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Abstracts of the Immature Beetles Meeting 2009

October 1–2, Prague, Czech Republic

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(editors)

The third Immature Beetles Meeting was held in Prague during October 1–2, 2009, nearly precisely two years after the previous meeting (for abstracts see FIKÁČEK et al. (2007)). Similarly as in 2007, the meeting took place at the Faculty of Science, Charles University, in cooperation with the National Museum in Prague and the Crop Research Institute in Prague. Altogether 36 participants from Europe, North and South America and Japan attended the meeting. Among those, the most expected was Cleide Costa from Museu de Zoologia, Universidade de São Paulo in Brazil, who presented the results of her life-long studies of the morphology and biology of larval Coleoptera. It was also nice to see that the number of pregraduate students was higher than in 2007 meeting and one of them (Yusuke Minoshima from Hokkaido University, Sapporo, Japan) even presented a very interesting lecture!

During both days, attendants presented 12 short lectures and six posters, whose abstracts are presented below in alphabetical order. Coffee breaks and a joint lunch in a nearby restaurant provided a handy opportunity for informal discussions of the lectures and individual research projects and interests of the participants. During both evenings, most people continued in a slightly more relaxed setting in a pub over a glass (or perhaps two) of Czech beer. To sum up, the meeting seemed to be again very fruitful.

Before the closing of the 2009 meeting, the participiants agreed with the two year interval for organizing the Immature Beetles Meeting and decided for Prague as its place, even through several other places were suggested. The next meeting is therefore planned for the autumn 2011 and will be held at the Charles University in Prague again. Details about the forthcoming meeting will be available on the Immature Beetles Meeting web pages at http://www.cercyon.eu/IBM/IBM_2011.htm, together with the photos and abstracts of the past meetings. Please contact us if you need further information.

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References

FIKÁČEK M., SKUHROVEC J. & ŠÍPEK P. 2007 (eds.): Abstracts of the Immature Beetles Meeting 2007, October 4–5, Prague, Czech Republic. *Acta Entomologica Musei Nationalis Pragae* **47**: 287–306.

The abstracts should be cited as follows:

AHRENS D. & ŠÍPEK P. 2010: Larval morphology in the light of chafer (molecular) phylogeny. P. 323. In: FIKÁČEK M., SKUHROVEC J. & ŠÍPEK P. (eds.): Abstracts of the Immature Beetles Meeting 2009, October 1–2, Prague, Czech Republic. *Acta Entomologica Musei Nationalis Pragae* **50**: 323–342.

The abstracts are printed without any corrections.

PRESENTATIONS

Larval morphology in the light of chafer (molecular) phylogeny

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In the light of the so far existing hypotheses of chafer phylogeny (pleurostict Scarabaeidae) we are seeking to prepare the basis for a combined approach analysing molecular as well as morphological data from adults and larvae. Here we represent first results for a larval chafer tree in the melolonthine lineages, including so far 54 taxa (including outgroups) and 55 characters. The currently still present poor resolution for some of the principal chafer lineages underlines the difficulty for a "only larval" tree approach. However, at the other hand we could retrieve the sister group relationship of the southern world melolonthine lineage and the Ablaberini + Sericini which was found also previously independently by adult and molecular characters.

We discuss our findings as well as some of the more relevant characters in the light of the more recent molecular tree hypotheses and give an outcome for the future project.

First record of myrmecophily in buprestid beetles: immature stages of *Habroloma myrmecophila* (Coleoptera: Buprestidae) associated with *Oecophylla* ants

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Adults of *Habroloma myrmecophila* Bílý, Fikáček & Šípek, 2008 (Buprestidae: Trachydini) were found to invade damaged or newly constructed nests of *Oecophylla smaragdina* (Fabricius, 1775) ants (Hymenoptera: Formicidae) during the visit of M. F. and P. Š. to Goa Province (India) in 2002. Larvae of this species were found during the second visit of the locality in 2005 to mine in the leaves forming the *Oecophylla* nest wall and pupate within the mines. Based on the available data, the life cycle of the buprestid species was reconstructed as follows: after mating, adult beetles invade damaged or newly constructed *Oecophylla* nests to lay eggs; larvae mine in the leaves forming the nest wall and pupate there as well; only adult beetles interact directly with ants, potentially triggering their necrophoric behaviour when caught (video showing the interactions of adult *Habroloma* with ants was shown, may be downloaded from http://www.cercyon.eu/Publications_PDF/BilyEtAl_HabrolomaVideo.avi.

Presented results were already published in the following paper:

BÍLÝ S., FIKÁČEK M. & ŠÍPEK P. 2008: First record of myrmecophily in buprestid beetles: immature stages of Habroloma myrmecophila sp. nov. (Coleoptera: Buprestidae) associated with Oecophylla ants (Hymenoptera: Formicidae). *Insect Systematic and Evolution* **39**: 121–131.

The Immature Coleoptera Collection of the "Museu de Zoologia da Universidade de São Paulo" Brazil

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Although C. Costa has been studying the biology of the immature beetles since 1966, the increase of the Coleoptera Immature Collection of the "Museu de Zoologia da Universidade de São Paulo" has been more intensive with the collaboration of S. A. Vanin since 1977, when a long term project was elaborated to collect and rear immature beetles. Then it was necessary to include in the project the installation of a laboratory with the entire necessary infrastructure to rear larvae. In this way that collection has grown steadily ever since, also counting on the expressive assistance of S. A. Casari and S. Ide in the years that followed. Financial research support to this project was provided by "Fundação de Amparo a Pesquisa do Estado de São Paulo (FAPESP)" and "Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)".

For about the last thirty years, we have made over 80 scientific expeditions to collect larvae mainly in the Atlantic Forest and "Cerrado" vegetation in Central Brazil. Part of the Amazon Forest and the "Restingas" areas of the South Coast of "São Paulo and Rio Grande do Sul" have also been visited. The specimens come chiefly from the following regions: Pará: Belém; Distrito Federal: Brasília; Mato Grosso: Cuiabá (Chapada dos Guimarães); Mato Grosso do Sul: Costa Rica; Goiás: Mineiros (Parque Nacional das Emas); Minas Gerais: Santa Bárbara (Serra do Caraça); Rio de Janeiro: Nova Friburgo; São Paulo: Araras, Campinas, Campos do Jordão, Guapiara, Guarujá, Itanhaém, Paranapiacaba, Peruíbe, Salesópolis (Estação Biológica de Boracéia), São Paulo; Paraná: Curitiba; Rio Grande do Sul: Pelotas, Rio Grande.

The methodology included the collection of larvae and of living adults for correlating immature and adults, and identifying the species. Sometimes, depending on the species, the correlation larva / adult was made on the spot and then both were fixed in an appropriate way. In other cases, depending on the larval instars, it was necessary to maintain them in the laboratory for not longer than two years. When we had a great larvae series of the same species and the laboratory rearing had been successful, it was possible to obtain and preserve larva, pupa and adult. Being the number of larvae small, we generally photographed the pupa and preserved the larva and the adult. If there was a single larva, the pupa was photographed, the larva and pupa exuviae were preserved and the adult was obtained. Consequently, a collection of about 18,521 larvae, 3,159 pupae and 17,480 adults was assembled: a collection in which the majority of immatures were correlated to the adults by means of their rearing.

So far, 27 scientific articles dealing with the specimens of that collection have been published in a series entitled “Larvae of Netropical Coleoptera”. 19 more articles, including large revisions and a book on the “*Larvas de Coleoptera do Brasil*” have been produced.

The collection is maintained in flasks of glass of several sizes and preserved in ethanol 70%. Now it is zipped in 6 steel cabinets and in 145 steel lidless drawers. Most of the adults are conditioned together with the immature reared in the laboratory; part of them is mounted dried and kept in separate cabinets. It is the unique collection among its congeners in the world that includes material almost exclusively reared in laboratory (Costa 1999).

In 1992 the use of the immature collection was made available after the creation of a database using “Access for Windows” that allows the input of the generated data, then making it easier to retrieve collection and to simplify the entering or deletion to information. Four linked files and their respective indexes form that database. The file *Imat-col*, the main one, contains information such as: number of the sample, localization of the sample in the collection, collection locality (coded), classification (coded) up to species level, data on sample movement (donations, exchanges, loans), description of the sample, generated publications, etc. There are files linked to it such as: *Imat-loc*, with data of the collection locality and collectors; *Imat-cla*, with the classification of the Coleoptera (Lawrence & Newton 1995), structured in such a way that periodic upgrades are allowed; and, *Imat-cri,* with relating data to the breeding of the material in the laboratory.

Coleoptera is the richest and the most diversified order among Insecta with ca. of 25,000 genera and 350,000 species, corresponding to 40% of the total insects and 30% of the animals. Large part of that contingent are found in the tropical regions and especially in the Neotropical Region considered the biggest repository of the biodiversity in the planet. About 7,000 genera and 80,000 species are known to come from the latter and among them approximately 5,000 genera and 30,000 species are from Brazil. These figures show how incipient is the knowledge of the diversity of that group, and how enormous is the task of the coleopterists in general, especially those in Latin America.

The complete metamorphosis is considered one of the causes of the great diversity of the holometabolan insects; but in the Coleoptera, the presence of the elytra contributes to its adaptation practically to both terrestrial and fresh water habitats.

Fauna diversity is better understood from bionomics and systematic studies that favor more precise knowledge of the ecological, morphological adaptations, inter-specific associations, etc., besides offering basic information to the phylogenetic studies of the groups. The larvae and adults of Coleoptera possess independent adaptations that reflect a more complex evolution in some way. Systematic and cladistic analysis that involves characters of larvae and adults could offer a wider vision of the evolutionary process.

COSTA C. 1999: Coleoptera, cap. 12. In: BRANDÃO C. R. F. & CANCELLO E. M. (eds.): Invertebrados terrestres, vol. 5. In: JOLY C. A. & BICUDO C. E. de M. (orgs.): *Biodiversidade do Estado de São Paulo, Brasil: síntese do conhecimento ao final do século XX.* Fundação de Amparo à Pesquisa do Estado de São Paulo–FAPESP, São Paulo, pp. 113–122.

LAWRENCE J. F. & NEWTON A. F. Jr. 1995: Families and subfamilies of Coleoptera (with selected genera, notes, references and data on family–group names). In: PAKALUK J. & ŚLIPIŃSKI S. A. (eds.): *Biology, phylogeny, and classification of Coleoptera: papers celebrating the 80th birthday of Roy A. Crowson. Vol. 2.* Muzeum i Instytut Zoologii, PAN, Warszawa, pp. 779–1092.

Coleoptera larval fauna associated with termite nests (Isoptera) with emphasis on the "bioluminescent termite nests" from central Brazil

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A numerous and diversified insect larval fauna including many beetle species is found in the interior of termite nests. This fauna occurs in living colonies as well as in abandoned nests. The inside of the nest provides stable environment protected against climatic variations and enemies. In many cases the termite nest seems to constitute the main or the only place where these beetles can develop.

For many years we collected and studied Coleoptera larvae, associated with termite nests, mainly species of the families Elateridae, Carabidae, Melyridae, Passalidae, Scarabaeidae and Tenebrionidae. As most of the studied species were described by us in several papers and in a book, and the species reported associated with the termite nests are of different taxa, we find it worthwhile presenting a synthesis of the gathered observations, pointing out some aspects not dealt with yet.

The beetle larvae that inhabit termite nests present modifications that allow them to cohabitate with the termites. Considering the features of larvae found only in the central inner part of termite nest, some are physogastric and bear special glands and different kinds of setae all over their bodies, whereas others are not physogastric. Both kinds of larvae may be termite predators. Some species usually live in the nest cabbage pan, feeding on organic matter, mushrooms and excrements or eating the nest walls and sometimes causing the nest to be destroyed. Other species live in superficial galleries of the nest and feed on preys that live outside. However, all interactions between these inquilines and their hosts are very complex.

The phenomenon of the bioluminescent termite nest from Central Brazil is very impressive; caused by larvae of *Pyrearinus termitilluminans* Costa (Coleoptera, Elateridae), which are found in old nests of *Cornitermes cumulans* (Kollar *in* Pohl) (Termitidae, Nasutitermitinae), one meter or more in height. These larvae excavate an intricate network of tunnels in the outer layers of the mounds leading outside, from where they stick out their head and green-shining luminous prothorax to attract and catch flying preys, especially termites and ants.

The topics discussed are as follow: (i) some general aspects of the bioluminescence related to the elaterid fireflies; (ii) description of the bioluminescence phenomenon of the termite nests from Central Brazil including a historical review, particularities of genus *Pyrearinus* Costa, 1975, mainly the *pumilus* group, where *P. termitilluminans,* the species responsible for the termite nest bioluminescence, is placed; (iii) other beetle larvae related to the termite nests and their adaptations to live in that environment; (iv) some functional categories of association of beetle larvae to termite nests.

Adaptations to myrmecophily and evolution of Paussini larvae (Coleoptera: Carabidae: Paussinae)

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Paussini is a pantropical monophyletic tribe containing 516 described species. Adults and larvae are obligate guests of ants (myrmecophilies) and adults have a remarkable diversity of morphological adaptations for living in ant nests. Larvae are extraordinarily rare and most descriptions are based on one, or only a few, 2nd and/or 3rd instar specimens. To date, larvae have been described from only 10 Paussini species representing three of the seven subtribes and four of the 22 genera (Cerapterina, *Arthropterus*, 1 species; Platyrhopalina, *Platyrhopalopsis,* 1 species; and Paussina, *Granulopaussus,* 1 species and *Paussus*, 7 species).

Recently we discovered larvae of two additional species of *Paussus*: two 1st instar larvae were reared from adult *Paussus favieri* collected in Morocco and a 2nd instar *Paussus* larva was collected in Madagascar. These new discoveries motivated us to compare the morphology among all known larvae of the tribe to assess the breadth and diversity of adaptations to a myrmecophilous lifestyle. Here, we present preliminary results.

Characteristics common to all Paussini larvae include a shortening of base of the head capsule; absence of coronal suture and stemmata; anteromedial emargination of the frontaloclypealabrale; reduction of palpi, lacinia, galea and ligula; shortening of antennae and mandibles; fusion of the leg segments (trochanter, femur, tibia, and tarsus) and presence of only one tarsal claw, and fusion of urogomphal lobes into plates. They also have a mandibular prostheca, swollen prementum, enlarged antennal sensorium, modified sensilla. Based on a phylogenetic analysis of these characteristics we recovered the following relationship among subtribes ((Cerapterina + (Platyrhopalina + Paussina)).

In stark contrast to the remarkable morphological diversity of unique adaptations present in adult Paussina, we found that the larvae show surprising morphological homogeneity, even among *Paussus* larvae that live with ants classified in different subfamilies. The strong similarity among larvae indicates there may be strong stabilizing selection acting at this life stage, whereas there seems to be divergent selection acting at the adult stage presumably driven by interactions with host ants. In fact, we found only few larval characters that may be phylogenetically informative within the subtribe. These are associated with the antennae, mouthparts and fine microstructure of the terminal disk. In particular, the following characters vary among species: 1) shape and dimensions of the antennal sensorium; 2) shape and length of antennomere IV; 3) presence/absence and relative length of the mandibular prostheca and of the seta closest to the prostheca; 4) relative position and shape of the seta closest to the retinaculum; 5) relative length and number of maxillary palpomeres; 6) presence/absence of remnants of the lacinia; 7) shape and length of the tarsal claw; 8) relative width and shape of plates of terminal disk; 9) structure, number and position of sensilla S-I; 10) length and shape of radial sensilla (sensilla S-II, marginal to terminal disk).

Biology and larval morphology of the genus *Satonius* (Coleoptera: Myxophaga: Torridincolidae)

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A brief review of the larval morphology and biology of the larvae of the family Torridincolidae was presented, focused on the genus *Satonius* Endrödy-Younga, 1997. Larval morphology of two species, *S. stysi* Hájek & Fikáček, 2008 and *S. kurosawai* Satô, 1982 was compared with remaining torridincolid genera. Larvae of *Satonius* were shown to be very characteristic among Torridincolidae by their extremelly flattened body with large lateral lobes of thoracic segments covering legs as well as by modified orientation of the legs and their unusual chaetotaxy). Suprisingly, all these characters are shared with the larvae of the genus *Ytu* Reichardt, 1973 which is not closely related to *Satonius* based both on larval and adult characters (Beutel 1999, Beutel et al. 1999). Similar morphology of larvae of *Satonius* and *Ytu* are therefore supposed as parallel adaptations for the larval environment – very thin film of water in seepage habitats. Bdeloid rotifers were found to be associated with most larvae of *Satonius stysi* available for our study – this represents the first known association of these rotifers with insects (they are only known to be associated with many aquatic Crustacea). A part of the presented results was already published by Hájek & Fikáček (2008).

BEUTEL R. G. 1999: Phylogenetic analysis of Myxophaga (Coleoptera) with a redescription of Lepicerus horni (Lepiceridae). *Zoologischer Anzeiger* **237** (1998/99): 291–308.

BEUTEL R. G., MADISSON D. R. & HAAS A. 1999: Phylogenetic analysis of Myxophaga (Coleoptera) using larval characters. *Systematic Entomology* **24**: 171–192.

HÁJEK J. & FIKÁČEK M. 2008: A review of the genus Satonius (Coleoptera: Myxophaga: Torridincolidae): taxonomic revision, larval morphology, notes on wing polymorphism, and phylogenetic implications. *Acta Entomologica Musei Nationalis Pragae* **48**: 655–676.

Horelophopsis larvae? The unknown larvae collected with *Horelophopsis hanseni* Satô et Yoshitomi (Coleoptera, Hydrophilidae, Horelophopsinae)

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Horelophopsinae is a subfamily of the family Hydrophilidae established for a single genus *Horelophopsis* Hansen, 1997, which includes two rare species, *H. avita* Hansen, 1997 from New Guinea and *H. hanseni* Satô et Yoshitomi, 2004 from Japan. The Horelophopsinae was recognised as a basal group of the family Hydrophilidae (s. str.) (Hansen 1997, Archangelsky et al. 2005). However, this subfamily was not included in most recently published phylogenetic studies. In particular, immature stages of Horelophopsinae have hitherto been completely unknown.

In the recent years, we have examined unknown hydrophilid larvae collected with the adults of *H. hanseni* from river estuaries of Amami-ôshima and Shikoku, Japan. It was a surprise that these larvae were very similar to larvae of the genus *Agraphydrus* Régimbart, 1903 (Hydrophilinae, Hydrophilini, Acidocerina), despite their expected assignment to the genus *Horelophopsis*. Adults of the genus *Agraphydrus* were collected upstream of the collecting sites of *Horelophopsis hanseni* and the reliable identification were therefore not possible just by association of larvae with adults. To confirm the identity of the unknown larvae, we sequenced ca. 570 bp-long portion of the mitochondrial COI gene of the unidentified larva and adults of *Horelophopsis hanseni*. In addition, we also compared the larval morphology of the unidentified larva with *Agraphydrus* larvae.

Firstly, we were able to identify the unknown larvae as *H. hanseni* based on COI gene analysis. Secondly, morphological comparison of *Horelophopsis* with *Agraphydrus* larvae suggests that these larvae are distinguishable by the following characters: 1) sensorial appendage of antennae; 2) inner tooth of the right mandible; 3) inner margin of the left mandible; 4) shape and setae of labium. However, other larval characters are very similar between *Horelophopsis* and *Agraphydrus*, and some characters are shared with other genera of the tribe Hydrophilini (e.g., body shape; asymmetrical anterior margin of head capsule; rather long sensorial appendage of antennomere 2; distinctly asymmetrical mandibles; inner margin of stipes with four slightly branched setae; incomplete sclerotised maxillary palpomere 1; abdomen with short setose “prolegs”).

It has been postulated that the subfamily Horelophopsinae is branched off at the base of the Hydrophilidae (s. str.) (Hansen 1997, Archangelsky et al. 2005), and the subfamily was therefore recognised as the sister taxon of Hydrophilinae + Sphaeridiinae, which include almost all species of Hydrophilidae (s. str.). Our observations of the larval morphology suggest two plausible conclusions: 1) *Horelophopsis* is closely related to *Agraphydrus* and the phylogenetic position of the subfamily Horelophopsinae is dubious; 2) adult morphology of *Horelophopsis*, which seem to be unique within the Hydrophilidae, may be a result of its adaptation to the habitat.

ARCHANGELSKY M., BEUTEL R. G. & KOMAREK A. 2005: Hydrophiloidea. 10.1. Hydrophilidae. Pp. 157–183. In: BEUTEL R. G. & LESCHEN R. A. B. (eds.): Coleoptera, Volume 1: Morphology and Systematics (Archostemata, Adephaga, Myxophaga, Polyphaga partim). *Handbook of Zoology, Vol. IV: Arthropoda: Insecta*. Walter De Gruyter, Berlin, 567 pp.

HANSEN M. 1997: A new subfamily for a remarkable new genus and species of Hydrophilidae from New Guinea (Coleoptera: Hydrophilidae). *Annales Zoologici* (Warszawa) **47**: 107–110.

Paussinae (Coleoptera: Carabidae) larvae recently discovered in Asia and Madagascar

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Paussinae, commonly known as flanged bombardier beetles, are a pantropical group of approximately 750 described species, most of which are obligate symbionts with ants. Larvae are described from relatively few, but taxonomically diverse, species representing 4 of the 5 tribes and 11 of the 43 genera. The larval stage has strong apomorphic traits that define the subfamily as well as many characters that are phylogenetically informative within the group. Since the last comprehensive review (Di Giulio et al. 2003) many new larvae have been described filling significant gaps in our knowledge (Di Giulio & Moore 2004, 2009; Moore & Di Giulio 2006). Most recently, larvae of *Sphaerostylus* (*Sphaerostylus*) *goryi* (Laporte de Castelnau, 1834) were collected in Madagascar and larvae of *Eustra* Schmidt-Goebel were collected in Asia [*Eustra* sp. was collected from a *Pachycondyla javana* Mayr, 1867 nest in Taiwan (Moore 2006; Gustav Chen, personal communication) and *Eustra chinensis* Bänninger, 1949 was field collected and reared from adults in Shanghai, China]. Here, we present a preliminary assessment of morphology of these larvae and discuss a method of using morphological and molecular datasets to reciprocally illuminate the evolutionary history of the Paussinae. Using this approach we recognize several larval apomorphies of the tribe Ozaenini: the presence of a transverse keel on the frontoclypeolabrum, a unique setation pattern on the stipes, and urogomphal lobe E divided into two sublobes. Other larval characters are shown to be convergences in taxa which are known to be myrmecophilous: the presence of an elongate galea, a shortened lacinia, a wide labral spine, a short ligula and partial fusion of urogomphal lobes. Future work will include a larval revision and a reassessment of characters and character states in the morphological matrix presented in the last review (Di Giulio et al. 2003) especially in light of new information in the seven new taxa discovered since that publication.

DI GIULIO A., FATTORINI S., KAUPP A., VIGNA TAGLIANTI A. & NAGEL P. 2003: Review of competing hypotheses of phylogenetic relationships of Paussinae (Coleoptera: Carabidae) based on larval characters. *Systematic Entomology* **28**: 509–537.

DI GIULIO A. & MOORE W. 2004: The first-instar larva of the genus Arthropterus (Coleoptera: Carabidae: Paussinae): implications for evolution of myrmecophily and phylogenetic relationships within the subfamily. *Invertebrate Systematics* **18**: 101–115.

DI GIULIO A. & MOORE W. 2009: The first known larva of the Australian genus Mystropomus Chaudoir (Coleoptera: Carabidae: Paussinae). *Australian Journal of Entomology* **48**: 140–148.

MOORE W.& DI GIULIO A. 2006: Description and behaviour of Goniotropis kuntzeni larvae (Coleoptera: Carabidae: Paussinae: Ozaenini) and a key to genera of Paussinae larvae. *Zootaxa* **111:** 1–19.

Rearing hydrophilid larvae (Coleoptera: Hydrophilidae)

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Many aquatic beetles can be reared *ab ovo* using a very simple method:

Several adults are put together in a small container with some tap water. They are not fed and no attempt is made to recreate a habitat. For swimming beetles (Dytiscidae and *Berosus*) the only thing provided is a leaf, as a substrate to deposit eggs. For crawling beetles, a string of moss is provided. After one or two days, eggs have been deposited in about half of the cases. If not, the project is abandoned. Eggs hatch after about ten days. The newly hatched larvae are fed with *Artemia*-naupliae. They are kept in the same container, unless only three or four are left. Canibalism occurs occasionally, but is not a huge problem when ample food is provided. This way, larvae can be bred to reach the third instar. Then they are killed in boiling water, cleared in lactic acid and described.

Review of published larval descriptions in carrion beetles (Coleoptera: Silphidae)

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The family Silphidae has recently ca. 183 valid extant species (Růžička & Schneider 2004; Sikes 2005, 2008). Papers concerning larval descriptions and/or illustrations cover 56 species of the family (ca. 31 % of the species): 21 species of the subfamily Nicrophorinae (ca. 28 % of the 75 species) and 34 species of the subfamily Silphinae (ca. 31 % of the 111 species). Some formal descriptions provide only insufficient details concerning external morphology of the larvae and omit characters on important morphological structures. Moreover, papers with single species descriptions provide sometimes only information relevant at generic level. External morphology of both subfamilies, Nicrophorinae and Silphinae, is characterized by Newton (1991) and Sikes (2005, 2008). Good regional identification keys are available only for northern North America (Anderson & Peck 1985) and for central Europe (Klausnitzer 1997).

No published information is available for the following genera/subgenera: *Eonecrophorus* Kurosawa, *Necroxenus* Semenov-Tian-Shanskiy (both Nicrophorinae); *Diamesus* Hope, *Heterotemna* Wollaston, *Deutosilpha* Portevin and *Chrysosilpha* Portevin (all Silphinae). However, larval material of *Diamesus osculans* (Vigors) and *Heterotemna tenuicornis* (Brullé) is at disposal, as well as other larvae belonging to several further species of *Aclypea* Reitter, subgenus *Eusilpha* Semenov, *Silpha* Linnaeus and *Thanatophilus* Leach.

ANDERSON R. S. & PECK S. B. 1985: *The carrion beetles of Canada and Alaska, Coleoptera: Silphidae and Agyrtidae. The insects and arachnids of Canada, Part 13*. Agriculture Canada, Ottawa, 121 pp.

KLAUSNITZER B. 1997: 19. Familie: Silphidae. Pp. 39–65. In: KLAUSNITZER B. (ed.): *Die Larven der Käfer Mitteleuropas. 4. Band, Polyphaga, Teil 3, sowie Ergänzungen zum 1. bis 3. Band*. Goecke & Evers, Krefeld, 370 pp.
NEWTON A. F., Jr. 1991: Silphidae. Pp. 339–341. In: STEHR F. W. (ed.): *Immature Insects, Volume 2*. Kendall/Hunt, Dubuque, 974 pp.
RŮŽIČKA J. & SCHNEIDER J. 2004: Family Silphidae Latreille, 1807. Pp. 229–237. In: LÖBL I. & SMETANA A. (eds.): *Catalogue of Palaearctic Coleoptera, Vol. 2: Hydrophiloidea – Histeroidea – Staphylinoidea*. Apollo Books, Stenstrup, 942 pp.
SIKES D. S. 2005: Silphidae Latreille, 1807. Pp. 288–296. In: BEUTEL R. G. & LESCHEN R. A. B. (eds.): *Handbook of Zoology, Volume IV: Arthropoda: Insecta, Part 38: Coleoptera, Beetles. Volume 1: Morphology and Systematics (Archostemata, Adephaga, Myxophaga, Polyphaga partim).* Walter de Gruyer, Berlin & New York, 632 pp.
SIKES D. S. 2008: Carrion Beetles (Coleoptera: Silphidae). Pp. 749–758. In: CAPINERA J. L. (ed.): *Encyclopedia of Entomology, Second Edition*. Springer, London, 4346 pp.

Seed feeding in carabid larvae (Coleoptera: Carabidae)

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Carabid beetles are important predators of seeds of many plant species, including weeds. In most studies only adults are concerned, although larvae of most seed-eating species also greatly depend on seeds as diet. This paper reviews the present knowledge on seed feeding by carabid larvae in terms of their behaviour, requirements, preferences and seed consumption rates.

Seed feeding by larvae occurs mainly within tribes Zabrini and Harpalini. Behaviour related to seed feeding included – seed caching in subterranean burrows and manipulation and dehusking the seed. Requirements for seed is documented on the larval survival and duration on development, and preferences on results from caffeteria experiments, when larvae had a choice. Consumption rates obtained in laboratory will be compared with that of the adults.

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Immature stages of Euchirinae: genera *Cheirotonus* and *Propomacrus* with comments on their phylogeny based on larval and adult characters

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The Euchirinae are considered to be a poorly studied, somewhat mysterious enigmatic group within the family Scarabaeidae with an uncertain subfamiliar status (Young 1989, Scholtz & Grebennikov 2005, Smith et al. 2006). The group consists of three genera primarily confined to highland areas of Asia, the Near East and SE Europe. In insular and continental Asia, species of *Cheirotonus* Hope, *Euchirus* Kirby et Spence and *Propomacrus* Newmann are distributed approximately between the province of Nanjiang in China in the north and the Sulawesi in the south. Two *Propomacrus* species are known from the Asia Minor, Near East, the Balkan peninsula and the Cyprus. Occurrence of representatives of the Euchirinae is usually associated with richly forested highlands covered with the old-growth broadleaved trees with holes required for survival for both of immature stages and adults.

Papers dealing with immature stages of this group are very scanty. Photos of all larval instars, pupae and pupal cases of *Cheirotonus jambar* Kurosawa are published (Mizunuma 1984), but they are not useful for morphological purposes. Only 3rd instar larva of *Propomacrus bimucronatus* (Pallas) is described so far (Lumaret & Tauzin 1992). Based on detailed morphological descriptions of pupa and all three instars larvae of *Cheirotonus formosanus* Ohaus, *Propomacrus bimucronatus* and *P. cypriacus* Alexis & Markis, the following diagnosis of the subfamily is provided: typical white grub; cranium richly setaceous; stemmata absent; labrum semioval, anterior margin trilobed; clithra present or absent; epipharynx with plegmata and proplegmata present, haptomeral region without heli, sense cone low, sclerotised plate absent, crepis reduced; mandibles with 2 scissorial teeth, stridulatory area without transverse ridges, only finely microsculptured; maxillar stridulatory teeth conical with membranous rim; galea and lacinia separated, but fitting tightly together; claw cylindrical with two apical seta and a small pointed tip; abdominal segments 9 and 10 separated, slit Y-shaped, palida absent, tergites with numerous spiny setae.

Life cycle of *Propomacus bimucronatus* under laboratory conditions was surprisingly fast, the adults hatched about one year after the eggs were laid, but some larvae remained in last larval instar till next season and hatched subsequently. Larvae fed on decayed *Fagus* and *Quercus* leaves, but preferred soft but compact pieces of rotten wood. Pupating occurred in a cocoon made by trampling the wood debris in carved holes inside large pieces of the decayed wood or loose, usually at the side of the container. Short male-male fights were observed during feeding, fights often occurred also during the competition about a receptive female.

A phylogenetic study of Euchirinae has never been conducted; similarly their classification as subfamily remains doubtful. Traditionally the group is considered as one of several separate subfamilies of pleurostict or phytophagous Scarabaeidae on the same level as e.g. Melolonthinae, Rutelinae, Dynastinae or Cetoniinae (Young 1989, Scholtz & Grebennikov 2005, Bezděk 2006), but recent studies indicate that the situation is more complicated. Ahrens (2006) and Smith et al. (2006) similarly have not found support for Euchirinae being a separate subfamily, discussing their affinities to the Melolonthinae (Smith et al. 2006) or to clade composed of several representatives of Melolonthinae (excluding Sericinae, Ablaberinae and representatives of fauna primarily confined to southern continents), Rutelinae, Dynastinae as well as Cetoniinae (Ahrens 2006). On the other hand, Šípek et al. (2009) found *Propomacrus* to be a sister group to all other pleurostict scarabs in their analysis. We discuss the phylogenetic position of Euchirinae based on a matrix of 105 morphological and ecological characters (55 larval and 50 adults characters) in 24 taxa of Scarabaeoidea. Our results indicate Euchirinae are sister group to a clade comprised of Melolonthinae + Rutelinae + Dynastinae with Cetoniinae being a sister group to this clade. However we consider our results as preliminary or "tentative" and publish them mainly to facilitate further discussion. It seems clear that the resolution of the obvious question regarding the subfamiliar classification of Euchirinae cannot be resolved until we will fully understand the phyllogeny of pleurostict Scarab beetles.

The project was supported by the Charles University Grant Agency (grant GAUK 119207) and by the Ministry of Education of the Czech Republic (grant MSM 0021620828).

AHRENS D. 2006: The phylogeny of Sericini and their position in the Scarabaeidae based on morphological characters (Coleoptera, Scarabaeidae). *Systematic Entomology* **31**: 113–144.

BEZDĚK A. 2006: Euchirinae. P. 181. In: LÖBL I. & SMETANA A. (eds.): *Catalogue of Palaearctic Coleoptera. Vol. 3. Scarabaeoidea – Scirtoidea – Dascilloidea – Buprestoidea – Byrrhoidea*. Apollo Books, Steenstrup, 690 pp.

LUMARET J.-P. & TAUZIN P. 1992: Le genre Propomacrus Newman, 1837. Donées biologiques et morphologie larvaire (Coleoptera, Scarabaeoidea, Euchiridae). *Nouvelle Revue d'Entomologie* **9**: 173–180.

MIZUNUMA T. 1984: *Cheirotonus jambar*. Asahi Publ., Tokyo, 104 pp.

SCHOLZ C. H. & GREBENNIKOV V. V. 2005: Scarabaeiformia Crowson, 1960. Pp. 345–425. In BEUTEL R. G. & LESCHEN R. A. B. (eds.): *Handbook of Zoology. A Natural History of the Phyla of the Animal Kingdom. Vol. 4 Arthropoda: Insecta, Part 38. Coleoptera, Beetles Vol. 1: Morphology and Systematics (Archostemata, Adephaga, Myxophaga, Polyhaga partim*. Walter de Gruyter, Berlin, 567 pp.

SMITH A. B. T., HAWKS D. C. & HERATY J. M. 2006: An overview of the classification and evolution of the major scarab beetle clades (Coleoptera: Scarabaeoidea) based on preliminary molecular analyses. *Coleopterists Society Monograph* **5**: 35–46.

ŠÍPEK P., GREBENNIKOV V. & GILL B. 2009: Afromontane Coelocorynus (Coleoptera: Scarabaeidae: Cetoniinae): larval descriptions, biological notes, phylogenetic analysis and polyphyly of Trichiini. *European Journal of Entomology* **106**: 95–106

YOUNG R. M. 1989: Euchirinae (Coleoptera: Scarabaeidae) of the world: distribution and taxonomy. *Coleopterist's Bulletin* **43**: 205–236.

POSTERS

The first instar larva of *Paussus favieri* (Coleoptera, Carabidae, Paussini)

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For over 200 years *Paussus favieri* has attracted the intense interest of researchers and collectors, probably due to its rarity, its bizarre structural adaptations to a myrmecophilous lifestyle, and the fact that it is one of the few paussine species known from of the Mediterranean Region. Through the years enormous efforts have been made to learn about the lifecyle and preimaginal stages of this species but to no avail.

Finally, on a recent collecting expedition to the High Atlas Mountains of Morocco we successfully reared the 1st instar larva of this remarkable European beetle. Here, we present our preliminary assessment of its larval morphology. Not only is this an important discovery due to the special intrigue that surrounds this species, but these specimens also represent the very 1st instar specimens of the subtribe Paussina.

In this poster we describe the collecting and rearing conditions and we present its larval morphology in contrast to the 1st instar of *Arthropterus*, classified in the subtribe Cerapterina and the only other 1st instar described for the tribe Paussini.

Comparative morphology of first instar larvae of Meloidae (Coleoptera, Tenebrionoidea) from Australia

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Of the four generally recognized subfamilies of Meloidae, only the Nemognathinae occur in Australia. This subfamily is widespread, absent only from New Zealand and Antarctica which lack Meloidae entirely. Except for the genus *Stenodera* all nemognathines are believed to be phoretic as first instar larvae (= triungulins). All species studied thus far are parasitoids of aculeate Hymenoptera. Phoretic nemognathines are divided into two tribes, Horiini and Nemognathini. The only genera recorded from Australia are *Horia* (Horiini), *Palaestra*, *Palestrida* and *Zonitis* (Nemognathini). However, other horiine and nemognathine genera common to Gondwanian areas (*Synhoria* and *Zonitoschema*, respectively) are known to occur. Of the approximately 65 described Australian species, the vast majority are assigned to the widely distributed genus *Zonitis*. Studies of adult anatomy indicate that a number of these species are inappropriately placed in *Zonitis* but instead represent a complex of possible new genera close to *Palaestra* which may be unique to Australasia. This first study of Australian meloid triungulin larvae supports this. It includes a description of *Palaestra rufipennis* (Westwood) as well as several other larvae collected in the field from adult bees or sweeping and consequently unassociated with adults.

Two larval assemblages can be recognized. The first (Group 1), a basal group, includes *Palaestra* and two species unassociated with adults. The second (Group 2), more derived, includes seven unassociated species. Group 1 is not easily placed to tribe. Its larvae lack modified spiracles on abdominal segment VIII, a trait characterizing all Nemognathini (Bologna & Pinto 2001). They also possess hair-like caudal setae which are absent in most members of that tribe. These traits are shared with the Horiini, yet Group 1 larvae lack toothed tarsal claws, the only derived feature of horiines. Furthermore, the assemblage also has a dense tuft of setae on the epipharynx, a feature present only in Nemognathini. It is clear that Group 1 larvae are thus far unique to Australia and distinct from all known Nemognathinae. Although additional research is required, it is likely they represent a primitive lineage of Nemognathini.

Group 2 larvae are more consistent with known Nemognathini. As in all described members of the tribe, the spiracles on abdominal segment VIII are placed on projecting horn-like evaginations. The absence of the epicranial suture and line of dehiscence on the pronotum as well as the low number of tooth-like transverse ridges on the mandibles suggest greatest similarity to genera placed in the Zonitides by MacSwain (1956) which includes *Zonitis*.

However, the distinct caudal setae in Group 2 larvae is absent in *Zonitis* and relatives.

The Australian Meloidae fauna, at the generic level, has generally been considered to include a relatively small endemic element (*Palaestra* and *Palaestrida*) and a more speciose component shared with other regions of the world (*Zonitis* and *Horia*). Current studies of adults and now of larvae show that several Australian species placed in *Zonitis* instead are more closely allied to *Palaestra*. They call for a complete re-evaluation of Australian species at the generic level.

BOLOGNA M. A. & PINTO J. D. 2001: Phylogenetic studies of Meloidae (Coleoptera), with emphasis on the evolution of phoresy. *Systematic Entomology* **26**: 33–72.

MacSWAIN J. W. 1956: A classification of the first instar larvae of the Meloidae (Coleoptera). *University of California Publications in Entomology* **12**: i–iv + 1–182.

A trip to microcosm of saproxylic beetles' larvae guts

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The larvae of the flat bark beetles (Coleoptera: Cucujidae) and the fire coloured beetles (Coleoptera: Pyrochroidae) live in the underbark environment of medial stage of dead wood succession. The status of their foraging behaviour is continuously discussed (Smith & Sears 1982, Lawrence 1991, Horák 2010). According to their lifestyle and associates, these beetles seem to be much more opportunistic than was expected.

Our research is focused on three model larvae of saproxylic beetles – *Cucujus cinnaberinus* (Scopoli, 1763) (Coleoptera: Cucujidae), *Schizotus pectinicornis* (Linnaeus, 1758) and *Pyrochroa coccinea* (Linnaeus, 1761) (Coleoptera: Pyrochroidae), which are characterized by convergent strategy of the larval development. Investigation of the species gut content and the analysis of present fungi species was a part of the proposed project, which was targeted on searching for main factors of a distribution, relationships and ecology of these subcorticoulous insects. By analyzing of the environmental conditions we want to evaluate the most important factors influencing the spatial and temporal distribution of studied species.

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SMITH D. B. & SEARS M. K. 1982: Mandibular structure and feeding habits of three morphologically similar coleopterous larvae: Cucujus clavipes (Cucujidae), Dendroides canadensis (Pyrochroidae), and Pytho depressus (Salpingidae). *Canadian Entomologist* **114**: 173–175.

LAWRENCE J. F. 1991: Cucujidae. Pp. 463-488. In: STEHR F. W. (ed.): *Immature insects, Vol. 2.* Kendall/Hunt, Dubuque, Iowa, USA, 974 pp.

HORÁK J. 2010: Contribution to knowledge of trophic preferences of the endangered saproxylic beetle Cucujus cinnaberinus (Coleoptera: Cucujidae) from eastern Bohemia. *Acta Musei Reginaehradecensis, Series A* **34**: in press.

An approach to the identification of *Meloe* (Coleoptera: Meloidae) larvae

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The presence of different ontogenetic stages in holometabolous Coleoptera is perhaps one of the clearest examples of the difficult in recognize and associate taxonomic units when different life stages are involved. The integration of morphological and molecular data can improve our understanding of groups of living organisms because their comparison helps to establish phylogenetic relationships, taxonomic diversity and biological history of lineages and finally it contributes to development of evolutionary studies and theories.

Triungulins of genus *Meloe* Linnaeus, 1758 are typically phoretic on bees and their different morphologies have been used to distinguish major species assemblages within the genus, which is one of the most speciose among the family Meloidae. Unfortunately the rarity of field and bees' nest collections of larvae and adults has precluded a taxonomic fine scale revision of *Meloe* species so as the formulation of hypothesis on the evolution of the group and of its association with bees along time.

This work started from an isolated field collection of *Meloe* larvae, on three different species of Hymenoptera. Since it was required a species identification, we have explored the reliability of cytoctrome oxidase I (COI) sequencing for DNA barcoding (Herbert et al. 2003) in genus *Meloe*. Comparing COI sequences of larvae with those obtained from adults of different *Meloe* species, it has been possible to identify larvae collected as belonging to *Meloe (Eurymeloe) mediterraneus* Müller, 1925. Our results suggest that this kind of molecular tool can be useful for matching immature and adult stages and for taxonomic discrimination of species among the genus.

Moreover, we use SEM photographs to better describe larvae of this species, which original morphological description was uncertain (Bologna 1991), and their attaching and grasping on hosts. As we have found larvae on different species of Hymenoptera (two social and one cleptoparasitic bees) we also propose hypotheses for different possible phoretic strategies of larvae to reach a host and for the existence of competition on host resources with other predators and parasites.

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BOLOGNA M. A. 1991: *Fauna d'Italia. XXVIII. Coleoptera Meloidae*. Calderini, Bologna, 541 pp.

HERBERT P. D. N., CYWINSKA A., BALL S. L. & de WARD J. R. 2003: Biological identification through DNA barcodes. *Proceedings of the Royal Society B* **270**: 313–321.

Larval morphology of *Berberomeloe* (Coleoptera: Meloidae)

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Berberomeloe Bologna, 1989 is a western Mediterranean genus of Meloidae with only two ascribed species, which were definitively recognized only recently (García-Paris 1998). *Berberomeloe insignis* (Charpentier, 1818) is a poorly known species with a restricted range, as it occurs only in the arid zone of the Iberian Peninsula (Almeria and Murcia province) and it is included in the Andalucia Invertebrates Red Book as vulnerable. On the contrary, *B. majalis* (Linnaeus, 1758) is a common species widely distributed both in the Iberian Peninsula and in the Maghreb.

Given that the relevance of first instar larval morphology in taxonomy and systematic of Meloidae is widely accepted (Bologna & Pinto 2001), we first described the first instar larva of *B. insignis* and we compared it with the larva of *B. majalis* assessing characters that permit species discrimination and genus diagnosis.

For the reason that there has been no research examining morphological variability of meloids at the intraspecific level in our work we have also analyzed morphometric data from different larvae of *B. majalis,* along its range. Results obtained indicate that it exists some level of differentiation between different geographical locations with a main break between eastern and western Iberian populations. On the contrary we do not recover significant differences between Iberian and African populations despite the existence of the Gibraltar Strait, which is a widely recognized barrier to animal dispersal (Busack 1986).

This poster is a report of the recently published paper: Settanni et al. (2009).

Acknowledgements. This research was supported by a EC Synthesys Project grant and an I3P grant from the CSIC (Ministry of Ciencia e Innovación, Spain) for CS. Support was also provided by the research project CGL2007-64621 (Ministry of "Ciencia e Innovación", Spain). Authors are also very grateful to Marina Alcobendas Bouche and Mario García-París for all their help during the work at the MNCN (CSIC).

BOLOGNA M. A. & PINTO J. D. 2001: Phylogenetic studies of Meloidae (Coleoptera) with emphasis on the evolution of phoresy. *Systematic Entomology* **26**: 33–72.

BUSACK S. D. 1986: Biogeographic analysis of the herpetofauna separated by the formation of the Strait of Gibraltar. *National Geographic Research* **2**: 17–36.

GARCÍA-PARÍS M. 1998: Revisión sistemática del género Berberomeloe Bologna, 1988 (Coleoptera, Meloidae) y diagnosis de un endemismo ibérico olvidado. *Graellsia* **54**: 97–109.

SETTANNI C., DI GIULIO A., FINOIA M. G. & BOLOGNA M. A. 2009: Intra- and interspecific analysis of first instar larval morphology in the genus Berberomeloe Bologna 1989 (Coleoptera: Meloidae). *Zootaxa* **2089**: 52–64.

A phylogenetic approach to the weevil genus *Tychius* using morphological characters of immatures and adults (Coleoptera: Curculionidae)

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The genus *Tychius* Germar, 1817 belongs to the subtribe Tychiina of the tribe Tychiini (Coleoptera: Curculionidae: Curculioninae) together with the closely related genus *Sibinia* Germar, 1817. Clark et al. (1977) studied the phylogeny of the Tychiini, hypothesizing a monophyletic lineage of Tychiina with the subtribes Lignyodina and Ochyromerina. These subtribes mainly share one apomorphy: the posteriorly curved sides of the ventrites.

Presently about 240 taxa of this genus are considered as valid species mainly living in the Palaearctic region (about 180), whereas the remaining are distributed in the Afrotropical (45 species) and Holarctic (10 species) regions and in the Indian subcontinent (3 species). The Palaearctic species are arranged into 20 groups. To the Palaearctic *T. intrusus* group possibly belong all of the Holarctic species. The southern African taxa are arranged into six groups, of which only four appear endemic, whereas two include also several Palaearctic species. However, also the four endemic groups appear very closely related to some Palaearctic ones, from which they can be separated only by few characters. In India three groups are represented, only one of them endemic (*T. eremita* group).

Among the genera of the large tribe Tychiini, species of *Tychius* have a relatively homogeneous biology, since all of their known hosts belong to the worldwide distributed family Fabaceae (Clark 1971, 1977, 1978; Clark & Burke 1977; Clark et al. 1978; Caldara 1989a,1990; Anderson 2002). Certain lineages within *Tychius* appear to have narrow, phylogenetically conserved host associations. However, whereas the Palaearctic and Holarctic species live mainly on Astragaleae and Trifoleae, the Afrotropical ones appear to live on Lotononideae and Indigofereae. Most species are seed predators, whereas a few species form galls on leaves, flowers or pods (Clark & Burke 1977, Korotyaev et al. 2005). When mature, larvae feeding on the seeds typically leave the pod and enter the soil to pupate (Clark & Burke 1977).

The purpose of the present work is: 1) to verify whether characters of immatures of *Tychius*, including several species studied for the first time, confirm the assemblage of many groups as presently considered on the basis of adult characters; 2) to analyze the relative relationships of groups of *Tychius* on the basis of characters of adult alone and immatures alone; 3) to reconstruct relationships assembling all the characters of both adult and immatures at least for the groups where immatures are known; 4) to verify whether there is a relationship between the phylogenesis of the groups of *Tychius* and that of the host plant.

Phylogenetic analysis of groups of *Tychius* was firstly performed to produce an hypothesis about their phylogenetic relationships using 60 characters of adults, 40 of which regarding external morphology and the others regarding male and female genitalia. Analysis was done by PAUP using characters entirely unweighted. The genera *Endaeus* and *Lignyodes* were used as outgroups. A strict consensus of 400 trees still suggests considerable lack of resolution concerning placement of many groups. However a majority-rule of these trees is informative suggesting many sister groups.

The comparative study of immatures of 25 species, 13 of them described for the first time, belonging to nine of the twenty Palaearctic groups confirmed that one of the more numerous groups, the *T. stephensi* group living on Trifoleae, seem to be monophyletic due to two apparent apomorphies: four *Prn* and two meso- and also metathoracic *psd*. These characters state might be only due to the adaptation of life strategy. The reduction of the number of setae in larvae of this group, whose species are among the smallest ones in the genus, might be due only to their very small size. It would be interesting to compare them to small species of other groups. So, we could establish if these characters are an example of convergence and/or they are true apomorphies.

The following step would be detailed larval descriptions of all 25 species and building of larval matrix. The final tree will be compared with the phylogenetic analysis of adults which is preparing also.

On the basis of the present data it seems that in the Palaearctic region Astragaleae and Trifoleae were parasitized in different occasions by unrelated clades.

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ANDERSON R. S. 2002: 131. Curculionidae Latreille 1802. Pp. 722–815 In: ARNETT R. H. Jr., THOMAS M. C., SKELLEY P. E. & FRANK J. H. (eds.): *American Beetles. Volume 2. Polyphaga: Scarabaeoidea through Curculionoidea.* CRC Press, Boca Raton, London, New York, Washington D.C.

CLARK W. E. 1971: A taxonomic revision of the weevil genus Tychius Germar in America north of Mexico (Coleoptera: Curculionidae). *Brigham Young University Science Bulletin, Biological Series* **13**: 1–39.

CLARK W. E. 1977: North American Tychius: new synonymy, and observations on phylogeny and zoogeography. *Entomologica Scandinavica* **8**: 287–300.

CLARK W. E. 1978: The weevil genus Sibinia Germar: natural history, taxonomy, phylogeny, and zoogeography, with revision of the New World species (Coleoptera: Curculionidae). *Quaestiones Entomologicae* **14**: 91–387.

CLARK W. E. & BURKE H. R. 1977: The curculionid genus Tychius Germar: natural history and coevolution with leguminous host plants. *Southwestern Entomologist* **2**: 106–120.

CLARK W. E., BURKE H. R. & ANDERSON D. M. 1978: The genus Tychius Germar (Coleoptera: Curculionidae): larvae and pupae of some species, with evaluation of their characters in phylogenetic analysis. *Proceedings of the Entomological Society of Washington* **80**: 626–654.

CLARK W. E., WHITEHEAD D. R. & WARNER R. E. 1977: Classification of the weevil subfamily Tychiinae, with a new genus and species, new combinations, and new synonymy in Lignyodini (Coleoptera: Curculionidae). *Coleopterists Bulletin* **31**: 1–18.

CALDARA R. 1989: Revisione tassonomica dei Tychius della Regione Etiopica (Coleoptera Curculionidae). *Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano* **130**: 5–56.

CALDARA R. 1990: Revisione tassonomica delle specie paleartiche del genere Tychius Germar (Coleoptera Curculionidae). *Memorie della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano* **25**: 51–218.

KOROTYAEV B. A., KONSTANTINOV A. S., LINGAFELTER S. W., MANDELSHTAM M. Y. & VOLKOVITSH M. G. 2005: Gall-inducing Coleoptera. Pp. 239–271. In: RAMAN A., SCHAEFER C. W. & WITHERS T. M. (eds.): *Biology, ecology, and evolution of gall-inducing arthropods. Volume 1.* Science Publishers Inc., Enfield, Plymouth, 817 pp.