Invasive Alien Species in Southeast Asia

By John R. MacKinnon

Invasive alien species (IAS) are causing billions of dollars worth of damage in Southeast Asia (SEA) as well as causing displacement and, in some cases, extinction of hundreds of indigenous species. Yet despite the magnitude of the damage, the prominence given to the control of IAS in the Convention of Biological Diversity and the many international protocols and initiatives to tackle this issue, almost no attention is paid to this threat in SEA; there are few national programmes to combat established IAS or reduce the risk of more from becoming introduced. Equally shocking is the fact that whilst some species have become established accidentally, the bulk was deliberately introduced.

The data sheets held on SEA countries by the Global Invasive Species Programme database http://www.issg.org for instance fail to reflect the great extent or urgency of the problem. Hundreds of species are involved – not less than ten species per country documented in the database.

The rate of introduction of alien species is greatly increasing with the globalisation of trade, and with more people traveling around the world. Moreover as more natural areas are transformed by rapid development, the openings for invasion become more numerous.

Some major culprits

Almost all lakes and fresh waterways of the region are clogged with such species as water hyacinth (*Eichhornia crassipes*), water lettuce (*Pistia stratiotes*), and yellow burhead (*Limnocharis flava*). These species impede boat transport and fishing activities and also cause eutrophication and loss of productivity. Clearing these weeds annually involves great labour costs.

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Water lettuce

Most lakes of the region have become invaded by introduced fish such as tilapia (*Tilapia mossambica*), which now even inhabits saline estuaries, Thai catfish (*Clarias batrachus*), bighead (*Aristichthys nobilis*), grass carp, snakeheads and even goldfish (*Cyprinus carpio*). Almost all endemic lake fish of the Philippines are already extinct as a result of such introductions. Losses of indigenous fish in major fisheries such as Tonle Sap in Cambodia have huge economic impacts.

In addition to many pantropical weeds that have become very aggressive such as *Eupatorium (Chromolaena) odoratum*, *Mimosa pudica* and grasses like *Imperata cylindrica*, many ornamental plants are spreading out of control across the region. These include *Lantana camara*, *Caesalpinia pulcherrima* and climbing plants that can smother the original vegetation such as Blue Trumpet Vine (*Thunbergia grandiflora*), Morning glory (*Ipomea carnea*), *Ipomea cairica*, Mile-a-minute vine (*Mikania micrantha*), *Bougainvillea spectabilis* and the edible Thai vine (*Coccinea indica*).

Exotic coloniser shrubs such as *Piper aduncum*, *Mimosa pigra* and prickly pear (*Opunia monacantha*) now cover huge areas of the region. The undergrowth of important nature reserves and parks in Luzon, Philippines, which should be covered in endemic palms and shrubs, are dominated by the admittedly attractive South American shrub (*Pachystachys coccinea*), in no way inhibited by the lack of its natural pollinators – the humming birds.

Foresters have consistently introduced exotic trees for plantations. There is often a short-term advantage in planting a species in the place where its natural pests and diseases are absent. In some cases such species spread out of control, displacing natural vegetation and profoundly changing the natural ecology. The Chinese super-tree (*Paulownia tomentosa*) is listed as invasive in many countries. Several introduced conifers have become established in the region and the spread of Australian eucalyptus and *Acacia* has a profound effect. Both *Acacia auriculiformis* and *Acacia mangium* grow well in SEA and spread natu-

rally over cleared and burned areas. These species create conditions of great flammability and themselves thrive on regular fire episodes in lands where natural forest fires were unheard of. As the 'haze' fires now burn annually in Borneo and Sumatra, so do these species spread at the expense of native species and transform those islands into firescape monsoon forests.

The introduced bullfrogs (*Rana catesbeiana*) and marine toads (*Bufo marinus*) have spread right across the region, competing with and actually devouring endemic amphibia along the way.

Moreover, the introduced African Giant snail (*Achatina fulica*) and golden apple snail (*Pomacea canaliculata*) for human consumption have been ecological disasters. These species are mostly not appreciated as foods in the region but are now dominating many ecosystems and, like agricultural pests, are causing huge losses. Other snails spread Eastern Schistosomiasis disease to humans.

Ship-spread rats – *Rattus rattus* and *R. norvegicus* – have eliminated local bird species on small islands, competed with indigenous rodents and also are potential sources of diseases and major agricultural pests.

The wild pig *(Sus scrofa)* has spread throughout the region, causing huge agricultural losses and outcompeting the indigenous forest pigs of the bearded pig (*barbatus, celebensis*) group.

Domestic cats and dogs have done untold damage, especially in islands that formerly lacked significant mammal predators such as in Sulawesi, parts of the Philippines and many small oceanic islands. Humans also seem to have spread the common palm civet (*Paradoxurus hermephroditus)* in early times.

Tree sparrow (*Passer montanus)* and House crow (*Corvus splendens)* have spread across the region as commensals of man and have become serious grain and urban pests, respectively. Java sparrow (*Padda oryzivora)* has become an established pest in many areas even though it remains endangered and rare in its native Java. Exotic parrots such as the Lesser yellow-crested cockatoo (*Cacatua sulphurea)* and the rainbow lorikeet (*Trichoglossus haematodus*) have even become established in some areas and have become noisy local pests in some cities.

Dangerous inverterbrates introduced to the region include the American cockroach (*Periplaneta americana),* which has become such a terrible household pest, crazy ants (*Anoplolepis gracilipes),* which have caused havoc among some native fauna, red fire ants, nematode worms and avian malaria.

Even more difficult to notice and control are the many microorganisms such as wood rot fungi that become introduced with timber shipments, other fungal pests and viral and bacterial diseases.

The scale of damage/losses

Economic assessments of the levels of damage caused by IAS in the U.S.A. result in figures of billions of US dollars per year. These losses are seen in production losses in agriculture, forestry, and fishery, and costly eradication programmes to eliminate undesirable species and diseases. The cleanup cost of one species of *Tamarix* is estimated at $US4 billion. Similar costing exercises are almost totally absent in the SEA region. But given the size of the region, the total human population and the greater direct dependence of the population on biodiversity and primary production systems, it is clear that the damage to ecosystems and economies must also be counted in billions of U.S dollars per annum.

Vulnerability

Examining patterns of invasion allows us to make some generalisations. Some ecosystems are more vulnerable than others. Freshwater systems, small islands, areas with high number of local endemic species and areas undergoing major landcover transformation are particularly vulnerable and need special vigilance and protection. A logged forest is more prone to invasion than a primary forest.

Equally we can recognise certain types of organisms that have a greater chance of becoming invasives. Vig-

www.bugzuk.com

African giant snail

www.ventanawild.org

Wild pig

orous r-selected coloniser species with fast reproductive rates and good dispersal ability are very dangerous. Such species include many grasses, climbers, coloniser shrubs and trees with wind dispersed seeds. Parasitic and carnivorous animals are also dangerous. Introduction of close relatives of indigenous species is highly prone to result in genetic pollution of the local form.

Why do we continue to introduce new species?

- Accidents: inadequate controls, laws, quarantine, etc.
- Irresistible urge to try to improve on nature (*ars* versus *natura* debate) or the "grass always looks greener on the other side of the hill" syndrome. The reason may be innocent, greed-driven or even malicious.
- Lack of local species to meet specific needs i.e. good fibre or ornamental properties.
- Short-term or long-term superiority of exotic varieties (often due to lack of local pests and diseases)
- Easier availability of alien seeds than local species; and lack of development of local germplasm over much of the developed world.

Why do local agencies pay so little attention to the problem?

- Failure to recognise long-term and indirect costs of introductions or costs will not be borne by an importer who generally shows a profit.
- Weaknesses of systematics and lack of awareness problem. Lack of recognition of local versus exotic species such that people do not notice that they are surrounded by exotics.
- Some problems such as spread of diseases, crop pests, grain losses to rats and domestic pests such as cockroaches are recognised as major economic losses but not generally recognised as being caused by alien invasives.
- Weakness of laws and control measures resulting from the lack of awareness as to the true scale of the problem.
- Unwillingness to interfere in 'commercial development'
- Over-concern over the hype of genetically-modified organisms (GMOs) without realising IAS is a more immediate and serious threat.

Conclusions

The enormous scale of threat from IAS has been consistently under appreciated in the region. IAS is probably the second greatest threat to biodiversity after loss of habitat.

Each country should be encouraged to take the problems of alien invasives more seriously.

Large countries should even be concerned about limiting movement of species across internal biogeographical barriers such as between different major islands of Indonesia or the Philippines.

They should undertake surveys and research to assess the extent to which indigenous or native species are already invaded by alien species and assess the economic implications of these invasions.

The findings of such studies need to be much more widely publicised or broadcast and in particular must be brought to the attention of government planners and regulators so that actions to control or eradicate IAS and limit further introductions can be justified and implemented.

National databases about alien invasives should be established on websites. International programmes such as GISP can assist in collating such data into easily accessible international databases. A good example of a national database can be found on http://www.chinabiodiversity.com. Such databases should list recognised invasives, give case studies of levels of damage and of control measures employed, biodata (maybe drawn from the country of origin) and have outreach and awareness role.

Most of the regulations limiting introduction, field trials and releases of new organisms into the environment would be the same for alien species and GMOs. GMO regulations should not be developed independently of alien invasive controls.

National programmes should be introduced including tax incentives to promote the use of native germplasm rather than introduced species for horticulture, urban greening, parks, golf courses, roadside trees and forestry.

The ASEAN Regional Centre for Biodiversity Conservation, which has held one national workshop on the subject of IAS in the Philippines, will set up a regional database on IAS, and host a regional IAS workshop in 2003.■

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