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CONFERENCE ABSTRACTS

Abstracts of the Immature Beetles Meeting 2023

October 5–6, Prague, Czech Republic

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The Immature Beetles Meeting (IBM) is a traditional bi-annual meeting held in Prague. The main topics of the meeting usually cover morphology, ecology and development of beetle larvae, as well as their taxonomic and biosystematic implications. The meeting took place at the Faculty of Science, Charles University, Prague, on Thursday. On Friday, several colleagues attended a plenary field excursion or visited the collections of the National Museum of the Czech Republic in Prague – Horní Počernice. In total, 36 colleagues from 9 countries attended the meeting. As the personal get-together is the major reason to organize the IBM, we did not allow the hybrid attendance this year. However, the number of participants was still higher than in 2021, including even that year's hybrid attendants. The majority of attendants were from Europe, mostly from the Czech Republic and the United Kingdom. However, colleagues from other European countries as well as from the United States attended the meeting too.

A total number of 8 oral contributions was presented. The talks covered diverse topics regarding beetle larvae, including fossils, larval biology, microbiomes, and systematics. Beetle families covered by the contributions include Carabidae, Leiodidae, Tenebrionidae, Curculionidae, Chelonariidae, Staphylinidae, and Scarabaeoidea. A methodical talk about mounting and conservation of larvae also took place. In comparison to previous years, in this year's IBM, we included some innovative content as well. On Thursday afternoon, a plenary discussion entitled *Problems, Obstacles and Solutions to Larval Research* was organized by Michael Ivie and Max Barclay. The discussion was originally proposed by Michael Ivie in reaction to the informal comments made by a number of regular IBM attendants that for them, the most valuable part of the IBM are discussions and possibilities to head contemporary problems together. Additionally, we also provided an option for the colleagues to attend a plenary excursion, which was organized on Friday morning, to the Klánovický les forest, a valuable natural protected area near the museum collections in Horní Počernice. Both the excursion and the discussion were very fruitful and we hope to include similar 'innovative' activities in future IBMs too. The meeting, however, couldn't be considered successful without the traditional beetle pub, which took place on both evenings. The possibility of informal discussion, moreover over a glass of the famous Czech beer, is traditionally the top-notch experience of the meeting. We are very happy that several Czech colleagues who couldn't attend the meeting joined us in the pub and contributed to the inspiring and open atmosphere.

The last IBM was strongly affected by the COVID pandemic, which resulted in a limited attendance and forced us to organize the conference in a suboptimal hybrid way. We are very glad that the IBM appears to recover after the tough pandemic years. We hope that the IBM tradition will continue with the jubilee 10th meeting in 2025, underpinning Prague as one of the key meeting points for the international community of beetle specialists. For more details about the IBM, see the following online address: www.immaturebeetles.eu/ as well as our Facebook page: www.facebook.com/ImmatureBeetlesMeeting/.

organizers of the Immature Beetles Meeting

Acknowledgements

We are very grateful to all colleagues who supported the organization of the IBM 2023 and who attended the meeting. We also thank all participants who presented their presentations and took part in the plenary discussion, as well as those who attended the informal beetle discussions in the evening larval pub, and attended the plenary excursion. Ivan Čepička (Head of the Department of Zoology, Charles University) kindly supported our initiative to organize the meeting and provided the space where the meeting took place. The National Museum of the Czech Republic, the Crop Research Institute, and the Czech

Entomological Society supported IBM 2023 as well. The meeting was organized as a part of the research activities of the organizers, partially supported by the grant SVV 260686/2023 (from Charles University) to AFD and PŠ.

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KOLE J. 2021: From Aquatics to Inquilines, what we know about the Larvae of Chelonariidae (Coleoptera: Byrrhoidea) P. 481. In: DAMAŠKA A. F., SKUHROVEC J. & ŠÍPEK P. (eds): Abstracts of the Immature Beetles Meeting 2023, October 5– 6, Prague, Czech Republic. *Acta Entomologica Musei Nationalis Pragae* **63 (2)**: 479–483.

ORAL PRESENTATIONS

‘Is it just a matter of time?’ – Comparison of weight of larvae and pupae among three populations of the yellow mealworm beetle *Tenebrio molitor* L. (Coleoptera: Tenebrionidae) breeding without blood refreshment

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The mealworm (*Tenebrio molitor*), a species of medium-sized omnivorous beetle, is a popular food source for animals (livestock, companion animals, exotic and protected animals kept in captivity under ex-situ programs). It is also a highly valuable element of the human diet in some parts of the world (Asia, Africa, and South America) and is getting more popular in other regions (European Union). The subjects of our study were three populations of *Tenebrio molitor*, differing in the number of years they remained without adding new individuals to the breeding population. Population 1 – donated to science club members for research purposes, has been kept without adding new individuals for 20 years. Population 2 – obtained from a commercial breeder, has been kept without adding new individuals for three years since 2020. Population 3 – beetles obtained from different sources, with new individuals added every three months.

The breeding of the population without introducing new individuals (without blood refreshment) could affect their genetic diversity by increasing homozygosity and reveal the unfavorable effects of inbreeding. We weighed 100 larvae (which were preparing for pupation – low mobility) and 100 pupae (recently pupated) from each population group using analytical laboratory scales. We have proved that individuals differ in weight between larvae and pupae. Statistically, the

study showed notable differences between Population 3 and the others, with differences visible in the median of each population group. The results show the importance of the cyclical addition of unrelated individuals to existing confined populations and the impact of these additions on weight.

From aquatics to inquilines, what we know about the larvae of Chelonariidae (Coleoptera: Byrrhoidea)

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The Chelonariidae are a family of compact beetles in the superfamily Byrrhoidea. More than 200 species in this family have been described, however, very few larvae are known, and even fewer are associated with the described species. The larvae of Chelonariidea are morphologically unusual, bearing long setae on distinctive lateral and dorsal protuberances, and in life being covered in a sticky exudate which rapidly becomes covered in detritus. The larvae of Chelonariidae are also notable for their habits, which are largely unknown but often speculated upon. Many early writers considered them to be aquatic, a notion which has since been largely discredited. More recent authors have considered them to be inquilines of ant or termite nests. This contention is difficult to support as few larvae are known at all, with their habits being more mysterious still. While there is evidence that at least one species being an inquiline in the nests of ants, there is evidence that some species are free living, and currently far more free living larvae are known than inquilines.

Examinations of the West Indian Chelonariidae have allowed us to associate the adults and larvae of three species, with an additional two species of larvae identified which cannot be associated with conspecific adults. All five of these species are likely free living, having been found in leaf litter. Several morphological characters have proven useful in distinguishing between the larvae of West Indian Chelonariidae, indeed the larvae are often more easily distinguished than are the adults.

Significant further work is required for the remaining species of Chelonariidae, especially with respect to *Pseudochelonarium* Pic, 1916 and *Brounia* Sharp, 1878 as no larvae are known of these genera. Additional larval Chelonariidae, especially specimens from Southeast Asia and New Zealand, are desperately needed to better understand this group.

Microbiota of two related bark beetle species varies according to host ecology

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The microbial communities associated with bark beetles are influenced by a combination of abiotic and biotic factors. Our study focused on the fungal and bacterial associates of bark beetles that infest European Ash (*Fraxinus excelsior*), specifically *Hylesinus fraxini* (Panzer, 1779), which attacks thin branches, and *Hylesinus crenatus* (Fabricius, 1787), which burrows into mature tree trunks. To analyze the community composition and abundance of fungi and bacteria, we examined samples from different developmental stages of both beetle species and their galleries using a combination of cultivation and metabarcoding techniques. Despite the fact that both beetles inhabit the same host tree and are closely related, they harbor distinct fungal communities. The thin branch borer, *H. fraxini*, primarily relies on *Geosmithia* (Ascomycota: *Hypocreales*) symbionts, whereas the trunk-infesting *H. crenatus* is predominantly associated with *Ophiostoma hylesini* (Ascomycota: *Ophiostomatales*). We tested a hypothesis that simple abiotic and biotic factors related to the microhabitat of each beetle species, such as temperature, water stability, pH, CO_2 content and secondary metabolites of the tree contribute to the significant differences in the fungal symbiont communities on a larger scale. The results were not significant and did not bring any explanation.

Morphology of very unusually modified larva of myrmecophilous Cholevinae (Coleoptera: Leiodidae)

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We present here the unique morphology of larva of family Leiodidae, found in the mid-south of Croatia, nearby the Adriatic Sea, associated with ants of the genus *Messor* Forel, 1890. Preliminary DNA sequencing leads to the subtribe Cholevina. Four genera: *Attaephilus* Motschulsky,1870, *Attumbra* Gozis, 1886, *Catopsimorphus* Aubé 1850, and *Philomessor* Jeannel, 1936 are myrmecophilous (Newton 1998). In spite of uncertain identification, we show our preliminary assessment due to few reasons. According to Hölldobler & Wilson (1990), there are many thousands of myrmecophilous coleopteran species in 35 families, but informations about such larvae in leiodid family are very scarce and old (e.g. Lea 1910, Silvestri 1912) or still fragmentary like for Camiarinae *Myrmicholeva* spp. (Newton 1998, Kilian 2019). Secondly, all myrmecophilous beetles' adaptations are worth of

interest. Finally, morphology of these larvae is unique and intriguing: bizarre, conical and strong setae of thorax and abdomen, abdominal glands, very long and hypertrichous appendages (antennae, urogomphi, and legs) and its mouthparts unmodified, resembling other Cholevinae. Comparing with Silvestri description before 111 years, we presume that it is *Attumbra* larva.

HÖLLDOBLER B. & WILSON E. O 1990: *The Ants*. Harvard University Press, Cambridge, 746 pp. https://doi.org/10.1007/978-3-662-10306-7

KILIAN A. 2019: Suctorial larval mouthparts of the enigmatic *Myrmicholeva* Lea (Leiodidae: Camiarinae). P. 574. In: SEIDEL M., ARRIAGA-VARELA E. & VONDRÁČEK D. (eds.): Abstracts of the Immature Beetles Meeting 2019, October 3−4, Prague, Czech Republic. *Acta Entomologica Musei Nationalis Pragae* **59**: 569–582.

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Mid-Cretaceous beetle larvae from Burmese amber: application of traditional and modern microscopy tools

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The beetles were already a highly diverse group of insects during the mid-Cretaceous, but our knowledge of them is almost entirely based on studies of adults while their larvae have been scarcely documented so far. This reflects our understanding of recent beetle species as well as the necessity to apply efficient microscopy tools for recognizing microstructures in suspicious detail. Here we demonstrate two studies on beetle larvae classified within different suborders and visualized by traditional microscopy techniques as well as synchrotron-radiation-based micro-computed tomography (SRμCT).

Cretorhadalus constantini Kolibáč et al., 2023 is assigned to the melyrid lineage of Cleroidea and tentatively classified within the basal family Rhadalidae. It represents the first record of an immature beetle of the basal cucujiform superfamily for the Mesozoic. Exceptional state of preservation allowed virtual reconstruction of the specimen and discern integumental details of cephalic structures, particularly the mouthparts. This larva has the ancestral cleroid pattern of the stemmata (2+3) and well-developed hooked urogomphi. Based on a comparison with extant rhadalids, as well as most members of the melyrid lineage, the larvae and adults of this new species were probably carnivorous, living on the trunks and branches of trees or in galleries where they foraged for soft xylophagous insects.

Cretomophron mutilus Rosová et al., 2023 is attributed to the distinctive monogeneric subfamily Omophroninae within megadiverse family Carabidae. It represents the second record of larva of the family for the Mesozoic. The well-preserved fossil exhibits several apomorphies supporting its placement in the small subfamily as well as distinctive characters that allowed to erect a new genus. The structural specializations of the head, prothorax and legs strongly suggest that the larva was burrowing in sand, as are the larvae of the extant genus *Omophoron* Latreille, 1802. It was probably an efficient predator, that could detect prey with its unusually shaped antennae and long maxillae, grasping it with the elongate apical mandibular teeth, and squeezing and piercing it between the bidentate retinaculum and a large and triangular nasale. Our results revealed details of the cephalic structures such as mouthparts, thoracic structures (e.g., legs with specialized pretarsus), and abdominal structures like urogomphi, etc. With modern microscopy tools it is possible to study body structures far more deeply and elucidate their functional significance. Hence, the efficient application of these techniques provides another perspective along the classical microscopy and should be more frequently applied in contemporary studies. This research is a contribution of KR, JSP and JP to the project of the Grant Agency of the Czech Republic (No. 21-05216S) and of JK to the project of the Moravian Museum by the Ministry of Culture of the Czech Republic (DKRVO MK000094862).

Immature stages of *Emus hirtus* in the phylogenetic context of the subtribe Staphylinina

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Adult and larval biological information about *Emus hirtus* (Linnaeus, 1758) were observed. All life instars of the species are imaged and redescribed. Through the larval morphological characters, and by compromising important larval characters from the major literature, we find larval characters are important and useful for classifying different genera groups of Staphylinina. So we summarize the stable and important characters for each genus group of Staphylinina, hope can help for future study.

What to do with dried-up larvae?

Petr ŠÍPEK

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Almost everyone has the painful experience of finding one of its most important samples from spirit collection dried-up. Dried-up vials with alcohol samples can be occasionally found in several museum collections, alcohol evaporates quickly and especially old vials may not seal perfectly. Sometimes dry pinned larvae are also found together along adult beetles in the same vial. Most people consider a dried-up larval sample useless for any studies. However, there is a good chance to recover such material using the trisodium phospate solution. The method is very easy and was originally published by VAN CLEAVE & ROSS (1947). The specimen is soaked in 0.5% solution of trisodium phosphate (Na_3P0_4); length of soaking depends on the size of specimen, from a few hours to several days. Specimens may initially float on the solution; however this is not the rule. Sinking of the specimen often indicates a sufficient stage of rehydration. When the specimens are soaked enough, they can be transferred into 75% alcohol by soaking them in 30% and 50% alcohol for few minutes. The method can be applied also for the rehydration of other dried-up spirit samples as Heteroptera (P. Banař, pers. comm.), spiders, mites (M. Řezáč, pers. comm.), or in helmitology. Some attention should be paid when rehydrating adult or larviform females which may contains eggs, as they might swell too much and cause the specimen virtually to explode (J. Gruber, pers. com.).

Trisodium phospate is used as a cleaning agent, food additive, stain remover, and degreaser. Therefore, it can be considered safe to use. The chemical comes in various hydric forms from anhydric trisodium fosfate to dodecahydrate. For re-hydratation of larval samples we successfully use the dodecahydrate of trisodium fosfate ($Na_3PO_4.12H_2O$).

VAN CLEAVE H. J. & ROSS J. A. 1947: Use of Trisodium Phosphate in microscopical technic. *Science* **106 (2748)**: 194.