The Global Invasive Species Information Network: What's in It for You?

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A well-known article in *BioScience*—probably the most widely cited scientific study on invasive species in recent years—calculated the annual cost of invasive species in the United States alone at $138 billion per year (Pimentel et al. 2000). The total annual cost of invasive species to human societies worldwide can therefore be estimated to be in the hundreds of billions of dollars, including the costs of control, detrimental effects on human health, and losses in agricultural production and ecosystem services. This enormous sum far exceeds the combined annual cost of all natural disasters (Munich Re Group 2004), making the problem of invasive species in both agricultural and natural ecosystems a high-priority issue. But there is hope for counteracting the invasive species challenge, and much of that hope stems from new strategies being developed for managing information about invasive species and their effects.

A solution

The ballooning problems, exacerbated by increasing global trade and human travel, generate a corresponding increase in the amount of information on invasives. Organizing that information and delivering it to users will require an unprecedented level of global coordination and cooperation. Fortunately, both of these components were in abundant supply in Baltimore, Maryland, for three days in April 2004. The occasion was a meeting of technical experts, held to implement a Global Invasive Species Information Network (GISIN) that will share invasive species information in a standardized way among information systems around the globe. Seventy-six experts from 26 countries gathered to discuss how to accomplish this lofty goal, compared notes from their own experiences, and recommended the key types of information to be shared among online invasive species databases.

Several international organizations were represented and contributed valuable insights on how GISIN should be organized. The Global Invasive Species Programme (GISP) and the Inter-American Biodiversity Information Network (IABIN) will contribute to the organizational framework. The Global Biodiversity Information Facility (GBIF) provides a working example of information system integration and will provide assistance related to database infrastructure (Edwards 2004). The World Conservation Union is the parent organization of the Invasive Species Specialist Group (ISSG), which presented valuable guidance to participants on the types of information that should be collected. And members of CAB International, BioNET International, and the Global Taxonomy Initiative (*www.biodiv.org/programmes/cross-cutting/taxonomy/*) contributed to the discussion on taxonomy and unique identifiers for data sources.

How will it work?

For the ISSG, decisionmakers, and invasive species scientists around the globe, GISIN will provide a reference tool that approaches the "one-stop shopping" described in another article in *BioScience* (Ricciardi et al. 2000). With species fact sheets, images, maps, and identification tools, GISIN can help in modeling and forecasting the spread of invasives by answering basic questions about those species' names, home ranges, biology, pathways, and management. Decisions about GISIN's content, formats, and controlled vocabularies will be made by invasive species specialists, and the results of those decisions will form the heart of the organization. This is the most difficult area on which to reach agreement, but if basic rules are not established and followed, we can foresee that GISIN will suffer from the "garbage in, garbage out" syndrome.

What precisely are the minimum data fields that invasive species information systems should have in common? Not surprisingly, the GISIN meeting determined that sharing information as minimal as genus and species may be useful (with family name highly recommended, to minimize duplications when genus and species names are identical). All records also need to include a resource ID linking back to the source database and the publisher. Six basic database types were identified: species profiles, experts, observations, specimens, projects, and bibliographies. A content working group will be formed to further develop this area of GISIN.

Who will benefit?

How will others benefit from the formation of GISIN? For GISP and the Secretariat of the Convention on Biological Diversity (*www.biodiv.org*), GISIN will organize the invasive species information generated by parties to the convention worldwide. We are the information specialists who will "identify formats, protocols and standards for more effective exchange of biodiversity-related data and information and...recommend the use of these formats in the establishment of the Global Invasive Species Information Network as a pilot initiative" (CBD/COP 2002).

It has been suggested that GISIN also be made a GBIF thematic node by creating an Internet gateway for access to GISIN members' biodiversity information. By this participation and by using GBIF's infrastructural guidelines, GISIN will in turn strengthen the rationale for GBIF. Museum collections are not

trophies to be stored away and forgotten; they provide occurrence data and the taxonomic basis for invasive species identification, which is the first step in invasive species control. If an invader cannot be properly identified, its origins cannot be examined for information relevant for managing it.

My organization, the National Biological Information Infrastructure (NBII; *www.nbii.gov*), promotes the sharing of biological information on the Web. NBII will host the GISIN Web site and Internet-based discussions at least during the initial stages of GISIN's development. We support both the top-down and the bottom-up development of GISIN. We coordinated the Baltimore meeting, with funding from the US State Department's Bureau of Oceans and International Environmental and Scientific Affairs and logistical support from Information International Associates.

At a grassroots level, NBII helps support the development of NISbase (*www.nisbase.org*), a distributed information system of aquatic invasive species databases that is jointly led by Gregory Ruiz of the Smithsonian Institution and Pamela Fuller of the US Geological Survey. NBII also provides coordination and support for the IABIN Invasives Information Network, or I3N (*www.iabin-us.org/projects/i3n/i3n_project.html*), which is a Western Hemisphere invasive species project of IABIN that has a strong capacity-building element for countries and organizations just beginning to collect invasive species information. At the GISIN meeting in Baltimore, I3N formed tentative new partnerships with Colombia, Galápagos, and Venezuela and shared software tools and database structures with representatives from Bangladesh, China, Malaysia, Morocco, and other countries.

Barriers

What is holding us back? The largest barriers to GISIN's development are the amount of information that needs to be organized and the lack of funding. Also high on the list of barriers is the difference in the degree of database development among participating countries. Fortunately, at the Baltimore meeting Argentina, Brazil, and the United States offered to share their databases with organizations just starting to develop, which will save money, give beginners a jump start, and ensure the databases will be able to "talk" to one another and be cross-searched.

Another problem is that funding is much easier to obtain for creating a new database than it is for populating an existing one. The proliferation of databases is astounding. A preliminary Web search conducted before the GISIN meeting found more than 150 online information systems containing invasive species data (Sellers 2004). Establishing consensus among the groups responsible for these systems concerning what information can be shared, and in what format, will require significant funding, organization, and persistence. Participants at the Baltimore meeting chose a six-member steering committee (with representation from Brazil, China, Denmark, Malaysia, Morocco, and the United States) to create a plan of work and define GISIN's organizational affiliations, which should enable GISIN to be considered for funding by global organizations.

Needs and plans

For GISIN to germinate and bear fruit, we need broad collaboration through strong partnerships with many other global, regional, and national organizations. We cannot limit our partnerships to invasive species organizations. Since all invasives are native somewhere, it is essential to compile basic species information from where a species naturally occurs so that we can find methods (biological, chemical, and mechanical) to control it where it is invasive.

In short, sharing invasive species information at the global level will facilitate prevention, early detection, rapid response, and all other areas of invasive species science. With support from its partners, GISIN will provide a much-needed platform for a global dialogue on standards development and create a global gateway to invasive species information. We invite all invasive species information managers to join us as we build this important network.

References cited

[CBD/COP] Conference of the Parties to the Convention on Biological Diversity. 2002. Scientific and Technical Cooperation and the Clearing-House Mechanism: Report of the Joint Convention on Biological Diversity/ Global Invasive Species Programme Informal Meeting on Formats, Protocols and Standards for Improved Exchange of Biodiversity-Related Information. (25 April 2004; *www.biodiv. org/doc/meetings/cop/cop-06/information/ cop-06-inf-18-en.pdf)*

Edwards JL. 2004. Research and societal benefits of the Global Biodiversity Information Facility. BioScience 54: 485–486.

Munich Re Group. 2004. "Topics geo—Annual Review of Natural Catastrophes 2003": Thousands of people killed and injured in five major catastrophes / Heat waves also a topic for insurance in the future. Press release, 25 February. (27 April 2004; *www.munichre.com/default_e.asp)*

Pimentel D, Lach L, Zuniga R, Morrison D. 2000. Environmental and economic costs of nonindigenous species in the United States. BioScience 50: 53–65.

Ricciardi A, Steiner WWM, Mack RN, Simberloff D. 2000. Toward a global information system for invasive species. BioScience 50: 239–244.

Sellers E. 2004. Databasing Invasions: A Review in the Context of the Global Invasive Species Information Network (GISIN). Baltimore: Information International Associates Inc. (22 April 2004; *http://invasivespecies.nbii.gov/as/ Databasing_Invasions_A_Review_ESellers (IIa).htm)*

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