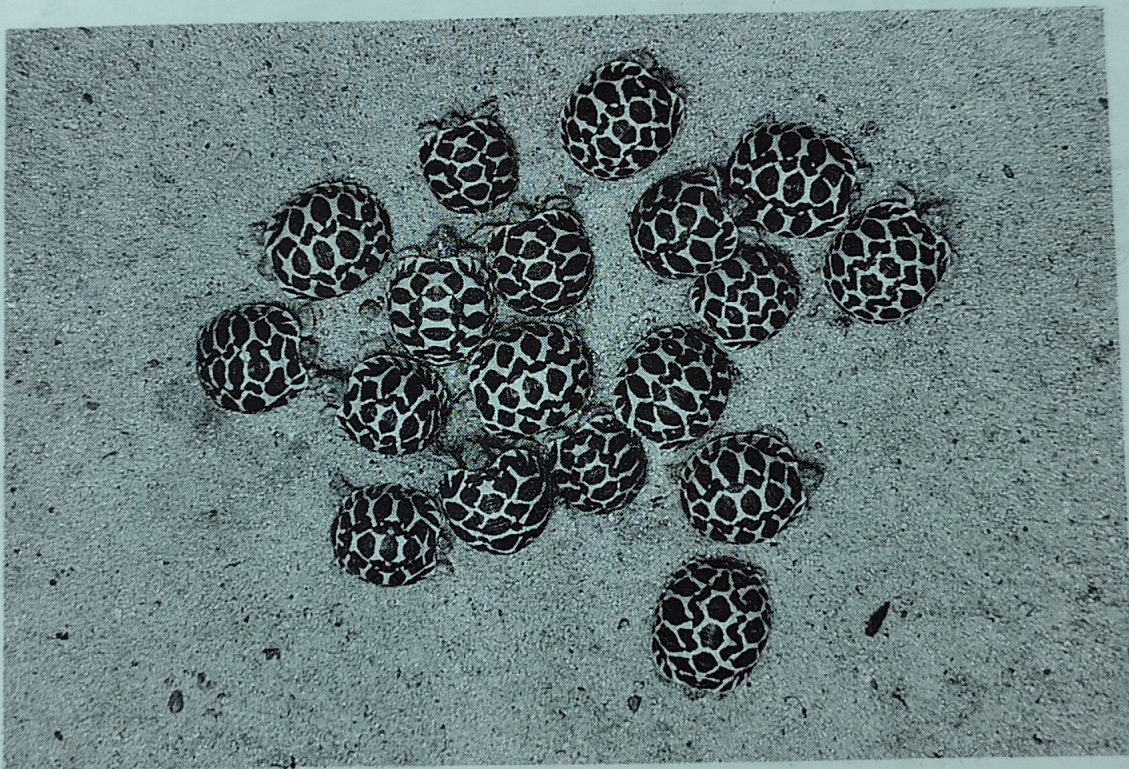


Cobra

Volumes 35 & 36

January - June 1999



*Newsletter of the
Chennai Snake Park Trust*

CHENNAI SNAKE PARK TRUST BOARD OF TRUSTEES

Shri B. Vijayaraghavan. IAS (Retd.)
Chairman

Dr. R.J Ranjit Daniels
Hon. Secretary

Shri P.V. Laxminaryana

Dr. V. Krishnamurthy

Shri S. Subbarayalu Naidu IFS (Retd.)

Shri K. R. Venkatesan IFS (Retd.)

Dr. A.V. Gopalakrishnan

Shri M. Raghuraman

Shri V.S. Raghavan

Dr. T. Sundaramoorthy

Wildlife Warden, Chennai
(Ms. Mita Banerjee IFS)

Jt. Director, Tourism Dept.,
Government of Tamil Nadu.
(Shri S.M. Sankaralingam)

Officer-in-Charge,
Zoological Survey of India,
Southern Regional Station,
Chennai.
(Dr. P.T. Cherian)

Head, Dept. of Zoology,
Madras University.
(Dr. Jayapaul Azariah)

Editorial Committee:

Dr. R.J. Ranjit Daniels,
Editor.

Shri. B. Vijayaraghavan

Dr. V. Krishnamurthy

Dr. A.V. Gopalakrishnan

Dr. V. Kalaiarasan

Cover

Star tortoises (*Geochelone elegans*) hatched in the Chennai Snake Park during June 1999.

Photo : Ranga R. Chari

Cobra

Volumes - 35 & 36

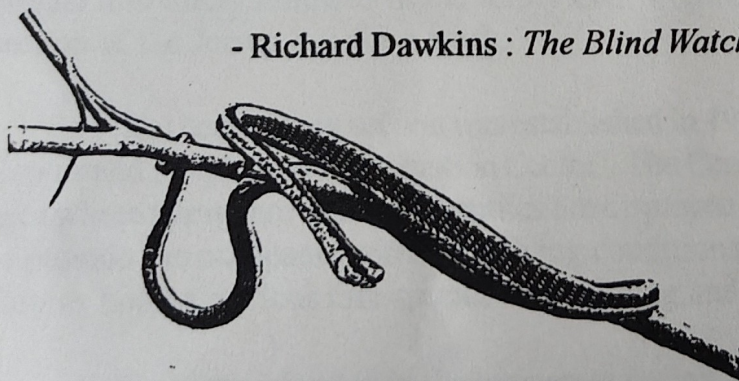
January - June 1999

CONTENTS

- 1** THE GAHERTY REPTILE AND AMPHIBIAN CONSERVATION CENTRE AT JERSEY ZOO - *V.Kalaiarasan.*
- 13** AN ACTION PLAN FOR AMPHIBIAN RESEARCH AND CONSERVATION IN INDIA - *R.J.Ranjit Daniels.*
- 18** STUDIES ON THE ECOLOGY OF COMMON ARBOREAL AND LAND SNAKES IN SCRUB JUNGLE FORESTS OF CHENGALPATTU-MGR DISTRICT, TAMILNADU - *R.Aengals.*
- 25** STATUS OF AMPHIBIAN DIVERSITY IN INDIA - *R.J.Ranjit Daniels.*
- 29** THE COMMUNITY STRUCTURE OF REPTILES IN THE SCRUB JUNGLE FORESTS IN CHENGAL-MGR AND MADRAS DISTRICTS - *V.Kalaiarasan.*
- 31** KEY TO IDENTIFYING THE MOST COMMON SPECIES OF INDIAN AMPHIBIANS BASED ON EXTERNAL CHARACTERS - *R.J. Ranjit Daniels.*
- 33** A FLYING SNAKE (*CHRYSOPELEA ORNATA*) IN A RURAL AREA NEAR RAJKOT CITY (GUJARAT) - *Shashank M. Buch.*
- 33** RUSSEL'S VIPER LAYING EGGS - *Ramadas Choondal.*
- 34** DISTRIBUTION, ADAPTATIONS, SURVIVAL AND CONSERVATION OF FROGS AND TOADS OF THE THAR DESERT, WESTERN RAJASTHAN - *Indra Kumar Sharma.*
- 35** RANDOM HARVEST - *B.Vijayaraghavan.*

“There is enough information capacity in a single human cell to store the *Encyclopaedia Britannica*, all 30 volumes of it, three or four times over.... There is enough storage capacity in the DNA of a single lily seed or a single salamander sperm to store the *Encyclopaedia Britannica* 60 times over. Some species of the unjustly called ‘primitive’ amoebas have as much information in their DNA as 1,000 *Encyclopaedia Britannicas*.”

- Richard Dawkins : *The Blind Watchmaker* (1986)





**THE GAHERTY
REPTILE AND AMPHIBIAN CONSERVATION CENTRE
AT JERSEY ZOO**

V. Kalaiarasan

Chennai Snake Park, Chennai-600 022

I had an opportunity to attend the training course on Methods and Management in the Breeding and Conservation of Endangered Species at the International Training Centre, Durrell Wildlife conservation Trust, Channel Islands, U.K. from January to April 1999. This course was designed as both theory and practical modules for six weeks and four weeks respectively. An additional one week was exclusively devoted to a workshop on population and habitat viability assessment facilitation skills conducted by Dr.U. Seal, Chairman, CBSG/IUCN.

Theory modules offered various subjects viz., biodiversity, conservation and zoos, zoo administration and management, essential principles of animal husbandry, captive animal health and welfare, small population biology, zoo and field research, public education in zoos, *in situ* conservation, reintroduction and introduction to computers.

During the practical session, trainees were encouraged to participate in routine animal keeping in order to understand the methods and management in animal husbandry followed in the Jersey Zoo. I opted to work in the herpetology section of the Jersey Zoo for a week.

The herpetology section was established in 1976 and named "The Gaherty Reptile and Amphibian Conservation Centre". The Centre has a large public viewing area where many rare species of reptiles are displayed in attractive cages designed to provide the occupants with ideal living conditions. The second portion of the Centre houses various rare species for breeding and reintroduction purposes.

Since the island is in the temperate region, the reptile centre is centrally heated and a temperature of 26°C maintained throughout the year. Most of the exhibits house mixed species (multispecies concept). Therefore, these exhibits are provided with different microhabitats, such as small trees, leaf litter, rock crevices, small pools etc., to cater to the needs of different species.



Daily reports on events such as breeding behaviour, nutrition and health are entered into a computer and submitted to the Animal Registrar by the animal staff and the veterinary department. This is entered in the Animal Records Keeping System (ARKS) of International Species Inventory System (ISIS), which helps to know the history of each individual.

The Jersey Zoo has a policy of giving the animals a diet as similar as possible to that consumed in their native habitat. Natural foraging behaviour is encouraged by incorporating "forage feeds" into a species' feeding programme and by the use of various environmental and behavioural enrichment techniques. A large proportion of the daily routine of the animal staff covers food preparation and distribution. The time and effort required to achieve an appropriate diet for a particular species, or even individuals, is considered a sound investment in successful animal management and breeding programmes.

This Zoo has an on-site organic farm for animal feed which ensures that there is no pesticide or fertilizer contamination. The herpetology section has an on-site live-feed breeding centre where crickets, fruit flies, waxmoth larvae, rats and mice are produced for use as feed.

Since the on-site organic farm production and on-site live food production centres are maintained by the Zoo, it makes it possible to maintain a high level of hygiene. Food is purchased from outside only from reliable sources. Spoiled food is always avoided. Fruits, vegetables, meat and fish are kept in separate refrigerators to avoid contamination. The food is supplemented with vitamins and minerals that help to promote good health and successful breeding.

Amphibian Diets

Anura

Discoglossidae

Alytes muletensis Mallorcan midwife toad

Eighteen adults kept in groups of 4-5.

Feed : 5-6 small (3-4 instar) crickets or fruit flies 3 times per week,
once per week in winter.

Supplement : Nutrobal dusted once per week on insects.

Other : Tadpoles given goldfish flakes 2-3 times per week.



Dendrobatidae

- Colostethus trinitatus* Trinidad stream frog
Dendrobates auratus Black & green poison arrow frog
Dendrobates azureus Blue poison arrow frog

C. trinitatus and *D. azureus* kept in a group of about 10 adults of each species. About 60 juveniles are kept separately in small groups. Three recently acquired *D. azureus* individuals are kept in another vivarium.

Feed : Crickets or fruit flies once per day, plus leaf litter fauna inside vivarium.
Tadpoles given goldfish flakes 2-3 times per week.

Supplement : Nutrobal dusted on crickets

Leptodactylidae

- Eleutherodactylus johnstonei* Monserrat whistling frog

A large colony of 50-100 individuals.

Feed : Crickets, fruit flies and leaf litter fauna.

Ranidae

- Rana dalmatina* Agile frog

About 30 adults are kept together in an outdoor enclosure. Tadpoles and juveniles are kept indoors.

Feed : During summer, wild food is supplemented with crickets given 2-3 times per week and these are dusted with nutrobal.

Tadpoles are given goldfish flakes 2-3 times per week and juveniles get tiny (1-2 instar) crickets once per day.

Reptile Diets

Note: The recommended dosage for the reptile supplement used (Nutrobal) is 1 pinch (~0.1g) to dust 20-25 adult crickets/mealworms or approximately 1 pinch per kg of animal.

Chelonia: Cryptodira Emydidae

Emys orbicularis European terrapin

Trachemys scripta elegans Red-eared terrapin

The two species are kept in separate groups, in outdoor enclosures (new borns are kept inside). Adult European terrapins weigh 300-400g, and red-eared females can weigh 1 kg or more. Males are much smaller, only 250-300g.

Feed : Two mice of appropriate size given twice per week (chopped for infants). Crickets and mealworms.

Plants and invertebrates present in enclosure.

Insects predominated in feed given to young animals.

Supplement : Chopped cuttlebone.

Trachemys decorata Hispaniolan slider

A group of 5 sub-adults.

Feed : Two mice of appropriate size given twice per week.

Greens such as chicory, pak choi, cabbage, once every 2 weeks

Supplement : Chopped cuttlebone.

Terrapene coahuila Mexican box terrapin

Kept in groups, totalling 30 animals. Adult weigh 400-500 g.

Feed : 2 mice are given twice per week.

10-15 crickets given once every 2 weeks.

Insects predominate in feed given to young animals.

Supplements : Nutrobal vitamin/mineral powder dusted on insects or chopped cuttlebone.



Cuora amboinensis. Asian box terrapin

Group of 3 males and 1 female, juveniles kept in groups. Adults weigh between 1.5 and 2 kg.

- Feed : 3-4 mice given twice per week.
Crickets given to juveniles once every 2 weeks.
Fruit such as grapes once per week.
- Supplement : Chopped cuttlebone.

Cuora aurocapitata. Yellow-headed box terrapin

Adult males weigh 250-300g and females 350-400g.

- Feed : 3 small chopped "pinkies"(mice) given twice per week.
Fruit (~25g) chopped, twice per week.
Catfood (25g) once every 2 weeks.
- Supplement : Nutrobal (0.05g) sprinkled on fruit or chopped cuttlebone.

Cuora galbinifrons. Vietnamese box terrapin

Six animals are kept either in groups or pairs depending on the time of the year.
Adult females weigh up to 1200 g and males 700-900g.

- Feed : 3-4 small "pinkies" (mice) given twice per week.
Fruit (~50g) Chopped, twice per week.
Catfood (25g) once every 2 weeks.
- Supplement : Nutrobal (0.1g) sprinkled on fruit or chopped cuttlebone.

Heosemys spinosa. Asian spiny terrapin

Six animals are housed as a group. Adults weigh 1.2 - 1.6kg.

- Feed : 3-4 small "pinkies" (mice) given twice per week.
Fruit (~30g) chopped, twice per week.
Catfood (25g) once every 2 weeks.
- Supplement : Nutrobal (0.1g) sprinkled on fruit or chopped cuttlebone.



Testudinidae

Geochelone radiata Radiated tortoise

Various groups/pairs according to season, kept in outdoor enclosures. They have daily access to grazing during the summer, and on fine days during winter, but are generally confined to heated sheds in the winter and feed increased. Adults weigh 10-12kg.

Feed : In summer, grazing plus: mixed greens e.g. dandelion, nasturtium, endives, lime leaves, chicory, pak choi, etc. (~100g), twice per week. When grazing is of inadequate quality, extra food is offered.

In winter, larger quantity of greens than in summer, four times per week.

Fruit: Small selection (~100g). Chopped, once per week.

Supplement : Nutrobal sprinkled on fruit.

Geochelone carbonaria Red-footed tortoise

Groups (7 animals in all) are kept in indoor enclosures. Adults weigh 10 - 12kg.

Feed : 1 "fuzzy" (mice) given once every 2 weeks

Fruit/Veg: (~150g) chopped, 5 times per week.

Supplement : Nutrobal (0.2g) sprinkled on fruit.

Testudo marginata Marginated tortoise

Adults kept in various groups/pairs and juveniles grouped together (21 animals). Adult males weigh 3.2 - 3.9 kg, females 2.6 - 2.9kg. Unheated housing provided for hibernation from September to April, and an outside grazing area for the summer months. No additional food is offered for about 2 weeks prior to hibernation.

Feed : Greens (~100 g), 3 times per week, in addition to grazing.

Fruit (~200g) chopped, twice per week in breeding season.

Supplement : Nutrobal sprinkled on fruit

Note : Young are not given fruit for about the first year of life.

Acrantophis madagascariensis. Madagascar ground boa

Single male, weight 5-6 kg.

Feed : 1 adult rat once per week, except for 1-2 months during the breeding season when food is refused.

Boidae: Bolyeriinae

Casarea dussumieri. Round island boa

Seventeen animals are kept singly, except during the breeding season, when each female is grouped with at least 2 males. Adult males weigh 70-120g and females 250-350g.

Feed : 1 small to large "pinky"(mouse) given twice per week, scented with chickmeat placed on the mouse's head.

Supplement : Nutrobal in solution injected into the mice given to females during the breeding season once weekly.
Occasionally receive artificial snake diet (appropriately sized snake sausage) as a mouse substitute. The sausages are scented by placing chick meat on them.

Difficult feeders are given 1 (live) gecko (*Gehyra mutilata*) 1-2 times per week.

Colubridae

Lampropeltis triangulum sinaloae. Sinaloan milksnake

One female and 2 males are kept together. Adults weigh 200-350g

Mice : 1 large "fuzzy"(mouse) once per week.

Thamnophis sirtalis tetrataenia. Sanfrancisco gartersnake

A pair is split up during the winter, and the male will not eat during the mating season. Adults weigh 200-300g.

Feed : Twice per week: Either a pink mouse or whitebait and occasionally artificial snake diet or earthworms.

Disease diagnosis and preventive measures : Prevention of disease is given paramount importance. The health of the reptiles is regularly monitored by examining



Squamata: Sauria
Gekkonidae

Nactus serpensinsulaSerpent island night gecko

Two pairs are housed in separate vivaria, adults weigh 10-15g.

Feed : 6 small crickets (3-4 instar) given 2-3 times per week.

Supplement : Nutrobal dusted on crickets once per week.

Nactus coindemerensisMauritius ground gecko

Two adults are kept separately. They weigh 4-5g.

Feed : 10 tiny crickets (1-2 instar), *Acheta domesticus*, given twice per week.

Supplement : Nutrobal dusted on crickets once per week.

Phelsuma guentheri Round island gecko

A total of 21 animals are kept individually. Adult females weigh 55-85g and males 75-100g.

Feed : 4-5 crickets of sizes appropriate to age/size of individuals, given 1-2 times per week.

Supplement : Abidec vitamin/mineral drops - one drop given once per week in diluted honey or golden syrup.

Iguanidae

Iguana delicatissima Lesser Antilles iguana

A pair of adults kept together. The male weighs about 1.5kg, the female 1.2kg.

Feed : Greens selection (~400g), 4 times per week.
Fruit e.g. papaya, mango, apple, orange, (~100g) chopped, twice per week.
75g sprouting mung beans, chick peas, beans given once every 2 weeks.

Cyclura c. cornutaRhinceros iguana

A pair of adults. Males weigh up to 7 kg and females up to 5.5kg.



- Feed : Greens: Whole head of pak choi (varied) 4 times per week.
During the summer forage is primarily given, e.g pseudo-acacia,
ash, willow, poplar, lime.
Fruit: (grapes and bananas preferred) (~100g) once per week.
- Female only : One day old chick once per week.
Vitamin tablet in fruit once every 2 weeks.

Basiliscus plumifrons. Plumed basilisk

Adults are kept in pairs and juveniles in groups (17 animals at present). Adults weigh 300-400g.

- Feed : 6 crickets or 2 locusts given 3 times per week.
Supplement : Nutrobal dusted on insects twice per week.

Oplurus cuvieri. Madagascan spiny-tailed iguana

Adults are kept in groups of 1 male and 2 females, juveniles are kept individually (13 animals at present). Adult males weigh ~200g, females 90-140g.

- Feed : 6 crickets or 2 locusts 3-4 times per week.
Supplement : Nutrobal on insects twice per week.

Agamidae

Hydrosaurus amboinensis. Malayan sailfin lizard

A group of 4 animals. Adults weigh 500-550g.

- Feed : 2 large "pinkies" (mice) once per week.
6 crickets / 2 locusts once per week.
Fruit & greens: twice per week (~50g fruit / ~30g greens)
- Supplement : Nutrobal on insects and fruit.

Scincidae

Leiopisma telfairii... . Round island skink

A pair of adults. They weigh 100-200g.

- Feed : 6-8 crickets given twice per week.
Supplement : Nutrobal added once per week.

Varanidae

Varanus prasinus. Emerald tree monitor

Two adult animals are kept separately. Weight: 170-180g.

Feed : 1 small "pinkie" (mouse) once every 2 weeks.
3-4 crickets / 1 locust twice per week.
1 quail/dove egg once every 2 weeks (in shell).
Supplement : Nutrobal on insects

Boidae: Pythoninae

Python molurus bivittatus. Burmese python

Five animals are kept in groups of 3 and 2. Adults weigh 30-50kg.

Feed : Young: 2 mice / 2 rats once per week.
Adults: 2 rabbits / 2 chicken every 4-5 weeks.

Python regius. Royal python

Two specimens are kept separately, except during the breeding season. Adults weigh up to 1 kg.

Feed : Rat /mouse: once per week.

Boidae: Boinae

Epicrates angulifer. Cuban boa

Eight adult females are kept singly. Weight 3-4 kg.

Feed : 1 rat (up to about 200g) per week.

Epicrates subflavus. Jamaican boa

Sixty juveniles are kept individually and 13 adults are kept as a group of females and single males. Mixing occurs in the breeding season, and males are not fed during this time. Adult males weigh 2-3kg and females 4-5kg.

Feed : 1 adult rat once per week/once every 2 weeks, depending on an individual's size. Young have their "pinkies" scented with chick meat (washed in water containing raw meat)



Acrantophis madagascariensis. Madagascar ground boa

Single male, weight 5-6 kg.

Feed : 1 adult rat once per week, except for 1-2 months during the breeding season when food is refused.

Boidae: Bolyeriinae

Casarea dussumieri. Round island boa

Seventeen animals are kept singly, except during the breeding season, when each female is grouped with at least 2 males. Adult males weigh 70-120g and females 250-350g.

Feed : 1 small to large "pinky"(mouse) given twice per week, scented with chickmeat placed on the mouse's head.

Supplement : Nutrobal in solution injected into the mice given to females during the breeding season once weekly.
Occasionally receive artificial snake diet (appropriately sized snake sausage) as a mouse substitute. The sausages are scented by placing chick meat on them.
Difficult feeders are given 1 (live) gecko (*Gehyra mutilata*) 1-2 times per week.

Colubridae

Lampropeltis triangulum sinaloae. Sinaloan milksnake

One female and 2 males are kept together. Adults weigh 200-350g

Mice : 1 large "fuzzy"(mouse) once per week.

Thamnophis sirtalis tetrataenia. Sanfrancisco gartersnake

A pair is split up during the winter, and the male will not eat during the mating season. Adults weigh 200-300g.

Feed : Twice per week: Either a pink mouse or whitebait and occasionally artificial snake diet or earthworms.

Disease diagnosis and preventive measures : Prevention of disease is given paramount importance. The health of the reptiles is regularly monitored by examining

Cobra, Vol. 35 & 36 - 1999

samples of faeces. Individual medical case history, diagnosis and details of treatment given are entered into the computer and a hard copy is also maintained. By and large, there is not much disease reported in the reptile centre. Small bruises and wounds occur sometimes due to burning when some reptiles try climbing over the powerful lights.

Breeding and release programmes : The major activities of the Gaherty Reptile and Amphibian Conservation Centre are captive breeding and release programmes for rare and endangered species such as Jamaican boa (*Epicrates subflavus*), round island gecko (*Phelsuma guentheri*), round island skink (*Leiolopisma telfairii*), round island boa (*Casarea dussumieri*) of Mauritius, radiated tortoise (*Geochelone radiata*), red-footed tortoise (*Geochelone carbonaria*) and plough share tortoise or Angonaka (*Geochelone yniphora*) of Madagascar. Rescue project for the Mallorcom midwife toad (*Alytes mulentensis*) is also one of the successful programmes being undertaken by the Trust.

Education : Education of the public visiting the Zoo is given great importance. The education department works very closely with the State of Jersey Education Service. "Keeper talks" on amphibians and reptiles are very popular. At the reception, the details of keepers' talks are prominently displayed so that the visitors could assemble in time. The trained education officer gives a lecture for about 5-7 minutes with the help of charts of amphibian/reptile exhibits and people are encouraged to see the feeding behaviour of animals by feeding the animals during the keeper talks. The zoo education department is having a "class room" facility where lectures on reptiles and amphibians and snake handling programmes are conducted exclusively for school groups.

Apart from zoo activities, this department takes extension work into schools with specific themes such as the Trust's projects for conservation of Round island boa (*C. dussumieri*), Round island skink (*L. telfairii*) and Round island gecko (*P. guentheri*) Ankonoka (*G. yniphora*) tortoise in Madagascar, etc.

Acknowledgements: I am grateful to the the Durrell Wildlife Conservation Trust for providing financial and other assistance for attending this course and to the Chairman and Honorary Secretary, Chennai Snake Park Trust for their encouragement and permission to attend the course.

Reference

Courts.S.E.1995: *Dietary Manual*, The Jersey Wildlife Preservation Trust.



AN ACTION PLAN FOR AMPHIBIAN RESEARCH AND CONSERVATION IN INDIA*

R.J. Ranjit Daniels

M.S. Swaminathan Research Foundation
3rd Cross Street, Institutional Area
Chennai-600 113.

Habitat destruction in the developing countries has been the most significant of factors attributed to the apparent decline in amphibians (Blaustein and Wake, 1990; Wake, 1991). There are many other factors subtly operating too. It has been found for instance that natural populations fluctuate considerably leading to local declines or extinctions of species. Direct destruction of habitat cannot therefore be singly held responsible for declining amphibians (Daniels, 1990; Pechman *et al*, 1991). The need for long term studies for a better understanding of community and population dynamics has been emphasized (Scott, Jr and Campbell, 1982; Pechman *et al*, 1991).

Research on amphibians in India is however directed more often on biology and life histories of selected species. Taxonomy has been ongoing parallel science. Biology of individual or selected species has interested researchers as it is easily done under laboratory conditions. For instance, finding a spawn or tadpoles and raising them in laboratory conditions and observing their development or morphometry, or obtaining a large collection of frogs and examining their crops or tissues are very popular. Comparatively, there has been less interest in observing amphibians in the field, trying to understand their status, distribution, habitat requirements and behaviour. Field studies of amphibians are rather time consuming and difficult and hence not been as popular as laboratory studies.

Future research on Indian amphibians should therefore be directed on 1) taxonomy, 2) species ranges, 3) species ecology and 4) conservation.

* Condensed version of a previously unpublished article.



Taxonomy

Very often ecologists treat taxonomy as an out-dated branch of science. The emphasis on quantitative ecology has been primarily responsible for this shift in trend. However, taxonomy is the most basic tool in ecology and particularly in a country like India with its rich amphibian fauna. There are many species yet to be discovered and described. For instance, during a brief study of Silent Valley, two new species of anurans were discovered (Pillai, 1986). In the Ponmudi Hills, Robert Inger and colleagues collected 2 unknown species of *Nyctibatrachus* (a genus endemic to the Western Ghats) in 1982 (Inger *et al*, 1984). During a short study of amphibians on the Western Ghats between 1990 and now, one new species of *Polypedates* (now described by Indraneil Das & M.S. Ravichandran as *P. pseudocruciger*) and another unidentified ranid were collected (Daniels, 1991 a & b). There are many more to come.

Taxonomy of tadpoles is far from complete. Without knowing the tadpoles, how can one understand the ecology and habitat dependence of these animals with a bimodal life? Field keys are to be developed. Not many field keys are available even for adult amphibians as of today. Killing animals for the sake of identification is a folly, when we do not know the status of many of our rare amphibians. Field guides to all species of amphibians, including their tadpoles stages, are immediately necessary. One of the first attempts to develop field keys in nontechnical terms to frogs and toads based on external appearance alone, is that of Daniels 1991 and 1997. However, these keys do not go beyond the generic level and are restricted to those families and genera on the Western Ghats. Developing simple field keys to species is a future challenge.

Species ranges

The ranges of much of our amphibians are poorly known. A good understanding of ranges of species helps us see the environmental tolerance of species at the broadest geographical scales. Eighty nine of the over 200 species of Indian amphibians are considered endemic to the Western Ghats, and largely to the southern Western Ghats (Daniels, 1992). However, we are not sure if the pattern that we see is conclusive or an artefact of improper surveys. Recent surveys have reported many species 'outside' their documented ranges. We know very little about the altitudinal ranges of our species. The fossorial caecilians are the least studied in this regard.



It is known that amphibians show the highest levels of endemism amongst vertebrates in the Western Ghats, accounting for 2.2% of the world's amphibians (Swengel, 1991). Comparisons of geographic ranges of species over India will throw more light on some of these biogeographical issues. Computerized databases on species ranges will considerably enhance our knowledge of Indian amphibians.

Ecology

Careful studies of the habitat/microhabitat utilization and niches of species of amphibians are necessary. Systematic data collection and quantitative analysis will help compare the patterns of community organization in the different subregions and habitats of the country. Amphibian communities are patterned directly by the local environment, as these are very sensitive animals. Species packing and densities within local amphibian communities might provide useful clues for long term management of biodiversity. Resource partitioning in amphibians is also of interest in testing many of the community theories. While there is a high diversity of species in the Western Ghats and Eastern Himalayas, the wetter parts of our country, there may be many interesting life histories in species occupying arid and more seasonal habitats. Lower diversity of species should not deter us from looking at amphibian ecology in these less hospitable environs.

Seasonal dynamics of amphibian communities are worth investigating. Many species are apparently extremely seasonal. Long term studies of population dynamics are particularly essential. Mark-recapture studies help understand seasonality of species and population dynamics of locally available species. It may be useful to start with the commoner species which are easily observed. Many general patterns might emerge from what initially seemed a simple field experiment. Do species disperse? Tadpoles of frogs such as that of *Rana curtipes* in the larger streams and rivers seem to disperse considerably. How far do they go? What are the survival rates like? We do not even know how many common toads survive per year. What are the causes for juvenile or adult mortality? There are several such questions of scientific interest.

Conservation

Conservation is a complex problem. It is concerned with the long term survival of species. A careful management of species and populations is therefore needed. Amphibians are good tools in understanding science. But they need not be



sacrificed in the name of research. Non-destructive field studies must be devised. Identification of species by external features, habits and calls must be emphasized. As mentioned above, the first step to species conservation is a field guide.

Human pressure on amphibian habitats is a reality. To some extent, law and force can protect our natural resources. But, in most cases, attempts to protect ecosystems have been futile. Not all species of amphibians however tend to dislike human interference. Niches provided by man has often attracted amphibians. Examples may be said of the street lamps and the visiting frogs and toads. Ecology of the species of amphibians that have invaded human-modified habitats has to be looked at more carefully. They have lessons for conservation of species.

Harvesting frogs for food has been a practice for ages. In developing countries, animal protein cannot be substituted easily. Natural animal protein has to be utilized though carefully without exhausting it. Understanding the population dynamics of the most preferred species and attempts at culturing them under captive conditions would considerably reduce the pressure on natural populations. Captive breeding and reintroduction of locally eliminated species would help sustain the overall population of species on a countrywide scale.

Sanctuaries and refugia are not probably required for most amphibians. In much of our natural reserves, populations of amphibians are incidentally getting protected. However, many species are existing as isolated populations in habitat islands. A study of genetic variability within and between isolated populations will be useful in long term monitoring of our amphibians. Polymorphism is quite expressed in amphibian populations. Certain colour forms tend to dominate in certain habitat types. Calls of species vary between populations too. It is important to understand the genetics that determine such variations, so that long term management of species in isolated areas does not prove to be detrimental to the genetic diversity in species.

Lastly, nature education is a must. Hitherto, the emphasis has been on birds and the larger vertebrates; the lesser beings such as amphibians have mostly been neglected. Amphibians need more advertisement. More posters, video films, folders, stickers, etc., are to be produced and distributed among the children in schools and the rural people.



STUDIES ON THE ECOLOGY OF COMMON ARBOREAL AND LAND SNAKES IN SCRUB JUNGLE FORESTS OF CHENGALPATTU-MGR DISTRICT, TAMILNADU*

R. Aengals

Chennai Snake Park,
Chennai-600 022.

Snakes are fascinating and form an important component of biota. They are undoubtedly the most maligned of creatures and probably suffer more than other animals largely due to superstition and ignorance. Everybody is interested in snakes; some fear them, others revere them.

Snakes are important groups of predators, the interception of which maintains the natural balance in the forests and deserts, the plains and the hills of India. By eating insects, rats and mice - many of which may carry disease and destroy crops, snakes perform a major ecological role and for this reason alone they are worthy of conservation by all means. Snakes have adapted to most of the diverse ecological conditions and have predominantly colonised the warmer, densely vegetated areas of the tropics. India has 241 species of snakes ranging in size from 100mm worm snake to 6m long python.

A study of the population density of snakes and the factors influencing it are considered significant. In order to understand this aspect, four species of snakes were selected and population density studies carried out.

Snakes have microhabitats. For example, in a vertical stratum, the arboreal snakes occupy a habitat at a particular specific height. The terrestrial snakes are known to occupy a habitat "on trees", "under cover", "near cover" or "open". It is of interest to analyse the microhabitat of some snakes living in two different habitats namely arboreal and terrestrial. Hence two arboreal snakes, one terrestrial snake and one snake occupying both arboreal and terrestrial habitats were selected for the investigation.

* Based on a project (1996) for the award of Ph.D. by the University of Madras

Cobra

Volume XV Issue 2

July – December 2021

Cobra, Vol. 35 & 36 - 1999



Ecologically snakes are very different from closely-related lizards. Foraging and predator-prey relations are the prime ecological and evolutionary forces shaping snake ontogeny and phylogeny. Unfortunately, much of the literature on the diets and food habits of snakes consists of little more than anecdotal lists of prey (Greene, 1982). The most important niche dimension for snakes is food; specifically prey types (Henderson, 1974).

Relationship between prey species richness and snake community composition is documented by Vitt (1987). Individuals of species are more at particular times and at particular places. Why do snakes move from one location to another? Temperature (Lilly-white, 1987), predation risks (Huey and Pianka, 1981) and availability of food (Vitt, 1987) are the main factors which could influence this. Many studies of habitat selection by snakes have focused on the physical structure and the environment although prey availability and distribution have also been suggested as potential factors influencing patterns of habitat use by snakes (Semlitsch and Moran, 1984; Shine and Lambeck, 1985; Weatherhead and Charland, 1985).

Each species prefers certain elements of the structural habitat. The choice of habitats generally has not been clearly demonstrated for snakes (Wright and Wright, 1957). Several studies have revealed peaks of relatively high seasonal activity for particular species of snakes (Oliver, 1955). Some species of snakes appear to have a strong endogenous rhythm for a specific diel activity pattern despite seasonal changes in temperatures (Platt, 1969). The type, size and amounts of prey consumed by a predator are influenced by many aspects of the animal's biology; its morphology, physiology, behaviour, reproduction status, habitat choice and energy needs (Henderson, 1993; Pyke, *et al*, 1977, Ryan *et al*, 1983 and Savitsky, 1983).

Objectives of the study

From the review of literature, it is evident that no sufficiently detailed study has been carried out on these aspects on the snakes of India. For most snakes, life history, their role in ecosystem and significance are still unexplored. Hence the study was aimed at the ecology of common colubrids viz., *Ahaetulla nasutus*, *Dendrelaphis tristis* and *Ptyas mucosus* and one elapid viz., the cobra *Naja naja*.

The work was designed to study the following aspects of the above mentioned species

1. Population density
2. Microhabitat preference
3. Activity pattern
4. Food habits and
5. Prey abundance.

Methods / Study site

The work was carried out from 1993 to 1995 at Orathi riverine habitat and Rajampalayam scrub jungle reserve forest which are situated in the southern part of the Mathuranthakam taluk in the Chengalpattu - MGR district, Tamilnadu.

Population Density: In riverine habitat and reserve forests study area two transects were laid (1000m x 5m). The number of snakes within the transects were counted while walking along the transects. Each transect was walked at least twice a month. From the data, population densities of snakes were estimated.

Microhabitat preference: In arboreal snakes, the microhabitats were divided into five categories viz., 0-1m, 1-2m, 2-3m, 3-4m, and above 4m. The canopy was further divided into middle canopy middle, middle canopy peripheral, top canopy middle, top canopy peripheral and tree top. In the terrestrial snakes, microhabitats were divided as on trees, under cover, near cover and open. The percentages of microhabitat preference were calculated.

Activity pattern: The frequency of activities of each snake viz., feeding, moving, resting, basking and others were recorded and later converted into percentage.

Food habits: During the study period, direct sightings of feeding and indirect method of gut content analysis of accidentally dead snakes were studied.

Prey abundance: The prey species that were encountered on transects (which were already laid to estimate snake populations) were recorded and the numbers estimated using similar methods as snakes.

Floristic Survey: Plant specimens were collected using methods of Santapau (1955) and Mathew (1981). They were identified with the help of standard regional flora (Gamble, 1967 and Nair & Henry, 1983). For systematic sampling, number of species of trees, shrubs and creepers were recorded and enumerated in transects (which were already laid to estimate snake population).

Results

The major results are tabulated below

		Arboreal Snakes	
		<i>Ahaetulla nasutus</i>	<i>Dendrelaphis tristis</i>
Population density	Highest Nos.	229	223
	Habitat	Riverine	Riverine
	Adult highest Nos.	24	23
	Month	July	May
	Habitat	Riverine	Riverine
	Young highest Nos.	14	12
	Month	October	September
	Habitat	Riverine	Riverine
Microhabitat	Highest utilised position	Middle canopy peripheral	Top canopy middle
	Nos./%	72 (31.44%)	82 (37.27%)
	Habitat	Riverine	Riverine
	Highest utilised stratum	1 - 2 metres	2 - 3 metres
	Nos. / %	93 (40.61%)	74 (33.18%)
	Habitat	Riverine	Riverine
Activity pattern	Highest observed activity	Basking	Moving
	Nos./%	71 (31.00%)	78 (34.99%)
	Habitat	Riverine	Riverine
Food habits			
	Direct method		
	Major food items	Skinks	Birds
	Nos.	15	5
	Habitat	Riverine	Reserve forest

Indirect method	Major food items Specimens observed Habitat	Lizards 5 Reserve forest	Toads 3 Riverine
Terrestrial Snakes			
		<i>Ptyas mucosus</i>	<i>Naja naja</i>
Population density	Highest nos. Habitat	181 Riverine	113 Riverine
	Adult highest nos. Month Habitat	20 October Riverine	11 November Riverine
	Young highest nos. Month Habitat	7 August-October Riverine	6 October Riverine
Micro habitat	Highest utilised microhabitat Nos./ % Habitat	Near cover 71 (39.23%) Riverine	Near cover 52 (46.02%) Riverine
Activity pattern	Highest observed activity Nos./ % Habitat	Moving 96 (53.04%) Riverine	Moving 59 (52.21%) Riverine
Food habits			
Direct method	Major food items Nos. Habitat	Squirrel 3 Reserve forest	Rat 4 Reserve forest
Indirect method	Major food items No. of specimens observed Habitat	Rats 3 Riverine	Rats 2 Reserve forest

prey abundance

The 12 species of major prey items, frog, toad, lizards, birds and mammals, were identified. The frequency of prey species and numbers were high (12 species; 3513 sightings) in riverine habitat when compared to reserve forest (9 species; 2071 sightings).

Floristic Survey

28 tree species and 18 shrubs were present of which, in riverine habitats, the dominant tree species was *Borassus flabellifer* and the dominant shrub species was *Randia malabarica*. In Reserve Forests, 16 species of trees and 11 species of shrubs were present. The dominant tree species was *Cassia marginata*. *Phoenix humilis* was the dominant species in general.

References

- Gamble, J.S. 1967. *Flora of the Presidency of Madras*, Botanical Survey of India, Calcutta.
- Greene, H.W. 1982. Dietary and phenotypic diversity in lizards: why are some organisms specialised? In: *Environmental and Empirical Approach* (D.Mossakouski and G.Roth, eds.) G. Fisher-Verlag, Stuttgart.
- Henderson, R.W. 1974. Resource partitioning among the snakes of the University of Kansas Natural Reservation; a preliminary analysis. *Milv. Publ. Mus. Contrib. Biol. Geol.* 1:1-11.
- Henderson, R.W. 1993. Foraging and Diet in West Indian *Corallas enydris* (Serpentes: Boidae) *J.Herp.* 27(1) 24-28.
- Huey, R.B. & Pianka, E.R. 1981. Ecological consequences of foraging mode, *Ecology* 62: 991-999.
- Lillywhite, H.B. 1987. Temperature, energetics and physiological ecology pp. 422-447. In *Snakes: ecology and evolutionary biology*. Edited by R.A.Segel, J.T. Colling and S.S. Novak. Macmillan, New York.
- Mathew, K.M. 1981. Materials for the flora of the Tamil Nadu - Carnatic, Rapinat Herbarium Publication, Trichirapalli

- Murthy, T.S.N. 1994. An updated Handlist of the Reptiles of India *Cobra*. Vol-17, pp.17-38.
- Nair, N.C. and Henry, A.N. 1983. *Flora of Tamil Nadu, India Volume 1*, Botanical Survey of India, Coimbatore.
- Oliver, J.A. 1955. *The Natural History of North American Amphibians and Reptiles*, Van Nostrand, New York.
- Platt, D.R. 1969. Natural History of hognose snakes *Heterodon platyrhinos* and *H. nasicus*. *Univ. Kans. Publ. Mus. Nat. Hist.* 18:253-420.
- Pyke, G.H., Pullian, H.R. and Chernove, E.L. 1977. Optimal foraging: A selective review of theory and tests, *Q. Rev. Biol.* 52:137-154.
- Ryan, M., Bartholomew, G.A & Rand, A.S. 1983. Energetics of reproduction in a neotropical frog, *Physalaemus pustulosus*. *Ecology* 64, 1456-1462.
- Santapau, H. 1955. *Botanical Collectors Manual*, Ministry of Natural Resources and Scientific Research Publications, New Delhi.
- Savitsky, A.H. 1983. Coadapted character complexes among snakes: fossoriality, piscivory and durophagy. *Am. zool.* 23, pp. 397-409.
- Semlitsch, R.D., and Moran, G.B. 1984. Ecology of the redbelly snakes (*Storeria occipitomaculata*) using mesic habitats in South Carolina. *Am. Midl. Nat.* III:33-40.
- Shine, R. and Lambeck, R. 1985. A radiotelemetric study of movements, thermoregulation and habitat utilization of arafura filesnakes (Serpentes: Acrochordidae) *Herpetologica*, 41:351-361.
- Vitt, L.J. 1987. Communities. In: *Snakes: ecology and evolutionary biology*. R.A. Seigel, J.T. Collins and S.S. Novak (ed.). Macmillan Publ. Co., New York, New York. pp. 335-365
- Weatherhead, P.J. and Charland, M.B. 1985. Habitat selection in an Ontario population of the snake, *Elaphe obsoleta*. *J. Herpetol.* 19:12-19.
- Wright, A.H. and Wright, A.A. 1957. Handbook of snakes of the United States and Canada, Vol. I. Comstock Publ. Assoc. Ithaca, New York. pp. 564.

STATUS OF AMPHIBIAN DIVERSITY IN INDIA

R. J. Ranjit Daniels

M. S. Swaminathan Research Foundation
3rd Cross Street, Institutional Area
Taramani, Chennai-600 113

Amphibians are poikilothermic (cold blooded) vertebrates with smooth skins leading a bimodal life - life in water as well as land. They may or may not possess limbs and tails. Amphibian skin is sensitive and devoid of visible scales. In most amphibians the life history is organized into egg, larval and adult stages.

There are 4200 species of amphibians in the world today. 80% of the species diversity of amphibians is within the tropics with the neotropical region (Central and South America) having the most (1200 species). India has 205 species which is little less than 5% of the world's amphibian species diversity. The significance of India's amphibian fauna lies in the fact that nearly 65% of our species are endemic. India also has the highest diversity of Caecilians (limbless amphibians) in Asia including 19 species (a couple of these yet to be taxonomically described). More species of amphibians are being discovered in India even today.

In India the amphibians are found all over the country including the cooler parts of the Himalayas upto Jammu and Kashmir and in the islands of Andaman and Nicobar: species such as the common toad *Bufo melanostictus* and the skipper *Rana cyanophlyctis* being the most widespread reaching altitudes of between 2000 and 3000 m above MSL. The centres of high diversity are however the Western Ghats (120 species) and the Eastern Himalayas (circa 60 species, hitherto known). The Western Ghats are also known for their high diversity of Caecilians: 17 out of the 19 species known to occur within India.



There are 3 orders viz., Caudata (salamanders and newts), Anura (frogs, treefrogs and toads) and Gymnophiona (Caecilians) extant within the class Amphibia in the world. The world's 4200 species of amphibians fall under 21 families. In India, we have representatives of all 3 orders with Caudata being represented by one species viz., *Tylototriton verrucosus*, the Himalayan Newt. As mentioned earlier 19 species represent the order Gymnophiona and the remaining 178 species are Anurans. These fall under 10 families viz., Caudata: Salamandridae (1 species), Gymnophiona: Ichthyophidae (9 species), Uraeotyphlidae (4 species), Caecilidae (4 species) and Anura: Pelobatidae (6 species), Bufonidae (21 species), Hylidae (1 species), Microhylidae (17 species), Ranidae (85 species) and Rhacophoridae (48 species). Of these, family Pelobatidae represents one of the oldest groups of amphibians extant on earth, the origin of which dates back to 165 million years ago. Taxonomic work at the generic level is more unstable and that at the subspecific level is poorly developed.

Sixty five percent of the amphibians are endemic to our country - the majority being restricted to the Western Ghats. While there are no families endemic to India, the most recent taxonomic literature lists eight genera including Caecilians (*Indotyphlus*, *Gegeneophis*, *Uraeotyphlus*) and anurans (*Bufoides*, *Melanobatrachus*, *Ranixalus*, *Nyctibatrachus*, *Nannobatrachus*) as endemic. Of these except *Gegeneophis* and *Bufoides*, which occur in the Eastern Himalayas, all others are exclusive to the Western Ghats.

There is no clear estimate of endangered species of amphibians in India. However, for practical purposes, all Caecilians may be considered endangered. Very few individuals of each species are reported anytime from anywhere. Other species of importance in this regard are anurans such as *Ansonia ornata*, *Pedostibes tuberculatus*, *Micrixalus saxicolus* and *Melanobatrachus indicus* which are extremely localized and rare. Except 10-20 species of Indian amphibians which are rather widespread and abundant, all others are rare and localized. It is therefore appropriate to treat the majority as threatened species.

(*Bos gaurus*) in PTR by the Wildlife Institute of India. A total of 19 species, belonging to 17 genera were documented from the Tiger Reserve. All sightings were between dawn and dusk (Table.1). All species have been listed according to the checklist of Indian snakes in the final report of the BCPP-CAMP workshop for Indian reptiles (Anand Rao et. al. 1998).

The common cobra (*Naja naja*) was recorded from all the vegetation types. All four species of keelbacks mentioned in the checklist were encountered in the moist riparian patches during pre-monsoon and monsoon seasons. The checkered keelback (*Xenochrophis piscator*) was commonly sighted along streams and was often seen feeding on small fishes and aquatic insects. The Indian python (*Python molurus molurus*) was seen on four occasions, in areas with steep rocky slopes. The biggest specimen recorded was about 2.2m in length. Two individuals, one each of two species of blind snakes (*Typhlops acutus* and *Ramphotyphlops braminus*) were found, under decaying logs in Teak-Miscellaneous forest.

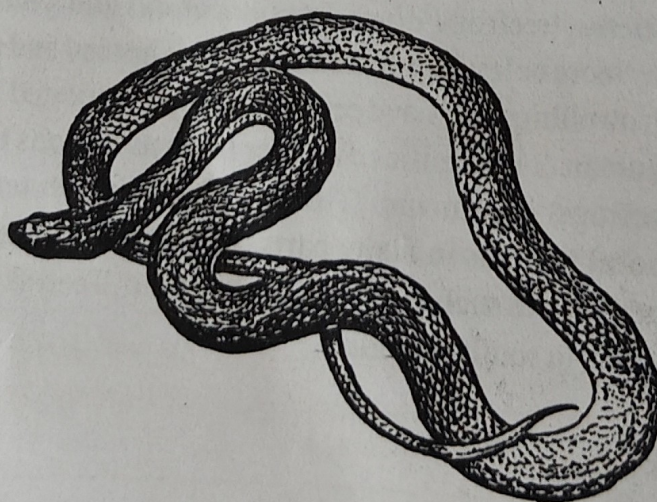
During the summer of 1996, relatively more cobras and rat snakes (*Ptyas mucosus*) were encountered in the east block of the National Park. This may be because, in the same year, mass flowering of bamboo occurred in this region. It has been reported that rodent populations increase during this phenomenon (Santapau 1962 and Chauhan & Saxena 1985). This may be a plausible explanation for the increase in the abundance of snakes during that period.

The white-eyed buzzard and crested serpent eagle are known to predate on snakes in PTR. The rat snake, checkered keelback and common bronzeback are some of the common species preyed upon by these raptors.

The varied landscape pattern in PTR offers a good opportunity for ecological research on herpetofauna. More detailed study should be carried out in and around the Protected Area to get a better understanding of the distribution and the existing conservation status of the herpetofauna of the Pench Tiger Reserve.

Humans have considerably exploited amphibians in India during recent history. Besides direct harvest as food and for the industry, a good number has been sacrificed for experimental and scientific purposes. Rice fields have been the centre of destruction for frogs. Figures of such harvest run into thousands of tonnes annually involving millions of frogs. Amphibians are also frequent victims on roads, especially after rains. Humans have further destroyed their natural habitats through chemical pollution and changing land use. The few studies carried out in India have pointed to the fact that humid forests are vital to the continued survival of our amphibians as majority of our species are restricted to these natural and pristine habitats.

Probably the most successful step in conservation of amphibians in India was the banning of frogleg export. No other special effort has been directed on these lower vertebrates. Habitat protection is an important future step suggested. Amphibians that migrate across roads in large numbers in Europe are being sufficiently protected today. In India, though the phenomenon is not as dramatic, care can be taken to protect amphibians on roads where there are ponds on either sides. Breeding frogs and toads frequently cross roads at night in these areas and are crushed by speeding vehicles.



THE COMMUNITY STRUCTURE OF REPTILES IN THE SCRUB JUNGLE FORESTS IN CHENGAI - MGR AND MADRAS DISTRICTS*

V. Kalaiarasan

Chennai Snake Park,
Chennai-600 022.

The investigation was an attempt to study the community structure of reptiles of scrub jungle forests in Chengalpattu - MGR and Madras districts, Tamilnadu, South India.

It primarily dealt with the (i) abundance (ii) species richness and diversity (iii) niche occupancy (iv) seasonal trends in the reptilian community structure and (v) factors that influence the local reptilian assemblage.

Four study areas viz., (i) Guindy National Park (ii) Illalur Reserve Forests (iii) Rajampalayam Reserve Forests and (iv) Pudupedu Reserve Forests were selected and reptilian community structure was compared by collecting data on the number of species, number of individuals in each species, and microhabitat preference during January 1991 to December 1992. Prior to this, a reconnaissance study was conducted in the Chengalpattu MGR Forest division during January 1990 to December 1990 in order to have a preliminary understanding of the reptilian fauna.

Based on the data collected, seasonal trends in reptilian species richness, diversity, abundance, niche breadth, niche overlap and microhabitat use in the four study areas were studied and compared. Influence of the vegetation structure on the reptilian fauna in the four study areas was investigated by vegetation analysis which included study of the plant species richness, diversity, abundance and similarity in those habitats.

Guindy National Park, Illalur Reserve Forests and Rajampalayam Forests had similar species richness as each had 28 species of reptiles, whereas Pudupedu Reserve Forests had only 14 species. Six species of lizards and seven species of snakes were common in all the four study areas. Lizards were most abundant in the Guindy National Park and Rajampalayam Reserve Forests. Snake abundance was highest in the Pudupedu Reserve Forests.

* Based on a project (1994) for the award of Ph.D by the Bharathidasan University.

A total number 11,439 observations on 35 reptilian species comprising of 2 species of turtles, 1 species of tortoise, 13 species of lizards and 19 species of snakes have been made during the study period. The highest number of records was in the Rajampalayam Reserve Forests (1883 sightings) and the least in the Pudupedu Reserve Forests (1422 sightings)

The reptilian diversity measured using inverse of Simpson Index showed the highest species diversity in Guindy National Park. Similarity in species composition of reptiles measured by Morisita Horn Index showed that the highest similarity was between the Guindy National Park and Pudupedu Reserve Forests and the least between Rajampalayam Reserve Forests and Pudupedu Reserve Forests.

Monthly frequency distribution of reptilian abundance showed that it was bimodal in the Guindy National Park and Illalur Reserve Forests and unimodal in the Rajampalayam and Pudupedu Reserve Forests indicating difference in the seasonal occurrence of the reptilian fauna. Such a seasonal variation was more marked in the snakes than in the lizards, turtles and tortoise species.

Habitat use by the reptiles indicated that they used the open terrestrial habitats between 46.68% and 75.82%, the fossorial habitats between 10.09% and 22.94%, the aquatic habitats between 1.52% and 11.98% and the arboreal habitats between 10.62% and 29.24%, among the four study areas. Microhabitat utilization of reptiles in the four study areas as measured by the frequency of occurrence showed that bare soils and low rocks were the most preferred. *Ptyas mucosus* was the most diversified microhabitat user as it used 17 different microhabitats, followed by *Varanus bengalensis* (15 different microhabitats) and *Sitana ponticeriana* (13 microhabitats).

Niche breadth of 35 species of reptiles measured by reciprocal of Simpson Index proposed by Levins varied from 1.0 to 6.93. *Mabuya trivitta* scored 6.93, *Ptyas mucosus* 6.18, *Varanus bengalensis* 6.04, and *Xenochropis piscator* 6.00. The minimum score of 1.0 was for *Callophis melanurus* in the Guindy National Park. *Atretium schistosum* and *Hemidactylus leschenaulti* scored 1.00 in the Illalur Reserve Forests and Pudupedu Reserve Forests respectively. *Sitana ponticeriana* and *Bungarus caeruleus* scored 1.47.

Niche overlap between two species measured by Horn's formula in the four areas varied from 1.0-100. The maximum and minimum niche overlap values indicate no overlap and complete overlap respectively. Based on the findings of the investigation, measures for the conservation of the reptilian fauna were suggested.



KEY TO IDENTIFYING THE MOST COMMON SPECIES OF INDIAN AMPHIBIANS BASED ON EXTERNAL CHARACTERS

R.J. Ranjit Daniels

M.S. Swaminathan Research Foundation,
3rd Cross Street, Institutional Area,
Chennai-600 113.

Note: Body refers to the part between tip of snout and vent excluding limbs. All descriptions are based on adult characters.

- A. Overall colouration cream to brown with or without darker markings on body. Tips of fingers and toes dilated into large sticky discs....Common treefrog (*Polypedatus maculatus*)

If not, go to B.

- B. Colouration varies from yellow to almost black; limbs weak and short in proportion to size of body; body covered with dark pigmented warts...Common toad (*Bufo melanostictus*)

If not, go to C.

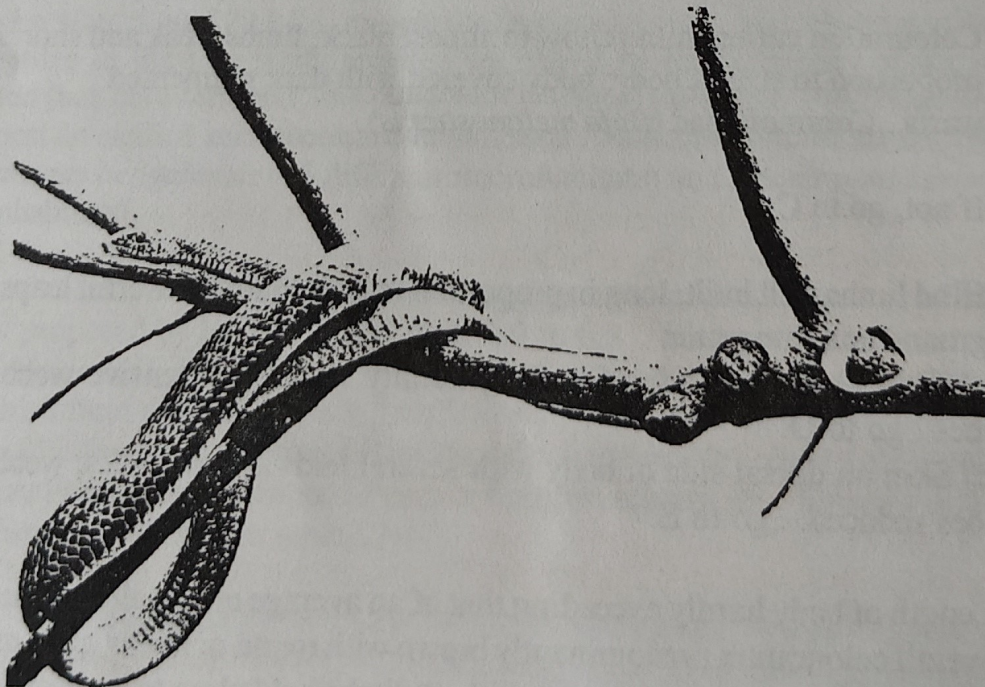
- C. Hind limbs well built, long in proportion to body aiding powerful leaps off the ground and into water.
a) Skin on dorsal side of body generally smooth; extensive webbing on toes...go to D.
b) Skin on dorsal side of body with several folds and wrinkles; webbing on toes reduced....go to E.
- D. Length of body hardly exceeding that of an average open palm (of hand); overall colouration predominantly brown with round or linear spots on dorsal surface of body; floats in water with all limbs held close to body on surface....Indian skipper (*Rana cyanophlyctis*)

Length of body often exceeding that of an average open palm; overall dorsal colouration leaf green to that of fresh cow dung, generally devoid of markings except yellow stripe along back.... Green frog (*Rana hexadactyla*)

- E. Generally small sized frogs, body not more than half the length of open palm; common within grass and leaf litter in wet areas.... Indian paddy field frog (*Rana limnocharis*)

Body length quite exceeding that of open palm; limbs proportionately shorter; dorsal skin with a number of darker spots..... South Indian bullfrog (*Rana crassa*)

Body length nearly as much as that of an open hand; limbs proportionately long and powerfully built; skin of body patterned with large patches of yellow/green; pale stripe on back very prominent... Indian Bullfrog (*Rana tigerina*)





NOTES

A FLYING SNAKE (*CHRYSOPELEA ORNATA*) IN A RURAL AREA NEAR RAJKOT CITY (GUJARAT)

During April, 1999 I received a telephone call late in the evening from a farm woman at a place on the outskirts of Ronki village and Santosh Nagar, Rajkot (Gujarat State) seeking help to remove a snake. On proceeding to the site, I found that the snake was lodged on the roof of a kachcha building situated between acres of farmland surrounded by a number of large trees. It was a flying snake - *Chrysopelea ornata*. It measured 75 cm and weighed 16 gms. The snake was later released into the wild.

Shashank M Buch

(Reg. Hon. Officer with AWBI, Chennai)

Block No.73, Rail Nagar 1,
Rajkot 360 001

RUSSEL'S VIPER LAYING EGGS

Vipera russelli found in South and Southeast Asia are known to give birth to young ones. Smith mentions occasional incidents of captive specimens depositing eggs with young ones in advanced stages of development.

On 27.6.99, a 105 cm long specimen in Trichur Zoo laid 31 eggs each measuring 28 to 32 mm in length. The snake had climbed on to a ledge in the cage and deposited the eggs on it and was found lying coiled up close to the eggs on the 28th morning by the zoo staff. One of the eggs had fallen down and was found broken. On examination however there was no trace of developing embryo. This is not surprising, considering the fact that the snake had been an inmate of the zoo for the past three years and had been kept alone in a cage.

Reference: Smith, M.A 1943, The Fauna of British India, Vol 3 *Serpentes*. P.485.

Ramadas Choondal

Taxidermist, Trichur Museum & Zoo
Trichur, Kerala



RANDOM HARVEST

Gujarat goes jurassic

A four-member Mumbai-based team of the Oil and Natural Gases Commission has unearthed fossil remains of the oldest known dinosaurs in India at Kaur Bet in the Kutch region of Gujarat. These are believed to belong to the middle jurassic period around 178 million years ago.

(Source: *The Hindu Business Line*. 22.9.99)

Landmark

A 15-centimetre-long lizard-like animal named *Casineria kiddi* whose fossilised skeletal fragments minus the head were found in an ancient scottish lake-bed may have been one of the first creatures to live on dry land. It dates back to almost 340 million years, a period about which little is known.

(Source: *The New Indian Express*. 17.8.99)

Bigmouth

How the amazingly stretchable jaws of snakes evolved from the inflexible jaws of their lizard ancestors has been a puzzle. Now, an intermediate stage in the evolution of a stretchable jaw has at last been identified in the mosasaurs, an extinct marine lizard in the Late Cretaceous seas around 100 million years ago. The discovery has been made by Michael S.Y. Lee from the University of Queensland and his colleagues who have written about it in a recent issue of *Nature*. Unlike all other known lizards, fossil or living, the mosasaur had highly flexible lower jaws like snakes and long teeth on the palate for gripping its prey. But it retained the immobile upper jaw typical of a lizard.

(Source: *The Hindu*. 19.8.99)



- (1.) Hissing: Most people realize this as a signal that it doesn't want to be bothered. However, you have to learn to read individual animals. My albino Burmese python (over 9 feet long and about 30 pounds) often hisses when I first reach in the cage to get him out. But almost always when he is held he stops the display and is very manageable.
- (2) Coiling in an "S" shape striking posture. Most people can recognize this signal.
- (3) Tail rattling: Often snakes will rattle their tails against the sides or bottom of the cage as a warning. It will sound very similar to a rattle snake's warning.
- (4) Forced breathing or a flattening out of its body: What the snake is trying to do is make it look bigger and more imposing than it is, similar to a cobra spreading its "hood".
- (5) A lack of tongue moving: Snakes usually flick their tongues regularly when they are comfortable. If they stop doing this or hold their tongue still with just the tips showing that often is a distress signal.
- (6) When a snake has grey or bluish eyes it is about ready to shed. It can't see very well and may interpret an attempt to handle it as a threat.
- (7) Don't smell like snake food: Always wash your hands and arms before handling your snake, especially if you have other warm-blooded animals as pets in the house such as dogs, cats or hamsters. Also if you have been around mice or rats be extra sure you have washed off those smells"

Frog's soothing touch and an alternative:

A drug developed from the toxin on the skin of the South American tree frog dulls chronic and acute pain as well as morphine does. After two decades of research on this, there was a set-back when the frog was put on the threatened species list. Now scientists have developed a synthetic version of the toxin ABT-594 which does not have the adverse side effects of the natural toxin.

(Source: *The Hindu*, 12.2.99)

- B. Vijayaraghavan

**Annual subscription for 4 issues of COBRA
commencing from the date of
subscription including postage.**

**Inland Individual - Rs. 75/-
Inland- Institution - Rs. 150/-
Overseas Individual & Institution - U.S. \$ 10/-**

**Subscription may be sent by MO/DD
drawn in favour of
" Chennai Snake Park Trust"
Payable at Chennai.**

**Chennai Snake Park Trust
Raj Bhavan Post
Chennai - 600 022. India.**

**Printed on behalf of the Chennai Snake Park Trust
by aad infinitum, alwarpet, chennai 600 018.**