

## Biodiversity surveys are crucial for India

The Prime Minister of India had recently released a report titled 'Biotechnology – A vision' (*Curr. Sci.*, 2001, **81**, 1157) that outlines a 10-year perspective of the government's priorities for increasing agricultural production, fighting diseases and combating nutritional deficiencies by primarily using new biotechnological methods. The report also states that a systematic documentation of biodiversity in the country would get underway, in addition to protecting important ecosystems such as the coastal belts and mangrove forests. India is one among the 25 hot spots of the richest and highly endangered eco-regions of the world<sup>1</sup>. Biodiversity has been given significance, but India's scientific base of knowledge on biodiversity and ways of adding values to it are unfortunately still weak<sup>2</sup>.

How much biodiversity is the Indian subcontinent in danger of losing? Even for scientists this question is difficult to answer, because some 400,000 species are estimated as unknown and about 125,000 described species<sup>2</sup> are often unmonitored, and other elements of biodiversity such as genes, populations, communities and habitats are all equally hard to assess. Even the population estimate for some of the most common monkeys such as the Hanuman langur, bonnet macaque and rhesus macaque is still not clearly known. The last major counting of these forest/urban-living monkeys throughout India was done during the early 1980s (refs 3 and 4). Unfortunately, surveys are time consuming and need a lot of funds and personnel, and only a few biologists would be willing to undertake such monumental tasks.

Yet another common mammal is the bat (Order Chiroptera) which comprises about 100 species, including 12 species of fruit bats in the subcontinent. But little is known about the population status, distribution and ecology of several species<sup>5,6</sup>. Only large mammals such as the elephant, rhino, lion and tiger have received considerable attention<sup>7</sup>, but bats have been ignored so far. Even snakes and rats enjoy much more religious protection than bats. Identifying bat species is also not an easy task and even experienced biologists can identify only a handful of species correctly<sup>8</sup>.

Between 5 July 1997 and 31 July 1998, out of curiosity to look at bats,

especially the Indian flying fox, *Pteropus giganteus*, we carried out surveys in villages covering the districts of Nagai, Thanjavur, and Thiruvavur (Tamil Nadu, India). We travelled by car to cover an area of 720 km<sup>2</sup>, which is 0.55% of the total area of the three districts. After locating each colony, we counted the bats at their day roost and also carried out visual counts while they emerged at dusk and returned at dawn<sup>9</sup>. We estimated a total of 6520 bats in 9 colonies (range 100–1250) with a density of 9.05 bats/km<sup>2</sup>. Young bats were recorded between 16 March and 30 May 1998, indicating the breeding season.

Seven colonies roosted on *Ficus benghalensis*, while two others preferred *F. religiosa* and *Avicennia marina*, respectively. The bats roosted 6 to 20 m from the ground on *F. benghalensis* and *F. religiosa* trees in sacred groves with temples of religious importance. Village people protected these groves from hunters. However, bats could be hunted

at night while foraging and people eat them since they believe that the meat has a cure for asthma and other respiratory illnesses, which is similar to other Asian countries<sup>10</sup>.

We monitored the population of flying foxes on a monthly basis over a year in two colonies (Thirumangaichery and Thalachangadu) in Nagai district. The population sizes of bats were significantly decreased between July 1997 and July 1998 in both colonies ( $F = 145.79$ ,  $df = 2, 23$ ,  $P < 0.01$ , Table 1) due to hunting. We observed hunters selling a total of 46 bats in local markets on 22 occasions between June and July 1998 (Figure 1). Hunting and population decline in fruit bats have been widely reported in the Pacific Islands and Southeast Asia<sup>10,11</sup>; and in Taiwan, intensive hunting resulted in the extinction of the Formosan flying fox<sup>12</sup>. Although the Indian flying fox was reported as a common species<sup>6</sup>, its population might be declining in some areas<sup>5</sup>. Without sys-

**Table 1.** Population size decline in two flying fox colonies during 1997 and 1998

Location	Year	Sample size	Min–Max	Mean	SD	Wilcoxon rank test
Thalachangadu	1997	6	550–650	619.2	38.3	$Z = 2.865$ , $P < 0.01$
Thalachangadu	1998	7	400–550	484.3	51.9	
Thirumangaichery	1997	6	870–1000	955.0	55.8	$Z = 2.937$ , $P < 0.01$
Thirumangaichery	1998	7	700–850	768.6	55.5	



**Figure 1.** A hunter showing an Indian flying fox that was shot the night before.

tematic surveys and monitoring of several colonies in various Indian states, the exact situation will not be known. Furthermore, the Indian Wildlife Protection Act considers all fruit bats as 'vermin'<sup>13</sup>, so these mega bats are 'legally vulnerable' for hunting pressure in unprotected areas. The flying foxes are in fact excellent seed dispersers, pollinators and indicators of habitat diversity.

Among the 25-biodiversity hot spots, the Western Ghats and Sri Lanka Hot spot has been listed as the most densely populated<sup>14</sup>, with 341 people/km<sup>2</sup>. Thus the threat to biodiversity is real and surveys have got to be intensified to document the vast biological resources of India. How hard or easy is it to accomplish such a task? Even students with a postgraduate degree in zoology apparently have difficulty in identifying 5–10 species of birds, lizards, fish or butterflies put together<sup>2</sup>. This is because students have hardly been encouraged to look at live creatures around them. In this murky situation, training becomes crucial to biology students and teachers to contribute significantly towards the biodiversity inventory. On the occasion of Salim Ali's birth centenary, the Indian Academy of Sciences launched 'Life-

scape' a project headed by Madhav Gadgil, a renowned conservationist, to enhance the quality of science education and to collect reliable data on the diversity of life using high school, college and postgraduate students as well as teachers<sup>2</sup>. This project certainly deserves support from all students and teachers of biology across India, and indeed this model could be used in other biological hot spots around the world to compile biodiversity data effectively.

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## Attesting wastage

I like to draw the attention of all persons in this country who still remain sane and faithful to rational practices. I have chosen *Current Science* for submitting this letter for publication because, in my opinion, this journal is the largest and most influential platform for exchange of ideas and actions of scientists (and technologists, scientific amateurs and interested laymen) in India. I also believe that scientists and scientific workers as a lot in this country have a more rational and open outlook than others; they cannot afford to waste time foolishly and the policy makers still pay heed to their voices.

I am now a reader in a university department. Earlier I was for more than a decade a Group 'A' Officer in the State Government of West Bengal. For the last 23 years or so, I have probably spent one-fifteenth (may be more) of this

23 × 365 × 24 hours on attesting copies of certificates, writing character certificates and doing such other utterly meaningless unproductive activities. Usually a student applying for admission to an institution or sitting for a public examination, or a person applying for training, scholarship, fellowship or a job is required to submit copies of mark sheets, certificates, testimonials, etc. (on an average by my estimate 10 sheets of papers) along with the application.

Each of these needs to be (compulsorily) attested by a Gazetted Officer, a Group 'A' Officer of some designation or status, a principal, a lecturer, MP, MLA, councillor or a person with suitable employment. Each of these persons is highly pressed for working time. Attestation means a signature with a date and sometimes (if one attests a photograph or a thumb impression) with other suitable

statements and an impression of a (rubber) seal. If one considers that a signature requires five seconds and stamping requires ten seconds and comparing original with the copy requires 30 seconds, and if in the whole of India at least 5 million such attestations are needed every day, then  $(6 \times 10^6 \times 45) / 3600 = 75,000$  man-hours are lost every day!

There is a tendency (quite natural though) of increasing the number of testimonials to be enclosed with an application. These are xerox-copied nowadays. Consider then the huge mass of papers being used and wasted! Moreover each copy would cost 40 to 60 paise, usually.

Most of the applicants are not even called for an interview. Often the interview is cancelled or readvertised. Ultimately only 0.1% or less on the whole is selected. All other papers (applications) are