INVASIVES

Newsletter of the Asia-Pacific Forest Invasive Species Network (APFISN)

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- The invasive species assessment protocol: A tool for creating regional and national lists of invasive and non-native plants that negatively impact biodiversity

Recent books

- Pest Management and Phytosanitary Trade Barriers

Forthcoming Symposia/Workshops

- 10 - 13 September 2008. First International Ragweed Conference. Budapest, Hungary
- 14 - 18 September 2008. 2nd International Symposium on Intractable Weeds and Plant Invaders. Osijek, Croatia
- 20 - 25 September 2008. 5th International Allelopathy Congress. Saratoga Springs, New York

The Asia-Pacific Forest Invasive Species Network (APFISN) has been established as a response to the immense costs and dangers posed by invasive species to the sustainable management of forests in the Asia-Pacific region. APFISN is a cooperative alliance of the 33 member countries in the Asia-Pacific Forestry Commission (APFC) - a statutory body of the Food and Agriculture Organization of the United Nations (FAO). The network focuses on inter-country cooperation that helps to detect, prevent, monitor, eradicate and/or control forest invasive species in the Asia-Pacific region. Specific objectives of the network are: 1) raise awareness of invasive species throughout the Asia-Pacific region; 2) define and develop organizational structures; 3) build capacity within member countries and 4) develop and share databases and information.

INVASIVES, bimonthly newsletter of the Asia-Pacific Forest Invasive Species Network (AFPISN) is intended to share information among countries in the Asia-Pacific region on Forest Invasive Species(FIS) and the threats they pose in the region. If you have any items of news value on FIS to share between national focal points of APFISN and more widely among foresters, agriculturists, quarantine personnel and policy makers, please pass them on to the editor - Dr. K. V. Sankaran, APFISN Coordinator, Kerala Forest Research Institute, Peechi-680 653, Kerala , India (sankaran@kfri.org). The newsletter is supported by the Food and Agriculture Organization of the United Nations (FAO) and USDA Forest Service.

Giant sensitive plant (*Mimosa pigra*)

Mimosa pigra - Habit

Mimosa pigra, commonly called the giant sensitive plant, is a prickly, aggressive woody shrub found especially in parts of Southeast Asia and Australia. It can form impenetrable, prickly thickets up to five meters high. The Global Invasive Species Database nominated this plant as being one among 100 of the world's worst invaders. The plant can interfere with irrigation and the recreational use of waterways. It has the potential to spread through natural grassland ecosystems and pastures, converting them into unproductive scrubland which can sustain only low levels of biodiversity. *M. pigra* is native to Mexico and Central and South America. In its native range, the growth of the plant is controlled by native insect and fungal pathogens. It was introduced to the Australian Darwin Botanic Gardens in the late 1800s and is now one of Australia's worst environmental weeds. It was introduced into Thailand from Indonesia in the 1960s, intended as a green manure and cover crop in tobacco plantations; later it was used to help control ditch-bank erosion around Chiang Mai, Thailand. This weed is now distributed widely in over 51 countries around the globe, including Australia, Brazil, Africa, Colombia, India, Papua New Guinea and the United States.

Mimosa pigra - flower

The shrub is supported by extensive lateral roots with numerous fine roots that have occasional nodules. The leaves are not as sensitive to physical stimulation as those of some other Mimosa spp. The stem of *M. pigra* is branched, 2 - 6 m long, has 5 ridges from which spines (up to 7 mm long) and bristles arise. The leaves are about 20 cm long and bipinnate, with 7 - 16 pairs per pinnae; each pinnae is composed of 25 - 40 linear pinnules. Straight, erect or forward pointing prickles are found at the junction of each pinnae and sometimes stouter, spreading or deflexed prickles are found between the pairs. Leaflets are linear-oblong, 3 - 8 (-12.5) mm long and 0.5 - 1.25 (-2) mm wide. The venation is nearly parallel with the midrib and the margins often bearing minute bristles. Inflorescences are sub-globose and pedunculate, with heads 1 cm in diameter. Each head contains 100 flowers, produced 1 - 2 (-3) together in the upper axils. Flowers are mauve or pink in color, calyx is minute, laciniate 0.75 - 1 mm long; corolla about 2.25 - 3 mm long; stamens, 8. Flowers are pollinated by bees and wind. The fruit is a thick, hairy compressed pod containing 20 - 25 seeds; 5 - 10 cm long and clustered; brown in color; densely bristled and breaking transversely into about 21 (14 - 26) partially dehiscent segments, each containing a seed, with the pod sutures persisting as an empty frame. The seeds are light brown to brown or olive green in color; light, oblong and flattened in shape; 4 - 6 mm long and 2 mm wide; are dispersed by water and can float for an indefinite period. The seeds are extremely hardy and can remain dormant for more than 15 years, depending on the environment. Dormancy of seeds in the soil is broken by expansion and contraction of the hard seed-coat by temperature changes ranging from about 25 - 70°C. Seeds buried deeper than 10 cm generally do not successfully germinate unless brought to the surface. Typical annual production is about 9,000 seeds per square meter. Annual seed production per plant has been measured at up to 220,000 seeds under ideal conditions. Scarification is required for quick and uniform germination of seeds. Germination percentages of seeds may vary from 75 - 94 percent. Invasion pathways to new areas are mainly by agricultural activities, vehicles from infested areas, mud on birds (especially waders), boats, and through animals, people and water currents.

Mimosa pigra - foliage

M. pigra favors a wet-dry tropical climate and would probably not be a major problem in regions with less than 750 mm or greater than 2,250 mm of rainfall, except in cases of clear-cutting. Mimosa does not appear to grow preferentially in any soil type, but is found most commonly in flood plains and on riverbanks within soils ranging from black clay to sandy clay to coarse siliceous sand. Seed production and plant life expectancy are greater on black cracking clays than on the lighter and silty loams. It is common along the edges of reservoirs, canals, river banks and roadside ditches, and in agricultural lands and overgrazed flood plains. It is more likely to colonize and eventually cause problems in disturbed areas. This is due to the ability of mimosa seeds to establish rapidly on bare soils which lack competitive pressures from other seedlings.

River floodplains and swamp forests in northern Australia are threatened by dense thickets of *Mimosa pigra*. The weed supports fewer numbers of birds and lizards, less herbaceous plants and fewer tree seedlings. It prevents traditional food gathering by Aborigines on otherwise resource-rich wetlands. *M. pigra* has the potential to harm a wide

number and variety of different types of primary production. If large infestations occur over farmland, mimosa may threaten the health of pastoral industries by reducing the area of grazing land and the carrying capacity of the land. Furthermore, if livestock are reliant on natural water sources for drinking, their access to water may be blocked. As a result, meat production and income may be reduced. *M. pigra* may reduce water flow and increase silt levels, as it commonly colonizes

Giant sensitive plant - infestation

water course edges. This may threaten the sustainability of reservoirs and canals and any livelihoods reliant on them. For example, in Thailand, the weed negatively impacts rice cultivation by blocking irrigation inlets and also encouraging an increase in the numbers of rats and crabs which damage crops. *M. pigra* may interfere with the cultivation of other economically-important plants. For example, *M. pigra* is able to compete with the young palm trees in immature oil palm plantations. Common along roadsides, mimosa may also increase the costs of maintaining power poles and cables used for electricity transmission. It may also decrease driver visibility, increasing the potential for traffic accidents.

M. pigra presents a very different picture in its native range, where its natural habitat is mainly marginal areas of canals, rivers and lakes, and this gives some hope to researchers looking for biological control agents.

Seeds of *Mimosa pigra*

In Thailand, *M. pigra* can serve as a pollen source for bees. The dry stems and branches are often collected and utilized as firewood. The root yields 10% tannin. *M. pigra* is used in tropical Africa as a tonic and to treat diarrhoea, gonorrhoea and blood poisoning. In Tanzania, the powdered leaf is taken with water to relieve swelling. In Zambia, the root ash is sprinkled over leprous patches on the skin. The root apparently acts an aphrodisiac to some persons and a calming agent to others. The seed is emetic and an expectorant and is used for tooth troubles. The leaf contains mimosine, an alkaloid which has medicinal properties. *M. pigra* can be used on the steep banks of water reservoirs as an erosion-control measure.

Mechanical removal of mimosa may involve bulldozing, chaining, or burning. A gasoline in gel form is typically applied from an aircraft to burn the stands. However, mimosa is fire-resistant and requires additional efforts, such as chaining, to enhance burning. Fire alone may actually increase mimosa densities by plant re-growth and enhanced seed germination.

Chemical methods are currently the primary means of controlling mimosa populations. Over twenty-one herbicides (applications include aerial spraying, bark and stem injections and soil treatments) have been tested for their effectiveness. Currently, 2,4,5-T, tebuthiuron, fluroxypyr, metsulfuron methyl, and hexazinone are the principal chemicals used to control mimosa.

Six natural enemies have been released in Australia following rigorous host-specificity testing, but have not yet had any discernible effect. Four of these have also been released in Thailand. The six agents include two seed-feeding bruchid beetles, one stem-feeding chrysomelid beetle, two stem-boring moths and a flower-feeding weevil. The first insects introduced to Australia as control agents were the seed-feeding beetles *Acanthoscelides quadridentatus* and *A. puniceus* (Bruchidae) from Mexico. They were released in Australia in 1984 and 1985, respectively, but have not attained high population densities and have had little impact on seed production. Two stem-boring moths, *Neurostrota gunniella* (Gracillariidae) and *Carmenta mimosa* (Sesiidae), were released in Australia in 1989; of these, *N. gunniella* established readily. The young larvae mine leaf pinnules and the older larvae tunnel in the stems, causing them to die. *Carmenta mimosa* complements the action of *N. gunniella* by tunneling stems of larger diameter. Other important insects currently being tested for their host specificities in Mexico and Australia are the seed- and flower-feeding weevils *Apion* sp., *Chalcodermus serripes, Sibinia fastigiata*, *S. ochreosa*, *S. pervana* and *S. seminicola.*

Two fungal pathogens, *Phloeosporella* sp. (Coelomycetes), and a rust, *Diabole cubensis*, severely debilitate *Mimosa pigra* in Mexico. *Phloeosporella* sp. attacks leaves, branches, main stems and seed pods, causing leaf fall and cankers of the stems and leading to ring barking and die-back. *Diable cubensis* causes chlorosis in stems and leaves, resulting in premature leaf fall. Both fungi are attacked by hyperparasitic fungi in their native range and it seems likely that their effect on mimosa could be even more damaging in Australia if they were to be introduced without their natural enemies. These fungi are under investigation in Mexico and Britain.

Sapium sebiferum – a new threat conquering the Himalayan region in India

Sapium sebiferum, commonly called Chinese tallow, a tree native to China and East Asia and introduced into India for multipurpose agroforestry or for the extraction of vegetable oil, is posing a new to threat to the Himalayan region by inhibiting the growth of native flora.

Chinese tallow- Tree with flower and fruit

The Chinese tallow is a fast-growing deciduous tree with a rounded or conical crown and an open, airy look. It can grow up to 12.2 m tall with a 6.1 m spread. The leaves are diamond-shaped, abruptly pointed at the tip, and 5 - 7.6 cm long. They flutter in the breeze like poplar leaves. In the fall, the leaves turn brilliant shades of scarlet, orange, yellow and maroon. The springtime flowers are formed in yellowish green catkins on the branch tips. The fruits are 3-lobed, brown capsules that open to reveal three white, waxy seeds that resemble popcorn. Like most members of the spurge family, broken twigs and leaf stems exude a milky latex sap. Chinese tallow begins producing seeds at the age of three years and a mature tree can produce 100,000 - 150,000 viable seeds per year. It also spreads by suckering and cut stumps re-sprout readily.

Chinese tallow is a tree that grows and spreads rapidly, is difficult to kill, and tends to take over large areas by out-competing native plants. It can thrive in well-drained uplands as well as in bottomlands, on the shores of water bodies, and even on floating islands. It is also referred to as Florida aspen and popcorn-tree, and continues to be sold in plant nurseries. These trees present a constant source of seed for continued infestation of natural areas because the seeds are transported by birds such as pileated woodpeckers, cardinals, yellow-rumped warblers, American robins, and grackles, as well as by water. While the length of time needed to deplete the seed bank is unknown, indications are that seeds remain viable for many years with little or no loss in viability. The plant sap and leaves are reputed to be toxic, and decaying leaves from the plant are toxic to other plant species.

In the United States, Chinese tallow has been grown as a shade tree and for its brilliant fall foliage. However, the plant is now known to be extremely invasive and hence is now rarely used for ornamental planting. Seed capsules of the tree yield a wax (Chinese vegetable tallow) that is used to make soap and candles. Oil extracted from the seeds is used as a lamp fuel and machine lubricant. In parts of the American southeast, decorative wreaths are made by stringing the popcorn-like seeds. Honeybees make a desirable light-colored honey from the flowers.

To kill Chinese tallow, cut the tree down and immediately paint the stump with a triclopyr herbicide. Good results also can be obtained by spraying the bark in a 15 cm wide band all around the base of the trunk with one of the triclopyr herbicides.

Rat invasions causing seabird decline worldwide

Rat attacking seabird

Invasive rats on ocean islands threaten seabird populations. These voracious rats attack bird nesting colonies, eating eggs, chicks and sometimes even adult birds. They have been observed preying on a quarter of all seabird species. Of the 328 recognized seabird species, 102 are considered threatened or endangered by the World Conservation Union, with predation by invasive species ranking among the top dangers. Seabirds are important ecological actors in the oceans and on islands, but 30 percent of all seabirds are at risk of extinction. In addition, invasive rats have caused extinctions of many native land birds, reptiles, frogs and even plants. By consuming fruits, seeds and flowers, rats can change the structure and composition of forests and alter the entire ecology of islands.

New publications

Peter, W. J. B., John, L. S., Chris, W., Michael, A. M. and P. P. Hugh. 2008. Cost-effective suppression and eradication of invasive predators. Conservation Biology, 22: 89 -98.

Reuben, P.K. and M.L. David. 2008. Preventing the spread of invasive species: economic benefits of intervention guided by ecological predictions. Conservation Biology, 22: 80-88.

Dong, S.K., Cui, B.S., Yang, Z.F., Liu, S.L., Ding, Z.K., Zhu, J.J., Yao, W.K. and G. L. Wei. 2008. The role of road disturbance in the dispersal and spread of *Ageratina adenophora* along the Dian–Myanmar international road. Weed Research, 282-288.

Lauren, D.Q. and S.H. Jodie. 2008. Ecological correlates of invasion by *Arundo donax* in three southern California riparian habitats. Biological Invasions, 10: 591-601.

Nicol, F., Eduardo, U., Ingolf, K. and K. Stefan. 2008. Alien plants in Chile: inferring invasion periods from herbarium records. Biological Invasions, 10: 649-657.

Florian, M. S., Birgit, C. S., Jeremy, V., Keefe,D.R., Erhard, C., Christian, S., Andrew V. S., Stephen, E. W. and H.C. Ross. 2008. Combined modelling of distribution and niche in invasion biology: a case study of two invasive *Tetramorium* ant species. Diversity and Distributions, 14: 538-545.

John, M.R., Larry, E.M., Nancy, Benton.,Ron,H., Stephanie, Lu. And K. Terri. 2008. The invasive species assessment protocol: A tool for creating regional and national lists of invasive and non-native plants that negatively impact biodiversity. Invasive Plant Science and Management, 1: 36-49.

Recent Books

Pest Management and Phytosanitary Trade Barriers. By N. Heather and G. Hallman. CABI, 2008. A significant amount of the world's economy is based upon the international trade of agricultural produce. For the producing countries, a growing concern is the potential economic and ecological damage that invasive species could cause. While threats can be decreased through the regulation of items potentially carrying invasive species, the effect of such restrictions on international trade also needs to be considered. A balance must therefore be achieved that permits the transfer of produce while filtering out unwanted pests. Drawing on the author's extensive experience, the social and financial implications of phytosanitary trade barriers are reviewed. This book offers valuable and comprehensive coverage of pest-related barriers and strategies for their implementation.

Forthcoming Symposia / Workshops

10 - 13 September 2008. First International Ragweed Conference. Budapest, Hungary. The conference will focus on the theoretical and practical aspects of ragweed infestation. Basic research, together with field applications, will be emphasized, along with laboratory, pilot, and modeling studies leading to innovative approaches. Contact: lkiss@nki.hu

14 - 18 September 2008. 2nd International Symposium on Intractable Weeds and Plant Invaders. Osijek, Croatia. The primary objectives of the Symposium are: 1) to foster communication among researchers and practitioners involved in the many disciplines encompassed by invasive plants and weed science; 2) to provide a forum for the presentation and discussion of recent and ongoing research in the field of invasive plants and weed science; and 3) to encourage new investigators (especially students) in weed science and invasive plants. Contact: Edita Stefanic; estefanic@pfos.hr

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