

## Biological invasion – Global terror

The invasion of alien species is recognized as a primary cause of global biodiversity loss. The Convention on Biological Diversity (CBD), 1992 visualized 'biological invasion of alien species as the second worst threat after habitat destruction'<sup>1</sup>. Biodiversity loss caused by invasive species may soon surpass the damage done by habitat destruction and fragmentation. Biological invasion may be considered as a form of biological pollution and a significant component of the human-induced global environmental change. In fact, introduced species are a greater threat to native biodiversity than pollution, harvest and disease combined<sup>2</sup>. Invasive species referred to as alien 'pests' or 'weeds' impose high costs on agriculture, forestry, and cause damage to ecosystems or the environment.

Naturalization has been recognized as the first phase of biological invasion. A naturalized species is defined as an introduced (non-native, exotic, alien) species that can consistently reproduce and sustain populations over many generations without direct intervention by humans. After successful local establishment, some naturalized species disperse and produce viable offspring in areas distant from the sites of introduction. Such naturalized species are called 'invasive'<sup>3</sup>.

Decisions need to be made on whether benefits derived from the invasive spread of an alien species outweigh the reduced value of ecosystem services, e.g. the loss of grazing land in areas invaded with *Prosopis*. The loss due to invasive species in the United States is estimated to be ~\$125–150 billion each year and 25% of the US agriculture gross national product is lost due to foreign pests and weeds<sup>4</sup>.

Despite the recent recognition of the impacts caused by invasive plants worldwide<sup>5</sup>, there are still many regions in the world where basic information on naturalized plant taxa and plant invasions is only anecdotal or completely lacking, for example, in Asia and the neighbouring regions<sup>6</sup>. Still there is an information gap on the exact number of naturalized alien species even in India. Comprehensive studies on invasive species and plant invasions are still missing in most of the countries. Establishment of a database of naturalized species is the first step in the development of invasion biology, and it will also serve as a stepping-stone for

further detailed studies on the biology and impact of individual species<sup>7</sup>.

The trade-based global economy stimulates the cultivation of economically important species. It also stimulates the accidental spread of the same species or other species. International law regulating the unintentional introduction of harmful alien species through trade is weak. There are two major conventions with provisions on aliens. One is the International Plant Protection Convention (IPPC), which presently addresses crop pests only. The IPPC could be expanded in scope to explicitly protect native (non-agricultural) plant life from introduced pests. The other major international agreement addressing alien species, the CBD, lacks teeth<sup>1</sup>. Article 8(h) addresses alien species by calling for the parties to: 'as far as possible and as appropriate: ... Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species'.

There is no question that understanding and dealing with the invasive problem is an enormous challenge. We need to develop techniques to make rapid assessment of the status and movement of invaders and of their potential ecosystem impacts. At present our knowledge about the status of invaders is generally regarding two states only – it is present (which is derived from flora lists) or it is firmly established and causing devastating damage (often learned from popular newspapers). Information is needed between these two extremes. In order to acquire this information a rapid sampling approach is needed that would produce a quantitative assessment of the status of invading species, that could be repeated at intervals, to provide a clear focus on emerging problems, helping to alleviate the crisis-management approach to invaders.

It is time to pay attention on the ecological impact of invasive aliens both at the species and ecosystem levels. Better planning is needed for early detection and reporting of infestations, and spread of new and naturalized weeds by creation of a 'Plant Detection Network' in each state through establishing communication links between taxonomists, ecologists and land managers for monitoring and control. Monitoring of invasion can be done through qualitative approach like species inventory (seasonally) and quantitative

approach using phytosociological methods and mapping using ground-based methods (via map overlays or GPS) and remotely-sensed images (aerial photos, high-resolution multi-spectral/hyperspectral data). Current control methods for invasive aliens are expensive, lengthy and risky, because total eradication is required to prevent re-establishment. Effective site-eradication procedures require multi-year treatments, continued monitoring and follow-up treatments. All infestations on adjacent lands must be treated to prevent re-invasion. Unfortunately, infestations common along railway tracks, roads and utility right-of-ways are rarely treated for eradication, fostering widespread immigration to adjacent lands. It is necessary to consider actions to deal with the current problems caused by invasive species and to reduce the magnitude of the problem in the future.

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