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General News

Japanese Knotweed Biocontrol is News in the UK

Approval in early March 2010 by Defra (UK Department of Environment, Food and Rural Affairs) for release of the psyllid *Aphalara itadori* against Japanese knotweed (*Fallopia japonica*) in England received widespread media coverage, including features on prime-time national television and radio and most national papers. The psyllid is the first biocontrol agent to receive approval for release against a weed not only in the UK but in Europe. Getting this far has meant persuading the generally risk-averse population and their representatives that classical biological control is a safe and viable weed control option. This article looks at how the media greeted the news.

CABI scientists and colleagues in Japan spent six years selecting the best agent from almost 200 insect and 40 fungal species from Japan using 90 British native and crop species for their safety screens. The process of testing and rejecting was explained in a dossier that underlined the focus on safety – one of a range of documents made available via the CABI website as part of its engagement with the public. CABI's Japanese knotweed team, led by Dick Shaw, also spent over a decade tramping the country, speaking to local government, industry and interest groups, raising awareness of biological control and its potential for weed management.

Announcing approval for release in England, Defra minister Huw Irranca-Davies said: "This project is not only ground-breaking, it offers real hope that we can redress the balance." In late March, the Welsh Environment Minister also gave approval for its release in Wales.

Given that the British are not famed for trusting their Government, it was reassuring that media coverage was overwhelmingly fair, if often sceptical. Articles highlighted Japanese knotweed's economic and environmental impacts with examples of structural damage and control costs widely reported: the "scourge of gardeners and builders alike" (Fiona Harvey, *Financial Times*, 8 March). Some journalists highlighted problems it has posed during construction of the 2010 Olympic site in east London; some noted that the World Conservation Union lists it as one of the world's 100 most invasive species. The *Daily Telegraph* (which gave extensive coverage of the Japanese knotweed story) carried an article (Richard Gray, 13 March) on difficulties people have begun experiencing in obtaining mortgages for properties deemed to be threatened by Japanese knotweed.

The role of natural-enemy release in the weediness of Japanese knotweed in the UK was noted in several articles. Journalists generally acknowledged the exacting nature of the testing procedure to ensure the agent was safe to release. In a very positive article, the BBC (Rebecca Morelle, 9 March, online) outlined the peer-review process, and the safety measures in place to contain the releases in the event of unexpected non-target impacts. Most articles quoted both supporters and detractors of biological control and wholly negative newspaper articles were rare. In regional terms, responses to approval for release of *A. itadori* in Wales were less equivocal than in England. For example, while the news was greeted "with caution in Cumbria" (*Westmorland Gazette*, 12 March) the Welsh *Milford Mercury* (1 April) said "Measures to tackle knotweed welcome."

Despite the outreach efforts by CABI, including many media interviews by Dick Shaw and a Viewpoint article by CABI's Chief Scientist on the BBC website (Matthew Cock, 9 March), some messages did not strike home.

Most articles referred to the host-specificity testing results as pivotal for approving the psyllid's release, and gave examples of invasive problems from past unregulated introductions. Nevertheless, most failed to distinguish biocontrol introductions made after testing from introductions made for other purposes without (or with inadequate) prior risk assessment. Alongside the cane toad, which reared its head almost ubiquitously as a biocontrol agent 'gone wrong', were alien introductions that had nothing to do with biological control, such as grey squirrel. Ironically, *Harmonia axyridis* was not identified as an escaped biocontrol agent; the only reference this author found to it was as an invasive alien.

Doubts were expressed about *A. itadori*'s specificity in the long term, suggesting the testing process was either not understood or not believed. The *Daily Telegraph* (Michael Leapman, 9 March) gave a good account of Japanese knotweed and other invasive horticultural escapees, but, after explaining that "each individual species [of psyllid] feeds on only one kind of plant" (a point also made in a separate article about the psyllid in the same paper [Louise Gray, 9 March]), expressed concern that "many creatures are adept at changing habits to fit in with a new environment." This fear that the psyllid will switch to new hosts once/if Japanese knotweed populations decline was commonly expressed.

The successful and safe record of weed biocontrol in other parts of the world generally received at best passing comment. A frequent view of classical biological control as a whole was that "it has been done elsewhere in the world with mixed results" (L. Gray, *Daily Telegraph,* 9 March). The *Guardian* (Juliette Jowit, 9 March) strove to achieve balance; although critical of "human interventions in the natural world" it added a comment, ascribed to the Global Invasive Species Programme, that "despite a few well-known failures, a third of biological control programmes … were judged successes". *Scotland on Sunday* (Jenny Fyall, 21 March) was more critical, and perhaps more typical: "In the past most introductions of alien species for pest control in other parts of the world have ended disastrously", citing thistle weevils in the USA, as well as... the cane toad.

The *Guardian* (Jowit, 9 March), was rare in acknowledging that classical biological control is not entirely new in the UK, citing the introduction of *Rhizophagus grandis* against spruce bark beetle in the 1980s. More typically, the *Daily Telegraph* (Leapman, 9 March) felt that "Biological control … is at its most effective and manageable in confined spaces", citing the use of predatory mites in greenhouses, and nematodes against slugs and snails "over a limited area of the vegetable garden" but that "Letting flocks of tiny insects loose to blow in the wind seems altogether more reckless".

Generally, the treatment of the news of *A. itadori*'s release in the mainstream media was fair. In contrast, bloggers were less balanced in their expressed views; although some were well informed, others were not (but that is another story). Over the years, at least partly through CABI's public engagement efforts, there have been repeated reports in the UK press about the build-up to this release, so that many environmental correspondents had been exposed to the concept already. This was probably an important precursor to receiving fair coverage.

Cassava Mealybug Has Reached Asia

In May 2009, the Department of Agriculture at Chatuchak, Bangkok, Thailand contacted the International Institute of Tropical Agriculture (IITA) in Benin for help in the biological control of the cassava mealybug, *Phenacoccus manihoti*, which had recently invaded Thailand and probably also Laos and Cambodia. By then, this mealybug had already spread across 160,000 ha in the eastern and northeastern provinces of Thailand, where cassava is an important export crop, mainly for starch production and cattle feed. Following pressure from the farmers and the Thai Tapioca Development Institute, including four other private sector associations (the Thai Tapioca Trade Association, the Thai Tapioca Processors Association, the Northeast Tapioca Processing Plants Association, and the Thai Tapioca Starch Producers Association), the government authorities became concerned about the high economic impact of this new pest. In fact, the forecast for cassava production was reduced to only 22.21 million tonnes for the 2009–10 harvest season, down from an earlier forecast of 27.76 million tonnes. This predicted loss was attributed to the devastation caused by cassava mealybug.

This same mealybug had reached Africa in the 1970s and caused widespread devastation and even famine when it destroyed cassava, which on that continent is an important food and locally traded subsistence crop. At the time, an IITA-led group of institutions, including CABI, CIAT (International Center for Tropical Agriculture), EMBRAPA (Brazilian Agricultural Research Corporation), the Agricultural Ministry of Paraguay, and the numerous agricultural ministries of the 20 or so concerned African countries under the umbrella of the Phytosanitary Council of the Organization of African Unity, had started a campaign to find, import, rear and distribute adapted natural enemies from South America, the purported home of this foreign invader. By 1981, the encyrtid parasitoid *Anagyrus lopezi* (then *Apoanagyrus* or *Epidinocarsis*) had been located in Paraguay, later in Brazil, shipped through quarantine, mass-reared at IITA-Nigeria and distributed. What followed was one of the greatest recent successes in classical biological control. By 1995, when the whole continent was invaded by the cassava mealybug, *A. lopezi* had been released at about 150 sites, where it established and from where it spread throughout all cassava-growing countries of sub-Saharan Africa[1]. In each country, within 2–4 years of its establishment, mealybug populations fell by ten times or more to non-economic levels, producing economic benefits of billions of dollars (depending on which scenario of benefit calculation was adopted)[2]. Other natural enemies were also released; some established, but none became important. Interestingly, *A. lopezi*, an uncommon parasitoid found in South America in a rather limited area of the Rio de la Plata basin, had been able to establish in Africa in all ecological zones, from the dry Sahel through the Congo rainforest to the East African highlands. The only places where control was not satisfactory and where *A. lopezi* was not considered effective were unmulched fields on very sandy soils. In these places, only better soil management was able to improve the situation.

In the beginning, the rate of spread of mealybug in Africa was around 150 km per year, but once *A. lopezi* had reached the front, further spread of the mealybug slowed considerably. Thanks to good quarantine services, Madagascar and neighbouring islands of the Indian Ocean remained free of this pest and onward spread seem to have been halted – that was, until the discovery of cassava mealybug in Asia last year. By 2009, the pest had already spread widely in Thailand, so that it must be assumed that the actual introduction had occurred some time in 2008 or perhaps earlier. The new invader was not immediately recognized because another closely related mealybug species common on cassava in Thailand, presumably *Phenacoccus madeirensis,* confused the situation. Once the invader had been identified by a taxonomic authority in the California Department of Food and Agriculture, USA (Dr Gillian Watson), the path for classical biological control was cleared. *Anagyrus lopezi* was imported from IITA-Benin into Thailand in September 2009 and reared under quarantine conditions at the Department of Agriculture, Bangkok, with a view to releasing the insect once release permits were issued. This happened in November 2009. Since then, about 2000 pairs of *A. lopezi* have been released on 100 ha of cassava at the Rayong Field Crop Center. In January 2010, more than 6000 adults were collected and re-released nearby. Currently, three rearing units are being constructed in the outbreak areas located in the east, northeast and central plain of the country.

Conditions in Thailand are rather unlike those in Africa. Cassava varieties and the economics of cassava production are different, and herbicides and insecticides are largely available to farmers and often used indiscriminately. At the species level, the local food webs also differ from those in Africa. A monitoring programme was thus set up.

Though mite pests were also discovered on cassava, these proved to be local *Mononychellus* (in the northern part of the country) and other species. However, the feared cassava green mite *Mononychellus tanajoa* from South America, which led to an equally important biological control programme across Africa, does not seem to have reached Asia yet.

It is hoped that by extending the collaboration that was so successful in Africa to Asia, the exotic mealybug will be controlled within a much shorter time span and at much reduced costs.

Recent press articles have reported mealybug damage to cassava in Banteay Meanchey Province in western Cambodia, ascribing this to the spread of *P. manihoti* across the Thai border. The cassava sector would like to see a swift response to what may rapidly become a serious threat to their industry. However, the species involved has not been yet identified and it is important that this is done quickly. As in the case of Thailand, before biocontrol agent introductions are set in motion, a preliminary risk assessment should be made and basic biological data collected about the food web of insects already associated with the mealybugs. This would inform a strategy decision, which should be made by the responsible authority in Cambodia, and allow post-release impact of introduced agents to be assessed.

[1]Neuenschwander, P. (2001) Biological control of the cassava mealybug in Africa: a review. *Biological Control* 21, 214–229.

[2]Neuenschwander, P. (2004) Harnessing nature in Africa. *Nature* 432, 801–802.

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Fighting Back at the Erythrina Gall-forming Wasp with a Natural Enemy

The *Erythrina* gall wasp (EGW), *Quadrastichus erythrinae*, was first described by Kim and co-authors in 2004 (*Journal of Hymenoptera Research* 13, 243–249) from specimens collected in Mauritius, Reunion, and Singapore. EGW was later found in Taiwan, then Florida and many other countries in Asia and the Pacific. A eulophid gall-former, it was inadvertently introduced into Hawaii in April 2005. Subsequently, it spread throughout the state causing onslaught and near decimation of native and introduced *Erythrina* trees. A gravid female deposits its eggs into the young leaves, petioles, and stems of the host trees. The larvae develop within the plant tissues thus resulting in the formation of galls, curling of leaves and swelling of shoots. Severe wasp infestation eventually leads to the death of affected trees.

At the onset, Hawaii government agencies and other pest practitioners employed various control methods, such as tree trimming, drenching, spraying and chemical injection, to control the wasp pest but to no avail. Consequently, the Plant Pest Control Branch of the Hawaii Department of Agriculture (HDOA) opted for classical biological control to mitigate the impact and further decimation of the *Erythrina* trees. In December 2005, a natural enemy of the wasp pest, *Eurytoma erythrinae*, was collected in Tanzania in East Africa. It was shipped back to the HDOA Insect Containment Facility where it was evaluated further to determine if it posed any potential threat to non-target organisms and native fauna in Hawaii. Subsequently, it was approved for release in Hawaii by the federal and state regulatory agencies.

An ectoparasitoid, *E. erythrinae* inserts its eggs into the plant tissue where a newly-hatched larva bores through to access the developing immature of the host pest inside the larval chamber. The parasitoid feeds and continues to prey on one or more hosts as it grows and matures. More often than not, the parasitoid larva will tunnel from gall to gall in order to satiate its need for additional food. This behaviour makes *E. erythrinae* a desirable biocontrol agent because its feeding causes the demise of multiple pest individuals.

Initial releases of the parasitoid throughout the state were commenced in November 2008. From all indications, the parasitoid is an effective biocontrol agent because more than a year after it was liberated, the unprecedented spread and persistent infestation by the gall-forming wasp has been considerably slowed down and largely thwarted. Sustained monitoring of wasp infestation on the *Erythrina* trees combined with dissection of gall deformities showed that the parasitoid is now widespread throughout the island chain, that trees have continued to bounce back with full, clean canopy, and that the parasitoid has caused as high as 90% mortality of the wasp pest.

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Biocontrol Agents Fly Through X-Ray Scans

In the movie and comic book The Incredible Hulk, Dr Bruce Banner, is exposed to a high level of gamma rays during an experiment gone wrong, and transforms into a giant green-skinned hulk whenever his pulse rate gets too high. In real life, irradiation –

using gamma rays from an isotope source such as cobalt or x-rays from a machine source – has many useful applications including medical imaging, sterilization of medical devices, polymer cross-linking, destruction of food borne pathogens, and disinfesting quarantine pests in exported commodities. Since 9/11, intensive baggage scans using various cabinet x-ray systems have become routine. In the USA, carry-on baggage of airport travellers is examined using Threat Image Protection Ready X-ray (TRX) systems located at passenger check points, whereas check-in baggage is screened using Explosive Detection System (EDS) x-ray equipment. The EDS equipment uses Computer-Aided Tomography (CAT scan) technology to produce a three-dimensional image and has the potential for producing higher radiation outputs than the TRX machines. Similar x-ray scan systems are used in other countries. The increased use of x-ray scanning has prompted many biological control practitioners to ask about possible harmful effects of x-ray radiation on shipments of live biological material, such as biological control agents. The important thing to know up front is that baggage x-ray scans expose biological materials to doses far below those that might have any harmful effects. A primer on radiation biology will help lend perspective on this issue.

The amount of energy absorbed by the insect is called absorbed dose and is expressed in units of gray (Gy). Equal doses of all types of ionizing radiation are not equally harmful. To account for differences, radiation dose is expressed as equivalent dose in units of sievert (Sv). The dose in Sv is equal to the absorbed dose multiplied by a radiation weighting factor. X-rays and gamma rays have a weighting factor of 1, so absorbed dose in Gy is equal to the same number in Sv. In older literature, the units of measurement were rads and rems, which are equivalent to Gy and Sv multiplied by 100 (1 Gy = 100 rads).

Insect response to irradiation has been studied for many years. Most studies of insect radio-tolerance have focused on determining doses that prevent adult emergence or sterilize the adult and thereby prevent reproduction. This information is used to develop sterile insect release programmes or to develop quarantine treatments to control insects. Insects are fully sterilized at doses between about 50 and 400 Gy. The dose required depends on many factors including insect life stage, sex, and taxonomic group. Several of the most radio-tolerant insects are Lepidoptera, and Lepidoptera are generally more tolerant than Coleoptera and Diptera. Little information is available for parasitic Hymenoptera but they probably fall on the lower end of the radio-tolerance spectrum. For example, the fruit fly parasitoid *Biosteres longicaudatus* was sterilized at 100 Gy. Another hymenopteran, the big-headed ant *Pheidole megacephala*, was sterilized at 90 Gy.

The Threshold Limit Value (TLV) is the level of radiation to which it is believed a worker can be exposed day after day for a working lifetime without adverse effects. This is an important number to calculate for the occupational health of people who work near a source of radiation, such as medical x-ray technicians. An acute TLV for insects would be helpful for evaluating the risk of exposure to x-ray scans. However, insect irradiation studies normally involve application of radiation doses within the range that produce a desired response (e.g. sterility), and seldom report information on threshold doses, i.e., doses that cause no measurable effects on insect reproduction or fitness. An acute TLV is likely highly variable depending on the species of insect and other factors. For example, a radiation dose of 20 Gy applied to third instars reduced the number of Mediterranean fruit flies (*Ceratitis capitata*) emerging as adults by 90% but had no effect on melon fly (*Bactrocera cucurbitae*) adult emergence compared with untreated controls, although both are tephritids; and a radiation dose of 60 Gy completely sterilized the diaspidid coconut scale (*Aspidiotus destructor*) but had no measurable effect on white peach scale (*Pseudaulacaspis pentagona*) (another diaspidid) reproduction compared with untreated controls. From this information we could estimate the TLV for the most sensitive insects at about 1–5 Gy, meaning a dose in this range would have no adverse effects on insect survival and reproduction. By comparison, an acute exposure dose of 5 Gy to a human would be lethal. Insects are many times more tolerant of irradiation than humans.

The radiation dose typically received by objects scanned by a cabinet x-ray system is 0.01 mSv (0.00001 Gy) or less. This dose is about 1/100,000th of the TLV we estimated above for the most sensitive insect (1 Gy). The level of radiation exposure from a check-in baggage x-ray scanner (CAT scan) is about ten times higher or 0.0001 Gy, but still harmless. Insects and humans alike are exposed to background irradiation from natural sources, such as radon gas, the radioactive isotope ^{40}K inside the body, outer space, rocks, and soil, averaging about 0.000008 Gy per day (0.008 mSv/day, 2.9 mSv/year). If you are sending your biological material by air, the radiation dose received during a typical transoceanic flight is 0.00004 Gy (0.04 mSv), or about four times the dose received during a carry-on baggage scan. At any rate, your insects are safe from any harm from x-ray scan procedures at the airport or any natural exposure to ionizing radiation, even if they were flown from Chernobyl to Three-Mile Island during a solar flare. But just in case, don't chase irradiated insects around the lab, or put them on a flight mill, or otherwise elevate their pulse rates!

Follett, P.A. (2009) Generic radiation quarantine treatments: The next steps. *Journal of Economic Entomology* 102, 1399–1406.

Food and Drug Administration (FDA) (2010) Frequently asked questions on cabinet x-ray systems.
Web: www.fda.gov/Radiation-Emitting Products/RadiationEmittingProductsand Procedures/SecuritySystems/ucm116421.htm

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Local Solution for Coffee Green Scales in PNG?

A project funded by ACIAR (Australian Centre for International Agricultural Research) in Papua New Guinea (PNG) has shown that local natural enemies are able to control invasive alien coffee green scales, *Coccus* spp., effectively under the right conditions. The project, which was conducted by CABI, the Research and Grower Services Division ((R&GSD) of the PNG Coffee Industry Corporation (CIC) and the Wildlife Conservation Society (WCS) PNG Office, set out to improve smallholder returns from coffee production through participatory improvements to integrated control of *Coccus* spp. Awareness among smallholders about the scales was found to be low, with many ascribing the damage from scales to the ants that attend them. Surveys have shown that the major ant species are also invasive aliens.

Experimental studies indicated that a number of factors are implicated in *Coccus* spp. outbreaks, including shade and local natural enemies. Ant-exclusion experiments indicated that banding to keep the exotic ants from tending the scales allowed native predators to reduce scale populations to insignificant levels. The suggested next step is to investigate whether this is economically viable for PNG's smallholder coffee farmers.

An exotic parasitoid, the encyrtid *Metaphycus baruensis*, was introduced and established under an earlier classical biological control programme in the 1980s, but its impact in unclear. Thus, under this ACIAR-funded project, an exotic pupal parasitoid, *Diversinervus stramineus*, was introduced into quarantine in PNG, although it has not been released, and national capacity for undertaking CBC was increased. A recommendation of the final project report[1] is that although CBC options can be considered, the relevant authorities in PNG need to decide on the relative merits of introducing agents when effective local natural enemies exist.

[1]Murphy, S.T., Brook, A., Shaw, R., Shaw, W., and staff of R&GSD, CIC and WCS, PNG (2010) Sustainable management of coffee green scales in Papua New Guinea. Final report. ACIAR, Canberra, Australia.

Landcare Research News

The latest newsletter from Landcare Research's weed biological control programme[1] includes news of a breakthrough for New Zealand in Chilean needle grass (*Nassella neesiana*) biocontrol. The project was already going well for Australia: an isolate of the most promising natural enemy, the rust fungus *Uromyces pencanus* (UP27) had been found that was able to infect Chilean needle grass from six out of seven of the Australian populations tested. However, UP27 did not attack any of the plants grown from seed sent from the north island of New Zealand, so the New Zealanders thought they would need a different isolate to solve their problems with the weed. However, recently, Chilean needle grass plants originating from the south island of New Zealand were tested in Argentina for the first time, and these were found to be susceptible to isolate UP27. This was a great leap forward, as the largest and most serious infestations in New Zealand are around Marlborough (south island). *Uromyces pencanus* is capable of severely debilitating plants in the laboratory and in the field in its native Argentina.

The high specificity of the rust has an up-side: UP27 is currently undergoing host range testing, and so far it has not caused rust pustules on any of the 43 non-target grass species tested, not even the congeneric weed *N. trichotoma*. There are still more plants to be tested to meet the requirements of Australian authorities, but enough has been done already for permission to be sought for the release of the rust into New Zealand. If *U. pencanus* is approved for release in either country, it will be a 'world first' for a biocontrol agent to be used against a grass.

Landcare Research has devoted a good deal of thought and effort to the issue of post-release assessment. In the same newsletter issue, Simon Fowler acknowledges that "While detailed population and ecosystem-level studies represent the ultimate goal ... in reality it is never going to be feasible to undertake many of these," but adds that, "Simpler, more affordable approaches to assessment if done well and repeated across the country should be able to satisfy the needs of many organisations involved in biocontrol". A Landcare Research-led two-day workshop in September 2009 proposed a hierarchical approach to assessment, starting simply and becoming increasingly more complex and expensive; how far people proceed depends on the results they are getting, available resources, and the level of proof required. This framework provides ideas for biocontrol scientists everywhere.

The first and universal step is to find out whether or not the agent has established; this may take years to ascertain. Only when an agent becomes common is it appropriate to take the next step, which is to measure abundance or damage, depending on the species. If populations are found to be large, or damage obvious, then the next step is triggered, which is to look at what it means for the weed population. This is where, historically, things have come unstuck because of the work (=resources) involved in data collection. Technological advancement provides new options, notably photography. Although there are limitations, imaging and data-handling software allow differences over time to be analysed. For situations where such technology is not the answer, socioeconomic tools such as landowner satisfaction and cost-saving surveys may be able to provide a good deal of useful feedback and data. While not scientifically perfect, such measurements of how an agent has performed are a decided improvement on doing nothing.

Source/further information: *What's New in Biological Control of Weeds?* No. 51 (February 2010). Landcare Research New Zealand Ltd 2010.
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SP-IPM Newsletter

The CGIAR (Consultative Group on International Agricultural Research) Systemwide Program on Integrated Pest Management (SP-IPM) second quarterly newsletter has been issued, and can be downloaded from: www.spipm.cgiar.org. Amongst content is an item on the IOBC (International Organization for Biological Control) initiative on biological control and access & benefit sharing: 'Is the CBD promoting environmentally friendly solutions to pest control?', and another on plans for *Fusarium oxysporum* f.sp. *strigae* as a mycoherbicide (Foxy2) for *Striga* control: 'MTA signed to launch mycoherbicide in Kenya'.

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CABI Invasives Blog

The CABI invasives team has established a Blog (http://cabiblog.typepad.com/invasives) to provide opportunities for scientists at its regional centres to highlight their research and debate topical issues in the field of invasive species. By doing this, they hope to spark wider debate in the field of invasive species, whilst ultimately working towards the reduction in occurrence and impact of invasive species across the globe through awareness raising and dissemination of scientific information and experiences.

Conference Reports

ANBP Focused on Regulatory Changes

For the past two years, the US-based ANBP (Association of Natural Biocontrol Producers) has been anticipating changes to USDA-APHIS-PPQ (US Department of Agriculture – Animal and Plant Health Inspection Service – Plant Protection and Quarantine) regulatory rules and policies that will possibly affect the movement of beneficial organisms in North America. It has also been interested in fostering a more productive dialogue with other agencies that have affected movements of some beneficials (US Fish and Wildlife Service; USFWS), or may be able to streamline foreign shipments (USDA-APHIS-Veterinary Service). Consequently, ANBP held its 2009 Fall Meeting on 27 October in Greenbelt, Maryland, close to offices for USDA-APHIS-PPQ, with ANBP members encouraged to attend, on a first-come, first-serve basis, with a limit of 25 people to keep the meeting focused and informal.

The meeting began with a welcome by ANBP President Kim Gallagher Horton and was followed by an overview of the current status of the commercial insectary industry in North America. This discussion was led by ANBP Board Member René Ruiter, who emphasized the breadth of the markets served, logistical issues, the importance of timely permit processing, and concern over potential changes to the process in the coming year. Brian Spencer, ANBP Board representative to the NAPPO (North American Plant Protection Organization) Biological Control Committee, followed with ANBP concerns over how NAPPO guidelines might affect the augmentation industry, and how they could help facilitate some of the movement issues. A main topic of discussion at the 2009 panel meeting concerned non-*Apis* pollinators.

Dr Shirley Wager-Pagé, Chief of the Pest Permitting Branch at USDA-APHIS-PPQ, then gave an informative presentation that outlined current APHIS policies concerning the movement of organisms, and more importantly, how the public, including ANBP, will be able to provide input to proposed changes in 2010. Three areas that will be addressed in these are: the exemption of certain organisms from interstate movement permit requirements; a tiered approach to formulating permit conditions for the movement and release of biocontrol organisms; and changes to the biocontainment facilities (inspection, approval and maintenance processes). Most importantly, she highlighted the importance of being aware of the comment period when these proposed changes are published; two public meetings will be held prior to that event. Public comment will be critical and ANBP, along with many other biological control groups, will be watching for these announced changes. Dr Wager-Pagé was joined by Dr Robert Tichenor, who handles the permits for entomophagous biological control and is also on the NAPPO Biological Control Committee. He discussed the current permitting issues and encouraged communication from ANBP about any permit-related questions.

Rounding out the meeting were representatives from two agencies that also impact the movement of beneficials. Dr Thomas Letonja, USDA-APHIS-Veterinary Services, was eager to learn about the biocontrol industry and how the Veterinary Service might help. This unit could be helpful in developing some form of 'certificate of purity' or similar document to help exports. ANBP will maintain links with his office and pursue this promising area. Mr David Sykes, USFWS, addressed the meeting next, and learnt about what ANBP does and how USFWS has been impacting some shipments. For the past few years, USFWS has been stopping/delaying shipments of dead *Ephestia kueniella* eggs, which have been used for decades to produce several beneficial insects; they are frozen and shipped express to US insectaries and universities. While USFWS does not regulate 'farm-raised' insects like mealworms and crickets, they are not recognizing *E. kueniella* as such, and are charging additional fees for moving these products. Why the relatively recent scrutiny of a product that is clearly not 'wildlife' is a question ANBP is actively pursuing. Mr Sykes shared ANBP's concern and, most importantly, alerted the meeting to the fact that USFWS is also reworking its regulations and policies this year. ANBP will be watching this process and providing input when it can, as it would like to ensure that its products are on the USFWS list of 'exempt' organisms, and clearly defined as farm-raised. Further developments on regulatory developments will be posted on the ANBP website (www.anbp.org).

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BIOCICON 2009

The Second Biopesticides International Conference, BIOCICON 2009, which was held on 26–28 November 2009 at St Xavier's College, Palayamkottai in Tamil Nadu, India, attracted over 255 delegates from Bulgaria, Nigeria, USA, Thailand, Indonesia, Malaysia and India. The main topics of the conference were: pests, microbes, natural enemies, botanicals and biotechnology-product developments; 136 research papers were presented in oral and poster sessions. The conference opened with a welcome speech followed by the inaugural address delivered by Dr P. Murugesa Boopathi who advocated the importance of looking into biopesticides to reduce crop damage. He released the abstract volume containing invited lectures and 244 pages of abstracts. Introducing the theme of the conference, K. Sahayaraj, the Organizing Secretary emphasized the need for utilizing locally available pesticidal plants, and natural enemies in pest management, to increase agricultural productivity.

In the pest session, P. Usha Rani spoke about *Trichogramma* as a living biopesticide. Other presentations dealt with: the biology of *Spalgis epius* and *Hyposidra* spp. in tea: the diversity and distribution of lepidopteran insect pests, and a fruit-piercing moth of agri-horticultural ecosystems and guava; the incidence of shoot borer in turmeric in Tamil Nadu; and *Earias vitella* and *Spodoptera litura* in *Bt* (*Bacillus thuringiensis*) and non-*Bt* cotton, respectively.

Two invited lectures were given in the microbe session by Ananda Mukhopadhyay, and K. Narayanan. The roles of various microorganisms – bacteria, endophytic bacteria, fungi, arbuscular mycorrhizae, nematodes and a microsporidian parasite isolated from *Papilio demoleus* – were considered. Commercial microbiocides like NPVs (nuclear polyhedrosis viruses), *Bt* and HaGV (*Helicoverpa armigera* granulovirus) impacts against economically important insect and also against nematode pests were elaborated. A few new indigenous bacterial isolates and nematodes were recorded. The compatibility of fungal biopesticides with commonly used insecticides for cotton pest management was also discussed.

In the natural enemy session, Prof. Kandasamy's invited lecture was on 'Improving parasitic efficiency of *Trichogramma chilonis* against *Chilo sacchariphagus indicus* in sugarcane'. Presentation topics included records and biology of natural enemies; natural enemy-mediated control of aphid pests (*Aphis gossypii, Toxoptera aurantii* and *Ceratovacuna langicera*); kairomonal effects on *Trichogramma* parasitoids; heat-resistant *Trichogramma* production; mass production of coccinellids; biosafety of microbial and botanical insecticides for coccinellids and spiders; and the effects of *Rhynocoris* bug salivary venom extract on *Spodoptera litura.*

Two invited lectures in the botanicals session were by Prof. Dikshit, who spoke on 'Biopesticide: an ecofriendly alternative to chemical pesticides' and Prof. Gomathinayagam, who described an in-vitro experiment on biological control of paddy brown spot using *Trichoderma viride.* The potential for botanicals in a wide range of situations was indicated by the breadth of presentations in this session. The efficacy was described of various botanicals for mosquito control, forest pest management, crop pest control (including *Bactrocera* fruit flies, lepidopterans, root-knot nematodes, *Cosmopolites* banana weevils, etc.) and for protecting pollinators and silkworms (*Bombyx mori).* Biosafety relating to fish was also touched on. Plants identified as sources of pesticidal extracts included well-known ones such as *Azadirachta indica* (=*Melia azadirach*), *Aloe vera* and *Ocimum basilicum* as well as many others like *Lippia nodiflora, Vitex negundo, Clerodendron inerme, Cleistanthus collinus, Citrullus colocynthis, Ageratum conyzoides* etc.

In the last session, on ecofriendly pest management, Dr Hristina Kutinkova described the use of mating disruptors in codling moth of apple orchards in Bulgaria in her invited lecture. Other presentations dealt with: RNAi-mediated gene knockdown in sucking and chewing insect pests; egg extracts of *Caryedon serratus* as oviposition deterrents; the use of methyleuginol in addition to botanicals to reduce mango fruit fly populations; the effect of host plant odours on *Aphis craccivora*; and the role of bio-nano-particles on antimicrobial and anti-insecticidal activities. Researchers emphasized how integration of botanicals and microbial insecticides along with synthetic insecticides increased crop production.

The conference ended with the following recommendations: start a biopesticides centre at St Xavier's College; bio-product-producing companies/organizations to be invited to this conference; the Indian Government should instigate a separate board for monitoring the biopesticides introduced in the country; BIOCICON could operate continuously and start a new working programme for biopesticides network programme. The organizers of the event anticipate the publication of a special issue of *Journal of Biopesticides* that will include all presentations given during the conference.

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Conference Announcements

International Weed Symposium in Hawaii

The XIII International Symposium on Biological Control of Weeds (ISBCW) will take place on 10–16 September 2011 in Hawaii. Watch the website for further details.
Web:
http://uhhconferencecenter.com/xiii_isbcw.html

Second Entomophagous Insect Conference

Following the first conference in Minneapolis, Minnesota, USA in July 2009, the Second Entomophagous Insect Conference will be held in Antibes, France, on 20–23 June 2011. This meetings series merges the North American-organized International Entomophagous Insects Workshop and the European Workshop on Insect Parasitoids.

Web: https://colloque.inra.fr/entomophagousinsects

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Arthropod Rearing and Quality Meeting

To create a 'Blueprint for the future of arthropod rearing and quality assurance', a Joint Meeting is being held in Vienna, Austria, on 19–22 October 2010 of the IOBC Global Working Group on Arthropod Mass Rearing and Quality Control (AMRQC), the Association of Natural Bio-control Producers (ANBP), the ASTM subcommittee E35.30 on Natural Multi-Cellular Biological Control Organisms, and the International Biocontrol Manufacturers Association (IBMA), Invertebrate Biocontrols Group, in cooperation with the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture. The programme will consist of invited papers and contributed presentations on the different aspects of arthropod rearing as it relates to quality control. Papers will serve as a basis for discussion and exchange, with the final aim of improving collaboration among scientists and practitioners.

Web: AMRQC (www.AMRQC.org);
ANBP (www.ANBP.org) and
IAEA (www.IAEA.org).

Aphidophaga Symposium

The IOBC (International Organization for Biological Control) Global Working Group 'Ecology of Aphidophaga' is holding its 11th International Symposium on 19–24 September 2010 in Perugia, Italy.

Web: www.aphidophaga11.unipg.it

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Fruit Flies Symposium

The 8th International Symposium on Fruit Flies of Economic Importance (ISFFEI) is being held on 26 September – 1 October 2010 in Valencia, Spain.

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