

Prokaryotic Survey of India

One of the greatest assets of our country is its biodiversity richness and India is considered as one of the 12 megadiversity zones of the world. Survey of most of the macroorganisms like plants and animals is taken care of by the Botanical Survey of India (BSI) and Zoological Survey of India (ZSI) respectively. While some of the microorganisms like algae, fungi and protozoa are covered in these surveys, 'the prokaryotes' remain neglected. Representing the vast majority among biological systems, prokaryotes remain unseen; as a result are less studied compared to other biological systems. Despite their structural simplicity, they have metabolic versatility which enables their extensive adaptation to diverse (including extreme) ecosystems. While some 'guestimates' put the figures of the liable prokaryotic species to be around 40,000, the asserts are a mere 8000 species having standing in bacterial nomenclature. However, these figures do not specifically pertain to the Indian context, where even guestimates are yet to be made. Complications involved in defining a prokaryotic species together

with lack of culturing methods make the guestimates unreliable. In addition, guestimates have not considered several ecosystems, particularly the endobionts and endoliths. With the growing concept of 'holobiomes' and realization of the role of prokaryotes in obesity, climate change, fast changing ecosystems and consequent disappearance of species, etc. it is time to initiate a systematic survey of prokaryotes before it is too late.

According to Kyrpides¹: 'The remarkable number of microbes already estimated to be several orders of magnitude greater than the number of stars in the universe – urgently calls for a transition from random, anecdotal and small-scale surveys toward a systematic and comprehensive exploration of our planet. . .'.
 India has just accelerated the race for discovery of new bacterial taxa. While a much smaller country like South Korea is on the top, India is in the 11th position with description of about 120 validly published prokaryotic species names, many of which are not of Indian origin. There is an immediate need to audit our

prokaryotic assets and estimate our liabilities, for which a systematic, dedicated and target-oriented survey is required under a common umbrella, 'Prokaryotic Survey of India' (PSI). 'Discover and conserve prokaryotes' should be the theme of the PSI and the major objective will be to conduct a complete survey of the prokaryotes in the country, make a repository, exploit their potential and create an Indian hub for bacteriologists.

1. Kyrpides, N. C., *Nat. Biotechnol.*, 2009, **27**, 627–632.

CH. V. RAMANA^{1,*}
 CH. SASIKALA²

¹Department of Plant Sciences,
 University of Hyderabad,
 Hyderabad 500 046, India

²Bacterial Discovery Laboratory,
 Centre for Environment,
 IST, JNT University,
 Hyderabad 500 086, India
 *e-mail: chvrsl@uohyd.ernet.in

Ganges River dolphin (*Platanista gangetica*) seeks help

The conservation of wildlife species in the Indian sub-continent has often been influenced by their aesthetic, socio-cultural and religious importance, prior to their ecological role. This system over the years has certainly been biased towards the terrestrial ecosystems affecting the aquatic species more severely. One such aquatic species towards which the conservationists have been passive is the endangered Ganges River dolphin *Platanista gangetica*, locally known as *Susu*. Being the only mammalian predator of the Ganges which is exclusively aquatic, it occupies the apex of the food chain and plays a vital role in maintaining the essential balance of its ecosystem. In spite of being a flagship species, representing an ecosystem in need of conservation¹, its status has become a matter of serious concern to its existence over the past few decades. It is very well said, 'as tiger is to forest, dolphin is to Ganges'

because both are important indicator species, why then has the dolphin being treated differently in terms of conservation and management?

Distributed along Ganges, Brahmaputra, Karnaphuli–Sangu and Meghna river systems and their tributaries from the foothills of the Himalayas to the limits of tidal zone in India, Bangladesh, Nepal and probably Bhutan its overall status from tens of thousands has gradually declined to a mere 1800 individuals² and the process of distribution shrinkage seems to continue. The existing population is in the form of small fragmented sub-populations. One such sub-population exists between Narora and Bijnor barrages and is believed to be the only surviving population in the Upper Ganga River³.

The species is facing a series of threats for its survival due to poaching, construction of dams and barrages (habitat

fragmentation), pollution, mining of sand and stones (habitat degradation) and incidental catches in gillnets of fishermen⁴ hence been placed in Schedule-I of Indian Wildlife (Protection) Act, 1972, Appendix I of CITES (Convention on International Trade in Endangered Species) and also listed as Endangered⁵.

Fluctuations in the population are often the reflection of habitat conditions. River Ganges though holds the distinction of being worshipped as goddess yet it is one of the most polluted rivers in the world due to the annual usage and discharge of about 2500 tonnes of pesticides and 1.2 million tonnes of fertilizers in its catchment area⁶. Practices like sand mining, siltation and excessive water extraction have further added to the damage by degrading the river ecosystem. Sand extraction destroys the dolphin habitat by smothering the bottom fauna and lowering the river productivity, while water

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extraction decreases the ability of river to dilute pollutants. In addition to this, extensive fishing has also posed severe effects on dolphin population. Ganges dolphins are blind yet social but troubled by the most social beings. These are mainly poached for their oil which has a very high price in the black market due to its medicinal value. The construction of barrages at Bijnor, Narora, Farrakha and Kanpur have restricted the movement of dolphins, which may inhibit genetic, social as well as ecological interactions among individuals, limit the gene-flow, increase their vulnerability to natural catastrophes and ultimately lead to their extinction.

Conservation and management of a species requires sound understanding of its ecology hence the population status of

the Ganges River dolphin needs to be reviewed frequently to know the trends and factors responsible for its declining population. The Ganges River Dolphin Programme initiated by WWF-India needs to be strengthened at a national level as in the case of Project Tiger to save this rare species from extinction. Motivation and involvement of the fishermen community towards conservation along with regular monitoring of dolphin population and distribution is the only way to protect it. If adequate measures are not taken immediately, we might soon have another Baiji corollary.

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TAWQIR BASHIR

*Wildlife Institute of India,
Dehradun 248 001, India
e-mail: tbashir@wii.gov.in*

Prospects of bamboo shoot processing in north-east India

India has a vast bamboo cover of about 100,000 km² which constitutes about 12.8% of the country's forest area. It is represented by 23 genera and 128 species of which 15 genera and 50 species are in Arunachal Pradesh¹. A few species of bamboo are edible and are also of medicinal value. Bamboo shoots find an important place in the south-east Asian cuisine. In north-east India, it is consumed either raw or processed because of its exotic taste and flavour. Bamboo shoots are low in fat and calories but rich in fibre with about 90% water. They are said to be anticancerous and antimicrobial; and are being scientifically tested at the Tamil Nadu Agricultural University (TNAU). They are effective in decreasing blood pressure, cholesterol and increasing appetite due to the presence of phytosterols. Shoots are used as raw material in the manufacture of steroidal drugs². They are used as extenders because they take on the flavour of the ingredients they are cooked with. Fresh shoots have a crisp and sweet flavour with limited shelf-life and have to be sold immediately (Figure 1). The peak availability period is June to October. Prices range from Rs 15 to 20 per kg depending upon availability and demand. To cater to the metro markets, the shoots need to be processed and preserved pro-

perly. *Bambusa balcooa* Roxb., *B. polymorpha* Munro in Trans., *B. tulda* Roxb., *Dendrocalamus giganteus* Munro in Trans., *D. hamiltonii* Nees et. Arn, *D. hookerii* Munro in Trans., *D. longispata* Kurz, *D. membranaceus* Munro in Trans., *D. sikkimensis* Gamble, *Gigantochloa rostrata* Wong in Malay., *Melocanna baccifera* (Roxb.) Kurz, *Phyllostachys bambusoides* Sieb., *Schizostachyum dullooa* Gamble, *Teinostachyum wightii* Beddome and two unidentified spp., *Chingwa* and *Khupri* are the edible species in north-east India³.

The processing starts with thorough washing followed by peeling off the skin, shredding, slicing and cutting into cones. Next, they are boiled for about 10 min to remove bitterness and unwanted matter. This is followed by storing in brine solu-

tion with 5% salt and 1% citric acid. The final step is vacuum packaging of the processed shoots in 100 g packets containing 25 ml brine solution. However, the tribal people of the north-east have evolved different indigenous techniques of processing – slicing, shredding, fermenting, pickling and drying. In Arunachal Pradesh, the young shoots are ground and dried; used as chutney or flavouring agent. Juice of fermented shoots stored for about 50–60 days is used for flavouring vegetables; shoots cut into pieces are boiled and used as vegetables⁴. The shelf-life of the product is one year without any deterioration of colour, flavour and texture and sold at a market price of Rs 80 per kg.

In India, bamboo shoots, either processed or raw, have a high demand in the



Figure 1. Fresh culms of *Phyllostachys bambusoides* Sieb for sale.