Assessment of biodiversity in megadiverse tropical countries: problems and a solution

Vojtech Novotny[1]

Many tropical countries face an urgent need for rapid assessment of their biodiversity for conservation decisions, bio-prospecting, as well as agricultural and forest management. Such assessments are particularly difficult in tropical countries as (i) their extremely rich biota makes any assessment complex, (ii) they often lack expertise and research infrastructure to accomplish this task. At the same time, these countries often have no shortage of people with excellent knowledge of the natural world, but are lacking in formal biological training. We argue that these people can be trained in the basics of biodiversity monitoring to such an extent that they themselves can undertake the most laborious and time consuming parts of biodiversity surveys, viz. field collecting, initial sorting, data-basing and documenting the samples. Laptop computers, stereomicroscopes and digital cameras are now so easy to use and relatively affordable that grassroots people can be trained to use them and be equipped with this technology. With relatively little training, which builds on their already excellent knowledge of the natural world, they can collect biological specimens and monitor various biodiversity parameters in their environment, thus preparing data for the final analysis by researchers. Unfortunately, this huge potential of indigenous biological surveyors remains by and large untapped, with few exceptions, such as the parataxonomists programmes at the National Institute of Biodiversity in Costa Rica (INBio) (Janzen et al. 1993) and at the Parataxonomist Training Centre in Papua New Guinea (Basset et al. 2000).

Some of the important issues involved in biodiversity monitoring by parataxonomists are as follows:

- What is the optimum synergy between parataxonomists, university students and researchers?
- How can large-scale biodiversity surveys be accomplished with the help of parataxonomists?
- Parataxonomists as experts linking traditional knowledge with formal research training
- Educational and political role of grassroots parataxonomists in their communities

These issues are briefly discussed below, based on experience from six years of parataxonomist-oriented research at the Parataxonomist Training Centre in Papua New Guinea.

The encyclopedic knowledge of the natural world by Papua New Guineans is well known and has been noted by several biologists (e.g., Diamond 1989, Beehler 1994). Villagers relying mostly on forest resources often posses exceptionally detailed knowledge of forest animals and plants, only a portion of which has been recorded in writing (e.g. Majnep & Bulmer 1977). This traditional knowledge of grassroots Papua New Guineans can be developed into skills, which are crucial to biological research and nature conservation (Basset et al. 2000, Novotny 2000). Gifted and dedicated young people with often little formal education can thus become parataxonomists and lead locally based grassroots education and conservation efforts. They receive a general, introductory training (scientific method of inquiry, biology, ecology, computing), complemented by training for particular research and education activities as needed.

The expertise of parataxonomists is well suited for conducting biodiversity surveys as they can collect biological specimens, preserve them and perform preliminary sorting to species, as well as field and laboratory experiments and observations. Their work results in first rate material, which can be deposited in national collections and made available for taxonomic studies. It also results in new, valuable ecological data on the specimens. Further, the parataxonomists record the field-collected information to computer databases and document plant and animal specimens by taking both conventional and digital pictures, thus creating information sources on PNG plants and animals which are otherwise rarely available.

[1] Parataxonomist Training Centre, Institute of Entomology, novotny@entu.cas.cz

The term "parataxonomist" was coined by Janzen, as a parallel to "paramedic" (Janzen et al. 1993). Para is a Greek prefix meaning in this context "in a secondary or accessory capacity", which characterizes precisely the position of the parataxonomists, as they work independently and understand the broader context of their research work, but yet do not have access to the same expertise as professional researchers do. The niche for parataxonomists is a distinct one, as opposed to the passive role of a local informant or "field assistant". The parataxonomists truly stand "at the side" of taxonomists (and other biologists), as also implied by the name.

Parataxonomists can greatly facilitate biological research in PNG, which is an important prerequisite for both preserving and benefiting from the wealth of biodiversity in the country. The parataxonomist programmes represent a direct transfer of knowledge and experience from numerous, often overseas, researchers to Papua New Guineans and enable their participation in cutting edge research.

The current training and research programme at the Training Centre in PNG includes eleven parataxonomists. They are mostly school leavers from 18 to 28 years of age, with formal education from grade 6 to 10. Training of the parataxonomists includes: (i) teaching in general biology and other science-related fields, (ii) animal and plant collecting and field study, using a wide range of techniques, (iii) animal and plant mounting and their preparation for taxonomic study, (iv) microscopy and digital macro photography, (v) computing, particularly data input and management of databases, word editors, spreadsheets, internet www pages, and image editing software, and (iv) principles of nature conservation and design of educational materials on environmental issues.

The activities of parataxonomists in education concerning environmental issues on the grassroots level are an important part of their work. They are much more effective communicators on the village and primary school level than most of the scientists and they can also integrate traditional knowledge systems with the current scientific approaches. Parataxonomists thus represent a link between traditional and modern scientific systems of knowledge of the natural word and they are able to use and synthesise both the traditional and the modern ones (Molem et al. 2001, Tamtiai et al. 2001). They are also excellent intermediaries in communication between researchers and grassroots communities, and their influence can be crucial for community decisions concerning conservation and resource management.

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