

Taxonomic research in India: Future prospects

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Taxonomic research in India is declining, despite its mega-diversity status. It is important to reprioritize the focus on issues like targeting the neglected taxonomic groups, networking of people and conservation agencies, modern approaches in systematics and bioprospecting programmes for a better conservation strategy through a participatory manner. These activities will provide a better future for biosystematics in India.

India is considered to be one of the mega biodiversity centres of the world containing diverse ecosystems with many novel organisms having new genes and secondary compounds. The potentialities of these organisms need to be inventoried in the immediate future for the benefit of humankind. This should be our highest priority since the pressure on our biodiversity is escalating in terms of Intellectual Property Rights, both by the developed countries as well as our neighbours (who share a large number of species with us). There is also a continued natural and biotic (including anthropogenic) pressure on our existing biodiversity. Hence, in this crucial moment, the concerned people must reprioritize their focus more on inventories and sustainable use of the country's biotic wealth.

Currently, there have been several publications emphasizing strengthening our research capacity in taxonomy and systematics of biodiversity. A recent article by Narendran¹ about research and education regarding taxonomic entomology, by and large reflects the view of other systematic biology researchers working on different groups of organisms (fungi, bryophytes, birds, reptiles, etc.) in our country. As he rightly pointed out, in the recent years taxonomic research in India is greatly neglected.

Future prospects

Some of the suggestions given by Narendran to improve systematic research in India are: need to increase the number of systematic researchers, publication of identification manuals, increase in funding, introduction of taxonomy in syllabus, conducting short-term training programmes in taxonomy, improving library facilities, publishing dedicated journals, establishing repositories and improving identification services, and so on.

However, the crux of the problem for decline of the biosystematic research in

India is: (1) Taxonomic research in India is confined to the specialized institutions such as Botanical Survey of India (BSI), Zoological Survey of India (ZSI), etc. and a few research groups in universities and colleges. Lack of future opportunities and avenues has resulted in very few young scholars taking up taxonomic studies. Similarly, inter- and intra-disciplinary coordination involving taxonomists are negligible and in fact lack objectivity. (2) Lack of inter- and intra-discipline cooperation and coordination among the research groups (lack of networking) and nature conservation agencies like the Forest Departments. (3) Lack of funding and suitable jobs, and so on.

The above issues drive the Indian students to select their disciplines based on lucrative carrier prospects like information technology, biotechnology, etc. from their early stages of education. Our present system of science education is not properly geared to take on the challenge of documenting the biodiversity of our country. In this system, students of biology have little or no contact with the rich tropical life all around them. Instead, they learn some routine facts from books, cut up some dead plants and animals and pass some boring examinations by memorizing such matter². So it is beyond doubt that the decline of taxonomic research in India is due to lack of interest in the young minds right from the beginning. The Indian biosystematics (and obviously the biosystematists) can overcome these problems and complete the task of compiling biodiversity inventories, if we follow the well-established models which proved to be fruitful in achieving the goals in similar programmes elsewhere.

Prioritizing neglected groups

There is a striking imbalance in prioritizing research between the macro- and micro-organisms in our country. What-

ever little amount is spent for the systematic research, the macro flora and fauna get maximum attention and the microbial diversity remains continuously neglected, and even when addressed, only the applied aspects get their major share. The documentation of many microbial groups still remains un- or under-explored. Our country is handicapped in terms of novel pharmaceutical products from potential microbial systems. The best example will be the under-explored lichenized ascomycetes as well as many similar groups, even though there is a global upsurge to tap these bio-resources to a greater extent using potential biotechnological applications based on accurate species identifications³⁻⁵. Hence, greater attention is required on research programmes targeting the so-far neglected microbial diversity with immediate effect. However, in the recent years, efforts are being made by various agencies to fill up the lacunae through all-India coordinated projects on grass and orchids.

Modern approach in systematics

Till today taxonomic research in our country remains mostly morphology-based, and it hardly incorporates data on biogeography, ecological status, environment-induced phenotypic changes, knowledge of local people (already descriptions of new species were made on the basis of ethnic knowledge)⁶, chemical data (wherever applicable), wild relative status, other usefulness including its economic and ecological potentials (see ref. 7 for the addition of more data). Today, molecular taxonomy is also an emerging field in resolving specific taxonomic problems. So we will be considered outdated if we remain as morpho-taxonomists alone, and this research will not lead us to the wise use of our biological

wealth as part of a better conservation strategy. We need to incorporate a large number of characters derived through the advanced aspects of biology in our biosystematic research. The outcome of this research must be illustrative (through colour photographs), user-friendly, people-oriented (may have different formats to suit the needs of a variety of target groups) manuals in both print and electronic versions. The conventional checklists with lot of technical jargons and poor quality line drawings must be avoided. In the Indian biosystematic literature the nomenclatural aspects were considered weak (lacunae like – not referring to the type/type-culture materials, correct author citations, etc.), which makes it substandard. This aspect also needs to be strengthened.

Networking the research groups

Inventory of Indian biodiversity in the broadest sense is a mammoth task, and it will be virtually impossible to complete it by few individual specialists placed far and wide. A better cooperation and coordination among researchers at a local, regional and national level is very much needed for exchange of specimens and other vital information such as specific issues concerning the identification and systematic position of the taxa, etc. But our systematic schools remain divided on many issues other than academics. Still we have to go a long way to have a change in our mindset to welcome new researchers to our domain.

Experiences in countries like Canada, UK and USA, demonstrate that a professional (biosystematist) and amateur cooperation at a regional level under the umbrella of an association or society (in the name Lichenology, Ornithology, etc.) is highly desirable to carry out large-scale inventories. These societies develop a corpus fund to support their activities through subscription from their members, sale of books and charts, and other gift items with the society's logo. They also publish dedicated, internationally reputed journals, bulletins and newsletters to encourage research in that particular taxonomic group. These societies run workshops and field meetings that welcome students and other interested people, including beginners. In this manner the systematists in these countries have a

larger work force, to survey vast water and landscapes. The society members all over the country use a specific data/mapping card format during the field studies. Prior to inventories the study areas are clearly mapped and grided, and depending upon the collection, the species distribution maps are prepared. These maps are also available for sale to the public. Thus, a variety of habitats, including their urban landscapes, countryside and even churchyards get thoroughly inventoried. These societies also publish popular illustrative books and charts on the respective target taxonomic group other than the regular floras. These societies are also accessible through the Internet. Thus, they are able to reach a wide range of people and also get them involved in the diversity explorations. The local or regional experts also receive funding from both the local and the national agencies to carry out their field studies. The reports published by these experts are compiled by the society to finalize the flora/fauna inventories. These societies also conduct periodical meetings to review the status of the taxonomic group under inventory. The final flora/fauna will be a multi-authored treatment, each specialist authoring a revision of specific taxa (genera, families, etc.) by studying the collection from all over the country. Apart from these national flora and fauna, in-depth studies on regional flora and fauna were also made. Thus, inventories in these countries are found to be very effective, and come out with a large number of new species. The number of lichen species recorded from British Isles outnumbers the lichens described so far from the Indian subcontinent, even though we are blessed with a tropical climate, and large extent of land with a diversity of ecosystems.

Madhav Gadgil's 'Project Lifescape'² operates on similar lines to enable India's vital stake in conservation and sustainable utilization of its biodiversity resources. The methodology of the project involves development of a network of experts to prioritize and identify target taxa and appropriate survey methods, preparation of illustrated accounts with identification keys, organizing reviews to test the scientific accuracy of the material generated as well as accessibility to users, field testing of the material generated on a pilot scale, and publishing the final version of the treatment through print and electronic media.

Role of State Forest Department

In our country, the vast potential of interested tribal youths, biology students, the State Forest Department (SFD) personnel and other interested people along with the available regional experts can form the groups for inventorying the biodiversity. Currently, the SFDs are considered as a confiscating agency, but in reality they are the custodians of the 'biodiversity-rich landscapes' of our country, having an established infrastructure both in the field and cities. Hence, the involvement of SFDs is highly essential in inventorying our biological wealth. The SFD can serve as a nodal point where it can bring the specialists and interested people (or the associations or societies) together to carry out this task. It can also serve as a platform for networking the regional experts and amateurs. With the available infrastructure the SFDs can provide the logistics in the field and necessary facilities for subsequent laboratory analysis of specimens. They can also hold the reference collections/repositories/herbaria of different target organisms. In these inventories, a detailed uniform data sheet/coding descriptor (similar to what the IPGRI has developed for crop plant accessions the world over) must be used all over the country. Computer databases and species mapping must be integral components of these inventories.

Conservation

Many taxonomists feel that producing a checklist of species is the end point of their participation in conservation and environmental management⁸. But the fact remains that biodiversity inventories must lead us to a sound bioresource management practice for a meaningful conservation strategy, through participatory approach, by different key stakeholders, including the poor and neglected sections of the community living in and around the biodiversity-rich locations. There are emerging examples at both national⁹ and international¹⁰ levels that the bio-prospecting of bioresources will be a viable answer to many issues related to biodiversity. The key stakeholders like the government departments/funding agencies, SFDs, industries, etc. must provide the necessary funding and facilities for members of the societies to continue regular field studies and monitoring

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to assess the status of biodiversity of each region. Thus, biosystematics can receive increased attention in the future.

Conclusion

If the national biosystematic research groups provide good identification of a species, in a friendly, faster and economical manner, one need not depend on the expensive identification services provided by organizations like Centre for Agriculture and Bioscience International. This activity alone will encourage new avenues of potential biological research. Already the biosystematists are the most wanted by the biotechnology industry for accurate species identification in the northern countries; and in India also the situation will be the same soon. The above integrated approaches will certainly revive biosystematics and also help complete the species inventory of our country within a stipulated time. As an added advantage, the National Bioresources Development Board under the Department of Biotechnology, Government of India has also set the priorities in the preparation of digitized inventories of plant, animal, microbial, and marine resources by imp-

roving R&D facilities for the development of bioresources with special reference to the northeastern region, Himalayan region, etc., along with knowledge empowerment and human-resource training. Let us be optimistic in achieving a complete inventory of our biological wealth by eliminating our lacunae and reorienting ourselves towards the goal.

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MEETINGS/SYMPOSIA/SEMINARS

International Seminar on GTS to GPS: Geodesy on the move

Date: 9–12 February 2003
Place: Dehra Dun, India

The focal theme of the seminar is “GTS to GPS: Geodesy on the move”.

Sub-themes include: Cadastral surveying and LIS – Rural and urban scenario; Geodetic datums – horizontal and vertical; Space-based technologies for surveying; Geodetic and geophysical measurements for earthquake monitoring; Marine geodesy; Spatial data infrastructure – Issues and challenges; Natural resources management; Microzonation and disaster management.

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National Symposium on the Ecology & Biodiversity of Aquatic Environments (SEBAE)

Date: 15–17 February 2003
Place: Allahabad

Themes include: Biodiversity in Aquatic Environments: Local, regional, global; Habitats (freshwater, brackish, marine); Species, populations, communities; Ecosystems, biogeographical regions; Diversity in Structure (morphology, genetical), Function (physiology, endocrine, biochemistry), and Behaviour of aquatic animals. Population ecology: Structure and function of population, community, ecosystem; Dynamics of exploited aquatic animals in natural and man-made environments; Role of biotechnology in conservation and enhancement of exploited populations; Pollution in aquatic environment and Indicator species; Bioinformatics, data bases.

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