly explored country is now drawing attention from researchers and conservationists around the globe.
The scale and rate of tropical forest degradation and loss of biological diversity is of worldwide concern.

An initiative for prioritizing areas of global importance has been the identification of Earth's biologically richest and most endangered terrestrial eco-regions (Collins *et al.* 1991). With very limited resources available for conservation, these biodiversity 'hotspots' have been seen as a practical way to minimize biodiversity loss (Mittermeier *et al.* 1999, and Myers *et al.* 2000). Indo- Burma (Myanmar), nested in the severely threatened and data deficient Asia- Pacific region is known to be exceptionally rich in flora and fauna[4] (Pawar and Birand 2001). Covering the tropical evergreen and temperate broadleaved forest from Northeast India and Bangladesh up to Vietnam, this region is one the 25 hotspots in the world (Mittermeier *et al.* 1999), and has been considered a contender for the title "hottest of the hotspots" (van Dijk et al. 1999).

However, as will be apparent in the following discourse, the forests and other crucial habitats are also the most threatened, and much of their diversity is being lost without even basic documentation. Hence, I present the initial results of a survey I conducted with some other field assistants. The survey has been undertaken in various habitat types of Bangladesh, which was aimed for inventorying amphibian and reptile species and supplementing existing information on specific conservation problems on selected habitats.

Background…….
As a native to Bangladesh, I initiated a research and conservation project on the herpetofauna of Bangladesh, the least known and most neglected group of animals of the country. My research goals included the production of an updated species list, a set of GIS-based distribution maps, and estimates species composition and richness in various habitat types in the wide ranges of habitats in Bangladesh. With 150 million people occupying the country having a population density of 2706 people per sq mile[5], Bangladesh is among the most densely populated nations on the earth. In such an overpopulated landmass, making a plan to conserve all of its forest habitats as well as its biological diversity is an ambitious objective. Hence, my overall goal of the project was to prioritize the forest habitats of Bangladesh based on their species richness and diversity , and finally initiate immediate conservation measures in some selected highly diverse, critically important ones analyzing the baseline information generated through this project.

4 About 13,500 flowering and gymnosperm plant species with 52% regional endemics, 329 mammal species with 22% endemics, 1170 bird species with 12% local or regional endemics, 202 amphibian species with 56% regional endemics, and 484 reptile species with 42% regional endemics.
5 Population densities in England is 706/sq mile and in the USA, the number is 80/sq mile.

[……CITED FROM PROJECT PROPOSAL…...] [6]

Project Objectives

The goal of my proposed project is to identify the conservation needs of the herpetofauna of Bangladesh and begin addressing them. This translates into the following aims:

I. Prepare an updated species list of the herpetofauna of Bangladesh,

II. Quantify the population status and dynamics of amphibians and reptiles in different habitats of the country,

III. Provide a set of GIS maps describing the distributions of herpetofauna in the country, and

IV. Help formulate a national management plan and initiate preliminary conservation activities for the herpetofauna of Bangladesh.

Expected Outputs

The project will achieve the following outputs by which substantial and long-term success could be evaluated:

> *Scientific knowledge.* The herpetofauna of Bangladesh is poorly known and mostly neglected despite being located within a biodiversity hotspot. The project will provide much new information, and scientific reports and research papers will be produced to disseminate this information.
>
> *Conservation & Public education.* I will engage local communities in herpetological conservation efforts while I will be working in the field. I will also produce a few non-technical field guides and information brochures on herpetofauna of Bangladesh.
>
> *Policy enhancement.* My research findings will be made available to policy makers at the national and international levels and discussed with designated managers of protected areas. I will link my research to few of the on-going national projects which are being implemented in collaboration with Bangladesh Government and IUCN-Bangladesh.
>
> *Scientific training.* The proposed research will be my Ph.D. project. Therefore, both information and techniques gained from this research will serve Bangladesh when I return to the country at the end of the project.

HOW AND WHAT WAS DONE

Based on various geographic, biological, and logistical factors, I selected seven permanent sampling sites (PSSs) in five different forest types (Nishat *et al*. 2002): evergreen, semi-evergreen, deciduous, mangrove, and swamp forest, and three study sites in the urban

and suburban areas. I spent, on an average, a week in each of my PSSs with one to three research assistants[7] mostly from Jahangirnagar University. Jahangirnagar is one of the twenty-eight public universities in Bangladesh and is one my PSSs as a suburban habitat. A brief description of my seven forested PSSs is:

Selected study sites

i. *Lawachara National Park:* Declared as a National Park in 1990s, this is a 1250 hectare highly diverse hilly evergreen forest situated in the northeaster part of Bangladesh (Map 1). Surrounded all around by human habitats, the park is a critical home for several primate species including the only ape of the country, the Hoolock Gibbon (*Hylobates hoolock*) [8]. The park was also a hotspot for me to find several species of new country and regional records for amphibian and reptile species of Bangladesh.

ii. *Comilla Tipperah Hills:* This is a partially degraded *sal* (*Shorea robusta*) forest habitat situated in the central-east and faces flash floods during the rainy season. This site enjoys tropical semi-evergreen forest but most of the hilly areas are already clear-cut, and much development happened in the last couple of decades. This site was selected to record any notable differences in animal composition between a degraded forest habitats with a considerably well managed forest habitat.

iii. *Tanguar Haor[9]:* 'Haor' is an internationally important seasonal wetland which includes numerous rivers, streams, irrigation canals, and large areas of seasonally flooded cultivated lands. Situated in the north-eastern part of Bangladesh, haor basin is one of the most remote areas of the country and only region where remnant patches of freshwater swamp and reed lands still exist. The Tanguar Haor is a 97.30 km2 wetland and one of the most important wintering and breeding grounds for migratory birds in Bangladesh.

iv. *Bandarban Hill District:* Bangladesh has three mountainous districts in the south-east (Map 1): Khagrachari, Bandarban and Rangamati. These are covered with forests that extend from Myanmar (Burma) and north-eastern India, and are highly diverse, mostly intact, and poorly explored. Other than the politically restless administrative situation, this hill district is one of the major habitats for highly diverse herpetofauna animal assemblage in Bangladesh. The hilly site was another important hotspot for me to find several species of new country as well regional records for amphibian and reptile species.

v. *Madhupur National Park:* Undulating red soil and sal (*Shorea robusta*) forest are the main ecological features of this park[10]. Sal forests are relatively dry and have been dramatically reduced during the last few decades.

6 This part has been taken from the original proposal sent to the Rufford Foundation for funding.
7 Mostly graduate students from the Department of Zoology, Jahangirnagar University and other researchers from home and abroad.
8 Hoolock Gibbon has been categorized as a Critically Endangered species by IUCN Bangladesh 2000
9 UNESCO declared the Tanguar Haor as a 'World Heritage Site' in Bangladesh
*10 This unique area is also a critical home for several primate species and had a healthy population of the Bengal tiger (*Panthera tigris*) and One-horned Rhinoceros (*Rhinoceros unicornis*).*

This 8,438 hectare deciduous forest is situated in the north-central part of Bangladesh and extends across the districts of Gazipur, Tangail and Mymensingh. The boundaries between this region and the adjoining regions are generally sharp and well defined. This dry and red soil habitat is a unique habitat for several reptile species including the Bengal Monitor (*Varanus bengalensis*) and the Banded Krait (*Bungarus fasciatus*).

vi. *Kaptai National Park:* Kaptai is a recently declared national park in one of the mountainous districts situated in the south-eastern part of Bangladesh. This type of natural forest is very scare and found only in the deep valleys where wet conditions exist with shade and mist. The canopy is irregular and the forest is multi-storied and uneven-aged. The tree species are essentially evergreen with few deciduous or semi-deciduous species. Earlier literatures (SoF 2001) reported the occurrence of 11 species of amphibians and 78 species of reptiles from the area following reports of about 100 years old.

vii. *Sundarbans Wildlife Sanctuary:* Sundarbans[11] is the largest chunk of productive mangrove forest in the world and a World Heritage Site recently declared by the UNESCO. This mangrove forest covers an area of about 5,770 sq km, of which 4,016 sq km is land and the rest comprises rivers, canals, and creeks. The total area of the World Heritage Site is 1,400 sq km (Reza *et al* 2004).

This is a crucial conservation area hosting Bengal tigers (*Panthera tigris*) and many other species including the largest venous snake of the world, the King Cobra (*Ophiophagus hannah*), and the largest reptiles of world, the Estuarine Crocodile (*Crocodylus porosus*).

Methodology

One I…..survey for updated species list: I conducted fieldwork in summers of 2006 and 2007 starting from mid-May until mid-August in different types of forest habitats in Bangladesh. During this time, I conducted visual encounter surveys (VES) (Doan 2003) with one to three field assistants in a wide range of habitats to record the maximum number of herpetofaunal species. The survey was designed with the goal of covering wide geographical swathes of
Bangladesh (Map 1). The survey was combined with active searching on marked and unmarked trails, scanning with the naked eye, the use of binoculars, and intensive microhabitat[12] searching.

Investigations (Heyer and Berven 1973, Inger 1980, Pearman et al. 1995) have specifically discussed herpetofaunal sampling methods to be used in tropical rain forests. Some standard methods are difficult to implement[13] or are completely inappropriate for rain forest herpetofaunal surveys. Doan (2003) compared various herpetofaunal survey techniques and came up with a conclusion that VES is much more effective in the tropical rain forests than most other standard survey techniques used by the herpetologists.

11 The Sundarbans mangrove forest spans both Bangladesh (62%) and India (38%).
12 Microhabitats have been defined here as places like: under stones, rocks, and fallen logs, in the tree hollows, etc.
13 For example, because of the lack of roads in most of the rain forests, night driving is impossible.

Therefore, I considered VES as my default technique for the herpetofaunal survey in Bangladesh.

I carried out time-constrained surveys mostly following VES in my already selected seven permanent sampling sites (Table 1). The PSSs were selected based on various geographic, biological, and logistical factors. In addition, I also used several trapping techniques (e.g. drift fences with pitfall and funnel traps, PVC pipes, minnow traps, etc.) to maximize the catch in the field. The captured animals were identified, measured, and photographed in the field and were released as soon as possible from where it was collected except for a new country or regional record. Unidentified as well as new animals were collected, euthanized in a human manner, and preserved for sending to a museum. Most of time in the field, I was accompanied by one to three research assistants (mostly graduate students) from Zoology Department of Jahangirnagar University. This was the most effected way of hand-on training for studying herpetofauna in Bangladesh for those students.

Table 1: Selected study sites in Bangladesh

Name of the study sites	Habitat types	Days spent	New Species[14]
Forest habitats			
Lawachara National Park	Primary evergreen forests (situated in the northeast of the country)	20	Yes
Bandarban Hill District	Semi-evergreen hill forest (situated in the southeast)	21	Yes
Madhupur National Park	Natural moist deciduous forests (plain sal forests: situated in the central and central north)	*17*	*Yes*
Sundarbans Wildlife Sanctuary (World Heritage Site)	Natural coastal mangrove forests (littoral forests: located in the southwest)	*16*	*No*
Kaptai National Park	Semi-evergreen hill forest (situated in the southeast)	*08*	*Yes*
Tanguar Haor (World Heritage Site)	Swamp wetland forest (haor habitat: situated in the northeast of the country)	*06*	*No*
Comilla Tipperah Hills	Tipperah hills human dominated degraded habitat (central east of the country)	*08*	*Yes*
Urban and suburban areas			
Jahangirnagar University Campus	Plain degraded sal forest dominated by humans (situated in the central part of the country)	*25*	*No*
Valuka Crocodile Farm	Patchy forested areas dominated by humans (situated in the south central part)	*09*	*No*
Jhenaidah Floodplain District	Human dominated habitat (situated in the south-western part)	*23*	*No*

14 Whether any new country or regional range extension report on amphibians and reptiles has been recorded during this study.
15 Günther (1864), Boulenger (1890), and Smith (1931, 1935, and 1943)

Two ii…..population status and habitat richness: In addition to the primary data collected in the field, I am now working on to prepare the most updated list of amphibians and reptiles specifying their exact distribution records in Bangladesh. This will be based on existing literatures and museum specimens preserved in different parts of the world. I would then compare the existing records (collected primary data, specimens kept in the major scientific or public collections, or described in the published literatures[15]) to draw a bio geographical trend of the amphibians and reptiles of the region. The old publications and distribution records[16] in the scientific collections will be considered as the major sources of baseline information to compare the previous distribution patterns. For analyzing bio geographical trends of an individual amphibian or reptile species, major river systems and drainage pattern within Bangladesh will be used as major bio geographical units. In this case, the bio-ecological zones delineated by IUCN Bangladesh (Nishat *et al* 2002) will be used as a major information source for the analysis.

Three iii…..a set of GIS maps: Vector-based GIS database has been collected from various sources in Bangladesh and the base maps are being prepared at this moment in the Texas Tech University GIS laboratory. I used hand-held GPS receiver units (Germin eTrex, Vista Color) to record UTM and/or Lat-Long coordinates for each individual species recorded during my survey in Bangladesh. Data obtained from field is being integrated and assembled in the already prepared ground-truthed and vector-based GIS database at the Texas Tech University's GIS laboratory. Special emphasis is being given to the animals categorized as *Data Deficient* and facing various degrees of extinction threats[17] as mentioned in IUCN Bangladesh (2000).

I am hopeful to finish producing GIS based species distribution maps by the end of 2008 for which advanced GIS-based computer programs (ArcGIS, and Suite) is being used. The final set of maps produced in this process will be a good ready available source of information, and a benchmark database for the amphibian and reptile species of Bangladesh. This will also be helpful for assessing global climate changes over the time and biodiversity or habitat management initiatives in Bangladesh.

Four iv…..preliminary conservation activities: I arranged at least eight herpetofaunal conservation awareness meetings in and around my study sites during my fieldwork over the course of last two years of field seasons. People living in the periphery of the protected areas were invited for these conservation awareness meetings. I, with my field assistants, tried to understand people's perception towards the conservation of herpetofauna of their area and helped them to minimize ways between the existing conflicts between people and wildlife (especially snakes). This, I believe, helps the local stakeholders to better understand animals close to them and potentially help conserve the "hated animals"[18] in

16 These publications and records were based on the major collection accumulated during the British Colonial period by the British researchers about a century back.
17 These were categorized by the IUCN as Critically Endangered, Endangered, and Vulnerable.
18 Historically, amphibians and reptiles are always been hated by the country people in Bangladesh.
19 ***Herping: Fun and Science. Study on Amphibians and Reptiles.*** *An Oral Presentation Delivered at the Department of Zoology, Jahangirnagar University, Dhaka, Bangladesh. August 2006.*

their area. I also organized several technical presentations[19] [20] on the natural history and conservation practices of herpetofauna in a number of research and conservation organizations in Bangladesh to disseminate my findings to the various community groups of the country. On August 2006, I had a television interview[21] on my herpetological research and conservation work in Bangladesh highlighting the importance of conservation of herpetofauna in the country. My work has been the cover story in several news magazines and bulletins which created a good impact and awareness among the local country people toward the conservation of herpetofauna in Bangladesh.

MAJOR ACCOMPLISHMENTS

In summer 2006 and 2007, I spent more than six months in the field doing fieldwork in Bangladesh. During this time, I could record more than 85 species of amphibians and reptiles which included at least 15 new species for Bangladesh. Seven of my research papers have been published in several peer reviewed journals. Several other publications are under preparation and will be available as soon as these are published. I am still working on the proper taxonomic identity for few other specimens. Hopefully, this work will ultimately leads to several other publications.

A list of published and accepted research papers during this project:

1. Reza, A.H.M.A. 2007. Destination Bangladesh: From the Himalayas to the Bay of Bengal. Iguana. *14(2): 106-114.*

2. Praschag, P., Hundsdorfer, A.K., ***Reza, A.H.M.A.*** *and Fritz, U. 2007. Genetic evidence for wild-living Aspideretes nigricans and a molecular phylogeny of South Asian softshell turtles (Reptiles: Trionychidae: Aspideretes, Nilssonia).* Zoologica Scripta. *36(4): 301-310.*

3. ***Reza, A.H.M.A.*** *and Mahony, S. 2007.* KALOULA TAPROBANICA *(Sri Lankan Bull Frog). Geographic Distribution.* Herpetological Review. *38(3): 348.*

4. Mahony, S. and ***Reza, A.H.M.A.*** *2007.* SYLVIRANA LEPTOGLOSSA *(Longtongued Frog). Geographic Distribution.* Herpetological Review. *38(3): 350.*

5. Mahony, S. and ***Reza, A.H.M.A.*** *2007.* KALOPHRYNUS INTERLINEATUS *(Striped Sticky Frog). Geographic Distribution.* Herpetological Review. *38(3): 348.*

6. Mahony, S. and ***Reza, A.H.M.A.*** *2007.* LYGOSOMA BOWRINGII *(Bowring's Supple Skink). Geographic Distribution.* Herpetological Review. *38(3): 353.*

7. Mahony, S. and ***Reza, A.H.M.A.*** *(Accepted). A herpetofaunal collection from the Chittagong Hill Tracts, Bangladesh, with two new species record for the country.*

20 ***Research and Photography: Experience on Bangladeshi Herps.*** *An Oral Presentation Delivered at the South Asian Institute of Photography, Dhaka, Bangladesh. July 2007.*
21 The television interview was aired on 09 August 2006 in one of our most popular national television channel. This was a 30 minutes program where I acknowledged receiving research fund from the Rufford Foundation.

As I have mentioned earlier that I am still working on the data for analyzing amphibian and reptile population status and habitat richness in different forest habitats of Bangladesh which would be difficult to predict a final conclusion at this stage. But however, my preliminary records suggest that the Lawachara National Park, a primary evergreen forest situated in the northeast of the country, supports the highest number of amphibian and reptile species than any other forest habitat in the country. A natural moist deciduous forest habitat situated in the central and central north, Madhupur National Park, supports some globally important frog and skink species[22]. Future work will focus on locating additional species and better documenting the distributions of taxa already found.

During this time, I was able to produce a good GIS database with majority of physical and biological data on Bangladesh which was the most difficult task in producing a set of GIS based species distribution maps. I mentioned 'most difficult task' because like most of the developed countries, Bangladesh does not have a single source of collecting the baseline information. I will finalize GIS maps production once after my summer 2008 field season is over. This is because; I will incorporate my last year's field data in my final set of maps production. This map set will be a ready-made source of information on amphibians and reptiles of Bangladesh. Hopefully, these maps will be available as soon as my fieldwork is over in 2008.

I was able to present my research findings in different community groups[23] [24] in Bangladesh to make them aware on the conservation of amphibians and reptiles. Several newspapers and magazine articles highlighted my research describing the importance of conservation in Bangladesh. Also, I was invited by one of our most population national television channel to discuss my research and the importance of such work in Bangladesh.

While working in the field, I trained up at least five graduate students from the Department of Zoology of Jahangirnagar University who will be continue working on conservation of herpetofauna of Bangladesh. Finally, producing a Ph.D. Dissertation is one my project objectives and hence, I am almost done with my Ph.D. Coursework[25] at the Natural Resource Management Department of Texas Tech University. Hopefully, I could finish my comprehensive examination by mid-2008 and will be producing my Ph.D. Dissertation afterwards.

22 Discussed broadly in my research publications.

23 ***Herping: Fun and Science. Study on Amphibians and Reptiles.*** *An Oral Presentation Delivered at the Department of Zoology, Jahangirnagar University, Dhaka, Bangladesh. August 2006.*

24 ***Research and Photography: Experience on Bangladeshi Herps.*** *An Oral Presentation Delivered at the South Asian Institute of Photography, Dhaka, Bangladesh. July 2007.*

25 Ph.D. Course requires 60 hours of class work which should be finished by the end of 2nd year of graduate enrolment.

CONCLUSION

The herpetological survey in Bangladesh was an unprecedented attempt at a simultaneous inventory of the most neglected faunal groups covering the wide geographical swath of habitats of the country. It yielded a number of interesting taxon records, but perhaps more importantly, provided additional insights into the conservation scenario of this biologically rich region of the world. With the existing knowledge at this moment, it is difficult to present an absolute measure of the level to which the existing PSS sites in Bangladesh complement each other's biotic diversity. However, the results from this project do point at the need to step up the level of biodiversity inventorying, not just in terms of areas, but also neglected biotic groups.

More attention needs to be drawn to the protected areas[26] of Bangladesh, where even basic information on the taxonomy and distribution of the most herpetofaunal taxa is still unknown. Any survey in these areas, especially in these poorly explored tropical forests, is likely to be very productive in terms of new range records, and even new taxa to science. In addition, Bangladesh is situated in an extremely attractive region (Nishat *et al* 2002) for ecological studies as well; and to us, the potential topics for research here appear practically unlimited. The handful of taxonomic and ecological studies[27] that have been carried out here, have provide invaluable insights into the effects of fragmentation and habitat alteration on biota, and possible solutions to deal with these problems.

Future Directions

A collaborative, synchronized taxonomic and ecological investigation across selected sites/habitats in Bangladesh will go a long way in filling information gaps. The future of this region's biological diversity will depend heavily on significant endeavours in research, education and conservation. Allocating some long-term funding for conservation projects and amending new biodiversity conservation policies would make a difference in future.

26 Bangladesh has 17 Protected Areas in the form of Wildlife Sanctuary, National Park, and Game Reserve
27 Khan 1982; Ahsan and Saeed 1989; Das 1990; Khan 1992; Ahsan 1992; Chowdhury 1996; Sarkar and Hossain 1997; Rashid and Swingland 1997; Ahsan 1998; Reza et al. 2000; Khan 2001; Ahsan and Parvin 2001, & 2004; Praschag and Gemel 2002; Reza 2007; Prashcag et al. 2007; Reza and Mahony 2007; Mahony and Reza 2007a, 2007b, & 2007c.

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FINANCIAL STATEMENT

[……CITED FROM PROJECT PROPOSAL…...][28]

The proposed budget is to cover the field research expenses for Summer 2006. This is one of the total five years field research project in Bangladesh. Hence, all figures in the proposed budget have been stated in £.

Item/Activity Category	Description	Non-RSG Expenses	RSG Expenses	Project Expenses
Transportation				
International	Round trip for PI/ USA-Bangladesh - USA	*550*	*550*	*1100*
Local travel	Research team travel cost while in the field @ £200/month	-	*800*	*800*
	Sub-total	*550*	*1350*	*1900*
Field Expenses				
Salaries/field staff	3 Field Assts will be appointed to	*600*	*600*	*1200*

& assistants	assist in the field for 4 months @ £100/month			
Food/per diems	4 person @ £50/month for 4 months	*400*	*400*	*800*
Purchased services	Accommodations while in the field/ 90 night @ £10/night	*400*	*500*	*900*
Equipment and tools	1 Digital camera unit with basic accessories, 1 Laptop, 2 GPS units, 2 slide callipers, weighing balance, etc.	*800*	*800*	*1600*
Supplies & materials	Drift fences, traps, snake tongs, bags, spot lights, collecting jars, chemicals	*200*	*300*	*500*
Repairs & maintenance	Field & laboratory equipments and supplies	-	*100*	*100*
	Sub-total	*2400*	*2700*	*5100*
Publication & Others				
Information brochures/leaflets	Number of copies (TBA)/ Preparation and printing	-	*200*	*200*
Final report	Preparation and printing	-	*100*	*100*
Communications	Lump-sum	*100*	*50*	*150*
Postage & freight	Lump-sum	-	*100*	*100*
Insurance/Medical	4 persons for 4 months	-	*200*	*200*
Miscellaneous	-	*200*	*250*	*450*
	Sub-total	*300*	*900*	*1200*
	Total	***3250***	***4950***	***8200***

Noteworthy to mention here that I managed two field seasons (summer 2006 and 2007) instead of one season (I promised to manage only the summer 2006) with the fund provided by the Rufford Foundation in 2006. Due to some unavoidable field situation, it was not possible for me to exactly follow my initial budget plan which was been promised to the Foundation. There are few deviations that I had to take to manage my project in a more effective way. I could not complete one activity (publication of information brochures or leaflets) which I promise to finish as soon as my whole project tenure is over in the next couple of years.

28 This part has been taken from the original proposal sent to the Rufford Foundation for funding.

Table 2: Budget line with actual field expenses and promised RSG expenses.

Major heads	***Description***	***Promised RSG Expenses***	***Actual RSG Expenses***	***Total Project Expenses***
Transportation				
International	Round trip for PI/ USA-Bangladesh - USA	*550*	*1200*	*2200*
Domestic field travel	Research team travel cost	*800*	*960*	*1450*
	Sub-total	*1350*	*2160*	*3650*
Field Expenses				
Research Assistants	Research Assistants salary and expenses	*600*	*410*	*1550*
Food/per diems	Field team food and per diems	*400*	*750*	*1100*
Purchased services	Accommodations for the field staff	*500*	*600*	*1200*
Equipment and tools	Digital camera, Weighing balance, Laptop, GPS units, Slide callipers, etc.	*800*	*200*	*3200*
Field supplies	Snake stick & tong, Drift fence, trap, bag, spot light, chemicals	*300*	*300*	*500*
Maintenance	Field & laboratory equipments	*100*	*130*	*200*
	Sub-total	*2700*	*2390*	*7750*
Publication & Others				
Information brochures/leaflets[29]	Preparation and printing	*200*	*0*	*0*
Final report	Preparation and printing	*100*	*100*	*100*
Communications	Lump-sum	*50*	*50*	*350*
Postage & freight	Lump-sum	*100*	*50*	*200*
Insurance/Medical	For the field team	*200*	*100*	*500*
Miscellaneous	-	*250*	*100*	*750*
	Sub-total	*900*	*400*	*1900*
	Total	***4950***	***4950***	***13300***

The 'Total Project Expenses' is way more than the current budget which has been supported by other small grants programs, Texas Tech University and from my own savings.

29 I will work on publishing information brochures/leaflets when my 3 years project tenure is over.

ANNEXTURES

Annex 1: Research Papers in the Herpetological Review

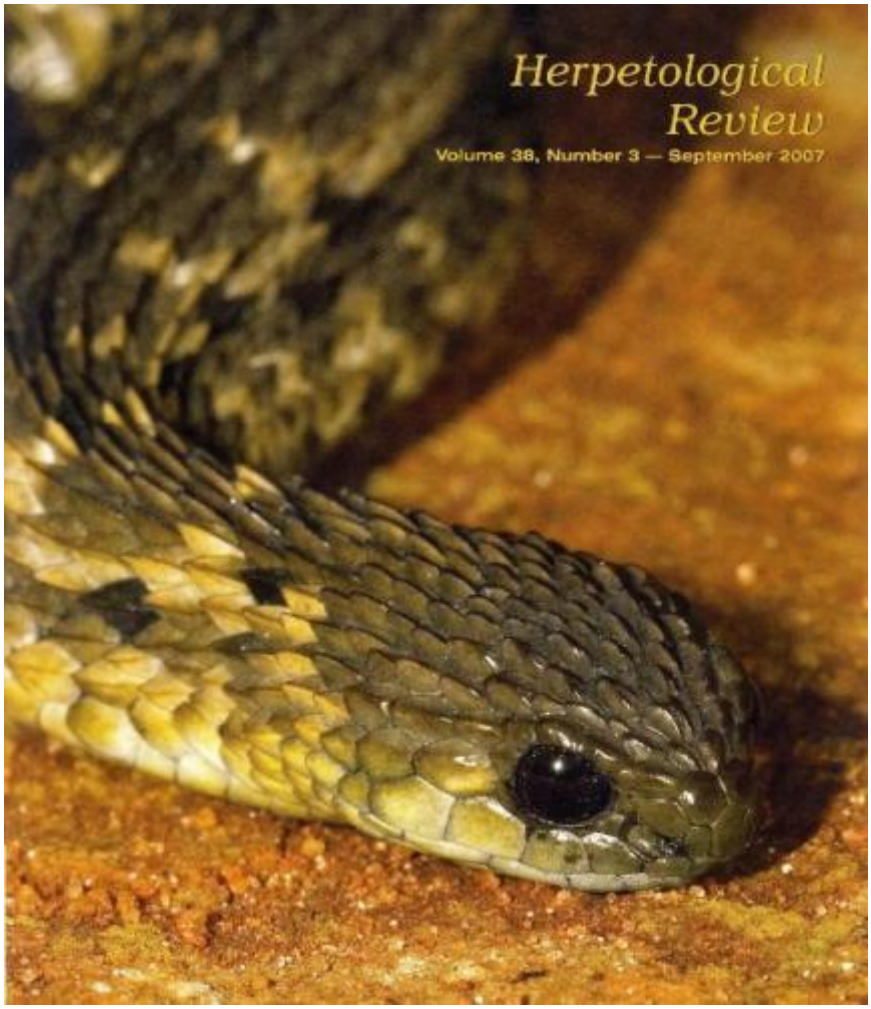

Fig 1: *Four research papers have been published in the latest issue (September 2007) of Herpetological Review (the official Journal of Society for the Study of Amphibia and Reptiles) on the distribution records of amphibians and reptiles of Bangladesh.*

Annex 2. Research Paper in the Iguana

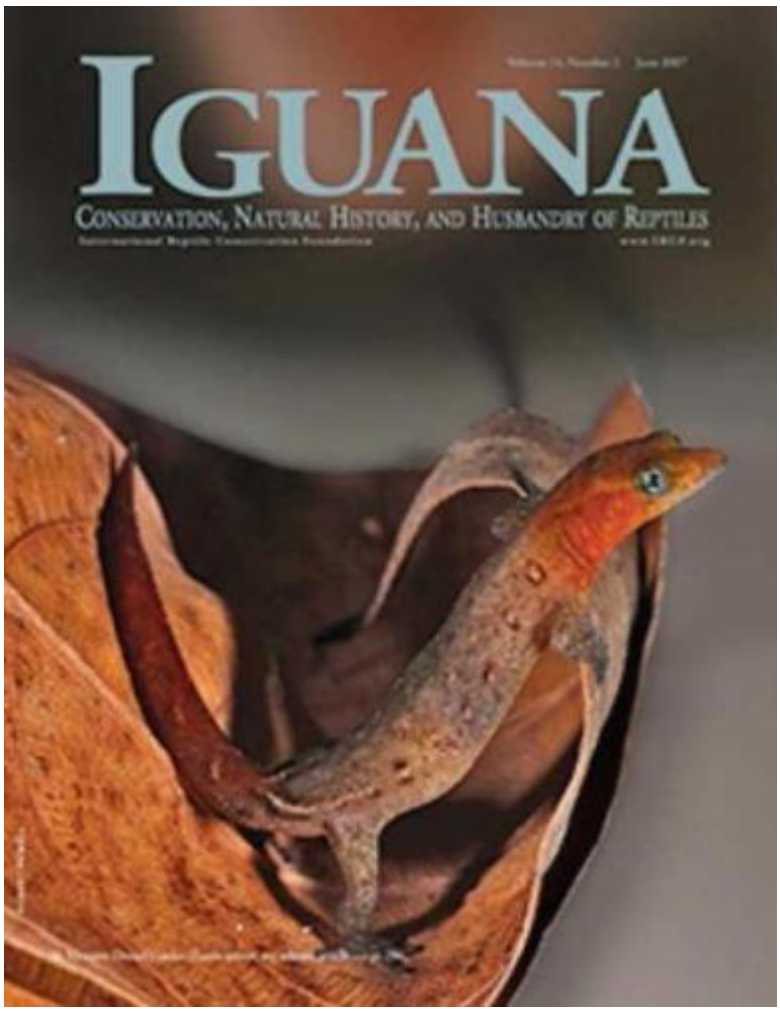

Fig 2: *Research paper has been published in June 2007 issue of Iguana (the official Journal of International Reptile Conservation Foundation).*

Annex 3: Research Papers in the Zoologica Scripta

Genetic evidence for wild-living *Aspideretes nigricans* and a molecular phylogeny of South Asian softshell turtles (Reptilia: Trionychidae: *Aspideretes, Nilssonia*)

P. Praschag, A. K. Hundsdörfer, A. H. M. A. Reza & U. Fritz

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doi:10.1111/j.1463-6409.2007.00282.x

Introduction

Softshell turtles (Trionychidae) are an ancient family of chelonians with a highly derived morphology, dating back at least to the Lower Cretaceous of Asia (Meylan & Gaffney 1992; Nessov 1995). The family comprises 30 extant species in 14 genera and is distributed in Africa, Asia, North America and New Guinea (Fritz & Havaš 2007). The shell of trionychid turtles is flattened and covered by a leathery skin instead of horny scutes; the bony shell is much reduced. Their neck is long and retractile, and limbs are paddle-like, with three strong claws on each. The snout is usually a long proboscis. All softshell turtles are highly aquatic and many species are vigorous predators of fish. External morphology is often difficult to use for taxonomic and phylogenetic purposes and much emphasis has been given to osteological characters (Meylan 1987; Ernst *et al.* 2000; Praschag & Gemel 2002).

The South Asian genus *Aspideretes* comprises four large-sized species (*Aspideretes gangeticus*, *A. hurum*, *A. leithii*, *A. nigricans*) with maximum shell lengths of 60–94 cm (Ernst *et al.* 2000). Until recently, one of these species, the Black Softshell Turtle (*A. nigricans*) was thought to be confined to the artificial pond at the Hazrat Sultan Bayazid Bostami Shrine in Nasirabad near Chittagong, Bangladesh. From this site, *A. nigricans* was described by Anderson (1875), and subsequent authors believed that the species either became extinct in the wild (Pritchard 1979; Groombridge 1982) or that it 'descended from introduced individuals of the more widespread *Trionyx* [now *Aspideretes*] *gangeticus*' (Groombridge 1982; Khan 1987) or of *A. hurum* (Rashid 1990). For a long time, *A. nigricans* was thought to be one of the world's most endangered chelonian species, comprising not more than 150–300 individuals in the semicaptive colony near Chittagong (Groombridge 1982;

Fig 3: Research paper has been published in the March 2007 issue of Zoologica Scripta (published by The Norwegian Academy of Science and Letters).

Annex 4: Research Paper has been accepted in Hamadryad

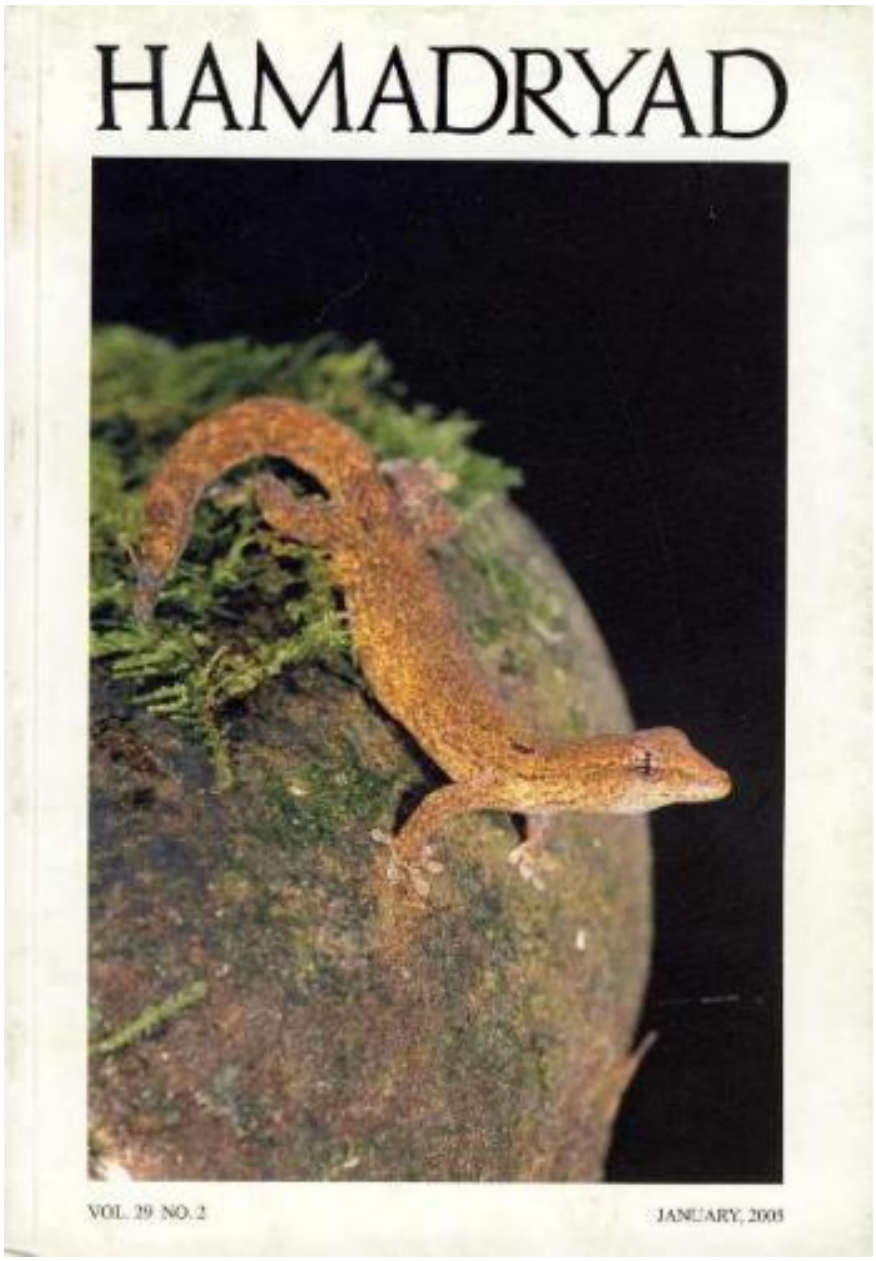

Fig 4: *Research paper has been accepted for publication in a future issue of Hamadryad (published by the Madras Croc Bank Trust of India)*

Annex 5: Conservation awareness talk at the nTV for general audience

Fig 5: *One of my television interviews was aired on 09 August 2006 in one of our most popular national television channel, called nTV. This was a 30 minutes program where I acknowledged receiving research fund from the Rufford Foundation.*

Annex 6: *Media Story in the National Daily Newspaper (in Bengoli)*

Fig 6: *Story published in the national daily newspaper, The Daily Jaijaidin, on August 22, 2007 highlighting my research in Bangladesh.*