

## BIOLOGICAL SURVEYS

[This is a modified and much abbreviated version of the paper on Biological Surveys that will be published in the proceedings of the symposium held at the XVIIth International Congress of Entomology, referred to on p. 10. This version omits, for instance, examples of Surveys from different countries that are treated in detail in the proceedings.]

A "biological survey" is any organized initiative to explore or characterize the biota of a region. Such organized undertakings are often especially necessary to support the provision of systematic services in entomology because of the great diversity of the insects. This account presents some generalizations from an analysis of attempts to collect, describe, inventory or coordinate the study of insect faunas of different regions.

### Current approaches

Current approaches toward biological surveys exist in three rather different settings.

First, some countries, especially in Europe, have a long history of study of the fauna; museums and other facilities are well established, and the insect fauna is relatively well known as to the species present. As a result, series of identification guides or monographs on the fauna usually already exist. Amateur interest in entomology is often well developed, allowing such programmes as the Biological Records Scheme in the British Isles, which maps species distributions largely by coordinating amateur involvement. The European Invertebrate Survey coordinates similar work in a wider region. These countries, too, usually conduct extensive studies of faunas outside their borders. For example, the British Museum (Natural History) has a world rather than a purely British perspective; many overseas faunal programmes are established in Italy; Hungarian faunal studies extend to Mongolia; etc.

A second setting for biological surveys is in countries which have substantial entomological manpower and substantial collections of insects, but their faunas are not especially well known. The problem in establishing "biological surveys" there is to find a way to make the best use of the available resources when so much remains to be done. These problems have usually been solved by surveys which coordinate work, by acting as a clearing house for information and by establishing relevant priorities (like the Biological Survey of Canada); or in addition by granting funds for work that accords with the national priorities that have been identified (like the Australian Biological Resources Study).

The third setting for biological surveys is in some of the countries of Africa, South America, and Asia, which have relatively few resources to commit to large scale biological surveys, but have large and very inadequately known faunas. In practice, most of these countries have relied even for basic identification service on outside organizations, emphasizing insects that are harmful or directly valuable in certain ways. Therefore, with few exceptions, broad faunal studies are limited except for initiatives from overseas.

### Origin of Survey organizations

An informative facet of different Survey organizations is their diverse origins. Especially in Europe, basic work on faunas and floras is generally recognized as a desirable activity which the government should fund at least to a certain level. Elsewhere this recognition is less general, and basic programmes have had more difficulty getting support. As a result of such difficulties, some biological surveys have even been started on temporary contracts whilst efforts continued to assure government support (e.g. Biological Survey of Canada).

Several of the more recent surveys have been launched as a result of pressure from informed scientists working either in informal groups, or through national scientific societies. For example, the Biological Survey of Canada was started through the efforts of the Entomological Society of Canada.

### Roles of biological surveys

A "complete" biological survey collects and preserves specimens, studies species taxonomy, considers species inventory, distribution and faunal patterns within the region, and publishes the results of these investigations. In addition, it is involved in ecological, experimental and evolutionary studies aimed at understanding as well as documenting the species composition and distribution, and in scientific coordination of studies.

Although these roles are seldom carried out in one place or organization, the broadest type of "biological survey" requires that all of them coexist. It is difficult to recommend hard and fast "rules" for what is needed in a Survey, however, because the "importance" of each role varies according to circumstances, especially how well the fauna is known and what national resources are available.

The structure of different "biological surveys" therefore differs widely. However, the chief value of the various types of biological surveys that have developed is that they can extend basic taxonomic work done on the fauna in three major ways:

- By publishing broad works on the fauna (e.g. faunal catalogues), and organizing faunal work into coherent series (e.g. handbooks for identification). This ensures future progress.
- By coordinating work by various individuals and agencies to improve efficiency (acting as a clearing-house), and coordinating the use and integration of taxonomic and faunistic information (through scientific discussion of what is required).
- By funding basic work in a planned way, or in a way that augments existing efforts in order to remedy conspicuous deficiencies.

### Support for biological surveys

To fulfil these general roles effectively, biological surveys must be of especially broad scope, long term, and of basic rather than applied scientific orientation. Like other endeavours in biosystematics, biological surveys therefore require substantial permanent resources in a climate which often undervalues basic science. Problems of initiating or continuing biological surveys anywhere in the world, in fact, have chiefly stemmed from lack of funding.

Funds tend to be forthcoming more easily, however, the more clearly knowledge of the fauna is seen to be related to aspects of science other than simply taxonomy, and to the exploitation and protection of natural resources. This argues for a broad orientation for biological surveys, including ecological and evolutionary in addition to taxonomic and distributional aspects. (It does not mean that work has to be "applied", but simply allows a study to be broadened to admit scientifically and environmentally relevant facts about the fauna.)

### Conclusions

This analysis suggests that the main roles of a Biological Survey are scientific rather than organizational ones, and thus must be organized through or by the scientific community and not

in isolation; but in practice the structure of existing biological surveys has depended to a great degree not on ideal requirements, but on faunal and financial circumstances, and on history. The majority of surveys, particularly in the old World, are orientated toward the production for publication of basic taxonomic work; some are based chiefly on coordination among existing resources (e.g. Biological Survey of Canada); some on the analysis of distributions, following taxonomy that is already relatively satisfactory (e.g. British Biological Records scheme); some are still incomplete.

Despite their diverse organization, however, biological surveys in whatever region of the world respond to the same difficulty - the overwhelming richness and natural importance of insects and their relatives, which forces a coordinated approach to solve complex faunal problems. It is worth repeating that ecological considerations should be included in such an approach: taxonomic surveys are necessary if insects are to be identified and inventoried, but such an inventory is only one part of any attempt to characterize and understand regional faunas.

What organisms do is a question to be asked in parallel with what they are by any biological survey. Recognition of this simple fact will help to provide broader support for biological surveys of any region, both from individual scientists and from a variety of organizations that are concerned with entomological problems.