



UNIVERSITÀ DEGLI STUDI DI MILANO

TO MAGNIFICO RETTORE OF UNIVERSITA' DEGLI STUDI DI MILANO

Marco Bonelli

CURRICULUM VITAE

PERSONAL INFORMATION

Surname	Bonelli
Name	Marco
Date of birth	31/05/1989

PRESENT OCCUPATION

Appointment	Structure
PhD Candidate	Department of Bioscience

EDUCATION AND TRAINING

Degree	Course of studies	University	Year of achievement of the degree
PhD	Environmental Sciences, title of the thesis: "Characterization of <i>Hermetia illucens</i> (Diptera: Stratiomyidae) midgut"	University of Milan	To be achieved in the current Academic Year 2017/2018
Master of Science	Crops and Plant Sciences, title of the thesis: "Adattamento di parassitoidi autoctoni a specie esotiche. l'esempio di <i>Drosophila suzukii</i> (Diptera: Drosophilidae) e <i>Psacotha hilaris hilaris</i> (Coleoptera: Cerambycidae)"	University of Milan	Academic Year 2013/2014
Bachelor of Science	Management of Cultivated Plants and Landscaping, title of the thesis: "Biologia e parassitoidi indigeni di <i>Psacotha hilaris hilaris</i> (Pascoe, 1857) (Coleoptera: Cerambycidae)"	University of Milan	Academic Year 2011/2012



FOREIGN LANGUAGES

Languages	Level of knowledge
English	B2
Chinese	HSK level 2 (certified)

AWARDS, ACKNOWLEDGEMENTS, SCHOLARSHIPS

Year	Description of award
2015	Public Competition for Admission to Phd Course in Environmental sciences at the University of Milan. Winner of a scholarship.

TRAINING OR RESEARCH ACTIVITY

Both my bachelor and master thesis projects were focused on the relationships between invasive insect species, i.e. *Psacotha hilaris* (Coleoptera: Cerambycidae) and *Drosophila suzukii* (Diptera: Drosophilidae), and native parasitoids, and the adaptation of the latter to the new introduced hosts. The work contributed to clarify the ecology of these invasive species in Italy and led to identify possible native natural enemies. My PhD project was focused on the biology of *Hermetia illucens* (Diptera: Stratiomyidae) midgut. The larvae of *H. illucens* are among the most promising agents for the bioconversion of low-quality biomass, such as food waste and by-products of the agri-food transformation chain, into sustainable and nutritionally valuable proteins for the production of animal feed. Despite the great interest toward this insect, a deep understanding of the morphofunctional properties of the larval midgut, the key organ that determines the extraordinary dietary plasticity this insect, has been completely overlooked. During my PhD I performed an in-depth characterization of this organ. This study led to propose a detailed functional model of the larval midgut of *H. illucens* in which each region is characterized by peculiar features to accomplish specific functions. Moreover, I evaluated the effects of feeding substrates with different nutritional composition on morphofunctional properties of the larval midgut. The results indicate a diet-dependent adaptation process of this organ: morphological, functional and metabolic differences were observed. This plasticity may be responsible for the ability of *H. illucens* larvae to grow and develop on very different organic substrates. I also evaluated the effect of diets with different nutrient content on the midgut microbiota composition of *H. illucens* larva, by *16s rRNA* gene sequencing. It was established that the feeding substrate and the functional features of each region of the midgut impact on the midgut microbiota. Finally, since in literature it is reported, without any supporting experimental data, that the adult stage of *H. illucens* does not need to eat or is even considered unable to eat, I conducted analyses of the functional properties of *H. illucens* adult midgut and of the feeding habits of the fly. The data demonstrate that the adult insect is endowed with a functional digestive system: it is able to feed and digest food, and this has an impact on the adult lifespan. All the data collected during my PhD project contribute to fill a gap of knowledge and can be fundamental to promote the exploitation of *H. illucens*, in particular, to develop strategies to optimize the bioconversion ability of this insect and its biotechnological applications. My PhD research project has been performed with a multidisciplinary approach, using different techniques: light, fluorescence and electron microscopy, immunohistochemistry, western blot analyses, real time PCR, high-throughput sequencing, transcriptome analysis, and enzymatic



assays.

Moreover, during the last two years, I have participated to preliminary studies on the ecology and reproductive biology of the endangered narrow endemic alpine plant *Androsace brevis* (Hegetschw.) Cesati (Primulaceae), focusing the attention on insect-mediated pollination. I work on wild pollinators since 2013 as project manager of a funded project that aims at studying and protecting the wild pollinators in the Monte Barro Regional Park by means of: i) a precise monitoring of the wild bees present in the area, ii) the definition of the wild bees pollination networks, and iii) the use of the pollen collected by wild bees as a bioindicator of the presence environmental contaminants (e.g. heavy metals).

Since 2013, I participate to a project regarding the study and management of populations of native and alien crayfishes in the Monte Barro Regional Park and Upper Brianza.

Since 2016, I conduct studies about the assessment of distribution of orthopterans belonging to the family Raphidophoridae in Northern Italy, using DNA barcoding techniques.

PROJECT ACTIVITY

Year	Project
2018	Involved in the project “Plastic biodegradation by insects”, funded by the University of Milan (Linea 2, Piano di sostegno alla ricerca 2017)
2017	Involved in the project “Living on the edge: ecology and reproductive biology of the endangered plant species <i>Androsace brevis</i> ”, funded by the University of Milan (Linea 2, Piano di sostegno alla ricerca 2016)
2015-present	Involved in the project “Insect Bioconversion: from vegetable waste to protein production for fish feed (InBioProFeed)”, funded by Cariplo Foundation (ID 2014-0550)
2013-present	Project manager of “BarroBugBox”, promoted by WWF Lecco, in collaboration with Parco Regionale Monte Barro and Apilombardia, funded by Apilombardia (2013-present) and Credito Valtellinese (2017), under the patronage of Regione Lombardia, ERSAF Lombardia and CIAA Lecco
2013-present	Involved in the “Crayfish project”, promoted by WWF Lecco, in collaboration with Parco Regionale Monte Barro

CONGRESSES AND SEMINARS

Date	Title	Place
14-16 November 2018	European PhD Network in “Insect Science” - IX Annual Meeting	Firenze (Italy)
25-28 September 2018	79° Congresso Nazionale Unione Zoologica Italiana	Lecce (Italy)
02-06 July 2018	XI European Congress of Entomology	Napoli (Italy)
12-15 June 2018	5th European Congress of Conservation Biology	Jyväskylä (Finland)
15-18 May 2018	2nd International Conference “Insects to Feed the World”	Wuhan (China)



15-16 November 2017	European PhD Network in “Insect Science” - VIII Annual Meeting	Napoli (Italy)
07-08 September 2017	3rd International Conference INSECTA	Berlin (Germany)
20-24 June 2016	XXV Congresso Nazionale Italiano di Entomologia	Padova (Italy)
20 May 2016	Invited speaker in the course “Destinazione Lilliput: un viaggio alla scoperta della microfauna lombarda” organized by WWF Lecco. Seminar title “Tutela degli impollinatori selvatici: il progetto BarroBugBox”	Galbiate (Italy)

PUBLICATIONS

Articles in reviews (published)
<p>Bonelli, M., Manenti, R. & Scaccini, D. (2017). Mountain protected areas as refuges for threatened freshwater species: the detrimental effect of the direct introduction of alien species. <i>Eco.mont</i> (Journal on Protected Mountain Areas Research), 9(2), 23-29. doi:10.1553/eco.mont-9-2s23</p>
<p>Manenti, R., Bonelli, M., Scaccini, D., Binda, A. & Zugnoni, A. (2014). <i>Austropotamobius pallipes</i> reduction vs. <i>Procambarus clarkii</i> spreading: Management implications. <i>Journal for Nature Conservation</i>, 22(6), 586-591. doi:10.1016/j.jnc.2014.09.001</p>

Articles in reviews (accepted)
<p>Bruno, D.*, Bonelli, M.*, De Filippis, F., Di Lelio, I., Tettamanti, G., Casartelli, M., Ercolini, D. & Caccia, S. (2019). The intestinal microbiota of <i>Hermetia illucens</i> larvae is affected by diet and shows a diverse composition in the different midgut regions. <i>Applied and Environmental Microbiology</i>, 85:e01864-18. doi:10.1128/AEM.01864-18</p> <p>*These authors contributed equally to the work</p>

Articles in reviews (submitted)
<p>Bruno, D.*, Bonelli, M.*, Cadamuro, A. G., Reguzzoni, M., Grimaldi, A., Casartelli, M. & Tettamanti, G. - The adult <i>Hermetia illucens</i> (Diptera: Stratiomyidae) is endowed with a functional digestive system - submitted to <i>Journal of Insect Physiology</i> in November 2018</p> <p>*These authors contributed equally to the work</p>
<p>Bonelli, M., Messinetti, S. & Spreafico, F. - New insights on <i>Troglophilus</i> Krauss, 1879 (Orthoptera: Rhaphidophoridae) species distribution in the westernmost area of their main range supported by molecular identification- submitted to <i>Entomological Science</i> in October 2018</p>
<p>Bonelli, M.*, Bruno, D.*, Caccia, S., Sgambetterra, G., Cappelozza, S., Jucker, C., Tettamanti, G. & Casartelli, M. - Structural and functional characterization of <i>Hermetia illucens</i> larval midgut - submitted to <i>Frontiers in Physiology</i> in September 2018</p> <p>*These authors contributed equally to the work</p>



Articles in reviews (in preparation)

Bonelli, M.*, Bruno, D.*, Gianfranceschi, N., Lupi, D., Tettamanti, G. & Casartelli, M. - The feeding substrate affects morphological and functional features of the *Hermetia illucens* larval midgut - in preparation

*These authors contributed equally to the work

Congress proceedings

Bonelli, M., Bruno, D., Tettamanti, G. & Casartelli, M. (2018). Characterization of *Hermetia illucens* (Diptera: Stratiomyidae) larval midgut. Book of Abstract European PhD Network "Insect Science", Florence (IT) 14-16 November 2017

Bruno, D., Bonelli, M., Lupi, D., Casartelli, M. & Tettamanti, G. (2018). Morphofunctional characterization of *Hermetia illucens* larval midgut. Riassunti 79° Congresso Nazionale Unione Zoologica Italiana, Lecce (IT) 25-27 September 2018

Bonelli, M., Bruno, D., Cagnola, A., Gianfranceschi, N., Jucker, C., Leonardi, M.G., Tettamanti, G. & Casartelli, M. (2018). Comparison of the morphofunctional properties of the larval midgut of *Hermetia illucens* (Diptera: Stratiomyidae) reared on different diets. Book of Abstracts XI European Congress of Entomology, Naples (IT) 02-06 July 2018

Bruno, D., Bonelli, M., Jucker, C., Lupi, D., Casartelli, M. & Tettamanti, G. (2018). Replacement of *Hermetia illucens* larval midgut during metamorphosis. Book of Abstracts XI European Congress of Entomology, Naples (IT) 02-06 July 2018

Casartelli, M., Bonelli, M., Bruno, D., Cappelozza, S., Lupi, D. & Tettamanti, G. (2018). Morphological and functional characterization of the larval midgut of *Hermetia illucens* (Diptera: Stratiomyidae), a promising insect for bioconversion and feed production. Book of Abstracts XI European Congress of Entomology, Naples (IT) 02-06 July 2018

Ferrante, L., Bonelli, M., Scaccini, D., Manenti, R., Normando, S., Florio, D. & De Mori, B. (2018). The extinction risk for threatened species in protected areas: the case of the freshwater crayfish (*Austropotamobius pallipes*) in Italy. 5th European Congress of Conservation Biology, Jyväskylä (FIN), 12-15 June 2018. doi:10.17011/conference/eccb2018/107432

Bonelli, M., Bruno, D., Gianfranceschi, N., Jucker, C., Leonardi, M.G., Tettamanti, G. & Casartelli, M. (2018). The influence of diet on the morphofunctional properties of *Hermetia illucens* (Diptera: Stratiomyidae) larval midgut. Journal of Insects as Food and Feed: 4 (Supplement 1), The 2nd International Conference 'Insects to Feed the World', Wuhan (CN) 15-18 May 2018. doi:10.3920/JIFF2018.S1

Bruno, D., Bonelli, M., Jucker, C., Lupi, D., Casartelli, M. & Tettamanti, G. (2018). Metamorphic remodelling of the larval midgut in *Hermetia illucens*. Journal of Insects as Food and Feed: 4 (Supplement 1), The 2nd International Conference 'Insects to Feed the World', Wuhan (CN) 15-18 May 2018. doi:10.3920/JIFF2018.S1

Bruno, D., Bonelli, M., Savoldelli, S., Cappelozza, S., Casartelli, M. & Tettamanti, G. (2018). The bioconversion capability of *Hermetia illucens* larvae: a morphofunctional study of the larval midgut. Journal of Insects as Food and Feed: 4 (Supplement 1), The 2nd International Conference 'Insects to Feed the World', Wuhan (CN) 15-18 May 2018. doi:10.3920/JIFF2018.S1

Bruno, D., Bonelli, M., Casartelli, M. & Tettamanti, G. (2017). The larval midgut of *Hermetia illucens* is characterized by a highly complex structural organization. Book of Abstract European PhD Network "Insect Science", Naples (IT) 15-16 November 2017



Bonelli, M., Bruno, D., Tettamanti, G. & Casartelli, M. (2017). Molecular and functional characterization of *Hermetia illucens* larval midgut. Book of Abstract European PhD Network "Insect Science", Naples (IT) 15-16 November 2017

Bonelli, M., Bruno, D., Montali, A., Jucker, C., Lupi, D., Casartelli, M. & Tettamanti, G. (2017). Structural and functional characterization of the larval midgut of *Hermetia illucens* for the best exploitation of its bioconversion ability. Book of Abstract INSECTA 2017, Berlin (DE) 07-08 September 2017. ISSN 0947-7314

Leonardi, M.G., Jucker, C., Savoldelli, S., Palamara Mesiano, M., Lupi, D., Casartelli, M., Bonelli, M., Cappellozza, S., Bruno, D., Romanelli, D. & Tettamanti, G. (2016). Utilizzo di *Hermetia illucens* per la produzione di proteine da substrati vegetali. Atti XXV Congresso Nazionale Italiano di Entomologia, Padova (IT) 20-24 June 2016

Bonelli, M. & Scaccini, D. (2016). Realizzazione e gestione di siti di nidificazione per i pronubi selvatici del Parco Monte Barro: il Progetto BarroBugBox. Atti XXV Congresso Nazionale Italiano di Entomologia, Padova (IT) 20-24 June 2016

OTHER INFORMATION

Scientific societies and commissions membership

- International Association of Astacology
- International Commission for Plant-Pollinator Relationships
- Società Entomologica Italiana

Applications for Research Funding

- 2017 BCFN YES! Research Grant Competition (Barilla Center for Food & Nutrition Foundation, international contest for young university students). Research proposal title: "Insects' superpower: the waste becomes safe". Not funded.

Didactic activities

- Co-tutor of 3 master thesis in Biodiversity and Biological Evolution (UniMi)
- Co-tutor of 1 master thesis in Nature Sciences (UniMi)
- Co-tutor of 3 bachelor thesis in Natural Sciences (UniMi)
- Co-tutor of 1 bachelor thesis in Management of Cultivated Plants and Landscaping (UniMI)
- Seminar "Introduzione alla Sistematica" in the Entomology course (Master's Degree in Nature Sciences) held by Prof. M. Casartelli at University of Milan (A.Y. 2017/2018)
- Seminar "Apterigoti, Paleotteri e Polineotteri" in the Entomology course (Master's Degree in Nature Sciences) held by Prof. M. Casartelli at University of Milan (A.Y. 2016/2017)

Courses, seminars and workshops attended

Courses for Environmental Sciences PhD students:

- Metodi molecolari applicati alla ricerca ambientale - Dr. Diego Fontaneto
- Matematica (ottimizzazione in più variabili) - Prof. Paola Morando
- Statistica - Prof. Roberto Ambrosini
- Genetica e Conservazione delle Popolazione - Prof. Ettore Randi
- "Comunicare la scienza" - organized by Prof. Caterina La Porta
- "The long journey: from early agriculture to genome editing" - organized by Dr. Piero Morandini



Other courses for PhD students:

- Insect biotechnology - organized by Prof. Gianluca Tettamanti at the University of Insubria, Varese

Seminars at the University of Milan

- DNA barcoding. A universal tool for biodiversity characterization: theoretical and practical aspect - Dr. Andrea Galimberti
- DNA metabarcoding to uncover environmental and communities biodiversity - Dr. Antonella Bruno
- The midgut of lepidopteran larvae: from physiological basic research to applied studies - Prof. Morena Casartelli
- Environmental DNA to understand biodiversity changes - Prof. Gentile Francesco Ficetola
- Cave colonisation by the fire salamander (*Salamandra salamandra*): zoological, ecological and evolutionary insights - Dr. Raoul Manenti

Workshops at the University of Milan

- Contest behaviour, mutual interference and the population/community ecology of bethylids - Prof. Ian C.W. Hardy

Other activities

- Volunteer at the scientific event “Il Giardino della Scienza” promoted by Fondo Ambiente Italiano (FAI) and the Department of Biosciences (UniMi)

Declarations given in the present curriculum must be considered released according to art. 46 and 47 of DPR n. 445/2000.

The present curriculum does not contain confidential and legal information according to art. 4, paragraph 1, points d) and e) of D.Lgs. 30.06.2003 n. 196.

Place and date: Milano, 19th November 2018

SIGNATURE