OBCL Newsletter

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U.S.D.A, Agricultural Research Service

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In This Issue

Introduction

OBCL is a group of overseas laboratories that support the domestic research carried out by USDA-ARS with the aim of "finding solutions to agricultural problems that affect Americans every day from field to table".

The **Australian Biological Control Laboratory (ABCL)** is based in Brisbane, Australia. The facility is run through a Specific Cooperative Agreement between USDA-ARS and Australia's Federal research body, CSIRO.
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The **European Biological Control Laboratory (EBCL)** is based in Montpellier, France, and has a satellite laboratory in Thessaloniki, Greece. Contact: Lincoln Smith, Link.Smith@ars.usda.gov / www.ars-ebcl.org

The **Foundation for the Study of Invasive Species (FuEDEI)** is based in Hurlingham, Argentina and is operated as a nonprofit research organization. Contact: Guillermo Cabrera Walsh, gcabrera@fuedei.org / www.fuedei.org

The **Sino-American Biocontrol Laboratory (SinoABL)** is based in Beijing, China.
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Previous newsletter editions are available at:
www.ars-ebcl.org

Australian Biological Control Laboratory - ABCL

Ear Leaf Acacia Gall Wasp

by Christine Goosem, Ryan Zonneveld and Matt Purcell

Ear leaf Acacia, *Acacia auriculiformis* (Fig. 1), is native to northern Australia, Papua New Guinea and Indonesia. It was introduced into Florida in 1932 and is becoming a serious invasive weed in the US. A biological control project has been funded by the South Florida Water Management District and the Florida Fish and Wildlife Conservation Commission. ABCL conducts exploration for biological control agents in collaboration with Dr. Melissa Smith at the USDA ARS Invasive Plant Research Laboratory in Fort Lauderdale, Florida.

Figure 1. Bradley Brown surveying and ear leaf Acacia tree in northern Australia.

Stem galls (Fig. 2) have been collected throughout the native range of ear leaf Acacia. This galling is likely to have a significant impact on plant growth causing reduced flowering and seed production. The gall-forming agent is a wasp from the genus *Trichilogaster* (Hymenoptera: Pteromalidae: Ormocerinae). Adults have frequently emerged from fresh green stem galls and dissections have revealed single larva or pupa inside each central cavity within the gall. Adults emerge and survive for five days. This year, large, intact galls were abundant in late summer/early autumn during flushing of new foliage and during the onset of flower bud development after the wet-season rains. Adult specimens were confirmed as *Trichilogaster* sp. by Dr John La Salle, a Chalcidoidea specialist at Australian National Insect Collection in Canberra, and it appears that this species could be undescribed and highly host specific.

Figure 2. *Trichilogaster* sp. stem gall found on ear leaf acacia in Australia (right: adult female, Lower left single larva inside gall).

Extension Activities in Northern Australia by ABCL Staff

by Christine Goosem and Ryan Zonneveld

In July and October this year two members of the ABCL team, Ryan Zonneveld (Fig. 3) and Christine Goosem (Fig. 4), went to Cape York at the northern tip of Australia to carry out field surveys for biological control agents of old world climbing fern, *Lygodium microphyllum* and ear leaf acacia, *Acacia auriculiformis*. Both plants are serious weeds in Florida. The main objective of these field trips was to collect a stem-boring moth *Siamusotima* sp. which is only found in and around the very remote indigenous town of Bamaga. The team also went to a range of sites throughout Cape York to collect defoliating *Musotiminae* moth larvae on *L. microphyllum* as well as various insect herbivores of ear leaf Acacia.

Figure 3. Ryan Zonneveld lecturing to indigenous students about entomology and biological control.

As most of the field sites visited by the ABCL team each year on Cape York are on indigenous land, ABCL staff made a commitment to give something back to the Bamaga and Injinoo aboriginal communities for their support. A highlight of the Cape York trips this year was staff teaching at two of the remote local primary schools. We presented to three of their early childhood classes about the research we do around Cape York for the USDA ARS; collecting 'good insects to control naughty plants'. We also taught them about the different features of insects and ran some fun interactive activities. The children were enthusiastic learners, being very quick to point out the differences between insects and spiders. They were amazed to learn that tiny weevils could clear a whole lake filled with an aquatic weed.

Figure 4. *Christine Goosem teaching enthusiastic and future potential biological control researchers in the classroom at Bamaga on Cape York, far northern Queensland.*

A finger puppet activity was also a hit with the kids; each student was given an insect puppet (Fig. 5) to observe their different physical characteristics and to learn some 'fun facts' about them. This had them flapping their wings like a butterfly, buzzing like a bee, jumping like a grasshopper and scaring off predators like a ladybug. The kids were almost convinced that bees were in fact good, beneficial, pollinating insects and not just nasty insects that sting. Metamorphosis was also covered in the sessions and the students quickly grasped that butterflies started their lives out as hungry caterpillars. Excited squeals rang through the classroom as a stick insect that we had collected in the field the previous day, walked over the kids' hands.

Some of the budding entomologists had brought in insects they had collected from their garden for us to identify. Maybe we'll see some of the children joining the ABCL team in 20 years' time…?

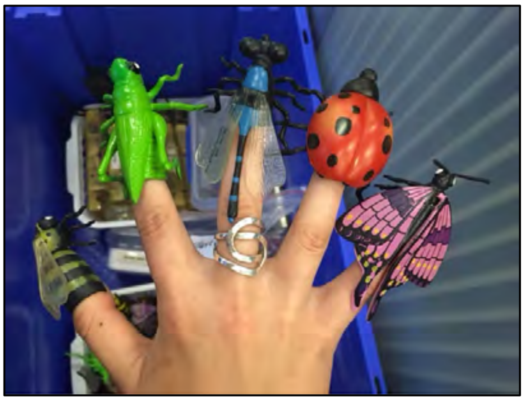

Figure 5. Insect finger puppets used to capture the imagination of indigenous students.

Foundation for the Study of Invasive Species - FuEDEI

Brazilian Peppertree Sawfly

by Willie Cabrera Walsh

The testing of prospective biological control agents of Brazilian peppertree (BP, *Schinus terebinthifolia*) and the search for new ones in Argentina continue to be top priorities for FuEDEI. Host specificity studies of the defoliating sawfly, *Heteroperreyia hubrichi* (Hymenoptera: Pergidae), indicate that it is highly specific. However, the potential toxicity of its larvae to vertebrates poses an important nontarget risk. To beter characterize this risk, mature larvae of *H. hubrichi* and *H. jorgenseni* were collected, weighed, fixed in 100 % ethanol and shipped to Dr. Boevé (Royal Belgian Institute of Natural Sciences, Belgium) for toxicity studies. We also conducted field surveys of plant use by *H. hubrichi* on native Anacardiaceae and Rutaceae species in the insect's native range. At the 27 sites visited between May 2016 and October 2017, *H. hubrichi* larvae were found feeding only on *S. terebinthifolius* and *S. weinmannifolius* (Table 1).

Table 1. Survey of plant use by larvae of the sawfly *Heteroperreyia hubrichi* under natural conditions in northeastern Argentina

Test plant species	No. of plants surveyed	No. of larvae
Schinus terebinthifolius	1561	739
Schinus molle	171	0
Schinus lentiscifolius	66	0
Schinus longifolius	21	0
Schinus weinmannifolius	68	10
Astronium balansae	25	0
Lithrea molleoides	195	0
Fagara sp.	26	0

In laboratory no-choice adult oviposition tests on cut plant material, *H. hubrichi* laid eggs on cut shoots of all tested species including native South American Anacardiaceae and the economically important exotic zebrawood (*Pistacia integerrima*) (Table 2). Additional replicates for this species and new species (*Lithrea molleoides*, *Astronium balansae*, *Pistacia vera*) will be conducted in the following months. Also adult no-choice tests on potted plants will be conducted in order to evaluate oviposition and larval development in a more natural scenario than cut foliage.

Table 2. No-choice adult oviposition tests of the sawfly, *H. hubrichi* on cut plant material

Test plant species	No. of replicates	No. of eggs (Mean ± SD)
Schinus terebinthifolius	10	109.6 ± 27.5
Schinus molle	5	38.0 ± 48.5
Schinus lentiscifolius	2	143.5 ± 28.9
Schinus longifolius	2	42.0 ± 59.4
Pistacia integerrima	5	31.4 ± 31.1

In a survey for natural enemies of *H. hubrichi* in Agentina, 727 larvae were collected and allowed to complete development. We observed that 1.5 % of the cocoons were parasitized by tachinid flies (Diptera) (Fig. 6). Also Pentatomidae bugs were occasionally found predating *H. hubrichi* larvae in the field. Tachinidae and Pentatomidae specimens were sent for identification to María Cecilia Gramajo (Fundación Miguel Lillo, Tucumán Province) and Gimena Dellapé (Museo de La Plata, Buenos Aires Province), respectively.

Figure 6. Natural enemies of the sawfly *Heteroperreyia hubrichi* (left: Tachinid parasitoid reared from cocoons, right pentatomid bug predating a larva)

European Biological Control Laboratory - EBCL

Eriophyid Mite on Medusahead in Italy

by Massimo Cristofaro, Francesca Marini, Radmilla Petanović, Biljana Vidović, Enrico de Lillo, Francesca Di Cristina, Gerardo Roselli, Fabrizio Freda, Silvia Barlattani, Matthew Augé, Brian G. Rector

Medusahead (*Taeniatherum caput-medusae*) is an annual grass native to Central Asia and the Mediterranean region, that is an invasive noxious weed in many western US states. BBCA Onlus has been involved in a classical biocontrol project on medusa-head since 2010, with support from ARS (EBCL & Reno) and the Bureau of Land Management. An eriophyid mite was discovered in 2014 at the National Park of Alta Murgia (Castel del Monte, Bari, Italy), which has been identified as a new species: *Aculodes altamurgensis* (Vidović *et al*., in preparation). This mite was not found on other grass species present in the same area (e.g., *Stipa austroitalica*, *Avena sativa*, *Triticum durum* and *T. aestivum*), suggesting that *A. altamurgensis* may be specific to medusahead.

Preliminary host specificity tests were conducted in the laboratory in 2015 and in a field garden in 2016, confirming that *A. altamurgensis* does not infest barley, wheat, oats, or maize. Five different populations of *T. caput-medusae* (three from USA and two from Italy) were tested for susceptibility to attack by the mite in a field garden in 2016. After 40 days, *A. altamurgensis* populations were found on all medusahead accessions, although numbers varied (Castel del Monte: 0.98, Sicily: 3.89, Boise: 4.34, Bull Flat: 0.79, Gerlach: 2.39 mites per gram of plant biomass), showing possible differences among the plant biotypes in suitability to the mite.

During 2017, periodic field observations at Castel del Monte from May to September revealed a strong association of this mite with the developing seeds (Fig. 7). This suggests that mites may disperse with mature seeds and/or overwinter inside them. Mites have also been observed on medusahead seedlings in late summer in Italy and Serbia, indicating that the mites are present during the plant's entire life cycle. Further studies need to be conducted to measure impact of the mite on medusahead. A colony of the mites was sent to Paul Pratt (ARS, Albany, CA) to conduct further studies on its host plant specificity.

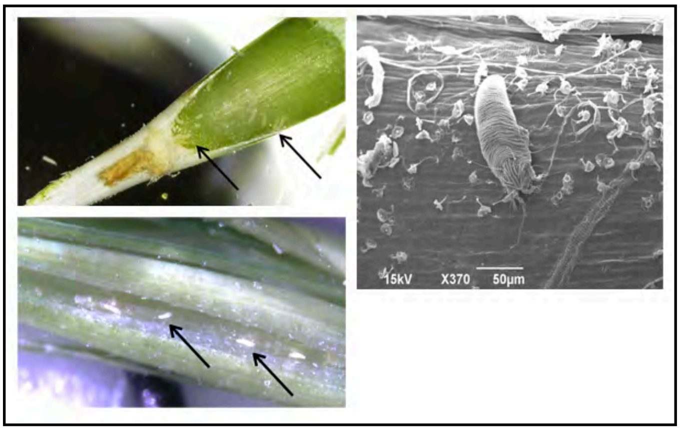

Figure 7. Eriophyid mites (*Aculodes altamurgensis* n. sp.) found inside a spikelet of medusahead at the end of the season at Castel del Monte, Italy (right: scanning electron micrograph of one mite)

Shipping Olive Fruit Fly Parasitoids to California

by Lincoln Smith, Floriane Chardonnet, Arnaud Blanchet, Marie-Claude Bon

EBCL has been mass-rearing a larval parasitoid (*Psyttalia lounsburyi*) of the olive fruit fly (*Bacrocera oleae*) and shipping them to release in California since 2013. A series of experiments have been conducted to improve the efficiency of rearing and survival of the parasitoids. This has resulted in over a ten-fold increase in productivity (Fig. 8; Chardonnet et al. 2017). During five years, over 116,000 adults have been shipped to California for release by colleagues at the University of California, Berkeley and California Dept. of Food and Agriculture (CDFA). Surveys by these colleagues report widespread establishment of *P. lounsburyi* in coastal California (Daane et al. 2017). Molecular genetic analysis of specimens shows that a strain originating from South Africa is established in the northern 2/3 of the state while a strain from Kenya is established in the southern 1/3 (Bon et al. 2017). Parasitism levels of up to 73% have been observed at some sites, suggesting that the parasitoid may have substantial impact.

Future research will focus on evaluating the specificity of *Psyttalia ponerophaga*, which originates from Pakistan. This species may be better adapted to the climate of California's Central Valley.

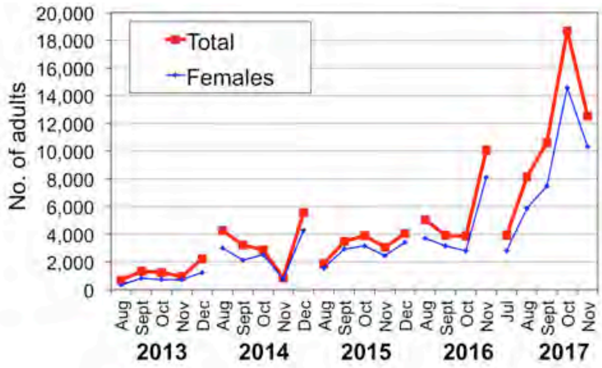

Figure 8. Shipments of the olive fruit fly parasitoid, *Psyttalia lounsburyi*, for release in California.

An Egg Parasitoid of the Viburnum Leaf Beetle

by Gaylord Desurmont

The viburnum leaf beetle (*Pyrrhalta viburni*) is a quickly spreading landscape and forest pest in North America. It was detected for the first time in the USA in Maine in 1994 and has since then spread steadily throughout the Northeast. It has also become established on the West Coast, particularly in the states of Washington and Oregon. The larvae defoliate native *Viburnum* shrubs and can can kill full-grown plants after 2-4 years of infestation. The beetle has one generation per year and overwinters as eggs. Females lay egg masses (6-12 eggs) inside cavities that they create in young branches. Because eggs remain for 6 to 10 months before hatching, they are a particularly vulnerable stage for predators and parasitoids.

An egg parasitoid *Aprostocetus* sp. (Hymenoptera: Eulophidae) has been reared from eggs of the viburnum leaf beetle (*Pyrrhalta viburni*, VLB) in France, the Netherlands, and Switzerland (Fig. 9). Parasitism rate was correlated to the number of egg masses present on a twig, suggesting a density-dependent attack rate (Fig. 10). Adult parasitoids emerge from parasitized VLB eggs in early spring, at the same time as VLB egg hatch, but VLB oviposition starts in late spring, roughly two months after parasitoid emergence. This means that either 1) adult parasitoids are able to survive in the field long enough to wait until VLB eggs become available and have one generation per year using solely VLB as a host, and/or that 2) parasitoids have a spring generation on an alternative host and a second generation infesting VLB egg masses in late spring or early summer. Experimental studies have started at EBCL to measure the maximum longevity of *Aprostocetus* adults and determine if they are able to complete a yearly life cycle using only VLB as a host.

Figure 9. The egg parasitoid *Aprostocetus* sp. on a viburnum leaf beetle egg mass (Photo: Franck Herard)

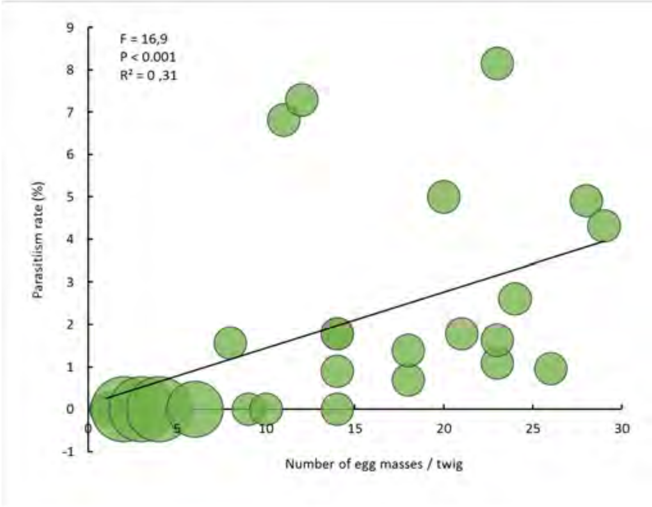

Figure 10. Correlation between density of viburnum beetle egg masses on *Viburnum tinus* twigs and parasitism rate by *Aprostocetus* sp. The diameter of the circles represents the number of overlapping points.

Retirement of Franck Hérard

by Lincoln Smith

Franck Hérard officially retired from EBCL on November 30, after more than 41 years of service to USDA-ARS (Fig. 11). During his career he has worked on a variety of tree insect pests, including gypsy moth, pine bark beetle, birch leaf miner, elm leaf beetle, pear psyllid, apple ermine moth, codling moth, Asian longhorned beetle, citrus longhorned beetle, viburnum leaf beetle, and leafhoppers. He has conducted foreign exploration in many countries, including China, Iran, Japan, Korea, and Morocco. Franck also collaborated with ARS scientists in Tifton, Georgia USA, to conduct innovative research on host searching behavior of a parasitoid of corn earworm using a wind tunnel. He has documented his work in at least 48 scientific publications on invasive insect pests, their biology, and prospective biological control agents. We greatly appreciate Franck's efforts and dedication to his research, and we will miss his habitual cheerfulness and willingness to help others. Our best wishes for an enjoyable retirement!

Figure 11. Franck Hérard, retiring from EBCL after 41 years of service as a Research Entomologist.

Recent Publications by EBCL

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