
# INVASIVES

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

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## New publications

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- Impacts of the biological control agent *Cyphocleonus achates* on spotted knapweed, *Centaurea maculosa*, in experimental plots.
- Selecting replacements for invasive plants to support frugivores in highly modified sites: A case study focusing on *Lantana camara.*
- The chemical control of the environmental weed basket asparagus (*Asparagus aethiopicus* L. cv. *Sprengeri*) in Queensland.
- Maximising the contribution of native-range studies towards the identification and prioritisation of weed biocontrol agents.
- A review of current knowledge of the weedy species *Themeda quadrivalvis* (grader grass).
- The biology of Australian weeds. 46. *Anredera cordifolia* (Ten.) Steenis.

## Recent books

- Unnatural landscapes: tracking invasive species
- Ecology of weeds and invasive plants: relationship to agriculture and natural resource management

## Forthcoming Symposia/Workshops

- 28 October - 2 November 2007. 12th World Lake Conference -Taal 2007, Jaipur, India.
- 19 - 21 September 2007. Alien Arthropods in South East Europe - Crossroad of Three Continents, Sofia,Bulgaria

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 Agricultural 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.

# Threats

## Velvet tree (*Miconia calvescens*)

Velvet tree (*Miconia calvescens*), also called bush currant or purple plague, is an evergreen tree native to rain forests of South and Central America (southern Mexico to southern Brazil). It belongs to the family Melastomataceae. The tree was introduced into the botanical garden in Tahiti, French Polynesia, as an ornamental plant in 1937 because of its attractiveness and botanical curiosity. *Miconia* now dominates over two-thirds of the forests of that island and has spread to other islands in French Polynesia. The species forms dense monospecific stands that shade out the native vegetation with its large leaves and suppresses the

*Miconia*- seedling


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.

growth and regeneration of native species in the understory. It has been recognized as one of the world's 100 worst invaders. *Miconia* is currently distributed in Australia, Dominican Republic, French Polynesia, Jamaica, New Caledonia, Sri Lanka, and the United States (Hawaiian Islands).

*Miconia* is a medium-sized tree that grows up to 15 m in height, with large attractive leaves (up to 80 cm long), which are arranged opposite each other on the stem. The leaves are dark green on the upper surface, with three prominent pale green nerves, and purple-blue beneath. Young stems and leaves are covered with velvet hairs. Flowering and fruiting begin after four to five years, when the trees are about 12 feet tall, and the process can be repeated two to three times in a year. Each inflorescence produces 1,000-3,000 short-lived flowers, which are sweet-scented, white to pink in colour, and arranged in large panicles up to 30 cm long. The ripe fruits are dark purple-black fleshy berries, around 1 cm in diameter, sweet tasting and very attractive to birds. Each fruit contains about 140-230 tiny seeds (0.5 mm in diameter). A mature *Miconia* tree can produce up to 5 million seeds. The seeds are

*Miconia* infestation

photosensitive and can remain viable in the soil for more than 5 years. Most seeds remain dormant until stimulated by an opening in the canopy, although seeds will also germinate under heavy shade. Seeds are dispersed by wind, water and frugivorous birds and small mammals. Birds can carry thousands of seeds up to 2 km away from the source tree. The boots and clothes of hikers, tires of vehicles and the translocation of machinery/equipments that have been contaminated with soil also help in spreading the seeds. The longevity of the soil seed bank is about 6-8 years; however, the majority of the seeds germinate with in 15-20 days. The growth rate of seedlings and juvenile plants is about 1 meter per year. Seeds can even germinate on rocks and bark of trees. Propagation of *Miconia* also happens through vegetative means such as planting of cuttings, layering and re-sprouting. The shallow root system of *Miconia* allows for increased soil erosion and landslides.

*Miconia* flower

The habitats of *Miconia* include pastures, forest edges, river banks, trail sides, roadsides disturbed areas, coastlands, riparian zones,

*Miconia* leaf- lower side

scrub/shrub lands, urban areas, wetlands and planted and natural forests. The species is shade tolerant, but it regenerates freely and grows more rapidly in forest gaps and open areas. The distribution of *Miconia* suggests wide climatic amplitude with a preference for tropical climates with distinct seasonality. It has the potential to cause irreversible damage to our rainforests and poses a big threat to all tropical and subtropical rainforests. In Hawaii and French Polynesia, it has devastated the native flora and fauna. In Tahiti, *Miconia* is a direct threat to about 70-100 native plant species, including 35-45 species endemic to French Polynesia. Under favorable conditions, *Miconia* can form dense thickets in the rainforest understorey and replace native vegetation and also affect wildlife

*Miconia* fruit

Populations. The weed normally occurs in areas from 10 to 1,800 meters above sea level and where annual rainfall is more than 2000 mm. *Miconia* is considered as the most invasive and damaging alien plant species to threaten wet forests in the Pacific islands.

Good sanitation is essential to control the spread of *Miconia*. To prevent human dispersal of seeds, people working in infested areas should change their clothes and shoes before leaving the area. Thorough washing of agricultural tools, machinery and other potential dispersing agents at the site would also help prevent the spread of seeds. Hand picking of seedlings and juvenile plants are the common mechanical control methods.

Chemical methods include the application of herbicides like Garlon and Triclopyr plus 2,4-D at cut surfaces of trees to prevent re-growth. Aerial spraying of Garlon 4 also has good control results. The potential use of several insects (Lepidopteran larvae) and leaf spot pathogens such as *Cocostroma myconae* and *Colletotrichum gloeosporioides f.sp. miconiae* as biocontrol agents are being investigated.

It may be noted that so far, *Miconia* has only spread to a few countries in the Asia-Pacific region. Undoubtedly, its incursion can cause great damage to rain forests and agricultural systems in the region. So, it is highly necessary to keep a watch. Quarantine officials should be vigilant to avoid the transportation of seeds or plants of *Miconia* to non-infested countries. Public awareness of the weed problem needs be promoted through newspapers, television and other communication media. If any

Leaf spots of *Miconia* caused by *Colletotrichum gloeosporioides*

of the readers of this newsletter happen to locate this plant in their area, it should immediately be brought to the notice of the country's APFISN focal point and the nearest agricultural or forest official.

## Red imported fire ant (*Solenopsis invicta*)

The red imported fire ants (*Solenopsis invicta*) - RIFA - are native to South America and are aggressive generalist foragers. They were accidentally introduced into the United States in the 1930s through the seaport of Mobile, Alabama. RIFA are now widespread throughout the southeastern United States and some Caribbean islands (e.g. Puerto Rico and the Virgin Islands) and have replaced two native species and the black imported fire ant. They have also spread to Australia, North America, Philippines, New Zealand, Hong Kong and southern China. RIFA are efficient competitors against other ants and have successfully enlarged their range. They commonly occur in agricultural areas, coastlands, deserts, disturbed areas, natural forests, planted forests, riparian zones, urban areas and watercourses.

Red imported fire ant-habit

RIFA are more aggressive than most native ants and have a painful sting. They respond to pheromones released by the first ant to attack. The ants swarm and sting immediately when any movement is sensed. The sting of RIFA contains a venom composed of a necrotizing alkaloid, which causes both pain and the formation of white pustules which appear one day after the sting. Their stings are rarely life threatening to humans and other large animals, causing only 80 documented deaths as of 2006, but they often kill smaller animals such as birds. The stinging ability allows them to subdue prey and repel larger vertebrate competitors from the resources. RIFA can occur in high densities and can dominate most potential food resources. Their high reproductive rate combined with suitable weather conditions help them to spread rapidly and steadily into new territories. Their nests vary in shape and size, but all have a honeycomb-like internal structure and are found in open areas like lawns, pastures, roadsides and abandoned croplands.They produce dome-shaped mounds up to 40 cm high without any obvious exit.

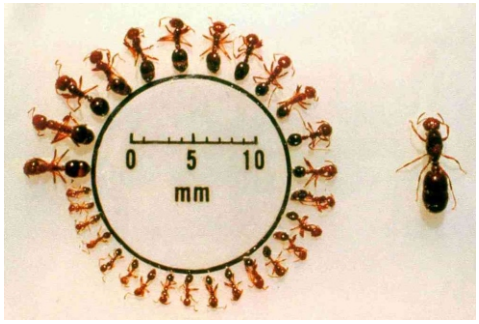
Red imported fire ant- mound

Fire ants are reddish brown to dark brown in colour, about 2-6 mm long, and their body is symmetrically divided into three major parts viz., head, mesosoma and metasoma. They have three pairs of legs and a pair of elbowed antennae. The distinguishing feature of RIFA is that they have two humps between the thorax and abdomen. As in other ants, the worker and soldier ants are sterile females. The queen is responsible for laying thousands of eggs. The number of males is low because they are only produced during a brief period of the year when mating swarms are emerging. After mating, the male dies and the queen searches for a safe place for nesting and makes a brood cell under soil. The queen relies on her fat reserves and energy acquired by absorbing wing muscle to survive until her first workers are ready for colony maintenance. The diet of foraging workers consists of dead animals, earthworms and vertebrates, and also they collect honeydews, sweets, proteins and fats found in homes. Worker ants bring solid food rich in protein to nourish the larvae, and the larvae secrete digestive enzymes that break down the solid food for the worker ants.

The movement of agricultural equipments and machinery from infested areas to new locations helps the fire ants to spread. The aquaculture industry and nursery trade are also responsible for their spread. RIFA are hot climate specialists and inhabit hot arid regions. Cold climates are unsuitable for their establishment in native ecosystems, but they can survive in such climates by nesting in human habitations. Continental areas receiving more than 510 mm of rainfall per year will support RIFA populations, while areas receiving lesser rainfall can still support them near sources of permanent water or in regularly irrigated areas. Deforested areas and the edges of forests are at risk of becoming colonized by RIFA. They construct earthen mounds for brood thermoregulation, which is a threat to densely wooded forest habitats. The colonies can survive cold conditions as low as -9° C . Tropical regions that are warm and wet do not represent a suitable habitat for fire ants.

Fire ant sting

Fire ants are omnivorous, feeding on almost all plants and animal material. They reduce the biodiversity among invertebrates and reptiles and may also injure frogs, lizards or small mammals. Studies have shown a minimum two-fold reduction among populations of field mice, oviparous snake, turtles and other vertebrates where RIFA are present. Also, they nurse numerous homopteran pests like aphids and scale insects. In particular, they have the potential to devastate native ant populations. In agricultural areas, RIFA feed on the germinating seeds of crops such as corn, soybean and sorghum, and on the buds and developing fruits of several other plants. Tunneling fire ants can damage potato tubers and pods of peanuts. In drip irrigation fields, fire ants build mounds over the emitters, thereby reducing or blocking the water flow. RIFA may also interrupt and reduce seed dispersal by competing with native ant species and eating whole seeds or ineffectively dispersing them. In the United States, it adversely affects 14 bird species, 13 reptile species, one fish species and two species of small mammals. The Australian Bureau of Agriculture Resources Economics has estimated that the losses due to fire ants in rural industries is more than AU $6.7 billion over 30 years. In the USA, the costs associated with RIFA are estimated at US$ 1 billion annually.




Size variation in RIFA worker ants and queen on the right

Early detection and subsequent nest treatment is the best measure to prevent the establishment of fire ant colonies in a new environment.Insecticides can either be applied to individual mounds or may be broadcast over a wide area. Mound specific treatment is environmentally and ecologically acceptable. Individual treatments can be done by mound drenches, surface dusts and mound injections. However, the disadvantage is that individual mounds must be located in order to be treated. In broadcast treatments, granular insecticides are used, which the ants carry to the colony and fed to nest mates and the queen. Mound drenches, surface dusts and mound injections may not necessarily reach the queen, who may be deep in the nest. So, the chances of reinfestation are more in such treatments.

Red imported fire ant- colony

The microsporidian protozoan *Thelohania solenopsae* and the fungus *Beauveria bassiana* are promising biocontrol agents against fire ants. *Solenopsis daguerri*, a parasitic fire ant, invades RIFA colonies to replace the queen in hopes of gaining control of the colony. For this reason, its use as a biocontrol agent is currently being explored. *Pseudacteon tricuspis* and *P. curvatus*

Death of young birds due to fire ant attack

are parasitoid phorid flies from South America, which parasitize the ants. Phorid flies have been introduced in many places in the southeastern United States, and are slowly reproducing and spreading to cover the entire RIFA range. A virus, SINV-1, has been found in about 20 percent of fire ants fields, which causes the slow death of infected colonies. It apparently has potential as a viable biopesticide to control fire ants.

*Solenopsis daguerri*

Phorid fly

The occurrence of RIFA in China, Philippines, Australia and New Zealand poses a definite threat of the ant spreading to other countries especially in the Asia-Pacific region. Creating awareness of RIFA among quarantine officials, foresters and scientists is essential to prevent its further spread. Great care is warranted at ports while importing plants, animals and other items.

# New publications

Panetta, F. D. 2007. Evaluation of weed eradication programs: containment and extirpation. Diversity & Distributions, 13: 33-41.

Corn, J.G., Story, J.M. and L. J. White. 2006. Impacts of the biological control agent *Cyphocleonus achates* on spotted knapweed, *Centaurea maculosa*, in experimental plots. Biological Control, 37: 75-81

Gosper, C. R.and G.Vivian-Smith. 2006. Selecting replacements for invasive plants to support frugivores in highly modified sites: A case study focusing on *Lantana camara.* Ecological Management & Restoration, 7: 197-203.

Breaden, R., Armstrong, T. and D. Hinchliffe. 2006. The chemical control of the environmental weed basket asparagus (*Asparagus aethiopicus* L. cv. *Sprengeri*) in Queensland. Plant Protection Quarterly, 21: 131-333.

Goolsby, J. A., Van Klinken, R. D. and W.A.Palmer. 2006. Maximising the contribution of native-range studies towards the identification and prioritisation of weed biocontrol agents. Australian Journal of Entomology, 45: 276-286.

Keith, A.F. and W.D. Vogler. 2006. A review of current knowledge of the weedy species *Themeda quadrivalvis* (grader grass). Tropical Grasslands, 40: 193-201.

Vivian-Smith, G., Lawson, B.E., Turnbull, I and P.O. Downey. 2007. The biology of Australian weeds. 46. *Anredera cordifolia* (Ten.) Steenis. Plant Protection Quarterly, 22: 2-10.

# Recent Books

**Unnatural landscapes: tracking invasive species:**By Ceiridwen Terrill, published by University of Arizona Press, 2007. Although widely publicized threats such as pollution, land development, changes in the atmospheric conditions, fire, and drought are frequently credited with posing the greatest danger to indigenous animals and plants, invasive species are quickly becoming a far more insidious peril to the survival of native wildlife. Drawing on field observations, research, and interviews with scientists, resource managers, and local residents, this book provides readers with the background and knowledge to begin combating what is quickly becoming the most important environmental crisis facing the fragile ecosystems of the American Southwest.

**Ecology of weeds and invasive plants: relationship to agriculture and natural resource management:**By Steven R. Radosevich, Jodie S. Holt and Claudio M. Ghersa, published by Wiley- Interscience, 3rd edition, 2007. This book presents a comprehensive, up-to-date, and in-depth coverage of weed ecology. It gives readers the tools and knowledge to understand how weeds and invasive plants develop and interact in the environment, and thus better manage and control them.

# Forthcoming Symposia / Workshops

**28 October - 2 November 2007. 12th World Lake Conference -Taal 2007, Jaipur, India.** The Conference participants will include policy and decision-makers, researchers from universities and institutions, lake and wetland managers, technology developers and others interested in the conservation and management of lakes and wetlands throughout the world. Contact: Dr.R.Dalwani(r_dalwani@taal2007.org)

**19 - 21 September 2007. Alien Arthropods in South East Europe - Crossroad of Three Continents, Sofia, Bulgaria.** The scientific program includes: legislation and phytosanitary control, arthropods on stored products, control strategies, ecology and control of non-indigenous arthropods, impact and risk assessment, alien arthropods used in biological control. Contact:www.ltu.bg/conferences/aasee

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