The Tachinid Times

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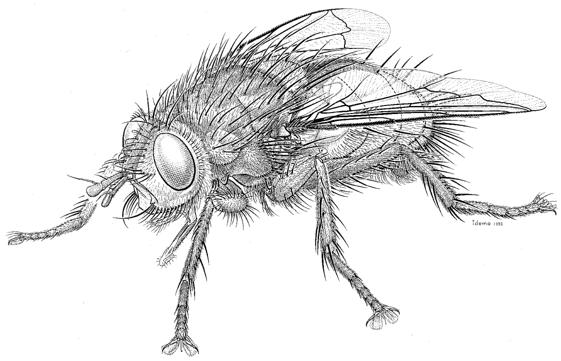

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A couple of significant changes to **The Tachinid Times** have taken place this year. Firstly, the newsletter has moved to a new location: http://res2.agr.ca/ecorc/isbi/tachinid/times/index.htm. Secondly, it is being produced as an Acrobat® PDF (Portable Document Format) file for the first time. Though this format may be inconvenient for some readers, it has a number of compelling advantages. It allows me to produce the newsletter faster because there is a one-step conversion from a WordPerfect® file with embedded colour images to a PDF file. Also, the result is a product that can be viewed on the Web (using the free Acrobat® Reader that is readily available online), downloaded from the Web, or distributed in hardcopy – each with exactly the same pagination and appearance. Because PDF files are "platform independent," different browsers and browser versions display the newsletter in the same way, thus avoiding the sometimes unpredictable results obtained with web pages written in HTML.

My thanks again this year to those of you who have contributed to this issue. I encourage all readers who work with tachinids and find this newsletter of interest to send me a note about his/her research for inclusion in next year's issue. I particularly like to hear from students so that we can inform the community about them and their tachinid research. Submissions on all aspects of tachinid biology and systematics are welcome, but please keep in mind that this is not a peer-reviewed journal and is mainly intended for shorter news items that are of special interest to others involved in tachinid research. Colour images are easily incorporated into the newsletter so I encourage contributors to include these with their text whenever possible.

As usual, please send me your news for inclusion in the newsletter before the end of next January. This newsletter appears first in hardcopy and then on the Web some weeks later.

Study on the phylogeny and diversity of Higher Diptera in the Northern Hemisphere (by H. Shima)

In 1999 I applied to the Japanese Government (Ministry of Education, Science, Culture and Sports) for a 3-year research grant to fund an international project under the general title, "Study on the Phylogeny and Diversity of Higher Diptera in the Northern Hemisphere." Funding was approved in 2000 and the first meeting of the project team was held in Fukuoka at the Biosystematics Laboratory of Kyushu University in late October. This first meeting was attended by all members of the team, namely myself (project leader; tachinid flies), Dr. S. Shinonaga (Tokyo Medical and Dental University, Tokyo; muscid and sarcophagid flies), Dr. H. Kurahashi (Taxonomy and Ecology Laboratory, National Institute of Infectious Diseases, Tokyo; calliphorid flies), Dr. T. Pape (Swedish Museum of Natural History, Stockholm; rhinophorid, sarcophagid and oestrid flies), and Drs. M. Wood and J. O'Hara (Systematic Entomology, Agriculture and Agri-Food Canada, Ottawa; tachinid flies). Team members studied the Diptera collection of Kyushu University (strong in Japanese and Southeast Asian insects, especially the Tachinidae) and chose individual and/or joint studies within the purview of the grant. Research on Tachinidae will include, but is not limited to, the following: I will continue with systematic studies on the Japanese and Chinese faunas, Dr. Wood will examine certain generic issues concerning the Nearctic and Palearctic faunas, and Dr. O'Hara will analyze the phylogenetic relationships within the

Ernestiini and related tribes. All members of the team will meet in Ottawa during the summer of 2001 and in Stockholm in 2002.

Tachinid-host associations (by J.O. Stireman)

I am currently in the midst of writing up my thesis work on tachinids at the University of Arizona. My thesis has consisted of several somewhat disparate studies, all with a general goal of trying to understand the ecological and evolutionary determinants of tachinid-host associations, with focus on those attacking Macrolepidoptera in southeastern Arizona. As Jim O'Hara can vouch, southeastern Arizona hosts a large diversity of interesting tachinid species. I began with an analysis of the spatial and temporal variation in the parasitoid complex of a ground dwelling arctiid caterpillar (*Grammia geneura*). The parasitoid complex of this wooly-bear caterpillar was dominated by tachinid flies (9 of 13 total parasitoid species), including *Exorista mella*, *Carcelia reclinata*, and several *Chetogena* and *Lespesia* species. The composition of the parasitoid complex and parasitism rates varied enormously over space and time, and in some cases were found to be related to features of the habitat. I also performed several laboratory behavioral assays with *Exorista mella* (which proved relatively easy to culture) examining the cues it uses to locate and accept hosts and how its behavior changes with experience.

In order to gain an understanding of the ecological determinants of tachinid–host associations over an entire community I undertook a large scale sampling program of macroLepidoptera in Mesquite-Oak grasslands in southeastern Arizona with the aid of a fellow graduate student (Mike Singer). We have reared several thousand caterpillars of over one hundred species and they have produced ca. 60 different species of tachinids. Last Spring I took a trip to the CNC in Ottawa, and with the aid of Jim O'Hara, I identified most of the specimens, though a few could not be named to species and may represent undescribed taxa. I am in the midst of trying to sort out the patterns from this large data set.

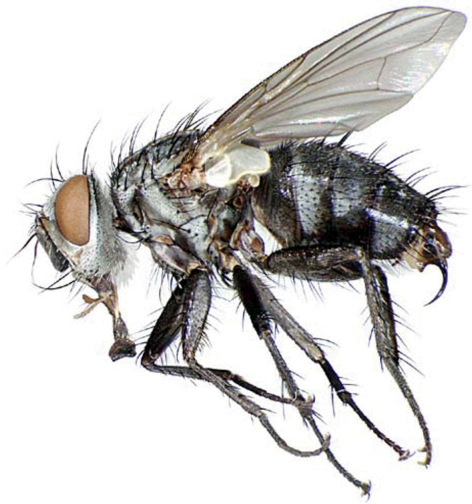
Finally, I sought to examine phylogenetic patterns of host associations by reconstructing a phylogeny of the Exoristinae using molecular methods (and a small subset of taxa). I do not want to say too much about the results of this project here, because I hope it will be published before too long. I can say that it was the wrong level of inquiry to understand host associations because in most exoristine groups host associations are quite vagile. I can also say that using molecular data did not free me from the rampant homoplasy that has faced previous tachinid systematists using morphological characters. Large numbers of homoplasious characters severely limited my ability to resolve many relationships. However, my results do generally support the more recent inclusive classification schemes of Herting and Wood.

Though my current outlook for postdoctoral positions may require that I work on non-tachinid focussed projects, I plan to keep studying (and collecting!) tachinids on the side and write funding proposals focusing on tachinid-host relationships. In terms of systematics and evolution, I am keenly interested in working on a combined molecular and morphological analysis of a taxonomically higher exoristiine group such as the genus *Lespesia* or *Winthemia* to analyze the evolution of host associations. I also hope to continue my ecological work both in terms of sampling and manipulative field experiments to further elucidate the ecological determinants of tachinid-host associations.

Effects of the introduction of *Compsilura concinnata* (Meigen) into North America (by J. Boettner)

[Editor's Note: It has long been known that *Compsilura concinnata* is no ordinary tachinid. Whereas most tachinids parasitize a relatively small number of hosts that are typically related either genetically or by microhabitat, *C. compsilura* is a generalist that has been recorded in North America from nearly 200 host species in about 25 families of insects, mostly belonging to the Lepidoptera and Symphyta (Hymenoptera) but also the Coleoptera (Curculionidae) (Arnaud, 1978, A host-parasite catalog of North American Tachinidae). *Compsilura concinnata* was introduced into eastern North America over a period of many years in the 1900s as a biological control agent, yet its possible effects on the native fauna were not studied until recently. Below I reproduce, with the permission of the senior author, the abstract of a paper that appeared at the end of last year that suggests *C. compsilura* is having an adverse effect on native silk moth populations in New England. However, this disturbing news should not be used to generalize about insect parasitoid introductions. Boettner et al. rightly argue not for a ban on biocontrol importations but for more careful study of the effects of proposed introductions on native species. This is a landmark paper that is garnering much attention and comment in the scientific and popular media.]

Boettner, G.H., Elkinton, J.S. and Boettner, C.J. 2000. Effects of a biological control introduction on three nontarget native species of saturniid moths. Conservation Biology **14**: 1798-1806.



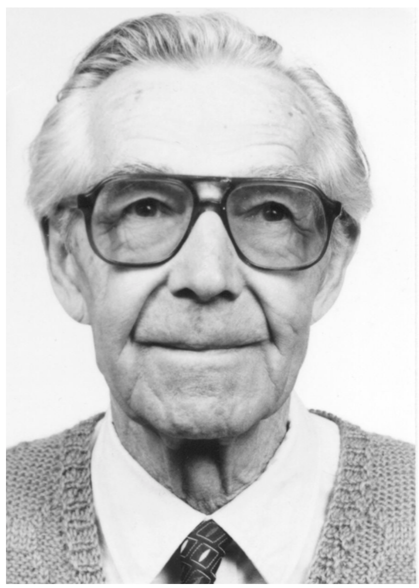
Compsilura concinnata (Meigen), female

[Photo by B. Cooper for J. O'Hara]

Abstract: Damage to nontarget (native) invertebrates from biological control introductions is rarely documented. We examined the nontarget effects of a generalist parasitoid fly, *Compsilura concinnata* (Diptera: Tachinidae), that has been introduced repeatedly to North America from 1906 to 1986 as a biological control agent against 13 pest species. We tested the effect of previously established populations of this fly on two native, nontarget species of moths (Lepidoptera: Saturniidae), *Hyalophora cecropia* and *Callosamia promethea*, in Massachusetts forests. We estimated survivorship curves for newly hatched *H. cecropia* larvae (n=500), placed five per tree in the field and found no survival beyond the fifth instar. We simultaneously deployed cohorts (n=100) of each of the first three instars to measure the effect of parasitoids during each stage of development. *C. concinnata* was responsible for 81% of *H. cecropia* mortality in the first three instars. We deployed semigregarious *C. promethea* in aggregations of 1-100 larvae in the field and recorded high rates of parasitism by *C. concinnata* among *C. promethea* larvae exposed for 6 days (69.8%) and 8 days (65.6%). We discovered a wild population of a third species of silk moth, the state-listed (threatened) saturniid *Hemileuca maia maia*, and found that *C. concinnata* was responsible for 36% (n=50) mortality in the third instar. Our results suggest that reported declines of silk moth populations in New England may be caused by the importation and introduction of *C. concinnata*.

Dr. Jirí Cepelák, 1917-2000 (by J. Vanhara)

Tachinologist Dr. Jirí Cepelák died on 1 October 2000. He was for many years the only tachinid specialist in Slovakia. He was born on 21 April 1917 in Pavlovice (Kutná Hora district) in the Czech Republic. His early school education was conducted in Trencín (Slovakia), where his father was a teacher. Under the influence of an enthusiastic naturalist, young Cepelák went to Prague in 1935 to study in the Faculty of Science, in Charles University. His academic studies were interrupted during World War II and for a period of time he worked in the National Museum in Prague with the well-known Czech entomologist Prof. J. Obenberger. Later he was deported to a forced labour camp in Germany. After the war he returned to university and graduated with a degree in zoology and geology. At first he was employed in the Agricultural Research Institute in Prague, then moved to the Ministry of Agriculture in 1947. In 1951 he took a position in the Research Institute of Greengrocery at Olomouc (CR), and in 1952 he was asked to teach at the University of Agriculture in Nitra (Slovakia). He became the head of the Department of Zoology and was a guiding force in its expansion. In 1957 he was appointed a senior lecturer (associate professor), and in 1967 he was awarded a CSc. (=Ph.D.) degree. In 1973 (due to political persecution) he went to the Slovak Academy of Sciences and remained there until he retired in 1978.



Dr. Cepelák in 1995 at 78 years old.

Dr. Cepelák's first tachinological paper was published in 1952. From that time onward he devoted most of his attention not only to tachinids but also to a number of dipteran families occurring in the territory of Slovakia, and occasionally the Czech Republic. He also studied the faunistics of Diptera in the territory of the

Balkan Peninsula (Bulgaria, Romania, Serbia). His crowning achievement in faunistics was the three-volume Diptera of Slovakia that he edited (1984, 1986, 1989). His last papers were published in 1997, including a chapter on the Tachinidae for the Checklist of Diptera of the Czech and Slovak Republics, and some faunistic news.

It was Dr. Cepelák's excellent idea to arrange meetings of the Czech and Slovak dipterists. The first such meeting, a workshop of dipterists, was organized by him and held in Nitra in 1969. These meetings, held every two years, continue to this day (15 meetings to date). The Proceedings of these meetings are published (since 1973) as *Dipterologica Bohemoslovaca*.

Slovak and Czech entomologists will long remember Dr. Cepelák for his outstanding contributions to dipterology.

References

Cepelák, J. 1952. 2ème contribution à la connaissance des Tachinaires tschèques. Cas. Cs. spol. ent. **49**: 169-180.

Cepelák, J., ed. 1984, 1986, 1989. Diptera of Slovakia I-III. Veda, Bratislava. 288 pp., 434 pp., 192 pp.

Cepelák, J. 1997. Faunistic records from the Czech and Slovak Republics. Tachinidae: Part I. *In* Vanhara, J. and Rozkosny, R., eds, Dipterologica bohemoslovaca. Vol. **8**. Folia Fac. Sci. Univ. Masaryk. Brun., Biol. **95**: 235.

Cepelák, J. and Vanhara, J. 1997. Tachinidae. Pp. 100-106. *In* Chvála, M., ed., Checklist of Diptera (Insecta) of the Czech and Slovak Republics. Karolinum, Charles University Press, Prague.

Vanhara, J. and Rozkosny, R. 1997. The 13th seminar of Czech and Slovak dipterists and a review of their previous meetings. In: Vanhara, J. and Rozkosny, R., eds., Dipterologica bohemoslovaca. Vol. **8**. Folia Fac. Sci. Univ. Masaryk. Brun., Biol. **95**: 5-7.

Ziegler, J. 2000. In memoriam Juraj Cepelák. [In German.] Studia dipterologica **7**: 559-572.

Potential for the control of the small rice stink bug, *Oebalus poecilus* (Dallas) by *Beskia aelops* (Walker) (by J.P. Sutherland)

The small rice stink bug, *Oebalus poecilus* (Dallas) (Heteroptera: Pentatomidae) is the most serious insect pest of rice in Guyana and many other South American countries (Kennard, 1965). Both the adults and later instar nymphs cause damage to rice grains by their feeding action and both the yield and quality of the harvested paddy are affected. Presently, control of *O. poecilus* is wholly by insecticide application and most farmers use insecticides, applying up to four sprays each season. As a possible component in an IPM programme for *O. poecilus*, the biological control efficacy of several parasitoids of *O. poecilus* is being studied. Under investigation are scelionid wasps, *Telenomus* spp., which are egg parasitoids, and Tachinidae which parasitise the adult stage of the bug.

Oebalus poecilus is known to be parasitised by two species of Tachinidae, *Gymnoclytia paulista* Townsend and *Beskia aelops* (Walker) (Guimarães, 1977; del Vecchio, 1993). In recent investigations in Guyana, only one specimen of *G. paulista* was found which emerged from a puparium reared from *O. poecilus* collected in Mibikuri, Region 6, Guyana on 21.vi.1999. Conversely, *B. aelops* is more commonly observed in South American rice fields (Townsend, 1928; del Vecchio, 1993).

Oebalus poecilus and associated parasitoids were studied in two commercial rice varieties, BR 444 and F_7-10, grown under wet-seeded, lowland irrigated conditions, during "autumn" 1999 (June to October), "spring" 2000 (October to April), and "autumn" 2000 (April to September). Four fields and adjacent levées were monitored using a 30cm sweep net on a weekly basis. Exactly 100 sweeps were taken at each site, with one complete sweep for every step forward. Sampling in fields was done at least 20m from levées to avoid potential edge effects. Samples were bagged and brought back to the laboratory for identification.

Over three seasons, a total of 2,289 *O. poecilus* were collected in rice fields and on the associated levées. In the "autumn" season of 1999 a total of 687 *O. poecilus* were caught in samples, in "spring" 2000 1,260 were caught and in the "autumn" season of 2000 only 342 bugs were netted. All *O. poecilus* were dissected to determine parasitism by tachinids. Tachinid larvae found were assumed to be *B. aelops* as this is the most commonly recorded species. In "autumn" 1999, only 4 *O. poecilus* were found to be parasitised, in "spring" 2000, 16 parasitised bugs were caught and in "autumn" 2000 there were 12 parasitised bugs. These represent percentage parasitism rates of 0.58, 1.27 and 3.51% respectively. *B. aelops* larvae were most abundant in early August and early October in 1999 and mid January and mid March in "spring" 2000 and the end of July in "autumn" 2000. Adult *B. aelops* were also swept from fields and there were a total of 40 in "autumn" 1999, 5 in "spring" 2000 but zero in "autumn" 2000. Adult *B. aelops* were caught in mid August in 1999 and mid February in "spring" 2000.

Puparia of *Beskia* which emerged from captive stink bugs in the laboratory at ambient temperature and humidity were kept in the hope of rearing the tachinids. However, those flies which emerged died within one or two days and did not feed on the 20% sucrose provided.

Given the low natural parasitism rates of *Beskia* and the apparent difficulty in rearing the adult flies, prospects for the biocontrol of *Oebalus* using *Beskia* are poor. However, this investigation has provided essential background information on the field abundance of *B. aelops*. This will undoubtedly be a useful contribution to an IPM programme, as knowledge of when parasitoids are most abundant and active can often determine the optimum times for insecticide treatment so as to limit the effects on natural enemy populations.

References

Guimarães, J.H. 1977. Host-parasite and parasite-host catalogue of South American Tachinidae (Diptera). Arq. Zool. **28**(3): 1-131.

Kennard, C.P. 1965. Pests and diseases of rice in British Guiana and their control. FAO Plant Protection Bulletin **13**: 73-78.

Townsend, C.H.T. 1928. On the structure, host habit affinity and geographic range of *Beskia* (Dipt.: Tachinidae). Ent. News **39**: 150-151.

del Vecchio, M.C. 1993. Parasitóides de adultos de *Oebalus ypsilongriseus* (DeGeer, 1773) (Heteroptera: Pentatomidae). An. Soc. Ent. Brasil **22**: 217-219.

Phytomyptera sp. (Diptera: Tachinidae): An important natural control agent of the quinoa moths, *Eurysacca* spp. (Lepidoptera: Gelechiidae) in central Peru (by C. Rasmussen[1], A. Lagnaoui[1] and P. Delgado[2])

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Introduction

Chenopodium quinoa Willdenow (Chenopodiacea), known as quinoa, is an important staple food crop of the Andean region of Latin America, with an annual (1998) production of 50,000 t in Bolivia, Peru and Ecuador. It has a high nutritive value and is well adapted to the dry, saline conditions found in southern Peru and Bolivia. Traditional farming practices such as crop rotation are usually the only form of control applied to combat insect pests, although chemical controls are used in some areas.

The main insect pests are *Eurysacca quinoae* Povolny and *E. melanocampta* (Meyrick) (Lepidoptera: Gelechiidae) (identifications by Ole Karsholt, Zoological Museum, Copenhagen, Denmark). The two species were only recently separated adding some confusion to the identity of species treated in older literature (Povolny, 1997).

Parasitoid

According to our research, an undescribed neotropical tachinid fly species of *Phytomyptera* Rondani (identifications by Norm E. Woodley in Delgado (1989) and James E. O'Hara, Systematic Entomology Section, Agriculture and Agri-Food Canada) is the most important parasitoid of *Eurysacca quinoae* in central Peru.

The adult flies are active during the day and are frequently seen flying around quinoa plants or walking up and down plant stems and inflorescences. According to the literature, *Phytomyptera* spp. comprise larviparous flies with a reproductive potential of up to 200 non-planidium type larvae (Andersen 1988).

Sampling

Third to fifth instar larvae of *E. quinoae* were sampled for mass rearing in the laboratory, and larval parasitism was evaluated by collecting and separating all pupae resulting from the collections. Because the sampling was not originally designed for evaluation of parasitoid presence, it was relatively unsystematic for this purpose.

Collections were made on 29 January and 21 February 2000 from the interandean Rio Mantaro valley of Junín in central Peru (c. 3300 m.a.s.l., 12°07'S 75° 12'W). A third collection was made on 6 April 2000, from the Puno altiplano in southern Peru at 3874 m.a.s.l. (15°42'S 70°05'W).

For Junín, total parasitism for the two collections was 30.6% (N=281) and 28.7% (N=157), respectively. The tachinid fly was the most important parasitoid group, constituting 95.4% and 71.1% of the parasitoid community; *Phytomyptera* sp. was found in 29.2% and 20.4% of the larvae. Ichneumonidae and Braconidae (Hymenoptera) parasitoids were also detected, with 1.4% and 8.3% presence in the two samplings, respectively.

In Puno, we found 27.0% parasitism (N=1016), with 0.5% from *Phytomyptera* sp., which constituted 1.8% of the total parasitoid community. Other parasitoids were present in 26.5% of the sampled larvae, mainly Ichneumonidae (20.7%) and, to a lesser extent, Encyrtidae and Braconidae (Hymenoptera).

Discussion

A major difference between Puno and Junín was detected with respect to the presence of *Phytomyptera* sp.: In Puno we found less than 1% parasitism from this parasitoid, whereas in Junín we found levels of more than 20%. There was c. 30% control of the quinoa moth in both regions, with *Phytomyptera* sp. as the main parasitoid in Junín.

Records from the literature on *Eurysacca melano-*

campta confirm that *Phytomyptera* sp. control in Puno is low during other months of the year (January to March) and higher in the valley areas, which have a lower elevation and thus a different climate. For example, while average parasitism of *E. melanocampta* in Puno ranges from 15 to 45%, parasitism of *Phytomyptera* sp. during January and March is only 1.2 to 4.6% (Delgado, 1989; Zanabria and Bargas, 1997). On the other hand, the positive effects of climate variation may be seen in data from localities in the valleys of Cusco, in southern Peru, which indicate an average *Phytomyptera* sp. parasitism of 11.7%, again on *E. melanocampta* (Ormachea and Quispe, 1993).

Puno and Junín differ in both climate and elevation. Junín is an interandean valley protected by mountain ranges, with an average temperature during the quinoa growth season (October to April) of 12.6°C and diurnal variation from 6.1 to 19.2°C. The climate in the altiplano of Puno is colder, with an average temperature of 9.7°C and diurnal variation from 4.7 to 14.8°C (CIP and SENAMHI weather station data).

In conclusion, there is very good natural control of *E. quinoae* by *Phytomyptera* sp. in Junín. Puno, with its distinct climate, marked by its colder night temperatures, is better adapted to control by the Hymenoptera species. Therefore, this study indicates the potential for good control of *E. quinoae* through the release of *Phytomyptera* sp. in areas with climate and conditions similar to Junín, where quinoa production has been promoted during recent years, as well as a demand for more studies on how to further encourage the activity of this parasitoid in relation to quinoa fields.

Voucher specimens

Phytomyptera vouchers have been placed in the American Museum of Natural History (New York), the Canadian National Collection (Ottawa) and the Universidad Nacional Agraria La Molina (Peru).

References

Andersen, S. 1988. Revision of European species of *Phytomyptera* Rondani (Diptera: Tachinidae). Entomologica scandinavica **19**: 43-80.

Delgado, P. E. 1989. Determinacion taxonomica y porcentaje de parasitismo de insectos beneficos sobre *Eurysacca melanocampta* Meyrick "Kcona Kcona" en quinua. Thesis: UNA. Puno (Peru): 1-46.

Ormachea, E. and Quispe, D. 1993. Evaluacion de parasitoides de la "polilla de la quinua" *Eurysacca melanocampta*, en el Cusco. *In*: XXXV Convencion nacional de entomología, Arequipa (Peru).

Povolny, D. 1997. *Eurysacca quinoae* sp.n. - a new quinoa-feeding species of the tribe Gnorimoschemini (Lepidoptera, Gelechiidae) from Bolivia. Steenstrupia **22**: 41-43.

Zanabria, E. and Banegas, M. 1997. Entomologia economica sostenible. UNA. Puno (Peru).

Pictures of natural and *in vitro* development of *Exorista larvarum* (L.) (by M. Dindo)

The tachinid *Exorista larvarum* (L.) is a polyphagous, gregarious larval parasitoid of Lepidoptera that is well distributed throughout Europe, northern Africa and several Asian regions (Herting, 1960).

The biology of *E. larvarum* was studied by Hafez (1953) in the noctuid host *Prodenia litura* F. and is very simple. Females lay macrotype eggs on the host body. The newly-hatched larvae penetrate the host integument in front of the egg, bore into the host body and form primary integumental respiratory funnels. Parasitoid larvae grow continuously until maturity. Pupation generally occurs next to host larva remains.

Several characteristics make *E. larvarum* particularly suitable for *in vitro* rearing. They include non-synchronised development with the host, polyphagy, and the fact that both in the host and in the diet the larvae remain in contact with atmospheric oxygen from the beginning of their development. Complete development of this tachinid was obtained on various insect material-free artificial diets based on crude ingredient, with adult yields approaching those commonly obtained in the factitious host *Galleria mellonella* L. (Mellini and Campadelli, 1995; Bratti et al., 1995; Dindo et al., 1999). Fly longevity and fecundity of the females obtained on a diet composed of commercial meat homogenate, chicken egg yolk, yeast extract and wheat germ were comparable to those of females that emerged from puparia formed in *G. mellonella* larvae (Dindo et al., 1999).

References

Bratti, A., Campadelli, G. and Mariani, M. 1995. *In vitro* rearing of *Exorista larvarum* (L.) on diet without insect components. Boll. Ist. Ent. "G. Grandi" Univ. Bologna **49**: 225-236.

Dindo, M.L., Farneti, R., Scapolatempo, M. and Gardenghi, G. 1999. *In vitro* rearing of the parasitoid *Exorista larvarum* (L.) (Diptera: Tachinidae) on meat homogenate-based diets. Biological Control **16**: 258-266.

Hafez, M. 1953. Studies on *Tachina larvarum* L. (Diptera, Tachinidae). III. Biology and life history. *Boll. Soc. Fouad Entomol.* **37**: 305-335.

Herting, B. 1960. Biologie der westpaläartchen Raupenfliegen. Dipt., Tachinidae. *Monogr. Angewandte Entomol.* **16**, 188 pp.

Mellini, E. and Campadelli, G. 1995. Formulas for "inexpensive" artificial diets for the parasitoid *Exorista larvarum* (L.). Boll. Ist. Ent. "G. Grandi" Univ. Bologna **50**: 95-106.

All pictures were taken by Prof. Piero Baronio.

Exorista larvarum adults in copula

Hatched eggs of *E. larvarum* on a larva of the factitious host *Galleria mellonella.* The parasitoid larvae have penetrated the host integument.

Third instar larvae of *E. larvarum* on artificial diet composed of skimmed milk, chicken egg yolk, yeast extract and saccharose.

Mature larvae and puparia of *E. larvarum* on artificial diet composed of commercial meat homogenate, chicken egg yolk, yeast extract and wheat germ.

Puparia of *E. larvarum* next to host larva remains.

UK Tachinid Recording Group (by C. Raper, M. Smith and M. Shaw)

[Editor's Note: The following information was taken from the web pages of an interesting new website created to aid in the documentation of tachinids of the UK.]

Web Address:
http://www.parnassus.demon.co.uk/Tachinidae/index.htm

The Tachinid Recording Group (TRG) is a resource for those interested in studying UK Tachinid Flies. The TRG was set up primarily to gather field records and host information and to act as a forum so that people interested in studying this group can exchange information.

The Tachinid Recording Group is quite informal – no-one is 'in charge' and we have no membership. Instead we just work together, sharing out the work and exchanging information on a regular basis. Saying that, each of us has our own specialities:

Chris Raper (chris.raper@hartslock.org.uk): I field most identifications and maintain this web site – I am definitely not an 'expert' on the group but I am learning fast and I can call on others to help with determinations of unusual material if necessary.

Matt Smith (MatSmith1@compuserve.com): Maintains the main copy of our database and produces our distribution maps using Dmap. Matt will also have a go at identifications.

Dr. Mark Shaw (mrs@nms.ac.uk): Has been studying parsitoid/host relationships for many years and his main field of expertise is with wasp parasitoids. Mark is included here because he has also been collating and publishing Tachinid parasite/host records in collaboration with Tom Ford and David Robertson. Mark would be very pleased to hear from anyone with wasp parasitoids but tachinid information would be best forwarded to me (Chris).

PERSONAL NOTES

Chuntian Zhang writes: I studied the systematics of Limnophorini and Phaoniini (Muscidae) under Prof. Wanqi Xue in Shenyang, China and Drs. S. Shinonaga and H. Kurahashi in Tokyo before coming to Kyushu University, Fukuoka, Japan. I started a Ph.D. program here in Fukuoka in April 2000 under Prof. Dr. Hiroshi Shima's directorship. The subject of my Ph. D. thesis is "A systematic study of the tribe Dexiini (Diptera: Tachinidae) of the eastern Palaearctic and Oriental Regions." Many references have already been collected and some specimens have been borrowed from Prof. Chienming Chao, Institute of Zoology, Chinese Academy of Sciences, Beijing, China. I would be very grateful for loans of Dexiini specimens and references for my study.

TACHINID BIBLIOGRAPHY

Each year I include here tachinid references I have found during the past year for the period 1980 to the present which have not appeared in previous issues of this newsletter. The complete bibliography is available on the Web at http://res2.agr.ca/ecorc/isbi/biocont/biblio.htm. I would be grateful if omissions or errors could be brought to my attention.

One of the main online abstracting journals that I use each year to search for tachinid literature was unavailable due to a technical problem this year when I was preparing this issue. Thus, this section is less complete than usual. I hope to include the references I have missed in next year's **Tachinid Times**.

Al-Doghairi, M.A. and Cranshaw, W.S. 1999. Surveys on visitation of flowering landscape plants by common biological control agents in Colorado. J. Kans. Entomol. Soc. **72**: 190-196.

Aldrich, J.R. and Cantelo, W.W. 1999. Suppression of Colorado potato beetle infestation by pheromone-mediated augmentation of the predatory spined soldier bug, *Podisus maculiventris* (Say) (Heteroptera: Pentatomidae). Agricultural and Forest Entomology **1**: 209-217.

Aleman, J., Delgado, M.L., Plana, L., Llanes, G., Fernandez, M., Burgos, T. and Garcia, G.A. 1999. Parasitic behavior of *Lixophaga diatraeae* Towns. (Diptera: Tachinidae) on *Diatraea saccharalis* Fab. (Lepidoptera: Pyralidae) in insectary. Revista de Proteccion Vegetal **14**: 133-135.

Aleman, J., Munoz, L., Plana, L., Llanes, G., Fernandez, M., Vidal, M. and Garcia, G.A. 1999. Effect of artificial recycled diet on some indicators of quality in the *Galleria mellonella* Linneo (Lepidoptera: Pyralidae) and *Lixophaga diatraeae* Townsend (Diptera: Tachinidae) rearing. Revista de Proteccion Vegetal **14**: 161-166.

Allison, J.D., McIntosh, R.L., Borden, J.H. and Humble, L.M. 2000. A new parasitoid (Diptera: Tachinidae) of Acanthocinus princeps (Coleoptera: Cerambycidae) in North America. J. Ent. Soc. British Columbia **97**: 3-5.

Alphen, J.J.M. van and Jervis, M.A. 1996. Foraging behaviour. Pp. 1-62. *In* Jervis, M. and Kidd, N., eds., Insect Natural Enemies. Practical approaches to their study and evaluation. Chapman and Hall. 491 pp.

Altieri, M.A. and Nicholls, C.I. 1999. Classical biological control in Latin America. Past, present, and future. Pp. 975-991. *In* Bellows, T.S. and Fisher, T.W., eds., Handbook of Biological Control. Principles and applications of Biological Control. Academic Press. 1046 pp.

Aslam, M. 1999. Identification of some parasites of the introduced pine sawfly, *Diprion similis* (Hartig) (Hymenoptera: Diprionidae) by examination of the mature larval remains. Sarhad Journal of Agriculture **15**: 45-46.

Bayram, S. and Kara, K. 1998. *Erycia fasciata* Villeneuve 1924, new record for fauna of Turkish Tachinidae (Diptera). Turkiye Entomoloji Dergisi **22**: 217-224.

Boettner, G.H., Elkinton, J.S. and Boettner, C.J. 2000. Effects of a biological control introduction on three nontarget native species of saturniid moths. Conservation Biology **14**: 1798-1806.

Bribosia, E., Champagne, R. and Bylemans, D. 2000. The useful organisms in our orchards: parasitic tachinids. [In Dutch.] Fruitteelt-nieuws **13(2)**: 6-7.

Cagán, L., Turlings, T., Bokor, P. and Dorn, S. 1999. *Lydella thompsoni* Herting (Dipt., Tachinidae), a parasitoid of the European corn borer, *Ostrinia nubilalis* Hbn. (Lep., Pyralidae) in Slovakia, Czech Republic and southwestern Poland. J. Appl. Entomol. **123**: 577-583.

Camerini, G. and Groppali, R. 1999. Predators and parasitoids of Hyphantria cunea in Pavia district (Northern Italy). [In Italian.] Informatore Fitopatologico **49(10)**: 19-28.

Campadelli, G. and Tschorsnig, H.P. 1999. Third contribution to the knowledge of the tachinid fauna of Romagna (Insecta Diptera Tachinidae). [In Italian.] Quad. Studi Nat. Romagna **12**: 43-46.

Chandler, P.J., O'Connor, J.P. and Nash, R. 2000. Diptera (Mycetophilidae, Empididae, Micropezidae, Drosophilidae, Sarcophagidae, Muscidae, Calliphoridae and Tachinidae) new to Ireland. Dipterists Digest (2nd series) **7**: 15-18.

Coombs, M. and Sands, D.P.A. 2000. Establishment in Australia of *Trichopoda giacomellii* (Blanchard) (Diptera: Tachinidae), a biological control agent for *Nezara viridula* (L.) (Hemiptera: Pentatomidae). Aust. J. Entomol. **39**: 219-222.

Dahlsten, D.L. and Mills, N.J. 1999. Biological control of forest insects. Pp. 761-788. *In* Bellows, T.S. and Fisher, T.W., eds., Handbook of Biological Control. Principles and applications of Biological Control. Academic Press. 1046 pp.

Doak, P. 2000. The effects of plant dispersion and prey density on parasitism rates in a naturally patchy habitat. Oecologia **122**: 556-567.

Dominguez, O., Ramirez, R., Liscano, O., Vilchez, M. and Urdaneta, R. 1999. Parasitoides de lepidopteros defoliadores del platano (*Musa* AAB, cv. Harton) en el sur del Lago de Maracaibo, Venezuela. Revista de la Facultad de Agronomia, Universidad del Zulia **16 (Suppl. 1)**: 95-101.

Easwaramoorthy, S., Kurup, N.K. and Santhalakshmi, G. 1999. Record of *Bacillus cereus* infection on *Sturmiopsis inferens* Tns. puparia. Insect Environment **5**: 71-72.

Elzen, G.W. and King, E.G. 1999. Periodic release and manipulation of natural enemies. Pp. 253-270. *In* Bellows, T.S. and Fisher, T.W., eds., Handbook of Biological Control. Principles and applications of Biological Control. Academic Press. 1046 pp.

[Entomological Laboratory, Kyushu University and Japan Wild Life Research Center, eds.] 1989. A checklist of Japanese insects. Volumes I, II and Index. 1767 pp. [Tachinidae, pp. 857-873.]

Etzel, L.K. and Legner, E.F. 1999. Culture and Colonization. Pp. 125-197. *In* Bellows, T.S. and Fisher, T.W., eds., Handbook of Biological Control. Principles and applications of Biological Control. Academic Press. 1046 pp.

Farneti, R. and Dindo, M.L. 1999. *In vitro* rearing of *Exorista larvarum* (L.) and *Brachymeria intermedia* (Nees), parasitoids of cork oak defoliators. Bulletin OILB/SROP **22**: 137-144.

Farneti, R., Dindo, M.L. and Cristiani, G. 1997. *In vitro* rearing of the larval-pupal parasitoid *Archytas marmoratus* (Townsend) (Diptera: Tachinidae) on oligidic diets: preliminary results. Boll. Ist. Entomol. "Guido Grandi", Univ. Bologna **51**: 53-61.

Farneti, R., Dindo, M.L. and Fanti, P. 1998. *In vitro* rearing of *Exorista sorbillans* (Wiedemann) and *Meigenia simplex* Tschorsnig & Herting (Diptera: Tachinidae): preliminary results. Boll. Ist. Entomol. "Guido Grandi", Univ. Stud. Bologna **52**: 75-84.

Farrar, N. and Ahmadi, A. 1997. The first report on the occurrence of the moth *Thiacidas postica* Walker (Lepidoptera: Noctuidae) in Iran. Applied Entomology and Phytopathology **66**: 45.

Ford, T.H., Shaw, M.R. and Robertson, D.M. 2000. Further host records of some West Palaearctic Tachinidae (Diptera) Entomologist's Record **112**: 25-36.

Georgiev, G. 2000. Studies on larval parasitoids of *Paranthrene tabaniformis* (Rott.) (Lepidoptera: Sesiidae) on urban poplars (*Populus* spp.) in Sofia, Bulgaria. Annals of Forest Science **57**: 181-186.

Habib-ur-Rahman and Zalucki, M.P. 1999. Population biology of *Euploea core corinna* (Nymphealiae: Lepidoptera) larvae on two species of host plants. Sarhad Journal of Agriculture **15**: 611-617.

Hasyim, A., Hasan, N., Syafril, H. and Nakamura, K. 1994. Parasitoids of the banana skipper *Erionota thrax* (L.) in Sumatera Barat, Indonesia, with notes on their life history, distribution and abundance. Tropics, Kyoto **3**: 131-142.

Hoch, G., Gschwantner, T. and Schopf, A. 1999. The gypsy moth and its natural enemies at different population densities in the oak forests of Eastern Austria. Bulletin OILB/SROP **22**: 121-128.

Jervis, M.A. and Copland, M.J.W. 1996. The life cycle. Pp. 63-161. *In* Jervis, M. and Kidd, N., eds., Insect Natural Enemies. Practical approaches to their study and evaluation. Chapman and Hall. 491 pp.

Jones, R.A. 2000. More of *Phasia hemiptera* (Fabricius) (Diptera, Tachinidae) in 1999. Dipterists Digest (2nd series) **7**: 80.

Jyothi, H.K., Veeranna, G. and Bali, G. 1998. Biology and life table studies of *Dirhinus anthracia* Walker (Hymenoptera: Chalcididae) a parasitoid of *Exorista bombycis* Louis (Diptera: Tachinidae) at various constant temperatures. Journal of Biological Control **12**: 93-100.

Kainoh, Y., Tanaka, C. and Nakamura, S. 1999. Odor from herbivore-damaged plant attracts the parasitoid fly *Exorista japonica* Townsend (Diptera: Tachinidae). Appl. Ent. Zool. **34**: 463-467.

Kara, K. and Bayram, S. 1999. New records of Tachinidae (Diptera) from Turkey. J. Entomol. Res. Soc. **1**: 17-20.

Kidd, N.A.C. and Jervis, M.A. 1996. Population dynamics. Pp. 293-374. *In* Jervis, M. and Kidd, N., eds., Insect Natural Enemies. Practical approaches to their study and evaluation. Chapman and Hall. 491 pp.

Kogan, M., Gerling, D. and Maddox, J.V. 1999. Enhancement of biological control in annual agricultural environments. Pp. 789-818. *In* Bellows, T.S. and Fisher, T.W., eds., Handbook of Biological Control. Principles and applications of Biological Control. Academic Press. 1046 pp.

Kogan, M., Helm, C.G., Kogan, J. and Brewer, E. 1989. Distribution and economic importance of *Heliothis virescens* and *Helicoverpa zea* in North, Central, and South America, including a listing and assessment of the importance of their natural enemies and host plants. Pp. 240-297. *In* King, E.G. and Jackson, R.D., eds., Far Eastern Regional Research Office, USDA, New Delhi, India.

Kolluru, G.R. 1999. Variation and repeatability of calling behavior in crickets subject to a phonotactic parasitoid fly. J. Ins. Behav. **12**: 611-626.

Legaspi, J.C., Legaspi, B.C. Jr., Lauziere, I., Smith, J.W. Jr., Rodriguez-del-Bosque, L.A., Jones, W.A. and Saldana, R.R. 2000. Incidence of Mexican rice borer (Lepidoptera: Pyralidae) and Jalisco fly parasite (Diptera: Tachinidae) in Mexico. Southwestern Entomol. **25**: 21-30.

Lehmann, G.U.C. and Lehmann, A.W. 2000. Spermatophore characteristics in bushcrickets vary with parasitism and remating interval. Behavioral Ecology and Sociobiology **47**: 393-399.

Letourneau, D.K. and Altieri, M.A. 1999. Environmental management to enhance biological control in agroecosystems. Pp. 319-354. *In* Bellows, T.S. and Fisher, T.W., eds., Handbook of Biological Control. Principles and applications of Biological Control. Academic Press. 1046 pp.

Liljesthröm, G. 1999. Modelo de simulacion de la dinamica poblacional de *Nezara viridula* (L.) (Hemiptera: Pentatomidae). Revista de la Sociedad Entomologica Argentina **58**: 65-70.

Maree, J.M., Kallar, S.A. and Khuhro, R.D. 1999. Relative abundance of *Spodoptera litura* F. and *Agrotis ypsilon* Rott. on cabbage. Pakistan Journal of Zoology **31**: 31-34.

Mathur, Y.K. and Singh, S.K. 1998. Some important natural enemies of *Amsacta moorei* Butler in Rajasthan. Indian Journal of Ecology **25**: 77-78.

McCann, K., Hastings, A., Harrison, S. and Wilson, W. 2000. Population outbreaks in a discrete world. Theoretical Population Biology **57**: 97-108.

Men, U.B. and Thakre, H.S. 1998. Field parasitization of sunflower semilooper, *Thysanoplusia orichalcea* F. by various parasitoids. PKV Research Journal **222**: 219-221.

Men, U.B. and Thakre, H.S. 1998. Parasitoids, predators and pathogens recorded on sunflower semilooper, *Thysanoplusia orichalcea* F. in Vidarbha. PKV Research Journal **22**: 218-219.

Merrifield, K. and Merrifield, R. 2000. *Phasia hemiptera* (Fabricius) (Diptera, Tachinidae) in 1999. Dipterists Digest (2nd series) **7**: 14.

Minami, T., Ishii, M. and Temma, K. 1999. Difference in parasitoid complex of gypsy moth, *Lymantria dispar* L. (Lepidoptera: Lymantriidae), between mountain coppice and urban greenery in Osaka, Japan. [In Japanese.] Jap. J. Appl. Ent. Zool. **43**: 169-174.

Oosterbroek, P. 1998. The families of Diptera of the Malay Archipelago. Fauna Melesiana Handbook **1**: 227 pp.

Pedrosa-Macedo, J.H. 2000. Biology and behavior of the strawberry guava sawfly, *Haplostegus epimelas* Konow 1901 (Hymenoptera: Pergidae), in southern Brazil. Proc. Entomol. Soc. Wash. **102**: 129-134.

Popov, A., Deltshev, C., Hubenov, Z., Beschovski, V., Dobrev, D. and Guéorguiev, B. 2000. Invertebrate fauna. Pp. 339-416. *In* Popov, A. and Meshinev, T., eds., High mountain treeless zone of the Central Balkan National Park. Biological diversity and problems of its conservation. Sofia, BSBCP.

Powell, W., Walton, M.P. and Jervis, M.A. 1996. Populations and communities. Pp. 223-292. *In* Jervis, M. and Kidd, N., eds., Insect Natural Enemies. Practical approaches to their study and evaluation. Chapman and Hall. 491 pp.

Proshold, F.I. and Carpenter, J.E. 2000. Survival of *Archytas marmoratus* (Diptera: Tachinidae) in *Helicoverpa zea* and *Spodoptera frugiperda* (Lepidoptera: Noctuidae) at low temperatures and short days. J. Entomol. Sci. **35**: 9-21.

Ramsauer, N. and Robert, D. 2000. Phonotactic orientation in a parasitoid fly. Naturwissenschaften **87**: 315-319.

Richter, V.A. 1999. The first record of the tachinid *Lypha dubia* Fallén from Sicily (Diptera: Tachinidae). Zoosystematica Rossica **8**: 189.

Richter, V.A. 2000. New data on the tachinid fauna (Diptera, Tachinidae) of the Russian far East. [In Russian.] Entomol. Obozr. **79**: 920-924.

Richter, V. and Tschorsnig, H.P. 2000. Eine neue asiatische Art der Gattung *Eloceria* (Diptera: Tachinidae). Stutt. Beitr. Naturk. (A) **602**: 1-4.

Robert, D. and Hoy, R.R. 1994. Overhearing cricket love songs. Natural History [Special issue on evolution for the 125th anniversary of the American Museum of Natural History, New York] **103**: 49-51.

Robert, D. and Willi, U. 2000. The histological architecture of the auditory organs in the parasitoid fly *Ormia ochracea*. Cell and Tissue Research **301**: 447-457.

Sanchez, V. and Carde, R. 1999. Isozyme patterns and their inheritance in the tachinid *Compsilura concinnata*. Journal of Heredity **90**: 568-572.

Shima, H. 1985. Notes on some tachinid species recently described or recorded from Japan. [In Japanese.] Makunagi/ Acta Dipterologica **13**: 13-19.

Simmul, T.L. and Clarke, A.R. 1999. Parasitism of *Acacicola orphana* (Erichson) (Coleoptera: Chrysomelidae) in Tasmania. Australian Entomologist **26**: 87-90.

Soto Rodriguez, G.A. and Gonzalez Herrera, A. 1999. Parasitoides de *Pythonides hyacinthinus* (Lepidoptera: Hesperiidae) en aguacate, *Persea americana* (Lauraceae). Revista de Biologia Tropical **47**: 628.

Stark, D.M., Purcell, A.H. and Mills, N.J. 1999. Natural occurrence of *Ametadoria misella* (Diptera: Tachinidae) and the granulovirus of *Harrisina brillians* (Lepidoptera: Zygaenidae) in California. Environ. Ent. **28**: 868-875.

Szatmari, S., Balazs, K., Meszaros, Z. and Jenser, G. 1998. Lepidoptera living on raspberry in North-Hungary. Bulletin OILB/SROP **21(10)**: 35-38.

Szpila, K. 1999. Calyptrata (Diptera) of the Gorzno-Lidzbark Landscape Park. II. Tachinidae. [In Polish.] Wiadomosci Entomologiczne **18**: 111-120.

Tachi, T. and Shima, H. 2000. Taxonomic study of the genus *Ceromya* Robineau-Desvoidy of Japan (Diptera: Tachinidae). Beitr. Ent. **50**: 129-150.

Thompson, S.N. and Hagen, K.S. 1999. Nutrition of entomophagous insects and other arthropods. Pp. 594-652. *In* Bellows, T.S. and Fisher, T.W., eds., Handbook of Biological Control. Principles and applications of Biological Control. Academic Press. 1046 pp.

Toma, R. and Guimarães, J.H. 2000. Revisão do gênero *Proparachaetopsis* revalidado (Diptera, Tachinidae). Iher ingia, Sér. Zool., Porto Alegre **88**: 15-24.

Toma, R. and Guimarães, J.H. 2000. Revisão do gênero *Pterotopeza* (Diptera, Tachinidae). Iheringia, Sér. Zool., Porto Alegre **88**: 7-14.

Tribe, G.D. 2000. Ecology, distribution and natural enemies of the *Eucalyptus*-defoliating tortoise beetle *Trachymela tincticollis* (Blackburn) (Chrysomelidae: Chrysomelini: Paropsina) in southwestern Australia, with reference to its biological control in South Africa. African Entomology **8**: 23-45.

Tschorsnig, H.P. 2000. Three new species of Palearctic Tachinidae (Diptera). Stutt. Beitr. Naturk. (A) **603**: 1-9.

Tschorsnig, H.P. and Brechtel, F. 1999. Raupenfliegen (Diptera: Tachinidae) aus dem Bienwald (Rheinland-Pfalz). Mitt. Pollichia **86**: 127-138.

Tschorsnig, H.P. and Doczkal, D. 2000. Raupenfliegen (Diptera: Tachinidae) vom Flugplatz Söllingen bei Baden-Baden. Mitt. bad. Landesver. Naturkunde u. Naturschutz N.F. **17**: 599-607.

Tschorsnig, H.P. and Herting, B. 2000. Raupenfliegen (Diptera, Tachinidae) aus der Trockenaue am südbadischen Oberrhein. Naturschutz-Spectrum. Themen **92**: 233-241.

Tschorsnig, H.P. and Niehuis, M. 2000. Raupenfliegen (Diptera: Tachinidae) eines xerothermen Standortes im Mittelrheintal (Rheinland-Pfalz). Fauna Flora Rheinland-Pfalz **9**: 631-638.

Tschorsnig, H.P. and Schubert, H. 1999. Raupenfliegen aus Baumkronen in Mitteleuropa (Diptera, Tachinidae). Entomofauna **20**: 269-280.

Valicente, F.H. and Barreto, M.R. 1999. Survey of natural enemies of the fall armyworm, *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae), in the Cascavel region, PR, Brazil. [In Portuguese.] Anais da Sociedade Entomologica do Brasil **28**: 333-337.

Vanhara, J. 1999. Tachinidae. Pp. 423-436. *In* Rozkosny, R. and Vanhara, J., eds., Diptera of the Pálava Biosphere Reserve of UNESCO, Vol. **2**. Folia Facultatis Scientiarium Naturalium Universitatis Masarykianae Brunensis, Biologia **100**. Pp. 229-458.

Viafara Millan, H.F., Roa, F.G. and Diaz, A.E. 1999. Parasitismo natural de Neoleucinodes elegantalis (Lepidoptera: Pyralidae) en zonas productoras de solanaceas del Cauca y Valle del Cauca, Colombia. Revista Colombiana de Entomologia **25**: 151-159.

Virla, E.G., Colomo, M.V., Berta, C. and Valverde, L. 1999. El complejo de parasitoides del "gusano cogollero" del maíz, *Spodoptera frugiperda*, en la República Argentina (Insecta: Lepidoptera). Neotrópica **45**: 3-12.

Wardlaw, J.C., Webb, N.R., McAlister, E.A.J. and Murcott, J. 2000. Observations on the life cycle of *Medina collaris* (Fallén) (Dipt., Tachinidae). Entomol. Mon. Mag. **136**: 21-29.

Weir, E.H. and Sagarzazu, L. 1998. Interspecific competition between *Metagonystilum minense* (Diptera: Tachinidae) and *Cotesia flavipes* (Hymenoptera: Braconidae) parasitoids of sugarcane borers (*Diatraea* spp., Lepidoptera:Pyralidae). Revista de Biologia Tropical **46**: 1135-1139.

Woods, H.A. and Bernays, E.A. 2000. Water homeostasis by wild larvae of *Manduca sexta*. Physiol. Entomol. **25**: 82-87.

Xu, Z.h. and Lou, J.x. 2000. Notes on two genera of Microteryini new to China. Descriptions of two new species (Hymenoptera: Encyrtidae). [In Chinese.] Acta Zootaxonomica Sinica **25**: 199-203.

Yager, D.D. 1999. Structure, development, and evolution of insect auditory systems. Microsc. Res. Technique **47**: 380-400.

Zeegers, T. 2000. Prolongation of plagues by parasitoids with microtype eggs. Proc. Exper. & Appl. Entomol., N.E.V. Amsterdam **11**: 145-150.

Ziegler, J. 1999. Checkliste der Raupenfliegen (Diptera: Tachinidae). Pp. 198-206. *In* Frank, D. and Neumann, V., eds., Bestandssituation der Pflanzen und Tiere Sachsen-Anhalts. Verlag Eugen Ulmer, Stuttgart.

Ziegler, J. 2000. Diptera (Larven). Pp. 789-802. *In* Hannemann, H.J., Klausnitzer, B. and Senglaub, K., eds., Exkursionsfauna von Deutschland. Wirbellose: Insekten. Spektrum Akademischer Verlag; Heidelberg, Berlin.

Ziegler, J. 2000. In memoriam Juraj Cepelák. [In German.] Studia dipterologica **7**: 559-572.

Ziegler, J. 2000. Tachinidae. Pp. 201-229. *In* Ziegler, J. and Menzel, F., eds., Die historische Dipteren-Sammlung Carl Friedrich Ketel. Revision einer zwischen 1884 und 1903 angelegten Sammlung von Zweiflüglern (Diptera) aus Mecklenburg-Vorpommern. Nova Supplementa Entomologica **14**, 266 pp. Deutsches Entomologisches Institut, Berlin.

Zubrik, M. 1998. Beitrag zur morphologie der puparien der im schwammspinner, *Lymantria dispar* (Lepidoptera: Lymantriidae) parasitierenden raupenfliegen (Diptera, Tachinidae) in der Slowakei. Lesnicky Casopis **44**: 275-285.

Zuk, M. and Kolluru, G.R. 1998. Exploitation of sexual signals by predators and parasitoids. Quarterly Review of Biology **73**: 415-438.

Zvereva, E.L. and Kozlov, M.V. 2000. Effects of air pollution on natural enemies of the leaf beetle *Melasoma lapponica*. J. Appl. Ecol. **37**: 298-308.

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