INVASIVES

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

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- Emerging technologies: An opportunity for weed biology research

Recent books

- Classical Biological Control of *Bemisia tabaci* in the United States. A Review of Interagency Research and Implementation
- From Biological Control to Invasion: the Ladybird *Harmonia axyridis* as a Model Species
- Invasive Plants: A Guide to Identification, Impacts, and Control of Common North American Species

Forthcoming Symposia/Workshops

- 28 April - 2 May 2008. 2008 NASA Carbon Cycle and Ecosystems Joint Science Workshop, Adelphi, MD, USA
- 26 - 30 May 2008. 2nd meeting of IUFRO Working Unit 7.03.12, Shepherdstown, WV, USA

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.

Chestnut blight pathogen (*Cryphonectria parasitica*)

Cryphonectria parasitica (syn. *Endothia parasitica*) is a fungus that primarily attacks *Castanea* spp., causing cankers on branches and stems, which ultimately result in blight and the death of the trees. The chestnut blight fungus has virtually eliminated the American chestnut, a commercial species prized for their fruits, tannin and beautiful decay-resistant wood, from eastern hardwood forests in the USA. Although *Castanea dentata* and *C. sativa* are the main hosts, the fungus also attacks hardwood tree species such as *C. mollissima*, *Alnus cordata, Ostrya carpinifolia, Carpinus betulus, Quercus pubescens, Q. petraea, Q. frainetto* and *Q. ilex*. The fungus can infect only the above ground parts of trees, causing cankers that enlarge, girdle and kill branches and trunks. The native range of the fungus is Asia, but it is now widely distributed in Austria, Belgium, Bosnia, Croatia, China, France, Georgia, India, Japan, Republic of Korea, Canada, USA, Germany, Greece, Hungary, Italy, Macedonia, Poland, Portugal, Russia, Slovakia, Slovenia, Spain, Switzerland, Tunisia, Turkey, Taiwan, Ukraine and Yugoslavia.

Chestnut blight was first observed in the USA in 1904, when it infected the American chestnut (*C. dentata*). It is widely accepted that the fungus was inadvertently introduced into the USA through chestnut seedlings imported from Japan. The risk of transmission of the disease through imported fruits and seeds is apparently very small. Interestingly, Japanese chestnut trees (*C. crenata*), as well as some Chinese chestnut trees (*C. mollissima*), are resistant to the fungus. While they may also become infected, the fungus seldom kills the trees. In contrast, the American chestnut (*C. dentata*), growing for thousands of years free of parasites, had not developed a resistance to the pathogen, and succumbed easily to the disease. There has also been extensive spread of the pathogen on *C. sativa* in Europe from Italy since 1938. However, there is evidence that the pathogen is behaving less virulently in Europe than in the USA.

C. parasitica infection occurs most commonly at branch points, where movement creates small wounds that allow the pathogen to enter the tree. Entry into wood is also through wounds produced by insect vectors. Trees less than 50 cm in height are only rarely affected and disease incidence increases with plant size, presumably because of an increase in the number of potential wound entry sites. On young, smooth-barked branches, blight-infected patches are bright brown, in contrast to the olive-green colour of normal bark. On older stem infections, the discoloration is less obvious. When the cambium dies rapidly due to infection, a sunken area results, but where disease progress is slower, new layers of bark form under the affected areas and there is a certain amount of swelling and subsequent cracking of the outer bark; thus, the stem cankers can appear swollen or sunken. The bark covering swollen cankers is usually loose at the ends of the canker. Trees die back above the canker and may sprout below. Frass and webs from secondary insects are common under loose bark. Death of tree branches occurs when the cankers girdle the stem, disrupting phloem transport and cambial growth. The leaves of affected trees wilt and turn brown, but remaining hanging on the tree. As the pathogen cannot enter the root system, genets survive and new sprouts are produced from the collar region. Eventually, the new sprouts also become infected from the inoculum that survives on the affected plant parts. It has been observed that a chestnut tree can die in as few as four days after being infected with the blight fungus.Cankers are generally of two types: perennial and annual. Annual cankers live for only one year and the host forms calluses over the disease. Perennial cankers last for many years, resisting the host's attempt to heal.

Stem canker

Chest nut blight affected trees of *C. dentata*

C. parasitica forms yellowish or orange asexual fruiting bodies (pycnidia) about the size of a pin head on the older portion of cankers. Spores may exude from these pycnidia as orange, curled horns during moist weather. Numerous perithecia (sexual fruiting body), maturing in the stromata are also common on the infected bark surface. Ascospores will be discharged from these perithecia during periods of warm rain events in spring, summer and autumn. Discharged ascospores and conidia are spread by wind and rain, but are also transmitted by beetles (*Agrilus* spp.) and birds. The fungus can also exist as a saprobe on broad-leaved trees beyond its parasitic host range. Fan-shaped, buff-colored mycelial wefts are formed in the inner bark and cambium of affected trees. Perithecia of the fungus are reddish in color and produced in groups of 10-20 over the cankers. Ascospores are hyaline, two-celled, constricted at the septum, and 10 x 4 µm in size. Conidia is exuded in yellowish tendrils from pycnidia, straight or slightly curved, hyaline, 2-3 x 1 µm. Mycelium of the fungus can live up to 10 months in the dried bark. On fruits, the fungus is

associated only with the nutshell and apparently does not affect seed germination or seedling growth. Although the bark miner *Spulerina simploniella* (Lepidoptera: Gracilariidae) located in Greece is considered as an agent in disease spread, other insect vectors are not thought to play a very important role in the transmission of the disease.

Mycelial fans under the bark of *Castanea* spp

C. parasitica has had a negative cascading effect upon native forest composition and diversity throughout most of the USA since its introduction. The American chestnut, *C. dentata*, was a dominant overstorey species in hardwood forests of eastern USA prior to the introduction of the blight. In southern Appalachian forests, the loss of mature chestnuts may have substantially reduced the forests' carrying capacity for certain wildlife species. After the spread of *C. parasitica*, oak (*Quercus* spp.), red maple (*Acer rubrum*) and hickory (*Carya* spp.) became the dominant overstorey tree species. Today, chestnuts continue to be an important understorey species because of sprouts produced by extant tree root systems. However, infected sprout clusters exhibit reductions in survival and size, particularly when in competition with other hardwoods. Allelopathic qualities of chestnut leaves could have affected large areas of eastern forests. With the abundance of competitive tree and shrub species in the southern Appalachians, it is possible that allelopathy had an influence on maintaining chestnut's dominance in the region.

It is recommended that wood of *Castanea* or *Quercus* from countries where *C. parasitica* occurs should be debarked before export, or the origin of the wood should be from a disease-free area. Nursery stock should come from areas considered free of the disease during the last growing season. Disinfection in a 5% solution of 40% formaldehyde and a 5% solution of Na-pentachlorphenolate for 5 minutes should kill the fungus on wood. Seeds of *Castanea* from countries where the disease occurs should have been treated before export. Soaking fruits for 30 minutes in a 1-2% solution of formaldehyde would make seeds pathogen-free. A virus that attacks the fungus appears to the best hope for the future of *Castanea* spp. and the current research is focused primarily on this virus and variants of it for biological control. The use of hypovirulent strains of the fungus also offers some prospect for control. The application of the hypovirulent strain around developing lesions may enable these lesions to recover and can convert the virulent strain into a hypovirulent strain. This method has been widely applied in France and Italy. Breeding for resistance to the disease is also underway with some success.

Hypovirulence treatment on *C.dentata*

News column

Climate change, a big win for weeds

Climate change will open new windows of opportunity for weeds to do what they do best invade. Many of the 3,000 foreign plant species now established as weeds in Australia could explode into new areas as current climatic limits on them are lifted, says scientists at CSIRO and Weeds CRC, Australia. Not only will increased temperatures allow northern weeds to move south, for example, frost-intolerant species such as rubber vine and Siam weed, but lowland weeds will also do better at higher altitudes where conditions have previously been too cold for them, said Dr Rachel McFadyen, noted Australian weed scientist. Worse still, some plants that are present in Australia, but have not yet behaved as weeds (the so-called "sleeper weeds") could burst onto the weeds scene and cost millions to control. She predicted serious economic impacts if ways to control them are not found. Although most plants will retreat in the face of changed conditions, the weedier ones will thrive and rapidly invade any new available space created by extreme events such as fire, floods and storms. Dr Darren Kriticos (CSIRO) said that climate modelling had progressed sufficiently for weed scientists around the world to start using these models to predict how known weeds might expand their range in response to climate change. According to the scientists, increasing levels of Co_2 will also directly affect plants, apart from any advantage or disadvantage caused by rising temperatures. There is more than one way that plants generate energy from sunlight, and that plants with the 'C3' energy system, such as parthenium, will do better under higher Co_2 levels.

Katrina, Rita caused forestry disaster

New satellite imaging has revealed that hurricanes Katrina and Rita produced the largest single forestry disaster on record in the USA. The hurricanes killed or severely damaged about 320 million trees in Mississippi and Louisiana. The die-off, caused initially by wind and later by weeks-long pooling of stagnant water, added significantly to the global greenhouse gas buildup putting much carbon from dying vegetation into the air. The total amount of carbon released is estimated to be about 100 million

tons, equal to the amount that all the trees in the United States take out of the atmosphere in a year. In addition, the death of so many trees has opened vast and sometimes fragile tracts to several aggressive and fast-growing exotic species that are already squeezing out far more environmentally productive native species yet another challenge to deal with.

Near East Network for Forest Health and Invasive Species (NENFHIS) established

Representatives of twelve countries from the Near East Region (Algeria, Cyprus, Egypt, Iran, Lebanon, Libya, Morocco, Saudi Arabia, Syria, Turkey, Tunisia and Yemen) participated in an expert meeting held in Hammamet, Tunisia during 11-13 December 2007 to establish a Forest Health and Invasive Species Network for the Near East Region. The meeting was jointly organized by the General Directorate of Forests in Tunisia and FAO. Resource persons in the meeting included Coordinators of the Forest Invasive Species Network for Africa (FISNA) and the Asia-Pacific Forest Invasive Species Network (APFISN) and representatives of USDA Forest Service and Canadian Forest Service. The meeting unanimously agreed to the establishment of the Network with the following mission statement "the network seeks to promote collaboration, sharing of expertise and information and implementation of projects to mitigate the adverse effects of biological invasion and subsequent impacts and declining health of forest ecosystems for mutual benefit of member countries". Membership of the Network is open to all members of the Near East Forestry Commissionwith associate membership for other countries/organizations. Mr. Samir Belhaj Salah, Forest Protection Officer, Tunisia is the interim Coordinator of the Network. Members of the provisional Executive Committee of the network included Algeria, Cyprus, Egypt, Iran, Lebanon, Libya, Morocco, Saudi Arabia, Syria and Yemen.

New publications

Palmer, W.A., and K.A.D.W. Senaratne. 2007. The host range and biology of *Cometaster pyrula*; a biocontrol agent for *Acacia nilotica* subsp. *indica* in Australia. Biocontrol, 52: 129-143.

Palmer, W.A., Lockett, C.J., Senaratne, K.A.D.W and A. McLennan. 2007. The introduction and release of *Chiasmia inconspicua* and *C. assimilis* (Lepidoptera: Geometridae) for the biological control of *Acacia nilotica* in Australia. Biological Control, 41: 368-378.

Dhileepan, K., Trevino, M., and E.L. Snow. 2007. Specificity of *Carvalhotingis visenda* (Hemiptera: Tingidae) as a biological control agent for cat's claw creeper *Macfadyena unguis-cati* (Bignoniaceae) in Australia. Biological Control, 41: 283-290.

Ellison, C. A., Evans, H. C., Djeddour, D. H and S.E. Thomas. 2008. Biology and host range of the rust fungus *Puccinia spegazzinii*: A new classical biological control agent for the invasive, alien weed *Mikania micrantha* in Asia. Biological Control, 45: 133-145.

Lu, B., Tang, C., Peng, Z., Salle, J.L and Fanghao Wan. 2008. Biological assessment in quarantine of *Asecodes hispinarum* Bouèek (Hymenoptera: Eulophidae) as an imported biological control agent of *Brontispa longissima* (Gestro) (Coleoptera: Hispidae) in Hainan, China. Biological Control, 45: 29-35.

Anderson, J.V. 2008. Emerging technologies: An opportunity for weed biology research. Weed Science, 56: 281-282.

Recent Books

Classical Biological Control of *Bemisia tabaci* in the United States. A Review of Interagency Research and Implementation: Eds. JuliGould, Kim Hoelmer and John Goolsby, Springer, 2008. This book reviews the interagency research and development effort on classical biological control in the USA from 1992-2002. The successful exploration, importation, screening, evaluation, rearing, and establishment of at least five exotic *Bemisia tabaci* natural enemies in rapid response to the devastating infestations in the USA is a landmark in interagency cooperation and coordination of multiple disciplines. In this volume, authors present detailed reviews of natural enemy exploration, introduction, and evaluation efforts that will serve as a guide to support and

encourage classical biological control inputs into other integrated pest management systems.

From Biological Control to Invasion: the Ladybird *Harmonia axyridis* as a Model Species. Eds. Helen E. Roy and Eric Wajnberg, Springer, 2008. *Harmonia axyridis* has been described as the most invasive ladybird on earth. It has a long history of use as a classical biological control agent in the USA and more recently in Europe. This beetle has been effective at controlling pest insects in a variety of crop systems but it poses unacceptable risks by impacting on non-target species as both an intraguild predator and competitor. Written by renowned scientists, this book is a synthesis of recent research on *H. axyridis* and provides informative insights into current perspectives and future directions. Biological control is an essential component of sustainable agriculture but the distinction between a successful biological control agent and an invasive species can be narrow.

Invasive Plants: A Guide to Identification, Impacts, and Control of Common North American Species. By Sylvan Ramsey Kaufman and Wallace Kaufman, Stackpole Books, 2007. This is an easy-to-use, wide-ranging guide to invasive plants in North America. It features full-color photos and descriptions of some 175 alien species both terrestrial and aquatic that are in some cases changing the landscape to an almost unimaginable degree. The accompanying text describes the plant's environmental and economic impacts as well as management techniques used to control it. The book also includes an explanation of what an invasive species and a step-by-step identification key.

Forthcoming Symposia / Workshops

28 April - 2 May 2008. 2008 NASA Carbon Cycle and Ecosystems Joint Science Workshop, Adelphi, MD, USA. The scope of this workshop includes all of the research and application areas within the carbon cycle and ecosystems focus area: terrestrial ecology, land cover and land use change, ocean biology and biogeochemistry, biodiversity, carbon management, invasive species, ecological forecasting and agricultural efficiency. The goals of the workshop are to foster interactions among funded researchers within and across the focus area disciplines, to share information about research results and progress, and to discuss future plans and direction for the focus area. Contact: meeting_support@cce.nasa.gov

26 - 30 May 2008. 2nd meeting of IUFRO Working Unit 7.03.12, Shepherdstown, WV, USA. This conference covers all taxa, with the focus on pathways and mitigations to prevent the spread of invasive species. Proposed oral sessions include: 1) Mitigating pathways for movement of invasive species; 2) Predicting which pests will be invasive; 3) Early detection and rapid response systems; 4) Information sharing systems; 5) Mitigation measures; 6) Biological control; 7) Impacts of invasive species around the globe; 8) Restoration of natural ecosystems. Contact: kbritton01@fs.fed.us

Compiled and edited by Dr. K. V. Sankaran, APFISN Co-ordinator on behalf of the Asia-Pacific Forest Invasive Species Network. For more information on the APFISN, please contact your national focal point or the APFISN Co-ordinator or Mr. Patrick Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok. Email: patrick.durst@fao.org