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IOBC-NRS NEWSLETTER

Content:

Message From the President:

Dr. Mark Hoddle during fieldwork

Managing Invasive Pests – the Perennial Challenge for Biological Control Scientists

The recent IPBES report "Invasive Alien Species and their **Control**" is a massive 890 page document compiled by over 200 contributing authors who reviewed more than 13,000 scientific publications. The report, as you would expect, details the negative impacts invasive species have on the economy, food and water security, human, animal, and plant health, and how these pests can increase marginalization and inequity. Invasive pests, those non-native species that cause economic or ecological damage or harm human, animal, and plant health, are recognized as one of the five major drivers adversely affecting agriculture and wilderness areas. Around 200 species are establishing in areas outside of their native range each year, and in 2019, the annual cost of biological invasions was estimated at US$423 million (I suspect that this cost is significantly underestimated).

Above, I emphasized "**Control**" in the title of this report. Biological control is recognized in the report as a management tool that can be applied over vast areas for the management of invasive pests. The risks with natural enemy releases is mentioned, but can be mitigated through the use of risk-based regulatory frameworks and it is acknowledged that this pest management technology can have highly successful and safe applications. Biological control is given a "high" rating for availability and effectiveness and a "medium" rating for ease of use.

An important question for biological control practitioners is "could we be better prepared for using natural enemies for control of invasive pests?" Often, our approach to biological control is "reactive" and programs are initiated long (typically years!) after the invasion has occurred and significant economic and ecological damage has resulted.

"Horizon scans" are an approach to identify species, sometimes referred to as "door knockers," that are likely to invade at risk areas in the future. From a California perspective (this is

where I am based), "horizon scans" for "door knockers" have identified spotted lantern fly, *Lycorma delicatula* (Hemiptera: Fulgoridae), a pest of grape and nut crops, as an invasive pest with high invasion potential for California where grapes and nuts are multi-billion dollar industries. This insect is widely established on the east coast of the U.S. and populations are creeping westwards.

As part of a risk management and decision-making support system, horizon scans can be used to justify and support "proactive" biological control of a target pest that has high invasion potential. Proactive biological control identifies a potential future threat and initiates work on candidate natural enemy species in advance of the anticipated incursion. The underlying idea of proactive biological control is to have natural enemies pre-approved for release prior to the establishment of the target pest. With this approach, it may be possible to reduce negative impacts if pre-approved host specific natural enemies could be established quickly after it is determined that the target pest can not be contained or eradicated and populations of concern are still small and localized.

This idea is gaining traction and is being discussed in a symposium entitled "Pre-emptive biological control: a novel approach to increase preparedness for potential biosecurity threats" at the Third International Congress of Biological Control in San Jose Costa Rica over 24-27 June 2024. The use of the adjective "pre-emptive" is used interchangeably (and incorrectly in my opinion!) with the adjective "proactive," which is be a topic for another "essay!" Examples of proactive projects in this newsletter are provided by Telmah Telmadarrehei who is working on an emerging invasive weed in Florida, and by Ricky Lara who is working on emerald ash borer that is threatening to invade California from Oregon.

I would like to end this message with a big "**THANK YOU**" to the IOBC-NRS board members. Cesar Rodriquez-Saona, Past President; Ricky Lara, Treasurer; Rob Morrison, Corresponding Secretary; and our Members at Large, Nicole Quinn, Jana Lee, and Chris Borkent. Sara Salgado Astudillo compiled this newsletter.

I look forward to seeing you all the Annual IOBC-NRS Symposium at the Annual Entomological Society of America meeting in Phoenix Arizona over 10-13 November 2024. The symposium will highlight the work and contributions made by the winners of the Distinguished Scientist and Early Career Outstanding Scientist Awards, and the Robert J. O'Neil Outstanding Ph.D. in Biological Control and Outstanding MS student Awards. The deadline for nominations and applications for these awards is 15 July 2024. If you know of strong candidates please nominate them!

Background Reading:

Hoddle, M.S. 2023. A new paradigm: proactive biological control of invasive insect pests. BioControl 69: 321–334. https://doi.org/10.1007/s10526-023-10206-5

Important announcements:

2024 Call for Awards Nominations. IOBC-NRS Deadline for Submissions – Monday 15 July 2024. Submit Nomination Packets to Mark Hoddle (mark.hoddle@ucr.edu) .

24-27 June 2024. Third International Congress of Biological Control (ICBC3). San José, Costa Rica.

10-13 November 2024. 2024 ESA annual meeting. Phoenix, AZ

To join IOBC-NRS or to renew your membership click here: Become a Member (iobcnrs.org) Or visit the IOBC-NRS website: https://www.iobcnrs.org

We invite you to contribute to our upcoming editions of the newsletter. Please contact Sara Salgado Astudillo (sara.salgadoast@ufl.edu) for submission details.

Distinguished Scientist Award 2023: Dr. Juli Gould

Dr. Juli R. Gould is a distinguished biological scientist specializing in biological control of invasive insect pests. Dr. Gould is currently serving at the USDA-APHIS-PPQ Science and Technology, Forest Pest Management Laboratory in Buzzards Bay, Massachusetts since 2001. Her career began as a postgraduate research associate at the University of California, Riverside, and she has held various significant roles, including entomologist positions at the USDA-APHIS-PPQ in Phoenix, Arizona, and Niles, Michigan. Dr. Gould earned her Ph.D. in Entomology from the University of Massachusetts, Amherst, and her B.S. in Natural Resources from Cornell University.

Dr. Juli Gould (right) and Dr. Cesar Rodriguez-Saona (left) at the Annual ESA Meeting, National Harbor, MD 2023.

Honorary Member Award: Dr. Ann Hajek

Dr. Ann Hajek is a renowned entomologist and professor in the Department of Entomology at Cornell University, a position she has held since 1994. Dr. Hajek earned her B.S., M.S., and Ph.D. from the University of California, Berkeley. Dr. Hajek has authored or co-authored nearly 300 publications, including two books and four edited volumes. Her research primarily focuses on the interactions between invasive insects and entomopathogenic organisms, with the aim of develop environmentally safe control methods for insect pests threatening North American forests. Dr. Hajek's outstanding contributions to entomology have been recognized with several prestigious awards, including the 2018 ESA Fellow, the 2015 L. O. Howard Distinguished Achievement Award from the ESA-EB, and the 2011 Distinguished Scientist Award from the IOBC-NRS.

Dr. Ann Hajek (right) and Dr. Cesar Rodriguez-Saona (left) at National Harbor, MD 2023.

Early Career Scientist Award 2023: Nathan Harms

Nathan Harms is a research biologist specializing in the biological control of weeds, particularly aquatic macrophytes. He earned his Ph.D. in Biological Sciences from Louisiana State University in 2020, where he studied under Dr. James Cronin and completed a dissertation titled "Biogeography of Biological Control: Spatial Variation in Agent-Host Interactions." Nathan also holds an M.S. in Biology from the University of North Texas, where his research focused on the macroinvertebrates associated with *Heteranthera dubia* across different geographical regions. He completed his B.S. in Biology at the University of Texas at Dallas. Currently, Nathan is a research biologist with the US Army Corps of Engineers, contributing his expertise to the management of aquatic plant species.

Dr. Nathan Harms evaluating plants

Robert O'Neil Award for Outstanding Ph.D. Student in Biological Control 2023: Sara Salgado

Sara is a Ph.D. candidate in Entomology at the University of Florida under the supervision of Dr. Carey Minteer. Sara's research is focused on developing a biological control program for earleaf acacia (*Acacia auriculiformis*), an invasive plant species that is rapidly spreading in Florida. This research has involved collaboration with scientists at The Commonwealth Scientific and Industrial Research Organisation (CSIRO). She is currently studying the biology of a bud galling wasp, *Trichilogaster* sp. nov. (Hymenoptera: Melanosomellidae).

Sara Salgado (right) and Dr. Cesar Rodriguez-Saona (left) at the ESA National Meeting, National Harbor, MD 2023.

Outstanding Masters Student Award 2023: Emily Le Falchier

Emily Le Falchier is currently pursuing an M.S. in Entomology and Nematology at the University of Florida, where she works under the mentorship of Dr. Carey Minteer. She completed her B.S. in Environmental Management in Agriculture and Natural Resources at the University of Florida. Her research focuses on developing mass rearing methods for biological control agents, particularly a thrips, *Pseudophilothrips ichini*, aimed at controlling the invasive Brazilian peppertree.

Emily Le Falchier (right) and Dr. Cesar Rodriguez-Saona (left) at the ESA National Meeting, National Harbor, MD 2023.

Classical biological control of spotted-wing drosophila

***Ganaspis kimorum* (Photo: Kent Daane)**

The spotted-wing drosophila (SWD, *Drosophila suzukii*) is a worldwide pest infesting blueberries, blackberries, cherries, raspberries and strawberries. In 2022, many laboratories released *Ganaspis kimorum* (formerly known as *brasiliensis*) , an imported parasitoid of SWD. This larval-pupal parasitoid was one of the dominant parasitoids in Asia and is highly host-specific. Classical biological control was possible thanks to a team led by Kent Daane that collected parasitoids that attacked SWD larvae in Asia, the native range of SWD. Several years of research was needed to obtain permits to release *G. kimorum*. Once permission was granted, starter colonies were sent to labs across the US to start colonies. Releases were done as part of individual lab projects, by state departments, and regional and national grants focused on SWD management. The US map shows releases made per state in 2022 and 2023 in the U.S. (map provided by Xingeng Wang).

The USDA ARS Areawide Program supported is a large program evaluating the impacts of parasitoids on spotted wing drosophila population densities. Release sites are paired with non-release control sites under standard managed by growers, and SWD densities are compared. The laboratories of Betsy Beers, Brian Hogg, Jana Lee and Vaughn Walton monitored and released *G. kimorum* in cherry, caneberry or blueberry farms in the parts of the California and the northwest U.S. Since selected farms are actively managed with low SWD densities, parasitoids were released in non-crop habitats where SWD reproduce on alternative hosts. In Oregon, wild blackberry provided *G. kimorum* the best chance of establishing. One Areawide site recovered *G. kimorum* at the end of the 2022 season, and over 4000 parasitoids were released at that site in wild blackberry over summer.

Leptopilina japonica, is another larval-pupal parasitoid associated with SWD in its native range. While petitioned for release, it was not approved due to its broader host range. However, adventive populations of *L. japonica* were first detected in Washington state. By 2022, *L. japonica* was detected in many parts of North America (see Gariepy et al. 2024 DOI: 10.3897/neobiota.93.121219). Though not intentionally introduced, its presence may help suppress SWD.

Contributed by Jana Lee

Releases of *G. kimorum* in blackberries. Graphic provided by Xingeng Wang.

Dr. Jana Lee conducting SWD fieldwork

Invasive Spread and Control Efforts of Earleaf Acacia in Florida

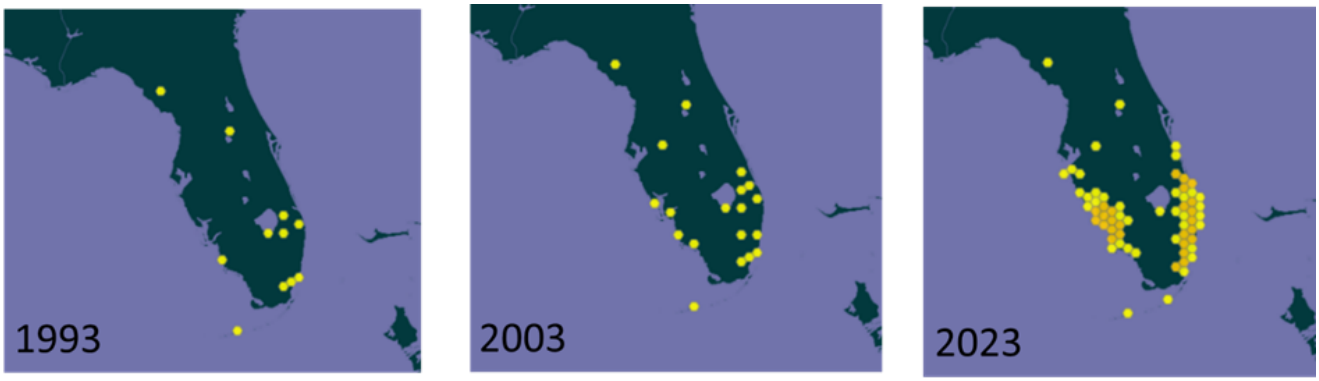

Figure 1: Maps illustrate the distribution of earleaf acacia, *Acacia auriculiformis*, in Florida during the years 1993, 2003, and 2023. Yellow hexagons indicate tree presence, and orange hexagons represent areas with a higher number of reported trees by EDDMapS.

Acacia auriculiformis A. Cunn. ex Benth, commonly known as earleaf acacia, is an evergreen tree that grows rapidly, reaching heights of 15–30 meters. This species often forms monoculture stands, especially in areas with a high-water table. Native to Australia, Papua New Guinea, and Indonesia, it was introduced to Florida, USA as an ornamental plant in the early 1900s.

Earleaf acacia exhibits several invasive characteristics: a high seed germination rate, long-lived flowers, high environmental tolerance, allelopathic properties, and effective dispersal mechanisms via birds, rain, and rivers. The tree produces an enormous number of very light seeds, facilitating its spread and establishing it as a serious invader in Florida.

The progression of earleaf acacia from 1993 to 2023 shows it spreading quickly from southern Florida (Fig. 1). This trend suggests that earleaf acacia will likely become a significant weed problem in the future. Both mechanical and chemical control methods have proven ineffective in slowing the spread of this invasive species. Species distribution models have shown that earleaf acacia has not yet reach its full distribution potential in the United States.

Scientists at the University of Florida have initiated a program using iNaturalist to record accurate distribution maps of earleaf acacia in Florida using citizen scientists, which will aid in control efforts and planning future biological control releases. Currently, a proactive biological control project conducted by scientists at the University of Florida and the United States Department of Agriculture – Agricultural Research Service is underway, studying two insects native to Australia, *Calomela intemerata* Lea (Coleoptera: Chrysomelidae) and *Trichilogaster sp. nov.* (Hymenoptera: Pteromalidae), as promising candidates for biological control agents against earleaf acacia (Fig. 2). Goals of this project include reducing current infestations of earleaf acacia in Florida and to slow the spread to prevent the species from reaching its full distribution potential. Host specificity and biology studies for *C. intemerata* are nearing completion. Studies on *Trichilogaster* sp. nov. are ongoing and will continue for the next few years. Once all these tests are completed, a petition for release will be filed with the Technical Advisory Group for the Biological Control of Weeds. Upon receiving approval from regulatory agencies, releases will begin in Florida.

Figure 2: An adult *Calomela intemerata* beetle feeding on a leaf of *Acacia auriculiformis* (left). An adult bud-galling wasp (*Trichilogaster* sp. nov.) on the earleaf acacia (right). Photos by the Minteer Lab.

We need your help tracking the spread of this invasive plant!

Please join our iNaturalist project using this QR code and report sightings

Contributed by Telmah Telmadarrehei

Proactive EAB Management Efforts in California

Emerald ash borer (EAB), *Agrilus planipennis* Fairemaire (Coleoptera: Buprestidae) is native to Asia and is a major invasive wood-boring insect pest in North America. First detected in Michigan in 2002, EAB has since spread to 36 US states and five Canadian provinces. It can infest and kill both ecologically and economically important host plants in the family Oleaceae. North American *Fraxinus* species and potentially cultivated olive, *Olea europaea,* are at risk. Thus, EAB remains a national threat to vast urban and forested ecosystems, commercial olive, and associated timber, nursery, and specialty crop industries. Economic loses attributed to EAB in the US exceed $10 billion as it continues to spread westward.

Detection of EAB in Oregon in summer 2022 prompted warranted concerns in neighboring California. EAB's arrival to California would exacerbate current statewide problems with invasive wood-boring beetles, e.g., gold spotted oak borer (*Agrilus auroguttatus*), Mediterranean oak borer (*Xyleborus monographus*), and several shot hole borers (i.e., a complex of *Euwallacea* species). Major economic losses and biodiversity erosion could result from delays in implementing effective long-term control options. In response, the California Department of Food and Agriculture (CDFA) Biological Control Program is developing proactive EAB management options ahead of any future incursion and establishment of this pest in the state.

The objectives of this proactive research project are to (1) obtain state permits required for movement of biological control agents, e.g., the larval EAB parasitoids *Spathius galinae* and *Tetrastichus planipennisi*, that have been approved for U.S. field release by USDA-APHIS, (2) identify ash and alternate host habitats suitable for future biological control agent releases, (3) initiate field surveys for known resident natural enemies of buprestid beetles in California that may attack EAB, and (4) install a regional EAB trap-based monitoring system in Northern California. CDFA is making progress on all project objectives in collaboration with the University of California, tribal groups, and county, state, and federal agencies. These collaborative efforts continue to enhance California's preparedness against the threat of imminent pests like EAB.

An adult EAB feeding on an ash leaf, image by Debbie Miller, USDA Forest Service, Bugwood.org

Tetrastichus planipennisi is one of several introduced EAB parasitoids in the U.S., image by David Cappaert, Bugwood.org.

Green Lindgren funnel traps are used to monitor EAB activity, image by Vincent Maiquez.

Contributed by Ricky Lara

CDFA's Biological Control Program Celebrates 50 Year Anniversary

CDFA Biological Control Program personnel and associates across the years.

2024 marks the 50th anniversary of California's Department of Food and Agriculture (CDFA) Biological Control Program. The program was established on March 1, 1974, with a statewide mission to lead and provide support for sourcing, evaluating, introducing, and establishing biological control agents of invasive insects and noxious weeds in California. The program began operating in Northern California with four staff members working on biological control of skeletonweed (*Chondrilla juncea*) and western grapeleaf skeletonizer (*Harrisina brillians*).

During the period from 1975-2011, the program hired more permanent staff and undertook a variety of biological control projects targeting 30 weed and 20 insect pests, using >90 biocontrol species and releasing over 60 million individual agents. Several of these projects had extremely successful outcomes, particularly for two target noxious weeds, dalmatian toadflax (*Linaria dalmatica*) and squarrose knapweed (*Centaurea virgata*), and three insect pests, ash whitefly (*Siphoninus phillyreae*), pink hibiscus mealybug (*Maconellicoccus hirsutus*), and cereal leaf beetle (*Oulema melanopus*). These projects were conducted in cooperation with other county, state, and federal agencies, universities, as well as international institutions overseas. The program's extensive efforts on agent releases and accompanying research projects can be found in the annual reports, which can be accessed here: CDFA Biological Control Program Annual reports.

Despite previous accomplishments, the program operated under limited capacity from 2012-2016 due to state budget cuts. However, the economic and ecological damage from invasive species did not disappear. The clear need to invest in pesticide alternatives for pest management, coupled with strong stakeholder support for state-led biological control and renewed state funding, brought the program back officially in 2017. More than ever, the program remains committed to protecting California's agriculture and natural resources from the growing threat of invasive species by delivering cost-effective classical biological control solutions.

The program still operates out of Northern California with two senior scientists, four permanent staff scientists, and four technicians, with plans to expand program capacity currently underway. Program funding comes from intramural and extramural funding in the form of grants, agreements, and subcontracts. The program is targeting more than 15 pests for biological control, including brown marmorated stink bug (*Halyomorpha halys*), diamondback moth (*Plutella xylostella*), yellow starthistle (*Centaurea solstitialis*), and a complex of knotweeds (e.g., *Fallopia sachalinensis*, *F. japonica*). These projects are accelerating the availability and adoption of sustainable pest management practices in California. A CDFA symposium celebrating the program's legacy will be held later this year. For more program information, please visit: https://www.cdfa.ca.gov/plant/ipc/biocontrol/

Contributed by Ricky Lara, Chris Borkent, Nathan Mercer