OBCL Newsletter

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Overseas Biological Control Laboratories
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. This has been a long term relationship originating in 1985. Contact: Matthew Purcell, matthew.purcell@csiro.au

The **European Biological Control Laboratory (EBCL)** is based in Montpellier, France, and has a satellite laboratory in Thessaloniki, Greece. It has a permanent staff of 1 American and 7 foreign scientists, 9 technicians and 5 administration/ support. Contact: Lincoln Smith, Link.Smith@ars.usda.gov

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

The **Sino-American Biocontrol Laboratory (SinoABL)** is based in Beijing, China. Contact: Liu Chenxi, liuchenxi@caas.cn

European Biological Control Laboratory - EBCL

Fortuitous Biological Control of citrus longhorned beetle in Italy

by *Franck Hérard, Matteo Maspero, Gérard Delvare, Marie-Claude Bon, Yijing Cen, Masatoshi Mochizuki, Tamotsu Murai and Nathalie Ramualde*

Citrus longhorned beetle (*Anoplophora chinensis*, CLB) was accidentally introduced from Asia into 11 countries of Europe and Turkey putting at risk a wide range of broadleaf trees. Destruction of infested trees is mandatory in many countries in an effort to eradicate the pest. An EBCL scientist surveyed for natural enemies attacking CLB and found 9 species of parasitoids attacking eggs and/or larvae. One of these, *Aprostocetus fukutai*, appears to be highly specific, parasitizing eggs of CLB, but not of the closely related Asian longhorned beetle (*Anoplophora glabripennis*, ALB) (Fig. 1). An integrative taxonomy approach including a multigene sequencing analysis confirmed the species identity of this parasitoid, which apparently was accidentally introduced to Italy from Japan, possibly by infested bonsai trees. A colony of the parasitoid was established in the EBCL quarantine laboratory, and an EBCL scientist developed methods to release the parasitoid and to monitor its presence using infested sentinel logs or potted tree stumps. Parasitism rates of up to 72% have been measured in the field, suggesting that this parasitoid is helping to limit the multiplication of the pest. It is hoped that a similar parasitoid can be found for ALB, which is a major invasive pest in the USA.

Figure 1. Female *Aprostocetus fukutai* laying eggs in a citrus longhorned beetle egg in the bark of a tree.

Biogeographic origin of invasive Sahara mustard

by Marie-Claude Bon, R. Sforza, Javid Kashefi, Matthew Augé, Francesca Marini, Fatiha Guermache, Lea Garcin and Lincoln Smith

Sahara mustard, (*Brassica tournefortii*, Brassicaceae) is a winter annual that was first identified in California in 1927, and has since spread eastward to Texas. The weed fuels wild fires and permanently displaces native desert vegetation. It also increases the abundance of *Bagrada* bug (*Bagrada hilaris*), an invasive pest that damages many cole crops in California. This plant has been proposed as a target for classical biological control, but its geographic origin is unknown. Its appearance is associated with importation of date palms which came from Algeria, Morocco, Egypt, Iraq, Saudi Arabia and Turkey. EBCL is collaborating with Daniel Winkler, at University of California, Irvine, who is using single nucleotide polymorphisms (SNPs) detected by a double digest RAD sequencing approach to characterize the genetic diversity of the weed populations and unravel the biogeographic origin of the Sahara mustard invasion in the U.S. EBCL scientists reviewed the known geographic distribution of the invasive and collected seeds for germination and DNA extraction in France and obtained seeds from collaborators in Egypt and Australia (Fig. 2). BBCA scientists contracted by EBCL collected weed populations in Italy, Israel, Jordan, Morocco, Turkey and Qatar. Determination of the biogeographic origin of the invasive Sahara mustard in the western USA will help determine where to look for prospective biological control agents.

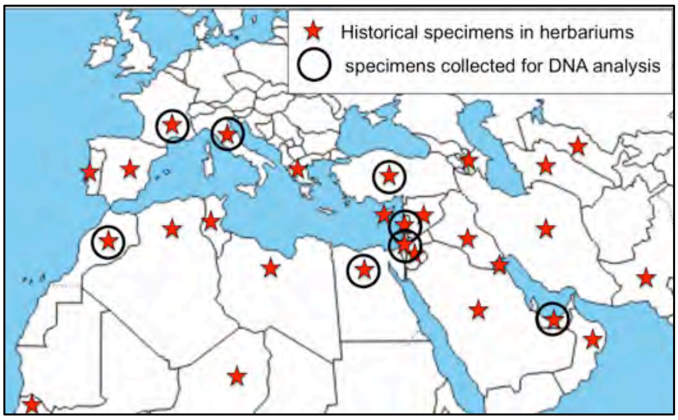

Figure 2. Known geographic distribution of Sahara mustard (stars) and countries sampled (circles) to determine the origin of the invasive populations in the western USA.

Eriophyid mite to control Russian thistle

by Lincoln Smith, Javid Kashefi, Massimo Cristofaro, Matthew Augé and Francesca Marini

The eriophyid mite, *Aceria salsolae*, has been evaluated as a prospective biological control agent of Russian thistle (common tumbleweed, *Salsola tragus*); but a petition for release was denied because of host specificity concerns. A field experiment was organized in collaboration with BBCA in Italy to test risk to critical nontarget plant species; however, repeated attempts in 2016 and 2017 to collect the mite at sites in Greece where it had previously been collected failed to produce mites for the experiment. In July, BBCA scientists expanded the search, looking in Italy, Bulgaria and Turkey, and finally succeeded to collect the mite in Turkey. There were too few mites to conduct the field experiment, so a laboratory colony was established at both BBCA and EBCL in preparation for 2018 (Fig. 3).

Figure 3. Russian thistle cuttings infested by the eriophyid mite, *Aceria salsolae*, in the EBCL quarantine laboratory.

Yellow starthistle seedhead weevil

by Lincoln Smith and Massimo Cristofaro

The weevil, *Larinus filiformis*, has been studied as a prospective biological control agent of yellow starthistle (*Centaurea solstitialis*) that is adapted to colder habitats (snow in winter). Previous research was conducted in Turkey, but access to this country is now limited. This summer, BBCA cooperators collected the weevil near Plovdiv, Bulgaria and sent them to EBCL to establish a colony. The adults have been ovipositing on plants in the EBCL quarantine greenhouse, which is a good start to establishing a colony for future studies (Fig. 4).

The weevil has one generation per year, so it will have to undergo vernalization before testing next year.

Figure 4. The weevil, *Larinus filiformis*, on a caged plant of yellow starthistle to produce a colony.

Visiting Scientists to EBCL-Thessaloniki

by Alexandra Chaskopoulou and Javid Kashefi

European Union Vector Control Analysis project (VECA)

Dr. Francis Schaffner, a world-renowned mosquito taxonomist from University of Zurich, Switzerland, came to Greece under the auspices of the Vector Control Analysis project (VECA) launched by the European Center for Disease Prevention and Control (ECDC). During early June Dr. Schaffner participated in organizing mosquito control trials and joined Dr. Chaskopoulou in survey trips targeting mosquitoes breeding in rice fields and other nearby sites (Fig. 5). In late June Dr. Laurence Marama, a public health expert from the ECDC Emerging and Vector-borne Diseases Programme, joined us in our field endeavours under the VECA project. During Dr. Marama's stay we were hosted in meetings with Greek government officials discussing the risk of vector borne diseases in Europe, with a focus on West Nile and Zika virus.

Figure 5. Dr. Schaffner collecting *Aedes geniculatus* larvae from a tree hole in Greece

Testing Filth Fly Traps

Dr. Jerry Hogsette (ARS, Gainesville, FL), Lead scientist in the Mosquito & Fly Unit at CMAVE, came to Greece in mid-June to perform studies on the seasonality and management of filth flies associated with cattle farms. During his stay we tested a variety of novel trapping methodologies against the common house fly (*Musca domestica*) and the stable fly (*Stomoxys calcitrans*) (Fig. 6). Some of these technologies were used for the first time in Europe and were very successful at collecting high numbers of the two targeted species. These methodologies may have potential to be used for controlling wild fly populations and thus reducing the nuisance and distress caused to domesticated animals.

Figure 6. Dr. Hogsette collecting fly larvae from underneath cow manure in Greece.

Biological Control of Cattle Fever Ticks

Dr. John Goolsby, an ARS livestock arthropod pest expert from Edinburg, TX, visited Greece and Bulgaria to explore for natural enemies of cattle fever tick (CFT, *Rhipicephalus annulatus*) from June 10 to July 2, 2017. He is collaborating with Javid Kashefi at EBCL in Thessaloniki to discover prospective biological control agents that could be used to help control CFT in the U.S. The two scientists worked at farms in three regions: the island of Crete, in NW Greece, and in Dobrich, Bulgaria (Fig. 7). Young calves were infested with laboratory-reared larvae of CFT in the hope that they would be parasitized by native parasitoids. After about a month, the engorged ticks were collected and transferred to an incubator to rear out possible parasitoids. This region is known to have natural populations of this tick, but it has not been surveyed for parasitoids.

Figure 7. Dr. Goolsby searching for engorged ticks in a cattle farm in Dobrich, Bulgaria.

Surveillance of Sand flies and Leishmania parasites

Dr. Petr Volf, a leading researcher in parasitology, and his team from Charles University, Czech Republic, and Dr. Vladimir Ivovic, a sand fly expert form University of Primorska, Slovenia, visited Dr. Chaskopoulou in Thessaloniki under the auspices of VectorNet project to survey sand fly populations associated with animal facilities in central and southern Greece. The field trip was very successful and resulted in large collections of a variety of species (Fig. 8). VectorNet is a joint initiative of the European Food Safety Authority (EFSA) and the ECDC, which started in June 2014. The project supports the collection of data on vectors and pathogens in vectors that are related to both animal and human health. The information created by this project will not only help to update the VectorNet distribution maps but will hopefully also enhance the collaboration between teams and the initiation of vector monitoring campaigns across Europe.

Figure 8. Dr. Volf setting a CDC light trap to collect sand flies in a chicken farm in southern Greece.

Foundation for the Study of Invasive Species - FuEDEI

Cold tolerant aquatic weevil to control Giant salvinia

by Fernando Mc Kay, Alejandro Sosa, Mariel Guala, Cristian Battagliotti, Willie Cabrera Walsh and Rodrigo Díaz

The aquatic weevil *Cyrtobagous salviniae* is an effective natural enemy of the aquatic fern giant salvinia (*Salvinia molesta*). However, the plant is invading more temperate areas with harsher winters in the US, such that the weevil populations can't establish and overwinter. Under an agreement with Louisiana State University (LSU), FuEDEI is searching for cold-hardy strains of *C. salviniae* in Argentina and exporting them to researchers at LSU. Constant, good sources of *C. salviniae* were found at Ceibas, south of the province of Entre Ríos (Fig. 9). During march 2016, researcher from LSU, Rodrigo Díaz spent a few days at FuEDEI to conduct preliminary studies of cold tolerance, coma recovery times and supercooling points (SCP) of *C. salviniae* from Ceibas. Later on 2016, a complete assessment of cold tolerant populations of *C. salviniae* was conducted at LSU facilities and revealed that survival at 0°C was 1.5-times greater, mean chill coma recovery time was 1.8-times faster, and mean SCP was 1.2-times lower in the Lower Paraná-Uruguay Delta population compared to the Louisiana population (Russell et al. 2017). These findings show that the Lower Paraná-Uruguay Delta provenance should be considered for managing *S. molesta* in temperate regions.

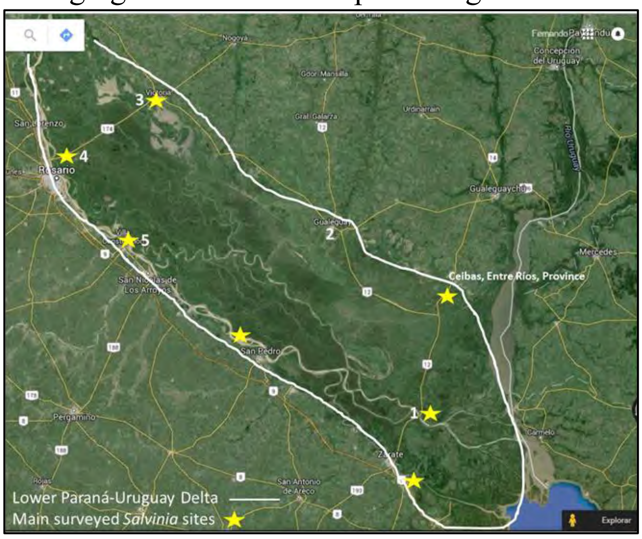

Figure 9. Main survey sites for collecting *Cyrtobagous salviniae* in the southern range of giant salvinia in Argentina.

Weevils were collected throughout the year at Ceibas, but highest numbers were collected between late summer and early spring (Apr. - Sept.; Fig. 10). Parous females were found throughout the year, but were relatively more common than nonparous females during July to September (Fig. 11).

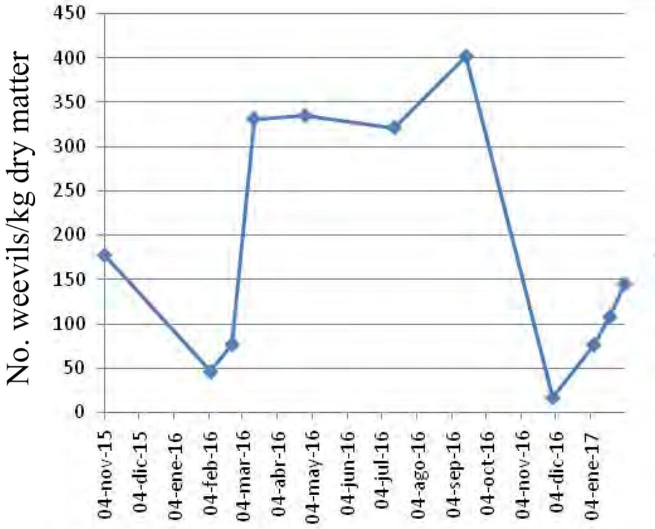

Figure 10. Seasonal occurrence and abundance of *Cyrtobagous salviniae* at Ceibas, Entre Ríos, Argentina

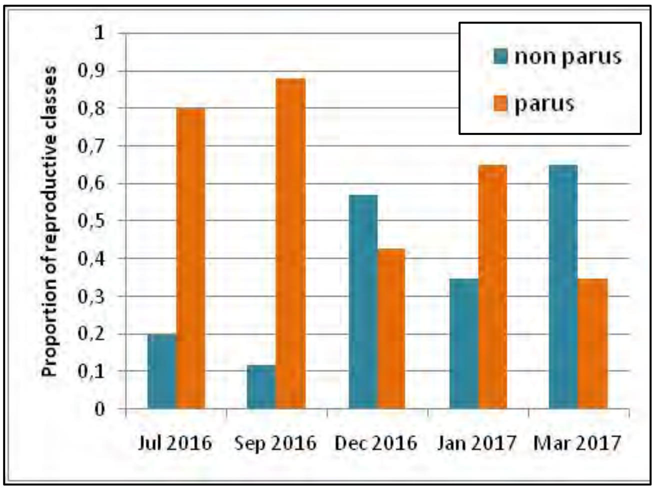

Figure 11. Proportion of parus and nonparus reproductive classes of *C. salviniae* females- July 2016/March 2017

Control of Salvinia in an artificial lake in the suburbs of the city of Buenos Aires

by Fernando Mc Kay, Alejandro Sosa, Mariel Guala, Cristian Battagliotti, Willie Cabrera Walsh

A 2-ha park reserve in the suburbs of the city of Buenos Aires (34°29′33″ S 58°28′46″W), close to the La Plata river and the Paraná-Uruguay Delta, has a small lake which is mostly covered with

Salvinia biloba. The lake has a surface area of 6700 m^2, and is 1.8 m at its deepest. Inspection of the plant mat during November 2016 (20 12-liter plastic buckets of Salvinia) revealed the absence of the weevil *Cyrtobagous salviniae*. This situation provided an opportunity to attempt the introduction and establishment of *C. salviniae* for experimental purposes, plus control the *S. biloba* infestation. On January 2017, 5 dome-floating cages (0.3 m^2), containing 50 *C. salviniae* adults each, and 5 without insects as controls, were installed on the lake (Fig. 12). A month later, no clear differences in plant damage between controls and treatment were found. Additional 500 *C. salviniae* adults, 100 per cage, were introduced in the new cages on April 2017. On May 2017, there were still no differences found between cages containing *C. salviniae* and the controls, and it is supposed that the weevils have not established. Efforts to establish *C. salviniae* will continue during the following months. We are also studying the effect of water nitrogen levels on weevil establishment in the laboratory.

Figure 12. Introduction of *Cyrtobagous salviniae* into Vicente López Reserve's lake. Installing cages on January 2017 (top). Opening cages on May 2017(bottom)

Waterhyacinth planthopper

by Alejandro Sosa, Marina Oleiro, Guillermo Cabrera Walsh, M. Cristina Hernández, Fernando Mc Kay, and Mariel Guala

We conducted a monthly field survey of Waterhyacinth, *Eichhornia crassipes*, for 18 months (2015-2016) in the Chaco and Formosa Provinces of Argentina to study the biology of the planthopper, *Taosa longula*. Females have an orifice in the seventh sternite that is for mating, which is open and visible only in mated females (Fig. 13).

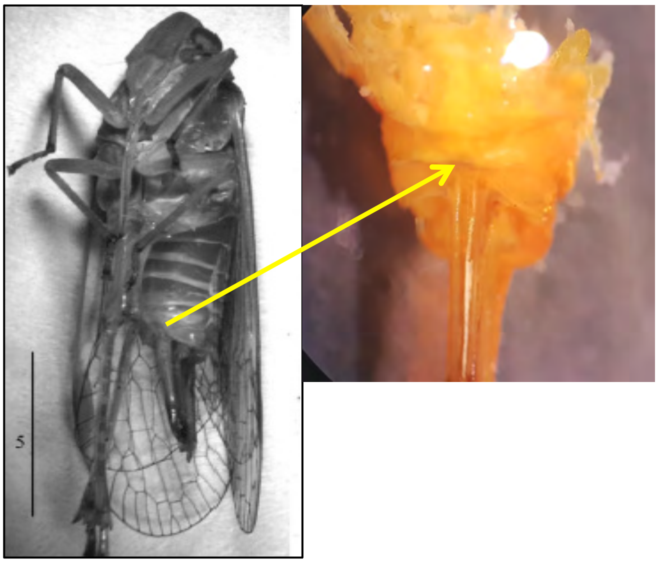

Figure 13. Mating orifice on sternite 7 of female *Taosa longula*

The highest number of reproductively mature females was found in February (Fig. 14). During April, many females were collected, but almost all of them were immature. We still can't be sure if this is a regular situation, or if year to year modifications can be expected. The largest number of mature females occurred in summer, probably associated with temperature and host plant phenology. The insect has 2-3 generations per year at these latitudes.

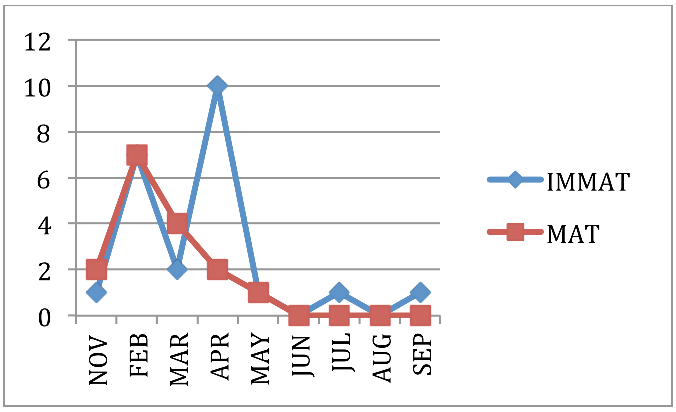

Figure 14. Seasonal abundance of immature and mature females (based on presence of mating orifice) of *Taosa longula* in 2015-2016.

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