

and sustainable change. Perhaps the money, time, and expertise required to implement a worldwide ban would be spent better by working in partnership with pesticide users to find safe and sustainable alternatives and to facilitate the establishment of education and extension programs for proper use of potentially hazardous chemicals. A worldwide ban is neither an effective nor a desirable solution to the problems associated with use of hazardous pesticides.

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References Cited

- Charbonneau, R. 1989. Cotton's friend, sprayer's foe: Chinese farm workers face painful effects of pyrethroid pesticides. *IDRC Rep.* 18: 6-7.
- FAO/UNEP. 1997. New or modified import decisions received between 1.1.97 and 30.06.97. *PIC Circular VII-July 1997.*
- Intergovernmental Forum on Chemical Safety (IFCS). 1996. Persistent organic pollutants: socioeconomic consideration for global action. *IFCS Experts Meeting in Manila, 17-19 June 1996.*
- Smith, C. 1993. U.S. pesticide traffic exporting banned and hazardous pesticides. *In Global Pesticide Campaigner* 3(3). PANNA, San Francisco, CA.
- WHO. 1995. Vector control for malaria and other mosquito borne diseases. *WHO Technical Report Series, 857.* WHO, Geneva.
- WHO. 1993. A global strategy for malaria control. WHO, Geneva.

Topic

Should Type Specimens of Insects Indigenous to One Country but Housed in Another be Returned to Their Country of Origin?

BACKGROUND

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THE INTERNATIONAL CODE OF ZOOLOGICAL NOMENCLATURE (ICZN 1985) contains little information on type specimen deposition, stating only that type specimens must be available to the scientific community. Only neotypes must be deposited in a public repository. All other types (e.g., holotypes, paratypes, lectotypes) may be deposited in an institution of the author's choice. It is the biological community, including taxonomists, that would be affected most by changes in the location of type specimens. However, one also must consider political/governmental implications and practical issues of implementation, especially if repatriation is to be retroactive. The following debate will address not only academic concerns but also important

political and economic elements related to the location of type specimens.

As biodiversity increasingly becomes a commodity, the issue of its ownership must be addressed. Who owns the biodiversity of a given region or country? What does this ownership mean? In reference to ownership, type specimens can be viewed (1) as representative of a species, (2) as a physical specimen, and (3) as the bearer of a proposed name. Which of these facets is emphasized has strong bearings on ownership. When governments possess species within their borders, they could lay claim to types representing endemic species. Widespread or migratory species are problematic. As physical specimens, type material collected from a country also could be claimed. However, a type specimen's primary value is as the bearer of a particular name, an attribute given to the particular specimen by the describing author. As such, claims of ownership could be made by the author or the author's country.

Economically, the issue of where type specimens are deposited involves the potential benefits of ownership balanced by the costs of maintenance and accessibility. Type specimens are more valuable to museums than nontype material. This is illustrated by the U.S. government's policy of granting tax write-offs for the donation of specimens to public museums. A tax write-off of \$290.00 is given for the donation of a holotype, whereas nontype material of the same species receives only \$3.00. Institutions do not profit directly from their type specimens. Rather, the types increase the scientific importance of a museum's holdings thereby affecting the museum's ability to acquire governmental funding, private endowments, and additional donations of specimens.

Museums with many type specimens (e.g., British Museum) receive hundreds of visitors annually who stay in local hotels, eat in local restaurants, and use local transportation. This economic influx, negligible in large cities, could be substantial in developing countries with weaker economies. However, economic benefits must be weighed against the high costs of maintaining a sound and environmentally stable building to protect type specimens, other materials, cabinets, drawers, and insect pins. Further, curators must be hired to monitor specimens for dampness, mold, and insect damage. Protection against theft and vandalism also must be considered. Museums that ship specimens to researchers also will have to pay for packaging material, person-hours to prepare and register loan material, and postage. Questions as to the ability of particular countries to meet these demands are real. The stability of local governments as well as economic support for institutions housing collections cannot be taken for granted.

Superimposed over national and institutional interests are the interests of individual taxonomists. Repatriation of type material would not affect all taxonomists equally because it would affect monographic, phylogenetic, and faunistic studies unequally. Monographic revisions and phylogenetic

research are defined taxonomically and involve determining nomenclature and species limits for superspecific taxa. Revisors must examine type material for all names proposed within their group. If an institution cannot afford to ship the required types, individual researchers incur these costs or visit the museum. Thus, a researcher doing this kind of research prefers to have types housed in fewer, well-funded institutions. Repatriation would increase the number of museums housing types for a given taxon because most superspecific taxa (e.g., genera) contain species from more than one country.

In comparison, faunistic studies are defined regionally and are often conducted by researchers who live near or within the region they are studying. For these researchers, travel/shipping costs of viewing type material would be reduced if types were located locally (although some widespread taxa still might be housed in foreign collections). In regions with poorly known biotas, maintaining types near the type locality would facilitate identification of new species. However, para-types and accurately identified reference collections also could serve this purpose.

Returning type specimens to institutions near the type locality raises important issues of implementation. How would the type locality be determined for type specimens with vague locality information (e.g., "Africa") or specimens collected from political regions that no longer exist or have had variable boundaries (e.g., Surinam or Ecuador)? Also, older types often are not distinguished from other material, making their recognition difficult and time consuming. Last, who will bear the economic burden of implementing a repatriation program requiring thousands of work hours to locate, recognize, package, and ship types? However, if type specimens remain where they are, taxonomists from countries with few types will continue to be frustrated unless they acquire the necessary resources to visit foreign institutions. The following debate should help to clarify these two positions and allow both perspectives to be compared and evaluated for their relative merits.

References Cited

International Commission on Zoological Nomenclature (ICZN). 1985. International code of zoological nomenclature. The Natural History Museum, London.



PRO POSITION

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TYPE SPECIMENS DEPOSITED IN THEIR COUNTRIES OF ORIGIN can become a catalyst for greater exchange of scientific information and increased accessibility to type specimens by native scientists. Important cul-

tural aspects of this issue, including national patrimony and natural heritage of native peoples, also must be considered.

Type specimens housed in their country of origin will lead to reciprocal benefits for local researchers and scientists abroad. Systematic research often requires the study of type specimens and is encouraged when the type specimen is readily available for study. Scientists from other countries who wish to study a particular species need to contact the local repository housing the type specimen(s). Not only will the visiting scientist gain valuable information, but local scientists will learn from the experiences of the visiting scientist. Use of collections by the local research community will facilitate the education of local people, making them more aware of their rich natural heritage. The National Institute for Biodiversity in Costa Rica already has implemented this approach. Local people are trained as parataxonomists and play an integral role in tropical biodiversity surveys. The project is producing valuable taxonomic knowledge and data and serves to promote conservation of biodiversity as local people learn to value their rich natural heritage by participating in its discovery (Gutierrez 1992). Clearly, depositing type specimens in their country of origin will not hinder research but will enhance it.

The cultural aspects of returning type specimens to their countries of origin can be summed up by the concept of patrimony. Patrimony is defined as the cultural and natural heritage of a country and includes the importance given to an object when it becomes a symbol for that country. It is our belief that nature is an integral aspect of culture. In all human cultures, symbols of nature have come to stand for national pride. Some examples in the United States are the bald eagle, the bison, and the giant redwood. These symbols represent our pride of having these species in our country, and hence they are protected and conserved. Type specimens are considered patrimony because they reflect the biodiversity and natural heritage of a nation. When type specimens are not housed in their country of origin, there is no official representation of that species and, hence, no official representation of the true biodiversity of that country.

In conclusion, there are two fundamental reasons why type specimens should be returned to their countries of origin. First, the placement of the type specimen in the care of its native country will enhance the advancement of local taxonomy and comparative systematics. As stated in *The Ichneumonidae of Costa Rica* by Ian Gauld, "We commend this form of collaboration between institutes in tropical and temperate countries not only as the most effective way of developing the basic taxonomic under-



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