SOCIEDAD ENTOMOLÓGICA ARGENTINA 1925 2025
ISSN 1851-7471 (online)
Centenary
Centenario
84 (1): e0108, 2025

Contributions to the knowledge of Argentine entomological biodiversity associated with biocontrol research at the FuEDEI

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Received 17-XII–2024 | **Accepted** 11-III-2025 | **Published** 31-III–2025
https://doi.org/10.25085/rsea.840108

ABSTRACT. The aim of this work is to highlight the contributions of the Fundación para el Estudio de Especies Invasivas (FuEDEI) to the knowledge on insect ecology and biodiversity of Argentina. As a result of 60 pest biocontrol projects conducted since 1962, 22 viruses and one nematode associated with ants, and 63 insect species have been described for Argentina. This work constitutes an example of the interdependence between the disciplines of biocontrol and taxonomy. In 59 % of the descriptions and/or redescriptions presented in this work, at least one Argentine entomologist was involved. This fact is not only a source of pride, but also illustrates the degree of development and excellence achieved by entomology in our country throughout the first 100 years of the SEA.

KEYWORDS. Entomology. Taxonomy. Biological pest control.

Aportes al conocimiento de la biodiversidad entomológica argentina asociados a las investigaciones en biocontrol en la FuEDEI

RESUMEN. El objetivo de este trabajo es destacar el aporte de la Fundación para el Estudio de Especies Invasivas (FuEDEI) al conocimiento sobre la ecología y la biodiversidad de insectos de Argentina. Como resultado de 60 proyectos de biocontrol de plagas realizados desde 1962 a la fecha, se describieron 22 virus y un nematodo asociados a hormigas, y 63 especies de insectos para la Argentina. Este trabajo constituye un ejemplo del refuerzo mutuo que existe entre las disciplinas del biocontrol y la taxonomía. En el 59 % de las descripciones y/o redescripciones presentadas en este trabajo participó al menos un entomólogo argentino. Este hecho no sólo es motivo de orgullo, sino que también ilustra el grado de desarrollo y excelencia alcanzado por la disciplina entomológica en nuestro país a lo largo de los primeros 100 años de la SEA.

PALABRAS CLAVE. Entomología. Taxonomía. Control biológico de plagas.

INTRODUCTION

The celebration of the 100 years of the Entomological Society of Argentina (SEA) motivated us to produce a review of the biological pest control projects carried out at the FuEDEI (Fundación para el Estudio de Especies Invasivas) to inventory the contributions to the knowledge of biodiversity derived from them. These include the discovery of new species of insects, pathogens and nematodes associated with insects, redescriptions and new species records for the country.

Brief historical overview of the FuEDEI

Although the facility now known as FuEDEI was instituted as a foundation in 2012, its beginnings as a biological control laboratory in South America date back to 1962. Towards the end of the 1950s, the Agricultural Research Service of the United States Department of Agriculture (ARS-USDA) began conducting research on the biocontrol of the alligator weed, *Alternanthera philoxeroides* (Mart.) Griseb. and the water hyacinth, *Pontederia crassipes* Mart., two of the most important aquatic weeds of South American origin in freshwater courses of the United States (USA) (Coulson et al., 2000). This initiative motivated the installation of the Biological Weed Control Laboratory in 1962 in the facilities of the Plant Pathology Institute of the INTA (National Institute of Agricultural Technology) in Hurlingham, Argentina. This collaboration culminated in the introduction and release in the United States of three insects: *Agasicles hygrophila* Selman and Vogt (Coleoptera: Chrysomelidae), *Amynothrips andersoni* O'Neill (Thysanoptera: Phlaeothripidae), and *Macrorrhinia endonephele* (Hampson) (Lepidoptera: Pyralidae) for the control of *A. philoxeroides* (Buckingham, 1996, Hayden & Landry, 2020). The use of *A. hygrophila* to control alligator weed turned out to be the first successful biocontrol experience of an aquatic weed in the world (Buckingham, 1996). The success of this biocontrol project prompted the establishment of an autonomous laboratory in 1967, in the city of Hurlingham, province of Buenos Aires. Towards the 1990s the laboratory was renamed the South American Biological Control Laboratory, until 2012, when the current foundation was established over an agreement between the USDA and local authorities.

Biological pest control projects from 1962 to the present

The biocontrol programs developed at FuEDEI involve, for the most part, species of plants or insects native to South America that are pests in other regions of the world. This involves carrying explorations in Argentina and neighboring countries in search for natural enemies (mostly arthropods and pathogens), and evaluating their potential as biocontrol agents. These studies often lead to the discovery of new species, their distribution and trophic associations, as well as uncovering aspects of the workings of the ecosystems that these organisms inhabit.

The main objective of this work is to highlight the contribution to entomology and knowledge of insect biodiversity in Argentina as a result of the development of biological pest control programs carried out at the FuEDEI. To this end, a list of the projects undertaken by FuEDEI since 1962 is provided. In addition, information on the species described and/or re-described in the course of our research is presented.

MATERIAL AND METHODS

The list of projects carried out by FuEDEI since 1962, their implementation period and whether or not they led to the release of biocontrol agents, was compiled by consulting the FuEDEI annual report archive and the World Catalogue of Agents and their Weeds (Winston et al., 2024). The list of described and/or redescribed species, new records for Argentina, and bibliographic references was compiled by examining FuEDEI's insect collection and publication archives (Supplementary information).

RESULTS

Since 1962 to date, 60 biocontrol projects were undertaken to different degrees of detail: 20 for the control of insect pests and 40 for the control of weeds (Table I). Of the total number of projects, one or more biocontrol agents (35 to date) were released for 20 targets: one target insect, one cattle dung fouling and 18 weeds (Table I). Seven biocontrol agents were described as new species and use to address problems caused by seven weeds affecting natural, productive and urban areas in eight countries (Table II).

As an extra benefit of these projects, a total of 22 ant viruses, one nematode parasitoid of ants and 63 insects were described as new species for Argentina (Supplementary information). Among these, 36 are phytophagous insects associated with plant species belonging to 17 genera within 12 families, 26 are insect parasitoids belonging to 16 genera within 10 families, one scavenger ant species (*Wasmannia longiseta* Cuezzo & Calcaterra), and 22 are pathogens (viruses) of two ant species, *Solenopsis invicta* Buren and *Wasmannia auropunctata* (Roger), and one nematode parasitoid of *S. invicta* (Supplementary information). The 63 insect species belong to the orders Coleoptera in the families Brentidae (one sp.), Buprestidae (one sp.), Chrysomelidae (five sp.) and Curculionidae (two sp.), Diptera in the families Cecidomyiidae (two sp.), Dolichopodidae (nine sp.), Phoridae (three sp.) and Tephritidae (one sp.), Hemiptera in the families Delphacidae (five sp.), Dictyopharidae (one sp.) and Miridae (one sp.) , Hymenoptera in the families Braconidae (five sp.), Encyrtidae (four sp.), Eucoilidae (onesp.), Eulophidae (three sp.), Eurytomidae (onesp.), Figitidae (onesp.), Formicidae (onesp.), Mymaridae (five sp.), Pergidae (onesp.), Platygastridae (two sp,) and Trichogramatidae (one sp.) (25 species in 11 families), Lepidoptera in the families Geometridae (one sp.), Gracillariidae (three sp.) and Tortricidae (one sp.) and Thysanoptera in the family Phlaeothripidae (two sp.) (Fig. 1) (Supplementary information).

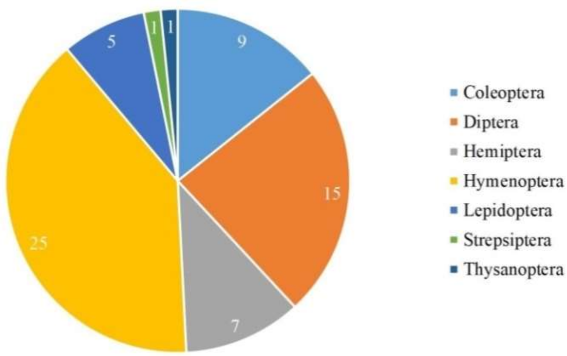

Figure 1. Number of described species of the different insect orders.

Species redescriptions included two mites and 51 insect species. At least one Argentine entomologist was involved in 83 of the 139 taxonomic descriptions and redescriptions compiled in this study (Supplementary information).

Table I. Projects undertaken by FuEDEI since 1962, their implementation period and whether or not they led to the release of biocontrol agents.

Period	Target	Release of biocontrol agents (Yes/No)
	Weeds	
1962-84, 2003-present	Alligator weed (*Alternanthera philoxeroides*)	Yes
1967-76, 2004-present	Water hyacinth (*Pontederia crassipes*)	Yes
1972-76, 1997-2015	Water lettuce (*Pistia stratiotes*)	Yes
1972-76, 2008-present	Water primroses (*Ludwigia* spp.)	No
1973-82	Latexplant (*Araujia odorata*)	No
1974-76, 2019-23	Parrot feather (*Myriophyllum aquaticum*)	Yes
1974-76, 2004-present	Frogbit (*Limnobium laevigatum*)	No
1974-76, 2005-21	Floating pennywort (*Hydrocotyle ranunculoides*)	Yes
1974-76, 2002-4, 2013-present	Giant salvinia (*Salvinia molesta*)	No
1976-80	Bitterweed (*Hymonoxys* spp.)	No
1976-78, 1987-88, 1997-2008	Mesquite (*Neltuma* spp.)	Yes
1976-95, 2008-19	*Parkinsonia aculeata*	Yes
1989-92	Groundsel (*Baccharis* spp.)	No
1976-97	Snake weed (*Gutierrezia* spp.)	Yes
1976-78, 1990-92	Tarbush (*Flourensia* spp.)	No
1976-78, 1991-94	Whitebrush (*Aloysia gratissima*)	No
1978-87	Thistles	Yes
1988-97	Cocklebur (*Xanthium strumarium*)	No
1976-78, 1993-2003	Cresosote bush (*Larrea tridentata*)	No
1994-96	Rattlebox (*Sesbania* spp.)	Yes
1996-97	Prickly pear (*Opuntia* spp.)	No
1996-2005	Tropical soda apple (*Solanum viarum*)	Yes
1998-2000, 2017-2019	Flaxleaf flea bane (*Conyza* spp.)	No
2003-2020	Brazilian pepper (*Schinus terebinthifolia*)	Yes
2003-11, 2015-20	Cabomba (*Cabomba caroliniana*)	Yes
2004-17	Brazilian waterweed (*Egeria densa*)	Yes
2004-08	Madeira vine (*Anredera cordifolia*)	Yes
2005-11	Balloon vine (*Cardiospermum grandiflorum*)	Yes
2005-2008	Barbados gooseberry (*Pereskia aculeata*)	No
2005-19	Pompon weed (*Campuloclinium macrocephalum*)	No
2006-11	Lippia (*Phyla canescens*)	No
2007	Cat's claw (*Dolichandra unguis-cati*)	No
2011-16	Chromolaena (*Chromolaena odorata*)	Yes
2017-2022	Silverleaf nightshade (*Solanum elaeagnifolium*)	No
2018-2022	Bellyache Bush (*Jatropha gossypiifolia*)	Yes
2018-present	Pampas grass (*Cortaderia selloana*)	No
2018-present	Saltcedar (*Tamarix* spp.)	No
2018-present	Yellow-flag Iris (*Iris pseudacorus*)	No
2019-present	Stinking passionflower (*Passiflora foetida*)	No
2021-present	Blue heliotrope (*Heliotropium amplexicaule*)	No
Period	**Target**	**Release of biocontrol agents (Yes/No)**
	Insects	
1971-74	Grasshopper parasitoids and pathogens	No
1979-1989	Dung fouling	Yes
1980-81, 2004-07, 2016-17	Fall armyworm (*Spodoptera frugiperda*)	No
1980-81	Velvetbean caterpillar (*Anticarsia gemmatalis*)	No
1987-present	Fire ants (*Solenopsis* spp.)	Yes
	Insects	
1988-1992	Filth flies	No
1993-96	Bollworms (*Heliothis* spp.)	No
1993-96	Melonworm moth (*Diaphania* spp.)	No
1993-2005	Rootworms (*Diabrotica* spp.)	No
1999-2003	Lygus bugs (*Lygus* spp.)	No
2001-present	Cactus moth (*Cactoblastis cactorum*)	No
2003-12	Glassy-winged sharpshooter (*Homalodisca vitripennis*)	No
2003-05	Sunflower moth (*Homoeosoma electellum*)	No
2009-22	Little fire ant (*Wasmannia auropunctata*)	No
2010-present	Harrisia cactus mealybug (*Hypogeococcus* spp.)	No
2010-19	Leaf-cutting ants (*Atta* spp. & *Acromyrmex* spp.)	No
2013-19	Stink bugs (Pentatomidae)	No
2014-22	Tawny crazy ant (*Nylanderia fulva*)	No
2016-2018	CBC (Citrus variegated chlorosis)	No
2021-present	HLB (Huanglonbing)	No

Table II. New insect species described and used as biocontrol agents.

Described species used as biocontrol agents	Target	Released country/year	Biocontrol success	Reference
Agasicles hygrophila Selman & Vogt (Coleoptera: Chrysomelidae)	*Alternanthera philoxeroides* (Mart.) Griseb. (Amaranthaceae)	USA, 1964/1979	Highly successful in Florida and warmer, coastal areas where the insects can overwinter, variable elsewhere. Not effective against plant terrestrial form.	Winston et al. 2024
A. hygrophila	*A. philoxeroides*	Australia, 1977 (Source: Ex. Argentina via USA)	Successful control of floating mats in New South Wales within two years of release. Provided control in Queensland within 10 months of redistribution. No effect in terrestrial habitat.	Winston et al. 2024
A. hygrophila	*A. philoxeroides*	Thailand, 1981 (Source: Ex. Argentina via USA (FL) via Australia)	Substantial control seasonally.	Winston et al. 2024
A. hygrophila	*A. philoxeroides*	China, 1981 (Source: Ex. Argentina via USA)	Impact vary by location. Provides good control of aquatic infestations in many rivers, ponds and lakes; causes heavy damage to terrestrial plants growing nearby but does not provide control.	Winston et al. 2024
A. hygrophila	*A. philoxeroides*	New Zealand, 1982 (Source: Ex. Argentina via USA (FL) via Australia)	Most effective in static water bodies in warm climates; efficacy restricted by low temperatures and flooding. Not able to attack terrestrial infestations.	Winston et al. 2024
Lysathia cilliersae Cabrera (Coleoptera: Chrysomelidae)	*Myriophyllum aquaticum* (Vell.) Verdc. (Haloragaceae)	South Africa, 1994 (Source: Ex. Brazil)	By 2014, had eradicated weed from 21% of sites, and is present and abundant at 90% of sites. Weed now considered under complete biological control and no additional agents needed.	Winston et al. 2024; Faltlhauser et al. 2025
A. hygrophila	*A. philoxeroides*	Puerto Rico, 1997 (Source: Ex. Argentina via USA)	Alligator weed has been successfully controlled by this agent.	Winston et al. 2024
Lepidelphax pistiae Remes Lenicov (Hemiptera: Delphacidae)	*Pistia stratiotes* L. (Araceae)	Argentina, 2011 (Redistributed in Argentina from Paraná River in Buenos Aires Province to lab culture to a reservoir in Buenos Aires Province).	*Pistia stratiotes* cover, biomass per square meter, and individual plant size decreased significantly within one year of release of *Lepidelphax pistiae* and *Neohydronomus affinis*, and other floating macrophytes later appeared. Within two years of release, *P. stratiotes* cover reduced to fraction of initial levels, and remained as such in 2017. Control attributed to both species.	Winston et al. 2024; Cabrera Walsh et al. 2017
Liothrips tractabilis Mound & Pereyra (Thysanoptera: Phlaeothripinae)	*Campuloclinium macrocephalum* (Less.) DC. (Asteraceae)	South Africa, 2013	Infested plants significantly shorter, produce fewer leaves and flowers, have lower above-ground dry mass. Populations continue to increase.	Winston et al. 2024; Mound & Pereyra 2008
Eueupithecia cisplatensis Prout (Lepidoptera: Geometridae)	*Parkinsonia aculeata* L. (Fabaceae)	Australia, 2013	Permanent populations were established at >60% of the release sites. Evaluation is ongoing and the full impacts may take up to a decade to become apparent.	Raghu et al. 2017
Eueupithecia vollonoides Hausmann (Lepidoptera: Geometridae)	*Parkinsonia aculeata* L. (Fabaceae)	Australia, 2014	Permanent populations were established at >60% of the release sites. Evaluation is ongoing and the full impacts may take up to a decade to become apparent.	Raghu et al. 2017
Coelocephalapion gandolfoi Kissinger (Coleoptera: Brentidae)	*Neltuma* (=*Prosopis*) spp. (Fabaceae)	South Africa, 2021	Too early to assess since agent's release	Winston et al. 2024

DISCUSSION

When biocontrol projects target species that are not of major economic or cultural importance in their native area, they often lead to the exploration of unknown trophic webs. Hence, researchers frequently come across organisms hitherto unknown to science, or associations never before observed, constituting novel contributions to the knowledge of biological diversity, species distribution, and trophic associations.

This is the case of many of the biocontrol projects undertaken at FuEDEI, where the targets are native plants and insects from South America that have become invasive elsewhere, or are closely related to South American species (Table I). As a result of the projects developed in FuEDEI, seven new species of insects were described and used as weed biocontrol agents (Table II). The impact of these biocontrol agents on target weed populations has been variable. For example, *Agasicles hygrophila* and *Lysathia cilliersae* Cabrera provided successful control of *A. philoxeroides* in USA, Puerto Rico and Australia, and *Myriophyllum aquaticum* (Vell.) Verdc. in South Africa respectively (Faltlhauser et al. 2025; Winston et al. 2024).

The impact of *Eueupithecia cisplatensis* Prout and *E. vollonoides* Hausmann spp. on *Parkinsonia aculeata* L. in Australia has not yet been definitively assessed (Raghu et al. 2017). And in the case of *Coelocephalapion gandolfoi* Kissinger, it is too early to make an assessment of the economic and ecological benefits of implementing the biological control program against *Neltuma* (=*Prosopis*) spp. in South Africa (Winston et al. 2024).

Few field and laboratory studies reach the depth of the methodology applied in biocontrol studies, where intensive sampling and rearing protocols, spread through large areas and several ecosystems, tend to provide full checklists of 1st to 3rd, or further, order in the food chain (Cabrera Walsh et al., 2023). An example of this is the Hymenoptera, which showed a clear predominance in the list of new species, almost all of them being parasitoids (Fig.1). This is not surprising, since these tend to be small, and thus more difficult to collect, and are usually only found when collecting and rearing their hosts in great numbers, an activity typical of biocontrol studies.

In addition, the implementation of biocontrol projects allowed us to study species that, although already described, when studied as potential biological control agents, made possible their redescription (Sosa et al., 2004; Hausmann et al., 2016).

Taxonomy and biocontrol are mutually reinforcing disciplines (Marvaldi, 2024; Shimbori et al., 2023), and this work is an example of that. The descriptions and/or redescriptions reported in this work would not have been possible without the taxonomists. Likewise, the existence of biocontrol programs developed at FuEDEI promoted the study of these species and allowed the provision of valuable bionomic data, highlighting how the intensive testing and laboratory rearing typical of this discipline redounds in knowledge otherwise difficult to find (Cabrera et al., 2023). The fact that at least one Argentine entomologist was involved in the majority (59 %) of the descriptions and redescriptions compiled in this study is not only a source of pride, it also shows the degree of development and excellence achieved by the entomological discipline in our country throughout the first 100 years of the SEA.

DATA STATEMENT

The supplementary information that supports the findings of this study is openly available in Figshare at https://doi.org/10.6084/m9.figshare.28632233

ACKNOWLEDGMENTS

We would like to thank the staff at FuEDEI for helping us collect the information presented in this paper.

REFERENCES

Buckingham, G.R. (1996) Biological Control of alligatorweed, *Alternanthera philoxeroides*, the world's first aquatic weed success story. *Castanea*, **61**, 232-243.

Cabrera Walsh, G., Hernández, M.C., Mc Kay, F., Oleiro, M., Guala, M., & Sosa, A. (2017) Lessons from three cases of biological control of native freshwater macrophytes isolated from their natural enemies. *Aquatic Ecosystem Health & Management*, **20**, 353-360.

Cabrera Walsh, G., Sosa, A.J., Mc Kay, F., Maestro, M., Hill, M., Hinz, H.L., Paynter, Q., Pratt, P.D., Raghu, S., Shaw, R., Tipping, P.W., & Winston, R.L. (2023) Is biological control of weeds conservation’s blind spot? *Quarterly Review of Biology*, **98**, 1-28.

Coulson, J.R., Vail, P.V. & Dix, M.E. (2000) 110 Years of biological control research and development in the United States Department of Agriculture: 1883-1993. U.S. Department of Agriculture, Agricultural Research Service, Washington DC, USA.

Faltlhauser, A.C., Cabrera, N., Hernández, M.C., Restrepo, A.F.S., Hill, M., & Sosa, A.J. (2025) *Lysathia flavipes* and *Lysathia cilliersae* Cabrera sp. nov. (Coleoptera, Chrysomelidae): genetic and morphological unravelling of biocontrol agents for two invasive aquatic plants. *ZooKeys*, **1228**, 11-52.

Hausmann, A., Chainey, J., Heard, T.A., McKay, F. & Raghu, S. (2016) Revision of the genus Eueupithecia Prout, 1910 from Argentina (Lepidoptera, Geometridae, Sterrhinae). *Zootaxa*, 4138, 392-400. https://doi.org/10.11646/zootaxa.4138.2.11

Hayden, J. E., & Landry, J. F. (2020) *Arcola malloi* (Pastrana), the alligatorweed stemborer, a new synonym of *Macrorrhinia endonephele* (Hampson)(Lepidoptera: Pyralidae: Phycitinae). *Insecta mundi*. Articles 0764- 0771

Marvaldi, A.E. (2024) Phylogenetic systematics and integrative taxonomy contribute to weed biological control. *Biological Control*, **197**, 105599. https://doi.org/10.1016/j.biocontrol.2024.105599

Mound, L.A., & Pereyra, V. (2008) *Liothrips tractabilis* sp. n. (Thysanoptera: Phlaeothripinae) from Argentina, a potential biocontrol agent of Weedy *Campuloclinium macrocephalum* (Asteraceae) in South Africa. *Neotropical Entomology*, **37**, 63-67.

Raghu, A., White, A. & Fichera, G. (2017) Parkinsonia biocontrol: release and field evaluation of two new agents. Final report for Meat and Livestock Australia Ltd, https://www.mla.com.au/contentassets/263c6b478bf4462e97dbb6701329874c/b.wee.0134_final_report.pdf (Accessed 9 March 2025).

Shimbori, E. M., Querino, R. B., Costa, V. A., & Zucchi, R. A. (2023). Taxonomy and biological control: new challenges in an old relationship. *Neotropical Entomology*, **52**, 351-372. https://doi.org/10.1007/s13744-023-01025-5

Sosa, A.J., Marino de Remes Lenicov, A.M., Mariani, R., & Cordo, H.A. (2004) Redescription of *Megamelus scutellaris* Berg (Hemiptera: Delphacidae), a Candidate for Biological Control of Water Hyacinth. *Annals of the Entomological Society of America*, **97**, 271-275. https://doi.org/10.1603/0013-8746(2004)097[0271:ROMSBH]2.0.CO;2

Winston, R.L., M. Schwarzlander, H.L. Hinz, M.D. Day, M.J.W. Cock, & Julien, M.H. (2024) Biological Control of Weeds: A World Catalogue of Agents and Their Target Weeds. Based on FHTET-2014-04, USDA Forest Service, Forest Health Technology Enterprise Team. https://www.ibiocontrol.org/catalog/ (Accessed 22 October 2024).