

Underlying Problems Of Databases: Concerns And Needs

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Review of the various databases at the workshop identified a number of problems inherent with databases targeted to alien invasive species. Of those reviewed, the databases were in various stages of development, utilized different data entry and management systems, and the means for maintaining the information in a current and accessible form was not always clear. A comprehensive database for all invasive species does not exist and is not likely to be developed because of the diversity of the various species and the diversity of users. Relevant information may be imbedded into larger databases designed for other purposes, and specific information on invasiveness is difficult to identify. The ideal solution is to create a single portal of entry to a multitude of databases, each of which is maintained in a scientifically accurate, timely, and accessible manner.

Organism Information and Verification

Databases will be of greater value for communicating information to multiple users addressing alien/invasive species only if agreement can be reached on common language, terms, and definitions across disciplines. For example, for some organisms it might be sufficient to include organism descriptions at the most common level of classification, the species. For others, such as microorganisms that are plant pathogens, subspecies, or infra subspecies, level descriptors must be included in order to record information relative to their distribution and host specificity. Further, the nomenclatural designations should include current scientific names as well as alternative and previously used names. There must be a mechanism for incorporating new descriptions and taxonomic changes, and new approaches to classification. Voucher specimens of some organisms are needed for examination to verify identity by systematists, who themselves are becoming an endangered species. In contrast, most microorganisms require comparison of characteristics with living cultures or nucleic acid from them. Systematists are increasingly using molecular genetic and genomic data for identification.

Organisms for Inclusion in Alien/Invasive Species Databases

The types or organisms most discussed were those which have been highly visible and recognized as invasive, nonindigenous species in aquatic, forest, range, and farmlands. Organisms such as “escaped” animal pets may also establish readily and become invasive, but data to support this do not seem to be available. No database information was included on the potential for invasiveness of nonindigenous species that have been introduced by, for example, botanical gardens as horticultural specimens and by others who have exchanged seeds such as agronomist/plant breeders and plant hobbyists. Such data could be valuable in addressing the ability to predict whether an introduced, nonindigenous species will become invasive and harmful. From experience, many introductions must be nurtured to survive in new habitats and are thus unlikely to become established and spread. Such negative data might be of value.

It is also known that all organisms bring with them a coterie of other organisms, both macrobial and microbial, that may be either beneficial pests or pathogens. These invisible invaders—hitchhikers—are co-travelers in the lives of organisms, but must be recognized and reconciled. A small number entering in this way are plant pathogens, recognized as alien/invasive and specific to a host; others go unnoticed. Pathogens such as viruses may not be considered invasive until a vector is introduced. It is important that databases be accessible across taxa, however, since some have a broader host range and the potential for harm is much greater. For example, the cross-kingdom affecting bacterium, *Burkholderia cepacia* (a.k.a. *Pseudomonas cepacia*), is a soil-inhabiting organism now known to have strains that cause disease in plants and animals.

Validity and Predictive Nature of Data

A database will only be as good as the data that are entered into it. A report that is from a single observation should be of questionable validity and entered with appropriate qualifications. Entries of the highest validity should be those from peer-reviewed publications, as the review should have established the quality of the identification, and the paper described the site(s) where the organism has been reported. A follow-up process is needed for updating and observation, and for providing evidence that an organism continues to exist in an area or it is no longer found. Since the amount of detail in a published report may vary, criteria that an organism must have met before it is included in a database of alien invasive species need to be agreed to. Such criteria may include the ability to colonize or establish in a site; maintain a population of individuals; spread to other sites; and have an environmental or economic impact. The process for assessing the impact of the species and judging it harmful should be stated. Differentiation must be made between ecosystem disruption and economic disruption. Past analyses have, for example, focused on economic disruption caused by pathogens and pest species rather than their impact on natural ecosystems. A database might be more useful for predicting and managing invasions if ecological

studies could be done in the countries of origin with potential and known invasive species. Credibility of predictions even with the best data is, however, low because of ecosystem variability.

Sensitivity of Data

A report of the presence of an organism, particularly a pest and pathogen species, may have tremendous implications for exchange of organisms in science, trade, or for other purposes. Thus, information becomes power and its validity and accessibility are crucial. Premature disclosure is a very sensitive issue and may lead to individual censure. Accurate, truthful reporting of species distribution may thus be compromised. Quarantines have been used quite effectively in the past to limit spread of recognized undesirable species, but their effectiveness in safeguarding not only agriculture but also natural ecosystems is being questioned. Secrecy, for whatever reason, can be a double-edged sword. There needs to be transparency between what is publicly available and why some data need to be restricted. The enormous increase in global movement of people and commerce, particularly live commodities and material, makes it imperative that alien invasive species databases resolve the issue of ownership and access in order to complement, rather than conflict with, international agreements.