

International Organisation for Biological Control (IOBC)
 Organisation Internationale de Lutte Biologique (OILB)



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Message from the President



As I sit and write my second message as President of the IOBC, my country, South Africa, has just entered another phase of lockdown as we battle the third wave of COVID to have hit the country. We are not alone as this virus continues to ravage most countries across the globe wreaking havoc and causing terrible distress. The knock-on effects will be felt for years to come. Not wanting to downplay the human tragedy, but as biologists I think we have all felt great frustration at not being able to get into the field, or our laboratories to do what we love most.

Despite the COVID restrictions, I have been amazed at the resilience and ingenuity of the biological control community around the world. Many of the Working Groups within the IOBC have been able to meet, albeit virtually, and communication within the Regional Sections has been excellent. I am also in no doubt that there has been an increase in the publication rate of biocontrol papers as researchers, unable to conduct fieldwork have found the time to write up data that has been sitting around, sometimes for years!

The highlight of 2021 thus far for the IOBC has been the highly successful Second International Congress of Biological Control hosted by CABI Switzerland from the 26-30 April. For those who attended this virtual conference, I think we would all agree that the organization was excellent, the virtual platform slick and free of glitches and the science was of a very high standard. The IOBC Global extends its heartfelt thanks to Ulli and Heike Kuhlmann and their team for the extremely hard work that they put into making this conference such a success. In closing the meeting, I remarked that whilst there was some reservations about having a virtual meeting, I think we all agree that the format worked very well. Of course we would all like to be at a face to face conference, meeting old friends and making new ones, given the global situation, this worked very well.

George Heimpel in his opening address discussed how biological control needs to be an Inter-disciplinary science whereby we integrating knowledge and methods from different disciplines and he suggested that our superhero in the interdisciplinary team was Control – X. Sitting through the congress it was clear to me that the diversity of applications for biological control is incredible, and I really hope that meeting such as this one gets people from the different aspects of biological control to start working together, bringing their expertise to the table of interdisciplinarity to allow us to tackle the challenges that face the world.

One of the benefits of a virtual meeting is that as there are no travel and accommodation costs, it is available to a wider audience. We accept that the timing was not perfect and that certainly biocontrol researchers in New Zealand, Australia, China and other parts of Asia were at a disadvantage, but such was the commitment that there were a number of them in the audience and presenting no matter what time of night it was. It was also heartening to see that biological control is a truly global science, and it is very encouraging to see the amount of research being undertaken in the resource poor areas of the world, solving local problems.

I presented the global biological control community with three challenges going forward. Firstly, capacity building. I am still amazed at how few people are involved in

biological control around the world. We need to double our efforts to train the next generation of biocontrol researchers and implementers. I believe that we need to apply our collective minds to improving how we assess the success of biological control. We need to broaden our post-release evaluation science to include economic, health and environmental benefits. And, we need to sell ourselves better. And finally, we need to find better ways of placing biological control into IPM systems.

I would like to thank the sponsors: CABI, IOBC, Koppert Biological Systems, BioBest Sustainable Crop Management. At this stage we are not sure where the next meeting will be, because there are few options that the IOBC Executive Committee are considering, but it will be in 2024.

So, despite the COVID restrictions 2021 has been a successful year for the IOBC Global and biological control in general. Let's hope that in the next six months the impact of the disease declines and we are all able to get back into the field and the laboratories and drive biological control forward.

Martin Hill

IOBC needs your help

Do you understand Access and Benefit Sharing measures and do they impact biocontrol?

The International Organization on Biological Control (IOBC) Global Commission on Access and Benefit-Sharing (ABS) is gathering information on the challenges practitioners may face when accessing biological control agents to import for research with a view to release into nature or to develop as a commercial product. These challenges are due to policies and procedures being implemented in certain countries that have ratified or acceded to the Nagoya Protocol on Access and Benefit-Sharing (ABS) of their genetic resources.

The IOBC Global Commission on ABS has posted a questionnaire on the IOBC website (https://www.iobc-global.org/IOBC-Global_comm_bc_access_benefit_sharing_survey_2021.html) asking biological control researchers and practitioners about their understanding of ABS measures being implemented around the world, and their perceptions of how these measures may impact biological control.

The information gathered will provide a baseline on the level of understanding by biological control researchers and practitioners of ABS and measures in place. This will guide IOBC and the Global Commission on a path forward including: refining best practices, developing a common position, and providing advice to governments and international organizations (e.g. Commission on Genetic Resources for Food and Agriculture, Convention on Biological Diversity). Results and further actions by the Commission will be posted on the IOBC Global website.

IOBC requests that you take the time to complete the survey and have your say on this important issue affecting biological control globally.

Worldwide education in biological control

IOBC Global often receives questions about education and training possibilities for biological control. With the help of our Regional Sections and Working Groups, we are frequently able

to help finding answers, but it is not always an easy and quick procedure. **Therefore, we ask you to provide information about education and training opportunities.** We will summarize this information and publish it on the Global website. Please present the information to secretary-general@iobc-global.org as follows:

Name of course / training:

Institute / organization providing this course:

Course period and length of course in days:

Costs of course:

Entrance requirements:

How did you become a biological control practitioner?

Another question IOBC regularly receive is what a person has to study to become a biocontrol practitioner. There is no straightforward answers to this questions as there are many roads to obtain a position in biological control. However, it might be helpful to collect a number of examples of careers of biological control experts and present these on the Global website. A few sentences will suffice. Here is how your Secretary General ended up in biocontrol: Joop C. van Lenteren studied experimental biology at Leiden University, got a MSc in animal ecology and plant anatomy, then obtained a PhD in behavioural ecology and population dynamics. During his thesis research he became interested in biological control and after his PhD, he started working on scientific and applied aspects of parasitoid-host relationships. He always cooperated with growers/farmers and producers of biocontrol agents and, looking back after 50 years of work in this fascinating field of applied science, is more than satisfied with the many professional friendships developed and successes obtained. **If you are willing to share your career path with those interested in becoming a biocontrol practioner, please send your information to secretary-general@iobc-global.org.**

Upcoming Events



IOBC Global activities:

We intend to organize the **General Assembly** of IOBC Global during the International Congress of Entomology in Helsinki in 2022. In the December 2021 newsletter we hope to provide more details about this meeting.

IOBC symposia presented at XXVI International Congress of Entomology in Helsinki from 18-23 July 2022:

1. Essential and useless ecological knowledge for applied biological control.
2. Revisiting the biosafety of exotic generalist arthropod biological control agents.
3. Omnivorous predators in augmentative biological control: blessing or nightmare?
4. Access and Benefit Sharing and Biological Control Genetic Resources

15th Workshop of the IOBC Global WG on Mass Rearing & Quality Assurance (MRQA) – Bologna, Italy, 5-9 September 2022



The workshop, entitled “**Delivering on the Increasing Demand for High Quality Invertebrates**” will be organized jointly with the Association of Natural Biocontrol Producers (ANBP) and the International Biocontrol Manufacturers’ Association (IBMA). The workshop objective is to explore opportunities for advancing the rearing of high quality entomophagous and phytophagous insects and mites, entomopathogenic nematodes, and other invertebrates for plant and animal pest management, human and animal food, and a variety of other uses. The program will consist of symposia on current “Hot topics,” invited and submitted presentations, and posters on selected aspects of invertebrate rearing and quality assurance as they relate to production and quality control. Presentations will serve as a basis for discussion and exchange, with the final aim of improving collaboration among scientists and practitioners. For more info, see: <https://www.mrqa.eu/workshop2022/>

Maria Luisa Dindo and Rose Buitenhuis,
Co-convenors of the IOBC Global Mass Rearing and Quality Assurance (MRQA) Working Group

Other biocontrol related events

Please see the complete lists of upcoming events related to biocontrol activities at the website of IOBC Global: www.IOBC-Global.org, and of IOBC-WPRS: <https://www.iobc-wprs.org/events/index.html#20210908>



III International Organic Fruit Symposium and I International Organic Vegetable Symposium
Catania (Italy), October 5–8, 2020



Di3A
Dipartimento di Agricoltura, Alimentazione e Ambiente

Rural and Urban Well-Being and Agroecological Perspectives for the Horticultural Supply Chain

**III International Organic Fruit Symposium and I International Organic Vegetable Symposium
Catania (Italy), December 14th-17th, 2021**

The Organizing Committee of ISHS III International Organic Fruit Symposium and I Organic Vegetable Symposium will hold the Symposium in December 14-17, 2021 as a virtual event. New Deadlines: the deadline for Early-bird registration is on August 1st, 2021; the Abstract submission will close on September 1st, 2021. The deadline for Full text submission is fixed for September 15th, 2021. Please find more information (fees, payments methods etc.) visiting our website <https://www.orghort2020.it/guidelines-for-registration/>.



6th Meeting of the International Society for the Biological Control of Arthropods (ISBCA)

British Columbia, Canada (Virtually), March 15-17 and 22-24, 2022

Save the dates! The 6th meeting of the ISBCA will be held virtually over two weeks in March 2022. Registration will open August 1, 2021. A virtual meeting format with sessions staggered among time zones and a mix of live and on-demand content will allow the affordable participation of the biological control community from around the globe from the comfort of their homes or workplaces, without concerns about travel restrictions. The meeting will be held over six days spread out over two weeks to allow attendees to attend to personal and professional responsibilities on non-meeting days. In addition to the scientific sessions we plan to have a series of 15 minute virtual bus tours available. These will include places you may want to put on your bucket list and biocontrol activities from around the world. Start taking your videos of experimental setups, long-term trials, biocontrol production facilities, eureka discoveries and more.

Call for Scientific Sessions. Proposals for scientific sessions will be accepted until October 15, 2021. There will be several sessions (each with six 10-min talks), plus poster sessions, covering a range of topics in fundamental and applied research related to the biological control of arthropods. As with past ISBCA meetings, a published proceedings with extended Abstracts is planned. Session proposals should be a maximum of 250 words, and include a list of tentative speakers and their affiliations. Please send proposals to Scientific Committee co-chairs Paul Abram (paul.abram@agr.gc.ca) and Peter Mason (peter.mason@agr.gc.ca). Sessions with similar topics may be combined at a later date.

More details to come soon. We look forward to seeing you virtually next year.

Local Organizing Committee

Paul Abram, Chandra Moffat, Brian Spencer, Dave Gillespie

**ICE2020 postponed to 2022
and preparations for ICE2024 started**



Prof.dr. Heikki Hokkanen, the President of the **XXVI ICE Helsinki** Organizing Committee informed us that the meeting will be postponed to 18-23 July 2022. For the latest information, please check the congress website at www.ICE2020Helsinki.fi.

Registrations and proposals for symposia are still possible. Some 1800 persons have already registered.

IOBC-sponsored symposia during ICE2022:

1. Essential and useless ecological knowledge for applied biological control.
2. Revisiting the biosafety of exotic generalist arthropod biological control agents.
3. Omnivorous predators in augmentative biological control: blessing or nightmare?
4. Access and Benefit Sharing and Biological Control Genetic Resources

**ICE2024**

Japan will host the **XXVII International Congress of Entomology** from August 25 – 30, 2024, in Kyoto, Japan.



2nd International Congress of Biological Control held successfully in 100% digital format

The Second International Congress of Biological Control (ICBC2) – co-organised by CAB International (CABI) and the International Organisation for Biological Control (IOBC) and sponsored by IOBC, CABI, Koppert Biological Systems and Biobest – has been held successfully in a 100% digital format. In the end of January 2021, the IOBC and CABI concluded that a face-to-face or even a hybrid meeting was no longer feasible in Davos, Switzerland, due to the global COVID-19 pandemic situation. Despite the obvious disadvantages of not having a face-to-face scientific meeting, it is clear that there were a number of obvious advantages for all participants, such as saving on travel, food and accommodation costs and not having to deal with visa issues. In addition, a 100% digital format increases accessibility and inclusion by reducing barriers to participation.

However, ICBC2 is a truly international meeting and therefore one of the major challenges remained which are the different time zones. A concept had to be developed which enabled most of contributors and observers to attend the digital scientific session (posters and talks) and panel discussions in real time when they were live-streamed. All scientific talks were pre-recorded to overcome potential bandwidth constraints in order to avoid a delayed delivery of sessions due to technical difficulties. In addition, all scientific

sessions and panels had to be recorded too, so that everyone would have the opportunity to watch them later for up to 30 days after the congress had ended through a video-on-demand function. To implement the digital format, IOBC and CABI in collaboration with KCS Convention Service had to find a reliable and high-quality IT service provider which was found in the company GroupConsulter which had the necessary experiences to guarantee the smoothly and professional delivery of ICBC2 in a satisfactory way for all international participants.



One of the Group Consulter technicians providing support during the meeting

ICBC2, which took place from 26-30 April 2021, built upon the 1st International Congress of Biological Control held in Beijing, China, and the 1st International Conference of Biological Control held in Bengaluru, India, during 2018. In total, 285 participants attended and presented nearly 50 poster presentations and 135 oral contributions in almost 30 sessions with 4 concurrent sessions in each time slot. A number of the 285 participants were young scientists and some of them were financially supported through an IOBC award which was provided when the young researchers hold an IOBC membership. Based on this outcome, ICBC2 provided a platform for multi and inter-disciplinary biological control research and application to tackle a variety of different pests.

In addition, three panel discussions were included in ICBC2. These included Ulli Kuhlmann (CABI) and Jennifer Lewis from the International Biocontrol Manufacturer Association (IBMA), who led a panel discussion looking at what is being done to improve the update of biological controls from a multi-stakeholder perspective. Other panel discussions featured Phillippe C. Nicot and Marc Bardin, from INRAE, France, who spoke about developing decision support systems to foster the use of biocontrol agents against plant diseases in the field, and Urs Schaffner (CABI), Nick Mills (University of California at Berkeley) and George Heimpel (University of Minnesota), who discussed creating synergies among the biological control approaches to promote the concept of 'One Health.'

The feedback after ICBC2 was very much encouraging as 90% of participants said that their expectations were met (41%), exceeded their expectations (27%) or significantly

exceeded their expectations (22%). Here are a few statements which the organizing team received through the feedback function of what liked most:

- *It was great way to allow attendees to not miss any talk, which is usually what happens in a conventional conference with multiple sessions at the same time. The online conference worked great!*
- *It was a very smoothly run congress. Chairing my session was a breeze with good IT support and an easy-to-use question management tool. It was nice having the meet-the-speakers session for a more open discussion, as a substitute for the face-to-face conversations you would have during breaks. The virtual meeting has its advantages in terms of flexibility and inclusiveness.*
- *Taping presentations makes the meeting less stressful for the presenters, which facilitates active participation in other talks and sessions.*
- *The conference platform worked brilliantly, it was easy to use and navigate between session (and displayed in local time) and posters. I thought the poster session/rooms were particularly effective.*
- *The conference was very well organized and there were a lot of opportunities to interact with the speakers. It would be great if also in future conferences there will be an option to participate remotely and that the presentations will be recorded.*
- *I hope future international congresses could adopt a hybrid form. That would allow more interactions between participant and at the same time allow people who do not have the possibility to participate in person e. g. due to financial reasons.*

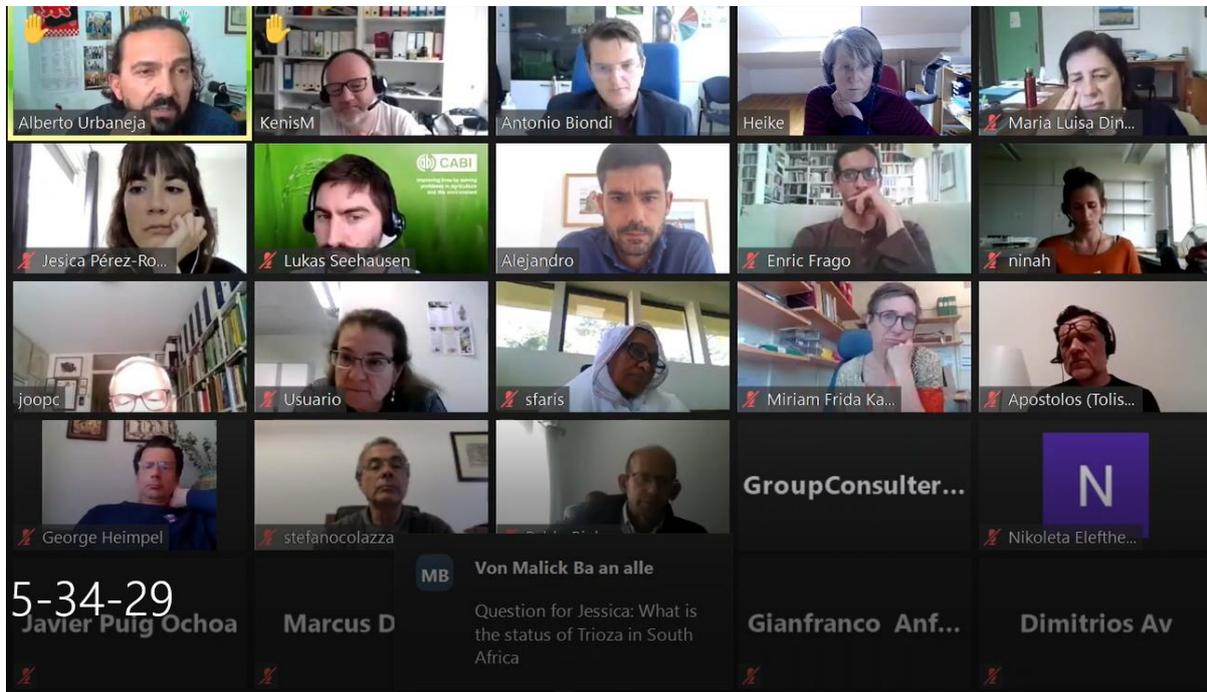
The feedback function also revealed a number of suggestions of how the next congress could be further improved.

- *It would have been nice for the panels if questions could have been asked directly (with video and audio) not only by sending written questions. This would have made the panels much more truly interactive and engaging.*
- *A challenge for future scientific committees of ICBC3: make this event become a truly global biocontrol event in terms of scientific content => implicate more weed scientists and plant pathologists if possible.*
- *Would be good if delegates made more use of the chat function/checked for messages, perhaps some sort of notification without having to open the chat would help with this.*
- *The awareness of who is present-on line during the live sessions for the session chairs would be good.*
- *I was a bit disappointed by the lack of women and diversity in some of the sessions.*
- *Although the platform allowed contact between the participants with good quality, it lacked interaction.*

The organizing team is very grateful for the feedback of what needs to be improved and it will be taken on board for the next ICBC3. The feedback has been also provided to the IT service provider so that they can also further improve their digital event platform.

One of the advantages of running a congress in a digital format is that a vast of user analytics can be obtained. We have not used the opportunity to the utmost extend but we were interested in the uptake of the video-on-demand function and how many participants were able to attend the live streamed sessions. It is now clear that the video-on-demand function is very much important for such an international congress as a lot of participants used the opportunity to look at some of the sessions through this format. This was the reason that we are extended the option so that everybody had the opportunity to revisit the

congress platform for over 30 days. In terms of watching a session, the user analytics showed a range of “plays” from a minimum of 92 to a maximum of 286 participants (with an average number of 168 participants watching a session).



Session in progress

Many thanks to all members of the scientific committee, to all panel and scientific session organizers and all regional coordinators who supported the organizing team in a very professional way to ensure a successful delivery of the event. At the end a huge thanks to all the participants for their great understanding, enthusiasm and collaboration to make ICBC2 a success in very difficult times. It was indeed important to catch up and to stay in touch as lots of excellent biological control research is currently being conducted in times of climate change and with an ever more important understanding about the importance of the conservation of biodiversity that agriculture relies upon.

We are looking forward to organize ICBC3 which should take place in 2024. We are currently looking into options for identifying a good event location and a local organizer.

Ulli Kuhlmann, George Heimpel and Martin Hill

Reactions from early career biological control scientists who received an IOBC Global grant to be able to attend ICBC2 - Davos

Ellen Cottingham (University of Melbourne, Melbourne, Australia): “IOBC2 was an eye opening international perspective of biological control developments and advancements. It was a please to be able to attend as a PhD candidate. I’m looking forward to seeing new and exciting research at the next meeting!” Best wishes, Ellen Cottingham

Emilie Demard (University of Florida, IRREC, FA, USA): “I enjoyed the 2nd ICBC meeting. It was my first time attending it. The way the time zone was displayed was pretty effective. I was attending from the USA and I could perfectly understand when I had to be online. Also, the recording of the video was really smooth. Good technical support. That was nice.”
Best, Emilie Demard

Patrick Fallet (University of Neuchatel, Neuchatel, Switzerland): “The congress held very exciting talks about recent progress in biological control and covered a wide spectrum of approaches. A particularly great aspect of the online meeting was that all presentations were recorded and available on-demand. This avoided the dilemma of which talk to watch and which to miss. The organizers also provided tools to communicate between participants, which compensated for the impossibility of a face-to-face meeting. The ICBC2 was overall a great success and I am looking forward to participating in the next congress. *One comment I would like to share with you is that there was no information regarding who and how many persons watched our own presentation. This may be something to propose (if feasible) in a future meeting.*” With best wishes, Patrick Fallet

Jérémy Gonthier (Agroscope Reckenholz, Switzerland): “As a young researcher and novice in the field of biological control, I really enjoy the last ICBC2. It opened my eyes to the broad and endless possibilities of research and application in the field of biological control. The online format was really convenient and easy to use with very interesting session always followed by interactive discussion. In the poster session, the chat function and the virtual room were great tool to present my work, exchange ideas and interact with new researchers. I would recommend The ICBC to any researcher or practitioner in the field and I’m already looking forward to the next edition.” Best, Jérémy Gonthier

Nina Patricia Haener (Agroscope Reckenholz, Switzerland): “In the majority of ICBC2 sessions I participated, the importance of knowledge exchange and communication between different stakeholders in biological control research for the advancement of the field and the development of solutions that are farmer-friendly was highlighted. In my opinion, ICBC2 did a great job in this perspective providing a thoroughly developed platform with many different options to get in touch with the participants. The virtual setup also allowed for the inclusion of farmers and other stakeholders working in the applied sector and to learn about their thoughts and opinions.” Best regards, Nina Haener

Sara Hermann (Penn State University, PA, USA): “This was my first IOBC meeting and while I had hoped it would be in-person, the virtual format was very accommodating and smooth. The flexibility of the virtual format allowed for broad participation in the meeting and the ability to connect with folks from across the globe. The sessions were wonderful and I was very glad to participate. Fingers crossed for an in-person meeting in the coming years!”
Sara Hermann

Tara O’Neill (University of London, London, UK): “I though the ICBC2 was absolutely excellent. As my first international congress, ICBC2 was an amazingly informative week of varied presentations across the breadth of biological control, from the many uses of Trichoderma to managing and protecting cacti. The conference platform was easy to navigate and the strong focus of each session really tied talks together, making them more accessible as

someone who's interested in everything but doesn't know the background. I found the private poster rooms really effective as a way to interact with other delegates about their research and to receive valuable comments and feedback on my own. While not quite the same as a trip to Switzerland, the virtual ICBC2 was an excellent event and thank you to everyone involved. I am also very grateful to the IOBC for supporting my attendance through the award for young researchers." Kind regards, Tara O'Neill

Chiara Pedrazzini (Agroscope and ETH, Zürich, Switzerland): "Despite the pandemic situation related to covid-19, I had the opportunity to attend the ICBC2, which took place online during the last week of April. Although there was no opportunity to meet the other participants for coffee or a meal, the excellent organisation made the conference very exciting and interesting, with many presentations from different continents. Congratulations on the organisation!" Kind regards, Chiara Pedrazzini

Gabor Potzsgai (Fujian Agriculture and Forestry University, FUZHOU, China): "As the COVID-19 pandemic hit the world most scientific meetings were cancelled, postponed, or moved to the online space. The organisers of the 2nd International Congress of Biological Control choose the last option, and they decided well. Although the Congress was a fully virtual event for the first time, how they organised the conference was spotless both from the presenter's and from the listener's perspective. As one of the inexperienced online speakers, I was very much relieved with the patient instructions from the technical support when we recorded my talk. Although I miss personal interactions from online meetings, the sparkling, yet relaxed atmosphere of the sessions on ICBC made them very friendly and left nearly the feeling of in-person conferences. The 'backstage' chat rooms and discussions after the sessions were particularly useful. Also, since I was busy with my daily work during several of the presentations, I could not listen to all the talks I was interested in. Yet, thanks for the recordings I was able to watch them back after the meeting. I was close to not being able to participate but, thanks for the support from IOBC Global, finally it worked out and I am glad I managed to join this great event. Thanks again for organising this event and for your support." All the best, Gabor Poszgai

Javier Puig Ochoa (Polytechnic University of Valencia, Valencia, Spain): "The participation on ICBC2 was a nice opportunity to exchange my research about the biological control of the citrus whitefly *Dialeurodes citri* on the Mediterranean region. As it is a pest spread worldwide, I had the opportunity to discuss the results with other colleagues that has been working on it before, even from some decades ago. Also, as the congress has been developed online due the pandemic situation, gave us the opportunity to assist on many conferences even some weeks after. I could enjoy some recorded conferences that had been programmed at the same time. And the change of a new format of the poster session to a short presentation on online private rooms was an easy way to interact with the data information and the speakers. I hope it will help you with future events!" Best regards, Javier Puig Ochoa

Lore Vervaeet (Ghent University, Ghent, Belgium): "I had a wonderful experience at the ICBC2. Shout out to everyone from the organization for the fabulous job ensuring the congress went smoothly and for providing room for discussion and sharing thoughts with other researchers. This congress definitely gave me an extra boost. Thank you!" Best regards, Lore Vervaeet

Biocontrol can offer a systemic and balanced solution for sustainable agriculture

IBMA IEEP Press Release, see:

<https://preview.mailerlite.com/i2z5t1/1715062550883735080/r3y7/>



A new report by the Institute for European Environmental Policy (IEEP) identifies the benefits of biocontrol as an alternative to environmentally harmful plant protection methods. The effect of plant protection methods on biodiversity and health are now at the centre of political and technical discussions. Particularly in face of the upcoming revision of the Sustainable Use Directive, a milestone within the implementation of the Green Deal objectives, it is essential to explore sustainable alternatives. Key findings:

- As a non-chemical and targeted input, biocontrol reduces the risks of environmental contamination (soil, water, human health). Its application thereby supports biodiversity enhancement and soil quality by creating a favourable status for microbial communities. Biocontrol can therefore be an enabler of the European Green Deal, particularly for the Farm to Fork objectives.
- Using natural mechanisms for pest and disease control brings farmers closer to understanding life cycles and insects' behaviour while creating a non-toxic environment for farm workers and consumers.
- The effectiveness of biocontrol can be amplified in ecological focus areas, such as flower strips. Deploying natural enemies in a framework of sustainable farming practices increases the success rate.
- The growing demonstration of biocontrol efficacy has boosted the biocontrol market. Nonetheless, the development of economically competitive biocontrol requires an adapted registration process, instead of following rules originally intended for chemical pesticides. The absence of a clear legal definition of biocontrol and its importance to Integrated Pest Management (IPM) and organic agriculture highlights the need for a systemic approach at the EU level.

Faustine Bas-Defosse, External Impact Director at IEEP, said: "The science is unequivocal on the need to move rapidly towards a sustainable food and farming system in order to stay within planetary boundaries. The European Green Deal, in particular its Farm to Fork and biodiversity strategies, aim at setting the way towards that new system of food production and consumption. As a systemic and balanced alternative to chemical inputs in farming, biocontrol is certainly an enabler of that system change. As an independent Think Tank striving for sustainability and science-based policy making, we were very enthusiastic when IBMA approached us to conduct a literature review on the benefits of biocontrol for the environment and its wider economic, climate and governance impacts. We indeed

believe that such evidence is needed for informed and sound decision making on the European Green Deal objectives' implementation.”

Top five policy recommendations:

- Definition: Using a common EU definition on biocontrol would bring clarity of its technical aspects to the political discussion on pest control for sustainable agriculture.
- Legal framework: Adapting the current EU legal framework to recognise the non-toxic implications of biocontrol, in comparison to chemical products, should be considered.
- Alignment opportunities: By increasing the uptake of biocontrol use, as part of IPM, the CAP can be better aligned with the SDGs and the Farm-to-Fork strategy – in creating a pathway for achieving the 2030 targets on organic farming and chemical pesticide reduction.
- Research needs: Extending research topics and investment beyond technical issues to biocontrol's relation to climate change mitigation and farm economics will create a more holistic image of the impact of the use of biocontrol.
- Field application: Pushing for larger scale and accelerated application, supported by available policy instruments in the Common Agricultural Policy, will show the potential that biocontrol demonstrates for controlling plant pests and diseases, in support of EU Green Deal targets

Vast amount of European agricultural subsidies will be used to stimulate agricultural practices beneficial for the climate, biodiversity, and the environment



Farmers play a key role in tackling climate change, protecting the environment and preserving landscapes and biodiversity. The European Commission aims to facilitate the role of farmers by ensuring that the Common Agricultural Policy (CAP) will:

- contribute to climate change mitigation and adaptation, as well as sustainable energy;
- foster sustainable development and efficient management of natural resources such as water, soil and air;
- contribute to the protection of biodiversity, enhance ecosystem services and preserve habitats and landscapes.

A new green architecture

In its proposals, the Commission sets out a new green architecture for the CAP, featuring strengthened mandatory requirements and increased funding opportunities for green farming. Amongst the measures foreseen in the proposals are:

- the preservation of soils through requirements to protect carbon-rich wetlands and practice crop rotation;
- an obligatory nutrient management tool, designed to help farmers improve water quality and reduce ammonia and nitrous oxide levels on their farms;
- a new stream of funding from the CAP's direct payments budget for "eco-schemes", which will support and incentivise farmers to undertake agricultural practices beneficial for the climate, biodiversity, and the environment.

Through such measures, the CAP will place agriculture at the heart of the European Green Deal, as well as the EU's ambitious biodiversity and farm to fork strategies.

Twenty five percent of the budget of about 370 billion EU for the period 2023-2027 will be reserved to support and incentivise farmers to undertake agricultural practices beneficial for the climate, biodiversity, and the environment.

Information copied from: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en#highergreenambitions

PDF fact sheet: https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/factsheet-agri-practices-under-ecoscheme_en.pdf

What about similar information from your country or region? Please send any news concerning policies boosting biocontrol and green agriculture in your country or region to joop.vanlenteren@wur.nl

icipi launches mass release of indigenous natural enemies to control fall armyworm



International Centre of Insect Physiology and Ecology

Press Release

Management of the invasive fall armyworm (FAW), scientifically known as *Spodoptera frugiperda* in Africa, requires the deployment of all tactics within the context of integrated

pest management (IPM). The International Centre of Insect Physiology and Ecology (icipe) has launched mass releases of indigenous natural enemies of FAW in Kenya.



Egg parasitoid, *Telenomus remus* parasitizing fall armyworm eggs

In Africa, the cultivation of maize represents one of the most important sources of food security, income generation and employment for over 300 million people. However, the recent invasion by FAW has led to yield losses of 8 – 20 million tonnes of maize on the continent. Maize is attacked by diverse species of native and invasive stemborer pests in Africa. However, the FAW has become the most devastating. It attacks all the developmental stages of the maize plant attracting an unprecedented scale of broad-spectrum application of chemical insecticides by

the growers. In Ethiopia and Kenya, more than 50% of maize growers that applied chemical pesticides for FAW control reported that they only provide marginal control or they are completely ineffective. These chemical pesticides are not only ineffective but expensive and pose serious detrimental effects to humans, biodiversity and the environment.



Egg parasitoid, *Trichogramma chilonis* parasitizing fall armyworm eggs

Since the first detection of FAW in East Africa, icipe, jointly with national and international partners have embarked on basic and applied research to understand the ecology of the pest in Africa to guide the development of sustainable management strategies suited for African conditions. Technologies such as the use of icipe's Push-pull technology, maize-legume intercropping and biopesticides have proven to be a key part of sustainable management strategy for FAW, particularly under smallholder

maize production systems in Africa. These technologies are eco-friendly and compatible with the use of biological control agents.

"Though FAW is an alien invasive pest, our research has unravelled significant information on widely distributed native parasitoid species in Africa (namely *Telenomus remus*, *Trichogramma chilonis* and *Cotesia icipe*) and their ability to successfully parasitize



Larval parasitoid, *Cotesia icipe* parasitizing young fall armyworm larva

and kill the invasive pest" explained, Dr Samira Mohamed, Senior Scientist, icipe. Our approach focusses on evaluating the performance of these native parasitoids on various life stages of the FAW to identify the most effective one. Further we intend to mass produce these effective parasitoids and release them in the FAW hotspots along with other eco-friendly management technologies to effectively manage the pest and improve maize yield", added Dr Mohamed.

In the last quarter of 2020 and following a comprehensive assessment of the performance of the native parasitoids, icipe jointly with national partners in Kenya has embarked on their mass releases. So far over 140,000 wasps each of *Telenomus remus* and *Trichogramma chilonis* that parasitize FAW eggs; and 5,000 wasps of *Cotesia icipe* that

parasitize early larval stages of FAW have been released in five counties (Taita-Taveta, Machakos, Embu, Meru, and Nyeri) of Kenya with very encouraging results.

The initial post release field assessments revealed that parasitism rates of FAW in the field increased by 55%, 50% and 38%, for *Trichogramma chilonis*, *Telenomus remus* and *Cotesia icipe*. “The released parasitoids work synergistically to bring down the population of FAW by attacking different developmental stages (eggs and larvae) of the pest. However, for these parasitoids to be able to effectively contribute to the suppression of pest, they need to be conserved by minimizing application of broad-spectrum chemical insecticides”, added Dr Mohamed.

“There are further plans for mass releases of these beneficial insects in other major maize growing zones across Kenya. Also, plans are under way with the national partners to expand the releases of these natural enemies to other eastern and southern African countries”, concluded Dr Sevgan Subramanian, Principal Scientist, icipe.

Information taken from icipe press release 19 February 2021:

<http://www.icipe.org/news/icipe-launches-mass-release-indigenous-natural-enemies-control-fall-armyworm>

First classical biological control program against a weed in Europe: *Trichilogaster acaciaelongifoliae* (Hymenoptera: Pteromalidae) released against *Acacia longifolia* (Fabaceae) in Portugal



Acacia longifolia (Fabaceae) (photo left, source: Australian Plants Society NSW) is a small shrub or tree species native to South-Eastern Australia. It is invasive in a number of countries including Argentina, Brazil, New Zealand and South Africa. Within the EPPO region it is considered invasive in Spain and Portugal where it can form extensive populations within coastal ecosystems which act to displace native plant communities. *A. longifolia* alters soil chemistry, reduces forest productivity, and increases the

potential for natural fires. In Portugal, the gall forming wasp *Trichilogaster acaciaelongifoliae* (Hymenoptera: Pteromalidae) (photo left, source: Elvasnews, 23 August 2015) was released



as a biocontrol agent in 2015. Since then, and up to 2020, the establishment, spread and impact of the biocontrol agent has been monitored across 61 sites. Since its first release, establishment has been confirmed at 36 sites. The transfer of the wasp from the southern hemisphere limited its initial establishment, but increased rates of establishment followed with synchronization of its life cycle to northern hemisphere conditions. *T. acaciaelongifoliae* populations then experienced an

exponential growth (from 66 galls by 2016, to 24 000 galls by 2018). Galled *A. longifolia*

branches produced significantly fewer pods (-84.1%), seeds (-95.2%) and secondary branches (-33.3%). The results are promising for the long-term effectiveness of this biocontrol agent and are also encouraging for future biocontrol programmes that require hemisphere translocations of biocontrol agents. Source: (2021) Establishment, spread and early impacts of the first biocontrol agent against an invasive plant in continental Europe. *Journal of Environmental Management*.

Information copied from EPPO Reporting Service NO. 5 PARIS, 2021-05 (<https://gd.eppo.int/reporting/Rse-2021-05>)

Want to see how much work is done on weed biological control in South Africa?



Centre for Biological Control Annual Report 2020

The annual report of the Centre for Biological Control provides an impressive amount of information about weed biological control, including reports on control of:

- Nine species of aquatic weeds
- Four species of Cactaceae weeds
- Five species of northern temperate weeds
- Two species of Invasive trees
- Six species of grasses
- Bugweed, Tamariz and African boxthorn



Water hyacinth – *Pontederia crassipes* – remains South Africa’s most problematic aquatic weed. Nine species of biological control agents have been released so far in South Africa. The CBC initiated a biological control project against this weed at the Hartbeespoort Dam in 2018 with the release of the weevil *Megamelus scutellaris*. The above satellite images show the area covered by the weed in September 2017 (left) and two years after release of the weevils in July 2020 (right) with less than 2.5% covered by the weed (Photo: David Kinsler)

Above information and photographs obtained from:

https://www.ru.ac.za/media/rhodesuniversity/content/zoologyandentomology/cbc/informationdocuments/CBC_2020_Annual_Report.pdf

What about similar information from your country or region? Please send any news concerning new, successful biocontrol programs in your country or region to joop.vanlenteren@wur.nl



BioControl, the Official Journal of IOBC

Eric Wajnberg, Editor-in-Chief

New, strongly increased Impact Factor for BioControl is 3.571!!
Congratulations editorial committee!!

Special Issue: “Revisiting the biosafety of exotic generalist arthropod biological control agents”. Guest editors: David Andow, Barbara Barratt, Robert Pfannestiel, Débora Pires Paula. Published in issue 1 of volume 66 (2021).

In memoriam Fred Bennett

September 16, 1925 – May 7, 2021



Frederick Douglas Bennett was born in 1925 in Spencerville, Ontario, Canada, about 80 km south of the national capital city of Ottawa. In 1947 he received a Diploma in Agriculture from Kemptville Agricultural College (later to become part of the University of Guelph), and in 1950 a B.Sc. in Agriculture from the University of Toronto. It may not have been known to many of his colleagues that in his student days Fred was a champion boxer and wrestler – in 1950 he was University of

Toronto Interyear Heavyweight Boxing Champion and Canadian Inter-University Light Heavyweight Wrestling Champion (Frank 2019a).

After early employment as an entomological assistant at the Canadian Forest Service, in 1950 Fred was appointed as Entomologist/Plant Pathologist to the Bermuda Department of Agriculture, and from then on spent his whole career in the tropics and subtropics. In 1952 he accepted a position as entomologist at the newly opened Commonwealth Institute of Biological Control (CIBC) station in Curepe, Trinidad, and became Entomologist-in-Charge there in 1958. In 1961 Fred received his Ph.D. from the University of California, Berkeley, for his thesis entitled “The taxonomy, biology, and parasites of some California species of *Leucopis* (Chamaemyiidae: Diptera)”. He was involved in the development of CIBC’s first laboratory facility, which opened in 1962 in Curepe, on the campus of the University of the West Indies in St. Augustine. In 1976 he was appointed Director of CIBC as a whole, with responsibility for its stations in Trinidad, Switzerland, India, and Pakistan. In 1985 Fred moved to Gainesville, Florida, to take up the position of Graduate Research Professor in the Department of Entomology and Nematology at the University of Florida. Howard recalls that Fred arrived at a time of transition in the Department, and was assigned office space in a trailer, but immediately began surveys for the natural enemies of black parlatoria scale (*Parlatoria ziziphi*) which was detected on backyard citrus in the Little Haiti area of Miami a few days after Fred’s arrival.

Fred’s biological control and entomological activities were documented in a profusion of publications and reports over a span of more than 60 years (Frank 2019b). He published close to 100 journal articles, of which the first appeared in 1955 and dealt with encyrtid parasitoids of mealybugs in Trinidad, and the last, in 2012, reported new beetle species for the fauna of the Isle of Man. He also produced many conference papers, book chapters, and project and consultancy reports. The latter included reports on travels to collect or release biological control agents, assess prospects for biological control of various pest or weed targets, and review and advise on the status of biological control programs. The titles of these reports give a flavour of the wide range of his experience, including work all over the Caribbean as well as in Guyana, Brazil, Bolivia, Colombia, Botswana, Sudan, Ecuador, Mexico, USA, Belize, and Venezuela. The reach of his influence is also shown by the involvement of over 100 co-authors from around the world in his papers and reports. Fred had a long association with IOBC. He was Chair of the Working Group on *Diatraea* and allied graminaceous borers in 1971, President of the Western Hemisphere Regional Section from 1971 to 1973, Treasurer of IOBC Global from 1980 to 1984, and received the NRS Distinguished Scientist Award in 1996.

To those of us who knew and worked with him, Fred was an unforgettable figure and his approach to biological control was influential. It was not his style to seek fame or credit, build ambitious mega-projects, or develop grand explanatory theories. Instead he sought practical opportunities to support and contribute to biological control, one project at a time, relying on his deep knowledge of insect biology and taxonomy, and on his vast network of personal connections. Through the course of his career he made key contributions to many biological control successes, including those against sugar cane borers (*Diatraea* spp.) in the Caribbean, armyworms (*Spodoptera* spp.) in Barbados, mole crickets (*Neoscapteriscus* spp.) in Florida, and invasive plants such as water hyacinth (*Eichhornia crassipes*), floating fern (*Salvinia molesta*) and parthenium weed (*Parthenium hysterophorus*) worldwide.

Fred was also heavily involved in the early stages of the programme on cassava mealybug (*Phenacoccus manihoti*) from the late 1970s. He had already developed expertise

on the Encyrtidae attacking mealybugs in Trinidad, describing new species in the 1950s, so was well placed to take up this work, together with Maajid Yaseen. At that time, the origin of the mealybug in southwest Brazil, Paraguay and Bolivia was not known, and CIBC's surveys of related mealybugs started in Trinidad and worked southwards. In due course, the mealybug and its natural enemies were discovered in Paraguay, and this major international collaboration with IITA, CIAT and others led to the successful and well-known biological control of this very important pest in Africa, and more recently Asia.

Three of us (Rachel, Matthew and Alec) first met Fred when we came to CIBC in Trinidad at the beginnings of our careers in biological control. Rachel arrived in 1966 as a new graduate from the UK, to work on a weed biocontrol project for her PhD at the University of the West Indies in St Augustine. She recalls: "He was my first boss, as well as external supervisor for my PhD. He taught me how to write reports and scientific papers. My early reports came back from him all scribbled over with red ink – mostly removing phrases and shortening sentences. As time passed, there was less and less red ink! I was probably the first young woman colleague he had worked with, as women were very scarce in science at that time. ... I was always keen on the field work which was an essential part of the job, and Fred supported me in this, trusting me to judge my safety or otherwise in the various places I worked. I remember my first field trip to Central America in 1968: Fred organized the trip through his network of contacts everywhere, mostly in sugar research stations, and gave me good advice such as 'don't try self-drive hire in Mexico; hire a car with driver' because of Mexican laws in the event of a serious accident. ... Then in 1972 with my PhD finished, there was a permanent position available in the CIBC for an entomologist – but in north-west Argentina to look for cactus insects for Australia, which involved working alone, with a lot of field work, and in Spanish. Fred backed me for the job, against a lot of opinions that this was not a job for a woman. I got the appointment and he continued to back me over the next three years, through significant difficulties from the political problems in Argentina at the time. After I married, resigned from the CIBC, and moved to Australia in 1976, he continued to be a friend and valued colleague."

Matthew remembers: "When I first arrived in Trinidad in 1978, I stayed in the CIBC guest room for a month. On one occasion I managed to lock the keys inside the room. Fred was in his office next door, and so I asked if he had a spare key. Before I could say any more, he had climbed onto a chair, from there onto a filing cabinet against the wall, pushed out one of the ceiling tiles, climbing onto the wall between the two rooms, removed a ceiling tile on the other side, dropped into the bathroom, and opened the door from the inside. I was impressed!" Clearly Fred's early athletic achievements had lasting benefits.

Fred never missed a collecting opportunity. Alec remembers: "In 1981, while Fred was in Mexico on his annual visit to advise me on the *Parthenium* project, I was invited to give a talk to students at the field station of the Universidad Autónoma de Nuevo León, outside Monterrey, to which Fred accompanied me. After the talk our hosts treated us to a barbecue, at which we consumed excellent *carne asada* washed down liberally with cold Mexican beer. Fred then announced that it was time to do some collecting. We proceeded, slightly unsteadily (at least in my case), around a field margin until Fred found a patch of Johnson grass attacked by the Mexican rice borer, *Eoreuma loftini*." This yielded a gregarious braconid ectoparasitoid, which was subsequently described as a new species, *Allorhogas* (now *Parallorhogas*) *pyralophagus* Marsh. It was subsequently mass produced in Texas, Trinidad, and *Pyralophagus* released against various pyralid stem borers in Barbados, St Kitts-Nevis, Trinidad & Tobago, USA, Brazil, India, Mauritius, Ghana, Bolivia, and Indonesia.

Fred's collecting habits were in evidence even during visits to CABI headquarters in England. Matthew was told by David Greathead that when Fred, as Director of CIBC, visited CABI HQ at Farnham Royal in the early 1980s, senior managers at CABI would walk to the local pub for lunch. When Fred joined them, progress was a little slow for their taste, as he considered it appropriate to turn over every leaf between CABI HQ and the pub.

In 1953 Fred married Elizabeth (Betty) Rapsey of Trinidad. They had three children - Philip, Horace and Victoria – and in time 7 grandchildren and 3 great-grandchildren. On Fred's retirement in 1993, he and Betty moved to "Crofton", a picturesque country house in the Isle of Man, overlooking the Irish Sea. Here he was able to keep in closer contact with his family in England, while continuing his collecting and publishing, and maintaining the house's extensive ornamental and vegetable gardens. He cared for Betty as she developed dementia, until her death in 2016, and in 2018 he moved to accommodation in a converted barn on the farm in Cambridgeshire, England, owned by his daughter Vicky and son-in-law Chris. Here he passed away peacefully on May 7, 2021.

In his remarks on receiving the NRS Distinguished Scientist Award in 1996, Fred noted a conversation with a workman who had come to Crofton to trim trees, and who asked what Fred had done before his retirement. 'I explained that I had worked in biological control in the tropics for most of my career. Keeping it simple, I went on to explain that often a foreign insect or plant became a pest because its natural enemies had not come with it, and that my job had been to go to its country of origin and search for these. When he heard that I had spent over forty years travelling pretty much around the world for this purpose he remarked: "And they paid you for this? Some people have all the luck." I agreed heartily. To me classical biological control has always been, and hopefully will continue to be, a personally satisfying and absorbing career.'

In closing, Rachel's thoughts on Fred speak for all of us and many others: "He was a real gentleman in the true sense of the word: a man of integrity, decent, honorable, faithful to Betty and supportive of her throughout their long marriage. He was a great boss and mentor to me and to others – encouraging young scientists to get out and do field work, to publish and present in conferences, correcting our faults of technique or style, a mine of information and experience himself but always willing to help us doing our own thing, supportive when things went pear-shaped (as they sometimes did!). At the time, I did not realize how lucky I was in having him as my first boss, but I recognize it now. Thank you, Fred, for your help and support when I was finding my way in a sometimes-difficult world."

Alec McClay, Ottawa, Canada

Matthew J.W. Cock, CABI, Egham, UK

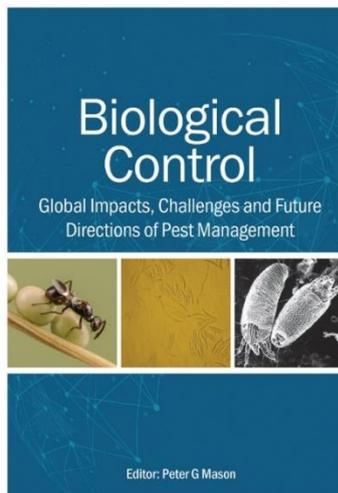
Howard Frank, Professor Emeritus, Entomology and Nematology Department, University of Florida

Rachel McFadyen, Brisbane, Australia

Frank, J. H. 2019a. A brief history of Frederick D. Bennett's entomological career. *Florida Entomologist* 102: 763-766.

Frank, J. H. 2019b. Frederick D. Bennett's Scientific Publications and Reports. *Florida Entomologist* 102: 767-774.

New Books on Biological Control and IPM



Biological Control: Global Impacts, Challenges and Future Directions of Pest Management

Edited by Peter G. Mason

Hard copies of the book will be available from CSIRO (Australia and New Zealand; <https://www.publish.csiro.au/book/7821/>) and CRC Press (all other countries; <https://www.routledge.com/Biological-Control-A-Global-Endeavour/Mason/p/book/9781032109275>) and the links are provided below. The eBook version will be available from more than 30 eRetailers, such as Amazon, Kobo, Google Books and eBooks.com.

The book provides a historical summary of organisms and main strategies used in biological control, as well as the key challenges confronting biological control in the 21st century. Biological control has been implemented for millennia, initially practised by growers moving beneficial species from one local area to another. Today, biological control has evolved into a formal science that provides ecosystem services to protect the environment and the resources used by humanity. With contributions from dedicated scientists and practitioners from around the world, this comprehensive book highlights important successes, failures and challenges in biological control efforts. It advocates that biological control must be viewed as a global endeavour and provides suggestions to move practices forward in a changing world. *Biological Control* is an invaluable resource for conservation specialists, pest management practitioners and those who research invasive species, as well as students studying pest management science.

For more information and contents of the book, see: <https://www.publish.csiro.au/book/7821/>



Theoretical basis and practice of biological control of pests and diseases

Editors: Hugo C. Arredondo-Bernal, Fernando Tamayo-Mejía, Luis A. Rodríguez-del-Bosque. Publisher: Biblioteca Básica de Agricultura, Colegio de Postgraduados. México.

Abstract: "Theoretical bases and practice of biological control of pests and diseases" seeks to strengthen technical capacities to face phytosanitary problems and support the sustainability of agricultural systems, benefiting food productivity, human health, and the economy of the producers. The publication of this book is part of the

celebration of the International Year of Plant Health 2020 and the celebration of 120 Years of Plant Health in Mexico.

Fifty-eight renowned specialists in Entomology, Phytopathology and Applied Biotechnology from 17 national and international institutions, including Agriculture and Agrifood-Canada and Texas A&M University, contributed their valuable knowledge. It includes 30 chapters and a glossary of terms related to the technology. This book is composed of six sections: (1) Fundamentals, where concepts and basics, systematics, and classical and molecular taxonomy are addressed. (2) Parasitoids and predators, which includes biological and behavioral aspects, and methodologies to establish classical biological control programs and evaluation methodologies. (3) Entomopathogens and antagonists, where all microorganisms that infect, sicken and kill pests are widely discussed, as well as aspects of biology, formulation, field application and genomic biotechnology and their implications for biological control. (4) Quality control and management. (5) A section on biological control in specific niches, which deals with weed control programs, protected agriculture and the arthropod and vertebrate biological control programs historically carried out in Mexico, as well as biological control in the context of IPM. (6) A section on Legal, Commercial and Intellectual Aspects, with analysis of the biological control trade in Mexico, patents, legislation and ethics associated with biological control and the environmental impact of the introduction of exotic biological control agents; finally a chapter that analyzes the future of BC in Mexico, taking into account academic-scientific, technological, social, economic, and commercial considerations.

This book is and will be the basis for the courses offered by the Mexican Society of Biological Control, but it will also be the reference and consultation document for students of biological sciences, agronomy or related subjects in the universities and postgraduate courses of the country. Its scope is that it will be a useful work for academics, researchers and agricultural producers, not only in Mexico, but also in other Latin American countries.



Biological Control in Latin America and the Caribbean appeared in 2020, Spanish version to appear in 2021

Editado por: Joop C van Lenteren, Universidad de Wageningen, Países Bajos, Vanda H P Bueno, Universidad de Lavras, Brasil, María Gabriela Luna, Universidad Nacional de La Plata, Argentina, Yelitza C Colmenarez, CABI, Brasil. Publisher: Acribia S.A., Zaragoza, Spain

Pocas publicaciones han proporcionado detalles históricos sobre el control biológico de plagas, malezas y enfermedades en América Latina y el Caribe, y los datos han estado fragmentados hasta ahora. Al reunir esta importante información en este libro, se ofrece una visión completa de los avances significativos en control biológico en el

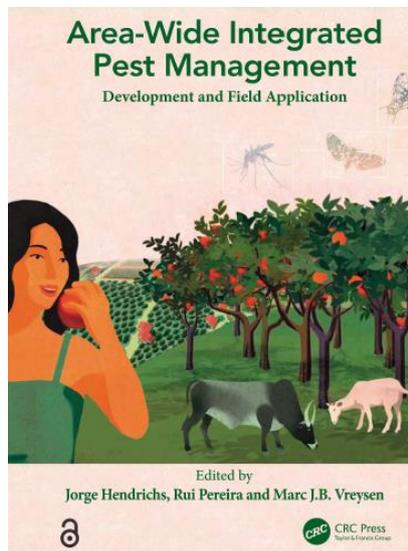
Continente suramericano e islas del Caribe. Para cada país, se proporciona una gran cantidad de texto, tablas y referencias sobre la historia de dichos proyectos. Con detalles sobre los éxitos y fracasos, lo cual puede ayudar en la planificación de futuros proyectos de control biológico. El libro proporciona una descripción general de las prácticas actuales de control biológico, revelando un alto nivel de utilización, lo que convierte a la región en la mayor área

tratada con control biológico a nivel mundial. En conclusión, el libro describe nuevos desarrollos y especula sobre el futuro del control biológico en América Latina y el Caribe.

Contenido clave:

- Resumen completo y documentado del control biológico en América Latina y el Caribe, junto con registros de plagas invasoras y nativas.
- Ejemplos únicos de control biológico por conservación, control biológico natural, control biológico clásico y control biológico aumentativo.
- Treinta capítulos específicos de países redactados por especialistas nacionales.
- Revela muchos casos de control biológico desconocidos internacionalmente y su investigación histórica.
- El primer intento serio de estimar cultivos y áreas bajo diferentes tipos de biocontrol.

Adecuado para estudiantes y profesionales que trabajan en el campo del control biológico, manejo de plagas, biología de invasiones, ecología y comportamiento, MIP y agricultura sustentable.



Area-Wide Integrated Pest Management - Development and Field Application

Edited by: Jorge Hendrichs, Rui Pereira, Marc J.B. Vreysen.
First published 2020, eBook published 1 January 2021

Several IOBC members participated in writing chapters of this book.

Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, including non-target species, air, water and soil. The extensive reliance on insecticide use reduces biodiversity, contributes to pollinator decline, destroys habitat, and threatens endangered species. This book offers a more effective applica-

tion of the Integrated Pest Management (IPM) approach, on an area-wide (AW) or population-wide (AW-IPM) basis, which aims at the management of the total population of a pest, involving a coordinated effort over often larger areas. For major livestock pests, vectors of human diseases and pests of high-value crops with low pest tolerance, there are compelling economic reasons for participating in AW-IPM. The book is essential reading for the academic and applied research community as well as national and regional government plant and human/animal health authorities with responsibility for protecting plant and human/animal health.

Open Access, eBook or Download: DOI, <https://doi.org/10.1201/9781003169239>

What about similar information from your country or region? Please send any news concerning new books on biocontrol or IPM that have appeared in your country or region to joop.vanlenteren@wur.nl

Call for Biocontrol Training Initiatives

Keen to organise a practical training courses in biological control? IOBC-Global may provide financial support

IOBC Global offers financial assistance to support participation of early-career practitioners/researchers in practical biocontrol training courses. If you have an idea for a training course for 2022, please contact secretary-general@iobc-global.org. He will provide you with the guidelines for writing a proposal. Proposals need to be sent to IOBC no later than 30 November 2021.

Regional sections of IOBC Global



APRS

Asia-Pacific Regional Section ([APRS](#))
Contact: Dr. Toni Withers; E-mail:
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ATRS

Afrotropical Regional Section ([ATRS](#))

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EPRS

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NRS

Nearctic Regional Section ([NRS](#))

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NTRS

Neotropical Regional Section ([NTRS](#))

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WPRS

West Palearctic Regional Section ([WPRS](#))

Contact: Dr. Gerben Messelink; E-mail: Gerben.Messelink@wur.nl

IOBC Global Working Group Contacts and Reports



Mass Rearing and Quality Assurance ([MRQA](#))

Contacts: Maria Luisa Dindo; Email: marialuisa.dindo@unibo.it; Rose Buitenhuis; Email: Rose.Buitenhuis@vinelandresearch.com

Website is: <https://www.mrqa.eu>

Next MRQA workshop

The next MRQA workshop was originally planned to be held September 2021 in Bologna Italy, but needed to be postponed to 1-5 September 2022. We are already working on the logistics to receive you at a wonderful historic location in the heart of the city of Bologna.

MRQA symposium at ICBC2 2021

To bridge the gap between the last and the upcoming workshop, MRQA co-convenors Maria Luisa Dindo and Rose Buitenhuis have submitted a symposium proposal entitled “Quantity AND quality: Responding to the challenge of increased demand for biocontrol agents” to the Second International Congress of Biological Control, that is planned to be held April 26-30, 2021, in Davos, Switzerland.



Ecology of Aphidophaga

Contact: J.P. Michaud; Email: jpmi@ksu.edu



Biological Control and Management of Eupatorieae Weeds

Contact: Michael Day; Email: Michael.Day@daff.qld.gov.au



Benefits and Risks Associated with Exotic Biological Control Agents

Contact: George Heimpel; Email: heimp001@umn.edu



International Working Group on *Ostrinia* and other maize pests (IWGO)

Contact: Ulli kuhlmann; Email: u.kuhlmann@cabi.org



Biological Control and Management of Parthenium Weed

Contact: Lorraine Strathie; Email: strathiel@arc.agric.za

Feed the Future Innovation Lab for Integrated Pest Management Hosts Webinar on Biological Control of *Parthenium hysterophorus*

Contributing Authors: Sara Hendery, Rangaswamy Muniappan, Kunjithapatham Dhileepan, Lorraine Strathie, Wondi Mersie, Nandagopal

Bakthavatsalam, Pramod K. Jha, Kazam Ali ; Contact: rmuni@vt.edu

In late March 2021, Virginia Tech’s Feed the Future Innovation Lab for Integrated Pest Management (IPM Innovation Lab) organized a webinar on biological control of the invasive weed *Parthenium hysterophorus* (Asteraceae), attended by nearly 200 participants from at least 14 countries. The intention of the webinar was to present the current status of

biological control of this weed in regions of Africa, Asia, and Australia and to facilitate discussion with an international audience, promoting biological control efforts on this destructive invader.

IPM Innovation Lab Director Dr. Rangaswamy Muniappan presented an introduction to the weed. *Parthenium hysterophorus* is native to Central and South America, but has accidentally been introduced to many regions of the world, including Australia, Asia, Africa, and associated islands, invading at least 48 countries with severe consequences. The weed dramatically reduces crop yields and available grazing land, impacts biodiversity, causes respiratory and skin allergenic responses in humans and animals, and taints valuable livestock milk and meat. Beginning in 2005, the IPM Innovation Lab and Virginia State University, U.S.A., initiated a classical biological control program to manage *Parthenium hysterophorus* in East Africa. Biological control programs on this weed were already running in Australia, India, and South Africa. Most recently, a program was initiated in Pakistan, and there have been fortuitous introductions of natural enemies to Nepal. These biological control activities have achieved major successes in some areas, reducing the vegetative and reproductive aspects of the weed and restoring valuable land. The following synopses describe each webinar presentation, highlighting the varied conditions and outcomes for biological control of *P. hysterophorus* around the world.

The Australian program was reported by Dr. Kunjithapatham Dhileepan from the Department of Agriculture and Fisheries in the Queensland Government in Australia. *Parthenium hysterophorus* is estimated to reduce grazing land and pasture production in Australia annually by more than AUD 16.5 million dollars. Biological control of *P. hysterophorus* in Australia was first initiated in the late 1970s and since then nine insect species and two rust fungi have been introduced. The research focus was to test and release as many host specific agents as possible, targeting all parts of the weed. All agents have become established in Queensland, Australia; however, the time taken for field establishment has varied, ranging from one to 15 years. Among them, the stem-galling moth *Epiblema strenuana*, the seed-feeding weevil *Smicronyx lutulentus*, the stem-boring weevil *Listronotus setosipennis*, the root-boring moth *Carmenta ithacae*, the summer rust *Puccinia xanthii* var. *parthenii-hysterophorae*, and the winter rust *Puccinia abrupta* var. *partheniicola* are widespread and proven effective in reducing the vigour and population of *P. hysterophorus* in central and north Queensland. As a result, the area infested with *P. hysterophorus* in central Queensland has declined since the mid-1990s, resulting in increased pasture production. Due to the absence of many of the effective agents in southern Queensland, current research efforts are focused on the redistribution of biological control agents from central Queensland into areas where they are not currently present.

Lorraine Strathie of the Agricultural Research Council – Plant Health and Protection in South Africa, reported that dense infestations of *P. hysterophorus* occur in South Africa and neighboring Eswatini, Mozambique, and Zimbabwe, several Western Indian Ocean islands, and more recently in Botswana. A biological control program began in 2003 in South Africa. The winter rust fungus *Puccinia abrupta* var. *partheniicola* was previously detected in South Africa without intentional introduction. As *P. abrupta* var. *partheniicola* is not common during the hot, wet summers when *P. hysterophorus* is prolific, the summer rust fungus *Puccinia xanthii* var. *parthenii-hysterophorae* was imported from Australia and its host specificity evaluated. Releases of *P. xanthii* var. *parthenii-hysterophorae* began in 2010 by transplanting infected plants into the field. With minimal release effort, *P. xanthii* var. *parthenii-hysterophorae* has established successfully and dispersed widely, reaching high disease inci-

dence under suitable conditions. *Listronotus setosipennis* and *Z. bicolorata* were released in 2013 after being shown to be suitably host specific. *Listronotus setosipennis* survived drought conditions and is present in nearly half of release sites, causing considerable damage at some sites, but with slow dispersal. In contrast, *Z. bicolorata* failed to establish at most release sites; sporadic outbreaks and extensive defoliation occurred at only a few sites and field populations declined to nil. The release strategy is being reconsidered to improve establishment of the beetle. *Smicronyx lutulentus* was released in 2015 in South Africa. Early establishment was detected; although initially low, it is improving. A combination of insect agents and the summer rust fungus was shown to significantly reduce *P. hysterophorus*. Despite earlier laboratory host range complications for *E. strenuana* on *Guizotia abyssinica*, the moth is being reconsidered and evaluated against local Asteraceae. Although it has been difficult to sustain laboratory populations of *Carmenta* sp. nr. *ithacae*, this agent remains a priority for evaluation and will be re-imported at the earliest opportunity.

Dr. Wondi Mersie of Virginia State University, U.S.A., provided a status report on biological control activities being undertaken on *P. hysterophorus* in East Africa. *Parthenium hysterophorus* has invaded eastern and southern Africa, and could potentially spread through much of sub-Saharan Africa. *Zygogramma bicolorata* is currently being reared at three locations and *L. setospennis* at a central location in Ethiopia. Both biological control agents are also being reared and have been field-released in Uganda, with initial success. Both insect agents were imported recently into Kenya but rearing attempts were not successful. Data on the establishment and performance of *Z. bicolorata* in Ethiopia indicated that the beetle can severely damage parthenium weed in areas with high rainfall. At a site in southern Ethiopia, *Z. bicolorata* defoliated a dense stand of parthenium weed within three months, thereby allowing the emergence of other plant species. A diverse flora composed of 14 plant species from 11 families was detected a year later at this site. During 2020, the unusually high rainfall and cool temperatures in July and August in Ethiopian highlands facilitated the widespread infection of parthenium weed by *Puccinia abrupta* var. *partheniicola*. The previously released *Z. bicolorata* continued to feed on the rust-infected plants. The high level of infection by the winter rust fungus observed in 2020 is not a regular occurrence but it can slow the growth and seed production of parthenium weed.

Dr. Nandagopal Bakthavatsalam of the Indian Council of Agricultural Research (ICAR) in India reported that *P. hysterophorus* was first recorded in India in 1955, and it is predicted that 65% of the total land area is vulnerable to invasion by this weed. Starting in 1983, *Zygogramma bicolorata*, *S. lutulentus*, and *E. strenuana* were imported into India. However, a laboratory culture of *S. lutulentus* could not be established and *E. strenuana* was found to feed on niger (*Guizotia abyssinica*), an important oil seed crop, in the laboratory. Establishment of *Z. bicolorata* has occurred in many parts of India, including Madhya Pradesh, Haryana, Delhi, Lower Uttarakhand, western Uttar Pradesh, and other regions. Efforts are required to investigate *S. lutulentus* further as together with *Z. bicolorata* they may more effectively manage parthenium weed. Importation of additional natural enemies such as *Carmenta* sp. nr. *ithacae* may also complement the existing agents *Z. bicolorata* and *P. abrupta* var. *partheniicola* to manage parthenium weed throughout India.

Dr. Pramod K. Jha of Tribhuvan University in Nepal reported that *P. hysterophorus* was first recorded in Nepal in 1967. This weed has spread northwards up to an altitude of 2000 m and has become a dominant weed along roadsides of major urban areas, grasslands, and fallow lands. However, there has been no serious attempt to control this weed in Nepal. Under the IPM Innovation Lab project, satellite imagery has been used to assess the distribu-

tion and spread pattern of *P. hysterophorus* in Nepal from 1990 to 2018, and projections demonstrate that it will spread further in the country by 2050 and 2070, under different climatic scenarios. Biological control agents *Z. bicolorata* and *P. abrupta* var. *parthenicola* have been fortuitously although unintentionally introduced to Nepal. It is assumed that the beetle entered Nepal from India between 2004 and 2007, and spread naturally in central Nepal. Two years ago, it was observed at the upper elevation of 1700 m asl at Timure in the northern part of Nepal, indicating its population at climatically diverse locations.

The report from Pakistan was presented by Dr. Kazam Ali of the Centre for Agriculture and Bioscience International (CABI), Action on Invasives Division in Pakistan. Both *Zygogramma bicolorata* and *P. abrupta* var. *parthenicola* were found locally on *P. hysterophorus* in Pakistan, without intentional introduction; however, *L. setosipennis* was imported. Australia, South Africa, and Ethiopia had earlier concluded *L. setosipennis* to be host specific and suitable for use against *P. hysterophorus*. The quarantine laboratory assessments of the host range of *L. setosipennis* that were conducted in Pakistan concurred with these findings. Results advocated for the release of *L. setosipennis* in Pakistan to compliment the biological control program and contribute to the management of this invasive weed.

Following these presentations, an interactive discussion session was held among presenters and audience. This webinar facilitated the sharing of updates on the current status of biological control of *P. hysterophorus* in various regions of the world, and ensuing discussions provided a platform for further engagement, benefitting all participants. There was considerable interest for the initiation and expansion of biological control activities on *P. hysterophorus* in several countries. The virtual webinar was deemed beneficial as it enabled much wider participation than an in-person meeting would have permitted.



Biological Control of Diamondback Moth & other Crucifer Insects

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IOBC Global Cactus Working Group

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www.ru.ac.za/centreforbiologicalcontrol/globalcactusworkinggroupgcwg/nextmeeting

The second ever meeting of the group was scheduled for April 2020, but had to be postponed due to the COVID-19 outbreak. The meeting will now take place at the Arebbusch Travel Lodge in Windhoek, Namibia, from 21-23 September 2021.



CroProPol - Using Managed Pollinators to Disseminate Biological Control Agents & Natural Products

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Study Group: Classical Weed Biological Control (CWBC)

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[global.org/global_sg_Classical_Weed_BC.html](https://www.iobc-global.org/global_sg_Classical_Weed_BC.html)



Study Group: Biological control of insect pests of Solanaceous Crops (IOBC-BiCoSol)

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IOBC Global Commission on Biological Control and Access and Benefit Sharing

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2020-2022 Actions: A symposium, *Access and Benefit Sharing*

and Biological Control Genetic Resources, has been organized by

Peter Mason and Barbara Barratt for the International Congress

of Entomology in Helsinki, Finland. The symposium was planned to take place on Thursday 23 July 2020 at 08:30h but with the postponement of ICE to 2022 the symposium will take place a year later. Several Commission members will be making presentations. A proposal will be made to BioControl to publish a special issue that will include full papers based on the symposium presentations plus contributions by others.

Future actions: The IOBC Global Commission on Access and Benefit-Sharing needs to review and revise the questionnaire. The revised version will then need to be circulated to the wider IOBC community (via IOBC Global newsletter). Commission members are asked to review and suggest revisions to the questionnaire. The Commission has also been tasked to document examples of experiences by recipients to access biological control agents from countries with and without ABS legislation. Some of these could be included in the proposed

BioControl special issue and Commission members are encouraged to express their interest to contribute.

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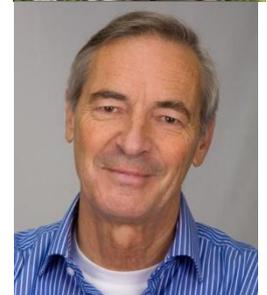
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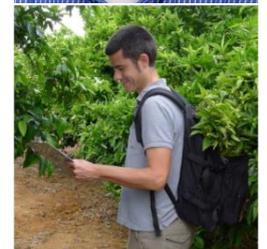
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- Individual Membership is open to all individuals engaged or interested in biological control.
- Institutional Membership is open to any institution, including government departments, academies of science, universities, institutes and societies participating in biocontrol activities.
- Supporting Membership is open to any person or institution interested in promoting the objectives of the Organization.
- Honorary Membership may be conferred by the Council to anyone who has made outstanding contributions to biological control.

For more information and application forms:

<http://www.iobc-global.org/membership.html>

