commentary

Towards an efficient management of biological invasions

Biological invasions are a current conundrum for the management of worldwide biodiversity. International transportation networks have facilitated the connection of distant regions, and eased the movement of exotic species historically confined to their native areas by natural barriers and dispersal constraints. Some of these species have the capacity to establish and spread successfully in newly occupied biogeographic regions, becoming a real problem for the hosting ecosystems and the humans that depend on them. They compete with native species and alter the functioning of ecosystems, threatening the services provided by these ecosystems and in some cases having direct effects on human health.

The management of biological invasions and/or ecosystems hosting them is becoming ever more relevant, as the number of exotic plant and animal species increases worldwide. Management actions range from preventive measures to avoid the introduction of exotic species, to control operations of entire ecosystems after establishment of invasive organisms. To facilitate the management of these novel ecosystems (*sensu* Hobbs et al. 2006), it is necessary to expose and develop appropriate data on the ecology and distribution of invasive species, as well as tools to assist in prioritizing actions for control of alien plants. In this vein, two papers have been published recently that shed some light into these issues.

The first study was conducted by several plant ecologists from Europe, and has been published in *Diversity and Distributions* under the leadership of Milan Chytrý from the Masaryk University (Czech Republic). Chytrý et al. (2009) provide the first spatially explicit quantification of the level of alien plant invasion at a regional level for Europe. Combining quantitative data on the proportion of alien species that invade different habitat types with a land-cover map, they produced a map that estimates the levels of invasion across Europe. Their utilization of habitats as a basis for mapping levels of invasion was justified by a previous study (Chytrý et al, 2008), in which habitat types were shown to be better predictions of invasion levels than other variables, such as environmental characteristics or propagule pressure.

Their results predict that the highest levels of alien plant invasions occur among arable land, urban and industrial areas, whereas the lowest levels occur in sclerophyllous vegetation, peatbogs and heathlands. The spatial distribution of the level of invasion suggests that the highest levels of invasion are in lowland areas of western Europe and in agricultural regions in central and eastern Europe. In contrast, low levels are predicted in boreal regions and mountainous zones, except along coastlines, irrigated agricultural land, and rivers of the Mediterranean region. Even though the approach used to elaborate the map is coarse and although there is potential for further improvements, this study provides a first look at the level of plant invasion in Europe and permits the identification of areas susceptible to donate/receive exotic species.

In parallel with this study mapping levels of invasion, Andrew J. Tatem from the University of Florida (USA) examined the potential dispersal of exotic species in a new study published in *Ecography*. Tatem (2009) provides a framework to predict biological invasion risks through the worldwide airline network, and assesses future changes due to human and environmental variations. The growth of air travel increases the propagule pressure and rate of exotic species introductions, but the establishment of such organisms in new regions will depend upon whether they find climatic conditions similar to those at their origin. Build upon a previous study (Tatem and Hay 2007), he examines the spatial and seasonal distribution of incoming traffic volume to individual airports, and combines this information with climate scenarios for the period 2007-2010 to identify potential invasion risk routes.

His results suggest that changes in global climate will be relatively small during the near future, but increases in incoming traffic from China, India, Russia and eastern Europe are expected to

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provide more opportunities for the importation of exotic species. The convergence of air routes from these growing economies to other climatically similar regions depends, however, on the time of the year of transport. The model predicts that climatically sensitive organisms travelling by air will find their destination airports most hospitable by June 2010. This study provides a first assessment of the transportation risk associated with air travel, and permits the scheduling of surveillance priorities in both space and time for preventing the entrance of exotic species.

Quantifying the levels of invasion and the potential invasion routes enables the identification of areas at risk of invasion, and therefore allows for targeted surveillance and control actions to prevent the movement and establishment of exotic species. The optimization of control operations is necessary to allocate the limited number of resources available in the most appropriate way, and assure the efficiency of surveillance systems in reducing the introduction and establishment of exotic species.

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book review

Science chic

Don't Be Such a Scientist: talking substance in an age of style, by Randy Olson

Island Press, Washington, 2009, 260 pp. ISBN 978-1-59726-563-8

http://www.dontbesuchascientist.com/

Public perception of the value of science and scientists is overwhelmingly positive in the USA (Pew-AAAS 2009). However, the standing of science as the nation's greatest achievement has declined significantly in the past decade. The most alarming aspect is that science's decline is not simply an artifact of the rise of other achievements; one-tenth of the population now recognize nothing as, or simply didn't know what was, instead of science, the greatest achievement of the last 50 years (Pew-AAAS 2009). Studies in Europe indicate similar trajectories, and although interest in science is positively correlated with science literacy the relationship breaks down in highly literate industrialized nations (Bauer et al. 1994; Allum et al. 2008). These observations are consistent with perceptions that changing recreational habits (Kristof 2009) and the [US] news media are undermining public understanding of science (Pew-AAAS 2009). Half of US scientists believe the media oversimplifies scientific findings, half believe the general public expects results too quickly, and three-quarters believe the media doesn't distinguish between robust and tentative results. The

