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Данный выпуск Трудов посвящен 75-летнему юбилею крупного российского энтомолога-гименоптеролога, члена Совета РЭО Дмитрия Рафаэлевича Каспаряна. Выпуск включает научные статьи его друзей, коллег и соратников по разнообразным вопросам исследования перепончатокрылых насекомых. Все опубликованные материалы прошли независимое научное рецензирование.

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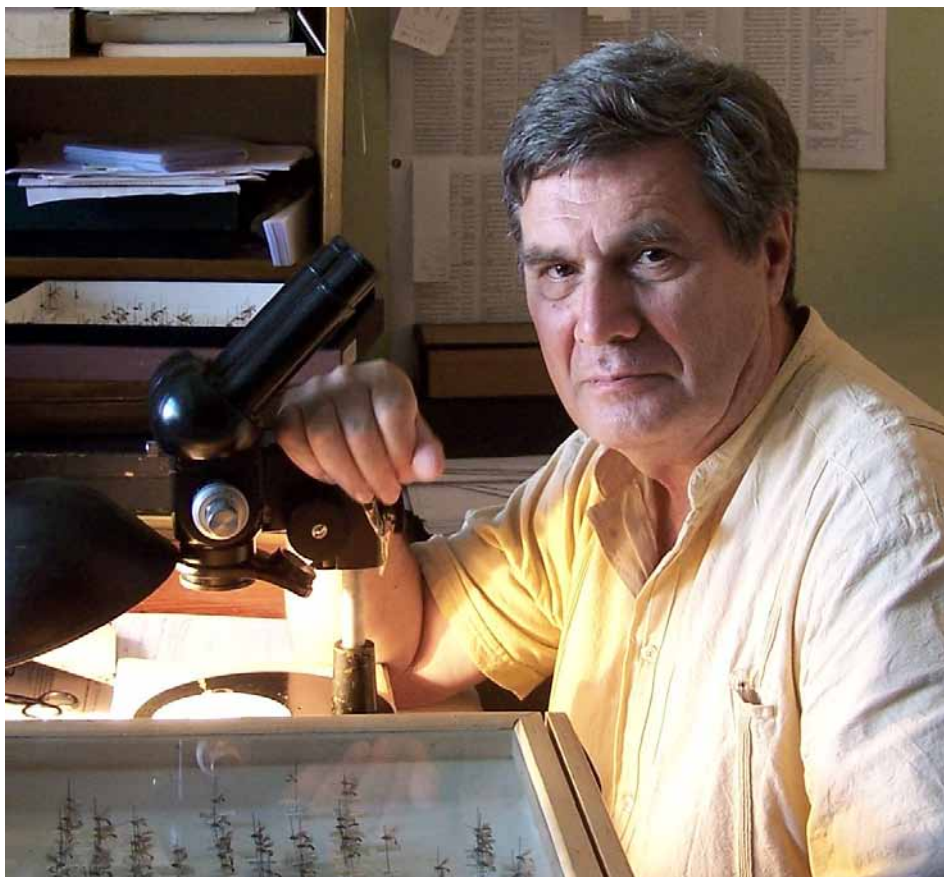*S.A. Belokobylskij, A.I. Khalaim*

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TO 75TH BIRTHDAY OF

DMITRI RAFAELEVICH KASPARYAN

К 75-ЛЕТИЮ

ДМИТРИЯ РАФАЭЛЕВИЧА КАСПАРЯНА

Word about Dmitri R. Kasparyan

Dmitri Rafaelevich Kasparyan was born on 8 June 1939 in Leningrad, USSR. During the Second World War he was evacuated with his mother to Irkutsk City, but later resettled to Kotelnich, Kirovsk Province. His father was killed in 1944 at the front. From 1943 to 1951 Dmitri Kasparyan lived in Moscow and in Ptichnoe, near Moscow, where he started his school education. In 1951 he returned with his family to Leningrad.

After leaving school in 1956, he entered the Leningrad State Forest Technical Academy, and graduated from this Academy in 1961. From 1961 to 1966 he worked as a forest research entomologist in the Far East Forest Research Institute in Khabarovsk, where he extensively studied parasitoids of forestry pests.

He returned to Leningrad in 1966 and started his postgraduate studies of Ichneumonidae systematics at the Zoological Institute of the USSR Academy of Sciences, in the Laboratory of Insect Taxonomy under the supervision by Professor Vladimir I. Tobias. In 1970 he defended his thesis of Candidate of Science (PhD) on the tribe Tryphonini (Ichneumonidae: Tryphoninae) of the fauna of USSR, and since that time and until now he works as a researcher in the Zoological Institute, St Petersburg. In 1996 he defended the thesis of Doctor of Sciences on evolution of parasitism in Ichneumonidae.

Based on the PhD thesis, a first monograph on Tryphonini of the USSR was published by D.R. Kasparyan in 1973 in serial issue "Fauna of USSR" (in 1981 this book was translated to English in USA). In 1981 he was an editor of the Guide to identification of Ichneumonidae of the European part of USSR (serial issue "Key to insects of the European part of USSR"). A second monograph with a revision of the Palaearctic fauna of the tryphonine tribe Exenterini and the subfamily Adelognathinae was published by D.R. Kasparyan in 1990, and a third monograph (jointly with V.I. Tolkanitz) on some tribes of Tryphoninae and the subfamily Eucerotinae was published in 1999.

From 1965 to 2014, Dmitri Kasparyan has published about 250 scientific papers (including five monographs) in which he described over 740 new taxa in Ichneumonidae, including 5 subfamilies. New species were described by him in 180 genera of 20 ichneumonid subfamilies. A list of his publications and new taxa are available in his personal webpage: www.zin.ru/labs/insects/hymenopt/personalia/kasparyan/

Dmitri Kasparyan participated in many expeditions to the Russian Far East (Kamchatka, South Kuriles, Khabarovsk and Primorskiy Territories, Amur Province), Siberia (Tyumen, Irkutsk and Chita Provinces, Buryatia, Tuva, Yakutia, Krasnoyarsk Territory), Urals, Kazakhstan, Middle Asia, the European part of Russia, Ukraine, Belarus and Slovakia.

Four postgraduate students have completed their PhD theses on Ichneumonidae under supervision by D.R. Kasparyan: Roman S. Dbar (1985), Andranik R. Manukyan (1990), Andrey E. Humala (1999) and Andrey I. Khalaim (2003).

From 1998 to 2007 Dmitri Kasparyan worked as a professor in the Autonomous University of Tamaulipas, Cd. Victoria, Mexico. From 2000 to 2013 he published two monographs and 38 journal articles on Mexican Ichneumonidae, in which seven new genera and about 168 species and subspecies belonging to ten subfamilies of Ichneumonidae were described, and a large number of new faunistic and host records were provided. More details of his work in Mexico is reviewed by Ruíz-Cancino with co-authors (see page 7 of this volume).

Dmitri Kasparyan continues to work actively, and this anniversary volume is our recognition and respect of his contribution to the study of the Ichneumonidae.

A.I. Khalaim
S.A. Belokobylskij

Contribution of D.R. Kasparyan to the knowledge of Mexican Ichneumonidae (Hymenoptera)

E. Ruíz-Cancino[1], J.M. Coronado-Blanco[1], A.I. Khalaim[1,2], S.N. Myartseva[1]

Вклад Д.Р. Каспаряна в познание семейства Ichneumonidae (Hymenoptera) Мексики

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Abstract. Dmitri R. Kasparyan started his extensive study of Mexican Icheumonidae in 1998 as a professor of the Universidad Autónoma de Tamaulipas in Cd. Victoria, Mexico. From 2000 to 2013, he has published two monographs and 38 journal articles on Mexican Ichneumonidae, where he described 7 new genera and 168 species and subspecies belonging to 10 subfamilies of Ichneumonidae, and provided a large number of new faunistic and host records. All new genera and 83 % of described species and subspecies belong to the Cryptinae, one of the most difficult, in terms of identification, and poorly known ichneumonid subfamilies. At the present day, as a result of work by D.R. Kasparyan and collaborators, over 1300 species and 343 genera belonging to 28 ichneumonid subfamilies are known from Mexico. Here we provide a complete list of new taxa described by D.R. Kasparyan from Mexico, all his monographs and journal articles on Mexican Icheumonidae, and the most important publications in memoirs and collections of papers.

Key words. Ichneumonidae, Hymenoptera, Mexico, D.R. Kasparyan.

Резюме. Дмитрий Рафаэлевич Каспарян начал интенсивно изучать ихневмонид Мексики в 1998 г., работая профессором Автономного университета Тамаулипаса в городе Сьюдад Виктория в Мексике. С 2000-го по 2013-й годы он опубликовал по мексиканским ихневмонидам 2 монографии и 38 статей, в которых описал 7 новых родов и 168 видов и подвидов, относящихся к 10 подсемействам сем. Ichneumonidae, а также сделал большое число новых фаунистических находок и указаний хозяев. Все новые роды и 83 % описанных видов и подвидов принадлежат к Cryptinae – одному из таксономически наиболее сложных и слабо изученных подсемейств ихневмонид. На сегодняшний день в результате исследований Д.Р. Каспаряна и его соавторов фауна сем. Ichneumonidae Мексики насчитывает около 1300 видов и 343 родов, относящихся к 28 подсемействам. Здесь мы приводим полный список новых таксонов ихневмонид, описанных Д.Р. Каспаряном, его монографий и статей в журналах по мексиканским ихневмонидам, а также наиболее важные публикации в сборниках научных работ и других изданиях.
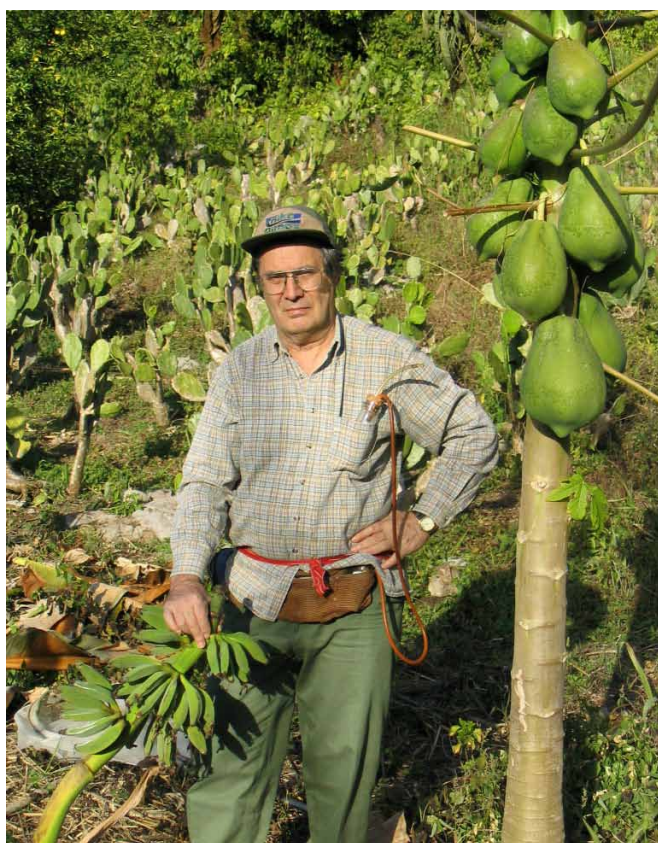
Ключевые слова. Ichneumonidae, Hymenoptera, Мексика, Д.Р. Каспарян.

Ichneumonidae is a megadiverse group in the order Hymenoptera and one of the most species-rich insect families, distributed worldwide and comprising over 24.000 described species (Yu *et al.*, 2012). The ichneumonid fauna of America north of Mexico (USA and Canada) was extensively studied in the second half of 20th century by the North American entomologists H.K. Townes, with co-authors (Townes, 1983; Townes, Gupta, 1962; Townes, Townes, 1959, 1960, 1962, 1978; Townes *et al.*, 1992), G.H. Heinrich (1977), C.E. Dash (1979, 1984, 1992) and others. The Ichneumonidae of Central America has been very irregularly studied. While the fauna of Costa Rica, a small Central American country, is among the best studied ichneumonid faunas of the world, being revised in a series of monographs by I.D. Gauld and co-authors (Gauld, 1991, 2000; Gauld, Wahl, 1997; Gauld *et al.*, 1998, 2002; Zuñiga-Ramirez, 2004), other Central American countries have generally been very poorly studied.

Zoogeographically, Mexico is an extremely interesting country situated between the Nearctic and Neotropical regions with a wide transition zone (Morrone, Márquez, 2008).

In the 19th and first half of the 20th centuries, many species of Ichneumonidae were described from Mexico by P. Cameron, E.T. Cresson and R.A. Cushman. According to the catalogue of Neotropical Ichneumonidae (Townes, Townes, 1966), in 1966 only 535 species of Ichneumonidae (less than half of the modern total) were known to occur in Mexico. After that, until the 21th century, the Mexican ichneumonid fauna was investigated rather slowly and irregularly, especially in comparison with the faunas of the USA, Canada and Costa Rica.

In 1998, Dmitri R. Kasparyan started his extensive study of Mexican Icheumonidae as a professor of the Universidad Autónoma de Tamaulipas in Cd. Victoria, Mexico (UAT), and worked in this university until 2007. During his work in the UAT, jointly with E. Ruíz-Cancino (curator of the insect collection of UAT), students and postgraduate students, a large amount of material of Ichneumonidae was collected during many field trips and expeditions in the State of Tamaulipas (106 species and subspecies, or 63 %, were described from this state) and in other parts of Mexico. As result of this and previous work, over 20 000 ichneumonid specimens, including 112 holotypes, are deposited now in the ichneumonid collection of UAT, which makes it the largest ichneumonid collection in Mexico. Besides the material of the UAT, considerable additional material (including types) was studied by D.R. Kasparyan from many other Mexican and USA collections, from INBio (Instituto Nacional de Biodiversidad, Costa Rica), and the Natural History Museum (London, UK).

From 2000 to 2013, D.R. Kasparyan has published two monographs and 38 journal papers on Mexican Ichneumonidae, where he described seven new genera and 168 new species and subspecies belonging to 10 subfamilies of Ichneumonidae (see Table below), and provided a large number of new faunistic and host records. All new genera and 83 % of new species and subspecies were described in the Cryptinae, which is one of the most poorly known ichneumonid subfamilies and contains some of the most ichneumonids to identify. The most valuable contribution by D.R. Kasparyan was to the knowledge of the tribe Cryptini: the main results of this work were published in two books (Kasparyan, Ruíz-Cancino,

Photo 1. Mexico, Tamaulipas, Gómez Farías, 2004.

Photo 2. Mexico, Tamaulipas, near Miquihuana, 2005.

2005a, 2008a) in which about 300 species from 54 genera belonging to 12 subtribes have been reviewed, including three new genera and 74 new species and subspecies. The greatest number of new species were described in the cryptine genera *Messatoporus* Cushman (14 species), *Lymeon* Förster (12), *Cryptanura* Brullé (10) and *Diapetimorpha* Viereck (9), and in the tryphonine genus *Phytodietus* Grav. (7).

At present, about 1300 species and 345 genera belonging to 28 ichneumonid subfamilies are now known to occur in Mexico, and 13 % of these species were described by D.R. Kasparyan. Recently, general information on Mexican ichneumonids was summarized by Ruíz-Cancino with co-authors (Ruiz-Cancino *et al.*, 2013), with estimates of the total species number for each subfamily in Mexico.

In the 21st century, the study of Mexican Ichneumonidae is continued by Santiago Bordera (University of Alicante, Spain) and Alejandra González-Moreno (Universidad Autónoma de Yucatán, Mexico), Andrey I. Khalaim (UAT and Zoological Institute RAS, St Petersburg, Russia) and E. Ruíz-Cancino (UAT). The most important papers by these authors on Mexican Ichneumonidae are as follows: Bordera with co-authors (2010, 2014), González-Moreno and Bordera (2011, 2012a, 2012b), Khalaim (2002), Khalaim and Hernández-Aguiar (2009), Khalaim and Ruíz-Cancino (2007, 2008, 2009, 2010, 2011a, 2011b, 2012, 2013a, 2013b), Khalaim with co-authors (2012, 2013), López-Ortega and Khalaim (2012).

Table. New taxa of Mexican Ichneumonidae described by D.R. Kasparyan in 2000–2013.

Subfamily	Taxa	Distribution*
Anomaloninae (2 species)	*Corsoncus fuscipennis* Kasparyan et Ruíz-Cancino, 2001b	Tam
	C. trochanteratus Kasparyan et Ruíz-Cancino, 2001b	Tam
Banchinae (3 species)	*Banchopsis caudatus* Kasparyan et Ruíz-Cancino, 2001a	SLP, Hgo
	Diradops hyphantriae Kasparyan et Pinson, 2007	NL, Tam, Ver, Yuc
	D. pulcher Kasparyan, 2007b	Tam, Ver

Subfamily	Taxa	Distribution*
Cryptinae (7 genera, 139 species and subspecies)	*Acerastes bimaculator* Kasparyan et Ruíz-Cancino, 2008a	Tam, Gro
	A. faciator Kasparyan et Ruíz-Cancino, 2008a	Tam
	A. myartsevae Kasparyan et Ruíz-Cancino, 2008a	Tam, Yuc, QR
	A. scabrosus Kasparyan et Ruíz-Cancino, 2008a	Tam
	A. tinctor Kasparyan et Ruíz-Cancino, 2008a	Tam, QR
	Agonocryptus brevicauda Kasparyan et Ruíz-Cancino, 2005a	Tam, Yuc
	Amydraulax mexicana Kasparyan et Ruíz-Cancino, 2003a	Coah, Tam
	Ateleute carolina maculator Kasparyan et Hernández-Aguilar, 2001	Tam; Costa Rica
	A. grossa Kasparyan et Hernández-Aguilar, 2001	Tam
	A. tinctoria Kasparyan et Hernández-Aguilar, 2001	Tam
	Baltazaria catemaco Kasparyan et Ruíz-Cancino, 2005a	Ver, Chis; Costa Rica, Panama, Peru
	B. crassicornis Kasparyan et Ruíz-Cancino, 2005a	NL, Tam, Yuc
	B. nodus Kasparyan et Ruíz-Cancino, 2005a	Tam
	B. notator Kasparyan et Ruíz-Cancino, 2005a	Tam
	B. rufata Kasparyan et Ruíz-Cancino, 2005a	Tam
	B. rufonotata Kasparyan et Ruíz-Cancino, 2005a	Tam, Tab, Yuc, QR
	Baryceros burgosi Kasparyan et Ruíz-Cancino, 2005a	Yuc
	B. petiolator Kasparyan et Ruíz-Cancino, 2005a	Tam, SLP
	B. tibiator Kasparyan et Ruíz-Cancino, 2005a	Tam
	Basileucus sincerus Kasparyan et Ruíz-Cancino, 2008a	Tam
	B. suspiciosus Kasparyan et Ruíz-Cancino, 2008a	Tam
	Bathyzonus interruptor Kasparyan et Ruíz-Cancino, 2008a	Tam; Costa Rica, Venezuela
	Bicristella cedrella Kasparyan et Ruíz-Cancino, 2003b	Tam, Yuc
	B. delphini Kasparyan et Ruíz-Cancino, 2003b	Yuc
	B. epimeron Kasparyan et Ruíz-Cancino, 2003b	Tam, Ver, Tab, QR; Costa Rica
	B. hilaris Kasparyan et Ruíz-Cancino, 2003b	Oax
	Cadarca Kasparyan et Ruíz-Cancino, 2004a	
	C. tobiasi Kasparyan et Ruíz-Cancino, 2004a	Tam
	Caenocryptus rufifrons mexicanus Kasparyan et Ruíz-Cancino, 2005a	NL, Tam
	Camera californica Kasparyan et Ruíz-Cancino, 2005a	BCS
	Cestrus altacima Kasparyan et Ruíz-Cancino, 2005a	Tam
	C. arcuatorius Kasparyan et Ruíz-Cancino, 2005a	NL, Tam, Yuc
	C. nigristernum Kasparyan et Ruíz-Cancino, 2005a	Tam
	Compsocryptus hugoi Kasparyan et Ruíz-Cancino, 2005a	Yuc
	Cryptanura armandoi Kasparyan et Ruíz-Cancino, 2006	Tam
	C. femorator Kasparyan et Ruíz-Cancino, 2006	Mor?
	C. hamulator Kasparyan et Ruíz-Cancino, 2006	Tam, Ver, SLP
	C. llera Kasparyan et Ruíz-Cancino, 2006	Tam
	C. lunai Kasparyan et Ruíz-Cancino, 2006	NL, Tam
	C. punctator Kasparyan et Ruíz-Cancino, 2006	Tam
	C. silvae Kasparyan et Ruíz-Cancino, 2006	Tam
	C. sostenesi Kasparyan et Ruíz-Cancino, 2006	Ver
	C. sternoleuca Kasparyan et Ruíz-Cancino, 2006	Tam, Mor
	C. xilitla Kasparyan et Ruíz-Cancino, 2006	SLP
	Debilos nigriceps Kasparyan, 2013	Oax

Subfamily	Taxa	Distribution*
	Diapetimorpha cognator Kasparyan et Ruíz-Cancino, 2005a	Tam, Yuc, Chis
	D. delfini Kasparyan et Ruíz-Cancino, 2005a	Yuc
	D. dorsator Kasparyan et Ruíz-Cancino, 2005a	Tam, Yuc, QR
	D. mandibulator Kasparyan et Ruíz-Cancino, 2005a	Yuc
	D. pedator Kasparyan et Ruíz-Cancino, 2005a	Yuc
	D. pronotalis Kasparyan et Ruíz-Cancino, 2005a	NL, Tam, Yuc
	D. quadrilineata Kasparyan et Ruíz-Cancino, 2005a	Tam
	D. tibiator Kasparyan et Ruíz-Cancino, 2005a	Yuc
	D. zaldivari Kasparyan, 2013	Oax
	Dicamixus lamprocryptus Kasparyan et Ruíz-Cancino, 2005a	Tam
	Digonocryptus coxator Kasparyan et González-Hernández, 2007b	QR
	D. femorator Kasparyan et Ruíz-Cancino, 2005a	Tam, Ver, Yuc, QR
	D. propodeator Kasparyan et Ruíz-Cancino, 2005a	Tam
	D. thoracicus Kasparyan et Ruíz-Cancino, 2005a	Tam, Tab, Yuc, QR
	Diplohimas fulvithorax Kasparyan et Ruíz-Cancino, 2005a	Yuc
	Dismodix brunniventris Kasparyan et Ruíz-Cancino, 2008a	Tam, Tab
	D. scapulator Kasparyan et Ruíz-Cancino, 2008	Tam, Yuc, QR
	Distictus mexicanus Kasparyan et Ruíz-Cancino, 2005a	Tam, Ver, Oax; Costa Rica
	Epicnemion Kasparyan et Ruíz-Cancino, 2008a	
	E. lineator Kasparyan et Ruíz-Cancino, 2008a	Tam
	Ethelurgus annulicornis Kasparyan et Ruíz-Cancino, 2000a	Tam
	Ferrocryptus Kasparyan et Ruíz-Cancino, 2005a	
	F. longicauda Kasparyan et Ruíz-Cancino, 2005a	Tam, Jal
	Fortipalpa Kasparyan et Ruíz-Cancino, 2007a	
	F. yucatanica Kasparyan et Ruíz-Cancino, 2007a	Yuc
	Gambrus madronio Kasparyan et Ruíz-Cancino, 2005a	Tam
	Hylophasma altacima Kasparyan et Ruíz-Cancino, 2005a	Tam
	H. cavigena Kasparyan et Ruíz-Cancino, 2005a	Tam, Yuc
	H. nigriceps Kasparyan et Ruíz-Cancino, 2005a	NL, Tam, Tab, Yuc
	H. pulchra Kasparyan et Ruíz-Cancino, 2005a	NL
	Ischnus basalis Kasparyan et Ruíz-Cancino, 2005a	Tam, Tab, Oax, Yuc
	I. cieloi Kasparyan, 2009	Tam, Oax
	Joppidium antennator Kasparyan et Ruíz-Cancino, 2005a	Jal
	J. discolor coxator Kasparyan et Ruíz-Cancino, 2005a	Dgo, NL, Tam; USA
	J. simile Kasparyan et Ruíz-Cancino, 2005a	Tam
	J. tinctipenne Kasparyan et Ruíz-Cancino, 2005a	Mich, Oax
	Khalaimia Kasparyan, 2012	
	Kh. mexicana Kasparyan, 2012	Ver
	Lamprocryptus alboannularis abdominator Kasparyan et Ruíz-Cancino, 2005a	Yuc
	L. nigrans Kasparyan et Ruíz-Cancino, 2005a	Tam, Ver, SLP, Oax
	Lanugo yucatan Kasparyan et Ruíz-Cancino, 2005a	Jal, Yuc
	Latosculum ruizi Kasparyan, 2004	NL, Tam, Ver, Yuc
	L. townesi Kasparyan, 2004	Oax
	Loxopus multicolor Kasparyan et Ruíz-Cancino, 2005a	Yuc
	L. unicolor Kasparyan et Ruíz-Cancino, 2005a	Tam, Yuc
	Lymeon albifemur Kasparyan, 2013	Oax
	L. atrator Kasparyan et Ruíz-Cancino, 2004c	Tam

Subfamily	Taxa	Distribution*
	L. clebschi Kasparyan, 2013	Oax
	L. mandibularis Kasparyan et Ruíz-Cancino, 2004c	Tam, Yuc
	L. minutus Kasparyan et Ruíz-Cancino, 2008b	Tam
	L. rufatus Kasparyan et Ruíz-Cancino, 2004c	Tab, Yuc
	L. rufinotum Kasparyan et Ruíz-Cancino, 2004c	Tam, Tab, Yuc, Chis
	L. rufoalbus Kasparyan et Ruíz-Cancino, 2004c	Yuc
	L. rufoniger Kasparyan et Ruíz-Cancino, 2004c	Tam, Tab, Oax, Chis
	L. rufotibialis Kasparyan et Ruíz-Cancino, 2004c	Yuc
	L. tinctipennis Kasparyan et Ruíz-Cancino, 2004c	Oax
	L. tricoloripes Kasparyan et Ruíz-Cancino, 2004c	NL, Tam, Ver, Yuc
	Mallochia distictus Kasparyan et Ruíz-Cancino, 2008a	Tam
	M. macula Kasparyan et Ruíz-Cancino, 2008a	Yuc, QR
	M. tabasco Kasparyan et Ruíz-Cancino, 2008a	Tab
	Melanocryptus whartoni Kasparyan et Ruíz-Cancino, 2008a	Jal
	Meringopus coronadoae Kasparyan et Ruíz-Cancino, 2005a	Coah
	Mesostenus laevicoxis Kasparyan et Ruíz-Cancino, 2008a	Tam, Oax, Yuc
	M. madronio Kasparyan et Ruíz-Cancino, 2008a	Tam
	M. pallipleuris Kasparyan et Ruíz-Cancino, 2008a	Tam
	M. scapularis Kasparyan et Ruíz-Cancino, 2008a	Tam
	Messatoporus antennator Kasparyan et Ruíz-Cancino, 2005b	NL, Tam
	M. covarrubiasi Kasparyan et Ruíz-Cancino, 2005b	Tam
	M. femorator Kasparyan et Ruíz-Cancino, 2005b	Tam
	M. fulvator Kasparyan, 2006b	Chis
	M. grandis Kasparyan et Ruíz-Cancino, 2005b	Tam
	M. jalapa Kasparyan et Ruíz-Cancino, 2005b	Ver, Oax
	M. kerzhneri Kasparyan et Ruíz-Cancino, 2008a	Ver
	M. maculipes Kasparyan et Ruíz-Cancino, 2005b	Tam
	M. mesonotator Kasparyan et Ruíz-Cancino, 2005b	Tam, Yuc
	M. mesosternalis Kasparyan et Ruíz-Cancino, 2005b	Tam
	M. propodeator Kasparyan et Ruíz-Cancino, 2005b	Tam, Yuc
	M. rufator Kasparyan et Ruíz-Cancino, 2005b	Tam
	M. terebrator Kasparyan et Ruíz-Cancino, 2005b	NL, Tam
	M. tibiator Kasparyan et Ruíz-Cancino, 2005b	Zac, Coah, NL, Tam
	Polycyrtidea carlosi Kasparyan et Ruíz-Cancino, 2008a	Tam, QR
	Polycyrtus burgosi Kasparyan et Ruíz-Cancino, 2004b	Tam, Yuc
	P. clavator Kasparyan et Ruíz-Cancino, 2004b	Yuc
	P. comma Kasparyan et Ruíz-Cancino, 2004b	Tam, Yuc
	P. crespoi Kasparyan et Ruíz-Cancino, 2004b	Ver
	P. curtispina Kasparyan et Ruíz-Cancino, 2004b	Tam, Yuc
	P. soniae Kasparyan et Ruíz-Cancino, 2004b	Tam, Yuc
	P. yucatan Kasparyan et Ruíz-Cancino, 2004b	Yuc
	Polyphrix mexicanus Kasparyan et Ruíz-Cancino, 2008a	Yuc
	Rhinium rubrum Kasparyan et Ruíz-Cancino, 2008a	Tam, Ver, Tab
	Strabotes nigrator Kasparyan et Ruíz-Cancino, 2008a	Tab
	S. tabasco Kasparyan et Ruíz-Cancino, 2008a	Tab
	Tamaulipeca Kasparyan, 2001	
	T. clypeator Kasparyan, 2001	Tam
	Tricentrum mexicanum Kasparyan et González-Hernández, 2007a	QR
	Trihaspis albicincta Kasparyan, 2007c	QR

Subfamily	Taxa	Distribution*
	Whymperia ferrugata Kasparyan et Ruíz-Cancino, 2005a	Tam, Yuc
	W. oaxaca Kasparyan, 2013	Oax
	W. rufata Kasparyan et Ruíz-Cancino, 2005a	Tam
	Xenarthron Kasparyan et Ruíz-Cancino, 2005a	
	X. pectoralis Kasparyan et Ruíz-Cancino, 2005a	Tam, Jal
Ctenopelmatinae (5 species)	*Asthenara atrator* Kasparyan, 2007b	Gro
	A. chiapas Kasparyan, 2007b	Chis
	A. coahuila Kasparyan, 2007b	Coah
	A. guerrero Kasparyan, 2007b	Gro
	A. michoacan Kasparyan, 2007b	Mich
Cylloceriinae (1 species)	*Cylloceria mexicana* Kasparyan et Ruíz-Cancino, 2003c	Tam
Oxytorinae (1 species)	*Oxytorus woolleyi* Kasparyan et Ruíz-Cancino, 2000b	Tam
Pimplinae (6 species)	*Iseropus hylesiae* Kasparyan, 2006a	Tam, Tlax
	Itoplectis gonzalezi Kasparyan, 2007a	Chis
	I. mexicanus Kasparyan et Niño, 2004	Tam
	I. multicolor Kasparyan, 2007a	Chis
	I. nigrithorax Kasparyan, 2007a	Chis
	I. specularis Kasparyan, 2007a	Mich, Oax, Chis
Rhyssinae (1 species)	*Megarhyssa verae* Kasparyan, 2002	Mor/EMex border
Tryphoninae (9 species)	*Lagoleptus fulviceps* Kasparyan, 2007e	Mor
	Phytodietus (Neuchorus) enriquei Kasparyan et Khalaim, 2013	Tam
	Ph. (N.) javieri Kasparyan, 2007d	Tam
	Ph. (N.) melanocerus Kasparyan et Ruíz-Cancino, 2004d	Mor
	Ph. (Phytodietus) ninyoi Kasparyan, 2007d	Tam
	Ph. (Ph.) ruizi Kasparyan, 2007d	Tam
	Ph. (N.) thompsoni Kasparyan et Ruíz-Cancino, 2004d	NL, Tam
	Ph. (Weisia) whartoni Kasparyan, 2007d	Gro
	Ph. (Ph.) yamilethi chiapas Kasparyan, 2007d	Chis
Xoridinae (1 species)	*Xorides (Exomus) madronensis* Ruíz-Cancino et Kasparyan, 2000	Tam

*Abbreviations of the Mexican States: BCS – Baja California Sur, Chis – Chiapas, Coah – Coahuila, EMex – Estado de México, Gro – Guerrero, Hgo – Hidalgo, Mich – Michoacán, Mor – Morelos, NL – Nuevo León, Oax – Oaxaca, QR – Quintana Roo, SLP – San Luis Potosí, Tab – Tabasco, Tam – Tamaulipas, Tlax – Tlaxcala, Ver – Veracruz, Yuc – Yucatán, Zac – Zacatecas.

Acknowledgements

Monographs (2) and journal papers (38) by D.R. Kasparyan on Mexican Ichneumonidae published in 2000–2013

2000

Kasparyan D.R., Ruíz-Cancino E. 2000a. A new species of *Ethelurgus* Foerster from Mexico (Hymenoptera: Ichneumonidae). *Acta Zoológica Mexicana*, **79: ** 57–60.

Kasparyan D.R., Ruíz-Cancino E. 2000b. First record of the subfamily Oxytorinae (Hymenoptera: Ichneumonidae) in Mexico, and description of a new species. *Annales del Instituto de Biología Universidad Autónoma de México (Serie Zoología)*, **71**(2): 125–131.

Ruíz-Cancino E., Kasparyan D.R. 2000. Una nueva especie del género *Xorides* Latreille (Hymenoptera: Ichneumonidae) del Estado de Tamaulipas, Mexico. *Acta Zoológica Mexicana*, **80:** 233–239.

2001

Kasparyan D.R., Hernández-Aguilar S.G. (2000) 2001. A new genus and four new species of the subtribe Ateleutina from Mesoamerica (Hymenoptera: Ichneumonidae, Cryptinae). *Zoosystematica Rossica*, **9**(1): 227–233. [16 April 2001]

Kasparyan D.R., Ruíz-Cancino E. (2000) 2001a. New record of the genus *Banchopsis* Rudow, 1886 for the New World with description of a new species (Hymenoptera: Ichneumonidae: Banchini). *Russian Entomological Journal*, **9**(4): 353–356. [19 April 2001]

Kasparyan D.R., Ruíz-Cancino E. 2001b. Review of the Mexican species of the genus *Corsoncus* Townes, 1971 (Hymenoptera: Ichneumonidae: Anomaloninae). *Russian Entomological Journal*, **10**(2): 159–162. [16 Oct. 2001]

2002

Kasparyan D.R. 2002. A new species of *Megarhyssa* Ashmead, 1900 (Hymenoptera: Ichneumonidae) from Mexico. *Russian Entmological Journal*, **11**(3): 305–306. [30 Dec. 2002]

2003

Kasparyan D.R., Ruíz-Cancino E. (2002) 2003a. Two genera of Gelini (Hymenoptera: Ichneumonidae), new to Mexico, with description of a new species. *Russian Entomological Journal*, **11**(4): 441–443. [25 July 2002]

Kasparyan D.R., Ruíz-Cancino E. 2003b. Review of Mexican species of the genus *Bicristella* Townes, 1966 (Hymenoptera: Ichneumonidae: Cryptini). *Russian Entomological Journal*, **12**(2): 213–220. [15 Dec. 2003]

Kasparyan D.R., Ruíz-Cancino E. (2002) 2003c. A new species of *Cylloceria* Schiødte from Mexico (Hymenoptera: Ichneumonidae). *Zoosystematica Rossica*, **11**(2): 347–349. [25 June 2003]

2004

Kasparyan D.R. 2004. Four new species of *Lymeon* Förster and *Latosculum* Townes (Hymenoptera: Ichneumonidae, Cryptinae) from Honduras and Mexico. *Proceedings of the Russian Entomological Society*, **75**(1): 27–34. [June 2004]

Kasparyan D.R., Niño S. 2004. A new species of *Itoplectis* Förster from Mexico (Hymenoptera: Ichneumonidae). *Zoosystematica Rossica*, **13**(1): 49–51. [28 Dec. 2004]

Kasparyan D.R., Ruíz-Cancino E. 2004a. A new genus of the tribe Cryptini (Hymenoptera: Ichneumonidae, Cryptinae) from Mexico. *Proceedings of the Russian Entomological Society*, **75**(1): 35–38. [June 2004]

Kasparyan D.R., Ruíz-Cancino E. (2003) 2004b. Review of Mexican species of the genus *Polycyrtus* Spinola, 1840 (Hymenoptera: Ichneumonidae: Cryptini), with key to the species of North America. *Russian Entomological Journal*, **12**(3): 311–327. [27 March 2004]

Kasparyan D.R., Ruíz-Cancino E. 2004c. Review of North American species of the genus *Lymeon* Foerster, 1869 (Hymenoptera: Ichneumonidae: Cryptini). *Zoosystematica Rossica*, **13**(1): 53–79. [28 Dec. 2004]

Kasparyan D.R., Ruíz-Cancino E. 2004d. Two new species of the genus *Phytodietus* Gravenhorst, 1829 (Hymenoptera: Ichneumonidae) from Mexico. *Russian Entmological Journal*, **13**(1–2): 73–76. [27 Aug. 2004]

2005

Kasparyan D.R., Ruíz-Cancino E. 2005a. *Cryptini de México (Hymenoptera: Ichneumonidae: Cryptinae). Parte I.* Serie "Avispas parasíticas de plagas y otros insectos". Universidad Autónoma de Tamaulipas, Cd. Victoria, Tamaulipas, Mexico. 286 p. [April 2005]

Kasparyan D.R., Ruíz-Cancino E. 2005b. A review of North American species of *Messatoporus* Cushman (Hymenoptera: Ichneumonidae, Cryptini). *Zoosystematica Rossica*, **14**(1): 105–122. [18 Oct. 2005]

14

2006

K a s p a r y a n D . R . (2005) 2006a. A new species of *Iseropus* Foerster from Mexico (Hymenoptera: Ichneumonidae). *Zoosystematica Rossica*, **14**(2): 210. [27 Jan. 2006]

K a s p a r y a n D . R . (2005) 2006b. A new Mexican species of *Messatoporus* Cushman (Hymenoptera: Ichneumonidae: Cryptini). *Zoosystematica Rossica*, **14**(2): 222. [27 Jan. 2006]

K a s p a r y a n D . R . , R u í z - C a n c i n o E . 2006. Review of Mexican species of the genus *Cryptanura* Brullé with a key to species from North America (Hymenoptera: Ichneumonidae: Cryptini). *Zoosystematica Rossica*, **15**(1): 87–112. [1 Dec. 2006]

2007

K a s p a r y a n D . R . 2007a. Review of Mexican species of the genus *Itoplectis* Först. (Hymenoptera: Ichneumonidae: Pimplinae) with description of four new species. *Russian Entmological Journal*, **16**(1): 109–114. [31 March 2007]

K a s p a r y a n D . R . (2006) 2007b. Five new species of *Asthenara* Foerster from Mexico (Hymenoptera: Ichneumonidae: Ctenopelmatinae). *Zoosystematica Rossica*, **15**(2): 327–330. [2 March 2007]

K a s p a r y a n D . R . 2007c. A new species of the genus *Trihaspis* Townes from Mexico (Hymenoptera: Ichneumonidae: Cryptini). *Zoosystematica Rossica*, **16**(1): 45–47. [15 June 2007]

K a s p a r y a n D . R . 2007d. Review of Mexican species of the genus *Phytodietus* Gravenhorst (Hymenoptera: Ichneumonidae). *Zoosystematica Rossica*, **16**(1): 49–58. [15 June 2007]

K a s p a r y a n D . R . 2007e. A new species of *Lagoleptus* from Mexico (Hymenoptera: Ichneumonidae: Tryphoninae). *Zoosystematica Rossica*, **16**(2): 262. [30 Dec. 2007]

K a s p a r y a n D . R . , G o n z á l e z - H e r n á n d e z A . (2006) 2007a. A new species of the genus *Tricentrum* Townes from Mexico (Hymenoptera: Ichneumonidae: Cryptini). *Zoosystematica Rossica*, **15**(2): 326. [2 March 2007]

K a s p a r y a n D . R . , G o n z á l e z - H e r n á n d e z A . 2007b. A new species of the genus *Digonocryptus* Viereck from Mexico (Hymenoptera: Ichneumonidae: Cryptini). *Zoosystematica Rossica*, **16**(1): 43–44. [15 June 2007]

K a s p a r y a n D . R . , P i n s o n D . O . 2007. A new species of *Diradops* Townes from Mexico (Hymenoptera: Ichneumonidae: Banchinae), a parasitoid of *Hyphantria cunea* (Drury) (Lepidoptera: Arctiidae), with notes on *Diradops mexicanus* (Cresson). *Zoosystematica Rossica*, **16**(1): 39–42. [15 June 2007]

K a s p a r y a n D . R . , R u í z - C a n c i n o E . 2007a. A new genus of the tribe Cryptini from Mexico (Hymenoptera: Ichneumonidae). *Zoosystematica Rossica*, **16**(2): 260–261. [30 Dec. 2007]

K a s p a r y a n D . R . , R u í z - C a n c i n o E . 2007b. Review of Mexican species of *Diradops* Townes, with a key and description of a new species (Hymenoptera: Ichneumonidae: Banchinae). *Zoosystematica Rossica*, **16**(2): 263–268. [30 Dec. 2007]

2008

K a s p a r y a n D . R . , R u í z - C a n c i n o E . 2008a. *Cryptini de México (Hymenoptera: Ichneumonidae: Cryptinae). Parte II*. Serie "Avispas parasíticas de plagas y otros insectos". Universidad Autónoma de Tamaulipas, Cd. Victoria, Tamaulipas, Mexico. 373 p. [Jan. 2008]

K a s p a r y a n D . R . , R u í z - C a n c i n o E . 2008b. A new species of *Lymeon* Foerster from Mexico (Hymenoptera, Ichneumonidae: Cryptini). *Zoosystematica Rossica*, **17**(1): 93–94. [23 Nov. 2008]

R u í z - C a n c i n o E . , K a s p a r y a n D . R . 2008. Registro de la subfamilia Acaenitinae y de la especie *Arotes pammae* Gauld (Hymenoptera: Ichneumonidae) para México. *Acta Zoológica Mexicana*, **24**(2): 221–223.

2009

K a s p a r y a n D . R . 2009. A new species of *Ischnus* from Mexico (Hymenoptera: Icneumonidae: Cryptini). *Zoosystematica Rossica*, **18**(1): 99–101. [3 July 2009]

2010

R u í z - C a n c i n o E . , K a s p a r y a n D . R . , C o r o n a d o - B l a n c o J . M . , M y a r t s e v a S . N . , T r y a p i t z i n V . A . , H e r n á n d e z - A g u i l a r S . G . , G a r c í a - J i m é n e z J . 2010. Himenópteros de la Reserva "El Cielo", Tamaulipas, México. *Dugesiana*, **17**(1): 53–71.

2012

K a s p a r y a n D . R . 2012. A new genus of ichneumon-flies of the subtribe Barycerotina (Hymenoptera: Ichneumonidae: Cryptinae) from Mexico. *Proceedings of the Zoological Institute RAS*, **316**(3): 248–253. [25 Sept. 2012]

2013

K a s p a r y a n D. R. 2013. A contribution to the knowledge of ichneumon flies of the tribe Cryptini (Hymenoptera: Ichneumonidae: Cryptinae) from Mexico. *Zoosystematica Rossica*, **22**(1): 93–106. [25 June 2013]

K a s p a r y a n D. R., K h a l a i m A. I. 2013. A new species of the genus *Phytodietus* Gravenhorst, 1829 (Hymenoptera: Ichneumonidae: Tryphoninae) from Mexico. *Proceedings of the Zoological Institute RAS*, **317**(1): 110–114. [29 March 2013]

R u í z - C a n c i n o E., K a s p a r y a n D. R., G o n z á l e z - M o r e n o A., K h a l a i m A. I., C o r o n a d o - B l a n c o J. M. 2013. Diversidad de Ichneumonidae (Hymenoptera) en México. *Revista Mexicana de Biodiversidad*, supl. **85:** 385–391. doi: 10.7550/rmb.32448 [Published online: 17 Sept. 2013]

Other important publications by D.R. Kasparyan
(in collections of papers, books, etc.)

H e r n á n d e z - A g u i l a r S. G., K a s p a r y a n D. R., R u í z - C a n c i n o E. 1999. Especies de Pimplini (Hymenoptera: Ichneumonidae) de dos localidades de la reserva de la biosfera "El Cielo", Tamaulipas. *Memorias XXII Congreso Nacional de Control Biológico (Guanajuato, Mexico, 28 y 29 de octubre 1999)*: 35–38.

H e r n á n d e z - A g u i l a r S. G., K a s p a r y a n D. R., R u í z - C a n c i n o E., C o v a r r u b i a s D i m a s C. A. 2000. Especies de Labeninae y Brachycyrtinae (Hymenoptera: Ichneumonidae) en la reserva "El Cielo", Tamaulipas, Mexico. *Memorias XXIII Congreso Nacional de Control Biológico (Guanajnato, Mexico, 16–18 noviembre 2000)*: 228–230.

K a s p a r y a n D. R., R u í z - C a n c i n o E., C o r o n a d o - B l a n c o J. M. 2003. Composición taxonómica de la fauna de Cryptini (Hymenoptera: Ichneumonidae: Cryptinae) en México. *Entomología mexicana*, **2:** 745–750.

K a s p a r y a n D. R., R u í z - C a n c i n o E. 2004. 35. Adenda a Ichneumonidae (Hymenoptera). *In*: L l o r e n t e B o u s q u e t s J., M o r r o n e J. J., Y á ñ e z O r d ó n e z O., V a r g a s F e r n á n d e z I. (Eds). *Biodiversidad, Taxonomía y Biogeografía de Artrópodos de México: Hacia una síntesis de su conocimiento*. México: 721–723.

P i n s o n - D o m í n g u e z O. N., L u n a - S a l a s J. F., K a s p a r y a n D. R. 2005. Registro de *Calliephialtes grapholithae* (Cresson) (Hymenoptera: Ichneumonidae) parasitando lepidópteros plaga en rueznos de nogal en Jaumave, Tamaulipas, Mexico. *Memorias XXVIII Congreso Nacional de Control Biológico (San Miquel de Allende, Guanajuato, Mexico, Noviembre 2005)*: 25–28.

R u í z - C a n c i n o E., C o r o n a d o - B l a n c o J. M., K a s p a r y a n D. R., K h a l a i m A. I. 2010. Ichneumonidae (Hymenoptera) en México. *In*: T o l e d o V. H. H., C o r o n a A. M. L., F l o r e s A. P., T o v a r E. S., C o r o n a d o - B l a n c o J. M., R u í z - C a n c i n o E. (Eds). *II Taller Internacional sobre Recursos Naturales. Memoria (Cuernavaca, Morelos, México, Marzo 2010)*: 51–56.

R u í z - C a n c i n o E., K a s p a r y a n D. R., C o r o n a d o - B l a n c o J. M. 2002. 37. Ichneumonidae. *In*: L l o r e n t e B o u s q u e t s J., M o r r o n e J. J. (Eds). *Biodeversidad, Taxonomía y Biogeografía de Artrópodos de México: Hacia una síntesis de su conocimiento*. Conabio-Ecosur-Bayer, Mexico: 631–646.

R u í z - C a n c i n o E., K a s p a r y a n D. R., C o r o n a d o - B l a n c o J. M., H e r n á n d e z - A g u i l a r S. G. 2005a. 42. Hymenoptera, Ichneumonidae. *In*: S á n c h e z - R a m o s G., R e y e s - C a s t i l l o P., D i r z o R. (Eds). *Historia Natural de la Reserva Biosfera El Cielo, Tamaulipas, México*: 454–463.

R u í z - C a n c i n o E., K a s p a r y a n D. R., C o r o n a d o - B l a n c o J. M., H e r n á n d e z - A g u i l a r S. G. 2005b. 43. Hymenoptera, Ichneumonidae: Pimplinae. *In*: S á n c h e z - R a m o s G., R e y e s - C a s t i l l o P., D i r z o R. (Eds). *Historia Natural de la Reserva Biosfera El Cielo, Tamaulipas, México*: 464–470.

References

B o r d e r a S., G o n z á l e z - M o r e n o A., K h a l a i m A. I., S ä ä k s j ä r v i I. E. 2014. Revision of North American species of *Clistopyga* (Hymenoptera: Ichneumonidae: Pimplinae). *The Canadian Entomologist*. doi: 10.4039/tce.2013.74 [Published online: 10 Jan. 2014]

B o r d e r a S., G o n z á l e z - M o r e n o A., S ä ä k s j ä r v i I. E., V e i j a l a i n e n A. 2010. Three new large-bodied species of *Labena* (Hymenoptera: Ichneumonidae: Labeninae), with a key to the Neotropical striata species group. *The Canadian Entomologist*, **142:** 103–119.

D a s c h C. E. 1979. Ichneumon-flies of America north of Mexico: 8. Subfamily Cremastinae. *Memoirs of the American Entomological Institute*, **29:** 1–702.

D a s c h C. E. 1984. Ichneumon-flies of America north of Mexico: 9. Subfamilies Theriinae and Anomaloninae. *Memoirs of the American Entomological Institute*, **36:** 1–610.

D a s c h C. E. 1992. The Ichneumon-flies of America north of Mexico: Part 12. Subfamilies Microleptinae, Helictinae, Cylloceriinae and Oxytorinae (Hymenoptera: Ichneumonidae). *Memoirs of the American Entomological Institute*, **52:** 1–470.

G a u l d I. D. 1991. The Ichneumonidae of Costa Rica, 1. Introduction, keys to subfamilies, and keys to the species of the lower Pimpliform subfamilies Rhyssinae, Poemeniinae, Acaenitinae and Cylloceriinae. *Memoirs of the American Entomological Institute*, **47:** 1–589.

G a u l d I. D. 2000. The Ichneumonidae of Costa Rica, 3. Introduction and keys to species of the subfamilies Brachycyrtinae, Cremastinae, Labeninae and Oxytorinae, with an appendix on the Anomaloninae. *Memoirs of the American Entomological Institute*, **63:** 1–453.

G a u l d I. D., S i t h o l e R., G ó m e z J. U., G o d o y C. 2002. The Ichneumonidae of Costa Rica. 4. *Memoirs of the American Entomological Institute*, **66:** 1–768.

G a u l d I. D., U g a l d e - G ó m e z J. A., H a n s o n P. 1998. Guía de los Pimplinae de Costa Rica (Hymenoptera: Ichneumonidae). *Revista de Biologia Tropical*, **46**, suppl. 1: 1–189.

G a u l d I. D., W a h l D. 1997. The Ichneumonidae of Costa Rica, 2. Introduction and keys to species of the smaller subfamilies Anomaloninae, Ctenopelmatinae, Diplazontinae, Lycorininae, Phrudinae, Tryphoninae (excluding *Netelia*) and Xoridinae, with an appendix on the Rhyssinae with a cladistic analysis of the genera and subgenera of Xoridinae. *Memoirs of the American Entomological Institute*, **57:** 1–485.

G o n z á l e z - M o r e n o A., B o r d e r a S. 2011. New records of Ichneumonidae (Hymenoptera: Ichneumonoidea) from Mexico. *Zootaxa*, **2879:** 1–21.

G o n z á l e z - M o r e n o A., B o r d e r a S. 2012a. The Ichneumonidae (Hymenoptera: Ichneumonoidea) of Ría Lagartos Biosphere Reserve, Yucatán, Mexico. *Zootaxa*, **3230:** 1–51.

G o n z á l e z - M o r e n o A., B o r d e r a S. 2012b. Review of Mexican species of *Podogaster* Brullé (Hymenoptera: Ichneumonidae: Anomaloninae) with description of two new species. *Neotropical Entomology*, **42**(1): 39–51. doi: 10.1007/s13744-012-0082-4

H e i n r i c h G. H. 1977. Ichneumoninae of Florida and neighboring states (Hymenoptera: Ichneumonidae, subfamily Ichneumoninae). *Arthropods of Florida and neighboring land areas*, **9:** 1–350.

K h a l a i m A. I. 2002. Two new species of the genus *Barycnemis* Förster from Mexico (Hymenoptera: Ichneumonidae, Tersilochinae). *Zoosystematica Rossica*, **11**(1): 167–169.

K h a l a i m A. I., F i g u e r o a d e l a R o s a J. I., M a r t í n e z - C a s t i l l o A. M., P i n e d a - G u i l l e r m o S., R u í z - C a n c i n o E. 2013. Contribution to the study of Mexican species of *Oedemopsis* Tschek, 1869 (Hymenoptera: Ichneumonidae: Tryphoninae). *Russian Entomological Journal*, **22**(4): 297–300.

K h a l a i m A. I., H e r n á n d e z - A g u i a r S. A. (2008) 2009. Review of the genus *Clistopyga* Grav., 1829 of Mexico (Hymenoptera: Ichneumonidae: Pimplinae). *Russian Entomological Journal*, **17**(3): 311–315.

K h a l a i m A. I., R u í z - C a n c i n o E. 2007. A new species of the genus *Xorides* from Mexico (Hymenoptera: Ichneumonidae). *Zoosystematica Rossica*, **16**(2): 269–270.

K h a l a i m A. I., R u í z - C a n c i n o E. 2008. A new species of *Alloplasta* from Mexico (Hymenoptera: Ichneumonidae: Banchinae). *Zoosystematica Rossica*, **17**(1): 81–82.

K h a l a i m A. I., R u í z - C a n c i n o E. 2009. Mexican species of *Labena* Cresson (Hymenoptera, Ichneumonidae) with description of a new species. *ZooKeys*, **5:** 65–74. doi: 10.3897/zookeys.5.62

K h a l a i m A. I., R u í z - C a n c i n o E. 2010. First record of the genus *Odontocolon* Cushman, 1942 from Mexico (Hymenoptera: Ichneumonidae: Xoridinae). *Zoosystematica Rossica*, **19**(2): 354–356.

K h a l a i m A. I., R u í z - C a n c i n o E. 2011a. North and Central American species of the genus *Flacopimpla* Gauld (Hymenoptera: Ichneumonidae: Pimplinae), with description of a new species from Mexico. *Proceedings of the Zoological Institute RAS*, **315**(1): 70–74.

K h a l a i m A. I., R u í z - C a n c i n o E. 2011b. Mexican species of *Colpotrochia* Holmgren, 1856 and *Cubus* Townes & Townes, 1959 (Hymenoptera: Ichneumonidae: Metopiinae). *Russian Entomological Journal*, **20**(1): 71–73.

K h a l a i m A. I., R u í z - C a n c i n o E. 2012. Mexican species of *Exetastes* (Hymenoptera: Ichneumonidae: Banchinae), with description of three new species. *Revista Mexicana de Biodiversidad*, **83:** 370–379.

K h a l a i m A. I., R u í z - C a n c i n o E. 2013a. A new species of *Megarhyssa* Ashmead (Hymenoptera: Ichneumonidae: Rhyssinae) from tropical Mexico with a key to Mexican species. *Zootaxa*, **3619**(2): 195–200. doi: 10.11646/zootaxa.3619.2.7

K h a l a i m A. I., R u í z - C a n c i n o E. 2013b. Mexican species of the genus *Stethantyx* Townes (Hymenoptera, Ichneumonidae, Tersilochinae). *Zookeys*, **360:** 83–94. doi: 10.3897/zookeys.360.6362

K h a l a i m A. I., R u í z - C a n c i n o E., C o r o n a d o - B l a n c o J. M. 2012. A new genus and species of Metopiinae (Hymenoptera, Ichneumonidae) from Mexico. *Zookeys*, **207:** 1–10. doi: 10.3897/zookeys.207.3339

K h a l a i m A. I., R u í z - C a n c i n o E., C o r o n a d o - B l a n c o J. M. 2013. New records of two rare species of the genus *Phytodietus* Gravenhorst, 1829 (Hymenoptera: Ichneumonidae: Tryphoninae) from Mexico. *Russian Entomological Journal*, **22**(2): 137–139.

L ó p e z - O r t e g a M., K h a l a i m A. I. 2012. First record of *Calliephialtes sittenfeldae* associated with the tephritid fruit fly *Anastrepha spatulata* in Mexico. *Journal of Insect Science*, **12**(34): 1–8. doi: 10.1673/031.012.3401

M o r r o n e J.J., M á r q u e z J. 2008. Biodiversity of Mexican terrestrial arthropods (Arachnida and Hexapoda): a bio-geographical puzzle. *Acta Zoológica Mexicana (n.s.)*, **24**(1): 15–41.

R u í z - C a n c i n o E., K h a l a i m A.I., C o r o n a d o - B l a n c o J.M. 2010. Hallazgo de *Banchopsis caudatus* Kasparyan & Ruíz (Hymenoptera: Ichneumonidae: Banchinae) en el estado de Hidalgo, México. *Acta Zoológica Mexicana*, **26**(1): 245–247.

T o w n e s H.K. 1983. Revisions of twenty genera of Gelini (Ichneumonidae). *Memoirs of the American Entomological Institute*, **35:** 1–281.

T o w n e s H.K., G u p t a V.K. 1962. Ichneumon-flies of America north of Mexico: 4. Subfamily Gelinae, tribe Hemigasterini. *Memoirs of the American Entomological Institute*, **2:** 1–305.

T o w n e s H.K., G u p t a V.K., T o w n e s M. 1992. The Ichneumon-flies of America north of Mexico, Part 11. Tribes Oedemopsini, Tryphonini and Idiogrammatini (Hymenoptera: Ichneumonidae: Tryphoninae). *Memoirs of the American Entomological Institute*, **50:** 1–296.

T o w n e s H.K., T o w n e s M. 1959. Ichneumon-flies of America north of Mexico: 1. Subfamily Metopiinae. *United States National Museum Bulletin*, **216**(1): 1–318.

T o w n e s H.K., T o w n e s M. 1960. Ichneumon-flies of America North of Mexico: 2. Subfamilies Ephialtinae, Xoridinae, Acaenitinae. *United States National Museum Bulletin*, **216**(2): 1–676.

T o w n e s H.K., T o w n e s M. 1962. Ichneumon-flies of America north of Mexico: 3. Subfamily Gelinae, tribe Mesostenini. *United States National Museum Bulletin*, **216**(3): 1–602.

T o w n e s H.K., T o w n e s M. 1966. A catalogue and reclassification of the Neotropic Ichneumonidae. *Memoirs of the American Entomological Institute*, **8:** 1–367.

T o w n e s H.K., T o w n e s M. 1978. Ichneumon-flies of America north of Mexico: 7. Subfamily Banchinae, tribes Lissonotini and Banchini. *Memoirs of the American Entomological Institute*, **26:** 1–614.

Z u ñ i g a - R a m i r e z R.J. 2004. The taxonomy and biology of the *Polycyrtus* species (Hymenoptera: Ichneumonidae, Cryptinae) of Costa Rica. *Contributions of the American Entomological Institute*, **33**(4): 1–159.

Y u D.S.K., v a n A c h t e r b e r g C., H o r s t m a n n K. 2012. *Taxapad 2012, Ichneumonoidea 2011*. Database on flash-drive. www.taxapad.com, Ottawa, Ontario, Canada.

Revision of the world species of *Chiloplatys* Townes (Hymenoptera: Ichneumonidae: Tryphoninae)

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Ревизия мировой фауны рода *Chiloplatys* Townes (Hymenoptera: Ichneumonidae: Tryphoninae)

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Abstract. The world species of *Chiloplatys* Townes (Hymenoptera: Ichneumonidae: Tryphoninae) are revised including re-descriptions of the two previously described species: *C. mexicanus* (Cresson) and *C. lucens* Townes et Townes. The genus is endemic to the Neotropical region (previously known from only Mexico and Costa Rica) and is one of only eight genera of the tribe Tryphonini from the region. Ten new species are described: *C. alophos* **sp. n.**, *C. cenodontis* **sp. n.**, *C. convergens* **sp. n.**, *C. divergens* **sp. n.**, *C. dmitrii* **sp. n.**, *C. fasciatus* **sp. n.**, *C. kalyx* **sp. n.**, *C. melanosoma* **sp. n.**, *C. oaxacaensis* **sp. n.**, and *C. verticalis* **sp. n.** The genus contains two monophyletic species groups: the *C. lucens* group and the *C. mexicanus* group. New country records for the genus are noted for Guatemala, Nicaragua and Ecuador, the latter being the first record of the genus from South America. A key to species is provided.

Key words. *Chiloplatys*, Ichneumonidae, Tryphoninae, Neotropical, revision.

Резюме. Ревизована мировая фауна рода *Chiloplatys* Townes (Hymenoptera: Ichneumonidae: Tryphoninae), включая переописания 2 ранее описанных видов *C. mexicanus* (Cresson) и *C. lucens* Townes et Townes. Этот род – эндемик Неотропической области (ранее был известен только из Мексики и Коста-Рики) и один из 8 родов трибы Tryphonini, распространенных в этой области. Описаны 10 новых видов: *C. alophos* **sp. n.**, *C. cenodontis* **sp. n.**, *C. convergens* **sp. n.**, *C. divergens* **sp. n.**, *C. dmitrii* **sp. n.**, *C. fasciatus* **sp. n.**, *C. kalyx* **sp. n.**, *C. melanosoma* **sp. n.**, *C. oaxacaensis* **sp. n.** и *C. verticalis* **sp. n.** Род включает 2 монофилетические группы видов: *C. lucens* и *C. mexicanus*. Представители рода впервые отмечены в Гватемале, Никарагуа и Эквадоре, причем последнее указание дается впервые для Южной Америки. Дан определительный ключ видов *Chiloplatys*.

Ключевые слова. *Chiloplatys*, Ichneumonidae, Tryphoninae, Неотропики, ревизия.

Introduction

The tribe Tryphonini is poorly represented in the Neotropical region with only 8 of 22 extant genera recorded (Yu *et al.*, 2012). In addition to *Chiloplatys* Townes recorded previously from southern Mexico and Costa Rica (Townes *et al.*, 1992; Gauld, 1997), the following genera are known: *Boethella* Bennett from Mexico, Peru and Brazil (Bennett, 2003), *Boethus* Förster from Mexico, Costa Rica, Brazil

and Argentina (Townes *et al.*, 1992; Gauld, 1997; Graf, Kumagai, 2002; Scaramozzino, 1992); *Lagoleptus* Townes from Mexico, Costa Rica and Guatemala (Gauld, 1997; Kasparyan, 2007); *Leviculus* Townes from Colombia (Townes, 1969); *Monoblastus* from Mexico (Townes *et al.*, 1992); *Otoblastus* Förster from Mexico and Venezuela) and *Polyblastus* Hartig from Costa Rica (Gauld, 1997). Including the two described species of *Chiloplatys*: *C. mexicanus* (Cresson) and the type species, *C. lucens* Townes et Townes, there are currently only 22 described species of Tryphonini in the Neotropical region (Yu *et al.*, 2012).

Nothing is known of the biology of *Chiloplatys*; however, all but one of the substantiated host records of the tribe Tryphonini are from sawflies (Hymenoptera). The one exception to this is that the European *Grypocentrus basalis* Ruthe has been reared from *Eriocrania* spp. (Lepidoptera: Eriocraniidae) (Heath, 1961; Jordan, 1998). Therefore it is expected that *Chiloplatys* spp. parasitize sawflies. Of the ten genera of Tryphonini for which hosts are known, only two have been reared from hosts other than Tenthredinidae: *Boethus* species have been consistently reared from Argidae (Hymenoptera) (Gauld, 1997) and *G. basalis* from Lepidoptera (but most *Grypocentrus* spp. host records are from Tenthredinidae). For this reason it is further speculated that *Chiloplatys* spp. also parasitize Tenthredinidae.

The placement of *Chiloplatys* within Tryphoninae is confirmed by the fact that some females have been caught bearing stalked eggs hanging from the ventral surface of their ovipositor (Figs 73–75), a trait that is a uniquely derived synapomorphy of Tryphoninae (Bennett, 2002). Furthermore, the genus is placed within tribe Tryphonini on the basis of the presence of pectinate claws, lack of notauli (grooves on the mesoscutum) and a well-sclerotized ventral valve of the ovipositor, as opposed to the tribe Oedemopsini in which species always have simple claws, generally have long notauli and possess at least a partial lack of sclerotization of the ventral valve of the ovipositor. Nevertheless, most specimens of *Chiloplatys* lack fore wing vein 3*rs-m* which is relatively rare for Tryphonini (but common for Oedemopsini), and when Townes and Townes (1945) described the genus, they placed it within their Eclytini (= Oedemopsini) (see *Literature* section for the genus *Chiloplatys*, below).

The purpose of this paper is to revise the genus *Chiloplatys* including description of ten new species. Furthermore, this revision was prepared as part of a commemorative issue honouring Dr Dmitri Kasparyan's 75th birthday. A revision of *Chiloplatys* was chosen to honour Dr. Kasparyan because he is a world expert on Tryphoninae and worked in Mexico for several years increasing our knowledge of the Mexican ichneumonid fauna greatly. Mexico is home to 10 of the 12 known species of *Chiloplatys*, of which 8 are endemic to the country.

Material and methods

All terms of ichneumonid morphology follow Townes (1969) with the following modifications: hypostomal carina for "oral carina", supra-antennal area for "frons", supraclypeal area for "face", gena for "temple", occiput for "postocciput", malar space for "cheek", epicnemial carina for "prepectal carina", laterotergites for "epipleura", gonoforceps for "claspers", and hypopygium for "subgenital plate". The term "mesosoma" is used for the body region that includes the thorax and first abdominal segment (the propodeum). The term "metasoma" is used for the apparent abdomen. Terms of relative position of the body follow Goulet and Huber (1993) (e.g., the dorsal surface of the legs is the upper surface when the legs are stretched out horizontally away from the body). Wing venation terms follow the Comstock-Needham system as updated by Ross (1936) and incorporate the recommendations of Goulet and Huber (1993) except for naming of the vein that forms the distal edge of fore wing cell 1+2*Rs* (the "areolet" of Townes, 1969). This vein is of uncertain origin and is here referred to as "vein 3*rs-m*" in conformity with Wahl and Gauld (1998). Abscissae of veins are indicated as follows: first abscissa of *Cu* = 1/*Cu*, second abscissa = 2/*Cu*, etc. The following terms for specialized structures are defined: epomia: a raised ridge (carina) on pronotum (Fig. 20); glymma: lateral depression sub-basally on tergite 1; notaulus: longitudinal groove sublaterally on mesoscutum (absent in *Chiloplatys*); and sternaulus: longitudinal groove subventrally on mesopleuron. The term reclivous refers to a wing cross vein that has its anterior end further away from the body than the posterior end (used with reference to fore wing vein 2*rs-m*) (Fig. 56 inset).

Measurements for particular structures were made as follows: supraclypeal width was measured at midheight compared to height in the middle (laterally); supraclypeal protuberance length measured in profile versus width at midheight measured in anterior view; distance from mandible to point of union of hypostomal and occipital carinae was measured as the distance of a tangent line from the lateral edge of

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the posterior mandibular condyle to the point of union (compared to the basal width of the mandible); hind femur dimensions were calculated by dividing the maximum length (not including the trochantellus) by the height at midpoint; length of tergite 1 measured in lateral view compared to width of tergite 1 measured in dorsal view at posterior edge. Measurements of holotypes are shown in parentheses after range. Characters listed in the generic description are those deemed relevant to distinguish *Chiloplatys* from all other genera of Tryphonini as defined by Townes (1969), Kasparyan (1973), Kasparyan and Tolkanitz (1999), and Bennett (2002).

Specimens are deposited at the following institutions: Canadian National Collection of Insects, Ottawa (CNC); the Natural History Museum, London, UK (BMNH); Instituto Nacional de Biodiversidad, Costa Rica (INBio), Texas A&M University, USA (TAMU), Universidad Autónoma de Tamaulipas, Cd. Victoria, Mexico (UAT) and the University of Turku, Finland (ZMUT). Label data for holotypes is reported *verbatim* from the labels (written in quotes), with depositories indicated in parentheses. Locality data for other specimens are provided in a standardized format. In the descriptions, measurements of holotypes are noted in square brackets for characters that vary between specimens.

Digital photos were taken using a Leica MZ16 stereomicroscope with motorized focus drive attached to a Leica DFC420 digital camera. Photos were combined and edited using Leica Application Suites Montage Multifocus software V3.8, Auto-Montage Pro 5.01 and Adobe Photoshop CS4. Authorship of all species is Bennett and Barnes.

Molecular sequences of the DNA barcode region of cytochrome oxidase I were obtained at either the Canadian Centre for DNA Barcoding, University of Guelph, Canada (CCDB) or the CNC. Primer pairs used to amplify particular DNA fragments are shown in Table 1 along with the fragment size and literature references that provide detailed methods with respect to protocols for each primer. Specimens that were sequenced at CCDB used primer pairs 1 and 2. Specimens sequenced at the CNC used primer pairs 3 and/or 4. For primers 3 and 4, 7.5 ul of GoTaq G2 Mastermix was used in a 15 ul reaction (1.5 ul of template and 0.6 ul of each primer). A two-step PCR cycling protocol was used as follows: 94°C for 5 min; 6 cycles of 94°C for 40 sec, 45°C for 40 sec; 72°C for 1min followed by 40 cycles of 94°C for 40 sec, 51°C for 40 sec and 72°C for 1 min and a final 72°C for 5 min and hold at 10°C. Specimens sequenced are listed in Table 2 including DNA voucher numbers, sequence length, institution where sequencing was performed and Genbank accession numbers. DNA was obtained from dried specimens as old as 1964 (48 to 49 years old at time of sequencing). See *Material examined* sections of each species for precise locality information and depositories of sequenced specimens.

DNA sequences were aligned using ClustalW (Thompson *et al.*, 1994) implemented through Bioedit 7.1.3.0 (Hall 1999). Rooting of the ingroup was done by inclusion of four species of *Monoblastus* Hartig that has been hypothesized to be the sister genus to *Chiloplatys* (Townes, Townes, 1950; Bennett,

Table 1. Primers used in PCR reactions to obtain DNA barcode region of COI.

Fragment	PCR Primer Name	Sequence (5′- 3′)	Fragment size (bp)	Reference
1	LepF1	ATTCAACCAATCATAAAGATATTGG	319	Hebert *et al.* (2004)
	C_ANTMR1D (cocktail primer 1:1)	RonIIdeg_R = GGRGGRTARAYAGTTC ATCCWGTWCC AMR1deg_R = CAWCCWGTWCCKRM NCCWKCAT		Fisher and Smith (2008)
2	RonMWASPdeg_t1	TGTAAAACGACGGCCAGTGGWTCW CCWGATATAKCWTTTCC	421	Fisher and Smith (2008)
	LepR1	TAAACTTCTGGATGTCCAAAAAATCA		Hebert *et al.* (2004)
3	Ich –COI-F3	CCHCGWATAAATAATATAAGATTYTGA	448	This study
	LepR1	TAAACTTCTGGATGTCCAAAAAATCA		
4	LepF1	ATTCAACCAATCATAAAGATATTGG	369	This study (after Hebert *et al.*, 2013)
	TypeR4	GGDGGRTAWAYWGTTCAWCC		

Table 2. Summary data for specimens of *Chiloplatys* and *Monoblastus* spp. for which DNA barcode region of COI was obtained. See Fig. 76 for relationships of species. CCDB = Canadian Centre for DNA Barcoding, Guelph, Canada. CNC = Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Canada. Numbers following species names indicate non-type specimen numbers in Fig. 76. H = holotype, P = paratype.

Voucher #	Species	Country: State	Base pairs	Sequence facility	Genbank Accession
CNCHYM 013261	*C. divergens* (H)	Mexico: Puebla	404	CNC	KJ591623
CNCHYM 04765	*C. dmitrii* (P)	Mexico: Sinaloa	407	CCDB	KJ591636
CNCHYM 09358	*C. dmitrii* (H)	Mexico: Sinaloa	658	CNC	KJ591631
CNCHYM 013210	*C. kalyx* (H)	Mexico: Puebla	404	CNC	KJ591639
CNCHYM 04766	*C. lucens* (1)	Mexico: Chiapas	569	CCDB	KJ591637
CNCHYM 04767	*C. lucens* (2)	Mexico: Chiapas	573	CCDB	KJ591638
CNCHYM 013211	*C. oaxacaensis* (P)	Mexico: Oaxaca	453	CNC	KJ591626
CNCHYM 013444	*C. alophos* (H)	Costa Rica: Cartago	409	CNC	KJ591635
CNCHYM 09951	*C. fasciatus* (H)	Mexico: Sinaloa	658	CNC	KJ591634
CNCHYM 09952	*C. fasciatus* (P)	Mexico: Sinaloa	604	CNC	KJ591640
CNCHYM 04768	*C. mexicanus* (1)	Mexico: Chiapas	623	CCDB	KJ591633
CNCHYM 09359	*C. mexicanus* (2)	Mexico: Chiapas	658	CNC	KJ591630
CNCHYM 09360	*C. mexicanus* (3)	Mexico: Chiapas	658	CNC	KJ591625
CNCHYM 013437	*C. mexicanus* (15)	Costa Rica: San José	658	CNC	KJ591632
CNCHYM 013262	*C. verticalis* (H)	Mexico: Oaxaca	454	CNC	KJ591627
CNCHYM 05018	*M. brachyacanthus*	Greece	631	CCDB	KJ591624
CNCHYM 05023	*M. davisi*	Canada: Ontario	607	CCDB	KJ591641
CNCHYM 05040	*M. innumerabilis*	Canada: British Columbia	614	CCDB	KJ591629
CNCHYM 05050	*M. macer*	USA: Florida	634	CCDB	KJ591628

2002). To analyze the effect of missing sequence data, two analyses were performed: 1) full sequence analysis regardless of sequence length (missing data included for partial sequences); 2) the largest subset of nucleotides that were obtained for all ingroup and outgroup taxa (missing data excluded for partial sequences). Phylogenetic analysis of sequence data was performed by the criterion of parsimony using TNT (Goloboff *et al.*, 2008). The optimal score was found 20 times using the default settings of "xmult" plus 10 cycles of tree-drifting. The optimal trees found were then imported into Winclada 1.00.08 (Nixon, 2002) for tree-viewing and then exported to NONA 2.0 (Goloboff, 1999) for additional branch-swapping using the command "max" to find the complete set of equally parsimonious cladograms for these starting cladograms. A strict consensus cladogram (Fig. 76) was produced using WinClada and modified with Adobe Photoshop CS4. Support on the preferred cladogram is shown by number of derived nucleotide substitutions for each node or terminal optimized using ACCTRAN which favours reversals over parallelisms.

Results

DNA barcodes were obtained from 15 specimens of *Chiloplatys* (9 species) as well as 4 specimens (4 species) of the sister genus *Monoblastus* (Table 2). Analysis 1 that included missing data (sequence length: 698 base pairs) found 13 equally parsimonious cladograms of length 438 (CI = 0.68; RI = 0.74). *Chiloplatys* was monophyletic in all cladograms and the genus divided into two well-supported monophyletic groups hereby named the *C. lucens* species group and the *C. mexicanus* species group (see *Taxonomy* section below for defining morphological characters and species included). All differences among the 13 trees were minor re-arrangements between particular taxa. Analysis 2 that excluded missing data (sequence length: 401 base pairs) found 1 most parsimonious cladogram of length 324 (CI = 0.65, RI = 0.75). This cladogram was one of the 13 cladograms found by analysis 1, therefore this cladogram was

Table 3. Sequence similarity matrix for DNA barcoding region of COI, based on 400 base pair central region known for all specimens. luc = *Chiloplatys lucens*, kal = *C. kalyx*; dm = *C. dmitrii*; div = *C. divergens*; ver = *C. verticalis*; oax = *C. oaxaensis*; me = *C. mexicanus*; fas = *C. fasciatus*; alo = *C. alophos*. Numbers after abbreviations = non-type specimen numbers in Table 2 and Fig. 76. H = holotype, P = paratype.

	luc1	luc2	kal	dm H	dm P	div	ver	oax	me1	me2	me3	me15	fas H	fas P	alo
luc 1	–														
luc 2	0.2	–													
kal	9.4	9.1	–												
dm H	6.2	5.9	8.5	–											
dm P	6.2	5.9	8.5	0.0	–										
div	7.9	7.6	4.9	6.0	6.0	–									
ver	7.3	7.0	7.7	3.8	3.8	6.5	–								
oax	6.2	5.9	7.4	3.6	3.6	7.0	4.1	–							
me 1	14.1	13.8	12.6	12.0	12.0	13.6	12.3	12.9	–						
me 2	14.1	13.8	12.6	12.0	12.0	13.6	12.3	12.9	0.0	–					
me 3	14.1	13.8	12.6	12.0	12.0	13.6	12.3	12.9	0.0	0.0	–				
me 15	15.0	14.7	13.6	12.9	12.9	14.5	13.2	13.8	0.8	0.8	0.8	–			
fas H	13.1	12.8	13.5	13.8	13.8	13.6	12.2	13.5	4.4	4.4	4.4	5.2	–		
fas P	13.1	12.8	13.5	13.8	13.8	13.3	12.2	13.5	4.4	4.4	4.4	5.2	0.0	–	
alo	13.8	13.4	11.4	12.0	12.0	13.0	12.3	12.9	2.0	2.0	2.0	2.3	5.0	5.0	–

chosen as the preferred topology for discussion of species relationships (Fig. 76). See the *Comments* sections of each species for a discussion of species relationships. Comparison of sequence divergence revealed a 3.8 to 9.4 % difference among species within the *C. lucens* species group, a 2.0 to 5.2 % difference among species within the *C. mexicanus* species group and a 12.8 to 15.0 % difference between the *C. lucens* and *C. mexicanus* species groups (Table 3).

Taxonomy

Chiloplatys Townes et Townes
(Figs 1–75)

Chiloplatys Townes et Townes, 1945: 51.

Type species: *Chiloplatys lucens* Townes et Townes, 1945, by monotypy.

Diagnosis. Distinguished from other genera of the Tryphonini by combination of the following characters: 1) body glabrous with only very fine, setiferous punctures (Figs 22, 46, 73) (except more coarsely punctate on supraclypeal area); 2) propodeum with all longitudinal carinae present anteriorly and/or posteriorly, roughly parallel anteriorly, anterior transverse carina completely absent, posterior transverse carina present (Figs 3, 44). In addition, 7 of 12 described species have a strongly protuberant, pyramidal projection on the supraclypeal area (unique in Tryphonini) (Figs 20–26) and 9 of 12 species have the point of union of the hypostomal and occipital carinae greatly heightened and projecting posteriorly into an angulate projection or lobe (Figs 32–39, 43). The latter structure is not unique within Tryphonini, for example, similar structures are found in *Monoblastus macer* Townes, *Ctenochira marginata* (Holmgren), and some species of *Tryphon* Fallén, for example, *T. rutilator* (Linnaeus).

Description. A d u l t . Body generally glabrous with very sparse, very fine setiferous punctures such that it appears almost impunctate (Figs 22, 46, 73), except supraclypeal area moderately punctate (Figs 16–19). Fore wing length 4.1 to 7.1 mm. Clypeus separated from supraclypeal area by a groove (Fig. 17), flat in profile, not divided into dorsal and ventral faces by a transverse line, apical edge not projecting ventroanteriorly, medially truncate to slightly convex in anterior view; teeth of mandible subequal in length and height or dorsal tooth up to twice as long as ventral. Outer face of mandibles basally moderately convex and moderately punctate; glossa not elongate; posterior mandibular condyles separated by greater width than inner margins of eyes at level of clypeal foveae. Malar space 0.3 to 0.5 times basal width of mandible. Occipital carina complete, joining hypostomal carina at a point 0.5 to 0.8 times basal width of mandible, the point of union heightened and

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directed posteriorly into an angulate projection or rounded lobe (Figs 32–43), the projection weakly projecting posteriorly in three species (Figs 40–42). Supra-antennal area without a medial, glabrous, triangular, vertical depression, without a medial supra-antennal horn or tubercle, but a moderately strong, longitudinal, medial carina present (Fig. 2). Vertex posterior to medial ocellus without a rounded, conical protuberance; distance between inner edges of toruli 0.5 to 0.8 times width of one torulus; dorsoposterior corner of pronotum not strongly thickened. Epomia not forming crest dorsally, not extending to posterior edge of pronotum ventrally (most species) or reaching edge (Fig. 20). Notauli absent. Epicnemial carina joined by
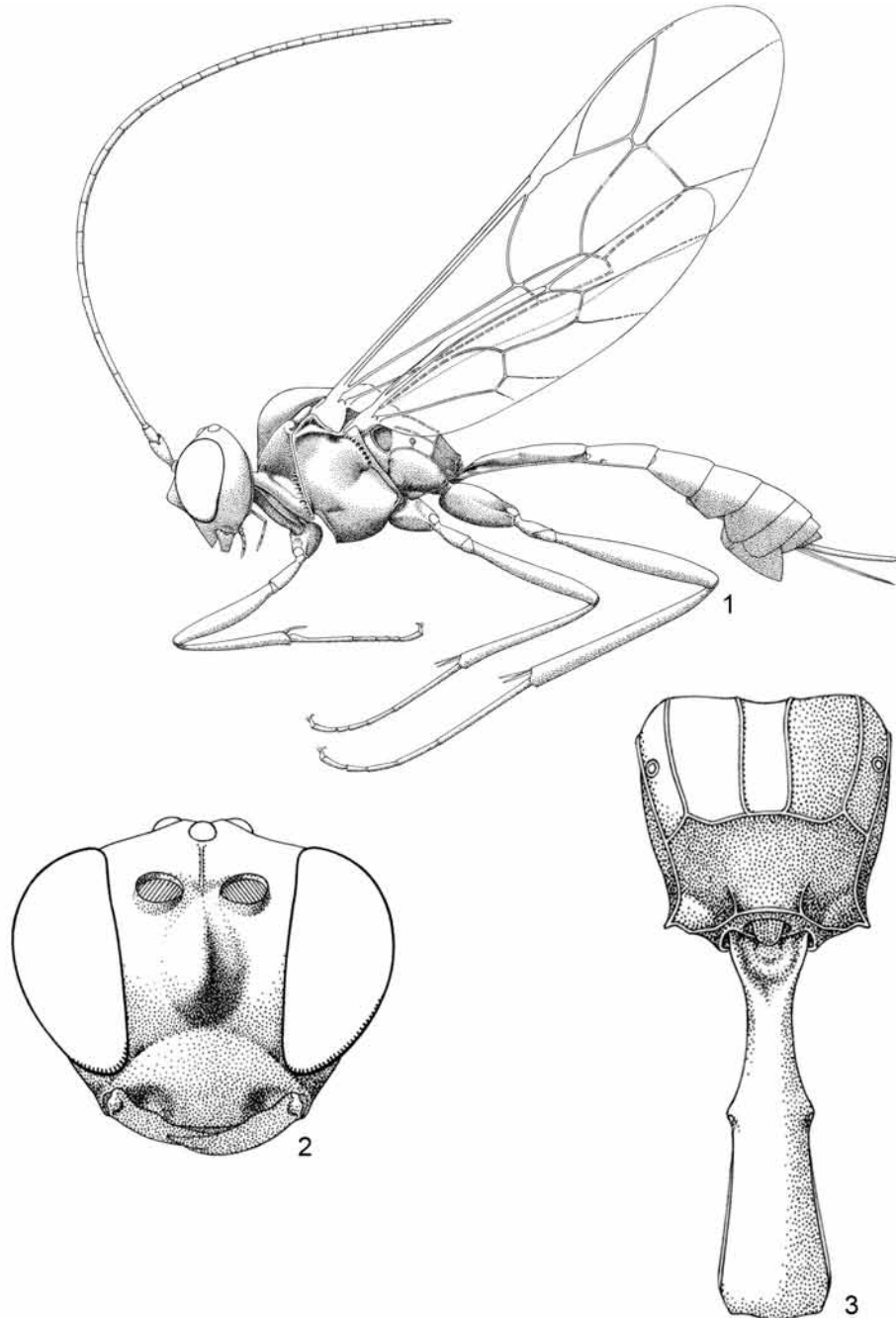
Figures 1–3. *Chiloplatys lucens*. 1 – lateral habitus; 2 – head, anterior; 3 – propodeum and tergite 1, dorsal. Re-drawn after Townes (1969).

an auxiliary carina that extends from anterior edge of mesopleuron, epicnemial carina not extending dorsal to point of union with auxiliary carina; longitudinal carinae of mesopleuron and mesoscutum absent. Angular flange on posterolateral edges of mesoscutum present (wide and angulate), associated "axillary tongue" present. Scutellum entirely dark, lateral carinae incomplete. Propodeum with all londitudinal carinae present except posterior section of lateral longitudinal carinae weak and/or incomplete in some species (Figs 48–49), anterior transverse carina absent, posterior transverse carina present. Fore tibia without a tooth on apex of anterior side. Trochantelli not fused on middle and hind legs. Tarsal claws strongly pectinate in basal 0.4 or nearly to apex. Fore wing vein 3*rs-m* absent (Fig. 57) (most specimens) or present as a vestige anteriorly (Fig. 55), or practically complete (Fig. 56), when present, cell 1+2*Rs* subtriangular, less than 1.4 times as wide as high, petiolate to subpetiolate anteriorly. Fore wing vein 2*m-cu* straight to slightly curved anteriorly, without an angulation (zig-zag), vein with a single long bulla (Fig. 55). Fore wing hyaline. Tergite 1 petiolate or gradually widening from anterior to posterior, relatively slender (2.0 to 3.3 times as long as posterior width), glymma present, anterolateral teeth absent, dorsal longitudinal carinae absent except as an anterior sulcus bordered by rounded edges (Fig. 59), dorsolateral longitudinal carina present and sharp basally, sharp to apex in some species (fig. 59). Spiracle of tergite 1 at about 0.5 (Fig. 59). Tergite 2 without a transverse, postmedial groove, without anterolateral grooves, but medial, sublateral paired swellings present in some species (Fig. 72). Tergites 1 and 2 not fused. Tergites 2 to 4 with yellow or orange at posterior of each segment in most species (Figs 60–63). Laterotergite of metasomal segment 3 divided from tergite by a crease, of metasomal segment 4 not divided (Fig. 63). Tergites 7 and 8 not turned anteriorly under metasoma. Ovipositor longer than apical height of metasoma (Fig. 63), sinuous or straight, dorsal valve apically tapered, ovipositor sheath elongate, flexible at base only or up to 0.5.

M a t u r e   l a r v a . Unknown.

E g g . Elongate ovoid, white or yellowish white, with one very narrow stalk attached subapically, the stalk longer than length of egg, egg surface with surface with or without reticulate sculpture. Anchor unknown. Known for *C. lucens* (Fig. 74), *C. mexicanus*, *C. fasciatus* **sp. n.** (Fig. 75), and *C. oaxacaensis* **sp. n.** (Fig. 73). Note that some eggs appear in a wizened condition, whereas others (of the same species) are not wizened. Likely this is an artefact of air-drying and does not reflect the condition of the egg prior to oviposition. The wizened condition makes it difficult to judge the true surface sculpture of the egg, but it can be stated based on examination of non-wizened eggs that some species have reticulate sculpture, for example, *C. lucens*, whereas others do not such as the *C. mexicanus* specimen from Costa Rica, Escazu (BMNH).

Hosts. Unknown, but probably tenthredinid sawflies (see Introduction).

Distribution. Central to southern Mexico, Guatemala, Nicaragua, Costa Rica and Ecuador (new generic country records for Guatemala, Nicaragua and Ecuador).

Species included. *Chiloplatys lucens*, *C. mexicanus* and ten new species.

Literature. Townes and Townes (1945) described the genus with *C. lucens* as type species. Townes (1946) moved *Tryphon mexicanus* Cresson to *Chiloplatys*. Townes and Townes (1949) moved *Chiloplatys* from Eclytini (= Oedemosini) to Tryphonini. Townes and Townes (1950) re-described *C. lucens* and *C. mexicanus* and provided a key to distinguish the two species; Gauld (1997) did the same.

Comments. Townes and Townes (1950) stated that "*Chiloplatys* seems to be an offshoot of *Monoblastus*", whereas Townes (1969) related the genus to *Lagoleptus* Townes and *Leviculus* Townes. Bennett (2002) supported the relationship of *Chiloplatys* to *Monoblastus* based on four synapomorphies including the complete absence of the notaulus and the ovipositor being longer than the apical height of the metasoma, but shorter than the length of the metasoma.

Key to the world species of *Chiloplatys*

1. Supraclypeal area with a strongly convex medial protuberance that appears roundly pyramidal in profile (Figs 20–26). Tergite 2 evenly convex posterior to thyridia, without any raised swellings medioposterior to spiracles. *C. lucens* species group.. 2

– Supraclypeal area without a strongly convex medial protuberance (Figs 27–31). Tergite 2 with a pair of weak swellings located medioposterior to spiracles (Fig. 72). *C. mexicanus* species group 8

2. Fore and middle coxae and metasoma completely black (Fig. 8) .... ***C. melanosoma* sp. n.** (Ecuador)

– Fore and middle coxae predominantly or completely pale (Figs 4–7, 9–15). Metasoma with at least some lighter markings (Figs 4–7, 9, 10)... 3

3. Hind coxa completely dark brown (Fig. 9). Hind tarsus light brown in basal half of basal tarsomere, yellow apical to that point ....***C. oaxacaensis* sp. n.** (Mexico: Oaxaca)

– Hind coxa with at least some lighter colour (Figs 4–7, 10), although sometimes only a small yellowish spot on inner surface near base. Hind tarsus completely light coloured or completely dark except pale at apex of tarsomeres 1 to 4.. 4

25

4. Hind femur dark (black to dark brown), except pale at extreme base (Figs 6, 7). Hind coxa ranging from brownish yellow basally with a brown longitudinal stripe on external surface from about basal third to apex (Figs 6, 7) to almost completely black, but always with a yellowish spot on inner surface near base. Hind tibia completely or almost completely brown..5

– Hind femur and coxa predominantly to completely pale coloured with no more than a trace of faint dark colour (Figs 4, 5). Hind tibia completely brownish yellow (Fig. 4) or mostly brownish yellow with brown longitudinal markings especially near apex (Fig. 5)..6

5. Tergite 3 with anterior and posterior whitish regions joining medially which when combined with light band on posterior of tergite 2 form a chalice-shaped pale mark (Fig. 62)..
....***C. kalyx* sp. n.** (Mexico: Puebla)

– Tergite 3 with separate anterior and posterior pale-coloured bands (Fig. 63)...
....***C. lucens* Townes et Townes** (central Mexico to Costa Rica)

6(4). Tergites 4 and 5 completely dark (black or dark brown) (Fig. 60). Fused basal and areolar area of propodeum strongly diverging at extreme posterior (Fig. 44)...... ***C. divergens* sp. n.** (Mexico: Puebla)

– Tergites 4 and 5 with some paler colour (white, yellow or orange) (Figs 61, 66). Fused basal and areolar area of propodeum parallel (Fig. 50) or diverging medially but then parallel-sided, not diverging at extreme posterior (Fig. 45)..7

7. Metasomal tergites 4 and 5 predominantly dark with posterior 0.2 to 0.5 ivory or brownish yellow (Fig. 61). Fore wing vein *2rs-m* reclivous (Fig. 5) ....***C. dmitrii* sp. n.** (Mexico: Sinaloa)

– Metasomal tergites 4 and 5 predominantly orange: with some brown marking in anterior 0.1 to 0.3 of segment, the remainder yellow or brownish orange (Fig. 66). Fore wing vein *2rs-m* vertical (Fig. 57)
....***C. verticalis* sp. n.** (Mexico: Oaxaca)

8(1). Union of occipital carina and hypostomal carina not greatly enlarged: hypostomal carina only slightly heightened and not projecting posterior to posterior edge of occipital carina (Figs 40, 41).....9

– Union of occipital carina and hypostomal carina enlarged: hypostomal carina greatly heightened, the point of union projecting slightly to greatly posterior to posterior edge of occipital carina (Figs 42, 43) 10

9. Apical 0.5 of clypeus orange, the rest dark (Fig. 18). Metasomal tergites 2 and 3 predominantly orange (Fig. 69). Combined basal and areolar areas of propodeum strongly converging posteriorly (Fig. 52)...***C. convergens* sp. n.** (Mexico: Veracruz)

– Apical 0.2 of clypeus brownish yellow, the rest dark. Metasomal tergites 2 and 3 predominantly black. (Fig. 68). Combined basal and areolar areas of propodeum subrectangular, only slightly converging posteriorly..***C. cenodontis* sp. n.** (Mexico: Michoacan)

10(8). Hypostomal carina greatly heightened but point of union with occipital carina only slightly projecting posterior to posterior edge of occipital carina (Fig. 42). Tergites 4 and 5 dark (brown to brownish orange) with conspicuous lighter coloured bands in posterior 0.1 to 0.3 (Fig. 70)...............................
....***C. fasciatus* sp. n.** (Mexico: Sinaloa)

– Hypostomal carina greatly heightened and point of union with occipital carina moderately to strongly projecting posterior to posterior edge of occipital carina (Figs 39, 43). Tergites 4 and 5 variously coloured: completely orange (Fig. 71) or dark except with lighter coloured bands posteriorly (Fig. 67).....
....11

11. Lateral longitudinal carina of propodeum between anterior edge and posterior transverse carina incomplete (Fig. 51). Hind coxa yellowish white except dark brown at base (Fig. 11). Tergites 4 and 5 dark brown, with only very thin, light-coloured posterior bands (Fig. 67)...
....***C. alophos* sp. n.** (Costa Rica)

– Lateral longitudinal carina of propodeum between anterior edge and posterior transverse carina complete (similar to Figs 48, 49). Hind coxa yellowish orange to brownish yellow (including basally) (Fig. 15) with some brown marks apically in most specimens. Tergites 4 and 5 completely orange (Fig. 71) or brown to brownish orange with conspicuous lighter colour bands in posterior 0.2 or more
....***C. mexicanus* (Cresson)** (central Mexico to Costa Rica)

26

Figures 4, 5. Lateral habitus, holotypes. 4 – *Chiloplatys divergens* (material extending anterior to mandibles is not part of wasp); 5 – *C. dmitrii*.

Chiloplatys lucens species group

Diagnosis. The *C. lucens* species group can be distinguished from the *C. mexicanus* species group by the presence of a strongly convex, pyramidal, medial protuberance on the supraclypeal area (Figs 20–26). Species in the *C. lucens* group also lack the paired sublateral swellings on metasomal tergite 2 present in species of the *C. mexicanus* group (compare tergite 2 of *C. lucens* group shown in Fig. 63 with tergite 2 of *C. mexicanus* group shown in Fig. 72). In addition, the posterior transverse carina of the propodeum is generally at or anterior to the midlength of the propodeum (Figs 44–50) compared to the *C. mexicanus* group in which this carina is slightly to strongly posterior to the midlength (Figs 51–54).

Species included. The *C. lucens* group includes the type species *C. lucens* Townes et Townes as well as the following new species: *C. divergens* **sp. n.**, *C. dmitrii* **sp. n.**, *C. kalyx* **sp. n.**, *C. melanosoma* **sp. n.**, *C. oaxacaensis* **sp. n.**, and *C. verticalis* **sp. n.** The species group was strongly supported by 17 derived nucleotide substitutions in the DNA barcode region (Fig. 76).

Chiloplatys divergens **sp. n.**

(Figs 4, 20, 32, 44, 60)

Type material. Holotype: female, label 1: "MEXICO: Puebla, 4.7 mi. SW La Cumbre. el. 5100' VII-23-1987, Woolley & Zolnerowich, 87/055"; label 2: "DNA Voucher CNCHYM 013261" (TAMU). Condition of type: intact except right antenna broken, distal 17 flagellomeres glued to point, other flagellomeres missing, right mid leg missing, material held in mandibles (Fig. 4).

Diagnosis. *Chiloplatys divergens* **sp. n.** can be distinguished from all other species of *Chiloplatys* by combination of: 1) supraclypeal area with a convex, medial protuberance that appears roundly pyramidal in profile (Fig. 20); 2) hind coxa brownish yellow, without any dark colour (Fig. 4); 3) tergites 4 and 5 completely black (except for very narrow, inconspicuous brownish colouring at extreme apices) (Fig. 60); 4) fused basal and areolar area of propodeum strongly diverging posteriorly near posterior transverse carina (Fig. 44). Whereas specimens of some other species of *Chiloplatys* have the fused basal and areolar area of the propodeum divergent medially (e.g., holotype of *C. dmitrii* **sp. n.**), no specimens are as strongly divergent at the extreme posterior of the area.

Description. A d u l t . F e m a l e . Fore wing length 6.0 mm. Supraclypeal area 1.2 times as wide at midheight as high, with a strongly convex medial protuberance that is about 0.5 times as long in profile (Fig. 20) as wide. Clypeus 1.8 times as wide as high. Dorsal tooth of mandible only slightly longer than ventral tooth. Malar space 0.4 times basal width of mandible. Ocello-ocular distance 1.8 times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by about 0.8 times basal width of mandible, this point extended ventrally and posteriorly into a strongly projecting, acutely angulate projection (Fig. 32). Antennal flagellum with 32 segments.

Epomia ventroposteriorly strong, joining horizontal carinulae extending from posterior edge of pronotum (Fig. 20). Lateral longitudinal carinae of propodeum complete from anterior edge of propodeum to posterior transverse carina, complete and strong from posterior transverse carina to posterior edge of propodeum (Fig. 44). Posterior transverse carina of propodeum located near midlength of propodeum, straight between medial longitudinal carinae except gently curving posteriorly near points of union of medial longitudinal carinae, then straight between medial and lateral longitudinal carinae. Combined basal and areolar areas strongly divergent posteriorly near posterior transverse carina (Fig. 44). Hind femur 5.4 times as long as medial width. Hind tarsal claw pectinate to about 0.6. Fore wing areolet with vein 2*rs-m* thickened anteriorly, slightly reclivous, length slightly longer than length of vein *M* between 2*rs-m* and vein 2*m-cu*. Hind wing vein 2/*Cu* about equidistant between vein *A* and vein *M*.

Tergite 1 of metasoma 2.9 times as long as apical width. Dorsolateral longitudinal carinae of tergite 1 not extending posterior to spiracle. Tergite 2 about as long as apical width (Fig. 60), anterior half uniformly convex, without a sublateral, rounded swelling on each side. Ovipositor sheath 0.4 times length of hind tibia.

Black. Antenna, dorsoposterior corner of pronotum and tegula brownish yellow, the former darkening to light brown apically. Apical 0.3 of clypeus reddish brown. Mandibles except at apex, palpi, fore and mid coxa, trochanters and trochantelli and apex of femora ivory, the mid leg slightly darker. Remainder of legs brownish yellow, posterior legs darker than anterior. Posterior 0.1 of tergite 1, anterior and posterior 0.2 of tergite 2, thyridia, anterior and posterior 0.3 of tergite 3 and extreme apex of tergite 6 brownish yellow, the lighter colour greater near midline (laterally) of segments, thus forming ovoid or triangular spots (Fig. 60). Laterotergites and sternites of metasoma including hypopygium ivory. Ovipositor sheaths brown.

M a l e . Unknown.

E g g . Unknown.

Molecular sequences. Partial DNA barcode region known for female holotype (Table 2).

28

Etymology. The species name is an adjective meaning diverging which refers to the fused basal and areolar area of the propodeum that is strongly divergent posteriorly near the posterior transverse carina (Fig. 44).

Figures 6, 7. Lateral habitus, holotype. 6 – *Chiloplatys kalyx*; 7 – *C. lucens*.

Comments. Within the *C. lucens* species group, *C. divergens* **sp. n.** shares the light colour of the hind coxa with *C. dmitrii* **sp. n.** and *C. verticalis* **sp. n.** It differs from these species in the colour of tergite 4 and 5 which is completely dark (conspicuous wide posterior pale coloured bands in *C. dmitrii* **sp. n.** and predominantly orange in *C.verticalis* **sp. n.** The phylogenetic analysis based on the DNA barcode region found *C. divergens* **sp. n.** to be the sister species to *C. kalyx* **sp. n.** (Fig. 76).

Chiloplatys dmitrii **sp. n.**

(Figs 5, 21, 33, 45, 61)

Type material. Holotype: male, label 1: "MEX. Sin. 15 mi. W. El Palmito, 5000' 8 July 1964. W.R.M. Mason"; label 2: "DNA Voucher CNCHYM 09358" (CNC). Condition: intact except missing left mid leg beyond coxa.

Paratypes. 1 male (AEIC), as holotype; 5 males (CNC), as holotype except 11.vii, 20.vii, 30.vii, 4.viii CNCHYM 04765, and 8.vii.

Diagnosis. Chiloplatys dmitrii **sp. n.** can be distinguished from all other species of *Chiloplatys* by combination of the following characters: 1) supraclypeal area with a convex, medial protuberance that appears roundly pyramidal in profile (Fig. 21); 2) hind femur yellow; 3) metasomal tergites 4 and 5 predominantly dark brown to black (not orange) with posterior 0.2 to 0.5 ivory or brownish yellow; 4) fused basal and areolar region of propodeum not diverging strongly posteriorly near posterior transverse carina, either diverging medially and parallel-sided posteriorly (Fig. 45) or entire area roughly parallel-sided therefore subrectangular.

Description. A d u l t . M a l e . Fore wing length 4.5 to 6.8 [4.5] mm. Supraclypeal area 1.3 to 1.4 [1.3] times as wide at midheight as high, with a convex medial protuberance that is 0.5 to 0.7 [0.6] times as long in profile (Fig. 21) as wide. Clypeus 1.6 to 1.9 [1.6] times as wide as high. Dorsal tooth of mandible about twice as long as ventral tooth. Malar space 0.3 to 0.5 [0.4] times basal width of mandible. Ocello-ocular distance 1.6 to 1.8 [1.6] times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.5 to 0.8 [0.8] times basal width of mandible, this point extended ventrally and posteriorly into a strongly protruding, roughly right-angled, angulate projection (Fig. 33). Antennal flagellum with 26 to 32 [26] segments.

Epomia ventroposteriorly strong, joining horizontal carinulae that extend from posterior edge of pronotum. Lateral longitudinal carinae of propodeum complete from anterior of propodeum to posterior transverse carina, complete or incomplete [complete] from posterior transverse carina to posterior of propodeum (Fig. 45). Posterior transverse carina of propodeum located near midlength of propodeum, straight or slightly arcuate [straight] between medial longitudinal carinae, slightly to moderately [moderately] angled at points of union with medial longitudinal carinae and slightly to strongly [strongly] arcuate between medial and lateral longitudinal carinae. Combined basal and areolar areas moderately narrow basally, divergent medially and then roughly parallel posteriorly (Fig. 45), some specimens wider basally and less divergent medially, therefore the area subrectangular. Hind femur 5.2 to 5.6 [5.6] times as long as medial width (Fig. 5). Hind tarsal claw pectinate to about half length with at least three pectinations, the pectination third from the apex longest and stoutest, but shorter than claw. Fore wing areolet with vein *2rs-m* slightly reclivous, slightly to greatly [slightly] longer than length of *M* between *2rs-m* and *2m-cu*, *2rs-m* of uniform width (Fig. 5) or strongly thickened anteriorly, some specimens with a very small remnant of vein *3rs-m* anteriorly [uniform width]. Hind wing vein *2/Cu* slightly closer to vein *M* than vein *A*.

Tergite 1 of metasoma 2.5 to 2.9 [2.9] times as long as apical width (Fig. 61). Dorsolateral longitudinal carinae not extending posterior to spiracle. Tergite 2 0.9 to 1.1 [1.1] times as long as apical width, anterior half uniformly convex sublaterally, without paired, sublateral rounded swellings posterior to spiracles.

Black. Basal half of mandibles, palpi, tegula, fore and mid coxae, trochanters and trochantelli, posterior 0.1 of metasomal tergite 1, anterior 0.1 and posterior 0.2 of tergite 2, thyridia, anterior and posterior 0.1 to 0.2 of tergite 3 (light colour greater along midline), anterior 0.1 and posterior 0.2 along midline (not laterally) of tergite 4, posterior 0.4 of tergite 5 along midline (not laterally), posterior 0.5 of tergite 6, tergite 7 except anterolaterally, laterotergites, hypopygium and gonoforceps yellowish white. Apical half of mandibles except extreme apex, scape, pedicel, flagellum basally, dorsoposterior corner of pronotum and leg parts not noted above yellow, the femora and hind coxa dark yellow, the tibiae and tarsi more yellowish brown with hind tibia darker on ventral surface. Apex of mandibles and apical flagellomeres brown. Metasoma black or dark brown [dark brown] anteriorly compared to dark or light [light] brown posteriorly.

F e m a l e . Unknown.

E g g . Unknown.

Variation. The areas that are yellowish white can be more brownish white, especially on the mandibles, tegula and the banding on the metasoma. Some specimens have a small amount of brown apically on hind coxa. The amount of yellowish white on tergites 3 and 4 varies: in one specimen the white anterior and posterior bands almost meet medially, with only a narrow dark region separating them. Tergite 7 of metasoma can be completely yellowish white.

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Molecular sequences. DNA barcode region known for male holotype and one male paratype (CNC) (Table 2).

Etymology. This species is named in honour of Dr Dmitri Kasparyan (Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia) for his contributions to ichneumonid taxonomy
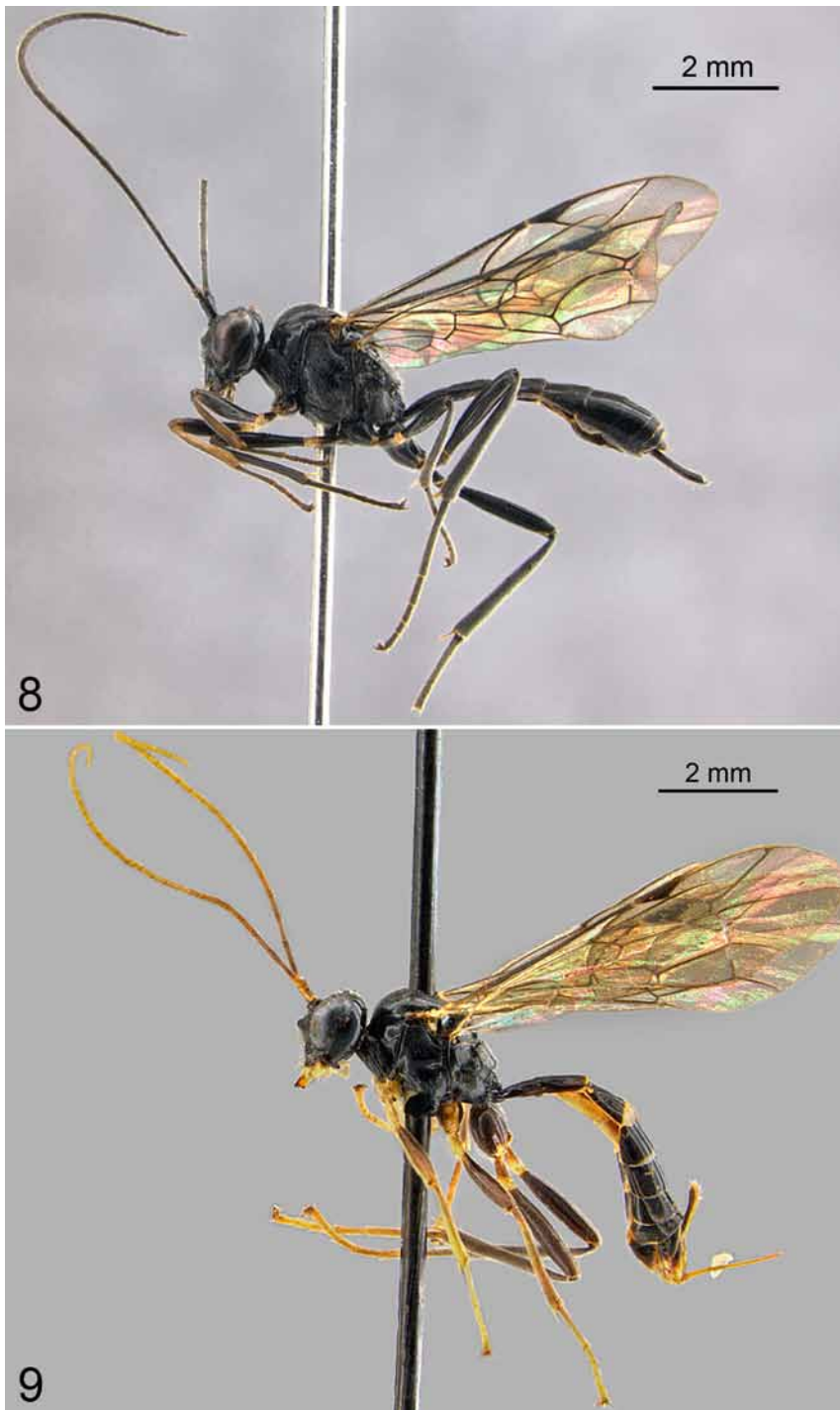
Figures 8, 9. Lateral habitus, holotype. 8 – *Chiloplatys melanosoma*; 9 – *C. oaxacaensis*.

especially his work on the ichneumonids of Mexico and the subfamily Tryphoninae. Because Dr Kasparyan has such a large number of patronyms based on the family name (43 in Ichneumonidea), this species is named after the first name instead.

Comments. The phylogenetic analysis found *C. dmitrii* **sp. n.** to be the sister species to *C. lucens* (Fig. 76).

Chiloplatys kalyx **sp. n.**

(Figs 5, 22, 34, 46, 62)

Type material. Holotype: male, label 1: "MEXICO: Puebla 4.7 mi. SW LaCumbre VII-23-1987 5100 ft. Coll. R. Wharton"; label 2: "DNA Voucher CNCHYM 013210" (TAMU). Condition of type: intact except distal 11 flagellomeres of right antenna and right mid leg beyond coxa missing.

Diagnosis. Chiloplatys kalyx **sp. n.** can be distinguished from all other species of *Chiloplatys* by combination of the following characters: 1) supraclypeal area with a convex, medial protuberance that appears roundly pyramidal in profile (Fig. 22); 2) hind coxa brownish yellow basally with a brown longitudinal stripe on external surface from 0.2 of length to apex (Fig. 5) and a brown spot internally on apical 0.3; 3) Tergites 2 and 3 brown with an ivory coloured chalice-shaped mark dorsally (Fig. 62). *Chiloplatys kalyx* **sp. n.** looks most similar to *C. lucens*, but *C. lucens* does not have the chalice-shaped mark on tergite 3 (although *C. lucens* may be light coloured on the anterior and posterior of tergite 3). It is clearly differentiated from *C. lucens* on the basis of the DNA barcode region (greater than 9 % difference).

Description. A d u l t . M a l e . Fore wing length 5.2 mm. Supraclypeal area 1.3 times as wide at midheight as high, with a convex medial protuberance that is about 0.4 times as long in profile (Fig. 22) as wide. Clypeus 1.4 times as wide as high. Dorsal tooth of mandible about twice as long as ventral tooth. Malar space 0.5 times basal width of mandible. Ocello-ocular distance 1.6 times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.8 times basal width of mandible, this point extended ventrally and posteriorly into a strongly protruding, acutely angulate projection (Fig. 34). Antennal flagellum with 30 segments.

Epomia ventroposteriorly strong, joining horizontal carinulae that extend from posterior edge of pronotum. Lateral longitudinal carinae of propodeum complete from anterior of propodeum to posterior transvers carina, complete from posterior transverse carina to posterior edge of propodeum, but relatively low and weak near posterior transverse carina (Fig. 46). Posterior transverse carina of propodeum located near midlength of propodeum, straight between medial longitudinal carinae, slightly angled at points of union with medial longitudinal carinae and straight to very slightly arcuate between medial and lateral longitudinal carinae. Combined basal and areolar areas wide, emarginated just anterior to middle but otherwise roughly parallel-sided (not convergent or divergent posteriorly) (Fig. 46). Hind femur 5.7 times as long as medial width (Fig. 5). Hind tarsal claw pectinate to about 0.5. Fore wing areolet with vein 2*rs-m* reclivous, slightly longer than length of *M* between 2*rs-m* and 2*m-cu*, 2*rs-m* slightly thickened anteriorly, but no trace of vein 3*rs-m*, (Fig. 5). Hind wing vein 2/*Cu* slightly closer to vein *A* than vein *M* (Fig. 5).

Tergite 1 of metasoma 2.8 times as long as apical width (Fig. 62). Dorsolateral longitudinal carinae not extending posterior to spiracle. Tergite 2 1.2 times as long as apical width, anterior half uniformly convex sublaterally, without paired, sublateral rounded swellings posterior to spiracles.

Black. Ventral surface of scape, pedicel, and basal flagellomere, fore femur, tibia and tarsus except apical tarsomere, mid femur and tibia except dorsal surfaces, hind coxa, trochanter and trochantellus (except for dark brown markings noted below), extreme posterior of tergite 1 medially and anterior 0.1 of tergite 2 medial to thyridia brownish yellow. Legs are darker dorsally than laterally or ventrally. Mandibles except at apex, palpi, posterior corner of pronotum, tegula, fore and middle coxae, trochanters and trochantelli, posterior 0.2 of tergite 2, thyridia, hourglass shape on tergite 3 (see Fig. 62), posterior 0.1 of tergites 4 and 7, all of tergite 8 and gonoforceps ivory (the light markings on tergites 2 and 3 together forming the distinctive chalice shape). Dorsal surface of scape and pedicel, apical tarsomere of fore leg, dorsal surface of middle femur and tarsus and apex of gonoforceps light brown. Antenna except as noted above, apex of mandibles, middle tarsus, longitudinal stripe on apical 0.8 of external surface of hind coxa, spot on apical 0.3 of internal surface of hind coxa, most of hind trochantellus except basally and on internal surface, hind femur except at extreme base, hind tibia and tarsus dark brown.

F e m a l e . Unknown.

E g g . Unknown.

Molecular sequences. Partial DNA barcode region known for male holotype (Table 2).

Etymology. The species name is an adjective meaning "chalice-shaped" in reference to the distinctively shaped, light coloured markings on tergites 2 and 3.

Comments. Despite the similarly coloured brown striped hind coxa of *C. kalyx* **sp. n.** and *C. lucens*, the phylogenetic analysis found *C. kalyx* to be the sister species of *C. divergens* **sp. n.**

32
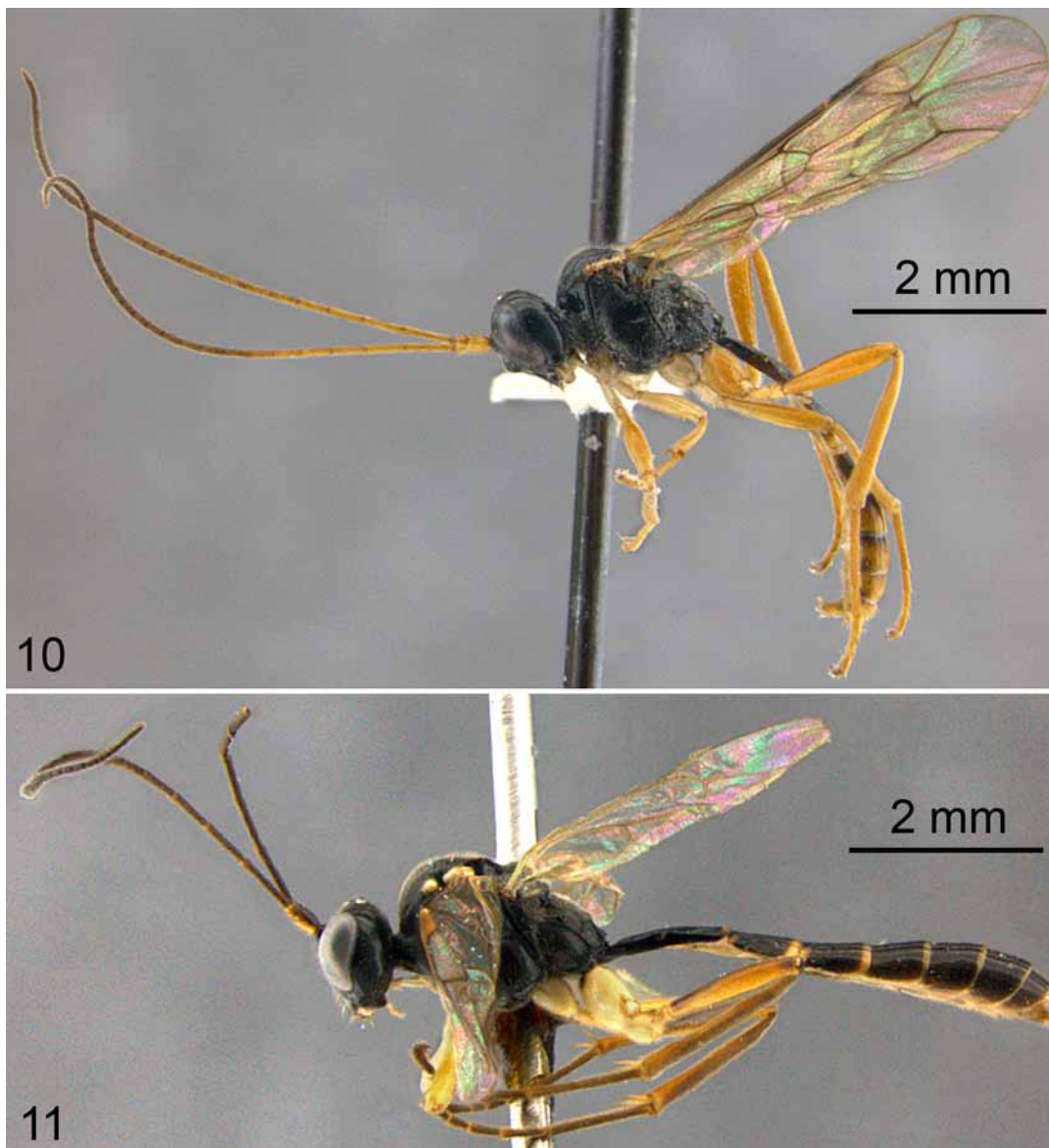
Figures 10, 11. Lateral habitus, holotype. 10 – *Chiloplatys verticalis*; 11 – *C. alophos*.

Chiloplatys lucens **Townes et Townes**

(Figs 1–3, 7, 16, 23, 35, 47, 63, 74)

Chiloplatys lucens Townes et Townes, 1945: 52.

Material examined. Mexico: 1 female (holotype), label 1: "Tancitaro, Tancitaro, Michoacan, Mex. VIII.15.40 6586 ft. Hoogstraal"; label 2: "Type Chiloplatys lucens Townes"; label 3: "Type No. 79" (AEIC). Condition of type: intact except right hind leg beyond coxa detached and glued to point, left fore tarsus missing and left mid fourth and fifth tarsomeres missing.

Non-type material. Costa Rica: Alajuela Prov.: 1 female, Estacion San Ramón, 4 km SW of Dos Rios de Upala, 680 m, xi.1995–ii.1996, F.A. Quesada, Malaise trap, CRI002 315609 (INBio); Cartago Prov.: 1 female, Grano de Oro, 1120 m, Chirripo, Turrialba, ix.1992, P. Campos, CRI000 918963 (INBio); Guanacaste Prov.: 1 female, Estacion Pitilla, 700 m, 9 km S Sta. Cecilia, P. Rios, 4–25.xi.1991, CRI000 496843 (INBio); 2 females, same locality, 27.vii–14.viii.1992, C. Moraga, CRI000 466771, CRI000 466673 (INBio); 1 male, same locality and collector, ix.1991, CRI000 460569 (INBIO); 1 male,

Sector San Ramón, 4.75 km WSW of Dos Rios de Upala, 860 m, 17.v–17.vi.1996, D. Briceño, Malaise, CRI002 318045 (INBio); 2 males, same locality, 17.viii–17.ix.1996, F.A. Quesada, CRI002 318762, CRI002 318707 (INBio); Puntarenas Prov.: 2 females, 1 male, San Vito, Las Alturas, 1500 m, v.1992 (BMNH); 1 male, same locality, viii.1991 (BMNH); 1 male, San Vito de C.B., Las Cruces, 1200 m, 7–14.viii.1982, B. Gill (AEIC); San José Prov.: 1 male, San Antonio de

Figures 12, 13. Lateral habitus, holotype. 12 – *Chiloplatys cenodontis*; 13 – *C. convergens*.

Escazú, 20.v.1987, H. & M. Townes, (AEIC); 1 male, same locality, 21.v.1987, (AEIC); 1 male, same locality, 1300 m, iv–v.1987, Gauld (BMNH); 1 male, same locality, vi.1988 (BMNH); 1 male, San Antonio de Escazú, Quebrada Lajas, 1600 m, viii–ix.1996, Flores (BMNH); 1 male, Zurquí de Moravia, 1600 m, vi–vii.1993, Hanson and Godoy, CRI001 123483 (INBIO). Guatemala: 1 male, El Quiché, 2 km S Chichicastenango, 11.ix.1987, Sharkey (AEIC). MEXICO: 1 female, Chiapas: San Cristóbal de las Casas, 7200', 27.vi.1969, Mason (CNC); 2 males, same locality, 29.vi.1969, CNCHYM 04766, CNCHYM 04767 (CNC); 1 female, Colima: 9 mi. N. Comala, 12.vii.1984, J. Woolley (TAMU); Oaxaca: 1 female, Vista Hermosa, 96.5 km SW Tuxtepec, 1450 m, 20.x.1962, H. & M. Townes (CNC); 1 female, same locality, x.19.1962 (AEIC).
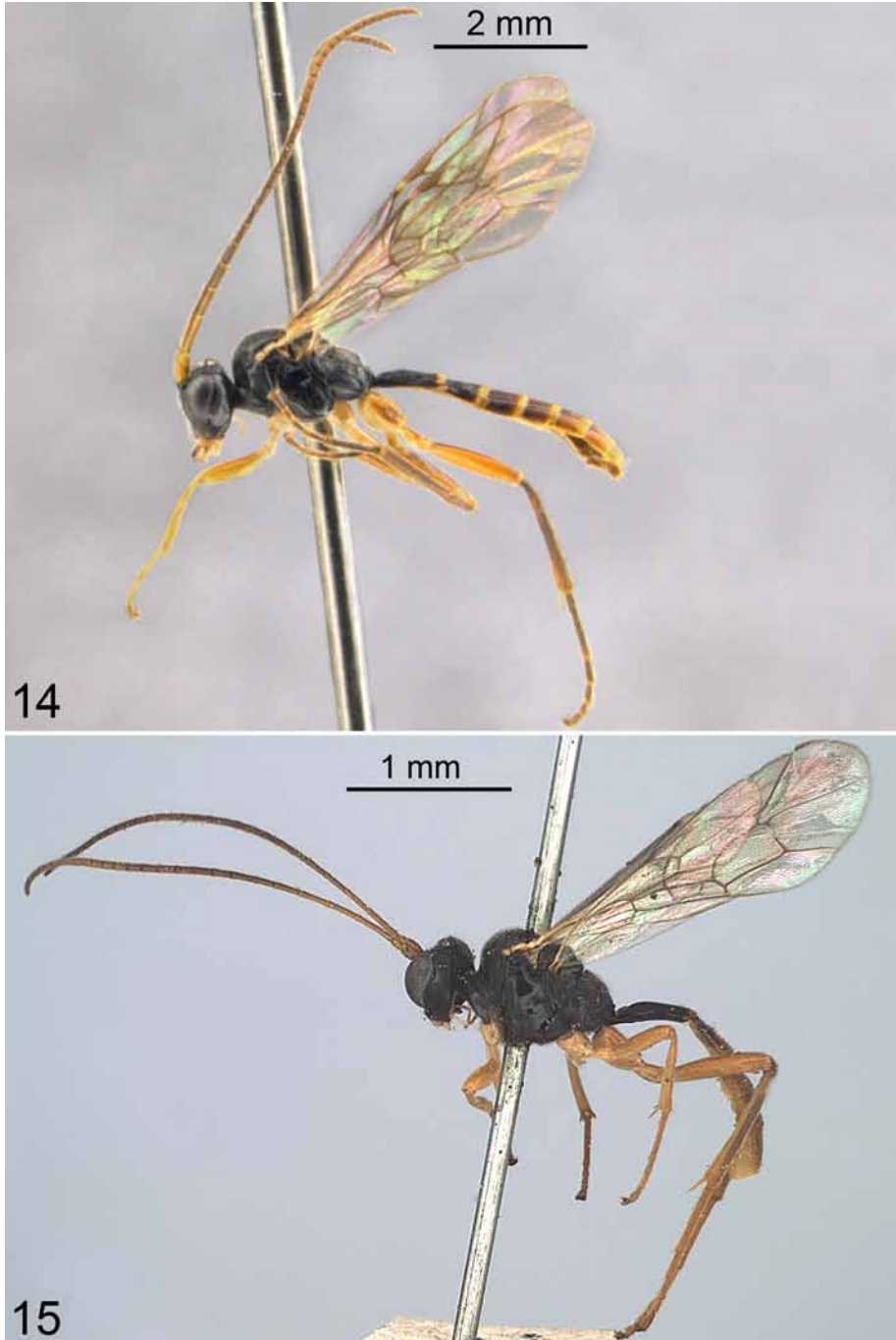
Figures 14, 15. Lateral habitus, holotype. 14 – *Chiloplatys fasciatus*; 15 – *C. mexicanus*.

Diagnosis. Chiloplatys lucens can be distinguished from all other species of *Chiloplatys* by the following combination of characters: 1) supraclypeal area with a convex, medial protuberance that appears roundly pyramidal in profile (Figs 1, 23); 2) hind femur completely dark except pale at extreme base (Fig. 7); 3) hind coxa with at least some dark colour, but not completely dark (most specimens brownish yellow basally with a brown longitudinal stripe on external surface extending from 0.1 to 0.3 to apex and a brown spot internally near apex (Fig. 7), but darker individuals with hind coxa completely dark except for a pale spot on interior surface near base – see variation in description, below); 4) metasomal tergite 3 medially dark with a brownish yellow posterior band and in most specimens also a brownish yellow anterior band (Fig. 63) (anterior and posterior bands of tergite 3 not meeting medially as in *C. kalyx* **sp. n.** shown in Fig. 62).
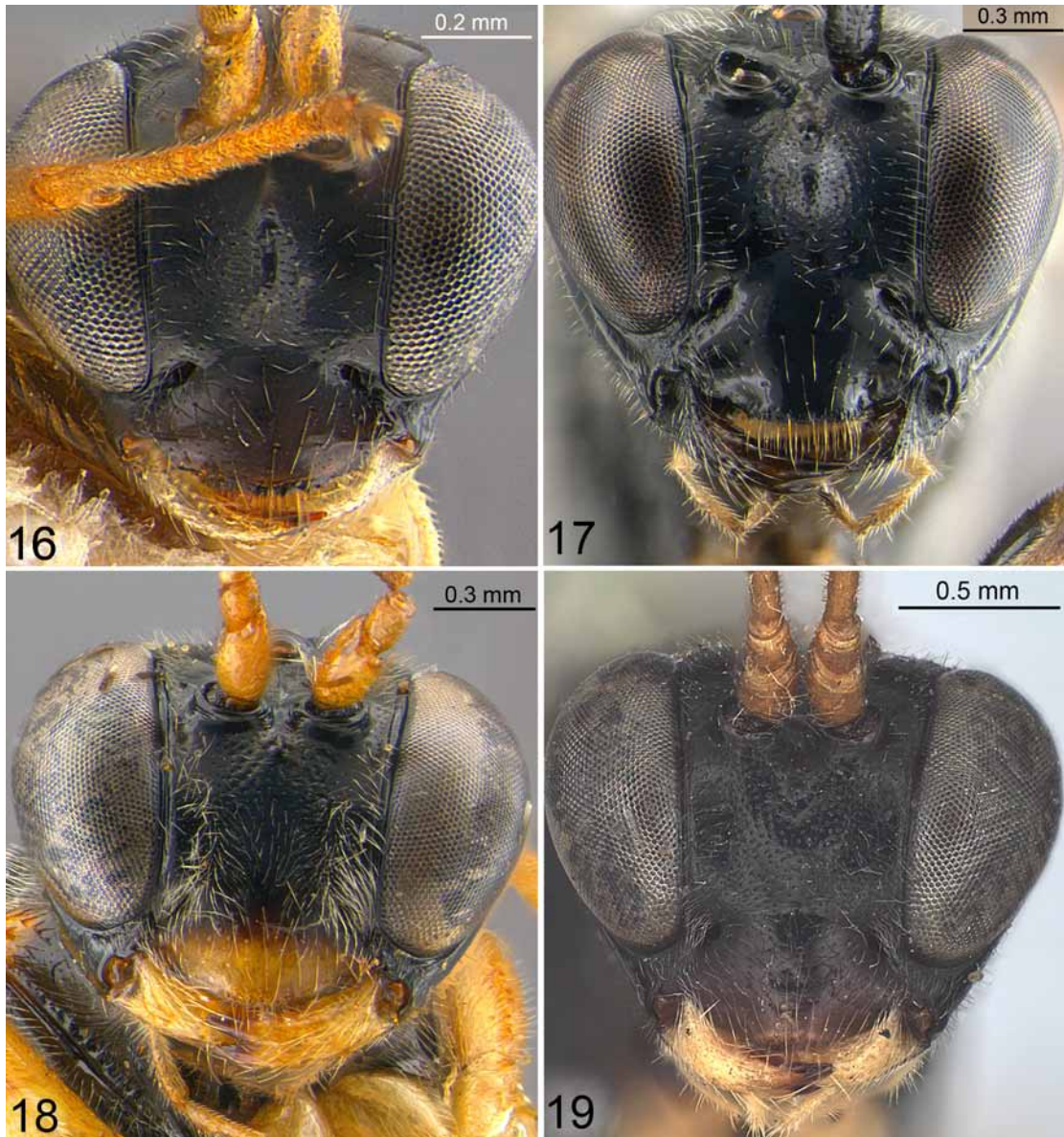
Figures 16–19. Head, anterior, holotype. 16 – *Chiloplatys lucens*; 17 – *C. melanosoma*; 18 – *C. convergens*; 19 – *C. mexicanus*.

Description. A d u l t . F e m a l e . Fore wing length 4.2 to 5.8 mm. Supraclypeal area 1.2 to 1.4 [1.3] times as wide as high, with a convex medial protuberance that is 0.6 to 0.7 [0.7] times as long in profile (Fig. 23) as wide (Figs 2, 16). Clypeus 1.5 to 1.8 [1.7] times as wide as high. Dorsal tooth of mandible 1.5 to 2.0 times [1.5] times as long as ventral tooth. Malar space 0.4 to 0.5 [0.5] times basal width of mandible. Ocello-ocular distance 1.5 to 2.0 [2.0] times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.6 to 0.8 [0.8] times
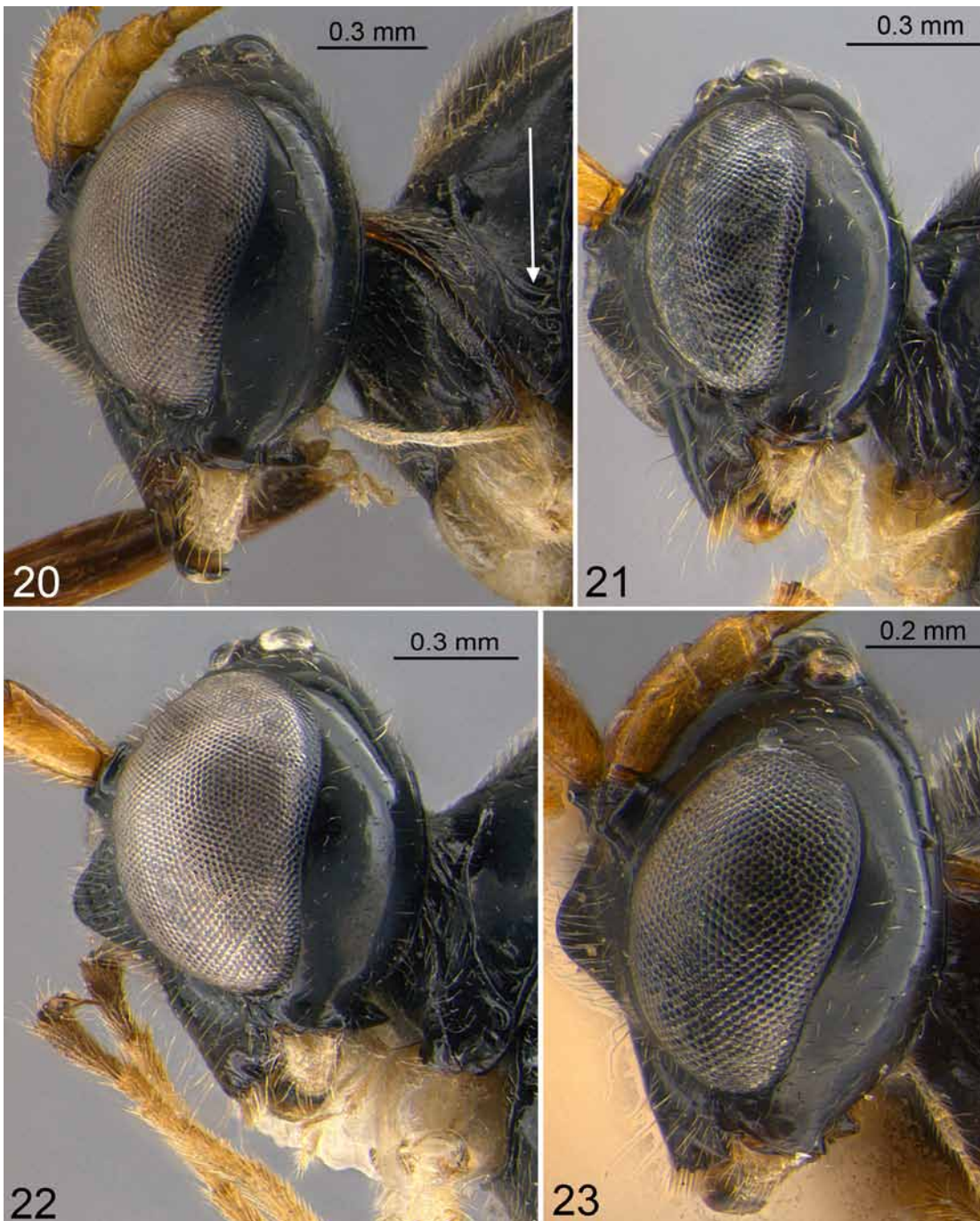
Figures 20–23. Head, lateral, holotype. 20 – *Chiloplatys divergens* (arrow points to strong epomia that joins horizontal carinulae extending from posterior edge of pronotum); 21 – *C. dmitrii*; 22 – *C. kalyx*; 23 – *C. lucens*.

basal width of mandible, this point extended ventrally and posteriorly into a strongly protruding, acutely angled projection (Fig. 35). Antennal flagellum with 26 to 32 [27] segments.

Epomia ventroposteriorly weak to strong, narrowly incomplete and not joining horizontal carinulae extending from posterior edge of pronotum or strong and joining [not joining]. Lateral longitudinal carinae of propodeum complete from anterior of propodeum to posterior transverse carina, incomplete from posterior transverse carina to posterior edge of propodeum (Fig. 47) or complete, but weak [complete, but weak]. Posterior transverse carina of propodeum located near mid-length of propodeum, straight or slightly curved [straight] between medial longitudinal carinae, slightly angled or straight [slightly angled] at points of union of medial longitudinal carinae and slightly (Fig. 3) to strongly arcuate between medial and lateral longitudinal carinae [strongly arcuate] (Fig. 47). Combined basal and areolar areas moderately wide to moderately narrow [moderately wide], slightly divergent posteriorly (Fig. 47) or subrectangular (Fig. 3) [slightly divergent]. Hind femur 5.7 to 6.4 [6.0] times as long as medial width (Fig. 7). Hind tarsal claw pectinate to 0.5 to 0.7 [0.5], with three or four visible pectinations that are relatively short, thin and closely spaced, the third from apex the longest, but still shorter than claw. Fore wing areolet with vein 2*rs-m* of uniform thickness (no vestige of vein 3*rs-m*), slightly reclivous to nearly vertical [slightly reclivous], length slightly longer than length of vein *M* between 2*rs-m* and vein 2*m-cu* (Fig. 1). Hind wing vein 2/*Cu* slightly closer to vein *A* than vein *M*, equidistant, or slightly closer to vein *M* [closer to vein *A*].

Tergite 1 of metasoma 2.3 to 3.3 [2.6] times as long as apical width. Dorsolateral longitudinal carinae not extending past spiracle or extending to apex [extending to apex]. Tergite 2 0.8 to 0.9 [0.9] times as long as apical width, anterior half uniformly convex sublaterally, without paired, sublateral rounded swellings. Ovipositor sheath 0.4 to 0.5 [0.5] times length of hind tibia (Fig. 7).

Black. Scape, pedicel, basal three flagellomeres ventrally, collar of pronotum laterally, posterior corner of pronotum, tegula, fore and middle femora and tibiae and fore tarsus yellowish orange. Mandibles except at apex, palpi, fore and middle coxae, trochanters and trochantelli, a faint mark subbasally on hind tibia, extreme apex of tergites 1, 6 and 7 medially, anterior 0.1 and posterior 0.1 of tergite 2, thyridia, anterior 0.2 and posterior 0.2 of tergite 3, laterotergites of tergite 4+ and hypopygium brownish yellow. Lighter coloured banding of tergite 3 more prevalent medially than laterally thus forming crescent shapes (Fig. 63). Hind coxa yellowish orange with a brown longitudinal stripe on exterior surface from 0.2 of length to apex and also on interior surface from middle to apex (amount of brown varies – see below). Apex of mandibles, flagellum (except ventral surfaces of basal three flagellomeres), middle tarsus, hind femur, hind tibia except faintly subbasally in some specimens, and tarsus and ovipositor sheaths brown.

V a r i a t i o n. The pronotum can be completely black. In the female from Colima (TAMU), the areas that are brownish yellow are bright white and the areas that are yellowish orange are brownish yellow. The amount of brown on the hind coxa varies from being two separate stripes on the inner and outer surface (most Mexico females including holotype, Guatemala female and San Jose and Puntarenas province females) to having these two stripes wide so they join together and cover more than half the surface of the coxa (Oaxaca female, 19.x, AEIC) to being predominantly dark with only the basal third on the inner surface pale (Alajuela female and three Estacion Pitilla females). Some females have the hind tibia completely dark brown, some have a faint patch of yellow subbasally (like the holotype) and some have a partial yellow stripe along ventral surface from as much as 0.2 to 0.5. The light coloured bands of the metasoma also vary: darker individuals (e.g., Oacaxa female, 19.x, Estacion Pitila and Alajuela females) have no band on posterior 0.1 of tergite 1, anterior of tergite 2, posterior of tergite 3, or anywhere on tergites 4 and 5 (the only pale colour being on the posterior 0.1 of tergite 2 and extreme anterior of tergite 3). In other individuals, the banding is still present on the posterior of all metasomal tergites, but not or only slightly on the anterior of the tergites and the bands and the shape of the bands can also differ: some specimens like the holotype have bands that are more prevalent along the midline compared to laterally (Fig. 63), whereas other specimens have bands that are of equal length across the tergites.

M a l e. As female except fore wing length 4.0 to 5.7 mm. Clypeus 1.4 to 1.7 times as wide as high medially. Ocello-ocular distance 1.3 to 1.7 times ocellar diameter. Flagellum with 25 to 31 segments. Some specimens have the angle of the hypostomal-occipital projection as a right angle as opposed to acutely angled. Hind femur 5.4 to 6.1 time as long as width at middle. Hind tarsal claw pectinate from 0.5 to 0.7 with two to four pectinations that can be close together or moderately spaced. Fore wing vein 2*rs-m* longer than abscissa of vein *M* between 2*rs-m* and 2*m-cu* or of equal length, vein 2*rs-m* strongly reclivous to nearly vertical (Costa Rican specimens are of equal length to abscissa of *M* and close to vertical). Tergite 1 2.4 to 2.8 times as long as apical width. Tergite 2 0.9 to 1.3 times as long as apical width. The same degree of colour variation occurs in the male as in the female on the hind coxa, hind tibia and metasoma, although in some males (e.g., from Guanacaste Prov.), the hind coxa is almost completely dark with only a small pale spot sub-basally on inner surface.

E g g. Known from four specimens, three from Costa Rica and one from Mexico (Fig. 74). Surface with net-like, raised reticulate sculpture. Costa Rican specimens have pale brown coloured eggs. The Mexican specimen has a bright white egg.

Molecular sequences. DNA barcode region known for two specimens from Mexico (Chiapas) (Table 2).

Comments. Gauld (1997) included all specimens he examined that possessed a protuberant supra-clypeal area within his concept of *C. lucens*. The current study has shown on the basis of correlating morphological characters and DNA barcode that the specimens included in *C. lucens* by Gauld (1997) comprised at least two species which could be distinguished by the colour of the hind coxa. Those with a varying amount of brown on the hind coxa are *C. lucens* and those with completely light hind coxa are

C. dmitrii **sp. n.** Note that additional material not examined by Gauld (1997) has revealed an additional five species related to these two species (see key to species for the *C. lucens* species group).

Even after recognizing the two species within Gauld's definition of *C. lucens*, the species still appears to be a relatively variable species in terms of some structures as well as the amount of pale colour on the hind coxa and metasomal tergites. For example, the propodeal carination varies from that shown in
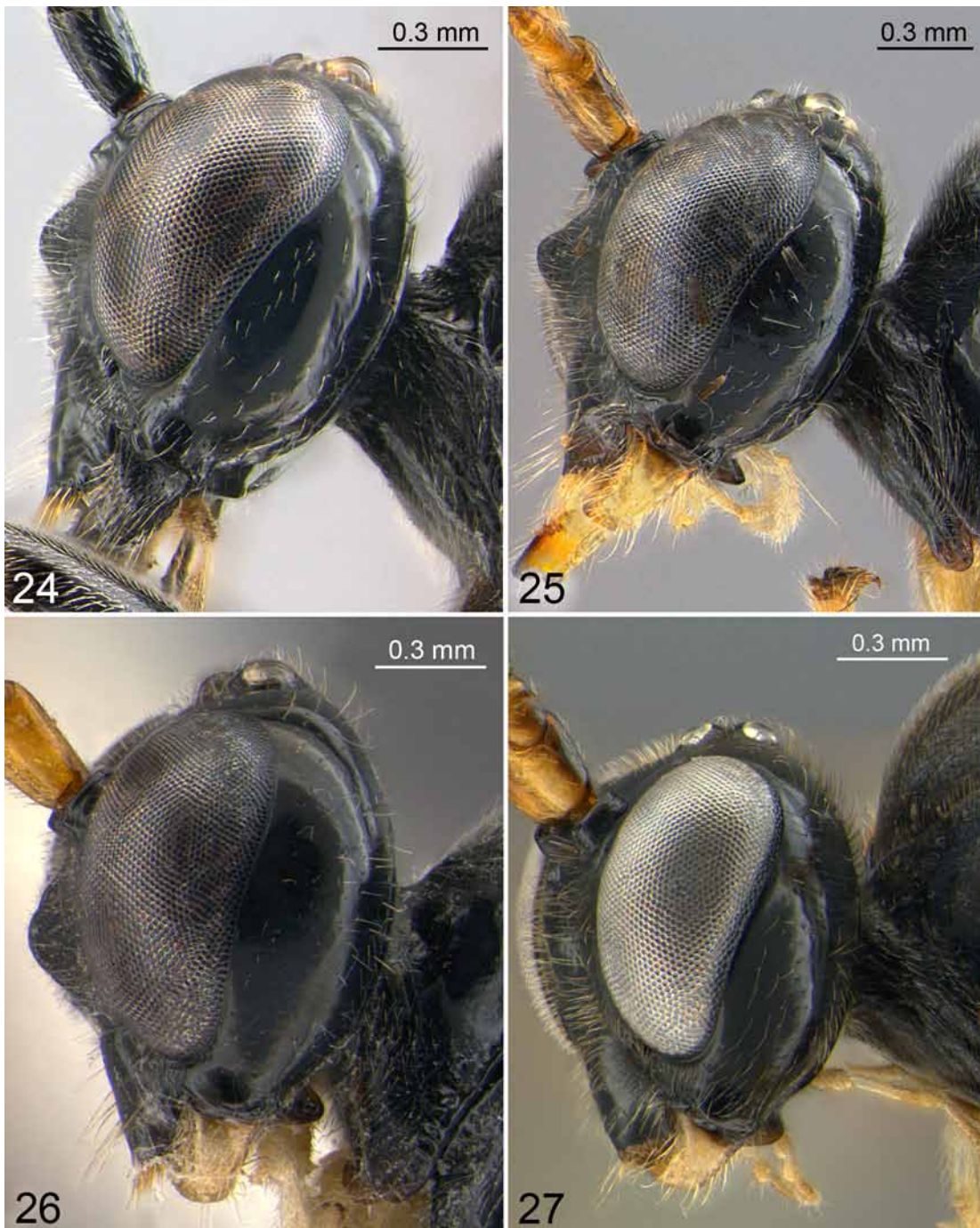
Figures 24–27. Head, lateral, holotype. 24 – *Chiloplatys melanosoma*; 25 – *C. oaxacaensis*; 26 – *C. verticalis*; 27 – *C. alophos*.

Fig. 3 (based on a non-type specimen at AEIC) to the condition in the holotype (Fig. 47 and see description above). Another character that previously appeared to vary only between the *C. lucens* and *C. mexicanus* species groups was the length of the dorsolateral carina of tergite 1; however, the holotype and a specimen from Mexico (Colima) appear to have the carina complete to the apex (similar to Fig. 59), which is not the case in other specimens of the species. This may indicate that multiple cryptic species are present within *C. lucens*, but there were no correlating characters (e.g., amount of light on the hind coxa and tergites) that correlated with these structural differences. Unfortunately, DNA from only two specimens of *C. lucens* (from one locality) could be amplified and both of these were from Mexico (Chiapas). The current hypothesis is that *C. lucens* extends from central Mexico to Costa Rica. There were no correlating characters that indicate that specimens from Costa Rica differ consistently from specimens in Mexico and Guatemala, although fore wing vein 2rs-m did seem more vertical and shorter in most Costa Rican specimens compared to elsewhere. In addition, specimens from Guanacaste Province were darker than specimens elsewhere, but the lightest Guanacaste specimens were about as dark as the darkest Mexican specimen from Oaxaca, so there was really no way to divide the specimens into two species on the basis of colour.

On the basis of the DNA barcode, *C. lucens* is sister species to *C. dmitrii* **sp. n.** and these two species are sister group to *C. oaxacaensis* **sp. n.** (Fig. 76). *Chiloplatys kalyx* **sp. n.** which has the hind coxa pale with a dark stripe on the external surface similar to most specimens of *C. lucens*, is not closely related on the basis of the DNA barcode (Fig. 76), therefore indicating that the colour of the hind coxa is a convergence.

Chiloplatys melanosoma sp. n.
(Figs 8, 17, 24, 36, 48, 64)

Type material. Holotype: female, label 1: "ECUADOR: Pichincha Mindo 1400 m, xii M. Cooper"; label 2: "Cooper coll. BMNH (E) 2005-152" (BMNH). Condition of type: intact except missing right antenna and distal four tarsomeres of right hind leg.

Diagnosis. *Chiloplatys melanosoma* **sp. n.** can be distinguished from all other species of *Chiloplatys* by either: 1) fore coxa predominantly brown or 2) metasoma completely black (Fig. 8). *Chiloplatys melanosoma* **sp. n.** is the darkest species known. All other described species have the fore coxa completely pale coloured (white, ivory or yellowish) and at least some pale colour on the metasoma. It is also the only species recorded from South America. Prior to the description of this species, the genus was only recorded from Central America (Central Mexico to Costa Rica).

Description. A d u l t . F e m a l e . Fore wing length 6.7 length mm. Supraclypeal area 1.5 times as wide at mid-height as high, with a convex medial protuberance that is about 0.3 times as long in profile (Fig. 24) as wide (Fig. 17). Clypeus 1.6 times as wide as high (Fig. 17). Dorsal tooth of mandible about twice as long as ventral tooth. Malar space 0.5 times basal width of mandible. Ocello-ocular distance 1.8 times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.7 times basal width of mandible, this point extended ventrally and posteriorly into a moderately protruding right-angled projection (Fig. 36). Antennal flagellum with 33 segments (only left antenna present).

Epomia ventroposteriorly strong, almost joined to horizontal carinulae extending from posterior edge of pronotum (very narrowly interrupted). Lateral longitudinal carinae of propodeum complete from anterior of propodeum to posterior transverse carina, incomplete from posterior transverse carina to posterior edge of propodeum (lacking anteriorly) (Fig. 48). Posterior transverse carina of propodeum located near midlength of propodeum, completely straight between medial longitudinal carinae, slightly angulate at points of union with medial longitudinal carinae and weakly arcuate between medial and lateral longitudinal carinae. Combined basal and areolar areas very slightly convergent posteriorly (Fig. 48). Hind femur 6.1 times as long as medial width (Fig. 8). Hind tarsal claw pectinate to about 0.6 with at least five relatively thin, moderately spaced pectinations. Fore wing areolet with vein 2*rs-m* of uniform thickness (no vestige of vein 3*rs-m*), slightly reclivous, length slightly longer than length of vein M between 2*rs-m* and vein 2*m-cu* (Fig. 8). Hind wing vein 2/*Cu* slightly closer to vein *A* than vein *M* (Fig. 8)

Tergite 1 of metasoma 2.5 times as long as apical width. Dorsolateral longitudinal carinae not extending posterior to spiracle, although tergite covered by a film of dirt which makes it difficult to judge precise length of carina (Fig. 8). Tergite 2 1.2 times as long as apical width, anterior half uniformly convex sublaterally, without paired, sublateral rounded swellings. Ovipositor sheath 0.4 times length of hind tibia.

Black with the following light brown: palpi, interior surfaces of fore coxa and trochanter, all of fore trochantellus and tibia and extreme base of fore femur, interior surface of mid trochanter and all of mid trochantellus and interior surface of hind trochantellus. All legs lighten in colour from base to apex such that tibia and tarsus are dark brown as opposed to black. Thyridia of tergite 2 and 3 brownish yellow.

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M a l e . Unknown.

E g g . Unknown.

Molecular sequences. Unknown.

Etymology. The species name is an adjective meaning "dark body".
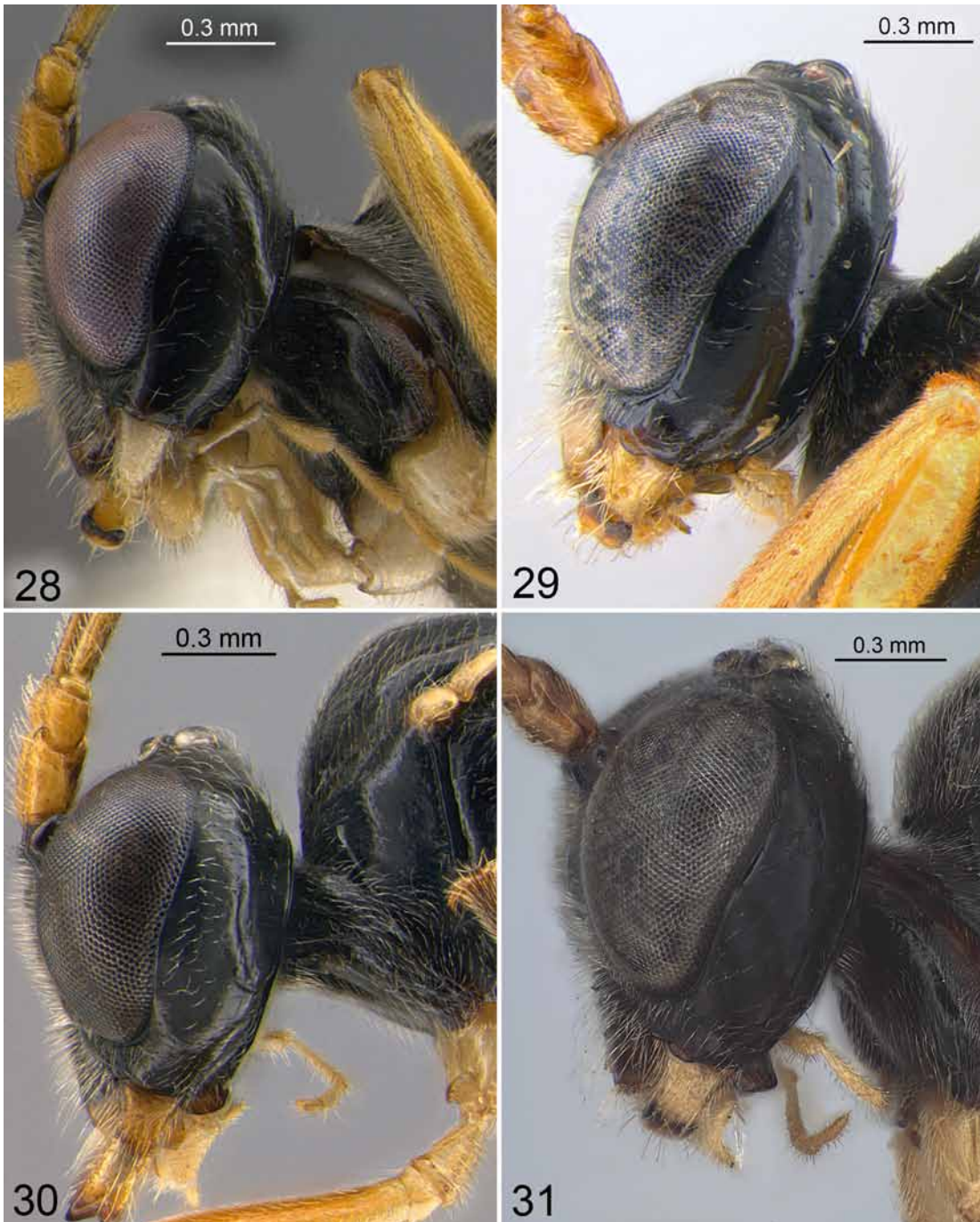
Figures 28–31. Head, lateral, holotype. 28 – *Chiloplatys cenodontis*; 29 – *C. convergens*; 30 – *C. fasciatus*; 31 – *C. mexicanus*.

Comments. Chiloplatys melanosoma **sp. n.** is by far the darkest species of the genus. *Chiloplatys melanosoma* **sp. n.** and *C. oaxacaensis* **sp. n.** are the only species that have the hind coxa completely dark coloured. *Chiloplatys melanosoma* **sp. n.** can be distinguished from *C. oaxacaensis* **sp. n.** by the latter having a completely pale fore coxa and conspicuous pale bands on the metasoma, especially on the posterior edge of tergite 2 and the anterior of tergite 3 (compare Fig. 8 with Fig. 9).
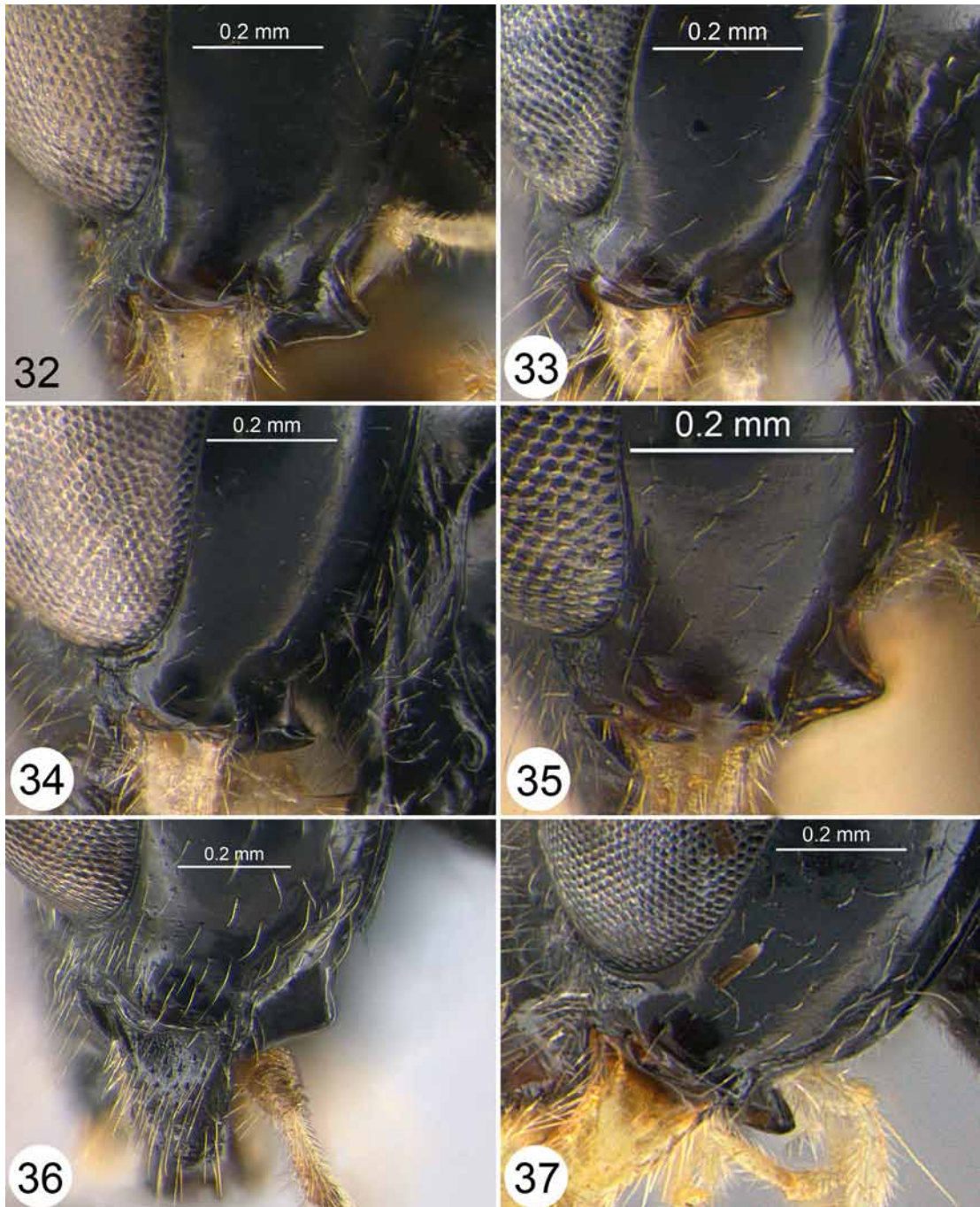
Figures 32–37. Head, lateral, holotypes showing point of union of hypostomal and occipital carinae. 32 – *Chiloplatys divergens*; 33 – *C. dmitrii*; 34 – *C. kalyx*; 35 – *C. lucens*; 36 – *C. melanosoma*; 37 – *C. oaxacaensis*.

Chiloplatys oaxacaensis sp. n.

(Figs 9, 25, 37, 49, 65)

Type material. Holotype: female, "MEXICO: Oaxaca 15.1 mi N. San Gabriel Mixtepec 3850 ft Hwy 131 VII-11-1987 R. Wharton" (TAMU). Condition of type: intact except right flagellomere broken beyond flagellomere 5 (glued to card under specimen) and left mesopleuron broken ventrally by pin.

Paratype. Same collecting data as holotype, DNA Voucher CNCHYM 013211, 1 female (CNC).

Diagnosis. Chiloplatys oaxacaensis **sp. n.** can be distinguished from all other species of *Chiloplatys* by combination of: 1) hind coxa completely dark brown (without any light colour); 2) metasoma with pale colour at extreme apex of tergite 1 and anterior and posterior of tergites 2 and 3 (Fig. 65) (these tergites completely black in *C. melanosoma* **sp. n.**).

Description. A d u l t . F e m a l e . Fore wing length 6.6–7.1 [7.1] mm. Supraclypeal area 1.3 times as wide at mid-height as high, with a convex medial protuberance that is about 0.5 times as long in profile (Fig. 25) as wide. Clypeus 1.8 times as wide as high. Dorsal tooth of mandible about twice as long as ventral tooth. Malar space 0.3 to 0.4 [0.3] times basal width of mandible. Ocello-ocular distance 1.6 to 1.8 [1.8] times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.8 times basal width of mandible, this point extended ventrally and posteriorly into a strongly protuberant, acutely angulate projection (Fig. 37). Antennal flagellum with 33 to 34 [33 left, 34 right] segments.

Epomia ventroposteriorly weak, not continuous to horizontal carinulae extending from posterior edge of pronotum. Lateral longitudinal carinae of propodeum complete from anterior of propodeum to posterior transverse carina, incomplete from posterior transverse carina to posterior edge of propodeum (lacking anteriorly) (Fig. 49). Posterior transverse carina of propodeum located near midlength of propodeum, straight between medial longitudinal carinae, slightly angled at points of union with medial longitudinal carinae and slightly arcuate or straight [straight] between medial and lateral longitudinal carinae. Combined basal and areolar area subrectangular, not convergent or divergent posteriorly [holotype with slight medial emarginations] (Fig. 49) (paratype more straight medially). Hind femur 5.5 to 5.8 [5.8] times as long as medial width (Fig. 9). Hind tarsal claw pectinate to about 0.4 with about five relatively thin, closely spaced pectinations. Fore wing areolet with vein 2*rs-m* slightly thickened anteriorly (Fig. 9), slightly reclivous and distinctly longer than abscissa of vein *M* between 2*rs-m* and 2*m-cu*. Hind wing vein 2/*Cu* equidistant between vein *A* and vein *M* (Fig. 9).

Tergite 1 of metasoma 2.6 to 2.8 [2.8] times as long as apical width. Dorsolateral longitudinal carinae not extending posterior to spiracle. Tergite 2 1.0 to 1.1 [1.1] times as long as apical width (Fig. 65), anterior half uniformly convex sublaterally, without paired, sublateral rounded swellings posterior to spiracles. Ovipositor sheath 0.4 times length of hind tibia (just a bit shorter than apical height of metasoma).

Black. Clypeus brownish in apical 0.3. Scape, pedicel and basal two flagellomeres brown dorsally, lighter ventrally, the flagellum lightening to yellow apically. Mandibles ivory, darkening to brownish yellow medially and black at apex. Palpi white. Dorsoposterior corner of pronotum brown, tegula yellowish brown. Fore leg ivory except brown on base of coxa interiorly, on dorsal and posterior surface of femur and dorsally at base of tibia. Apical tarsomere of fore leg light brown. Mid leg with coxa brown except light brown on external surface, trochanter and trochantellus ivory except a brown stripe on dorsal surface of trochanter, femur brown except ivory ventrally at extreme base, tibia light brown except ivory ventrally in basal 0.6, basal tarsomere light brown, the rest of tarsus brownish yellow. Hind leg brown except trochanter a bit lighter ventrally, trochantellus and extreme base of femur brownish yellow, tarsus light brown basally and yellowish apically. Metasoma with ivory at extreme posterior of tergite 1 and anterior of tergite 2 as well as a crescentic band in posterior 0.2 of tergite 2 and anterior 0.2 of tergite 3 and a faint band in posterior 0.1 of tergite 3 (Fig. 65). Thyridia yellow. Hypopygium brown except yellow dorsally. Ovipositor sheaths brown.

M a l e . Unknown.

E g g . Present in holotype (Fig. 73) and paratype. Whitish yellow, not wizened, surface without reticulation but with some low dimpling.

Molecular sequences. Partial DNA barcode region known for female paratype (Table 2).

Etymology. The species name comes from the state of Mexico (Oaxaca) in which the type locality is located.

Comments. See comments for *C. lucens.*

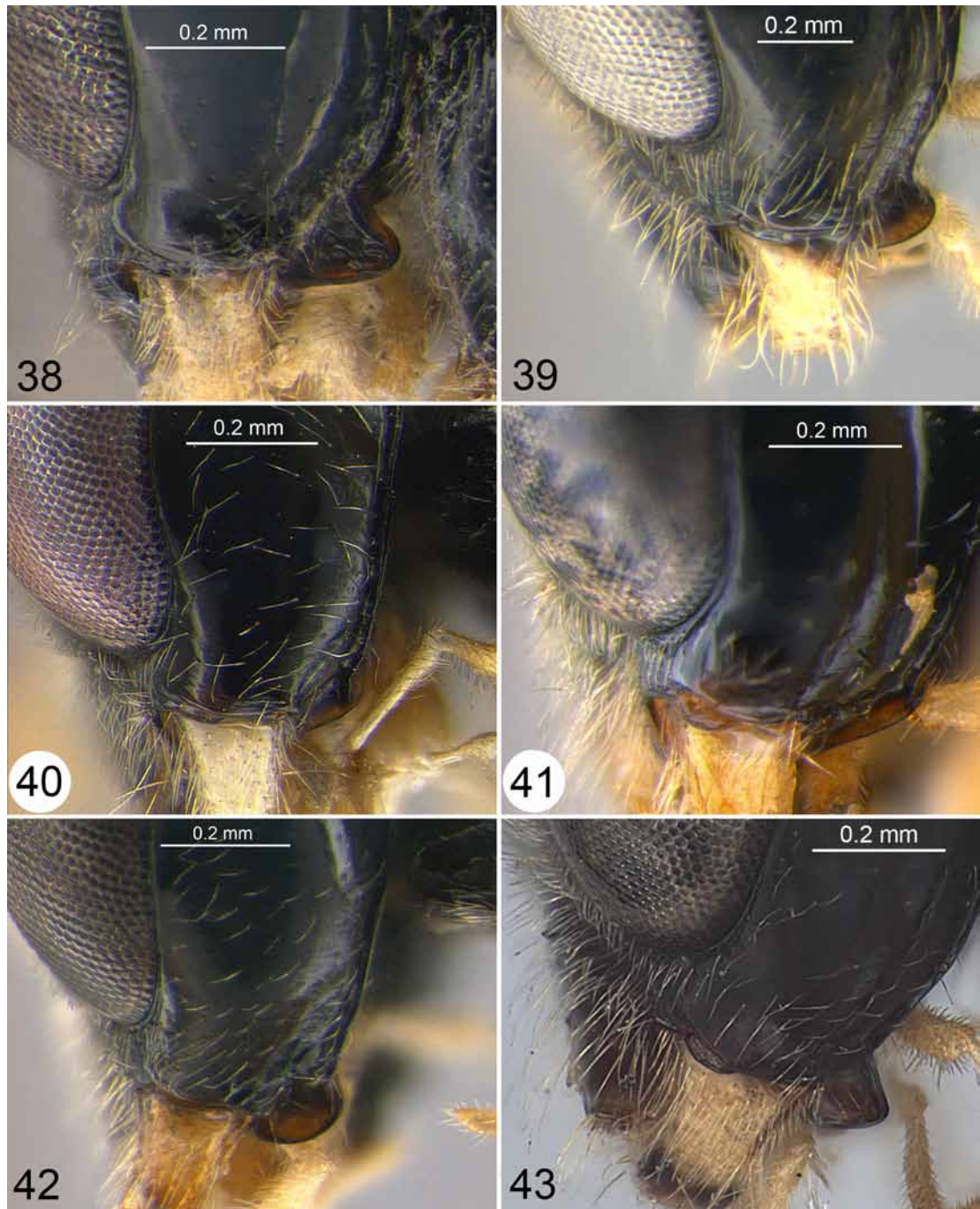### *Chiloplatys verticalis* sp. n.

(Figs 10, 26, 38, 50, 57, 66)

Type material. Holotype: male, label 1: "MEXICO: Oaxaca 4.4 mi S San Gabriel Mixtepec 2500 ft Hwy 131 VII-10 to 11-1987 R. Wharton"; label 2: "DNA Voucher CNCHYM 013262" (TAMU).

Diagnosis. Chiloplatys verticalis **sp. n.** can be distinguished from all other species of *Chiloplatys* by combination of: 1) supraclypeal area with a convex, medial protuberance that appears roundly pyrami-

dal in profile (Fig. 26); 2) metasomal tergites 4 and 5 predominantly orange: with some brown marking in anterior 0.1 to 0.3 of segments, the remainder yellow or brownish orange (Fig. 66) (these tergites predominantly black or dark brown in all other species of the *lucens* group). The areolet of *Chiloplatys verticalis* **sp. n.** is unusual within *Chiloplatys* in that vein 2*rs-m* is vertical (not reclivous) and much longer

Figures 38–43. Head, lateral, holotypes showing point of union of hypostomal and occipital carinae. 38 – *Chiloplatys verticalis*; 39 – *C. alophos*; 40 – *C. cenodontis*; 41 – *C. convergens*; 42 – *C. fasciatus*; 43 – *C. mexicanus*.

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than the abscissa of vein *M* between *2rs-m* and *2m-cu* (Fig. 57). The hind wing vein *2/Cu* is also unusual in that it is much closer to vein *M* than vein *A* (closer to vein *A* or at most only slightly closer to vein *M* in other species).
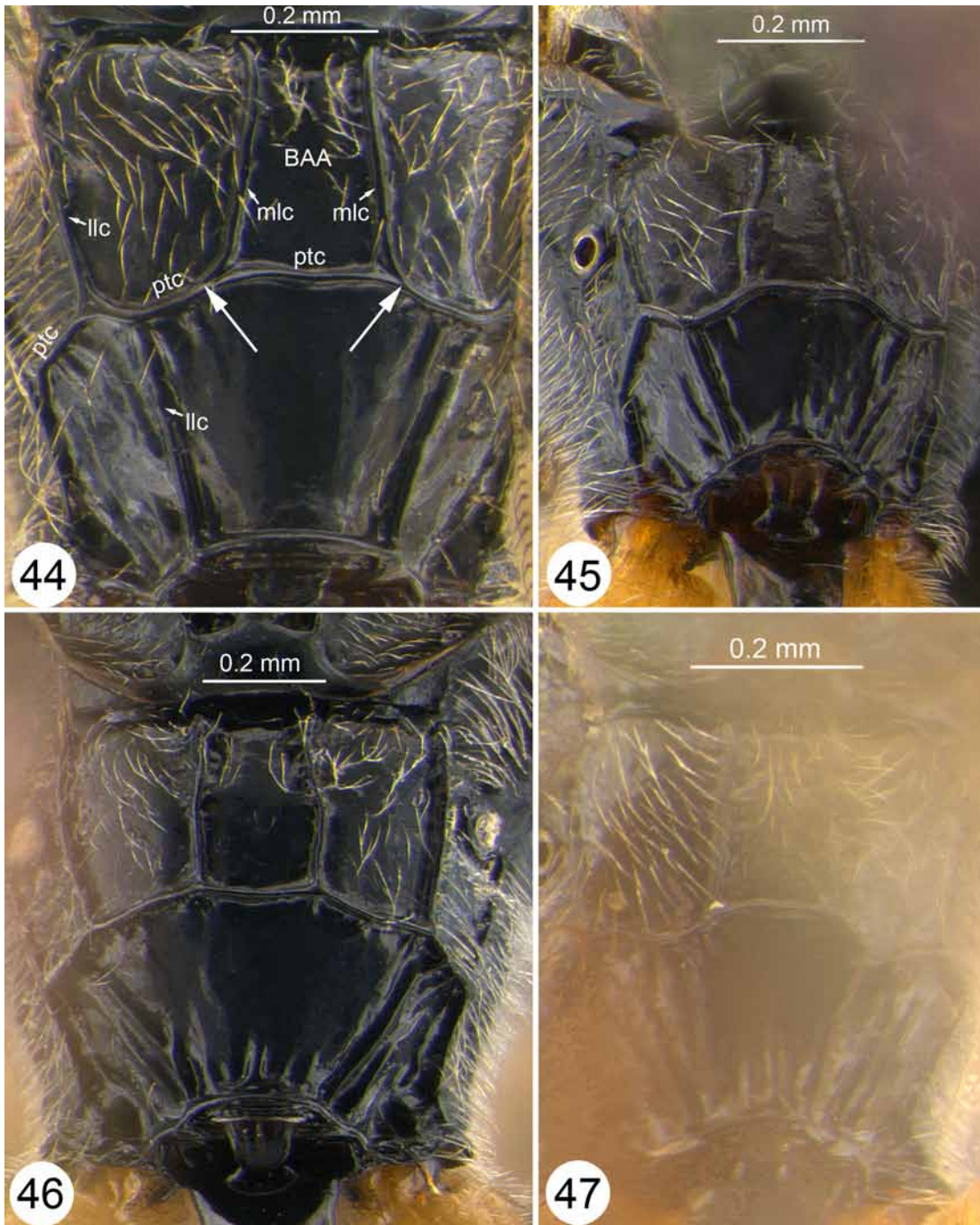
Figures 44–47. Propodeum, dorsoposterior, holotype. 44 – *Chiloplatys divergens*; 45 – *C. dmitrii*; 46 – *C. kalyx*; 47 – *C. lucens*. LLC – l ateral longitudinal carina. MLC – medial longitudinal carina. PTC – posterior transverse carina. BAA – fused basal and areolar area. Large arrows point to points of union of medial longitudinal carinae and posterior transverse carina.

Description. A d u l t . M a l e . Fore wing length 6.0 mm. Supraclypeal area 1.2 times as wide at midheight as high, with a convex medial protuberance that is about 0.3 times as long in profile (Fig. 26) as wide. Clypeus 1.8 times as wide as high. Dorsal tooth of mandible about twice as long as ventral tooth. Malar space 0.3 times basal width of mandible. Ocello-ocular distance 1.8 times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.7 times basal width of mandible, this point extended ventrally and posteriorly into a strongly protruding, roughly right-angled rounded projection (Fig. 38). Antennal flagellum with 31 (right) and 32 (left) segments.

Epomia ventroposteriorly weak, not joining horizontal carinulae extending from posterior edge of pronotum. Lateral longitudinal carinae of propodeum complete from anterior edge of propodeum, incomplete from posterior transverse carina to posterior edge of propodeum but petiolar area with several long, strong carinulae extending most of length of area, but not joined to form a complete carina (Fig. 50). Posterior transverse carina of propodeum located near midlength of propodeum, straight between medial longitudinal carinae, strongly angled at points of union with medial longitudinal carinae and strongly angulate or arcuate between medial and lateral longitudinal carinae. Combined basal and areolar areas wide, roughly parallel-sided, but slightly emarginate just anterior to middle (Fig. 50). Hind femur 5.3 times as long as medial width (Fig. 10). Hind tarsal claw pectinate to about 0.6. Fore wing areolet with vein *2rs-m* of uniform thickness, vertical, length distinctly longer than length of vein *M* between *2rs-m* and vein *2m-cu* (Fig. 57). Hind wing vein *2/Cu* much closer to vein *M* than vein *A* (Fig. 57).

Tergite 1 of metasoma 2.4 times as long as apical width (Fig. 66). Dorsolateral longitudinal carinae not extending posterior to spiracle. Tergite 2 as long as apical width (Fig. 66), anterior half uniformly convex, without paired, sublateral swellings.

Black. Antenna and dorsoposterior corner of pronotum brownish yellow, the former darkening to brown apically. Apical half of clypeus dark brown. Mandibles except at apex, palpi, tegula, fore and mid coxa, trochanters and trochantelli ivory, the mid leg slightly darker. Remainder of legs brownish yellow, posterior legs darker than anterior. Metasoma as shown in Fig. 66. Tergite 1 brownish orange on sides ventral to lateral longitudinal carina from 0.4 to posterior edge and also on dorsoposterior 0.2 to 0.4 of segment (lighter laterally than medially), the extreme posterior part of segment yellowish. Tergite 2 dark brown in anterior 0.6, orange from 0.6 to 0.8 in a roughly triangular pattern that is longest along the midline, posterior 0.2 ivory. Tergite 3 ivory in anterior 0.2 and posterior 0.1 medially, with two dark brown subtriangular spots from 0.2 to 0.6, the remainder of the segment orange. Tergite 4 brown in anterior 0.2, a bit lighter medially compared to laterally, orangish yellow in posterior 0.8 with lightest colour most posteriorly. Tergite 5 similar to tergite 4 but brown only in anterior 0.1. Tergites 6 to 8 orangish yellow, tergite 7 more yellowish. Laterotergites and sternites ivory. Gonoforceps brownish yellow.

F e m a l e . Unknown.

E g g . Unknown.

Molecular sequences. Partial DNA barcode region known for male holotype (Table 2).

Etymology. The species name is an adjective meaning vertical in reference to the vertical fore wing vein *2rs-m* of the areolet.

Comments. The phylogenetic analysis found *C. verticalis* **sp. n.** to be the sister species to the grouping *C. oaxacaensis* **sp. n.** + (*C. dmitrii* **sp. n.** + *C. lucens*) (Fig. 76).

Chiloplatys mexicanus species group

Diagnosis. The *C. mexicanus* species group can be most easily distinguished from the *C. lucens* species group by the absence of the strongly convex, pyramidal, medial protuberance on the supraclypeal area (Figs 27–31) (this area being uniformly convex). Species in the *C. mexicanus* group also possess the autapomorphic condition of the second metasomal tergite that bears paired sublateral swellings (Fig. 72). In addition, the posterior transverse carina of the propodeum is located slightly to greatly posterior to the midlength of the propodeum (around the midlength in the *C. lucens* species group).

Species included. The *C. mexicanus* group includes *Chiloplatys mexicanus* (Cresson) and the following new species: *C. alophos* **sp. n.**, *C. cenodontis* **sp. n.**, *C. convergens* **sp. n.** and *C. fasciatus* **sp. n.** It was strongly supported by 15 derived nucleotide substitutions in the phylogenetic analysis using the DNA barcode region of COI (Fig. 76).
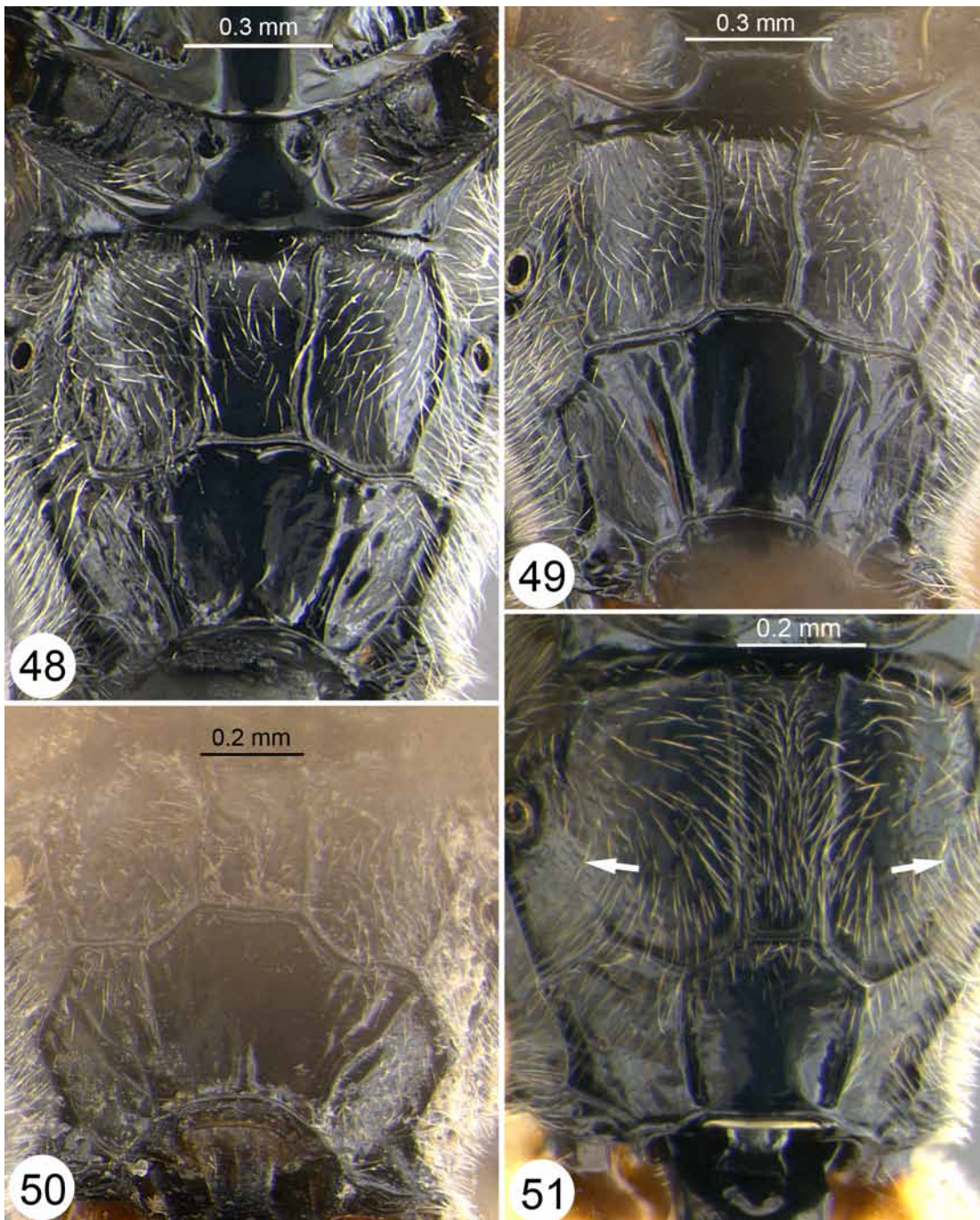
Chiloplatys alophos sp. n.
(Figs 11, 27, 39, 51, 67)

Type material. Holotype: male, label 1: "COSTA RICA: Cartago Pv. 4 km NNE Cañon, Genesis II 2350 m, iii.-vi 1996. P. Hanson"; label 2: "DNA Voucher CNCHYM 013444" (BMNH). Condition of type: intact except left antenna missing beyond flagellomere 4, right mid leg missing.

Diagnosis. Chiloplatys alophos **sp. n.** can be distinguished from all other species of *Chiloplatys* by the lateral longitudinal carina of propodeum being incomplete between anterior edge and posterior transverse carina (Fig. 51). In addition, the following three characters in combination can diagnose this species: 1) supraclypeal area flat, without a convex, medial protuberance (Fig. 27); 2) metasoma black except for very narrow brownish yellow bands in posterior 0.1 of each segment, except brownish yellow in pos-

Figures 48–51. Propodeum, dorsoposterior, holotype. 48 – *Chiloplatys melanosoma*; 49 – *C. oaxacaensis*; 50 – *C. verticalis*; 51 – *C. alophos* (arrow points to absence of lateral longitudinal carina anteriorly).

terior 0.2 of tergite 2 (Fig. 67); 3) point of union of occipital and hypostomal carinae strongly heightened and extending posterior to posterior edge of occipital carina as a strongly protruding, rounded projection (Fig. 39). Within the *C. mexicanus* species group, *C. alophos* **sp. n.** has the darkest coloured metasoma. In comparison, *C. fasciatus* **sp. n.** has predominantly dark metasomal tergites, but they tend to be predominantly brown or brownish orange, not black, and the posterior light coloured bands are much more conspicuous (compare Fig. 67 to Fig. 70). Also, the occipital-hypostomal tooth of *C. fasciatus* **sp. n.** does not project greatly posterior to the occipital carina, but is highly raised (compare Fig. 39 to Fig. 42). Some specimens of *C. mexicanus* also have a lot of brown on the metasoma, but the posterior tergites always have at least some orange colour which in not present in *C. alophos* **sp. n.** Finally, the hind coxa of *C. alophos* **sp. n.** is uniquely coloured within *Chiloplatys* (yellowish white except dark brown at base) (Fig. 11). Since this species is only known from one specimen and it is known that the colour of the hind coxa can vary slightly intraspecifically in some species, the diagnostic nature of this character requires confirmation.

Description. A d u l t . M a l e . Fore wing length 6.4 mm. Supraclypeal area 1.2 times as wide at midheight as high, without a convex medial protuberance (Fig. 27). Clypeus 1.5 times as wide as high. Dorsal tooth of mandible only slightly longer than ventral tooth. Malar space 0.5 times basal width of mandible. Ocello-ocular distance 1.9 times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.6 times basal width of mandible, this region strongly heightened and extending posterior to posterior edge of occipital carina as a strongly protruding, slightly rounded projection (Fig. 39). Antennal flagellum with 31 segments.

Epomia ventroposteriorly weak, not joining horizontal carinulae extending from posterior edge of pronotum. Lateral longitudinal carinae of propodeum absent from spiracle to near posterior transverse carina (complete from anterior to posterior transverse carina in all other species), complete and strong from posterior transverse carina to posterior edge of propodeum (Fig. 51). Posterior transverse carina of propodeum located posterior to midlength of propodeum, straight between medial longitudinal carinae, angled at points of union with medial longitudinal carinae and strongly angled between medial and lateral longitudinal carinae (Fig. 51). Combined basal and areolar areas narrow and slightly convergent posteriorly (Fig. 51). Hind femur 6.4 times as long as medial width (Fig. 11). Hind tarsal claw pectinate to about 0.8 with at least four stout, long pectinations, the third from the apex the longest and stoutest (longer than claw). Fore wing areolet with vein 2*rs-m* strongly reclivous, slightly shorter than length of vein *M* between 2*rs-m* and vein 2*m-cu*, vein 3*rs-m* absent except as a very short weakly pigmented vestige anteriorly. Hind wing vein 2/*Cu* equidistant between vein *M* and vein *A*.

Tergite 1 of metasoma 2.7 times as long as apical width. Dorsolateral longitudinal carinae extending posterior to spiracle, quite sharp just posterior to spiracle, but fading to a rounded ridge towards apex. Tergite 2 1.1 times as long as apical width, anterior half with paired, sublateral swellings.

Black. Scape and pedicel brown dorsally, brownish yellow ventrally. Flagellum brown. Apical 0.1 of clypeus, apical segment of maxillary palp, apex of fore and mid femora, anterior and dorsal surface of hind trochanter, all of hind trochantellus, laterotergites of metasomal segments 4 to 7, posterior sternites and gonoforceps light brown. Basal four segments of palpi, dorsoposterior corner of pronotum, tegula, fore and mid coxae white (coxae with a trace of yellow apically on posterior surface). Mandibles, except at apex, and apical segment of labial palp brownish white. Fore and mid trochanters, trochantelli and femora yellow (whitish yellow ventrally and brownish yellow dorsally, both femora light brown at extreme apex). Fore and mid tibiae and tarsi brown (light brown ventrally and darker brown dorsally, becoming darker from base to apex and mid leg slightly darker than fore leg). Hind coxa and posterior and ventral surfaces of trochanter yellowish white except coxa dark brown at extreme base. Hind tibia with a brown longitudinal stripe dorsally and brownish orange ventrally. Hind tarsus brown, darkening from base to apex. Posterior 0.1 of tergites 1 and 3, thyridia, posterior 0.2 of tergite 2 and extreme apices of tergites 4 to 7 brownish yellow. Posterior band on tergite 2 wider laterally than medially (Fig. 67).

F e m a l e . Unknown.

E g g . Unknown.

Molecular sequences. Partial DNA barcode region known for holotype (Table 2).

Etymology. The species name is an adjective that means lacking a crest, referring to the lack of the anterior section of the lateral longitudinal carina of the propodeum.

Comments. The DNA barcode of the holotype was most similar to the barcodes of the four specimens of *C. mexicanus*, but differed by at least 2 % (Table 3). The phylogenetic analysis found it to be the sister species to *C. mexicanus* (Fig. 76).

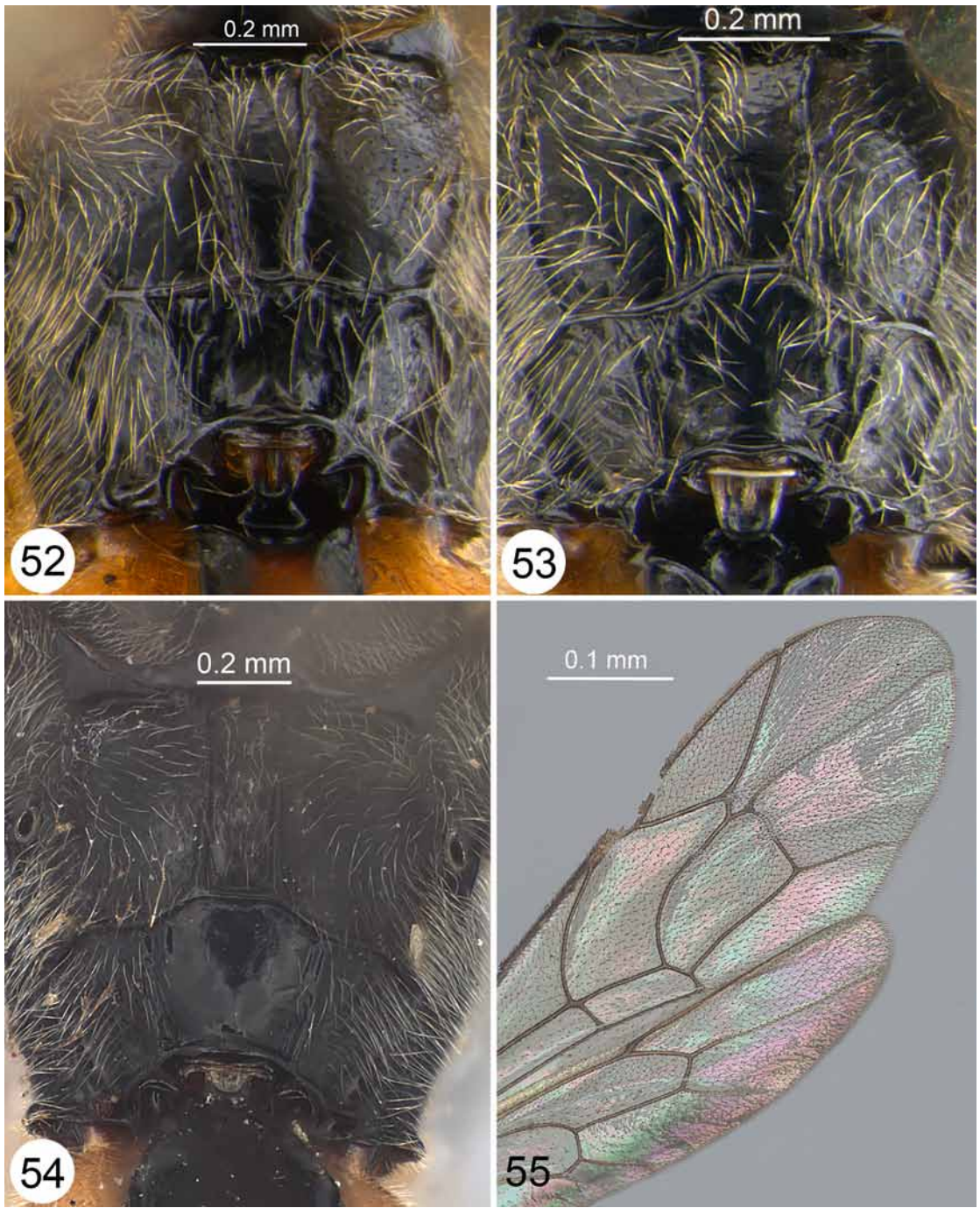### *Chiloplatys cenodontis* sp. n.
(Figs 12, 28, 40, 68)

Type material. Holotype: male, "MEXICO: Michoacan, 6 miles N. Cheran 7-8-VII-1985, J. Woolley G. Zolnerowich 85/034" (TAMU).

Non-type material. MEXICO: Morelos: Felipe Neri, 22.vii.1987. S. Ramirez A., 1 male (UAT).

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Diagnosis. Chiloplatys cenodontis **sp. n.** can be distinguished from all other species of *Chiloplatys* by combination of: 1) point of union of hypostomal and occipital carinae not extending conspicuously posterior to the posterior edge of the occipital carina and the hypostomal carina only slightly heightened (Fig. 40); 2) metasomal tergites 2 and 3 predominantly dark, tergites 4 and 5 anteriorly dark orange brown (Figs 12, 68) (compared to *C. convergens* **sp. n.** in which segments 2 to 8 are predominantly or entirely

Figures 52–55. Propodeum, dorsoposterior (52–54) and wings (55). 52 – *Chiloplatys convergens*, holotype; 53 – *C. fasciatus*, paratype, female; 54–55, *C. mexicanus*, holotype.

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orange). In terms of colour, within the *C. mexicanus* species group, *C. cenodontis* **sp. n.** most closely resembles *C. faciatus* **sp. n.** because of the banded metasoma, but the hypostomal-occipital lobe on *C. fasciatus* **sp. n.** is greatly heightened (compare Fig. 40 to Fig. 42).

Description. A d u l t . M a l e . Fore wing length 5.1 to 5.6 [5.1] mm. Supraclypeal area 1.1 to 1.3 [1.3] times as wide at midheight as high, without a convex medial protuberance (Fig. 28). Clypeus 1.6 to 1.9 [1.9] times as wide as high. Dorsal tooth of mandible only slightly longer than ventral tooth. Malar space 0.5 times basal width of mandible. Ocello-ocular distance 1.8 to 1.9 [1.9] times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.6 to 0.7 [0.6] times basal width of mandible, hypostomal carina only slightly heightened and not extending posterior to posterior edge of occipital carina (Fig. 40). Antennal flagellum with 30 to 32 [30] segments.

Epomia ventroposteriorly weak, not joining horizontal carinulae extending from posterior edge of pronotum. Lateral longitudinal carinae of propodeum present from anterior of propodeum to posterior transverse carina, complete and strong from posterior transverse carina to posterior edge of propodeum. Posterior transverse carina of propodeum located slightly posterior to midlength of propodeum, very slightly to strongly [very slightly] arcuate between medial longitudinal carinae, strongly angled at points of union with medial longitudinal carinae and moderately arcuate between medial and lateral longitudinal carinae. Combined basal and areolar areas of moderate width and roughly rectangular, slightly to moderately [slightly] convergent posteriorly. Hind femur 4.8 to 5.3 [4.8] times as long as medial width (Fig. 12). Hind tarsal claw pectinate to about 0.7 with three stout, long pectinations, the middle one longest and stoutest (slightly longer than claw). Fore wing areolet with vein 2*rs-m* slightly to strongly [slightly] reclivous, slightly thickened anteriorly (but without any vestige of vein 3*rs-m*), about equal in length to length of vein *M* between 2*rs-m* and vein 2*m-cu*. Hind wing vein 2/*Cu* slightly closer to vein *M* than vein *A*.

Tergite 1 of metasoma 2.6 to 2.7 [2.6] times as long as apical width. Dorsolateral longitudinal carina strong and sharp to apex. Tergite 2 1.0 to 1.2 [1.0] times as long as apical width, anterior half with paired, sublateral swellings.

Black. Basal half of mandibles, dorsoposterior corner of pronotum, tegula, fore coxa apically and posteriorly and mid coxa posteriorly white. Apical half of mandibles except at apex, palpi, base and dorsal surface of fore coxa, mid coxa except posteriorly, fore and mid trochanter and trochantelli and hind trochantellus brownish white. Apical 0.2 of clypeus brownish yellow. Ventral surface of scape, pedicel and basal seven flagellomeres, fore femur, tibia and tarsus except dorsal surface of apical tarsomere, mid femur and tibia, hind coxa, trochanter and tibia subbasally, apically and ventrally, laterotergites of metasomal segments 4 to 7 and posterior sternites, posterior 0.1 of metasomal tergite 1, thyridia, posterior 0.2 of tergite 2, anterior 0.1 and posterior 0.2 of tergites 3 and 4, posterior 0.1 of tergite 5 and all of tergites 6 and 7 yellow. Fore and mid leg lighter in colour than hind leg and metasoma darker darkening from anterior to posterior and from dorsal to ventral surfaces. Ventral surface of flagellum apical to flagellomere 6, apical fore tarsomere, middle and hind tarsus, dorsal surface of hind tibia from 0.3 to 0.8 and gonoforceps light brown. Apex of mandible, dorsal surface of antenna and basal 0.1 of hind tibia brown. Medial parts of tergites 2 to 5 brown fading to orange.

V a r i a t i o n . Paratype is pale yellow in parts in which the holotype is white. In addition, the subbasal yellow ring of the hind tibia is not complete, present as only a slight lighter region on dorsal surface. Tergite 6 is darker anteriorly in the paratype.

F e m a l e . Unknown.

E g g . Unknown.

Molecular sequences. Unknown.

Comments. The holotype and the non-type specimen from Morelos (Felipe Neri) share the slightly heightened, but non-projecting lobe at the union of the hypostomal and occipital carinae; however, the lobe in the non-type specimen is slightly higher than in the holotype. There are also slight colour differences (see above) and a few structures differ slightly in their dimensions (e.g., the clypeus and hind femur). Because of these differences I have not designated the specimen as a paratype. Hopefully more specimens will be collected that will show the variation in this species and whether the specimen from Felipe Neri fits within this range.

Etymology. The species name is an adjective meaning lacking a lobe, referring to the non-projecting, weakly heightened lobe at the union of the occipital and hypostomal carinae.

Comments. See comments for *C. convergens* **sp. n.**

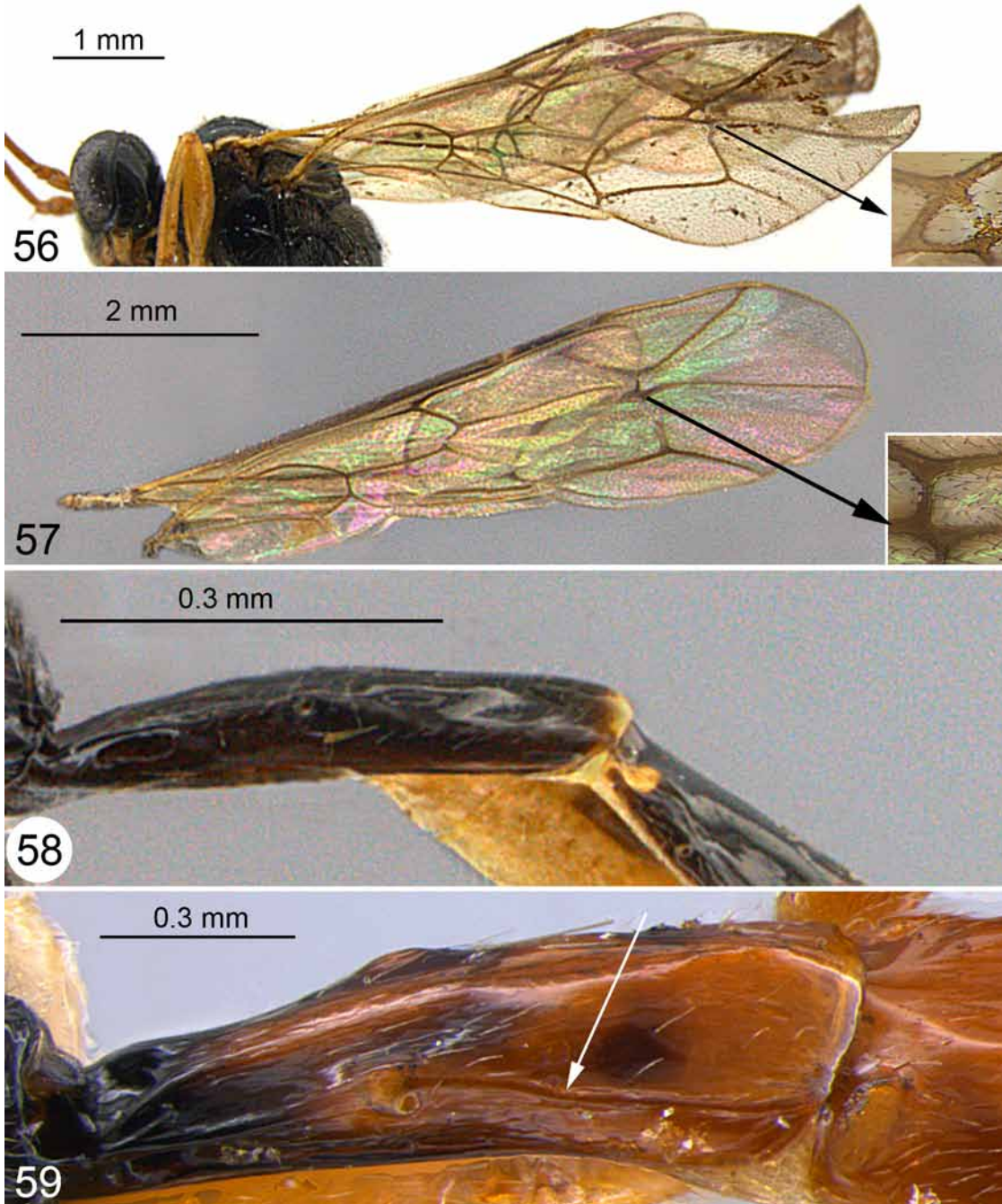### *Chiloplatys convergens* **sp. n.**
(Figs 13, 18, 29, 41, 52, 56, 59, 69, 72)

Type material. Holotype: male, "State of Veracruz, Mex., Aug. 6, 1961 R. & K. Dreisbach" (AEIC). Condition of type: intact, except right flagellomere has only 22 segments attached to pedicel, left has 24, apical flagellomeres broken and glued to point (9 segments for each antenna).

Paratype. Mexico, Veracruz: Jalapa, 1–6.viii.1961, R. and K. Dreisbach, 1 male (AEIC).

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Diagnosis. Chiloplatys convergens **sp. n.** can be distinguished from all other species of *Chiloplatys* by combination of the following characters: 1) point of union of hypostomal and occipital carinae only slightly heightened and not extending much posterior to the posterior edge of the occipital carina (Fig. 41); 2) metasomal tergites 2–8 predominantly orange, with at most, traces of dark in segments 2 and 3 (Fig. 69). The two known specimens of *Chiloplatys convergens* **sp. n.** are also the only *Chiloplatys*

Figures 56–59. Fore wing showing areolet, holotype (56, 57) and metasomal tergites 1 and 2, dorsolateral, holotype (58, 59). 56, 59 – *Chiloplatys convergens* (arrow in Fig. 59 points to dorsolateral carina of tergite 1); 57 – *C. verticalis*; 58 – *C. oaxacaensis*.

specimens known that have orange markings on the dorsal surface of tergite 1 anterior to the spiracles (Fig. 69). In addition, the combined basal and areolar regions of the propodeum converge more strongly posteriorly than any other species of *Chiloplatys* (Fig. 52).

Description. A d u l t . M a l e . Fore wing length 5.7 to 6.1 [6.1] mm. Supraclypeal area 1.4 to 1.5 [1.5] times as wide at midheight as high (Fig. 18), without a convex medial protuberance (Fig. 29). Clypeus 1.8 to 2.0 [2.0] times as wide as high (Fig. 18). Dorsal tooth of mandible about 1.5 times as long as ventral tooth. Malar space times 0.4 basal width of mandible. Ocello-ocular distance 1.9 to 2.1 [2.1] times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.6 times basal width of mandible, hypostomal carina only slightly heightened and the point of unioni of the two carinae not extending much posterior to posterior edge of occipital carina (Fig. 41). Antennal flagellum with 32 to 33 segments [holotype assumed to have 33 calculated by adding the 9 segments glued to the point (including the apical segment) to the number of flagellomeres attached to the left pedicel (24)] (see condition of type, below).

Epomia ventroposteriorly weak, not joining carinulae extending from posterior edge of pronotum. Lateral longitudinal carinae of propodeum complete and strong from anterior of propodeum to posterior transverse carina, complete from posterior transverse carina to posterior edge of propodeum, petiolar area also with a pair of incomplete, anteriorly curving carinulae extending from posterior edge of propodeum and more medial to lateral longitudinal carinae (Fig. 52). Posterior transverse carina of propodeum located posterior to midlength of propodeum, straight between medial longitudinal carinae, not angled at points of union with medial longitudinal carinae and straight between medial and lateral longitudinal carinae so that posterior transverse carina is almost completely straight medially (Fig. 52). Combined basal and areolar areas very narrow and strongly convergent posteriorly (Fig. 52). Hind femur 4.6 to 5.2 [4.6] times as long as medial width. Hind tarsal claw pectinate to about 0.8 (with three visible, stout pectinations, the middle one longer than claw). Fore wing areolet with vein *2rs-m* reclivous, about the same length as vein *M* between *2rs-m* and vein *2m-cu*, distinct portion of vein *3rs-m* present anteriorly (Fig. 56). Hind wing vein *2/Cu* distinctly closer to vein *M* than vein *A* (Fig. 56).

Tergite 1 of metasoma 2.3 to 2.5 [2.3] times as long as apical width (Fig. 69). Dorsolateral longitudinal carinae extending to apex (Fig. 59). Tergite 2 0.8 to 0.9 [0.8] times as long as apical width (Fig. 69), anterior half with paired, sublateral swellings (Fig. 72).

Black. Ventral half of clypeus, mandible except at apices of teeth, scape, pedicel and basal segment of flagellum yellowish orange, remainder of flagellum darkening to brown apically, slightly darker on dorsal surface. Apex of mandibles brown. Palpi, dorsoposterior corner of pronotum, tegula, fore and mid coxa, trochanter and trochantellus pale yellow. Fore and mid femora and tibiae yellow. Fore and mid tarsi brownish yellow. Hind legs yellowish orange becoming darker apically. Metasoma including gonoforceps orange except for dark brown in anterior 0.2 of tergite 1, dorsolaterally and laterally in anterior 0.4 with faint brown marks continuing ventrolaterally to 0.7 (Fig. 69) and dorsolaterally to 0.6 and also from 0.7 to 0.8 (Fig. 59). Metasoma becoming lighter towards posterior.

V a r i a t i o n . Paratype as holotype except, the more medial, curving "carinulae" present in the petiolar area of the propodeum are complete to the anterior transverse carina (incomplete in holotype), whereas the straighter, more lateral "carinae" are incomplete. Areolet of fore wing with a shorter portion of vein 3rs-m present anteriorly (although remnant still present).

Tergite 1 dark brown in anterior 0.8, except for faint orange brown traces dorsomedially from 0.2 of length to spiracle and dorsolaterally around spiracles. Tergite 1 orange in posterior 0.2. Tergite 2 predominantly orange except for brown in anterior 0.3, the brown also extending dorsolaterally to 0.7. Tergite 3 predominantly orange with a pale, brown band from 0.2 to 0.4.

F e m a l e . Unknown.

E g g . Unknown.

Molecular sequences. Unknown.

Etymology. The species name is an adjective meaning convergent referring to the basal and areolar area of the propodeum which is strongly convergent posteriorly.

Comments. The point of union of the occipital and hypostomal carinae of *C. convergens* **sp. n.** and *C. cenodontis* **sp. n.** is only slightly heightened and does not project posterior to the posterior edge of the occipital carina (Figs 40, 41). Molecular sequence data is not available for these two species, but we hypothesize that they are sister species and that together they may form a sister group to the other species within the *C. mexicanus* species group, all of which have a strongly posteriorly projecting and/or heightened hypostomal-occipital tooth or lobe.

Chiloplatys fasciatus **sp. n.**
(Figs 14, 30, 42, 53, 70, 75)

Type material. Holotype: male, label 1: "MEX. Sin. 15 mi. W. El Palmito, 5000' 16 July 1964. W.R.M. Mason"; label 2: "DNA voucher CNCHYM 09951" (CNC). Condition: intact except missing left mid leg.

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Paratypes. Mexico: Sinaloa: as holotype, 8 males (4 CNC, 1 of which is CNCHYM 09952; 1 AEIC, 1 BMNH, 1 TAMU, 1 ZMUT); 1 male, as holotype except 8.viii, (CNC); 4 females, as holotype except 25.vii, 30.vii, 8.viii, 8.viii (CNC).

Diagnosis. Chiloplatys fasciatus **sp. n.** can be distinguished from all other species of *Chiloplatys* by having the point of union of hypostomal and occipital carinae protruding strongly ventrally because the hypostomal carina is strongly heightened, but this region is only slightly projecting posterior to the posterior edge of the occipital carina (Fig. 42). Within *Chiloplatys*, *C. fasciatus* **sp. n.**, *C. convergens* **sp. n.**
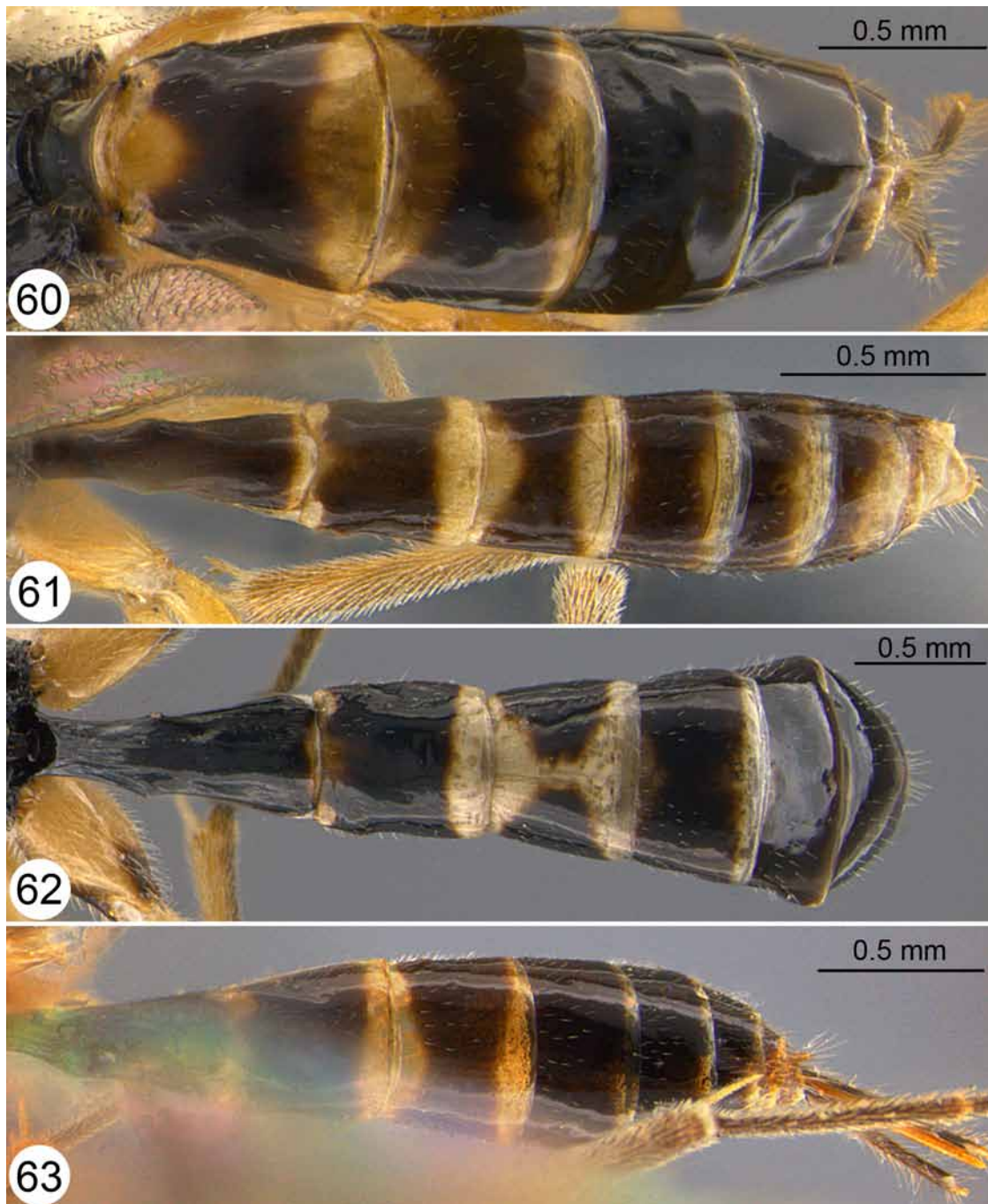
Figures 60–63. Metasoma, holotype, dorsal. 60 – *Chiloplatys divergens*; 61 – *C. dmitrii*; 62 – *C. kalyx*; 63 – *C. lucens*.

and *C. cenodontis* **sp. n.** are the only species that do not have a strongly posteriorly projecting lobe posteroventrally on the head, but in *C. convergens* **sp. n.** and *C. cenodontis* **sp. n.**, the hypostomal carina is only slightly heightened and not at all projecting posteriorly (Figs 40, 41), whereas in *C. fasciatus* **sp. n.**, it is greatly heightened and slightly projecting posteriorly (Fig. 42). *Chiloplatys fasciatus* **sp. n.** belongs to the *C. mexicanus* species group, therefore it lacks the convex, medial protuberance of the supraclypeal area (Fig. 30) and it has a mostly dark metasoma (at least in tergites 1 to 3) with contrasting pale bands on the posterior of the tergites (Fig. 70).

Description. A d u l t . F e m a l e . Fore wing length 4.2 to 5.0 mm. Supraclypeal area 1.3 to 1.4 times as wide at midheight as high, without a convex medial protuberance (as in Fig. 30). Clypeus 1.4 to 1.6 times as wide as high. Dorsal tooth of mandible only slightly longer than ventral tooth. Malar space 0.4 to 0.5 times basal width of mandible. Ocello-ocular distance 1.9 to 2.1 times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.6 to 0.7 times basal width of mandible, the hypostomal carina heightened greatly, but not extending much posterior to posterior edge of occipital carina (as in Fig. 42). Antennal flagellum with 26 to 29 segments.

Epomia ventroposteriorly weak, narrowly to widely incomplete, not joining carinulae extending from posterior edge of pronotum. Lateral longitudinal carinae of propodeum complete from anterior of propodeum to posterior transverse carina, ranging from complete (but weak) to narrowly incomplete from posterior transverse carina to posterior of propodeum (Fig. 53). Posterior transverse carina of propodeum located posterior to midlength of propodeum, straight between medial longitudinal carinae, slightly to moderately angled at points of union with medial longitudinal carinae, slightly arcuate between medial and lateral longitudinal carinae (Fig. 53). Combined basal and areolar areas moderately wide and subrectangular, weakly convergent posteriorly (Fig. 53) or sub-parallel. Hind femur 5.0 to 5.5 times as long as medial width (as in Fig. 14). Hind tarsal claw pectinate nearly to apex with at least three stout pectinations, the third from apex the longest, a bit longer than claw (Fig. 75). Fore wing areolet with vein *2rs-m* slightly reclivous, clearly shorter than length of vein *M* between *2rs-m* and vein *2m-cu* (Fig. 14), vein *2rs-m* thickened anteriorly, with a definite vestige of vein *3rs-m* anteriorly in most specimens. Hind wing vein *2/Cu* equidistant between veins *M* and *A* or closer to *M* (as in Fig. 14).

Tergite 1 of metasoma 2.2 to 2.4 times as long as apical width (Fig. 70). Dorsolateral longitudinal carinae sharp, extending to apex. Tergite 2 0.8 to 0.9 times as long as apical width, anterior half with paired, sublateral swellings. Ovipositor sheath (Fig. 75) 0.4 to 0.5 times as long as hind tibia.

Black. Mandibles except apically, palpi, dorsoposterior corner of pronotum, tegula, fore and middle coxae, trochanters and trochantelli, posterior 0.1 of metasomal tergite 1, posterior 0.2 of tergites 2, 3 and 4, laterotergites and posterior sternites including hypopygium yellowish white. Apical 0.2 of clypeus, ventral surfaces of scape, pedicel and basal three flagellomeres, apical third of flagellum, hind coxa, trochanter and trochantellus, all femora except inner surface of hind femur, fore and mid tibiae and hind tibia subbasally on outer surface and on ventral surface in apical 0.3 to 0.5, fore tarsus, apical 0.1 to 0.2 of basal four tarsomeres of middle and hind leg, thyridia, posterior 0.2 of metasomal tergites 5 and 6, all visible parts of tergites 7 and 8 and ovipositor yellow. Darkness of yellow varies: fore leg lightest, hind leg darkest; apical 0.2 of clypeus, dorsal surfaces of femora and apical fore tarsomere are darkest yellow, hind coxa ventrally and sternites are the palest yellow. Dorsal surface of scape, pedicel, flagellum except apical third, inner surface of hind femur, hind tibia except yellow parts noted above, middle and hind tarsi, except at apex of basal four tarsomeres brown. Apex of mandibles, basal 0.8 of clypeus, basal 0.8 of tergites 2 to 6 and ovipositor sheath dark brown. Darkness of brown decreases from anterior to posterior of metasoma.

V a r i a t i o n . some females are lighter in colour such that the brown on the inner surface of the hind femur is more dark brownish yellow, the subbasal yellow on the hind tibia is more extensive including part of the ventral surface and the metasoma is much lighter with tergites 4+ being entirely brownish yellow to yellow and the white apical bands on tergites 1 to 3 being longer and more yellow than white. Some females have a faint brownish mark on the outer surface of the hind coxa near the apex.

M a l e . As female, except fore wing length 4.1 to 5.1 mm [4.9]. Supraclypeal area 1.3 to 1.4 [1.3] times as wide at midheight as high. Clypeus 1.4 to 1.7 [1.7] times as wide as high. Malar space 0.4 to 0.5 [0.4] basal width of mandible. Ocello-ocular distance 1.8 to 2.1 [1.8] times maximum diameter of lateral ocellus. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.6 to 0.7 [0.7] times basal width of mandible. Antenna with 26 to 29 [28] flagellomeres.

Lateral longitudinal carinae of propodeum complete to narrowly incomplete from posterior transverse carina to posterior of propodeum [complete]. Posterior transverse carina of propodeum straight or slightly arcuate [straight] between medial longitudinal carinae, slightly to moderately [moderately] angled at points of union with medial longitudinal carinae, slightly to strongly [strongly] arcuate between medial and lateral longitudinal carinae. Combined basal and areolar areas of moderate to narrow [narrow] width ranging from subrectangular to moderately convergent [moderately convergent] posteriorly. Hind femur to 5.0 to 5.2 [5.0] times as long as medial width. Hind tarsal claw pectinate to about 0.7 with 2 or 3 [2] visible stout pectinations, the most second from the apex the stoutest and longest, a bit longer than claw. Fore wing areolet with vein *2rs-m* ranging from slightly thickened anteriorly with no vestige of vein *3rs-m* to having vein *3rs-m* long and conspicuous [left wing vein *3rs-m* long, right wing with no vestige of *3rs-m*]. Hind wing vein *2/Cu* equidistant between veins *M* and *A* or closer to *M* [closer to *M*].

Tergite 1 of metasoma 2.1 to 2.5 [2.4] times as long as apical width. Tergite 2 0.9 to 1.1 [1.0] times as long as apical width, anterior half with paired, sublateral swellings.

54

Colour as for female, except flagellum is slightly darker in male, especially apically on ventral surface (brown as opposed to brownish yellow). Males show similar variation as seen in the females. The male holotype is a lighter individual in terms of the metasoma (posterior tergites tend toward brownish yellow and yellow versus brown) (Fig. 14). It does have a faint brown mark on the hind coxa and the hind femur is quite dark brown on inner surface.

E g g . Attached to ovipositor on three of four female paratypes. Eggs are wizened in dried specimens (Fig. 75), unlike in *C. oaxacaensis* **sp. n.** (Fig. 73).
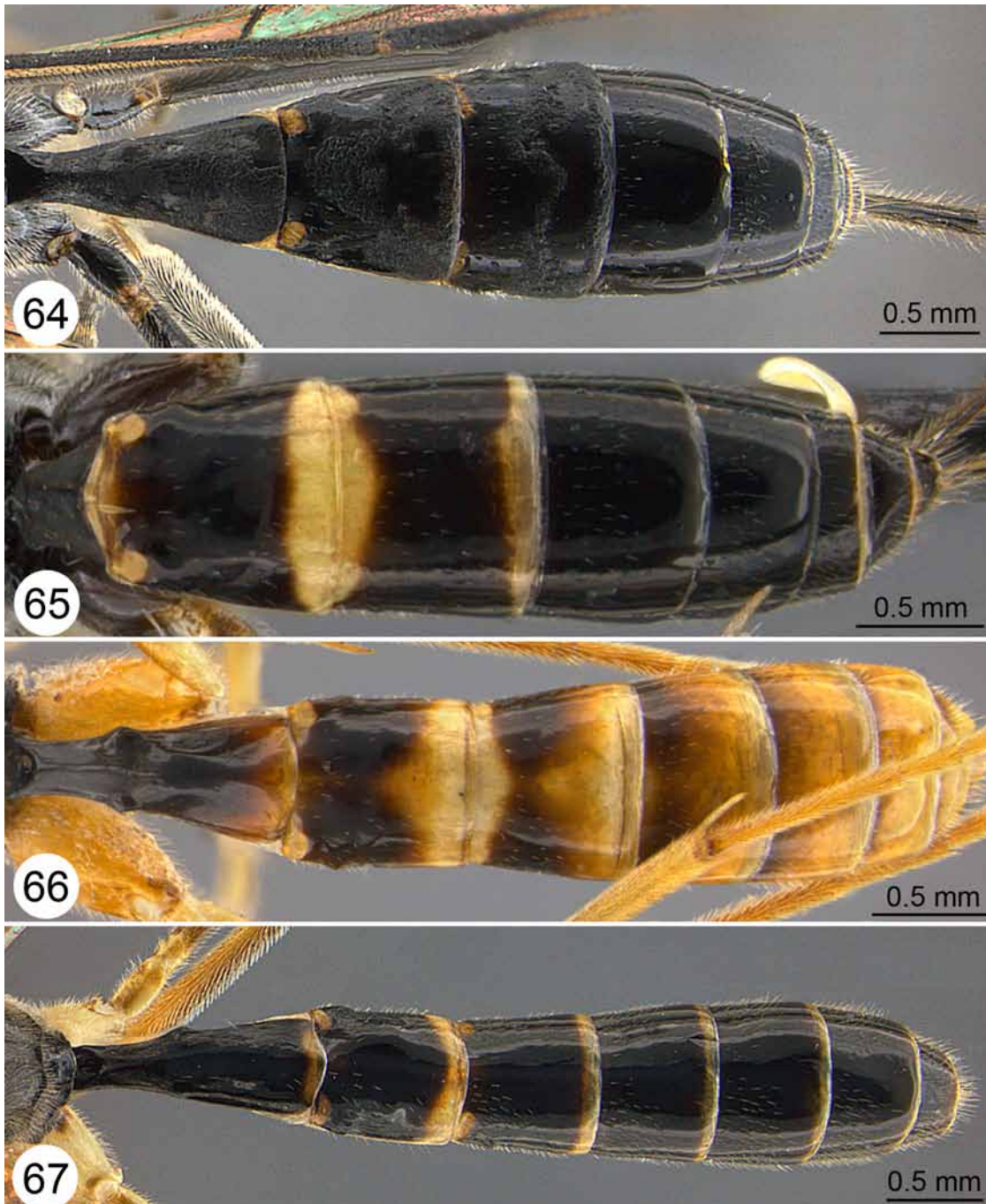
Figures 64–67. Metasoma, dorsal, holotype (64, 66, 67) and paratype (65). 64 – *Chiloplatys melanosoma*; 65 – *C. oaxacaensis*; 66 – *C. verticalis*; 67 – *C. alophos*.

Molecular sequences. DNA barcode region known for male holotype and one male paratype (Table 2).

Etymology. The species name is an adjective meaning "banded" referring to the lighter coloured banding on the posterior of the metasomal tergites.

Comments. The male paratype for which molecular sequence is known is of the dark variant in comparison to the pale variant holotype. The DNA barcode of these two specimens is identical supporting the hypothesis that the variation in colour is intraspecific. The phylogenetic analysis found *C. fasciatus* **sp. n.** to be the sister species to the other two species of the *C. mexicanus* species group that were included in the analysis (*C. alophos* **sp. n.** and *C. mexicanus*) (Fig. 76).

Chiloplatys mexicanus (Cresson)

(Figs 15, 19, 31, 43, 54, 55, 71)

Tryphon mexicanus Cresson, 1874: 391.

Material examined. 1 male (holotype), "Mex."; label 2 (red): Type No. 2664 –. Label 3 (handwritten): "Tryphon mexicanus Cr" (PNAS). Condition: Metasoma missing posterior to tergite 6 and all sternites and laterotergites posterior to S1 also lacking. Gonoforceps absent. Anterior margins of both fore wings slightly damaged/ missing near stigma. Mesosoma cracked on left mesopleuron and with a hole in right mesopleuron. Otherwise intact.

Non-type material. Costa Rica: San José Prov.: 1 male, San Antonio de Escazú, 20.v.1987, H. & M. Townes (AEIC); 1 male, same label data except 22.v.1987 (AEIC); 1 male, same label data except 24.v.1987 (AEIC); 1 female, 2 males, same label data except 1300 m, v.1987, Eberhard (BMNH); 1 female, same label data except, ix.-x.1987 (BMNH); 1 female, same label data except 5.xi.1988, P. Hanson (BMNH); 1 female, San Antonio de Escazú, Quebrada Lajas, 1600 m, viii–ix. 1996, Flores (CNCHYM 013437) (BMNH); Guatemala: Sacatepéquez Dept.: 1 male, 5 km SE Antigua, 2330 m, 14.52860°N 90.68885°W, oak forest, 10–13.vi.2009, Malaise, LLAMA#MA-B-08-2-02 (ZMUT); 1 male, same label data except 2335 m, 14.52846°N 90.68874°W, LLAMA#MA-B-08-2-01 (ZMUT); Mexico: Chiapas State: 1 male, San Cristobal de las Casas, 29.v.1969; W.R.M. Mason (CNCHYM 09359) (CNC); 1 male, same label data except (CNCHYM 04768) (CNC); 1 male, same label data except 27.vi.1969 (CNCHYM 09360) (CNC); 1 male, 3 mi. NE San Cristobal, 27.vi.1969, B.V. Peterson (CNC); 1 female, San Cristobal San Felipe, 7200', 4.ix.1990, R.W. Jones (TAMU); Jalisco State: 1 male, Guadalajara, 27.vii, McClendon (PNAS); Michoacan State: 1 female, 5 km W. of Zacapu, 13.vii.1951, H.E. Evans (AEIC); Veracruz State: Jalapa, 1 female, 28.ix–3.x.1961, R. & K. Dreisbach (AEIC); Nicaragua: Jinotega Dept.: 1 male, RN Datanil El Diablo, 1380 m, 13.10367°N 85.86904°W, 19–21.v.2011, Malaise trap, Cloud forest, LLAMA#MA-D-04-3-02 (ZMUT).

Diagnosis. *Chiloplatys mexicanus* can be distinguished from all other species of *Chiloplatys* by combination of the following characters: 1) supraclypeal area flat (Fig. 31), without a convex, medial protuberance; 2) point of union of occipital and hypostomal carinae extended ventrally and posteriorly into a strongly projecting, roughly right-angled, slightly rounded lobe (Fig. 43); 3) tergites 4 and 5 completely orange (Fig. 71) or brown to brownish orange with conspicuous lighter colour bands in posterior 0.2 or more (not completely dark as in *C. alophos* **sp. n.**). Based on colour, lighter individuals of *C. mexicanus* most closely resemble *C. convergens* **sp. n.** but *C. convergens* **sp. n.** has the hypostomal-occipital lobe much lower than *C. mexicanus* and not projecting posteriorly. Darker individuals most closely resemble *C. fasciatus* **sp. n.**, but the hypostomal-occipital lobe is much more posteriorly projecting in *C. mexicanus* compared to *C. fasciatus* **sp. n.** (compare Fig. 42 to Fig. 43).

Description. A d u l t . F e m a l e . Fore wing length 4.8 to 6.0 mm. Supraclypeal area 1.2 to 1.4 times as wide at midheight as high (Fig. 19), without a convex medial protuberance as seen in profile (Fig. 31). Clypeus 1.4 to 1.6 times as wide as high (Fig. 19). Dorsal tooth of mandible from slightly longer to about 1.5 times as long as ventral tooth. Malar space 0.4 to 0.5 times basal width of mandible. Ocello-ocular distance 1.8 to 2.1 times ocellar diameter. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.6 to 0.7 times base of mandible, this point extended ventrally and posteriorly into a strongly projecting, roughly right-angled, slightly rounded lobe (Fig. 43). Antennal flagellum with 28 to 32 segments.

Epomia ventroposteriorly weak, not joining horizontal carinulae that extend from posterior edge of pronotum. Lateral longitudinal carinae of propodeum complete anterior to posterior transverse carina, generally strong and complete from posterior transverse carina to posterior edge of propodeum, but some specimens weaker and may be interrupted medially. Posterior transverse carina of propodeum situated slightly to strongly posterior to midlength of propodeum, straight or arcuate between medial longitudinal carinae, very slightly to strongly angled at point of union with medial longitudinal carinae, slightly to strongly arcuate or angled from medial to lateral longitudinal carinae (Fig. 54). Combined areolar and basal areas of moderate width (most specimens) or relatively narrow, rectangular, barely converging at all posteriorly (most specimens) (Fig. 54) or moderately converging. Hind femur 5.0 to 5.6 times as long as medial width. Hind tarsal claw pectinate to 0.7 to 0.8 length of claw with at least four stout, closely spaced claws, the third from apex the longest and a bit longer than claw.

Fore wing areolet with vein *2rs-m* slightly to strongly reclivous, equal in length to abscissa of *M* between *2rs-m* and *2m-cu* (Fig. 54) or slightly longer, vein *3rs-m* varying from completely absent, present as a remnant anteriorly (Fig. 54) or complete. Hind wing vein *2/Cu* slightly closer to vein *M* or equidistant.

Tergite 1 of metasoma 2.0 to 2.5 times as long as apical width. Dorsolateral longitudinal carina extends posterior to spiracle, sharp to about 0.8 of tergite, the posterior 0.2 generally as a rounded edge, but sharp in some specimens. Tergite 2 0.8 to 1.2 times as long as apical width, sublaterally in basal half with a slightly raised rounded swelling on each side (darker coloured than rest of tergite). Ovipositor sheath 0.4 to 0.5 times as long as length of hind tibia.
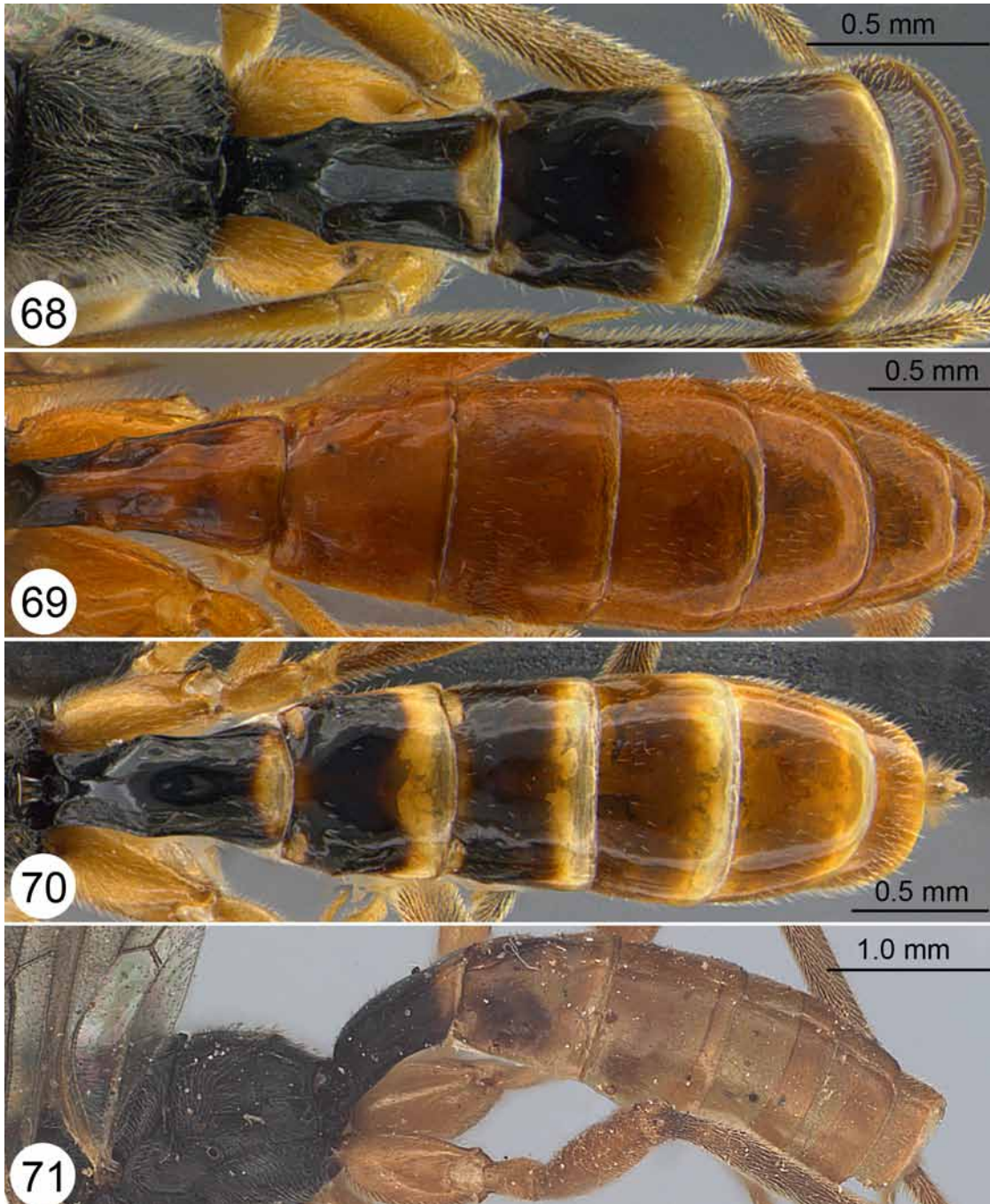
Figures 68–71. Metasoma, dorsal (68–70) and dorsolateral (71). 68 – *Chiloplatys cenodontis*, holotype; 69 – *C. convergens*, holotype; 70 – *C. fasciatus*, paratype, female; 71 – *C. mexicanus*, holotype.

Black. Mandible except at apex, palpi, dorsoposterior corner of pronotum, tegula, fore and middle coxae, trochanters and trochantelli yellowish white. Apical 0.2 of clypeus, ventral surface of scape, pedicel and basal five segments of flagellum and parts of legs not noted above or below, yellow, with fore leg lightest and hind leg darkest, dorsal surfaces darker than ventral. Hind tibia predominantly yellow except light brown in basal 0.1, and brownish yellow in a longitudinal stripe on dorsal and anterior surfaces from 0.2 to near apex. Apex of hind coxa and base of hind femur also stained slightly
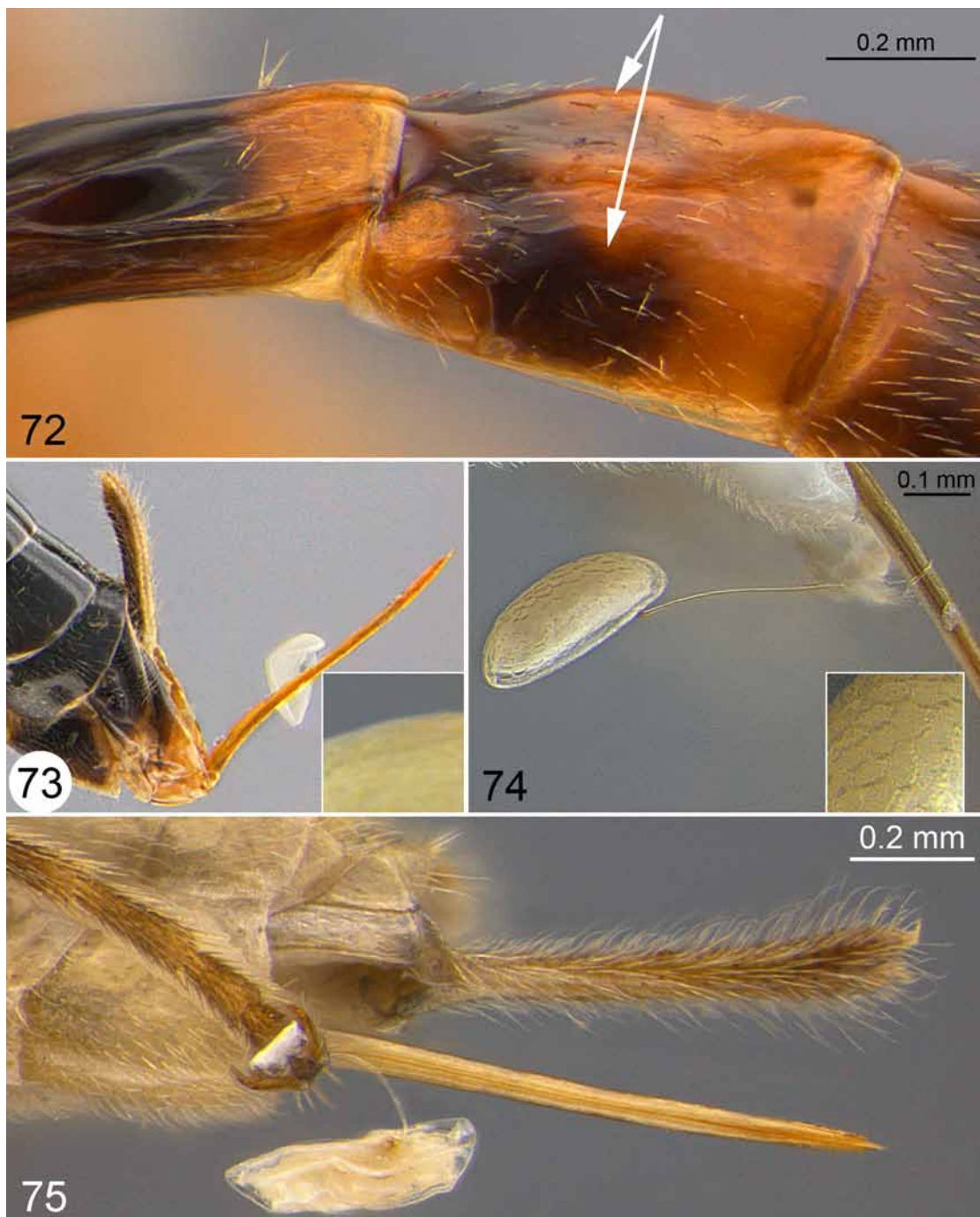
Figures 72–75. Tergites 1 and 2, dorsolateral (72) and posterior tergites, dorsolateral, showing ovipositor and egg (73–75). 72 – *Chiloplatys convergens*, paratype; 73 – *C. oaxacaensis*, holotype; 74 – *C. lucens*, non-type (Mexico: Colima); 75 – *C. fasciatus*, paratype. Arrows on Fig. 72 indicate sublateral swellings present in the *C. mexicanus* species group.

with light brown. Apex of mandible, clypeus between midline and apical 0.2 and ovipositor sheath dark brown. Dorsal surface of antenna light brown, darkening apically. Posterior 0.1 of metasomal tergite 1, anterior 0.2 of tergite 2 medially, thyridia, posterior 0.3 of tergite 2, anterior 0.1 and posterior 0.5 of tergite 3, all of tergites 4+, laterotergites and sternites including hypopygium yellowish orange. Tergite 2 from anterior edge to 0.6 (except medially in anterior 0.1) and tergite 3 from 0.2 to 0.5 brown with tinges of yellowish orange.

V a r i a t i o n . Some females are entirely yellowish orange on tergites 2+ or tergites 3+. Alternatively, one female from Escazu (BMNH) has brown on tergites 4 and 5. The clypeus may be yellow in apical 0.3 or only in apical 0.1. Darkness of brown and brownish yellow areas on hind tibia can be lighter or darker. Metasomal tergites 2+ can be brownish orange in areas that are described above as yellowish orange.

M a l e . As female except, fore wing length 4.8 to 6.4 [6.2] mm. Supraclypeal area 1.3 to 1.4 [1.4] times as wide at midheight as high (Fig. 19), without a convex medial protuberance as seen in profile (Fig. 31). Clypeus 1.6 to 1.9 [1.7] times as wide as high (Fig. 19). Dorsal tooth of mandible just a bit longer to 1.5 times as long [1.3] as ventral tooth. Malar space 0.4 to 0.5 [0.5] times basal width of mandible. Ocello-ocular distance 1.7 to 2.1 [2.1] times ocellar diameter. Point of union of occipital and hypostomal carinae distant from base of mandible by 0.5 to 0.7 [0.5] times base of mandible, this point extended ventrally and posteriorly into a strongly projecting, roughly right-angled or slightly acute [right-angled], rounded lobe (Fig. 43). Antennal flagellum with 29 to 32 [30 right, 31 1eft] segments.

Variation in propodeal carinae similar to female. Condition in holotype shown in Fig. 54. Hind femur 5.1 to 5.8 [5.6] times as long as medial width (Fig. 1). Hind tarsal claw pectinate to 0.7 or 0.8 [0.7] with three or four visible stout pectinations, the longest the third from apex (most specimens) or second from apex [third]. Fore wing areolet with vein 2rs-m reclivous, about equal or slightly longer than abscissa of M between 2rs-m and 2m-cu [left wing with vein 2rs-m
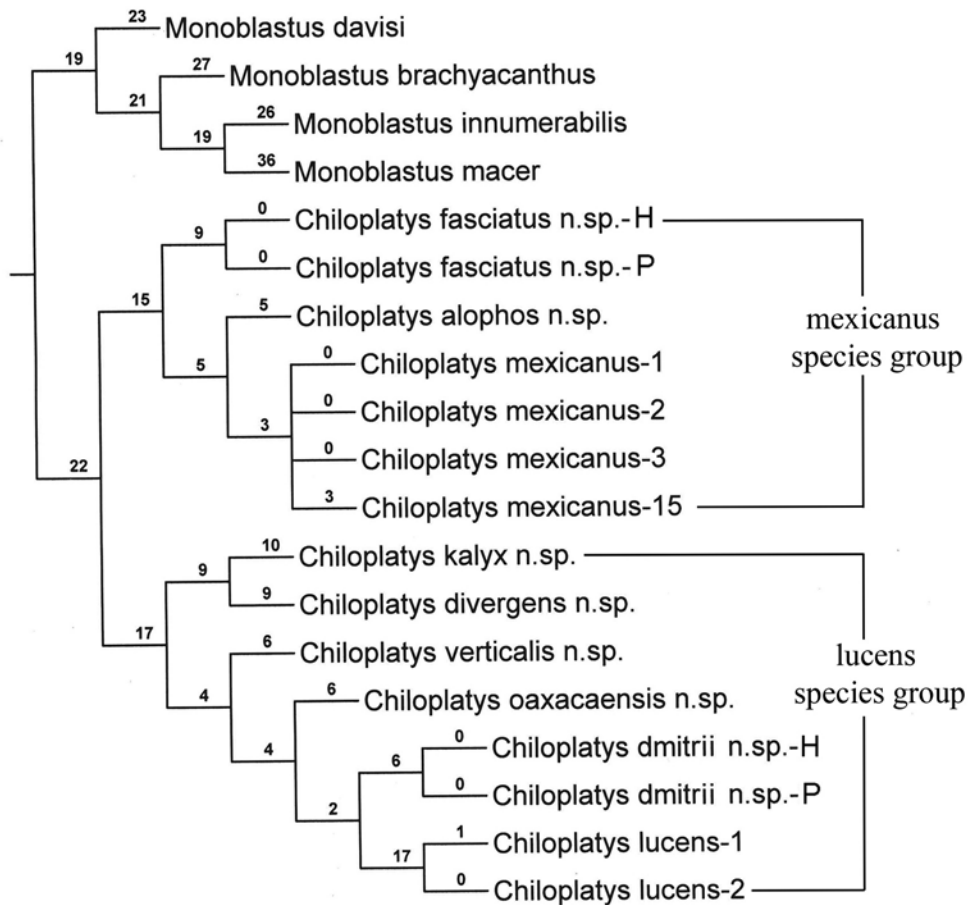
Figure 76. TNT analysis of *Chiloplatys* spp. relationships based on 401 base pair fragment of COI DNA barcoding region (1 tree, length = 324, CI = 0.65, RI = 0.75). Numbers above branches are number of nucleotide substitutions supporting node or taxon. *Monoblastus* spp. were used as outgroup to *Chiloplatys* based on the findings of Bennett (2002). Numbers following species names indicate non-type specimen numbers, H = holotype, P = paratype.

slightly thickened anteriorly with an inconspicuous swelling where vein 3*rs-m* would join; right wing with definite vestige of vein 3*rs-m* present anteriorly (Fig. 55)], vein 3*rs-m* absent in most specimens or present as a vestige anteriorly. Hind wing vein 2/*Cu* ranging from slightly closer to vein *A* than vein *M* to slightly closer to vein *M* than vein *A* [slightly closer to *A* (Fig. 55)].

Tergite 1 of metasoma 2.2 to 2.7 [2.2] times as long as apical width. Dorsolateral longitudinal carina of tergite 1 extending as a sharp crease to at least 0.8 of tergite, extending all the way to apex in some specimens. Tergite 2 0.8 to 1.2 [0.8] times as long as apical width, sublaterally in basal half with a slightly raised rounded swelling on each side (similar to Fig. 72).

Colour as in female.

V a r i a t i o n . Similar to female. Holotype shown in Fig. 15 is on the lighter end of the colour spectrum for this species with dark only on tergite 2 (all posterior tergites yellowish orange). Other specimens have tergites 3+ brown (becoming lighter apically), each tergite with yellow bands anteriorly and posteriorly (similar pattern to holotype of *C. fasciatus* **sp. n.** shown in Fig. 14). The hind tibia in the holotype is dark basally which is the condition in all specimens we have seen except for one of the Guatemalan specimens (2330 m) (ZMUT) which is yellow both basally and subbasally. Despite this, structurally this Guatemalan specimen still fits within the range of *C. mexicanus*.

E g g . Known for four specimens: Mexico (Michoacan) (AEIC) is yellowish white, not wizened, surface not reticulate, but with some low dimpling; three Costa Rica (Escazu) specimens (BMNH) are yellowish white and wizened. On the Escazu specimens, it does not appear that there is reticulate sculpture like that seen in the *C. lucens* specimen from Colima, but this is difficult to tell with the wizening.

Molecular sequences. DNA barcode region known for four specimens: two males and one female from Mexico and one female from Costa Rica (Table 2).

Comments. The single male specimen on which the original description of Cresson (1874) is based is the holotype, not the lectotype as stated by Yu with co-authors (2012). This conclusion is based on Article 73.1.2 of the Code – "If the nominal species-group taxon is based on a single specimen, either so stated or implied in the original publication, that specimen is the holotype fixed by monotypy".

Chiloplatys mexicanus displays some colour variation on the metasoma, but otherwise the colour is relatively homogenous. The occipital-hypostomal projection is quite distinctive (strongly projecting ventrally and posteriorly as a slightly rounded, roughly right-angled lobe) (Fig. 43). The propodeal carination and length of the dorsolateral carina of tergite 1 are somewhat variable (see description above), but we believe this is indicative of the labile nature of these carinae and not the presence of cryptic species within *C. mexicanus*. This hypothesis is supported by the molecular data which revealed slight differences in the shape and location of the propodeal carinae despite almost identical DNA barcodes. The molecular data also support the hypothesis that *C. mexicanus* ranges from Mexico to Costa Rica in that the barcode from the specimen from Costa Rica was only 0.76 % different than the three specimens from Mexico (see Table 3).

Discussion

It could be argued that because the *C. lucens* and *C. mexicanus* species groups are well-supported, monophyletic lineages on the basis of both molecular and morphological characters they should be recognized as discrete genera. This nomenclatural change is not proposed because sequence divergence rates within the *lucens* group are nearly as high (up to 9.4 %) as rates between the two species groups (12.8 % to 15.0 %) as well as because of morphological characters that clearly link the two groups (e.g., enlarged point of union of the hypostomal and occipital carina in species of both groups, characteristic propodeal carinal pattern and the highly glabrous body with only very fine, setiferous punctation). At a species level, the study has increased the number of described species from 2 to 12. Considering the relative rarity of this genus in collections, the high degree of molecular divergence among specimens (see Table 3) and the number of singletons in this study, it is likely that there are many additional species of *Chiloplatys* waiting to be discovered. Certainly, the study highlights the relatively poor sampling that has occurred in the Neotropical region to date (with the exception of Costa Rica) and it will hopefully act as an impetus to encourage more collecting in the future.

Acknowledgements

References

B e n n e t t A . M . R . 2002. *Cladistics of the Tryphoninae (Hymenoptera: Ichneumonidae) with a discussion of host use and the evolution of parasitism in the Ichneumonidae*. PhD thesis, Toronto, Ontario: University of Toronto. 366 p.

B e n n e t t A . M . R . 2003. A new genus and five new species of Neotropical Tryphoninae (Hymenoptera: Ichneumonidae). *Journal of Hymenoptera Research*, **12**: 209–219.

C r e s s o n , E . T . 1874. Descriptions of Mexican Ichneumonidae. *Proceedings of the Academy of Natural Sciences of Philadelphia*, **1873**: 374–413.

F i s h e r B . L . , S m i t h M . A . 2008. A revision of Malagasy species of *Anochetus* Mayr and *Odontomachus* Latreille (Hymenoptera: Formicidae), *PLoS ONE*, **3**. e1787. doi: 10.1371/ journal.pone.0001787

G a u l d I . D . 1997. The subfamily Tryphoninae. *In*: Gauld I.D., Wahl D., Bradshaw K., Hanson P., Ward S. The Ichneumonidae of Costa Rica, 2. Introduction and keys to species of the smaller subfamilies, Anomaloninae, Ctenopelmatinae, Diplazontinae, Lycorininae, Phrudinae, Tryphoninae (excluding *Netelia*) and Xoridinae, with an appendix on the Rhyssinae. *Memoirs of the American Entomological Institute*, **57**: 330–428.

G o l o b o f f P . A . 1999. *NONA, version 2.0*. Program and documentation. Published by the author, Tucuman, Argentina.

G o l o b o f f P . , F a r r i s J . , N i x o n K . 2008. TNT: A free program for phylogenetic analysis. *Cladistics*, **24**: 774–786.

G o u l e t H . , H u b e r J . T . (Eds) 1993. *Hymenoptera of the world: an identification guide to families*. Ottawa, Research Branch of Agriculture Canada, Publication 1894/E. 668 p.

G r a f V . , K u m a g a i A . F . 2002. *Boethus catarinae* sp. nov. do Brasil (Hymenoptera, Ichneumonidae, Tryphoninae). *Acta Biologica Paranaense*, **31**: 51–58.

H a l l T . A . 1999. BioEdit: a user-friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. *Nucleic Acids Symposium Series*, **41**: 95–98.

H e a t h J . 1961. Some parasites of Eriocraniidae (Lep.). *Entomologist's Monthly Magazine*, **97**: 163.

H e b e r t P . D . N . , P e n t o n E . H . , B u r n s J . M . , J a n z e n D . H . , H a l l w a c h s W . 2004. Ten species in one: DNA barcoding reveals cryptic species in the neotropical skipper butterfly *Astraptes fulgerator*. *Proceedings of the National Academy of Sciences U.S.A.*, **101**: 14812–14817.

H e b e r t P . D . N , d e W a a r d J . R . , Z a k h a r o v E . V . , P r o s s e r S . W . J . , S o n e s J . E . , M c K e o w n J . T . A . , M a n t l e B . , L a S a l l e J . 2013. A DNA 'Barcode Blitz': Rapid Digitization and Sequencing of a Natural History Collection. *PLoS ONE*, **8**(7): e68535. doi: 10.1371/journal.pone.0068535

J o r d a n T . 1998. Eiformen und Lebensweise zweir Artengruppen der Gattung *Grypocentrus* (Hymenoptera: Ichneumonidae) spezifische Parasitoiden von im Fruhjahr an Birken minierenden Trugmotten-Arten (Lepidoptera: Eriocraniidae). *Entomologia generalis*, **22**: 223–231.

K a s p a r y a n D . R . 1973. *Ichneumonidae, subfamily Tryphoninae, tribe Tryphonini. Fauna of the USSR, Hymenoptera. Volume III. Number 1*. Leningrad: Nauka. 320 p. (In Russian. Translated to English: New Delhi, Amerind Publishing Co. Ltd. 1981. 414 p.)

K a s p a r y a n D . R . 2007. A new species of *Lagoleptus* from Mexico (Hymenoptera: Ichneumonidae: Tryphoninae). *Zoosystematica Rossica*, **16**: 262.

K a s p a r y a n D . R . , T o l k a n i t z V . I . 1999. *Ichneumonidae, subfamily Tryphoninae: tribes Sphinctini, Phytodietini, Oedemopsini, Tryphonini (addendum), Idiogrammatini, subfamilies Eucerotinae, Adelognathinae (addendum), Townesioninae. Fauna of Russia and neighbouring countries. Insecta, Hymenoptera. Volume III. Number 3*. St Petersburg: Nauka. 404 p.

N i x o n K . 2002. *WinClada version 1.00.08* Published by the author, Ithaca, New York.

R o s s H . H . 1936. The ancestry and wing venation of the Hymenoptera. *Annals of the Entomological Society of America*, **29**: 99–111.

S c a r a m o z z i n o P . L . 1992. *Boethus fritzi* a new Tryphoninae from Argentina (Hymenoptera, Ichneumonidae). *Bollettino del Museo Regionale di Scienze Natumrali – Torino*, **10**: 217–220.

T h o m p s o n J . D . , H i g g i n s D . G . , G i b s o n T . J . 1994. CLUSTAL W: improving the sensitivity of progressive multiple sequence alignment through sequence weighting, position specific gap penalties and weight matrix choice, *Nucleic Acid Research*, **25**: 4876–4882.

T o w n e s H . K . , T o w n e s M . 1945. A key to the genera of Eclytini (=Thymaridini) and a revision of the Neotropical species (Hymenoptera, Ichneumonidae). *Boletín de Entomologia Venezolana*, **4**: 41–53.

T o w n e s H . K . 1946. The generic position of the Neotropic Ichneumonidae with types in the Philadelphia and Quebec museums described by Cresson, Hooker, Norton, Provancher, and Viereck. *Boletín de Entomologia Venezolana*, **5**: 29–63.

T o w n e s H . K . 1969. Genera of Ichneumonidae, Part 1. *Memoirs of the American Entomological Institute*, **11**: 1–300.

T o w n e s H . K . , G u p t a V . K . , T o w n e s M . J . 1992. The Ichneumon-flies of America north of Mexico. Part 11. Tribes Oedemopsini, Tryphonini and Idiogrammatini (Hymenoptera: Ichneumonidae: Tryphoninae). *Memoirs of the American Entomological Institute*, **50**: 1–296.

T o w n e s H . K . , T o w n e s M . 1949. A revision of the genera and of the American species of Tryphoninae Part I. *Annals of the Entomological Society of America*, **42**: 321–395.

T o w n e s H . K . , T o w n e s M . (1949) 1950. A revision of the genera and of the American species of Tryphoninae Part II. *Annals of the Entomological Society of America*, **42**: 397–447.

W a h l D . B . , G a u l d I . D . 1998. The cladistics and higher classification of the Pimpliformes (Hymenoptera: Ichneumonidae). *Systematic Entomology*, **23**: 265–298.

Y u D . S . K . , v a n A c h t e r b e r g K . , H o r s t m a n n K . 2012. *Taxapad 2012, Ichneumonoidea 2011*. Database on flash-drive. www.taxapad.com, Ottawa, Ontario, Canada.

A revision of *Sachtlebenia* Townes, with notes on the species of *Townesion* Kasparyan (Hymenoptera: Ichneumonidae: Banchinae)

G.R. Broad

Ревизия рода *Sachtlebenia* Townes с замечаниями к видам *Townesion* Kasparyan (Hymenoptera: Ichneumonidae: Banchinae)

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Abstract. The genus *Sachtlebenia* (Ichneumonidae: Banchinae) is revised and two new species described, *S. dmitrii* **sp. n.** from Vietnam and *S. gillae* **sp. n.** from Brunei. The two species of the related genus *Townesion* are distinguished and *T. japonicus* Kasparyan is newly recorded from Russia (Sakhalin). Synapomorphies are proposed for *Sachtlebenia* and *Townesion*.

Key words. Taxonomy, parasitoid.

Резюме. Ревизован род *Sachtlebenia* (Ichneumonidae: Banchinae), в котором описаны 2 новых вида: *S. dmitrii* **sp. n.** из Вьетнама и *S. gillae* **sp. n.** из Брунея. В родственном роде *Townesion* рассмотрены 2 вида, включая *T. japonicus* Kasparyan, который впервые отмечен с Сахалина (Россия). Предложены синапоморфии для родов *Sachtlebenia* и *Townesion*.

Ключевые слова. Систематика, паразитоид.

Introduction

The genera *Sachtlebenia* Townes and *Townesion* Kasparyan (Hymenoptera: Ichneumonidae) comprise a strikingly aberrant and distinctive pair of genera. Unlike any other ichneumonids, the second to fourth metasomal tergites are much more strongly sclerotized than the posterior tergites, which are hidden under the fourth tergite, and the metasomal insertion is high above the hind coxal insertions. Two genera of Cryptinae, *Hemigaster* and *Rothneyia*, have a similar sclerotization of the metasoma but differ most obviously in the petiolate first metasomal segment that is inserted level with the hind coxae. Restricted to Eastern Asia, both *Sachtlebenia* and *Townesion* are very rare in collections but recent collecting in the Eastern Palaearctic and Oriental regions has produced two undescribed species of *Sachtlebenia* and additional specimens of *Townesion*, which are described here. Gauld and Wahl (2000) established that these aberrant genera should not be treated as a separate subfamily, Townesioninae, as had been proposed by Kasparyan (1993) but instead comprised a highly apomorphic lineage of the tribe Glyptini, of the subfamily Banchinae. Although Gauld and Wahl (2000) proposed several apomorphic characters that support the placement of the so-called townesionine genera in the Glyptini, it should be noted that the single molecular phylogenetic study including a representative of this clade (*Townesion ussuriensis* Kasparyan) failed to recover this taxon within the Banchinae (Quicke *et al.*, 2009), although only a single gene was se-

quenced. Pending a more robust molecular phylogenetic analysis, Gauld and Wahl's (2000) conclusions are followed here. Although Gauld and Wahl (2000) did not question the monophyly of each genus, in light of their striking similarities, I have tried to identify apomorphies that define each as reciprocally monophyletic genera.

Material and methods

Morphological terminology follows Gauld (1991). Photographs were taken using a Canon EOS 450D digital camera attached to a Leica MZ12 stereomicroscope. Partially focused photographs were combined using Helicon Focus software. Specimens from the following institutions were examined: American Entomological Institute, Gainesville, Florida, USA (AEI); The Natural History Museum, London, UK (BMNH); Ehime University, Japan (EUMJ); General Station of Forest Pest Management, State Forestry Administration, Shenyang, China (GSFPM); Naturalis Biodiversity Centre, Leiden, Netherlands (RMNH); Texas A&M University Insect Collection, College Station, Texas, USA (TAMU).

Taxonomic part

Sachtlebenia and *Townesion* are clearly closely related and are unlikely to be confused with any other genera of Ichneumonidae. Gauld and Wahl (2000) suggested nine apomorphies for this clade, the most distinctive of which are the high insertion of the metasoma to the propodeum; metasomal segments five to nine retracted beneath the fourth tergite (Figs 2, 7); mesoscutum with a posterior transverse suture (Fig. 3); the deeply impressed, narrow malar groove (Fig. 1); and fore wing vein *Rs+2r* arising from the proximal 0.3 of the elongate pterostigma (Fig. 2b). Characters that are shared with the genus *Sjostedtiella* Szépligeti include the flat clypeus; tapered, slightly twisted mandibles; goblet-shaped antennal scape (Fig. 1); and the epomia strong, long, paralleling the anterior margin of the pronotum. Additionally, the triangular areas on the second to fourth tergites, delimited by paired, lateromedian grooves, distinguish the tribe Glyptini (other ichneumonids with diagonal grooves on the metasoma, such as some Pimplinae and *Lycorina* Holmgren, differ in the precise pattern of grooves). In the generic treatments that follow, full descriptions and brief diagnoses of the two genera are included. Species descriptions and diagnoses concentrate on characters of value at the species level and do not repeat most of the generic characters listed here or by Gauld and Wahl (2000). Because of the close similarity of all species within each genus, the descriptions concentrate on colour patterns and the shape of the posterior apex of the fourth tergite. The two "townesionine" genera can be distinguished from each other as follows.

1. Ground colour pale yellow or ivory, with restricted dark markings; malar space about 2.0 times basal mandibular width; face conspicuously raised relative to malar groove and with central area separated by faint grooves (Fig. 1a); fourth metasomal tergite with a pair of lateral projections ...... ***Sachtlebenia***

– Ground colour black with restricted pale markings; malar space slightly shorter than basal mandibular width; face not raised, uniformly convex (Fig. 1b); fourth metasomal tergite with two pairs of lateral and lateromedian projections .... ***Townesion***

Sachtlebenia Townes, 1963

Described for the distinctive *Sachtlebenia sexmaculata* Townes, no other species of *Sachtlebenia* have been described until now and specimens are present in very few collections. Species are restricted to the Oriental region, although *S. sexmaculata* has been collected towards the northern edge of Oriental China, in Jiangxi Province (Sheng *et al.*, 2013). This is clearly a very infrequently collected genus. The new species from Brunei and Vietnam are each known only from only one and two specimens respectively, each from quite large-scale collecting effort that resulted in collections of thousands of ichneumonids. Clearly there is potential for further finds.

Description. Fore wing 5.9–7.5 mm. Malar space long, about 2.0 times basal mandibular width, with sharply defined, narrow sulcus; clypeus not distinctly separated from face, rather flat; mandibles slender, slightly twisted; face swollen, noticeably bulging on inner side of malar groove then slightly concave, convex centrally with vague grooves either side of convexity, with fine striae on lateral convexities and clypeus, coarsely punctate/puncto-striate over remainder of face;
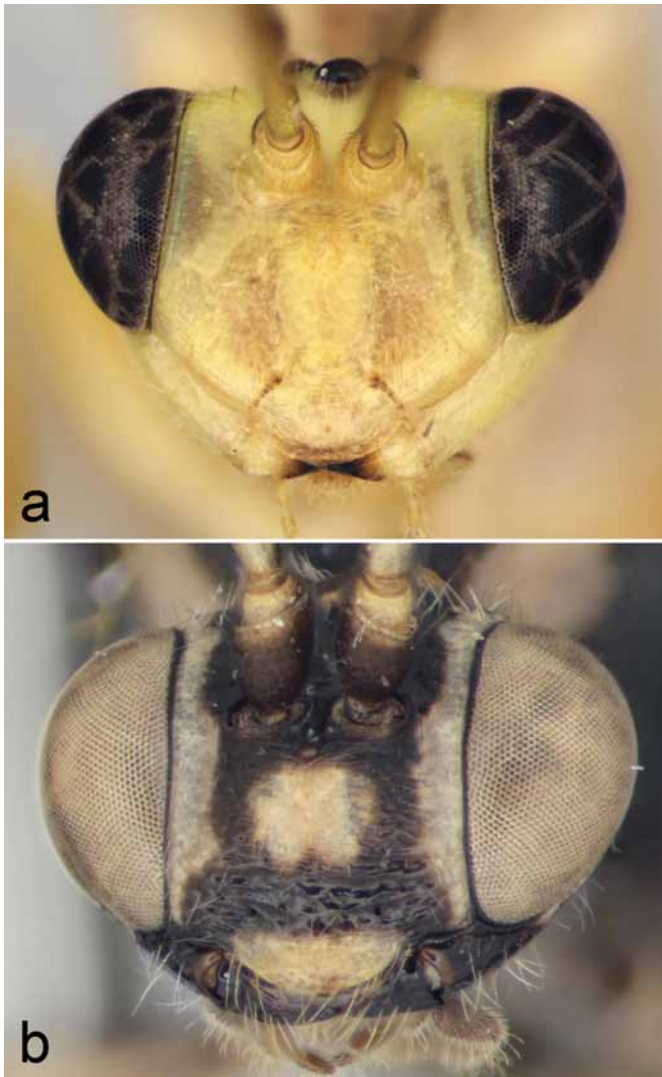
Figure 1. Head, frontal view: a – *Sachtlebenia sexmaculata*, b – *Townesion ussuriensis*.

antenna long, with 50–53 flagellomeres, scape short, goblet-shaped; frons without a medial projection; occiput not strongly impressed, lacking vertical ridges. Mesosoma not especially bulging, posterior edge of pronotum slightly curved; mesopleuron dorsally punctate, otherwise unsculptured, smooth; epicnemial carina present; upper division of metapleuron distinct, raised; epomia strong, paralleling anterior margin of pronotum; mesoscutum with transverse suture posteriorly and scutoscutellar groove transstriate. Propodeum with posterior transverse carina fairly well-defined, ranging from complete to only present laterally; propodeal spiracle elongate. Fore tibial spur 0.25 times length of first tarsomere; fore and mid-tarsal claws fully pectinate, hind claw only with basal one or two teeth. Metasomal foramen dorsal to, widely separated from hind coxal foramina; first metasomal tergite without anterolateral angulate projections (teeth), lacking defined medial and lateral carinae; metasoma with deep grooves on tergites two-four, delimiting anteriorly pointing triangles, although grooves weaker on tergite four; tergites not strongly convex in lateral view; fourth tergite posteriorly with paired lateral projections of varying development, with thin, translucent flange or lamella developed to varying extent between projections; fifth to ninth tergites retracted beneath fourth tergite. Ovipositor very short, abruptly narrowed near base, needle-like over most of its length. Ground colour pale yellow or creamy white with restricted black markings on metasoma, legs and sometimes on dorsum of mesosoma and head. Fore wing with triangular, petiolate areolet, vein 2*m-cu* opposite 3*rs-m*; pterostigma long, narrow, with *Rs+2r* arising from proximal 0.3; fore wing with infuscate band along distal edge, well-defined or only vaguely defined.

Comparative diagnosis. Sachtlebenia can be distinguished from all other ichneumonids by the combination of the metasoma arising from the propodeum far above the hind coxae; the fifth and following metasomal tergites retracted beneath the heavily sclerotized first to fourth tergites; and the pale yellow / ivory ground colour.

The three known species differ in colour pattern and in the apical edge of the fourth tergite. Additionally, there are minor differences in sculpture on the frons and pronotum; *S. sexmaculata* is larger than the other two species.

Key to species of *Sachtlebenia*

1. Tegula black on at least posterior half; fourth tergite with paired grooves deeply impressed (Fig. 5b); female with mesoscutum, metascutellum and inter-ocellar area / vertex with large black marks and black spots on metasoma large, occupying at least 1/3 the length of each tergite (Fig. 3b) (male unknown) ....***S. dmitrii* sp. n.**

– Tegula pale yellow; fourth tergite with paired grooves weak (Fig. 5a,c); female with mesoscutum, metascutellum and inter-ocellar area / vertex uniformly pale yellow and black spots on metasoma small, occupying much less than 1/3 the length of each tergite (Fig. 3a,c) (male of *S. gillae* unknown, male of *S. sexmaculata* with pattern of black spots similar to *S. dmitrii*; Fig. 4)................................. 2
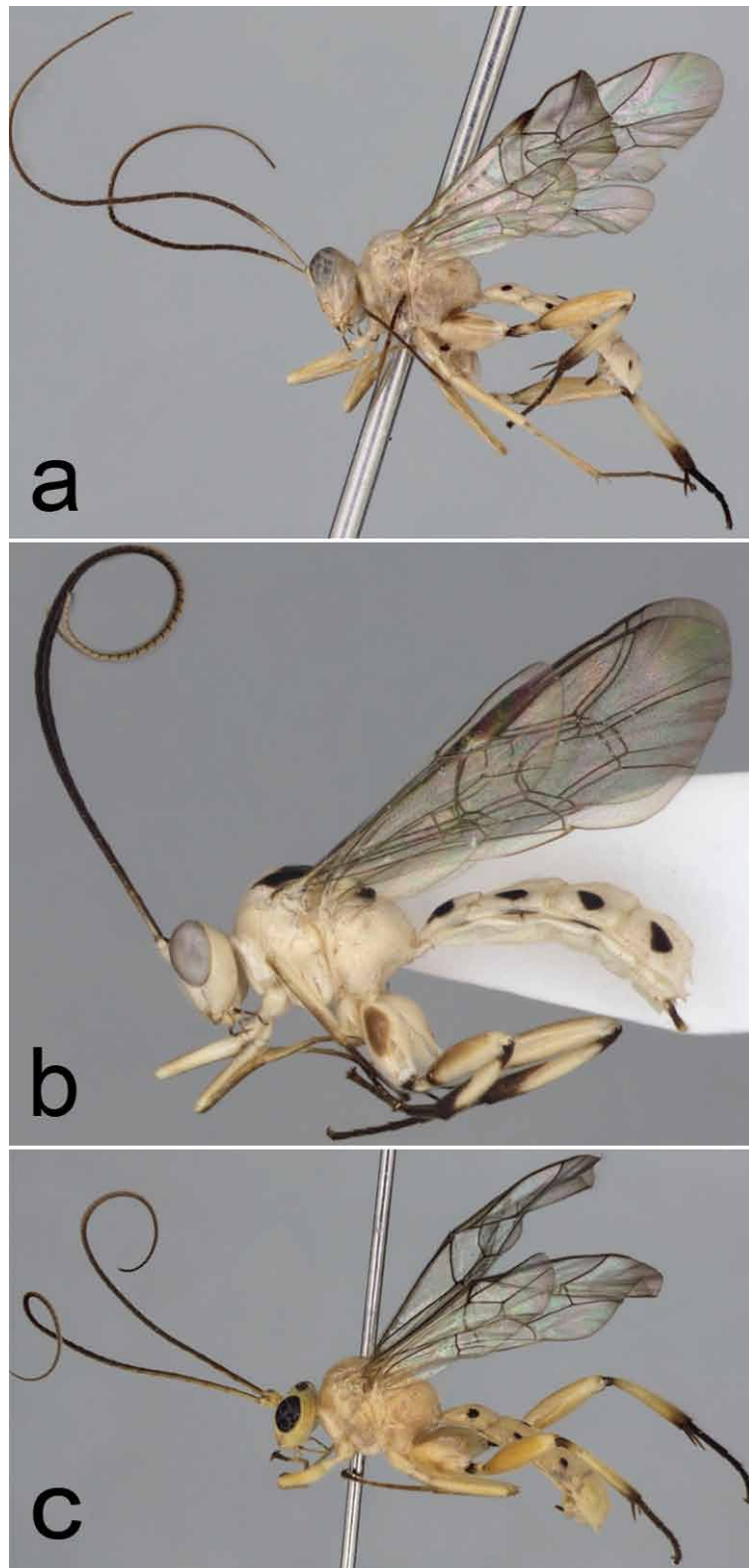
Figure 2. *Sachtlebenia* species (females), lateral view: a – *S. gillae*, b) *S. dmitrii*, (c) *S. sexmaculata*.

2. Posterior edge of fourth metasomal tergite shallowly concave, lacking conspicuous transparent lamella (Fig. 5a) .... *S. gillae* **sp. n.**
– Posterior edge of fourth metasomal tergite with medial and lateral concavities, with conspicuous transparent lamella especially developed medio-laterally (Fig. 5c) .... *S. sexmaculata* **Townes**

Figure 3. *Sachtlebenia* species (females), dorsal view: a – *S. gillae*, b – *S. dmitrii*, c – *S. sexmaculata*.

***Sachtlebenia dmitrii* sp. n.**

(Figs 2b, 3b, 5b)

Material examined. Holotype female: "S. VIETNAM: Lam Dong, Bidoup Nuiba N.P., nr Da Lat, Mal. Trap 1-12, 1650-1700 m, 11-19.x.2005, C. v. Achterberg & R. de Vries, RMNH'05a" (RMNH).

Paratype. 1 female (EUMJ), Vietnam, Lam Dong Province, Dam Rong, Da Knang, QL27, near Phu Son, N11°55′90″ E108°10′24.40″, 1270 m, 2.iii.2014 (Fujisawa leg.).

Description. Fore wing length 6.5 mm. Antenna with 53 flagellomeres. Upper part of frons finely punctate between ocelli and eyes. Pronotum punctate dorso-posteriorly, finely transversely striate laterally. Propodeum with almost complete posterior transverse carina, from hind coxal insertion almost to metasomal insertion. Fourth metasomal tergite with deeply impressed paired lateromedian grooves, posteriorly with strong, acutely pointed lateral projections, deeply concave between and with wide, transparent lamella between, lamella narrower medially (Fig. 5b). Ground colour of body varying from ivory in holotype (Figs 2b, 3b) to pale yellow in paratype. Antennal flagellum dark brown / black but dull yellow basally and apically, scape and pedicel dark brown dorsally. With dark brown / black markings as follows: ocellar area and vertex immediately behind ocelli, holotype with paired spots either side, on vertex; mesoscutum on posterior third, reaching further anterior laterally (holotype) varying to medio-posterior spot, c. 1/3 width of mesoscutum (paratype); metascutellum; paired lateral spots on metasomal tergites one to four, spots narrowly joining on first tergite (holotype) or separated by about 1/3 times spot diameter (paratype); wing venation, including pterostigma; tegula on posterior half; ovipositor sheath; hind trochanter, except for white dorsal spot; hind femur basally, anteriorly; hind tibia apically, basally; tarsi, except basally extensively yellowish-brown on fore tarsus. With paler brown marks on anterior face of hind coxa, along dorsal, anterior faces of hind femur, fore and mid tibiae; maxillary palp with four apical segments dark brown; apex of fore and hind wings distinctly infuscate.

Distribution. Vietnam.

Comments. This species, known from only two females, is close to *S. sexmaculata*, the males of which share a similar pattern of dark markings to *S. dmitrii* **sp. n.**, and with both species possessing a wide lamella at the end of the fourth tergite. However, the paired grooves on the fourth tergite are much weaker in *S. sexmaculata*, which has the tegula pale yellow, rather than half black. The very pale, ivory colour of the holotype is unlike other specimens of *Sachtlebenia* and could possibly be an artefact of its preservation or chemical treatment, although other mainly yellow ichneumonids from this collection are no paler than usual.

Etymology. It is a pleasure to be able to name this distinctive new species after Dr Dmitri Kasparyan, on his 75th birthday, in honour of his huge body of work on ichneumonid taxonomy, including the description of the genus *Townesion*.

Figure 4. *Sachtlebenia sexmaculata* (male), dorsal view.
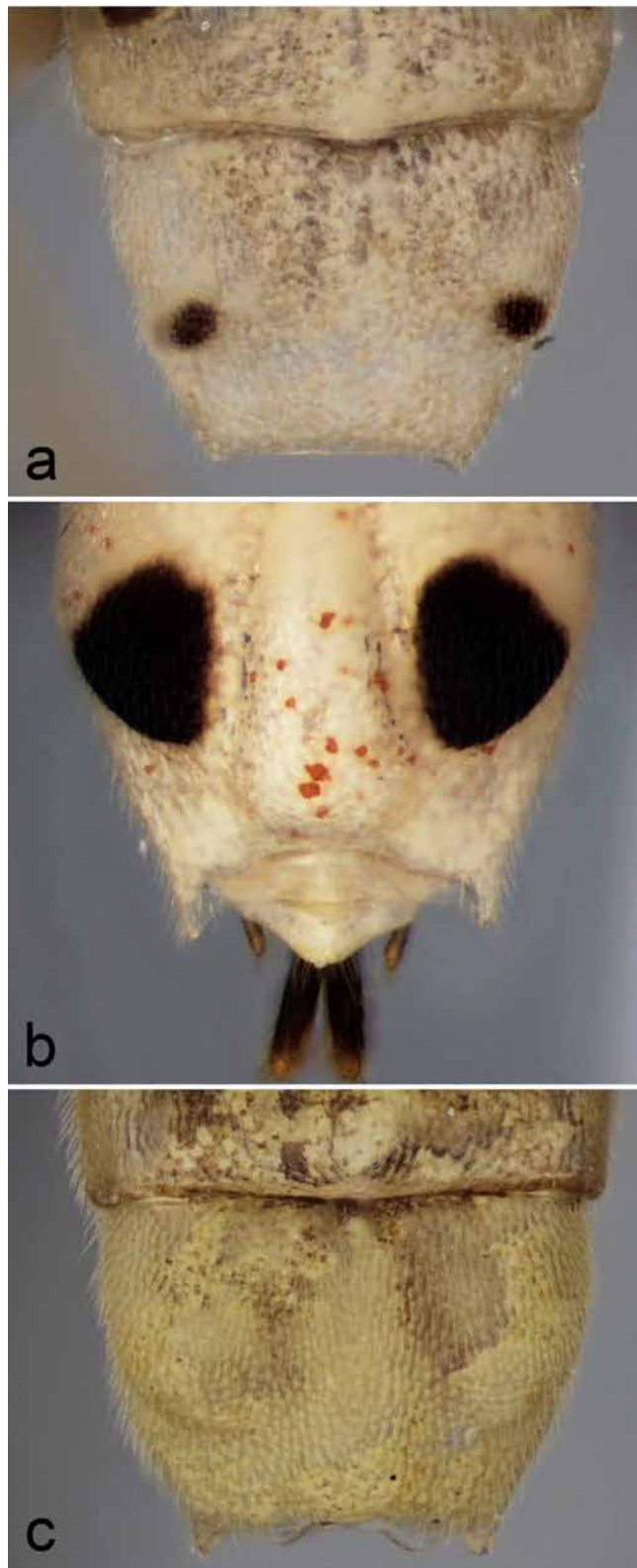
Figure 5. *Sachtlebenia* species (females), fourth metasomal tergite: a – *S. gillae*, b – *S. dmitrii*, c – *S. sexmaculata*; levels adjusted for *S. dmitrii* to increase visibility of transparent lamella.

Sachtlebenia gillae sp. n.

(Figs 2a, 3a, 5a)

Material examined. Holotype: female "BRUNEI: Ulu Temburong N.P., Malaise trap 14.ii-9.iii.1982, M.C. Day coll. BMNH(E) 2011-106" (BMNH).

Description. F e m a l e. Fore wing length 5.9 mm. Antenna with 51 flagellomeres. Upper part of frons finely striate, with intermixed punctures, between ocelli and eyes. Pronotum densely punctate dorso-posteriorly, transversely puncto-striate ventrally. Propodeum with only short section of posterior transverse carina, extending dorsally from hind coxal insertion. Fourth metasomal tergite with very weakly impressed paired lateromedian grooves, posteriorly with short, only slightly acutely pointed lateral projections, shallowly concave between and with very thin, transparent lamella between (Fig. 5a). Ground colour of body (Figs 2a, 3a) dull, pale yellow. Antennal flagellum dark brown / black but dull yellow basally and extensively, apically, scape and pedicel entirely pale yellow. With dark markings as follows: paired lateral black spots on metasomal tergites one to four, all spots distantly separated and no larger than about 0.25 length of tergite, spots smallest on fourth tergite; wing venation brown, pterostigma basally dull yellow; ovipositor sheath dark brown; hind trochanter black, except for dull yellow dorsal spot; hind femur basally, anteriorly black; hind tibia black apically, narrowly basally; tarsi black, except basally extensively yellowish brown on fore tarsus. With dark brown dorsal spot on hind coxa, pale brown / dull yellow along much of anterior face of hind femur, fore and mid tibiae; maxillary palp with four apical segments, labial palp with two apical segments dark brown. Fore and hind wings distally narrowly, vaguely infuscate.

M a l e. Unknown.

Distribution. Brunei.

Etymology. This beautiful, unique species is named after my wife, Gill.

Sachtlebenia sexmaculata Townes, 1963

(Figs 1a, 2c, 3c, 5c)

Material examined. China, Jiangxi Province, Quannan, 31.v.2010, 2 females (BMNH), 2 females (GSFPM). Taiwan, Wushe, 1150 m, 19.iv.1983, coll. H. Townes, 1 female, 1 male (AEI). Same data except 26.iv.1983, 1 female, 1 male (AEI). Additionally, David Wahl provided images of a female from Taiwan, Chin-Chin, i.1909, coll. H. Sauter (AEI). An image of the holotype female is available online from the website of the Taiwan Agricultural Research Institute (http://timdm.tari.gov.tw/aic/detail.php?metadata=1&sid=31120334&genus=Hymenobosmina&species=sexmaculata&speauthor=&speauthor); note that this is incorrectly labelled as *Hymenobosmina sexmaculata*.

Description. F e m a l e. Fore wing length 6.8–7.5 mm. Antenna with 51–53 flagellomeres (n = 4). Upper part of frons with a few, coarse striae, with intermixed punctures, between ocelli and eyes. Pronotum densely punctate dorso-posteriorly, mostly smooth, unsculptured ventrally. Propodeum with complete posterior transverse carina, extending from hind coxal insertion to metasomal insertion. Fourth metasomal tergite with weakly impressed paired lateromedian grooves, posteriorly with distinct, acutely pointed lateral projections, deeply concave between, with angulation lateromedially, and with wide, transparent lamella between (Fig. 5c). Ground colour of body (Figs 2c, 3c) dull, pale yellow. Antennal flagellum dark brown / black but extensively dull yellow basally, ventrally and apically, ventrally, pedicel entirely pale yellow, scape with dark brown mark dorsally. With black markings as follows: paired lateral black spots on metasomal tergites one to three, all spots distantly separated and no larger than about 0.25 length of tergite, one specimen (from Taiwan) with small spots on tergite 4, spots decreasing in size from first to fourth tergites; ovipositor sheath dark brown; hind trochanter, except for pale yellow dorsal, distal half; hind tibia narrowly apically, basally; hind tarsus; fore and mid distal tarsomeres. Richer, orange yellow on dorsal spot of hind coxa, much of anterior face of hind and fore femora. Fore and mid tibiae dull brown on anterior faces, fore and mid tarsi extensively pale brown; maxillary palp dull brown, with dark spot on second segment, labial palp entirely dull yellow. Wing venation brown, pterostigma entirely dull yellow. Fore and hind wings distally very narrowly, vaguely infuscate.

M a l e (Fig. 4). Similar to female but with more extensive black / dark brown markings and slightly stouter antenna, with 48–49 flagellomeres (n = 2). There are dark markings on vertex, on posterior of mesoscutum (extending anteriorly laterally and medially), metascutellum and paired spots on metasomal tergites one to four, each spot larger than in female, occupying about 1/3 length of each tergite. Genitalia concealed under tergite four, tip of aedeagus visible in each specimen.

Comments. This is the only *Sachtlebenia* species for which both sexes are known, and there is marked sexual dimorphism in colour pattern. This could also be true for other species of *Sachtlebenia*. The more extensively black-marked male of *S. sexmaculata* resembles *S. dmitrii* **sp. n.** whilst the female more closely resembles *S. gillae* **sp. n.** Both sexes of *S. sexmaculata* have pale yellow tegulae and weakly impressed grooves on the fourth metasomal tergite, which distinguish the species from *S. dmitrii* **sp. n.** The specimens from Taiwan are slightly smaller (females with fore wing length 6.8–7.3 mm) and the gap between the lateral projections of the fourth tergite is slightly narrower, when compared to mainland

Chinese specimens, but the differences are small and I have seen specimens from only isolated parts of the species' presumed range, so I treat these as being conspecific.

Distribution. China: Fujian (Townes, 1963) and Jiangxi Provinces (Sheng *et al.*, 2013); Taiwan (Chao, 1976).

## *Townesion* **Kasparyan, 1993**

Kasparyan (1993; Kasparyan, Tolkanitz, 1999) has described two, very similar species of *Townesion* from the Russian Far East and Japan. In contrast to *Sachtlebenia*, this seems to be a genus of the temperate Palaearctic, also rarely collected. A recent acquisition of c.20.000 Ichneumonidae from Primorskiy Territory, collected by Malaise traps in 2001, contained only a single specimen of *Townesion*. Kasparyan and Tolkanitz (1999) proposed some characters to separate the two species of *Townesion*, which I have found to be reliable in identifying the few specimens I have seen. The key to species remains tentative though as I have not been able assess intra-specific variation in the rather minor characters used to separate the species.
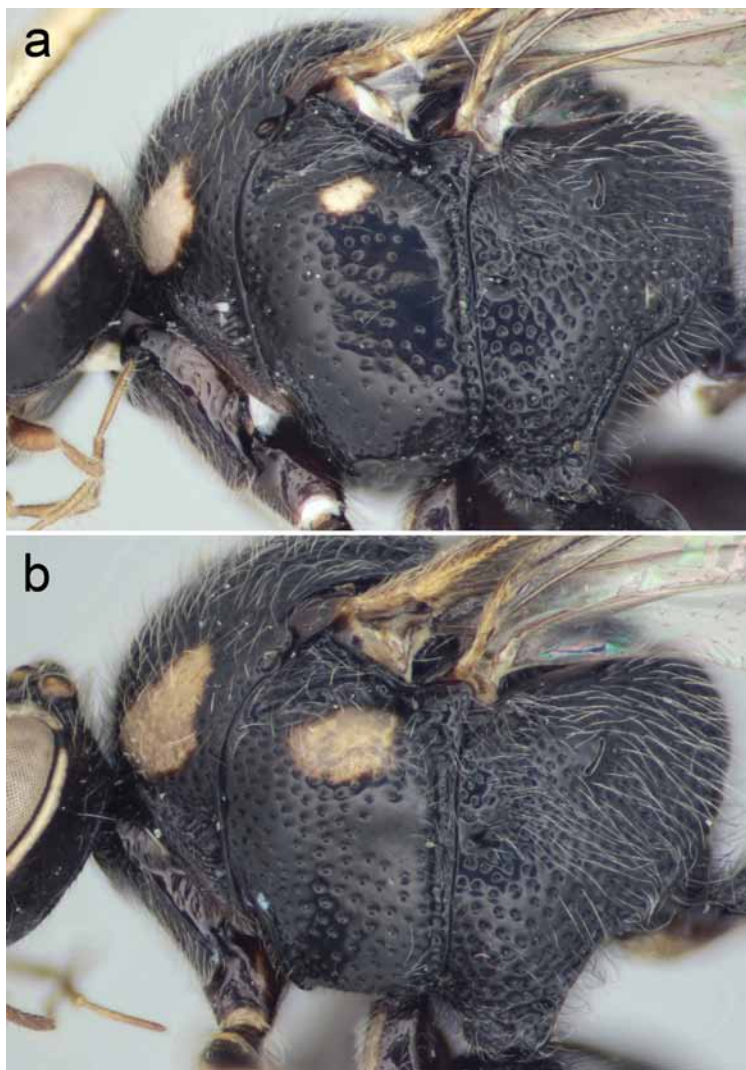
Description. Fore wing 5.5–6.1 mm. Malar space about as long as basal mandibular width, with sharply defined, narrow sulcus; clypeus not distinctly separated from face, rather flat; mandibles slender, slightly twisted; face not swollen, rather uniformly convex except strongly convex centrally, this area not defined laterally by grooves, with rather coarse striae adjacent to malar groove, clypeus mostly unsculptured, punctate dorsally, face otherwise coarsely punctate/puncto-striate; antenna relatively short, with 32–35 flagellomeres, scape short, goblet-shaped; frons without a medial projection; occiput not strongly impressed, lacking vertical ridges. Mesosoma bulging, posterior edge of pronotum distinctly curved; mesopleuron punctate over most of surface; epicnemial carina present; upper division of metapleuron not raised; epomia strong, paralleling anterior margin of pronotum; mesoscutum with transverse suture posteriorly and scutoscutellar groove trans-striate. Propodeum with posterior transverse carina well-defined, narrowly incomplete medially, near metasomal insertion; propodeal spiracle elongate. Fore tibial spur 0.5 times length of first tarsomere; all tarsal claws fully pectinate. Metasomal foramen dorsal to, widely separated from hind coxal foramina; first metasomal tergite without anterolateral angulate projections (teeth), with complete, strongly raised median and lateral carina; metasoma with deep grooves on tergite two, delimiting anteriorly pointing triangle, similar grooves much weaker on tergites three and four; tergites strongly convex in lateral view; fourth tergite posteriorly with paired lateromedian and lateral projections, lateral projections longer, with fully sclerotized, thin

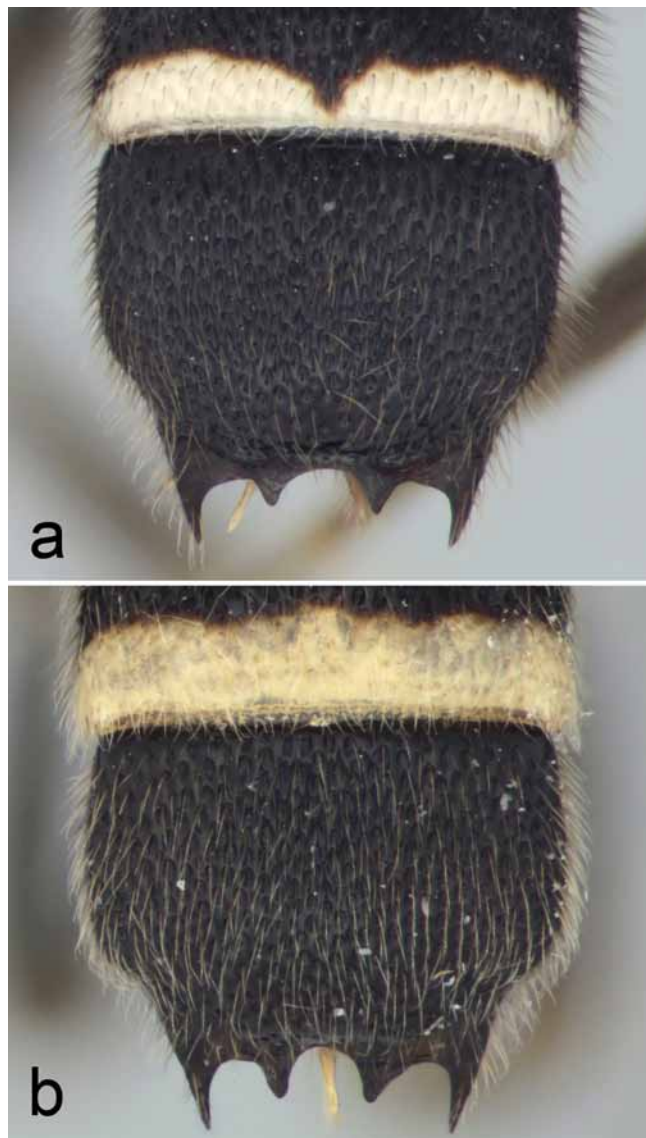**Figure 6.** *Townesion* species, mesopleuron: a – *T. japonicus*, b – *T. ussuriensis*.

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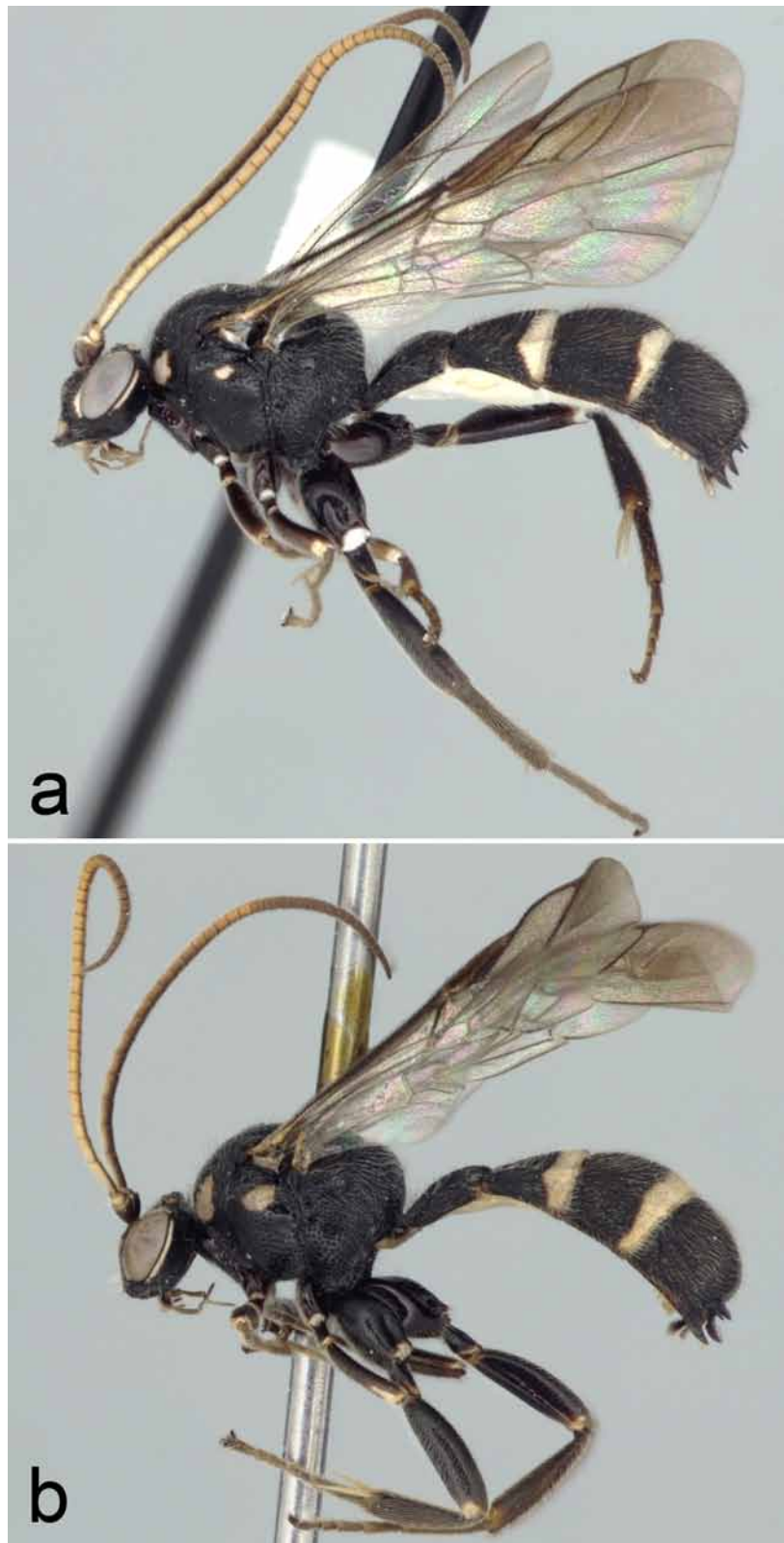
Figure 7. *Townesion* species, lateral view: a – *T. japonicus*, b – *T. ussuriensis*.

flange between projections; fifth to ninth tergites retracted beneath fourth tergite. Ovipositor very short, slender but not abruptly narrowed near base, with shallow, distal notch on upper valve. Ground colour black with restricted creamy white markings on metasoma (hind edges of tergites two and three), legs, mesopleuron, pronotum and head. Fore wing with triangular, sessile areolet, vein 2*m-cu* opposite 3*rs-m*; pterostigma long, narrow, with *Rs*+2*r* arising from proximal 0.3; fore wing with extensive infuscate patch apically, anteriorly.

Diagnosis. Townesion can be distinguished from all other ichneumonids by the combination of the metasoma arising from the propodeum far above the hind coxae; the fifth and following metasomal tergites retracted beneath the heavily sclerotized first to fourth tergites; and the black ground colour.

Key to species of *Townesion*

1. Antenna with 32 or 33 flagellomeres; larger; mesopleuron more sparsely punctate (Fig. 6a); metasoma wider, second tergite 1.35 times as wide as medially long, third tergite 1.4 times; sclerotized part of first sternite brown..***T. japonicus* Kasparyan**

Figure 8. *Townesion* species, fourth metasomal tergite: a – *T. japonicus*, b – *T. ussuriensis*.

– Antenna with 35 flagellomeres; smaller; mesopleuron more densely punctate (Fig. 6b); metasoma narrower, second tergite 1.25 times as wide as medially long, third tergite 1.3 times; sclerotized part of first sternite dull yellow .... ***T. ussuriensis* Kasparyan**

Townesion japonicus Kasparyan, 1999

Material examined. 1 female, Russia: Sakhalin Island, S part, near Sokol town, 47°14.56'N, 142°46.56'E, 24.VII–1.VIII.2001, coll. D. Bennett, SK-01-DJB-27; 1 female, same data except 47°14.94'N, 142°47.73'E, 21.VIII.2001, SK-01-DJB-075 (both TAMU).

Description. Fore wing length 5.8–6.1 mm. Antenna with 32–33 flagellomeres. Mesopleuron with punctures well separated medially, with extensive glabrous areas (Fig. 6a). Metasoma wider than in *T. ussuriensis*, second tergite 1.35 times as wide as medially long, third tergite 1.4 times; fourth metasomal tergite shallowly concave between projections (Fig. 8a). Third tergite with medially indented pale, apical band. Sclerotized part of first sternite brown.

Distribution. Japan, mainland (Kasparyan, Tolkanitz, 1999); Russia: Sakhalin (**new record**).
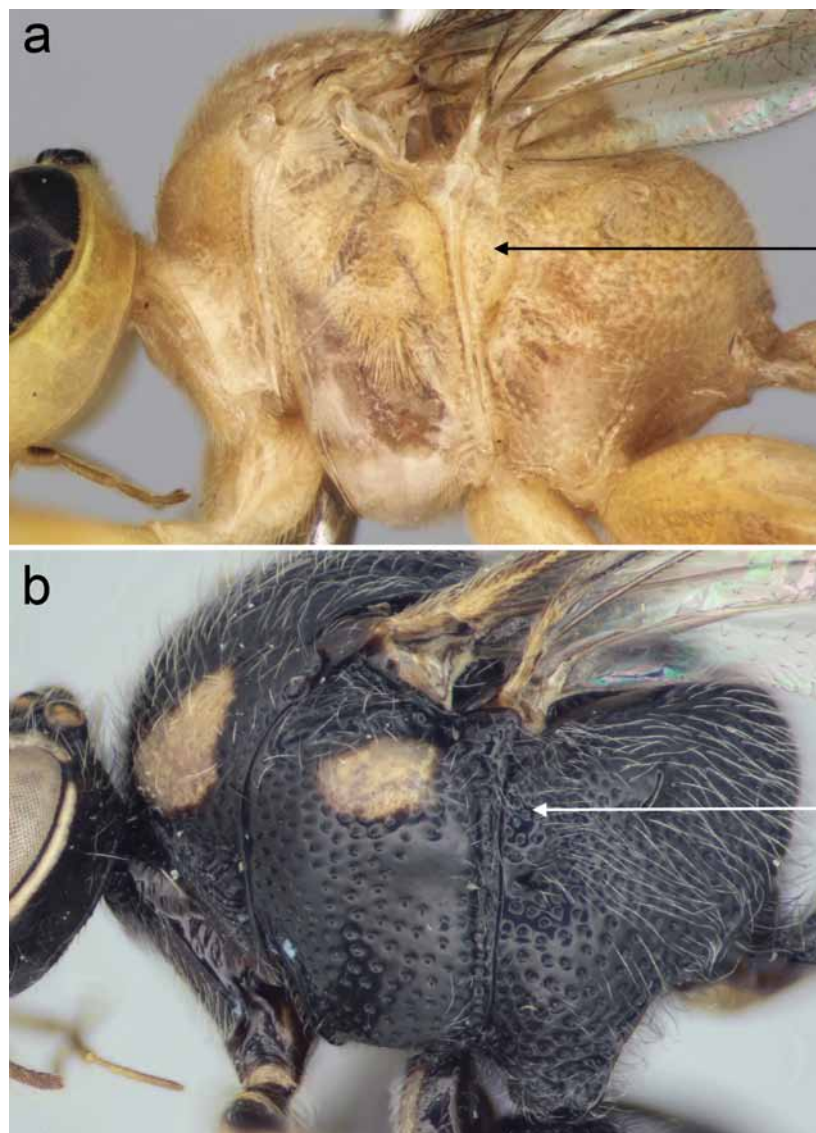
Figure 9. Comparison of the mesosoma of *S. sexmaculata* (a) and *T. ussuriensis* (b). Arrow points to the dorsal division of the metapleuron.

Figure 10. Comparison of the hind tarsal claw of *S. sexmaculata* (a) and *T. ussuriensis* (b).

Townesion ussuriensis Kasparyan, 1993

Material examined. 1 female, Russia: Primorskiy Territory, Lazo Nature Reserve, c.170 km E. of Vladivostok, Ta-Chingousa, 43°01'07"N, 134°07'46"E, 0 m, sandy coast, Malaise trap, 19–31.VIII.2001, coll. M. Quest, BMNH(E) 2009-59 (BMNH).

Description. Fore wing length 5.5 mm. Antenna with 32–33 flagellomeres. Mesopleuron with punctures closer together medially than in *T. japonicus*, with narrow glabrous areas (Fig. 6b). Metasoma narrower than in *T. ussuriensis*, second tergite 1.25 times as wide as medially long, third tergite 1.3 times; fourth metasomal tergite deeply concave between projections (Fig. 8b). Third tergite with pale, apical band not medially indented. Sclerotized part of first sternite dull yellow.

Distribution. Russia: Primorskiy Territory (Kasparyan, 1993).

Discussion

Monophyly of the genera.

The species of *Sachtlebenia* and *Townesion* are very similar. There is a distinct generic difference in colour pattern, with *Sachtlebenia* species being pale yellow with some black markings, whilst *Townesion* species are basically black, with some pale yellow markings. Other morphological differences are fairly slight but both genera can be defined by probable apomophies. *Townesion* species have more convex mesosomal sclerites, which results in a more rounded appearance to the mesosoma (Figs 7, 9b) and a distinctly curved posterior edge to the pronotum; linked to this, the upper division of the metapleuron is hardly defined (Fig. 9b). The second to fourth metasomal tergites of *Townesion* species are more convex than in *Sachtlebenia* (Figs 2, 7) and the posterior rim of the fourth tergite has two pairs of projections in *Townesion* (Fig. 8) and one pair in *Sachtlebenia* (Fig. 5). The fourth tergite character was noted by Kasparyan (1993). In contrast, the mesosoma and metasoma of *Sachtlebenia* are arguably more plesiomorphic, with sclerites not so convex and the posterior edge of the pronotum straighter (Fig. 9a); the upper division of the metapleuron is defined as usual for Banchinae (and most ichneumonids) (Fig. 9a); the metasoma is less convex (Fig. 2) and the posterior rim of the fourth tergite has a single pair of weaker projections (Fig. 5). However, *Sachtlebenia* can be defined relative to *Townesion* on the basis of several apomorphies, namely the long malar space, elevated face (medially and laterally, relative to the malar space) (Fig. 1a) and the reduced hind claw pectination (Fig. 10). Additionally, the antennae of *Sachtlebenia* are longer, although the polarity of this character is less clear, with much variation in the wider Glyptini. Contrary to Kasparyan (1993), both genera have oblique grooves on second to fourth metasomal tergites, but these are faint on the third and fourth tergites of *Townesion*. As these genera seem to represent reciprocally monophyletic groups of species, which are readily distinguishable, it is sensible to retain the use of two genera.

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Biology.

Nothing is known of the biology of *Sachtlebenia* or *Townesion*. If they are correctly placed in Banchinae then, in common with all other banchines with known hosts, they will probably be parasitoids of Lepidoptera. As Gauld and Wahl (2000) noted, the carapace-like metasoma and short, very thin ovipositor are features that could be associated, by analogy with some Braconidae, with oviposition into very small host larvae or larvae still enclosed in the egg. The host stages attacked may differ between genera as the ovipositors of *T. japonicus* and *T. ussuriensis,* whilst being very short and slender, nevertheless have a distinct preapical, dorsal notch, a feature associated with oviposition in active larvae (van Veen, 1982; Belshaw *et al.*, 2003). All three species of *Sachtlebenia* possess ovipositors that are basally widened then abruptly narrowed so that most of the length of the ovipositor is needle-like. This could indicate that oviposition occurs in the host larva prior to hatching from its egg as is known in some other ichneumonids, for example, *Stilbops* and *Collyria* (Hinz, 1981; Salt 1931) or very precise oviposition in particular tissues of a small host larva.

Acknowledgements

References

Belshaw R., Grafen A., Quicke D.L.J. 2003. Inferring life history from ovipositor morphology in parasitoid wasps using phylogenetic regression and discriminant analysis. *Zoological Journal of the Linnean Society*, **139**: 213–228.

Chao H.-F. 1976. *An outline of the classification of the Ichneumon-flies of China (Hymenoptera: Ichneumonidae).* Beijing: Scientific Publisher. 413 p. (In Chinese.)

Gauld I.D. 1991. The Ichneumonidae of Costa Rica, 1. *Memoirs of the American Entomological Institute*, **47**: 1–589.

Gauld I.D., Wahl D.B. 2000. The Townesioninae: a distinct subfamily of Ichneumonidae (Hymenoptera) or a clade of the Banchinae? *Transactions of the American Entomological Society*, **126**: 279–292.

Hinz R. 1981. Die europäischen Arten der Gattung *Stilbops* Förster (Hymenoptera, Ichneumonidae). *Nachrichtenblatt der Bayerischen Entomologen*, **30**: 62–64.

Kasparyan D.R. 1993. Townesioninae, a new ichneumonid subfamily from the Eastern Palearctic (Hymenoptera: Ichneumonidae). *Zoosystematica Rossica*, **2**: 155–159.

Kasparyan D.R., Tolkanitz V.I. 1999. *Ichneumonidae subfamily Tryphoninae: tribes Sphinctini, Phytodietini, Oedemopsini, Tryphonini (addendum), Idiogrammatini. Subfamilies Eucerotinae, Adelognathinae (addendum), Townesioninae.* Fauna of Russia and neighbouring countries. Insecta, Hymenoptera. Volume III. Number 3. St Petersburg: Nauka. 404 p. (In Russian.)

Quicke D.L.J., Laurenne N.M., Fitton M.G., Broad G.R. 2009. A thousand and one wasps: a 28S rDNA and morphological phylogeny of the Ichneumonidae (Insecta: Hymenoptera) with an investigation into alignment parameter space and elision. *Journal of Natural History*, **43**: 1305–1421.

Salt G. 1931. Parasites of the wheat-stem sawfly, *Cephus pygmaeus* Linnaeus, in England. *Bulletin of Entomological Research*, **22**: 479–545.

Sheng M.-L., Sun S.-P., Ding D.-S., Luo J.-G. 2013. *Ichneumonid Fauna of Jiangxi (Hymenoptera: Ichneumonidae).* Beijing: Science Press. 552 p.

Townes H.K. 1963. *Sachtlebenia*, a new glyptine ichneumonid (Hymenoptera). *Beiträge zur Entomologie*, **13**: 523–525.

van Veen J.C. 1982. Notes on the biology of *Banchus femoralis* Thomson (Hym., Ichneumonidae) an endoparasitoid of *Panolis flammea* (D. & S.) (Lep., Noctuidae). *Journal of Applied Ecology*, **94**: 300–311.

A morphological assessment of the ovipositor in the subfamily Ctenopelmatinae (Hymenoptera: Ichneumonidae) with specific reference to variation in the subapical, dorsal notch and its evolutionary significance

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Морфологическая оценка роли яйцеклада в подсем. Ctenopelmatinae (Hymenoptera: Ichneumonidae) со специальным вниманием к изменчивости субапикальной дорсальной выемки и ее эволюционному значению

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Abstract. A study of variation in ovipositor morphology in Ctenopelmatinae (Ichneumonidae) is provided and used to assess structures that have previously been used to define the Ophioniformes, the Ctenopelmatinae, and more specifically the tribe Pionini (Ctenopelmatinae). Monophyly of Ophioniformes is not supported by ovipositor characteristics. Specifically, the dorsal, subapical notch of the ovipositor is not restricted to ophioniform subfamilies, rendering homoplastic the last remaining morphological synapomorph used in the original definition of the Ophioniformes. Preliminary data suggest, however, that the position of the valvilli may differ between ophioniform and pimpliform taxa that possess a dorsal, subapical notch: basad the notch in Ophioniformes and distad the notch in Pimpliformes. An additional function of the ovipositor notch is proposed, associated with relatively large, sclerotized eggs.

Key words. Ichneumonidae, Ctenopelmatinae, Diplazontinae, ovipositor.

Резюме. Изучена изменчивость морфологического строения яйцекладов в подсем. Ctenopelmatinae (Ichneumonidae). Результаты этого исследования использованы для оценки структур, ранее использовавшихся при характеристике офионоидного комплекса (Ophioniformes), включающего подсем. Ctenopelmatinae и особенно его трибу Pionini. Монофилия Ophioniformes не поддержана признаками строения яйцеклада. В первую очередь показано, что дорсальная субапикальная выемка на яйцекладе не является уникальной характеристикой подсемейств офионоидного комплекса, делая гомоплатичной последнюю оставшуюся морфологическую синапоморфию, использованную в первоначальном определении этого комплекса. Однако предварительные данные позволяют предположить, что положение вальвул может различаться у таксонов офионоидного и пимплинного (Pimpliformes) комплексов, обладающих дорсальной субапикальной выемкой: она более базальная у Ophioniformes и дистальная – у Pimpliformes. Предполагается, что дополнительное функционирование выемки яйцеклада также связано с откладыванием относительно крупных склеротизованных яиц.

Ключевые слова. Ichneumonidae, Ctenopelmatinae, Diplazontinae, яйцеклад.

Introduction

Townes (1969) recognized 25 subfamilies of Ichneumonidae, and this number has steadily increased to ~40 (Gauld *et al.*, 2002; Quicke *et al.*, 2005, 2009). Using the arrangement of subfamilies in Townes (1969), Gauld (1985), Wahl (1990, 1991, 1993), Wahl and Gauld (1998) established informal groupings of subfamilies, basing these on discrete characters hypothesized as synapomorphs. These informal groupings have been recognized and used by most subsequent workers, most notably by Belshaw and Quicke (2002) and Quicke with co-authors (2005), with the number of informal groupings expanded slightly by Quicke with co-authors (2009). Morphology of the reproductive tract and ovipositor featured significantly in the original delineation of the informal group Ophioniformes relative to the two other major informal groups, the Pimpliformes and Ichneumoniformes.

Wahl (1990) delineated a monophyletic Pimpliformes, comprising eight subfamilies: Pimplinae, Rhyssinae, Diacritinae, Poemeniinae, Acaenitinae, Cylloceriinae, Orthocentrinae and Diplazontinae. Wahl and Gauld (1998) defined Pimpliformes on the basis of larval and adult characters, with basal members having stout ovipositors.

Monophyly of the Ophioniformes, as proposed by Gauld (1985), was based on three synapomorphies: possession of a dorsal subapical notch on the ovipositor, shared possession of a distinctive female reproductive tract, and endoparasitic larvae that lack a labral sclerite and possess a Y-shaped prelabial sclerite. Gauld (1985) originally included the following subfamilies: Ophioninae, Campopleginae, Cremastinae, Tersilochinae, Banchinae, and Ctenopelmatinae. Wahl (1991, 1993) later redefined Ophioniformes by adding Tatogastrinae and Anomaloninae and discredited the reproductive tract and prelabial sclerite as synapomorphies. Belshaw and Quicke (2002) added Mesochorinae, Metopiinae, Lycorininae, Neorhacodinae, Oxytorinae, Phrudinae, Stilbopinae, and Tryphoninae to the Ophioniformes, and these were retained by Quicke with co-authors (2005, 2009) with minor changes in subfamily names.

The ovipositor notch was the only explicitly defined morphological synapomorphy for Ophioniformes left intact by Wahl (1991, 1993) and yet it has largely been ignored in this context. A well defined notch is present in all subfamilies originally included in Ophioniformes by Gauld (1985), though poorly developed in many tersilochines. However, this character is not present in most of the taxa added by Belshaw and Quicke (2002) in their expanded concept of Ophioniformes and one of the ctenopelmatine tribes, the Pionini, is generally characterized (Townes, 1970) by the absence of a notched ovipositor. In the morphological analysis of ophioniform subfamilies by Quicke with co-authors (2005), the ovipositor notch was not included.

The present study examines morphological variation of the ovipositor in one of the originally included members of the Ophioniformes, the Ctenopelmatinae, with a focus on the subapical notch. There are two primary objectives: 1) to examine features of the ovipositor for their utility in higher classification and 2) to explore variation in the ovipositor notch for potential insight into functional morphology.

Material and methods

Acquisition of materials. Ichneumonids were obtained primarily from Malaise traps operated in College Station, Texas, from 2003 to 2008. Additional Malaise trap material was available from traps run in Florida, Michigan, and Idaho by D.B. Wahl, A. Cognato, and A. Gillogly, respectively. Ethanol-preserved representatives of all major ophioniform subfamilies, sensu Gauld (1985) and Wahl (1991, 1993), were set aside for dissection as were selected exemplars from outside the Ophioniformes. Representatives of the following subfamilies and ctenopelmatine tribes were examined for gross morphological features: Ichneumoniformes (Cryptinae, Ichneumoninae), Ophioniformes (sensu Quicke *et al.*, 2009) [Anomaloninae, Banchinae, Campopleginae, Cremastinae, Mesochorinae, Metopiinae, Ophioninae, Tersilochinae, Tryphoninae and the ctenopelmatine tribes Pionini (seven genera), Perilissini (six genera), Euryproctini (four genera), and Mesoleiini (eight genera)], Pimpliformes (Diplazontinae, Orthocentrinae, Pimplinae), Labeninae, and Xoridinae. For a detailed list of taxa dissected and coded for the morphological characters presented below, see Table below (p. 88). Voucher specimens are deposited in the Texas A&M University Collection as voucher number 676.

The following additional genera of Ctenopelmatinae, unavailable for dissection, were examined from pinned specimens only, for a better understanding of variation in external features. The number in

parentheses corresponds to the number of species examined if greater than 1: Ctenopelmatini [*Ctenopelma* Holmgren (2), *Homaspis* Foerster, and *Xenochesis* Foerster]; Perilissini [*Lathrolestes* Foerster (12 additional species), *Nanium* Townes (4), *Neurogenia* Roman, *Perilissus* Holmgren (5 additional species), *Priopoda* Holmgren (2)]; Mesoleiini [*Lamachus* Foerster, *Mesoleius* Holmgren (8), *Neostroblia* Heinrich, *Saotis* Foerster, and *Scopesis* Foerster]; Chrionotini (*Olethrodotis* Foerster); Scolobatini (*Scolobates* Gravenhorst); Seleucini (*Seleucus* Holmgren); and Westwoodini (*Westwoodia* Brullé).

Data collection. Morphological characters were examined across all taxa from the ethanol samples and 21 of these were specifically coded/quantified for available ctenopelmatine taxa and selected Ophioniformes. The codings were assembled in a taxon by character matrix (see Table) to facilitate comparison across taxa and to serve as a preliminary database for anyone wishing to explore these features further in a phylogenetic context. To address the question of whether characters besides the ovipositor notch can be used as a synapomorphy for the Ophioniformes, several Diplazontinae with notched ovipositors, similar in gross appearance to those of many ctenopelmatines, were coded as an outgroup.

Images documenting ovipositor shape were acquired digitally using Syncroscopy's AutoMontage® software in combination with a ProgRes 3008 digital camera. Images were processed and databased as in Cameron and Wharton (2011). These images were also used for more precise measurements regarding angles of the notch (Fig. 1: the greater the angle, the wider the notch) and other morphometric characters (for many additional images and more background data, see the Ophioniformes taxon page at: http://mx.speciesfile.org/projects/8/public/public_content/show/23870?content_template_id=88).

Terminology and morphology. The ovipositor originates from the gonapophyses of the eighth and ninth abdominal segments, forming dorsal and ventral valves which collectively function for deposition of eggs (Snodgrass, 1935; Quicke *et al.*, 1999). The dorsal valve is the product of fusion between the two gonapophyses of the ninth abdominal segment. Towards the base, the two gonapophyses retain separate lumens in ichneumonoids, and are connected ventrally and dorsally by layers of membranous cuticle (Quicke *et al.*, 1994). In at least some members of the Ichneumonidae, the upper valves of the ovipositor
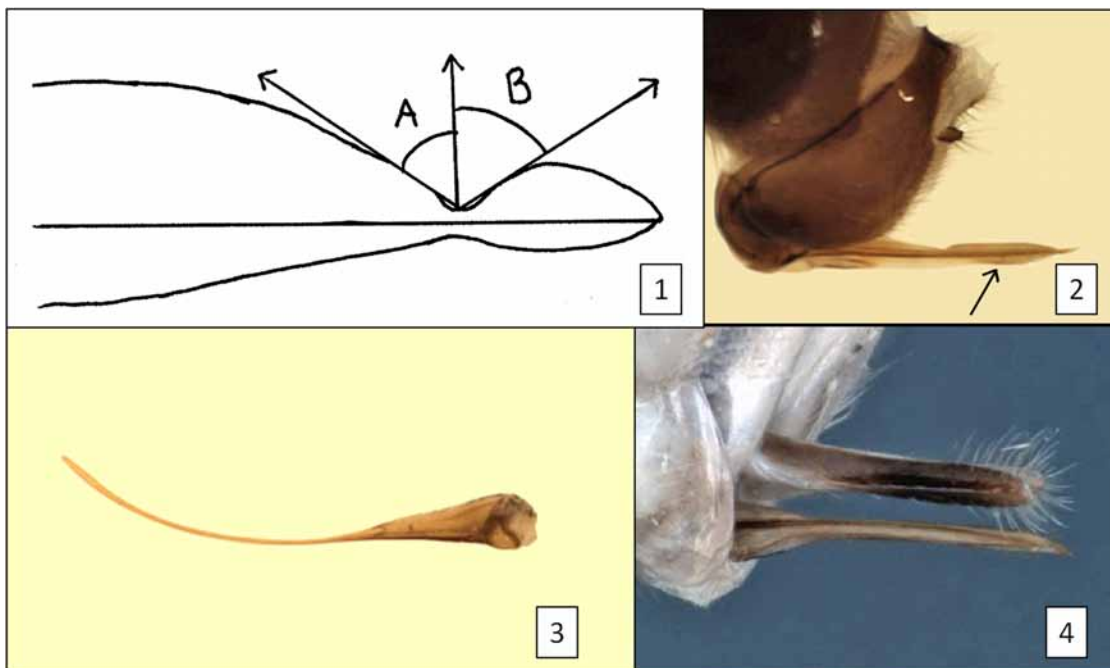
Figures 1–4. Ovipositors. 1 – generalized, illustrating how angles are measured. 2 – Diplazontinae, *Syrphoctonus* sp., arrow showing position of valvillus. 3 – *Sympherta* sp., showing bulbous basal expansion with an abrupt change relative to the rest of the ovipositor. 4 – *Anoncus* sp., lateral view.

have a mid-dorsal groove basally. More apically, the two gonapophyses are completely fused in all apocritans (Quicke *et al.*, 1994). The ventral valves are gonapophyses of the eighth abdominal segment and are never fused. The conjunction of the upper and lower valves produces the egg canal. The mechanism in which the upper and lower valves interlock and slide along each other is referred to as the olistheter. The olistheter is a tongue and groove mechanism (Rahman *et al.*, 1998; Quicke *et al.*, 1994, 1999).

In many ichneumonoids, there is either a notch or an elevated nodus subapically on the dorsal valve. Species with a nodus lack a subapical notch, and vice versa. The nodus is present in ectoparasitoid ichneumonid subfamilies such as Cryptinae, Xoridinae, and Pimplinae (Rahman *et al.*, 1998). There is a strong correlation between possession of a notch and koinobiont endoparasitism attacking larval instars. Functionally speaking, the subapical notch in ichneumonids (and braconids) may be analogous to the ovipositor clip discovered by van Lenteren *et al.* (1998) in the eucoiline wasp *Leptopilina heterotoma* (Thompson), which attacks larvae of *Drosophila* Fallén. The clip consists of a deep, denticulate groove on the upper valve subapically, with a closing mechanism. Function of the clip is to grip the torn cuticle of the host directly after the parasitoid's initial penetration to prevent the host trying to wiggle free (van Lenteren *et al.*, 1998). It is unlikely that the notch in ichneumonids functions in the exactly the same way as the notch in eucoilines since some elements seem to be missing, but there is the strong possibility of an analogous function (Boring *et al.*, 2009).

Results

Ovipositor characters and associated states. Characters and character states coded in Table (p. 88) are listed here. Images of many of the character states are provided on the Ophioniformes taxon page cited above.

1. *Basal expansion.* Three character states differentiate the basal region: (0) bulbous with an abrupt change relative to the rest of the ovipositor, (1) thick when compared to the rest of the ovipositor but without an abrupt change, (2) base relatively equal in height to the rest of the ovipositor.

2. *Upper margins of the dorsal valves basad notch.* Four character states describe the upper margins of the dorsal valves. The upper margins run parallel to the olistheter (states 0 and 3) or gradually decrease into the notch (states 1 and 2). (0) upper margins run parallel to the olistheter, (1) upper margins run parallel to the olistheter then gradually decrease towards the notch, (2) upper margins gradually decrease towards the notch becoming the notch, (3) upper margins gradually decrease towards the apex of the ovipositor with an interrupted drop into the notch versus gradually forming the notch.

3. *Upper margin of dorsal valves distad notch.* Three character states describe the condition of the upper margins of the dorsal valves distad the notch. (0) upper margins run parallel to the olistheter, (1) upper margins taller in the middle when compared to proximal and distal heights, (2) upper margins more spade shaped: the tallest area is basal rather than medial or apical.

4. *Fusion patterns of the dorsal valves.* Fusion patterns in the dorsal valves are highly variable across the examined taxa and multiple characters were used to describe this variation. The first consists of three character states: (0) no fusion, (1) partial fusion, and (2) complete fusion. No fusion occurs when the two dorsal valves are separate from one other and you can move each valve independently, as is typical of sawflies. When the dorsal valves form a solid unit without being separated by either a membranous area or a medial line they are considered to be completely fused. Partial fusion is a highly variable feature among the taxa and is therefore treated in more detail in characters 5–7.

5. *Partial fusion.* Partial fusion describes the presence of a median line or membranous region basally separating the two dorsal valves. The following character states are used to describe the extent of a membrane or median line along the ovipositor: (0) separation of dorsal valves extends distally into the notch, (1) separation of dorsal valves is evident basally and distad the notch, but not in the notch (2) membrane or median line extending through the notch and distal to the notch thus running the entire, not necessarily connected, length of the ovipositor, or (3) separation of dorsal valves only present basally, not extending through the notch or distad the notch.

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6. *Partial fusion of dorsal valves at the base.* Between the base of the ovipositor and subapical dorsal notch, variation occurs with regard to degree of sclerotization: (0) desclerotization occurs in a broad V-shaped configuration with the outlines of the dorsal valves being distinctly more sclerotized, (1) desclerotization is more confined to the medial area of the dorsal valves with a gradual increase in sclerotization distally along the dorsal valves.

7. *Medial structures in desclerotized basal portion of dorsal valves.* Within the area of desclerotization at the base of the dorsal valves, the dorsal valves meet along a midline that is either: (0) membranous or (1) variously sclerotized but not completely membranous.

8. *Pairs of valvilli.* The numbers of valvilli present on the ventral valves are counted in pairs. In order to be considered a pair, there is one valvillus on each valve in the same relative position. Articulated, chitinous flaps known as valvilli protrude into the egg canal from the lower valves. The presence of at least one valvillus (Fig. 2) serves as a synapomorphy for Ichneumonoidea + Aculeata (Quicke *et al.*, 1992), though subsequent molecular analyses have not supported this sister-group relationship (Heraty *et al.*, 2011; Sharkey *et al.*, 2012). The number of valvilli can vary from zero to seven on a single lower valve (the latter found in some species of *Pion* Schiødte) (Quicke *et al.*, 1992; Boring *et al.*, 2009), and position differs greatly from basally to near the apex of the ovipositor. Valvilli were present in nearly all specimens examined, but intraspecific variation in the presence or absence of valvilli was observed for two species of Ctenopelmatinae, with 1 of 4 specimens of *Campodorus* species 3 and 1 of 4 specimens of *Oetophorus pleuralis* (Cresson) completely lacking valvilli.

9. *Placement of valvilli.* If valvilli are present, there are two character states assigned to the position of valvilli relative to the notch. (0) valvilli proximal to the notch and (1) valvilli distal to the notch. Theoretically, valvilli could also occur adjacent the notch, but we did not observe any species with this characteristic.

10. *Desclerotization at the base.* Four character states differentiate desclerotization at the base of the ovipositor: (0) absence of desclerotization, (1) desclerotization only at the base of the dorsal valves, (2) desclerotization only at the base of the ventral valves, (3) desclerotization at the base of both dorsal and ventral valves.

11. *Serrations on the lower valves.* Serrations are often found on the apex of the lower valves, and this is treated as a simple presence/absence character. (0) absence of serrations, (1) presence of serrations.

Serrations on the lower valves are lost or reduced throughout the Ctenopelmatinae. Loss of serrations on the lower valves, however, is common in koinobiont endoparasitoids (Quicke *et al.* 1999), and thus characteristic of several other subfamilies besides Ctenopelmatinae.

12. *Subapical dorsal notch.* There are eight characters associated specifically with the subapical dorsal notch, and most of these are defined in the next six paragraphs. However, initially there are two character states: (0) absence (no notch), (1) presence.

13. *Subapical dorsal notch relative to olistheter.* This character specifies whether or not the deepest portion of the notch touches the olistheter. (0) notch does not touch olistheter, (1) notch touches olistheter, with no measurable space between the two.

14. *Ridges on the distal end of the subapical dorsal notch.* (0) ridges absent, (1) ridges present, giving the appearance of a well-defined edge. Ridges on the proximal, downslope of the subapical dorsal notch were absent on all ichneumonids we examined that possessed a subapical, dorsal notch.

15. *Ridges on the apex of the dorsal valves.* There are two states: (0) absent, (1) present. These ridges are presumed to be remnants of serrations of the dorsal valves, a character only present in basal ichneumonids (Quicke *et al.*, 1994, 1999).

16. *Length from midnotch to apex of ovipositor.* The length from mid notch to the apex of the ovipositor is a continuous character. Because of that, the character states are not the length but rather the position of the notch relative to the length of the ovipositor: (0) in the middle of the ovipositor, (1) between the middle and apex of the ovipositor.

17. *Relative height of the dorsal valve on either side of the subapical dorsal notch.* The height of the dorsal valve proximal and distal to the subapical dorsal notch is measured to determine if the height of

the dorsal valve before and after is equal. There are three character states coded for this character: (0) height of the dorsal valve proximal to subapical dorsal notch is equal to the height of the dorsal valve distal to the notch, (1) height of the dorsal valve proximal to subapical dorsal notch is greater than the height of the dorsal valve distal to subapical dorsal notch, (2) height of the dorsal valve distal to the subapical dorsal notch greater than the height of the dorsal valve proximal to subapical dorsal notch.

18, 19. *Shape of the notch.* In order to further isolate where or if changes occur in the shape of the notch, the notch has been divided into two halves, the proximal (character 18) and distal (character 19). There are four character states assigned to describe the shape of each half: (0) concave, (1) convex, (2) diagonal, and (3) vertical. Several of the specimens examined were difficult to code, and an intermediate state was used, such as 2/0 which is intermediate between being perfectly diagonal and conspicuously concave.

Angles. Specific measurements associated with the dorsal, subapical notch were made from images of the specimens listed in Table (p. 88). These measurements include relative height of the dorsal valve and the depth and width of the notch. Relative height of the dorsal valves was measured by determining the height anterior and posterior to the notch (thus, two measurements) making sure to exclude the distance between the lowest point of the notch and the olistheter. The depth of the notch was measured as the vertical distance between the bottom of the notch and an imaginary line extending tangentially over the notch from the top of the dorsal valve. Width of the notch (Fig. 1) was based on the angle from the centermost point of the notch and its tangent both anterior (Fig. 1, A) and posterior (Fig. 1, B) to the dorsal valve; the greater the angle, the wider the notch. Determination of angles (Angle A and Angle B) was made by using the common sine function from trigonometry.

Additional structures may be present on the lateral sides of the dorsal valves. In our preliminary assessment, these were found only in Xoridinae and Labeninae, and so were not used in the ctenopelmatine character set described here. Similarly, a few additional characters were examined and found either to be essentially invariant for the comparisons of interest (valvilli present or absent; proximal ridges on downslope of subapical dorsal notch; alignment pattern of ventral valves) or applicable only to taxa outside the Ophioniformes (e. g. dorsal, subapical nodes).

Differentiating Ophioniformes from Pimpliformes, as represented by Diplazontinae. The representatives that we examined of the ophioniform subfamilies [sensu Gauld (1985) and Wahl (1991, 1993): Anomaloninae, Banchinae, Campopleginae, Cremastinae, Ctenopelmatinae, Ophioninae, and Tersilochinae] are united by the following shared character states: partial fusion of dorsal valves; valvilli present, placed proximal to subapical dorsal notch; and ridges absent on apex of dorsal valve of ovipositor.

Among the Pimpliformes, subapical, dorsal notches were found in several species of Diplazontinae and Orthocentrinae. Characteristics of the diplazontine ovipositor relative to those of the Ophioniformes are: dorsal valves sometimes completely fused; apex of dorsal valve often with one or two ridges; and valvilli distal to subapical dorsal notch (Fig. 2). While most of the observed features are too variable for use in unambiguous differentiation of diplazontine ovipositors from those of the Ophioniformes, the position of the valvilli is definitive: basad the notch in Ophioniformes and distad the notch in Pimpliformes.

Character states common to members of the Ctenopelmatinae. Of the nine tribes included within the Ctenopelmatinae by Yu *et al.* (2012), adequate material for dissection was available only for the four largest tribes: Euryproctini, Mesoleiini, Perilissini, and Pionini. Of the others, *Olethrodotis* Foerster (Olethrodotini) has an ovipositor that is as long as the metasoma: unusually long for Ctenopelmatinae (Townes, 1970), and there is a small but distinct subapical, dorsal notch. The ovipositors are very short in *Scolobates* Grav. (Scolobatini), *Seleucus* Holmgren (Seleucini), and *Westwoodia* Brullé (Westwoodiini). The subapical, dorsal notch is deep and broad in *Scolobates* and *Seleucus*, but barely indicated in *Westwoodia*, in which the ovipositor narrows distally. Only three of the six genera of Ctenopelmatini were examined, and these exhibited exceptional variability. For example, some species of *Ctenopelma* Holmgren have a subapical dorsal notch whereas many others do not. Species of *Homaspis* Foerster do not possess a subapical dorsal notch but species of *Xenochesis* Schmied. have a very conspicuous subapical dorsal notch. The Ctenopelmatini are typical of the variation in all tribes (regardless of whether the ovipositor was dissected or examined intact) that precluded definitive characterization of the subfamily Ctenopelmatinae on the basis of ovipositor characteristics.

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Pionini. A subapical dorsal notch was absent (Fig. 3) in all pionines examined except *Hodostates* Foerster, which was placed in Pionini by Townes (1970) and retained there by Cameron and Wharton (2011) despite presence of a deep, distinct notch. Even if *Hodostates* were excluded, the loss of the notch is homoplastic within Ctenopelmatinae (Figs 3, 4, 8) and we were also unable to discover any other morphological features of the ovipositor that can be used to define Pionini unequivocally (with or without *Hodostates*).

Perilissini. Although a high degree of variability exists within Perilissini, there is a suite of characters that, when taken together, differentiate perilissines from other tribes: base never abruptly narrowing distally as in many pionines; upper margins of dorsal valves never run parallel to olistheter; usually 2 pairs of valvilli; serrations present on the lower valves; and desclerotization at base never restricted to the dorsal valves: though desclerotization of the dorsal valve is more extensive than it is in mesoleiines. Townes (1970) describes the perilissine form of the notch as varying from strong (Fig. 5) to shallow (Figs 6, 7) or even sometimes absent as seen in Fig. 8. This proved to be a continuous character across perilissines based on our measurements of the shape of the notch. The perilissine ovipositor is often upcurved as in many pionines, but never downcurved as in many mesoleiines and euryproctines.

Mesoleiini. Members of the tribe Mesoleiini that we examined share the following combination of character states: base always thick; upper margin of dorsal valve never parallel to olistheter; upper margin of dorsal valves distad notch never spade-shaped; 1 pair of valvilli; desclerotization at base never restricted to the dorsal valves; and distal half of notch always concave. Mesoleiine ovipositors tend to be deeply notched and serrate except in *Anoncus* Townes, which lacks a notch (Fig. 4).

Euryproctini. The following combination of characters is found in all euryproctines examined: base thick, never abruptly narrowing distally; upper margins of dorsal valves distad notch either parallel to olistheter or spade-shaped; 2 pairs of valvilli; desclerotization present on the ventral valve or none at all; and serrations present on apex of ovipositor.

Discussion

Ophioniformes. There are several morphological characters of the ovipositor shared by all members of the Ophioniformes examined in this study. However, we did not find any characters specific to
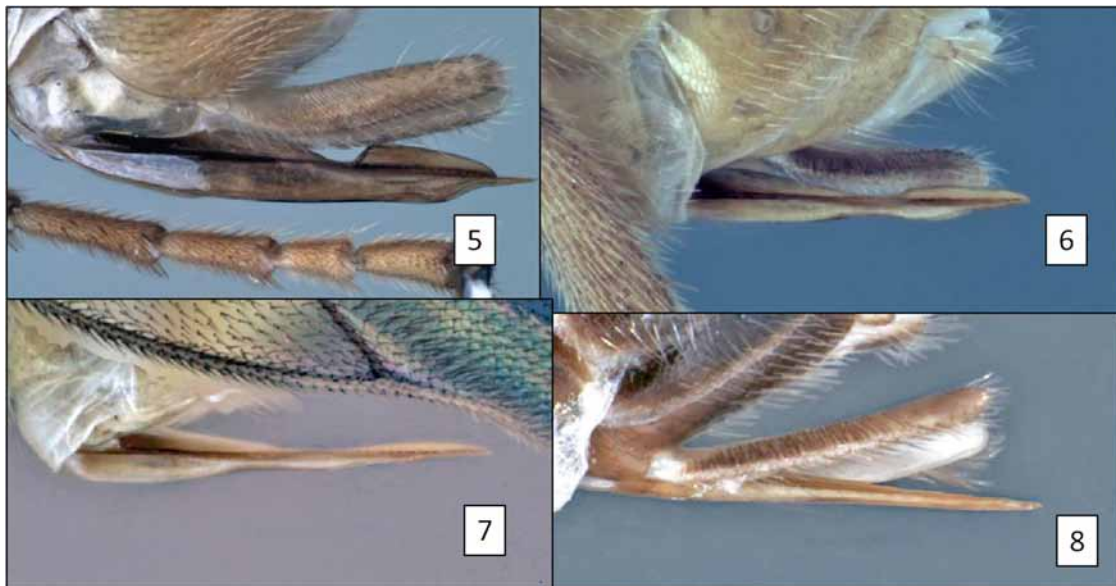
Figures 5–8. Perilissine ovipositors. 5 – *Priopoda* sp. with deep, conspicuous subapical dorsal notch. 6 – *Lathrolestes* sp., with deep, conspicuous subapical dorsal notch. 7 – *Lathrolestes* sp. with broad, shallow subapical dorsal notch. 8 – *Lathrolestes* sp. without notch.

Ophioniformes that were not also present in at least some of the non-ophioniform taxa. Thus, we were unable to find support for the monophyly of the Ophioniformes sensu Gauld (1985) and Wahl (1991, 1993), nor of the expanded Ophioniformes of Quicke with co-authors (2000, 2005, 2009) and Belshaw and Quicke (2002) using the ovipositor characteristics that we examined. More specifically, the subapical, dorsal notch has apparently been lost independently several times within the Ctenopelmatinae and also in the Tersilochinae. More significantly, although used previously as a defining feature of the Ophioniformes (Gauld, 1985; Wahl, 1991, 1993), a well-defined notch is also present in many Diplazontinae, Orthocentrinae, and Metopiinae. While Quicke with co-authors (2005) include Metopiinae in their expanded Ophioniformes, and Quicke with co-authors (2009) found Metopiinae well embedded within the Ctenopelmatinae in their analyses, the Diplazontinae and Orthocentrinae remain deeply nested within the Pimpliformes in the analyses by Quicke with co-authors (2000, 2009) and Belshaw and Quicke (2002), supporting the original inclusion of these two subfamilies in Pimpliformes by Wahl (1990).

This leaves Ophioniformes, as defined by Gauld (1985) and Wahl (1991, 1993) without any morphological synapomorphies. Yet, members of the subfamily Diplazontinae do differ, within the context of their ovipositors, from nearly all members of the Ophioniformes in the placement of valvilli relative to the notch and these differences suggest areas of future investigation for features that might support the monophyly of at least a portion of the Ophioniformes. Specifically, placement of the valvilli needs to be surveyed in more detail among the Metopiinae and those non-ophioniform taxa with a subapical dorsal notch. The expansion of the Ophioniformes (e. g. Quicke *et al.*, 2009) leaves open the possibility of characterizing this group on the basis of the original reproductive tract features noted by Pampel (1913) while at the same time thoroughly demolishing the ovipositor notch as a useful feature in this regard since presumptive basal groups such as Tryphoninae lack a notch.

Ctenopelmatinae. We also failed to find definitive characters of the ctenopelmatine ovipositor. Though disappointing, this is not surprising since Townes (1969, 1970) noted only that the ctenopelmatine ovipositor is short and bears a subapical dorsal notch. Townes (1970) also noted several important exceptions. Even if we ignore the Olethrodotini, whose two known species have exceptionally long ovipositors, ovipositor length varies considerably among the remaining Ctenopelmatinae. Ovipositor length is not obviously correlated with body size since some of the shortest ovipositors are found in the Westwoodiini, which are among the largest of the Ctenopelmatinae. In Perilissini, relatively long ovipositors are found in small-bodied *Lathrolestes* Foerster and large-bodied *Perilissus* Foerster.

Similarly, we are unable to define any of the currently valid tribes on the basis of the ovipositor characters we examined. In particular, variation in the presence or absence of a subapical notch is widespread at the tribal level. The lack of a notch has been used as a diagnostic character of Pionini (while ignoring the inconvenience of *Hodostates*). The absence of a notch in more typical pionines may represent the primitive condition in ichneumonid ovipositors, similar to what is found in putative basal groups (e. g. Quicke *et al.*, 2000) such as Xoridinae, Ichneumoninae, and most Pimpliformes. The basal grade within the Ophioniformes (Quicke *et al.*, 2009) includes the Tryphoninae, which also lack a dorsal, subapical notch. Many tryphonines also have a u-shaped groove medially at the base of the propodeum and laterally at the anterior edge of the lateral longitudinal carina of the propodeum, the only other feature used by Townes (1970) to characterize Pionini. An alternative hypothesis is that the absence of a notch represents a secondary loss associated, for example, with oviposition in host eggs. Our data support the latter hypothesis since the entire ovipositor is strongly narrowed distad the enlarged base in pionines (often abruptly so: Fig. 3) relative to most ichneumonids, and dorsal nodes and serrations, typical of xoridines, ichneumonines and most pimpliformes, are absent in pionines. More importantly, our survey of ctenopelmatine ovipositors shows several possible transitions from a notched to an unnotched condition.

Townes (1970) noted extensive variation in the notch of perilissines. Our measurements of the subapical notch in *Perilissus* and *Lathrolestes* show a full range of variation among species: transitioning from a deep, narrow, relatively abrupt notch to a very broad, shallow indentation in which the notch is barely perceptible (Figs 5–8). This provides strong evidence that the overall evolution from an ovipositor with a conspicuous subapical dorsal notch to a pionine-like ovipositor without a notch can occur gradually as exemplified by the Perilissini. More abrupt transitions are suggested by morphological variation in Mesoleiini and Ctenopelmatini, suggesting the possibility that the pionine ovipositor may have multiple origins and Pionini may consequently be polyphyletic.

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Functional morphology. Considerable information has been published on the functional significance of needle-like ovipositors, which are found throughout the Ichneumonoidea but are particularly prevalent among species that oviposit in host eggs (Wharton, 1997; Brajkovic *et al.*, 1999). Pionines are generally thought to oviposit in host eggs (Pschorn-Walcher, Zinnert, 1971; Townes, 1970) explaining the needle-like ovipositor in most species, but several species in the genus *Rhorus* Foerster oviposit through the stemmata of early instar larvae (Pschorn-Walcher, Zinnert, 1971; Gauld, 1988). This would explain why serrations are retained on the ventral valves in *Rhorus*, but lost in other Pionini. The small eggs of pionines, regardless of where they are placed, are associated with a needle-like ovipositor that lacks the dorsal, subapical notch.

By contrast, few papers have addressed the function of the subapical notch. Some of the most detailed of these are papers by van Lenteren with co-authors (1998) and Boring with co-authors (2009). Van Lenteren with co-authors (1998) provided a beautifully detailed study on the functional morphology of an ovipositor clip in *Leptopilina* Foerster, a eucoiline figitid parasitoid of *Drosophila* Fallén. In the species studied by van Lenteren with co-authors (1998), the host cuticle is held in a subapical notch by a sliding mechanism during oviposition bouts. However, a similar sliding structure was not present in any of the ichneumonids that we examined, nor has any structure of this nature been described in the detailed studies on Ichneumonoidea by Quicke with co-authors (1992, 1994, 1999, 2000) and Boring with co-authors (2009). Boring with co-authors (2009) summarized some of the functional morphology literature associated with oviposition in Hymenoptera, and offered an elegant, morphology-based hypothesis on the function of the subapical notch in Ichneumonoidea, using the braconid *Homolobus truncator* (Say) as their model. Their work focuses on functions associated with eggs that undergo considerable distortion as they flow down the ovipositor tube, and is thus mostly inapplicable to ctenopelmatine ovipositors modified for the passage of large eggs that do not undergo distortion as they pass down the ovipositor. Nevertheless, the argument that the subapical notch in Ichneumonoidea serves as a way to hold the integument of the host during oviposition (Belshaw *et al.*, 2003; Boring *et al.*, 2009), similar to the function in figitids, has strong morphological support. Two other possible functions of the subapical dorsal notch are given by van Veen (1982) and Quicke with co-authors (1999). Van Veen (1982), working with *Banchus femoralis* Thomson, gives evidence, later adopted by Boring with co-authors (2009), that the subapical dorsal notch facilitates determining the correct depth during the act of oviposition. Quicke with co-authors (1999) additionally hypothesized that the subapical dorsal notch may serve as a point of articulation allowing the tip to hinge upwards to assist exit of the egg. Our study of ctenopelmatine ovipositors shows the notch to be exceptionally variable among species. Such variation is difficult to understand in a taxon attacking eruciform hosts of larval sawflies. Instead, one would predict that the notch would be nearly identical across genera if the function is to anchor the ovipositor in the host integument during egg-laying. We offer an alternative hypothesis, that seems to correlate better with variation in the relatively large, stiff eggs of those ctenopelmatines with a notched ovipositor.

During our dissections of the ovipositor, we observed that ctenopelmatine eggs were generally quite large (sometimes equal to or exceeding in diameter the diameter of the ovipositor) and usually weakly to strongly sclerotized. Similar observations have been made by many others, including Graham (1953), Pschorn-Walcher and Zinnert (1971), Gauld (1988), and Quicke with co-authors (1999), and were quantified by Cummins with co-authors (2011). In order for such large, stiff eggs to pass down the ovipositor, some distortion of the valves is essential. The presence of a notal membrane mid-dorsally facilitates this distortion, providing flexibility and the necessary expansion of the egg canal to accomodate large eggs (Quicke *et al.*, 1994). The ventral valves curve towards one another but are free hanging (their only point of articulation being the olistheter), which further compensates for large, solid eggs that are physically demanding. We are thus in agreement with Quicke with co-authors (1994) that the function of the divided upper valve is to allow necessary distortion to accommodate larger egg sizes.

A relatively large egg cannot be extruded from the ovipositor into the host in the same fashion that has been described for *H. truncator* (Boring *et al.*, 2009) and several other Hymenoptera (see Skinner, Thomson, 1960) that have elastic eggs. Instead of or in addition to an anchor in the host integument, another function of the ovipositor notch is as an egg guide, pushing the egg out of the ovipositor ventrally as it moves distally along the ovipositor shaft, much akin to the purported function of the sperone described by Boring with co-authors (2009). Differences in size and shape of the egg should then be corre-

lated with differences in the size and shape of the notch, providing a testable hypothesis. This hypothesis essentially takes an internal view of the function of the notch, focusing on the proximal side of the slope, whereas alternative suggestions have focused on the external features. The subapical dorsal notch results in a tapering of the dorsal valve internally which would guide the egg out rather than resulting in an abrupt stop for the egg.

Acknowledgements

References

Belshaw R., Quicke D.L.J. 2002. Robustness of ancestral state estimates: evolution of life history strategy in ichneumonoid parasitoids. *Systematic Biology*, **51:** 450–477.

Belshaw R., Grafen A., Quicke D.L.J. 2003. Inferring life history from ovipositor morphology in parasitoid wasps using phylogenetic regression and discriminant analysis. *Zoological Journal of the Linnean Society*, **139:** 213–228.

Boring C.A., Sharkey M.J., Nychka J.A. 2009. Structure and functional morphology of the ovipositor of *Homolobus truncator* (Hymenoptera: Ichneumonoidea: Braconidae). *Journal of Hymenoptera Research*, **18:** 1–24.

Brajkovic M., Krunic M., Tomanovic Z., Stanisavljevic L.J. 1999. Morphological adaptations of the ovipositor of braconid wasps (Braconidae: Hymenoptera) associated to biological characteristics of their hosts. *Acta Entomologica Serbica*, **4:** 107–125.

Cameron M.D., Wharton R.A. 2011. Revision of *Hodostates* (Hymenoptera: Ichneumonidae: Ctenopelmatinae), with a discussion of tribal placement. *The Canadian Entomologist*, **143:** 136–156.

Cummins H.M., Wharton R.A., Colvin A.M. 2011. Eggs and egg loads of field-collected Ctenopelmatinae (Hymenoptera: Ichneumonidae): Evidence for phylogenetic constraints and life-history trade-offs. *Annals of the Entomological Society of America*, **104:** 465–475.

Gauld I.D. 1985. The phylogeny, classification and evolution of parasitic wasps of the subfamily Ophioninae (Ichneumonidae). *Bulletin of the British Museum of Natural History*, **51:** 1–185.

Gauld I.D. 1988. Evolutionary patterns of host utilization by ichneumonoid parasitoids (Hymenoptera: Ichneumonidae and Braconidae). *Biological Journal of the Linnean Society*, **35:** 351–377.

Gauld I.D., Sithole R., Gomez J., Godoy C. 2002. Ichneumonidae of Costa Rica, 4. *Memoirs of the American Entomological Institute*, **66:** 1–768.

Graham A.R. 1953. Biology and establishment in Canada of *Mesoleius tenthredinis* Morley (Hym.: Ichneumonidae), a parasite of the larch sawfly, *Pristiphora erichsonii* Htg. (Hym.: Tenthredinidae). *Report of the Quebec Society for the Protection of Plants*, **35**: 61–75.

Heraty J., Ronquist F., Carpenter J.M., Hawks D., Schulmeister S., Dowling A., Murray D., Munro J., Wheeler W.C., Schiff N., Sharkey M.J. 2011. Evolution of the hymenopteran megaradiation. *Molecular Phylogenetics and Evolution*, **60:** 73–88.

Pampel W. 1913. Die weiblichen Geschlechtsorgane der Ichneumoniden. *Zeitschrift fuer wissenschaftlichle Zoologie*, **108:** 290–357.

Pschorn-Walcher H., Zinnert K.D. 1971. Investigations on the ecology and natural control of the larch sawfly (*Pristiphora erichsonii* Htg., Hym.; Tenthredinidae) in central Europe. *Technical Bulletin of the Commonwealth Institute of Biological Control*, **14:** 1–50.

Quicke D.L.J., Fitton M.G., Ingram S. 1992. Phylogenetic implications of the structure and distribution of ovipositor valvilli in the Hymenoptera (Insecta). *Journal of Natural History*, **26:** 587–608.

Quicke D.L.J., Fitton M.G., Tunstead J.R., Ingram S.N., Gaitens P.V. 1994. Ovipositor structure and relationships within the Hymenoptera, with special reference to the Ichneumonoidea. *Journal of Natural History*, **28:** 635–682.

Quicke D.L.J., LeRalec A., Vilhelmsen L. 1999. Ovipositor structure and function in the parasitic Hymenoptera with an exploration of new hypotheses. *Atti dell'Accademia Nazionale Italiana di Entomologia Rendiconti*, **47:** 197–239.

Quicke D.L.J., Fitton M.G., Notton D.G., Broad G.R., Dolphin K. 2000. Phylogeny of the Ichneumonidae (Hymenoptera): A simultaneous molecular and morphological analysis. *In*: Austin A.D., Dowton M. (Eds). Hymenoptera: Evolution, biodiversity and biological control., Canberra: CSIRO Publishing: 74–83.

Quicke D.L.J., Fitton M.G., Broad G.R., Crocker, B., Laurenne N.M., Miah M.I. 2005. The parasitic wasp genera *Skiapus, Hellwigia, Nonnus, Chriodes,* and *Klutiana* (Hymenoptera, Ichneumonidae): recognition of the Nesomesochorinae stat. rev. and Nonninae stat. nov. and transfer of *Skiapus* and *Hellwigia* to the Ophioninae. *Journal of Natural History*, **39:** 2559–2578.

Quicke D.L.J., Laurenne N.M., Fitton M.G., Broad G.R. 2009. A thousand and one wasps: a 28S rDNA and morphological phylogeny of the Ichneumonidae (Insecta: Hymenoptera) with an investigation into alignment parameter space and elision. *Journal of Natural History*, **43:** 1305–1421.

Rahman M.H., Fitton M.G., Quicke D.L.J. 1998. Ovipositor internal microsculpture in the Braconidae (Insecta, Hymenoptera). *Zoologica Scripta*, **27:** 319–331.

Sharkey M.J., Carpenter J.M., Vilhelmsen L., Heraty J., Liljeblad J., Dowling A.P.G., Schulmeister S., Murray D., Deans A.R., Ronquist F., Krogmann L., Wheeler W.C. 2012. Phylogenetic relationships among superfamilies of Hymenoptera. *Cladistics*, **28:** 80–112.

Skinner E.R., Thompson G.H. 1960. Film: The Alder woodwasp and its insect enemies.

Snodgrass R.E. 1935. *Principles of insect morphology*. New York: McGraw-Hill. 667 p.

Townes H.K. 1969. Genera of Ichneumonidae Part 1. *Memoirs of the American Entomological Institute*, **11:** 1–300.

Townes H.K. 1970. Genera of Ichneumonidae Part 3. *Memoirs of the American Entomological Institute*, **13:** 1–307.

Van Lenteren J.C., Isidoro N., Bin F. 1998. Functional anatomy of the ovipositor clip in the parasitoid *Leptopilina heterotoma* (Thompson) (Hymenoptera: Eucoilidae), a structure to grip escaping host larvae. *International Journal of Insect Morphology and Embryology*, **27:** 263–268.

Van Veen J.C. 1982. Notes on the biology of *Banchus femoralis* Thomson (Hym, Ichneumonidae) an endoparasitoid of *Panolus flammea* (D.1. S.) (Lep., Noctuidae). *Zeitschrift fuer angewandte Entomologie*, **99:** 300–311.

Wahl D.B. 1990. A review of the mature larvae of Diplazontinae, with notes on larvae of Acaenitinae and Orthocentrinae and proposal of two new subfamilies (Insecta: Hymenoptera: Ichneumonidae). *Journal of Natural History*, **24:** 27–52.

Wahl D.B. 1991. The status of *Rhimphoctona*, with special reference to the higher categories within Campopleginae and the relationships of the subfamily (Hymenoptera: Ichneumonidae). *Transactions of the American Entomological Society*, **117:** 193–213.

Wahl D.B. 1993. Cladistics of the genera of Mesochorinae (Hymenoptera: Ichneumonidae). *Systematic Entomology*, **18:** 371–387.

Wahl D.B., Gauld I.D. 1998. The cladistics and higher classification of the Pimpliformes (Hymenoptera: Ichneumonidae). *Systematic Entomology*, **23:** 265–298.

Wharton R.A. 1997. Generic relationships of opiinae Braconidae (Hymenoptera) parasitic on fruit-infesting Tephritidae (Diptera). *Contributions of the American Entomological Institute*, **30**(3): 1–53.

Yu D.S.K., van Achterberg C., Horstmann K. 2012. *Taxapad 2012, Ichneumonoidea 2011*. Database on flash-drive. www.taxapad.com, Ottawa, Ontario, Canada.

Table. Taxon by character matrix for ovipositor features.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Angle A	Angle B
Ophioniformes																					
Ophioninae																					
Enicospilus sp.	0	3	1	1	1	-	-	1	0	2	1	1	0	1	0	1	1	0	0	59.96	66.31
Ophion sp.	0	2	0	1	3	-	-	1	0	2	1	1	0	1	0	1	1	2/1	2	81.89	71.69
Campopleginae																					
Microcharops sp.	1	3	0	1	3	0	0	2	0	0	1	1	0	0	0	1	1	2	2	45	45
Campoplex sp.	1	1	2	1	3	-	-	2	0	0	1	1	0	0	0	1	1	1/2	3	46.44	1
Cremastinae																					
Xiphosomella sp.	2	0	0	1	3	-	-	1	0	0	1	1	1	1	0	1	1	1	3	45.17	1
Trathala sp.	1	0	0	1	3	-	-	1	0	3	1	1	1	1	0	1	1	1	3	45.17	1
Pristomerus sp.	1	0	1	1	2	-	-	1	0	3	1	1	0	1	0	0	0	1	3	63.23	1
Tersilochinae																					
Diaparsis sp.	1	0	0	1	0	-	-	1	0	3	1	1	0	1	0	1	0	0	0	78.75	78.75
Banchinae																					
Banchus cf vittosus Townes et Townes (2 specimens)	1	1	0	1	1	-	-	2	0	0	1	1	1	0	0	1	1	1	1	26.51	26.77
Anomaloninae																					
Aphanistes sp.	0	2	0	1	3	0	1	1	0	3	1	1	0	0	0	1	1	2/1	2/1	53.13	75.41
Trichionotus sp.	0	2	0	1	3	-	-	1	0	3	1	1	0	0	0	1	1	2/1	2/1		
Ctenopelmatinae																					
Pionini																					
Labrossyta species 1	0	2	1	1	3	0	1	1	0	0	1	1	0	1	0	1	1	2/1	0	77.61	56.44
Pion species 1	1	1	-	1	-	-	-	-	-	-	-	0	-	-	0	-	-	-	-		
Sympherta burra (Cresson)	0	2	-	1	-	0	0	2	-	2	0	0	-	-	0	-	-	-	-		
Rhorus varifrons (Cresson)	0	2	-	1	-	1	1	2	-	0	1	0	-	-	0	-	-	-	-		
Trematopygus species 1	0	1	-	1	-	0	0	2	-	3	0	0	-	-	0	-	-	-	-		
Hodostates rotundatus (Davis)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	0	-	-	-	-		
Lethades species 1	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	-	-	-	-		

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Angle A	Angle B
Perilissini																					
Absyrtus paniscoides (Ashmead) (2 specimens)	1/2	1/3	2	1	0/2	0	0	2	0	3/2	1	1	0	1	0	1	1	0	0	71.08/71.81	46.05/63.58
Aechmeta indotata (Davis)	1	1	0	1	0	0	0	2	0	-	1	1	0	1	-	1	1	2/1	2/0	69.79	63.19
Lathrolestes species 1	1	3	2	1	0	0	0	2	0	2	1	1	0	0	0	1	0	0	0	71.81	79.52
Lathrolestes species 2	1	2	1	1	2	0	0	2	0	-	1	1	0	0	0	-	0	0	0	84.88	85.26
Oetophorus pleuralis (Cresson) (4 specimens)	1/2	1/2	2	1	3/2	0	0	0/2	0	0/2/3	1	1	0	1/0	0	1	1	0, 2/0 or 2/1	0 or 2/0	72.55/72.36/ 72.52/68.05	71.69/53.13/ 68.29 (2)
Trematopygodes oculatus (Davis) (3 specimens)	1/2	1/2	1	1	2/3	0	0	2	0	2	1	1	0	0	0	1	1	2/0	2/0	65.39/68.75	74.78/81.54
Perilissus discolor (Cresson)	1	1	2	1	0	0	0	2	0	-	1	1	1	0	0	1	1	2/0	0	75.75	56.20
Mesoleiini																					
Alexeter species 1	1	3	1	-	-	-	-	-	-	2	1	1	1	1	0	1	1	1	0	66.44	55.47
Alexeter species 2	1	3	0	1	2	1	1	1	0	0	1	1	1	1	0	1	1	0	0	65.28	44.97
Anoncus species 1	0	0	1	1	-	0	1	2	-	3	0	0	-	-	-	-	-	-	-		
Barytarbes honestus (Cresson)	1	3	0	1	2	-	-	1	0	2	1	1	0	1	0	1	1	0	0	62.21	74.55
Campodorus crassitarsis (Thomson)	1	2	1	1	-	-	-	-	-	2	1	1	1	1	0	1	1	1	0	48.21	53.13
Campodorus species 2	1	3	1	1	2	1	1	1	0	2	1	1	1	1	0	1	1	0	0	60.03	33.75
Campodorus cf species 2 (2 specimens)	1	3	0/1	1	3/2	1	1	1	0	2	1	1	0	1	0	1	1	0	0	71.81/67.09	59.13/60.18
Campodorus species 3 (4 specimens)	1	2	1/0	1	2	1	1	1/0	0	2/0	1	1	1	1/0	0	1	1	0, 2/0	0	68.72/68.58/ 67.97/ 68.72	63.23/47.58/ 63.23/ 66.44
Campodorus species 4	1	2	0	1	2	-	-	-	-	-	1	1	1	1	0	1	1	2/0	0	71.81	39.87
Mesoleiini species 1 (2 specimens)	1	3	1	1	2	-	-	1	0	2	1	1	0	1	0	1	1	2/0	0	65.23/57.94	45.04/45.17
Mesoleiini species 2	1	3	0	1	0	-	-	-	-	2	1	1	1	1	0	1	1	0	0	60.03	46.49
Scopesis sp.	1	3	0	1	-	-	-	-	-	-	1	1	1	1	0	1	1	1	0		
Mesoleiini species 4	1	2	0	1	2	1	1	1	0	0	1	1	0	1	0	1	1	2/0	0	72.83	47.58
Euryproctini																					
Hadrodactylus sp.	1	3	0	1	2	0	0	2	0	2	1	1	0	0	0	1	1	0	0	72.10	63.23
cf Synomelix sp.	1	3	0	1	2	0	1	2	0	-	1	1	1	0	0	1	1	0	1	74.12	63.23
Euryproctus sp. 2	1	2	2	1	0	-	-	-	-	0	1	1	0	1	0	1	1	2/1	3	65.20	1
Euryproctus cf sp. 2 (2 specimens)	1	2	-	1	0	1	0	-	-	2	1	1	0	1	0	1	1	2/0	3	69.52/73.31	1

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Angle A	Angle B
Pimpliformes																					
Diplazontinae																					
Diplazon scutellaris (Cresson) (2 specimens)	1	2/3	2	1	2	1	0	3	1	1	1	1	1	0	0/1	1	1	2/0	3	67.38/70.48	1
Enizemum sp. (2 specimens)	1	3	2	1	3	-	-	1/2	1	3/1	1	1	0	0	0/1	1/0	1	0	0	62.50/59.96	57.68/63.23
Diplazon bradleyi Dasch	1	3	2	1	-	-	-	1	-	3	1	1	1	0	0	1	1	0	0	68.96	38.68
Sussaba sp. 1 (3 specimens)	1	1/2/3	0/2	1	2	1	0	2	1	1	-	1	0	0	0	1	1	2/1	0/1	78.75	20.04
Diplazon laetatorius (F.) (2 specimens)	1	3	2	1	3	-	-	2/3	1	3	1	1	0	0	1	1	1	2/0	1	66.49/65.51	47.79
Syrphoctonus sp.	1	2	2	2	-	-	-	-	-	1	1	1	0	0	0	1	1	2	1	67.55	11.31
Syrphoctonus sp. 1	1	3	2	2	3	-	-	3	1	1	1	1	0	0	1	1	1	2/0	1	66.44	69.52
Syrphoctonus sp. 2 (2 specimens)	1	3	2	1	-	-	-	2	1	1	1	1	1	0	1	1/0	1	0	1	56.21	56.81
Syrphoctonus sp. 3	1	2	2	1	1	-	-	3	1	3	1	1	0	0	1	1	1	2/0	2/0	66.93	61.93
Metopiinae																					
Metopius (Cultrarius) comptus	1	2	0	1	2	0	0	1	1	3	1	1	1	0	0	1	1	2/0	2/0	45.17	63.23
Exochus species 1	1	2	-	1	3	0	0	1	0	2	1	0	-	-	0	-	-	-	-		
Trieces species 1	1	2	2	1	3	0	0	1	0	2	1	1	0	0	0	1	1	2/0	1	80.70	56.44
Tryphoninae																					
Polyblastus sp.	0	1	-	1	-	-	-	2	-	3	1	0	-	-	0	-	-	-	-		

Overall results of the chromosomal study of parasitic wasps of the subfamily Ichneumoninae (Hymenoptera: Ichneumonidae)

V.E. Gokhman

Итоги хромосомного исследования наездников-ихневмонид подсемейства Ichneumoninae (Hymenoptera: Ichneumonidae)

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Abstract. Overall results of the chromosomal study of 94 species of parasitic wasps of the subfamily Ichneumoninae are summarized in the present paper, including new data for the two species, *Hoplismenus pica* Wesmael (2n = 20) and *Ichneumon melanotis* Holmgren (2n = 24). The diploid chromosome number in the Ichneumoninae can vary from 2n = 16 to 2n = 34, with a clear mode at 2n = 22. An overview of the main pathways and mechanisms of karyotype evolution within the subfamily and its subordinate taxa is made. Taxonomic implications of chromosomal characters in the Ichneumoninae are outlined.

Key words. Hymenoptera, Ichneumonidae, Ichneumoninae, parasitic wasps, parasitoids, chromosomes, karyotypes, taxonomy.

Резюме. В представленной работе подведены итоги хромосомного исследования 94 видов наездников подсемейства Ichneumoninae, включая новые данные по 2 видам: *Hoplismenus pica* Wesmael (2n = 20) и *Ichneumon melanotis* Holmgren (2n = 24). Диплоидное число хромосом ихневмонин может варьировать от 2n = 16 до 2n = 34 с четким максимумом при 2n = 22. Сделан обзор основных путей и механизмов эволюции кариотипа Ichneumoninae и таксонов более низкого ранга в пределах подсемейства. Показано значение хромосомных признаков для решения проблем таксономии ихневмонин.

Ключевые слова. Hymenoptera, Ichneumonidae, Ichneumoninae, паразитические перепончатокрылые, паразитоиды, хромосомы, кариотипы, таксономия.

Introduction

The Ichneumonidae is one of the largest insect families with more than 24 000 described species (Aguiar *et al*., 2013). In turn, parasitic wasps of the subfamily Ichneumoninae, which exclusively attack butterflies and moths (Lepidoptera), also constitute one of the most speciose groups of the Ichneumonidae (see e.g. Rasnitsyn, 1978). The author of the present paper started a systematic chromosomal study of this subfamily more than thirty years ago. First results of this work were published simultaneously with karyotypic data for a particular member of the Ichneumoninae provided by another research team (Gokhman, 1985; Hedderwick *et al*., 1985). A few years later, I prepared my PhD thesis on the chromosomal study of more than 60 species of the Ichneumoninae (Gokhman, 1990). Nevertheless, the karyotypic investigation of this subfamily continued during the subsequent years (Gokhman, 1991, 1993, 2001, 2002,

2007; Gokhman, Quicke, 1995; Gokhman, Mikhailenko, 2008). In addition, a monograph on chromosomal analysis of parasitoid Hymenoptera, which contained results of the karyotypic study of more than 90 species of the above-mentioned subfamily, was also published a few years ago (Gokhman, 2009).

The aim of the present paper is therefore an incorporation of the newly obtained results into the existing knowledge of chromosome sets of the Ichneumoninae. Moreover, when my monograph (Gokhman, 2009) had already come out of print, Quicke *et al.* (2009) published an extensive analysis of the Ichneumonidae that contained the most detailed phylogenetic reconstruction for the family. This work confirmed my earlier conclusions (Gokhman, 1995), at least those concerning reconstruction of phylogenetic relationships of the main groups of the Ichneumoninae. Both these reconstructions, together with the preliminary phylogenetic analysis of the subfamily Ichneumoninae conducted by Hilpert (1992), were used in the present paper for discussion of certain features of karyotype evolution in this group.

The present work is devoted to the anniversary of Dmitri R. Kasparyan, the most prominent Russian expert on Ichneumonidae systematics.

Material and methods

The new karyotypic data given in the present paper were obtained from the study of adult female parasitoids collected by the author at their hibernation sites, i.e. under the bark of fallen trees in a mixed forest in the surroundings of the city of Kaluga (Russia) in April through November 2013. Chromosomal preparations of ovarian tissue were made and analyzed using standard techniques (Gokhman, 2009) with minor modifications. The existing data (Gokhman, 2009) as well as the newly obtained results were used to demonstrate distribution of various groups of the subfamily Ichneumoninae by the chromosome number both at the species and genus levels. In the latter case, calculations were made according to the "genus-karyotype concept" proposed by Crozier (1975) to decrease the effect of uneven study of different taxa. Phylogenetic analysis of chromosomal variation in the Ichneumoninae was based on the reconstructions made by Hilpert (1992), Gokhman (1995), and Quicke *et al.* (2009).

Results and discussion

Hoplismenus pica Wesmael

2n = 20 (Figs 1a, 1b). This is the first karyotypically studied species of the subtribe Hoplismenina that, in turn, belongs to the tribe Ichneumonini. Nine metaphase plates from a single female were examined. The first pair of submetacentric chromosomes is substantially longer than the remaining ones, which show more or less continuous gradation in length. In addition to the submetacentrics of the first pair, metacentric (the second, fifth, eighth and ninth pairs), submetacentric (the sixth and tenth pairs) and subtelocentric chromosomes (the third, fourth and seventh pairs) also present within the karyotype. The so-called spontaneous C-banding was observed on five metaphase plates which all showed a similar banding pattern. This banding revealed pericentromeric segments of heterochromatin on all chromosomes (Fig. 1b). These segments substantially vary in size between different chromosome pairs; submetacentrics of the first pair carry the largest heterochromatic segment.
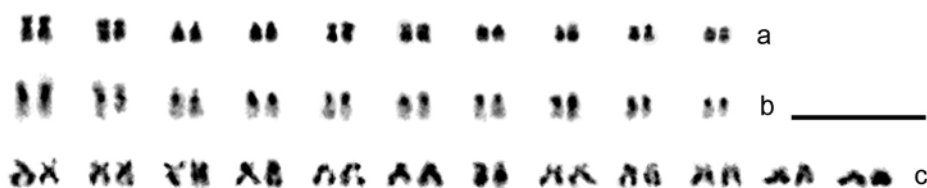
Figure 1. Karyograms of parasitic wasps of the subfamily Ichneumoninae: *Hoplismenus pica* (a, b) and *Ichneumon melanotis* (c). a, c – routine chromosomal staining; b – spontaneous C-banding. Scale bar – 10 μm.

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***Ichneumon melanotis* Holmgren**

2n = 24 (Fig. 1c). Only the chromosome number determined in a single specimen from the Moscow Province (Gokhman, 1990) was previously known for this species. Six metaphase plates from four females were studied in the present paper. All chromosomes gradually decrease in size within the chromosome set. As in the previous species, metacentric (the first, third, fourth and ninth pairs), submetacentric (the second and sixth to eighth pairs) and subtelocentric chromosomes (the fifth and tenth to twelfth pairs) present within the karyotype.

Data on chromosome sets of 94 species of the subfamily Ichneumoninae are currently available. Since the number of described species of this group can roughly be estimated as one-fourth of an analogous value for the family Ichneumonidae in general (Rasnitsyn, 1978), the amount of the Ichneumoninae with known chromosome sets therefore constitutes approximately 1.5 % of the species number for the subfamily. If this estimate is correct, then the Ichneumoninae must be considered one of the best karyotypically studied groups of parasitic wasps. Members of the subfamily Ichneumoninae with known chromosome sets belong to the tribes Phaeogenini and Ichneumonini, and those classified under the latter group further belong to the subtribes Barichneumonina, Protichneumonina, Cratichneumonina, Hoplismenina, Ichneumonina, Amblytelina, and Eurylabina (see Hilpert, 1992). The subdivision of the Phaeogenini into subtribes is also proposed (Diller, 1981), but phylogenetic relationships of these groups, apart from those of the Ichneumonini, are unknown. Moreover, most differences between the subtribes of the Phaeogenini are likely to be based on reductions (see Diller, 1981), and therefore monophyly of these groups seems doubtful.

The chromosome number substantially varies within the Ichneumoninae; this parameter can differ more than twice between certain species, i.e. from 2n = 16 in both *Patrocloides dubitatorius* (Sulzer) [= *P. chalybeatus* (Gravenhorst)] and *Ctenichneumon funereus* (Geoffroy) to 2n = 34 in *Virgichneumon digrammus* (Gravenhorst) as well as in *Chasmias motatorius* (Fabricius) (Gokhman, 1985, 1990, 1993, 2007). Interestingly, both the highest and the lowest 2n values in the Ichneumoninae were found not only within the tribe Ichneumonini, but also within its largest subtribe, Ichneumonina (Gokhman, 1993). The modal chromosome number of the Ichneumoninae is 2n = 22; it is the most frequent both at the genus and species levels (Figs 2a, 2b). In general, chromosome numbers are relatively stable within most genera of the Ichneumoninae, although these numbers can be substantially diverse in certain groups such as *Virgichneumon* Heinrich and *Cratichneumon* Thomson (see below).

Chromosomes of many Ichneumoninae more or less gradually decrease in size within a given karyotype, except for a few members of the subtribe Barichneumonina, e.g. *Vulgichneumon saturatorius* (Linnaeus) with 2n = 18, which diploid set contains seven pairs of large bi-armed chromosomes and two pairs of small acrocentrics (Gokhman, 1990). Meta-, submeta-, and subtelocentric chromosomes usually predominate within karyotypes of the Ichneumoninae, although chromosome sets of a few members of the subtribes Barichneumonina and Cratichneumonina contain considerable amounts of acrocentrics. Karyotypes of the subfamily Ichneumoninae are therefore relatively symmetrical (see: Gokhman, 2009).

Chromosome sets of the overwhelming majority of the Ichneumoninae were studied using routine chromosome staining. Only karyotypes of the three members of the genus *Dirophanes* Förster were examined with the help of differential staining, i.e. C-banding (Gokhman, 1997). This study demonstrated that chromosome sets of closely related species of the Ichneumoninae with the same 2n value can strongly differ in the size and localization of heterochromatic segments and, on the contrary, karyotypes of members of the same genus with different chromosome numbers can be similar in this respect. Nevertheless, the data obtained (including these published in the present paper) suggest that most species of the subfamily Ichneumoninae have relatively small pericentromeric (sometimes also telomeric and intercalary) segments of heterochromatin.

The accumulated information on the karyotype structure of closely related species and forms of the Ichneumoninae (see Gokhman, 2009) suggests that the following rearrangements contributed to the evolution of chromosome sets in this group: deletions and duplications of the constitutive heterochromatin, inversions, translocations, tandem fusions and centric fissions. However, a thorough karyotypic study of the Ichneumoninae using modern techniques of chromosomal analysis would be needed to reveal the impact of each of these rearrangements in more detail. Nevertheless, a decrease in the chromosome number in the Ichneumoninae is likely to have occurred through chromosomal fusions (mostly tandem ones), whereas an increase in this parameter usually took place via the origin of aneuploids and the subsequent

restoration of even chromosome numbers. In addition, the increase in the chromosome number sometimes also occurred through centric fissions accompanied by the tandem growth of the constitutive hetero-chromatin and emergence of the so-called pseudoacrocentric chromosomes, e.g. in *Chasmias motatorius* (Gokhman, 1985). In other words, mechanisms of the chromosome number evolution in the Ichneumoni-nae were strongly asymmetrical (Gokhman, 2009).

According to the most detailed phylogenetic reconstruction of the family Ichneumonidae based on an extensive dataset which contained both morphological and molecular information (Quicke *et al*., 2009), the tribe Phaeogenini, along with Alomyini s.str. with completely unknown karyotypes, is the least ad-vanced group of the subfamily Ichneumoninae. Since 2n = 22 was found in the overwhelming majority of the genera and species of the Phaeogenini, it can be considered as the modal chromosome number of this group. The same 2n value is characteristic of many other Ichneumoninae, although substantially higher variation in this parameter is observed within the tribe Ichneumonini. This value, i.e. 2n = 22, together
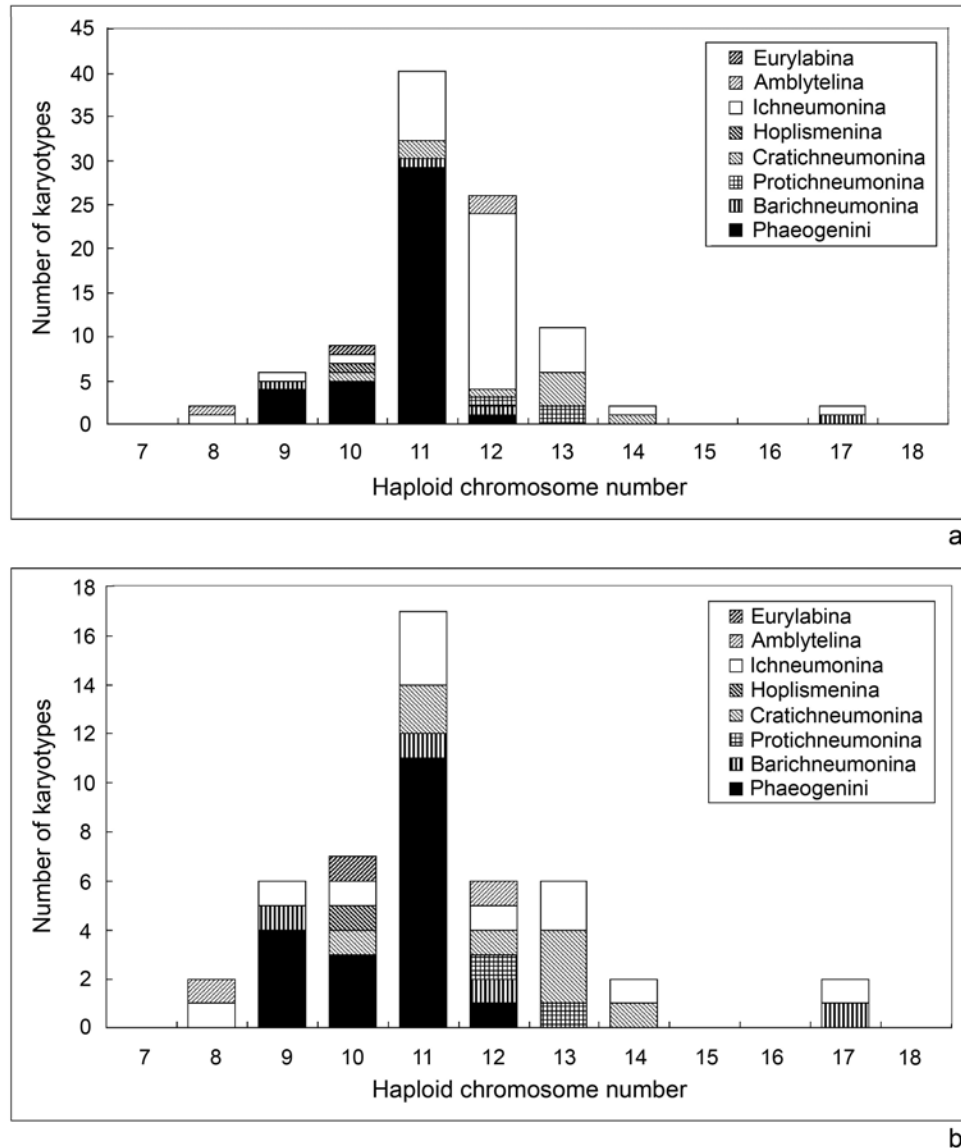
Figure 2. Karyotype distribution of parasitic wasps of the subfamily Ichneumoninae by the chromosome number [according to Gokhman (2009), updated] at the species (a) and genus levels (b).

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with the karyotypic predominance of bi-armed chromosomes that more or less gradually decrease in size, must represent the ancestral character state for the whole subfamily (Gokhman, 1990). If this is true, then an independent decrease in the chromosome number through tandem fusions that occurred in a number of genera of the tribe Phaeogenini was the main trend of the chromosome number evolution within this group. On the contrary, a considerable increase in $2n$ value is characteristic of the majority of the Ichneumonini, despite the decrease in the chromosome number within certain subtribes and genera (as well as groups of genera) of this tribe (Gokhman, 1990). An increase in the proportion of acrocentrics within a given chromosome set, i.e. karyotypic dissymmetrization, can also be observed in some Ichneumonini that mostly belong to the less advanced subtribes, such as Barichneumonina and Cratichneumonina (Gokhman, 2009).

The above-mentioned differences between trends of karyotype evolution in certain larger taxa of the Ichneumoninae could be explained from the viewpoint of the general mode of phylogenetic change in these groups (Gokhman, 1995, 2009). According to this hypothesis, evolution of the tribe Phaeogenini occurred in a relatively narrow adaptive zone, which might be considered ancestral for the subfamily Ichneumoninae in general. After the emergence of the group, more advanced Ichneumoninae entered the new, relatively broad and free zone, in which the intensive adaptive radiation of the Ichneumonini took place. The enormous species diversity of this tribe that includes large numbers of similar-looking members has therefore resulted from this radiation.

As can be seen from the phylogenetic reconstruction of the karyotypically studied groups of the Ichneumoninae proposed by the author (Fig. 3), the data obtained do not allow for detection of any specific trend of karyotype evolution within these groups. In addition, all species of the tribe Phaeogenini that do not belong to the largest and most diverse subtribe Phaeogenina, i.e. members of the genus *Heterischnus* Wesmael from the corresponding subtribe as well as a few genera of the subtribe Dicaelotina (Diller, 1981) have the same chromosome number, $2n = 22$. Moreover, their karyotype structure is comparable to that of other species of the Phaeogenini. As far as the tribe Ichneumonini is concerned, both a substantial increase in the chromosome number in a few members of the subtribes Barichneumonina, Cratichneumonina, and especially Ichneumonina, as well as a certain decrease in the chromosome number in some other taxa can be observed. The latter groups include the subtribes Hoplismenina and Eurylabina, which both contain the only studied species. Together with the parallel pathways of karyotype evolution in many of these taxa (e.g. chromosomal fusions in the two latter subtribes), this lack of evolutionary specificity could be explained by the possible polyphyly of the above-mentioned groups. Indeed, Quicke *et al.* (2009) who conducted a detailed morphological and molecular analysis of the Ichneumonidae have not found any support for monophyly of the majority of currently accepted tribes and subtribes of the
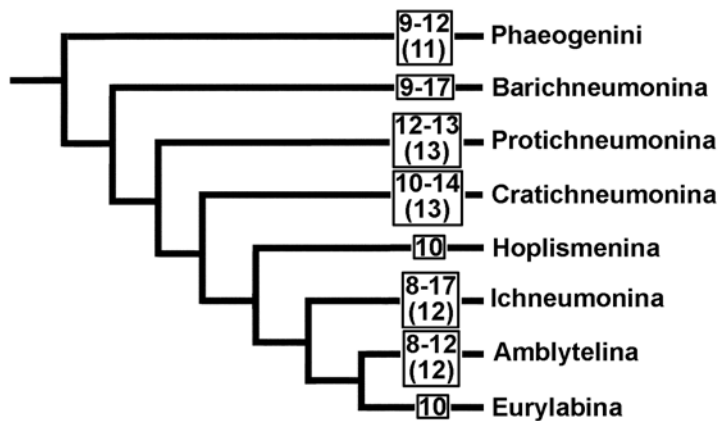
Figure 3. Phylogenetic tree of karyotypically studied tribes and subtribes of the subfamily Ichneumoninae [according to Hilpert (1992), Gokhman (1995) and Quicke *et al.* (2009)] with shown variation ranges of the haploid chromosome number. The most frequent chromosome numbers of certain groups are given in brackets.

subfamily Ichneumoninae. However, groups of genera with lower chromosome numbers (which must be treated as synapomorphies in this particular case) can be listed within subordinate taxa of the Ichneumonini (Gokhman, 2009). The corresponding examples include the genera *Patrocloides* Heinrich with 2n = 16 and *Pseudoamblyteles* Heinrich with 2n = 18 from the subtribe Ichneumonina; although the genus *Ctenichneumon* Thomson, which also has 2n = 16, formally belongs to the subtribe Amblytelina, it might be considered here as well. Species of the genus *Dirophanes* with 2n = 20 and 18 also fit the similar pattern.

As far as taxonomic aspects of chromosomal variation in the Ichneumoninae are concerned, the karyotypic diversity of this group more or less corresponds to the morphological one, at least at first sight. A more detailed investigation shows that chromosome sets of the tribe Phaeogenini are fairly uniform (as noted above), and some genera of the Ichneumonini from the less advanced subtribes Barichneumonina and Craticheumonina are the most variable, perhaps due to the so-called rule of archaic diversity (Mamkaev, 1968). Indeed, all karyotypically studied species of the former subtribe have different chromosome numbers (Gokhman, 1990). For example, *Baranisobas ridibundus* (Gravenhorst) has 2n = 24, and *Vulgichneumon saturatorius* has 2n = 18. Moreover, in both studied species of the genus *Virgichneumon*, i.e. *V. faunus* (Gravenhorst) and *V. digrammus*, 2n = 22 and 34 respectively. The diversity of chromosome numbers in the genus *Cratichneumon* is also impressive. For example, two studied *Cratichneumon* species, i.e. *C. culex* (Müller) [= *C. fabricator* (Fabricius)] and *C. viator* (Scopoli), have 2n = 24 and 28 respectively. The two other species also fit this pattern, even if *C. sicarius* (Gravenhorst) with 2n = 22 might in fact be included into the genus *Sycaonia* Cameron, and *C. rufifrons* (Gravenhorst) which has 2n = 26 perhaps also should be included into a separate genus (A.P. Rasnitsyn, personal communication). At the same time, 20 out of 29 studied members of the largest genus *Ichneumon* Linnaeus have 2n = 24, although species with 2n = 26 (for example, *I. inquinatus* Wesmael), 22 (*I. sarcitorius* Linnaeus, etc.) and even 20 (*I. submarginatus* Gravenhorst) can also be found within this group (Gokhman, 1990, 1993).

Nevertheless, taxonomic use of chromosomal characters in the Ichneumoninae is the most effective at the species level, especially if a morphological study is unable to detect or reliably separate closely related species. In particular, two species of the tribe Phaeogenini, *Tycherus australogeminus* Gokhman and *Aethecerus ranini* Gokhman which both have 2n = 22, were detected and described using karyotypic data for the first time in parasitoid Hymenoptera (Gokhman, 2009). Moreover, this information was incorporated into the general descriptions of these taxa as diagnostic features that distinguished them from closely related *T. ischiomelinus* (Gravenhorst) and *Ae. dispar* Wesmael which have 2n = 18 and 24 respectively (Gokhman, 1991). In addition, forms with 2n = 24 and 26 were detected within each of the two morphological species, *Ichneumon extensorius* Linnaeus and *I. suspiciosus* Wesmael. These forms have an apparent species status, but are virtually indistinguishable by their external morphology (Gokhman, 1993).

In conclusion, data obtained from the chromosomal analysis of parasitic wasps of the subfamily Ichneumoninae during the last 30 years, allowed not only to describe common features of chromosome sets and to outline the main pathways of karyotype evolution in this group, but also to detect previously unknown species-level forms. Some of these forms were later described as new species according to the routine taxonomic procedure (Gokhman, 2009). We can therefore hope that chromosomal analysis will successfully be used to explore many other subfamilies of the Ichneumonidae, together with other less studied parasitoid groups.

Acknowledgements

References

Aguiar A.P., Deans A.R., Engel M.S., Forshage M., Huber J.T., Jennings J.T., Johnson N.F., Lelej A.S., Longino J.T., Lohrmann V., Mikó I., Ohl M., Rasmussen C., Taeger A., Yu D.S.K. 2013. Order Hymenoptera. *Zootaxa*, **3703**(1): 51–62.

Crozier R.H. 1975. Animal Cytogenetics. V. 3. Insecta. Pt. 7. Hymenoptera. Berlin–Stuttgart: Gebrüder Borntraeger. VI + 95 p.

Diller E. 1981. Bemerkungen zur Systematik der Phaeogenini mit einem vorläufigen Katalog der Gattungen (Hymenoptera, Ichneumonidae). *Entomofauna*, **2**(8): 93–109.

Gokhman V.E. 1985. Chromosome sets in some Ichneumoninae (Hymenoptera, Ichneumonidae). *Zoologichesky Zhurnal*, **64**(9): 1409–1413. (In Russian.)

Gokhman V.E. 1990. *Karyology and systematics of parasitic wasps of the subfamily Ichneumoninae (Hymenoptera, Ichneumonidae)*. Unpublished PhD thesis (Biology). Moscow: Moscow State University. 174 p. (In Russian.)

Gokhman V.E. 1991. New species of Phaeogenini (Hymenoptera, Ichneumonidae) from the European part of the USSR. *Zoologichesky Zhurnal*, **70**(12): 73–80. (In Russian.)

Gokhman V.E. 1993. New data on the karyology of Ichneumonina (Hymenoptera, Ichneumonidae). *Zoologichesky Zhurnal*, **72**(3): 85–91. (In Russian.)

Gokhman V.E. 1995. Trends of biological evolution in the subfamily Ichneumoninae and related groups (Hymenoptera Ichneumonidae): an attempt of phylogenetic reconstruction. *Russian Entomological Journal*, **4**(1–4): 91–103.

Gokhman V.E. 1997. Differential chromosome staining in parasitic wasps of the genus *Dirophanes* (Hymenoptera, Ichneumonidae). *Entomological Review*, **77**(2): 263–266.

Gokhman V.E. 2001. Chromosomes of the family Ichneumonidae (Hymenoptera). *Entomological Review*, **81**(9): 1202–1209.

Gokhman V.E. 2002. Chromosomal analysis of the superfamilies Ichneumonoidea and Chalcidoidea (Hymenoptera). *In*: Melika G., Thuróczy C. (eds). Parasitic wasps: evolution, systematics, biodiversity and biological control. Budapest: Agroinform: 243–248.

Gokhman V.E. 2007. New data on chromosomes of parasitic wasps of the subfamily Ichneumoninae (Hymenoptera, Ichneumonidae). *Entomological Review*, **87**(2): 231–233.

Gokhman V.E. 2009. Karyotypes of parasitic Hymenoptera. Dordrecht: Springer Science+Business Media B.V. XIII + 183 p.

Gokhman V.E., Mikhailenko A.P. 2008. Chromosomes of Ichneumonidae (Hymenoptera): new results and conclusions. *Entomological Review*, **88**(4): 391–395.

Gokhman V.E., Quicke D.L.J. 1995. The last twenty years of parasitic Hymenoptera karyology: an update and phylogenetic implications. *Journal of Hymenoptera Research*, **4**: 41–63.

Hedderwick M.P., El Agoze M., Garaud P., Periquet G. 1985. Mise en évidence de mâles hétérozygotes chez l'hyménoptère *Diadromus pulchellus* (Ichneumonide). *Genetics Selection Evolution*, **17**: 303–310.

Hilpert H. 1992. Zur Systematik der Gattung *Ichneumon* Linnaeus, 1758 in der Westpalaearktis (Hymenoptera, Ichneumonidae, Ichneumoninae). *Entomofauna*, Supplement **6**: 1–389.

Mamkaev Y.V. 1968. A comparison of morphological differences within lower and higher groups of the same lineage. *Zhurnal Obshchei Biologii*, **29**(1): 48–55. (In Russian.)

Quicke D.L.J., Laurenne N.M., Fitton M.G., Broad G.R. 2009. A thousand and one wasps: a 28S rDNA and morphological phylogeny of the Ichneumonidae (Insecta: Hymenoptera) with an investigation into alignment parameter space and elision. *Journal of Natural History*, **43**(23): 1305–1421.

Rasnitsyn A.P. 1978. Foreword. *In*: Heinrich G.H. Eastern Palaearctic Ichneumoninae. Leningrad: Nauka: 3–5. (In Russian.)

Mexican species of the subgenus *Dicolus* Förster, genus *Megastylus* Schiødte (Hymenoptera: Ichneumonidae: Orthocentrinae), with descriptions of a new species

A.E. Humala

Мексиканские виды подрода *Dicolus* Förster рода *Megastylus* Schiødte (Hymenoptera: Ichneumonidae: Orthocentrinae) с описанием нового вида

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Abstract. A new species of the genus *Megastylus* Schiødte, *M.* (*Dicolus*) *kasparyani* **sp. n.**, is described from tropical Mexico. New data on distribution of the Holarctic species *M.* (*D.*) *pectoralis* Förster in Mexico is provided.

Key words. Orthocentrinae, *Megastylus,* new species, Mexico, North America, Neotropics.

Резюме. Описан новый вид наездников-ортоцентрин *Megastylus* (*Dicolus*) *kasparyani* **sp. n.** из тропиков Мексики. Приведены новые данные по распространению голарктического вида *M.* (*D.*) *pectoralis* Förster.

Ключевые слова. Orthocentrinae, *Megastylus*, новый вид, Мексика, Северная Америка, Неотропика.

Introduction

Megastylus Schiødte, 1838 is relatively large orthocentrine genus occurring worldwide and comprising 34 species (Yu *et al*., 2012). The genus is divided into two subgenera: *Megastylus* s. str. containing 27 species and *Dicolus* Förster, 1869 with seven species. However, many species of the genus are still not described, and even the European fauna has not been studied satisfactory. The Nearctic fauna of the genus was revised by C. Dasch, who reported there 14 species of *Megastylus* (Dasch, 1992), while the Neotropical fauna remains almost unknown. *Megastylus* species were not included in the Catalogue of Neotropical Ichneumonidae (Townes, Townes, 1966), though the genus is among the species-rich in Neotropics (Townes, 1971; Gauld, 1991; Veijalainen *et al*., 2012). Members of this genus are known as koinobiont parasitoids of nematocerous Diptera (Sciaroidea: Keroplatidae) larvae.

In the course of long-term research on the Mexican fauna of ichneumonid wasps, conducted at the Autonomous University of Tamaulipas (Cd. Victoria, Mexico), only one species of the subgenus *Dicolus*, *M.* (*D.*) *pectoralis* Förster, 1871, has been reported from this country (Humala *et al*., 2011). One more new Mexican species of this subgenus is described in this paper. A review of Mexican species of the subgenus *Megastylus*, with descriptions of several new species, will be published in my forthcoming paper.

Material and methods

The specimens examined in this study are deposited in or were borrowed from the following collections: Universidad Autónoma de Tamaulipas, Cd. Victoria, Tamaulipas, Mexico (UAT) and Universidad Nacional Autónoma de México, D.F., Mexico (UNAM). The morphological terminology mostly follows Gauld (1991). Observations were made using a MBS-10 stereomicroscope. Photographs were taken with a DFC 290 digital camera attached to a Leica MZ9.5 stereomicroscope; images were combined using Helicon Focus Pro v. 5.3 software.

Taxonomic part

Genus *Megastylus* Schiødte, 1838

Subgenus *Dicolus* Förster, 1869

Type species: *Dicolus insectator* Förster, 1871.

Megastylus species have a unique scape structure amongst the Orthocentrinae and Ichneumonidae: it is large and inflated, the hind edge of its apical truncation membranous and in dry specimens infolded. All species of the subgenus *Dicolus* can be distinguished from other *Megastylus* species by the anterior transverse groove of propodeum situated at the anterior 0.25–0.3 of the propodeum and well separated from the postscutellum medially, together with an elongate first flagellomere.

Megastylus (*Dicolus*) *kasparyani* sp. n.

(Figs 1–7)

Differential diagnosis. This new species differs from other known New World *Dicolus* species by the combination of the following characters: flagellum with 47 flagellomeres; first flagellomere long, 9.2 times as long as wide; vein *2m-cu* with two bullae; propodeum with two transverse carinae; base of fore coxa with transverse carina. From the Holarctic *M. impressor* Schiødte, 1838 it may easily be separated by the wider face and subparallel inner eye orbits (convergent ventrally in *M. impressor*), long malar space, more rough sculpture of head and mesosoma, not so conspicuous pubescence on flagellum, tawny face and pale markings along frontal orbits.

Description. F e m a l e . Body length 5.4 mm, fore wing 4.9 mm (Fig. 1).

Head width 0.95 times its height; head matt, sparsely punctate. Face at level of antennal sockets 0.55 times as wide as head width, its inner orbits subparallel (Fig. 2). Margins of antennal sockets raised to form round lamellae. Scape ovoid, considerably inflated and obliquely truncate at about 70° from transverse; antenna long, with 47 flagellomeres, first flagellomere 9.2 times as long as wide, second flagellomere 3.8 times as long as wide; all flagellomeres longer than wide and densely covered with long erect setae exceeding diameter of segments. Frons dull, nearly impunctate; face coriaceous, scarcely punctate. Clypeus narrow, strongly convex, about 1.6 times as wide as high, its apical margin slightly convex; clypeal foveae large and open. Malar space very long, 2.5 times as long as basal width of mandible, 0.35 times as long as face width, with distinct impressed subocular sulcus and more roughly sculptured coriaceous strip between eye and base of mandible (Fig. 6). Mandible slender, strongly tapered and turned inwards, lower tooth small, much shorter than upper tooth; maxillary palps long. Ocelli of moderate size, ocular-ocellar line about 1.2 times as long as maximum diameter of lateral ocellus, postocellar line 0.8 times as long as maximum diameter of lateral ocellus (Fig. 3). Occipital carina complete.

Mesosoma coriaceous, its length 1.6 times height; epomia lacking. Epicnemial carina well developed, almost reaching hind margin of pronotum at its mid-height (Fig. 5). Mesoscutum convex, with sparse small punctures bearing long setae; notaulus shallow, developed to centre of mesoscutum. Scutellum with lateral longitudinal carinae reaching its posterior end. Sternaulus weak and indistinct. Propodeum covered with rather long setae, both transverse carinae complete, lateral longitudinal carinae developed only anteriorly, lateromedian longitudinal carinae lacking (Fig. 7). Propodeal spiracle circular, separated from pleural carina by one diameter of spiracle.

Fore wing with vein *2m-cu* slightly postfurcal, vein *3rs-m* entirely absent, *2m-cu* with two bullae, nervellus intercepted in lower third, discoidella depigmented.

Legs long and slender; base of fore coxa with distinct transverse carina (Fig. 6); hind coxa matt, hind femur 8.1 times as long as broad, 0.75 times as long as hind tibia; hind basitarsus 0.45 times as long as hind tibia; distal end of hind tibia with an internal fringe of long, fine, dense setae, spurs straight and very slender, tarsal claws slender and simple.

First tergite of metasoma slender, slightly constricted behind spiracles, 4.1 times as long as posteriorly broad, matt, with sparse long setae laterally; glymma lacking; spiracles protruding, situated at anterior 0.45 of tergite; postpetiole some-

what inflated in middle and narrowed to apex (Fig. 4); longitudinal carinae lacking; first sternite fused to tergite, 0.65 times as long as tergite length, in lateral view forming weakly rounded lobe in its anterior half; second tergite 1.6 times as long as posteriorly broad. Remaining tergites more finely sculptured, metasoma weakly compressed to apex. Metasomal tergites covered with long setae started from second tergite. Ovipositor short and slender, its sheath as long as hind femur broad.

C o l o u r   p a t t e r n . Head black; clypeus and face medially, except for fuscous wedge-shaped area between antennal sockets, yellowish brown, more dusky on facial margins and malar space. Scape brown, flagellum fuscous; mandibles

Figures 1–4. *Megastylus kasparyani* **sp. n.** (female): 1 – habitus, lateral view; 2 – head, anterior view; 3 – head, dorsal view; 4 – basal tergites of metasoma, dorsal view. Scale bars: 1 – 1.0 mm; 2–4 – 0.25 mm.

except for reddish teeth, palps, tegulae and spots along frontal orbits pale yellow. Mesosoma fuscous, mesepimeron and pronotum excluding anterior part reddish brown; propleurum mostly brown; mesopleurum dark brown; metasoma fuscous, tergite 3 light brown anteriorly. Fore and mid legs light brown, with coxae and trochanters yellowish. Hind coxa light brown, infuscate dorsally; hind femur light brown, trochantellus and narrow anterior spot of hind femur somewhat infuscate; hind tibia and tarsus more fuscous. Wings hyaline, pterostigma and veins brown.

M a l e . Unknown.
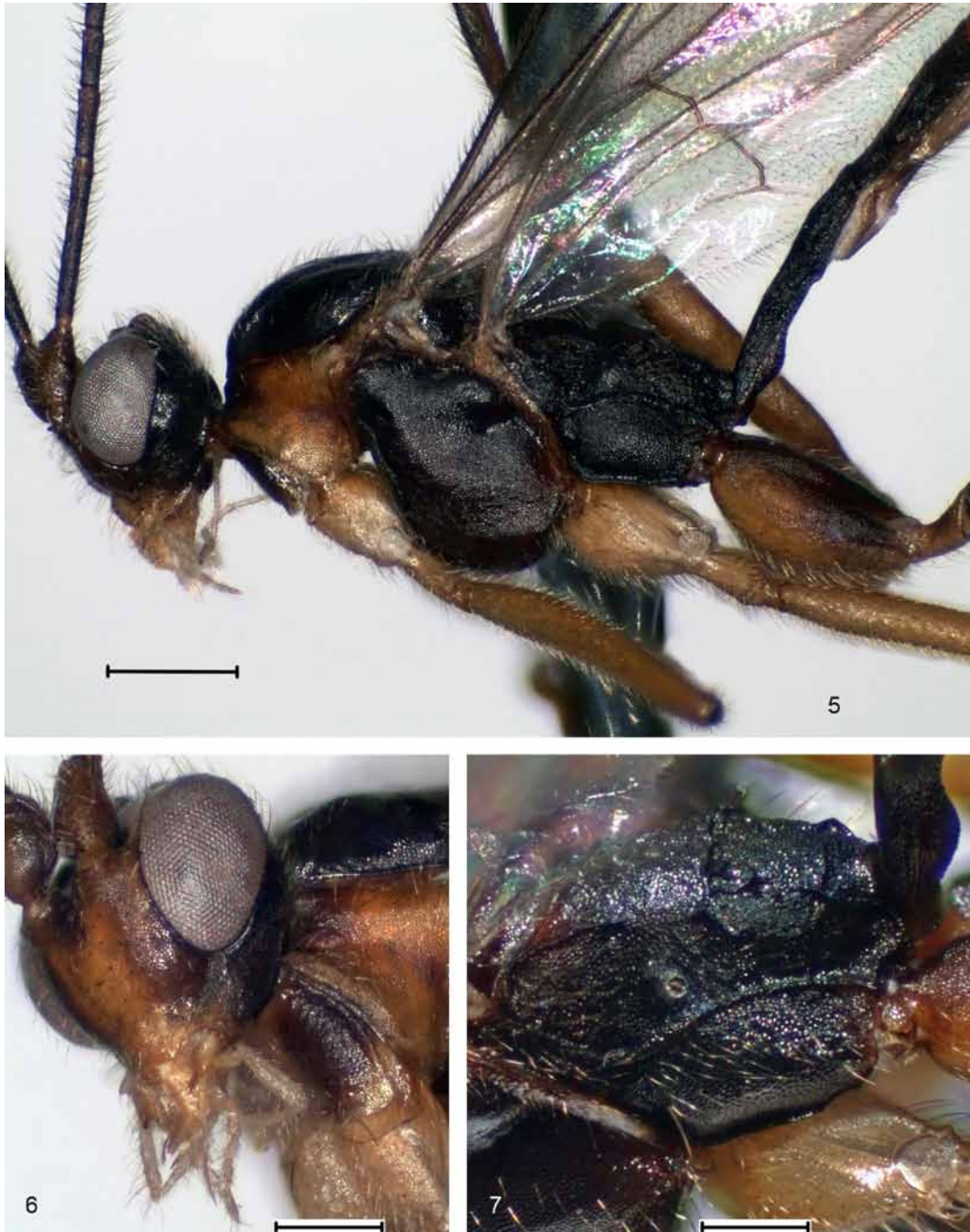
Figures 5–7. *Megastylus kasparyani* **sp. n.** (female): 5 – head, mesosoma and base of metasoma, lateral view; 6 – head latero-ventroanterior view; 7 – propodeum, latero-dorsoposterior view. Scale bars: 5 – 0.5 mm; 6, 7 – 0.25 mm.

Etymology. The species is named in honor of my teacher and colleague Dr Dmitri R. Kasparyan in recognition of his valuable study of the Mexican Ichneumonidae fauna.

Material examined. Holotype: female (UNAM), Mexico, Oaxaca, Santiago Comaltepec, 2427 m, N 17.58424°, W 96.49428°, humid oak pine forest, Malaise trap, 12–20.VI.2007 (H. Clebsch leg.).

Distribution. Mexico (Oaxaca).

Megastylus (*Dicolus*) *pectoralis* **Förster, 1871**

The species is easily recognizable as the female hind tibia is inflated in the proximal two thirds and with strong subapical constriction, vein *2m-cu* with a single bulla, the propodeum has only the posterior transverse carina, and the head and mesosoma are pale.

Material examined. 1 female (UAT), Mexico, Tamaulipas, Gómez Farías, Los Cedros, Malaise trap, 16–26.XIII. 1998, leg. S. Hernández and C. Covarrubias.

Distribution. Holarctic: Canada, USA (Alaska, Oregon), Mexico (Tamaulipas), Europe, Western Siberia, Russian Far East.

Remarks. It is southernmost known locality for this species.

Acknowledgements

References

D a s c h C . 1992. The Ichneumon-flies of America North of Mexico. Part 12. Subfamilies Microleptinae, Helictinae, Cylloceriinae and Oxytorinae (Hymenoptera: Ichneumonidae). *Memoirs of the American Entomological Institute*, **52:** 1–470.

G a u l d I . D . 1991. The Ichneumonidae of Costa Rica, 1. Introduction and keys to subfamilies, and keys to the species of the lower pimpliform subfamilies Rhyssinae, Poemeniinae, Acaenitinae and Cylloceriinae. *Memoirs of the American Entomological Institute*, **47:** 1–589.

H u m a l a A . E . , R u í z - C a n c i n o E . , C o r o n a d o - B l a n c o J . M . 2011. Orthocentrinae (Hymenoptera: Ichneumonidae) nuevos y poco conocidos de México. *Memorias 21 y 22 Encuentro Nacional de Investigación Científica y Tecnológica del Golfo de México (May 2011, Tampico, Tamaulipas, México)*: 196–200.

T o w n e s H . K . 1971. The genera of Ichneumonidae, part 4. *Memoirs of the American Entomological Institute*, **17:** 1–372.

T o w n e s H . K . , T o w n e s M . 1966. A catalogue and reclassification of the Neotropic Ichneumonidae. *Memoirs of the American Entomological Institute*, **8:** 1–367.

V e i j a l a i n e n A . , W a h l b e r g N . , B r o a d G . R . , E r w i n T . L . , L o n g i n o J . T . , S ä ä k s j ä r v i I . E . 2012. Unprecedented ichneumonid parasitoid wasp diversity in tropical forests. *Proceedings of the Royal Society of London, Series B – Biological Sciences*, **279:** 4694–4698.

Y u D . S . K . , v a n A c h t e r b e r g C . , H o r s t m a n n K . 2012. *Taxapad 2012, Ichneumonoidea 2011*. Database on flash-drive. www.taxapad.com, Ottawa, Ontario, Canada.

Three new species of the genus *Probles* Förster (Hymenoptera: Ichneumonidae: Tersilochinae) from the Russian Far East

A.I. Khalaim

Три новых вида рода *Probles* Förster (Hymenoptera: Ichneumonidae: Tersilochinae) с Дальнего Востока России

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Abstract. Three species of the genus *Probles* Förster belonging to the subgenus *Euporizon* Horstmann are described from the Russian Far East: *P. carinator* **sp. n.**, *P. dmitrii* **sp. n.** and *P. hankaensis* **sp. n.** A partial identification key to Far Eastern species of *Euporizon* is provided.

Key words. *Euporizon*, Russia, Palaearctic region, taxonomy, key.

Резюме. С Дальнего Востока России описаны 3 новых вида из подрода *Euporizon* Horstmann рода *Probles* Förster: *P. carinator* **sp. n.**, *P. dmitrii* **sp. n.** и *P. hankaensis* **sp. n.** Приведен фрагмент определительного ключа для дальневосточных видов подрода *Euporizon*.

Ключевые слова. *Euporizon*, Россия, Палеарктика, систематика, определительный ключ.

Introduction

Probles Förster is one of the most species rich tersilochine genera comprising 49 described species, classified in 5 subgenera: *Euporizon* Horstmann (31 species), *Microdiaparsis* Horstmann (9 species), *Probles* s. str. (4 species), *Rhynchoprobles* Horstmann (1 species) and *Rugodiaparsis* Horstmann (4 species). The genus is known predominantly from the Palaearctic region with the majority of species recorded only from Europe, while the East Palaearctic and Nearctic faunas are very poorly known. Beyond the Holarctic region, two species of *Probles* are known from the Oriental region (Khalaim, 2011), one species was recently described from southern Africa (Khalaim, 2013), and three undescribed species were reported from Australia (Gauld, 1984).

The Asian part of Palaearctic region is very poorly studied, being represented by five species: *P. sibirica* Khalaim, 2007 from Mongolia and Russian Siberia, *P. vulnifica* Khalaim et Sheng, 2009 from the Palearctic part of China, and three species recently described from South Korea, *P. fulgida* Khalaim et Balueva, *P. korusa* Khalaim et Kim and *P. rukora* Khalaim et Lee (Khalaim, 2007; Khalaim, Sheng, 2009; Khalaim *et al*., 2013). Six more undescribed species of *Euporizon* were reported from South Korea and Vietnam (Khalaim, 2011), and one abundant Korean species will be described in my forthcoming paper (Khalaim *et al*., in press.). No species of *Euporizon* were known from the Russian Far East until now.

Some species of the genus have been recorded as parasitoids of the beetle families Ciidae, Curculionidae, Endomycidae and Melandryidae in Europe (Horstmann, 1971, 1981).

The aim of this work is to describe three new species of *Euporizon* from the Russian Far East, and provide a partial key for identification of these species.

Material and methods

This work is based on the collection of the Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia (ZISP). All holotypes and most paratypes are deposited in ZISP. Two paratypes of *P. carinatus* **sp. n.** are deposited in the Natural History Museum, London, UK (BMNH).

Morphological terminology follows Townes (1971) with changes according to Khalaim (2011). Photographs of wings (Figs 2, 11, 22) were taken from microscope slides prepared with Canada balsam. All photographs were taken at ZISP with a DFC 290 digital camera attached to a Leica MZ16 stereomicroscope, and partly focused images were combined using Helicon Focus software.

Taxonomic part

Partial key to species of *Euporizon* of the Russian Far East

1. Propodeum with distinct basal keel which is 0.8–1.25 times as long as apical area (Fig. 7). First metasomal segment slender, 3.3–4.0 times as long as broad posteriorly (Figs 8, 30). Ovipositor short and rather robust, with weak dorsal subapical depression and more or less distinct rounded tooth before this depression (Figs 9, 31); sheath 0.8–1.3 times as long as first tergite 2

– Propodeum without a distinct basal keel, with short or long basal area which is sometimes indistinct. First metasomal segment usually less slender. Ovipositor varied, usually longer 3

2. Malar space 0.4 times as long as basal width of mandible (Fig. 5). Dorsolateral area of propodeum granulate, dull (Fig. 7). Propodeal spiracle separated from pleural carina by 0.5–1.0 times diameter of spiracle. Ovipositor sheath 0.8–1.0 times as long as first tergite (Fig. 8) .... *P. carinator* **sp. n.**

– Malar space 0.9 times as long as basal width of mandible (Fig. 24). Dorsolateral area of propodeum polished (Fig. 29). Propodeal spiracle separated from pleural carina by 1.5 times diameter of spiracle (Fig. 29). Ovipositor sheath 1.3 times as long as first tergite (Fig. 30)................. *P. hankaensis* **sp. n.**

3. Second recurrent vein interstitial (Fig. 11). Ovipositor sheath 2.1 times as long as first tergite (Fig. 17).. *P. dmitrii* **sp. n.**

– Second recurrent vein postfurcal. Ovipositor sometimes shorter ....Other species of *Euporizon*

Probles (*Euporizon*) *carinator* sp. n.

(Figs 1–9)

Comparison. Similar to *P. hankaensis* **sp. n.** but distinct in having a shorter malar space, granulate and dull dorsolateral areas of propodeum, shorter distance between propodeal spiracle and pleural carina, and shorter ovipositor. These two species are readily distinguished from other members of *Euporizon* by the propodeum with a very long basal keel and a broad apical area.

Description. F e m a l e (holotype). Body length 4.25 mm. Fore wing length 3.4 mm.

Head strongly and roundly constricted behind eyes in dorsal view (Fig. 3); temple 0.65 times as long as eye width. Mandible moderately slender, with upper tooth distinctly longer than lower tooth (Fig. 5). Clypeus lenticular, 2.85 times as broad as long (Fig. 5), in profile almost flat; smooth in lower part, finely granulate and distinctly and sparsely punctate in upper half. Malar space about 0.4 times as long as basal width of mandible (Fig. 5). Flagellum of antenna more or less filiform or very weakly tapered towards apex, with 24–26 flagellomeres (25 flagellomeres in holotype) (Fig. 1); subbasal flagellomeres 2.2–2.4 times, and subapical flagellomeres about 1.2 times as long as broad; flagellomeres 1 to 3(4) bear subapical finger-shaped structures on outer surface, these structures are best developed on the basal flagellomere and rather weak on flagellomeres 3 and 4. Face, frons and vertex distinctly granulate, dull; face with very dense and indistinct (because of granulation) punctures. Temple finely and sparsely punctate on finely granulate background. Occipital carina complete. Hypostomal carina absent.

Notaulus as weak wrinkle or tubercle, rarely completely absent. Mesoscutum granulate, dull, with very dense indistinct punctures. Scutellum with lateral longitudinal carinae developed in its anterior half. Foveate groove moderately deep, crenulate, strongly S-curved, extending from prepectal carina to about posterior 0.8 of mesopleuron (Fig. 6). Mesopleuron granulate; centrally punctate, almost smooth and weakly shining between punctures. Metapleuron distinctly granulate, impunctate. Propodeum with long basal keel which is 0.8 times as long as apical area (Fig. 7). Dorsolateral area granulate, dull, impunctate (Fig. 7). Propodeal spiracle separated from pleural carina by 0.5–1.0 times diameter of spiracle. Apical area very broad (Fig. 7), flat, granulate, impunctate, sometimes with fine transverse wrinkles. Apical longitudinal carinae weak, sometimes indistinct.

Fore wing (Fig. 2) with second recurrent vein distinctly postfurcal; intercubitus usually about as long as abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius 1.25 times as long as width of pterostigma. Metacarp almost reaching apex of fore wing. Postnervulus intercepted below middle. Hind wing with nervellus slightly reclivous. Legs slender. Hind femur 5.0 times as long as broad and 0.85 times as long as tibia. Tarsal claws long and slender.

Figures 1, 2. *Probles carinator* **sp. n.**, females. 1 – habitus without wings, lateral view (holotype); 2 – wings (paratype).

First tergite (Fig. 8) slender, 3.9 times as long as broad posteriorly, entirely smooth, with petiole round in cross-section. Glymma situated in apical 0.65 of first tergite, small but deep, joining by distinct groove to ventral part of postpetiole. Second tergite 1.35 times as long as anteriorly broad. Thyridial depression well-developed, almost twice as long as broad. Ovipositor short and robust, weakly upcurved, somewhat thickened near apex, with weak dorsal subapical depression and rounded tooth before this depression (Fig. 9); sheath 0.9 times as long as first tergite.

Figures 3–9. *Probles carinator* **sp. n.**, paratypes, females. 3 – head and mesoscutum, dorsal view; 4 – head, front view; 5 – lower part of head, fronto-ventral view; 6 – head and mesosoma, lateral view; 7 – propodeum, dorso-lateral view; 8 – metasoma with ovipositor, lateral view; 9 – ovipositor, lateral view.

Head, mesosoma and first tergite black. Palpi, mandible (teeth reddish), lower half of clypeus and tegula yellow. Scape and pedicel of antenna yellow; flagellum brown basally to dark brown apically. Pterostigma brown. Legs yellow to brownish yellow. Metasoma behind first tergite predominantly brownish yellow to brown, tergites 2 and 3 (sometimes also tergite 4) dorsally with dark brown or blackish mark on anterior half.

M a l e . Flagellum with 24–26 flagellomeres, basally less slender, distinctly tapered towards apex. Malar space somewhat shorter. Second tergite longer. Otherwise similar to female.

Variation. This is a very uniform species with minor variation in structure and color.

Etymology. From the Latin *carina* on account of the propodeum having a single basal carina (keel).

Material examined. Holotype: female (ZISP), Russia, Primorskiy Territory, Anisimovka, forest, meadows, 10.VIII. 1991 (S.A. Belokobylskij coll.).

Paratypes. Russia, Primorskiy Territory: same data as holotype, 1 female (ZISP); same locality, forest, 4.IX.1982 (V.I. Tobias coll.), 2 females (ZISP); 20 km SE of Ussuriysk, Gornotaezhnoe, forest, on light, 31.VII.1991 (S.A. Belokobyl-skij coll.), 1 female (ZISP). Same locality and collector, 1.VIII.1991, 1 female (ZISP); same locality and collector, 5.VIII. 1991, 1 female (BMNH); same locality, on light, 3.IX.1983 (E. Budris coll.), 1 female (ZISP); 30 km E of Spassk-Dalniy,
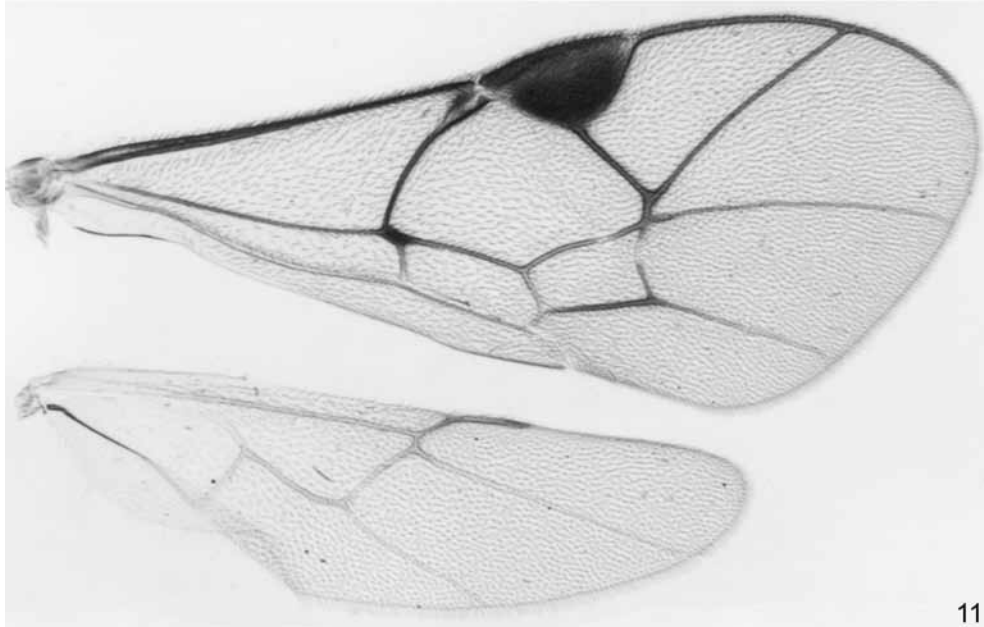
Figures 10, 11. *Probles dmitrii* **sp. n.** (female, holotype). 10 – habitus without wings, lateral view; 11 – wings.

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forest, 28.VII.1998 (S.A. Belokobylskij coll.), 1 male (ZISP); Sudzukhinskiy (= Kievka) Gulf, forest and meadow near shore, 4.VIII.1972 (V. Kuslitzkiy coll.), 1 female (BMNH); Vladivostok, Sedanka, 2–13.IX.1982 (V.I. Tobias coll.), 2 females, 1 male (ZISP); Kedrovaya Pad' Nature Reserve, oak forest, 2.IX.1981 (S.A. Belokobylskij coll.), 1 female (ZISP); Novokachalinsk, Khanka Lake, mixed forest, 25.VII.1995 (S.A. Belokobylskij coll.), 1 male (ZISP).

Distribution. Russian Far East (Primorskiy Territory).

Biology. Host unknown. Flight period from end of July to mid September. Two females were taken at light.

Probles (*Euporizon*) *dmitrii* sp. n.

(Figs 10–20)

Comparison. This new species is immediately distinguished from other Far Eastern species of *Euporizon* by the fore wing with the second recurrent vein interstitial (Fig. 11) and a long, slender ovipositor (Fig. 17).

Description. F e m a l e (holotype). Body length 4.3 mm. Fore wing length 3.8 mm.

Head roundly constricted behind eyes in dorsal view (Fig. 13); temple 0.55 times as long as eye width. Mandible moderately slender with upper tooth longer than lower tooth (teeth in unique specimen strongly worn). Clypeus lenticular, 2.6 times as broad as long (Fig. 15), in profile almost flat; smooth, finely and sparsely punctate in upper 0.4. Malar space 0.7 times as long as basal width of mandible (Fig. 14). Flagellum of antenna very weakly tapered towards apex, with 22 flagellomeres (Fig. 12); subbasal flagellomeres 1.6–1.8 times as long as wide, subapical flagellomeres weakly elongate to subsquare; flagellomeres 4 to 7 bear subapical finger-shaped structures on outer surface, this structure is weaker on flagellomere 7 (Fig. 14). Face, frons and vertex finely granulate, dull, with very fine (partly indistinct because of granulation) punctures. Temple with fine and moderately dense punctures on very finely granulate and weakly shining background. Occipital carina complete. Hypostomal carina absent.

Notaulus as very weak wrinkle. Mesoscutum granulate, dull, with weak and dense punctures. Scutellum with lateral longitudinal carinae developed basally. Foveate groove sharp, with transverse wrinkles, weakly upcurved anteriorly, extending from prepectal carina to about posterior 0.7 of mesopleuron. Mesopleuron smooth with fine and sharp punctures. Metapleuron granulate, impunctate. Propodeum with indistinct (because of fine longitudinal wrinkles) basal area which is 0.7 times as long as apical area (Fig. 16). Dorsolateral area very finely granulate, centrally and anteriorly almost smooth, without distinct punctures, weakly shining. Propodeal spiracle separated from pleural carina by 1.2 times diameter of spiracle. Apical area anteriorly rounded (Fig. 16), flat, granulate, impunctate, with fine transverse wrinkles. Apical longitudinal carinae complete.

Fore wing (Fig. 11) with second recurrent vein interstitial; intercubitus long. First abscissa of radius 1.15 times as long as width of pterostigma. Metacarp not reaching apex of fore wing. Postnervulus intercepted below middle. Hind wing (Fig. 11) with nervellus vertical or slightly reclivous. Legs slender. Hind femur 5.2 times as long as broad and 0.9 times as long as tibia. Tarsal claws long and slender, rather strongly curved.

First tergite (Fig. 18) slender, 3.2 times as long as broad posteriorly, dorsally smooth, with petiole laterally striate. Glymma situated slightly behind middle of first tergite, deep, joining by distinct groove to ventral part of postpetiole (Fig. 18). Second tergite 1.3 times as long as anteriorly broad (Fig. 19). Thyridial depression well-developed, about 1.5 times as long as broad (Fig. 19). Ovipositor slender, weakly and evenly upcurved (Fig. 17), slightly thickened near apex, with shallow dorsal subapical depression and weak rounded tooth before this depression (Fig. 20); sheath 2.1 times as long as first tergite.

Head, mesosoma and first tergite black with brownish hue; posterior corner of pronotum and upper anterior corner of mesopleuron yellowish. Palpi, mandible (teeth black), tegula and legs yellow. Clypeus brown ventrally to dark brown dorsally. Scape and pedicel of antenna yellow; flagellum fuscous. Pterostigma brown. Metasoma behind first tergite dark brown anteriorly to yellow-brown posteriorly.

M a l e . Unknown.

Etymology. Named in honour of my teacher, the well-known Russian expert in Ichneumonidae, Dmitri R. Kasparyan.

Material examined. Holotype: female (ZISP), Russia, Primorskiy Territory, Novokachalinsk, Khanka Lake, mixed forest, 14.VIII.2003 (S.A. Belokobylskij coll.).

Distribution. Russian Far East (Primorskiy Territory).

Biology. Host unknown. Flight period August.

Probles (*Euporizon*) *hankaensis* sp. n.

(Figs 21–31)

Comparison. Similar to *P. carinator* **sp. n.** but distinct in having a longer malar space (Fig. 24), polished dorsolateral area of the propodeum (Fig. 29), longer distance between the propodeal spiracle and pleural carina (Fig. 29), and a longer ovipositor (Fig. 30).

Figures 12–16. *Probles dmitrii* **sp. n.**, female (holotype). 12 – head with antennae, dorsal view; 13 – head and mesoscutum, dorsal view; 14 – head and anterior part of mesosoma, lateral view; 15 – head, frontal view; 16 – propodeum, dorso-lateral view.

Description. F e m a l e (holotype). Body length 3.8 mm. Fore wing length 3.65 mm.

Head roundly constricted behind eyes in dorsal view (Fig. 26); temple 0.6 times as long as eye width. Mandible slender with upper tooth distinctly longer than lower tooth. Clypeus lenticular, 2.75 times as broad as long (Fig. 25), in profile almost flat; smooth, finely and sparsely punctate in upper 0.4. Malar space 0.9 times as long as basal width of mandible (Fig. 24). Flagellum of antenna more or less filiform, with 23 flagellomeres (Fig. 23); second flagellomere almost twice, mid flagellomeres about 1.5, and subapical flagellomeres 1.2–1.3 times as long as broad; flagellar subapical finger-shaped structures indiscernible. Face, frons and vertex granulate, dull; face with dense, indistinct (because of granulation) punctures. Temple very finely granulate, with indistinct punctures. Occipital carina complete.

Notaulus as moderately strong wrinkle. Mesoscutum granulate, dull, with dense and shallow punctures. Scutellum with lateral longitudinal carinae developed basally. Foveate groove sharp, moderately broad, with distinct transverse wrinkles, extending from prepectal carina to posterior 0.8 of mesopleuron, strongly upcurved in anterior 0.6 and almost horizontal in posterior 0.4 (Fig. 27). Mesopleuron smooth and shining, very finely and uniformly punctate. Metapleuron finely granulate, impunctate. Propodeum with weak basal keel which is 1.25 times as long as apical area (Fig. 29). Dorsolateral area smooth and shining, without distinct punctures. Propodeal spiracle separated from pleural carina by 1.5 times diameter of spiracle (Fig. 29). Apical area very broad, flat, uneven, impunctate, weakly shining. Apical longitudinal carinae complete.

Fore wing (Fig. 22) with second recurrent vein distinctly postfurcal; intercubitus as long as abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius distinctly longer than width of pterostigma. Metacarp reaching apex of fore wing. Postnervulus intercepted below middle. Hind wing (Fig. 22) with nervellus vertical. Legs slender. Hind femur 5.0 times as long as broad and 0.85 times as long as tibia. Tarsal claws long and slender.

First tergite (Fig. 30) slender, 3.3 times as long as broad posteriorly, dorsally smooth, with petiole striate laterally. Glymma situated in apical 0.6 of first tergite, small, joining by distinct groove to ventral part of postpetiole. Second tergite 1.5 times as long as anteriorly broad (Fig. 28). Thyridial depression well-developed, almost twice as long as broad. Ovipositor moderately slender, very weakly upcurved, somewhat thickened near apex, with weak dorsal subapical depression (Figs 30, 31); sheath 1.3 times as long as first tergite.

Head, mesosoma and first tergite black with brownish hue. Palpi, mandible (teeth black), lower 0.3 of clypeus and tegula brownish yellow. Scape and pedicel of antenna brownish yellow, flagellum fuscous. Pterostigma dark brown. Legs brownish yellow. Metasoma behind first tergite dark brown or black anteriorly to pale brown posteriorly.

Figures 17–20. *Probles dmitrii* **sp. n.**, female (holotype). 17 – metasoma with ovipositor, lateral view; 18 – base of metasoma, lateral view; 19 – base of metasoma, dorso-lateral view; 20 – apex of ovipositor, lateral view.

M a l e . Unknown.

Etymology. Named from the type locality, Hanka Lake (or "Khanka", common English name).

Material examined. Holotype: female (ZISP), Russia, Primorskiy Territory, Novokachalinsk, Khanka Lake, mixed forest, 12.VIII.2003 (S.A. Belokobylskij coll.).

Distribution. Russian Far East (Primorskiy Territory).

Biology. Host unknown. Flight period August.
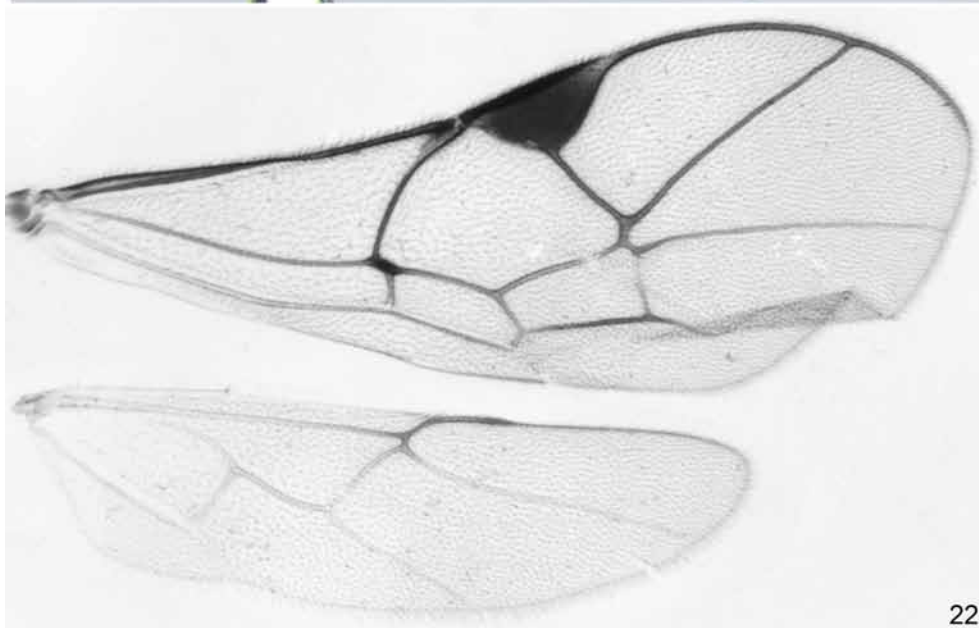
Figures 21, 22. *Probles hankaensis* **sp. n.**, female (holotype). 21 – habitus without wings, lateral view; 22 – wings.

Figures 23–28. *Probles hankaensis* **sp. n.**, female (holotype). 23 – antennae, lateral view; 24 – head with bases of antennae, lateral view; 25 – head, front view; 26 – head, dorsal view; 27 – head and mesosoma, ventro-lateral view; 28 – second tergite, dorsal view.

Acknowledgements

Figures 29–31. *Probles hankaensis* **sp. n.**, female (holotype). 29 – posterior part of mesosoma, lateral view; 30 – metasoma with ovipositor, lateral view; 31 – apex of ovipositor, lateral view.

References

G a u l d I . D . 1984. An Introduction to the Ichneumonidae of Australia. *Bulletin of the British Museum* (*Natural History*) (*Entomology*), **895**: 1–413.

H o r s t m a n n K . 1971. Revision der europäischen Tersilochinen I (Hymenoptera, Ichneumonidae). *Veröffentlichungen der Zoologischen Staatssammlung*, **15**: 47–138.

H o r s t m a n n K . (1980) 1981. Revision der europäischen Tersilochinen II (Hymenoptera, Ichneumonidae). *Spixiana*, suppl. **4**: 1–76.

K h a l a i m A . I . 2007. 17. Subfamily Tersilochinae. *In*: L e l e j A . S . (Ed.). *Keys to the insects of the Russian Far East. Vol. IV. Neuropteroidea, Mecoptera, Hymenoptera. Part 5*. Vladivostok: Dal'nauka: 566–597. (In Russian.)

K h a l a i m A . I . 2011. Tersilochinae of South, Southeast and East Asia, excluding Mongolia and Japan (Hymenoptera: Ichneumonidae). *Zoosystematica Rossica*, **20**(2): 96–148.

K h a l a i m A . I . 2013. New data on the Afrotropical Tersilochinae (Hymenoptera, Ichneumonidae). *Proceedings of the Russian Entomological Society*, **84**(2): 129–136.

K h a l a i m A . I . , B a l u e v a E . N . , K i m K . - B . , L e e J . - W . 2013. Three new species of the genus *Probles* Förster (Hymenoptera, Ichneumonidae, Tersilochinae) from South Korea. *ZooKeys*, **348:** 77–88. doi: 10.3897/zookeys. 348.6177

K h a l a i m A . I . , S h e n g M . L . 2009. Review of Tersilochinae (Hymenoptera, Ichneumonidae) of China, with descriptions of four new species. *ZooKeys*, **14**: 67–81. doi: 10.3897/zookeys.14.141

T o w n e s H . K . 1971. The genera of Ichneumonidae, Part 4. *Memoirs of the American Entomological Institute*, **17**: 1–372.

A new species of the genus *Cremastus* Gravenhorst (Hymenoptera: Ichneumonidae: Cremastinae) from Turkey

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Новый вид рода *Cremastus* Gravenhorst (Hymenoptera: Ichneumonidae: Cremastinae) из Турции

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Abstract. *Cremastus kasparyani* **sp. n.** from Turkey is described. The new species is distinguished from all Western Palaearctic species by swollen and partly flattened from below trochantellus of hind leg.

Key words. *Cremastus*, new species, Turkey, Ichneumonidae, Hymenoptera.

Резюме. Описан новый вид *Cremastus kasparyani* **sp. n.** из Турции. Этот вид отличается от всех западнопалеарктических видов рода вздутым и отчасти сплюснутым снизу трохантеллюсом задней ноги.

Ключевые слова. *Cremastus*, новый вид, Турция, Ichneumonidae, Hymenoptera.

Introduction

The genus *Cremastus* Gravenhorst, 1829 is widely distributed in the Holarctic region and comprises 94 species in the Nearctic region (Dasch, 1979), 30 species in the Palaearctic region, and two species in the Afrotropical region (Yu *et al.*, 2012). Species of this genus are koinobiont endoparasitoids of Lepidoptera and, less commonly, Coleoptera larvae in tunnels, leaf rolls, buds, galls and other similar concealed habitats (Wahl, 1993). Key to Western Palaearctic species was proposed by Kolarov (1997). Until now, 11 species of *Cremastus* were known from Turkey (Kolarov, 1997; Kolarov *et al.*, 2002; Kolarov, Yurtcan, 2009; Çoruh *et al.*, 2013). A new species was found in materials from south Turkey. Specimens of this species were collected on meadows close to coniferous forest by standard entomological net.

Taxonomic part

Cremastus kasparyani sp. n.

Description. M a l e . Fore wing 3.2 mm, body 4.9 mm long. Head weakly and roundly narrowed behind eyes (Fig. 1). Lateral ocellus small, its diameter 0.7 times as long as oculo-ocellar line. Frons slightly concave above bases of antennae. Flagellum of antenna with 30 segments; all segments elongate, first segment 3.6 times as long as wide. Inner orbits of eyes slightly divergent downwards; face 2.1 times as wide as long (Fig. 2). Clypeus 3.9 times as wide as long, with weakly convex apical margin. Mandible large with equal teeth. Malar space 0.8 times as long as basal width of mandible. Occipital

carina weak, joining the hypostomal carina close to base of mandible. Temple 0.7 times as long as transverse diameter of eye. Frons matt, face rather coarsely and densely punctate, the distance between punctures as long as its diameter. Clypeus and temples with sparse punctures only.

Mesosoma 1.8 times as long as high. Notaulus extending to the middle of mesonotum, but shallow. Prepectal carina reaching hind margin of pronotum at its mid-height. Propodeum fully areolated. Basal area pointed posteriorly. Areola pentagonal, 2.1 times as long as wide (Fig. 5.). Combined basal area and areola 1.5 times as long as petiolar area. Propodeal spiracle small, of equal distance from lateral and pleural carina.

Fore wing with pterostigma 2.5 times as long as wide, first section of radius originated posteriorly its mid-length (Fig. 3). Metacarp a little longer than intercubitus (9 : 7). Basal vein slightly arched. Nervulus antefurcal; second recurrent vein distinctly postfurcal. Parallel vein connected with postnervulus a little above the middle. Hind wing with four distal hamuli. Nervellus indistinctly intercepted below middle, discoidella not pigmented. Legs slender, hind femur 3.4 times as long as wide. Trochantellus of hind leg swollen and partly flattened from below (Fig. 4). Ratio of hind tarsomeres length as 28 : 12 : 10 : 7 : 8. Tarsal claws simple.

Metasoma compressed from third segment. First metasomal segment almost straight, 3.5 times as long as wide posteriorly; glymma present. Postpetiole and second tergite finely longitudinally striate, following tergites matt.

Black. Inner orbits, outer orbits partly, clypeus, mandible, front surface of fore femur, front surface of middle femur except base, trochantellus from below, tegula and base of pterostigma yellow; tibiae with indistinct subbasal whitish ring; second tergite yellow-red apically; legs (except coxae and trochanters) brown, greater part of tibiae from above dark yellow.

F e m a l e . Unknown.

Type material. Holotype: male, Turkey, Isparta, Gölcük, 1200 m, 7.VI.2004 (University of Plovdiv, Bulgaria).

Paratypes. Same data as holotype, 2 males.

Etymology. The new species is dedicated to famous Russian ichneumonologist Dr Dmitri R. Kasparyan for his contributions to Ichneumonidae taxonomy.

Comparison. The new species is close to *C. geminus* Gravenhorst, 1829, but differs by its smaller ocelli, longer malar space, swollen and partly flattened from below second trochanter of hind leg, smaller body size and coloration. In the identification key to the Western Palaearctic *Cremastus* species (Kolarov, 1997), the new species runs to the couplet 15. It can be included in this key with the following modification:

15. Clypeus wide, weakly convex, with almost straight front edge...15A

– Clypeus narrow, moderately or strongly convex, with front edge curved outwards.......................... 17

15A. Trochantellus of hind leg swollen and partly flattened ventrally............***Cremastus kasparyani* sp. n.**

– Trochantellus of hind leg not swollen and not flattened from below... 16
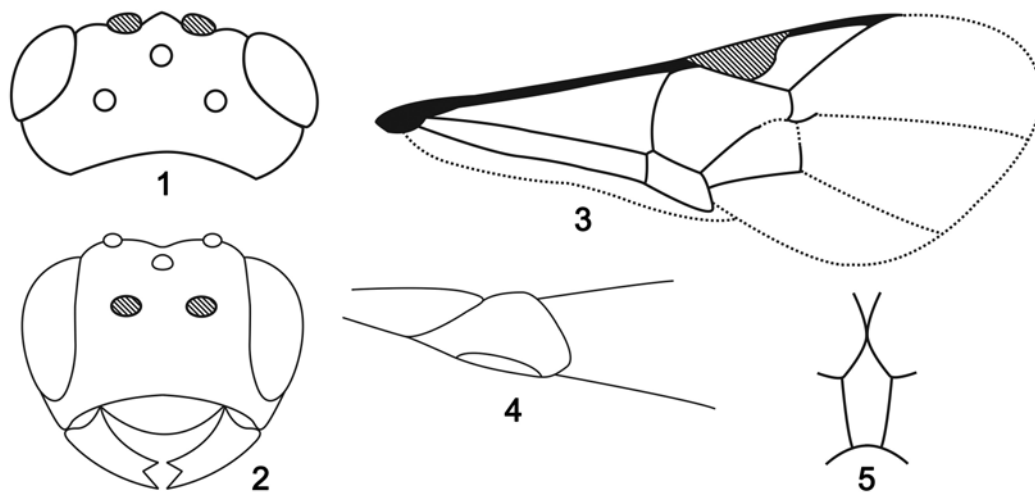
Figures 1–5. *Cremastus kasparyani* **sp. n.** 1 – head, dorsal view; 2 – head, front view; 3 – fore wing; 4 – trochantellus of hind leg; 5 – combined areola and area basalis of propodeum.

Acknowledgements

References

Çoruh S., Gürbüz M.F., Kolarov J., Yurtcan M., Özdan A. 2013. New and little known species of Ichneumonidae (Hymenoptera) for the Turkish fauna. *Journal of the Entomological Research Society*, **15**(3): 71–83.

Dasch C.E. 1979. *Ichneumon*-flies of America north of Mexico: 8. Subfamily Cremastinae. *Memoirs of the American Entomological Institute*, **29:** 1–702.

Kolarov J. 1997. A review of the subfamily Cremastinae (Hymenoptera, Ichneumonidae) of the Balkan peninsula, Turkey and Cyprus. *Beiträge zur Entomologie*, **47**(1): 169–199.

Kolarov J., Yurtcan M. 2009. A study of the Cremastinae (Hymenoptera: Ichneumoidae) from Turkey. *Turkish Journal of Zoology*, **33:** 371–374.

Kolarov J., Coruh S., Ozbek H., Yildirim E. 2002. A contribution to Ichneumonidae (Hymenoptera) fauna of Turkey: The subfamily Cremastinae. *Turkiye 5. Biyolojik Mucadele Kongresi (Erzurum, 4–7 Eylul 2000)*: 275–278.

Wahl D.B. 1993. Family Ichneumonidae. *In*: Goulet H., Huber J.T. (Eds). *Hymenoptera of the World: An identification guide to families*. Agriculture Canada Publication 1894E. 668 p.

Yu D.S.K., van Achterberg C., Horstmann K. 2012. *Taxapad 2012, Ichneumonoidea 2011*. Database on flash-drive. www.taxapad.com, Ottawa, Ontario, Canada.

Two closely related species of *Cubocephalus* (Hymenoptera: Ichneumonidae: Cryptinae) with asymmetric ovipositors

M. Schwarz

Два близкородственных вида рода *Cubocephalus* (Hymenoptera: Ichneumonidae: Cryptinae) с асимметричными яйцекладами

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Abstract. Two species of *Cubocephalus* (Ichneumonidae: Cryptinae) from the Palaearctic region with asymmetric ovipositors, *C. crassivalvus* Hinz and *C. kasparyani* **sp. n.**, are discussed. The function of this asymmetry is unknown.

Key words. Ichneumonidae, Cryptinae, *Cubocephalus*, new species, Palaearctic region, asymmetric ovipositor.

Резюме. Обсуждаются два палеарктических вида *Cubocephalus* (Ichneumonidae: Cryptinae) с асимметричным яйцекладом: *C. crassivalvus* Hinz и *C. kasparyani* **sp. n.** Функциональное значение такой асимметрии неизвестно.

Ключевые слова. Ichneumonidae, Cryptinae, *Cubocephalus*, новый вид, Палеарктика, асимметричный яйцеклад.

Introduction

Cubocephalus Ratzeburg, 1848 is a large genus distributed widely in the Holarctic region (Townes, 1970; Yu *et al*., 2005). Townes and Gupta (1962) revised the North American species of this genus and divided them into nine species groups, but there is no modern revision of the European or Asian species. The keys by Schmiedeknecht (1905), Habermehl (1917), Meyer (1933) and Jonaitis (1981) include only a part of the European species and are not up to date. Several undescribed Palaearctic species are known to the author. One of them, described below, is exceptional in having an asymmetric ovipositor. It is closely related to the European *Cubocephalus crassivalvus* Hinz having also an ovipositor whose left and right sides are strikingly different, which was overlooked hitherto.

Material and methods

Material in the Biologiezentrum at Linz (Austria) and in the Zoologische Staatssammlung at München (Germany) was investigated. Morphological terminology follows mainly Townes (1969) except for the terms malar space, mesopleuron, metapleuron and trochantellus, which follow Fitton *et al*. (1988). The images were taken at Biologiezentrum at Linz using a Nikon AZ100M.

Results

Cubocephalus crassivalvus Hinz, 1969

(Figs 10–12)

This species was described by Hinz (1969) after two females from northern Sweden, and hitherto no other material has been listed in the literature. The male is still unknown.

Hinz (1969) did not mention the unusal characters of the ovipositor, and therefore the ovipositor is described here.

The ovipositor, which is short, robust and weakly curved upwards, is significantly asymmetric (Figs 10–12) in all three known specimens. The upper valve is conspicuously enlarged and encloses the lower valve, which is therefore hardly seen in lateral view. The dorsal valve has on the right side subapically a large, very deep and slightly elongated depression, which occupies almost the entire ovipositor width and is oblique to the longitudinal body axis. The depression is dorsally narrower than ventrally, and its dorsal end protrudes basally (Fig. 10). On the left side the ovipositor is not pressed at the same level. Basal to this depression on the right side there is on the left a significant depression, which is somewhat smaller than that on the right side (Fig. 11). In dorsal view both depressions are clearly visible. Both upper valves are fused together without a dividing seam (Fig. 12). The lower valve is slender and subapically has fine teeth ventrally.

Material examined. S w e d e n : 1 female, Kiruna, 1.VIII.1968 (holotype); 1 female, same data except 23.VIII.1964 (paratype) (both in coll. Zoologische Staatssammlung München). A u s t r i a : 1 female, East Tyrol, Abfaltersbach, Drauufer, sewage treatment plant, 23.VI.2004, coll. A. Kofler (in coll. M. Schwarz).

This species is here recorded from Central Europe for the first time.

Cubocephalus kasparyani sp. n.

(Figs 1–9)

Type material. Holotype: female, "Mongolia – W 40km-SW Uliastay dunes, 18.VII.2005, J. Halada lg." (in coll. Biologiezentrum at Linz, Austria).

Comparison. This species is very similar to *C. crassivalvus* Hinz, but differs most obviously by its ovipositor. *Cubocephalus kasparyani* **sp. n.** also has an asymmetric ovipositor, but the depressions are not so pronounced, and the ovipositor is curved upwards approximately at a right angle subapically.

Both these species key to the *C. brevicornis* species group using Townes and Gupta (1962) and agree rather well with the description of this species group, but differ strikingly by their asymmetric ovipositors. Hinz (1969) mentions that Townes has seen *C. crassivalvus* and also places it in the *C. brevicornis* group. As the differences from the other known species of the *C. brevicornis* group are to be found only in the ovipositor, a feature present exclusively in the female.

Description. F e m a l e . Body length 7.1 mm. Antenna short and slightly widened in its middle, but broken off apically, third segment (except annellus) 1.1 times as long as wide. Front edge of head in lateral view makes distinct acute angle with imaginary extension of hind margin of eye. Head granulate and with distinct punctation. Face very short and moderately densely punctured. Clypeus wide, 3.1 times as wide as long, with scattered large punctures, ventrally not granulate, its lower margin blunt (Fig. 3). Mandibular teeth of about equal length. Malar space 0.6 times as long as basal width of mandible. Temple with scattered punctures. Frons with scattered punctures, but moderately densely punctured medially. Frons at height of antennal scrobe near eye margin with small but distinct bump. Distance between lateral ocellus and eye margin as long as distance between lateral ocelli. Upper edge of vertex distinctly higher than ocelli in lateral view. Head in dorsal view behind eyes long, weakly rounded laterally and hardly narrowed (Fig. 4).

Mesosoma somewhat flattened dorsoventrally. Mesoscutum finely granulate and dull, moderately densely punctured (Fig. 5). Notaulus indicated only anteriorly. Scutellum flat, lustrous, very weakly granulate, with scattered and fine punctures. Mesopleuron including most of speculum granulate and mainly dull, with scattered and distinct punctures. Speculum ventrally lustrous and densely punctured dorsally. Sternaulus shallow, extending only to middle of mesopleuron. Median section of posterior transverse carina of mesosternum fine and without pair of teeth. Metapleuron granulate and matt, in addition ventrally wrinkled, without distinct punctures. Propodeum (Fig. 6) of moderate length, with rough granulation and with fine rugosity, matt. Apical transverse carina of propodeum present but indistinct medially. Median and lateral longitudinal carinae present only proximally.

Legs stout with hind femur 2.9 times as long as wide.

Fore wing with sides of areolet distinctly converging anteriorly. Nervulus opposite basal vein.

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Metasoma with tergites distinctly granulate and proximal tergites dull, without distinct punctures. First metasomal segment with ventrolateral carina distinct, dorsolateral carina weak and median dorsal carina absent. Ovipositor sheath short, 0.55 times (without curvature) as long as hind tibia, widened behind its middle and clearly pointed towards tip. Ovipositor very robust, straight basally and strongly bent upwards apically; in lateral view dorsal margin of ovipositor makes right angle (Figs 7, 8). Upper valve unusually enlarged, enclosing lower valve which is only partly visible in lateral view. Lower valve apically with weak teeth ventrally. Upper valve asymmetric, with distinct longitudinal furrow on right side (Fig. 7); caudal margin of furrow just behind curvature of ovipositor. On left side longitudinal furrow weak (Fig. 8). Upper valve

Figures 1–6. *Cubocephalus kasparyani* **sp. n.** (holotype, female). 1 – habitus, dorsal view; 2 – habitus, lateral view; 3 – head, frontal view; 4 – head, dorsal view; 5 – mesoscutum; 6 – propodeum, dorsal view. Scale bars: 1, 2 – 1.0 mm; 3–6 – 0.1 mm.

caudal of curvature with indentation laterally; indentation on left side more basal than on right side. Both upper valves fused together without dividing suture (Fig. 9).

C o l o u r a t i o n . Body black. Seventh tergite of metasoma with hind margin white medially. Antennal flagellum basally, mandible partly, postpetiole apically, second and third tergites mainly, median transverse band on fourth tergite and most of legs orange. Second metasomal tergite basolaterally with black spot and third tergite black basally. Fore and mid coxae partly, and fore and mid trochantelli partly black. Palps brownish. Fore wing with pterostigma brown and yellowish brown in its basal half except margins.

M a l e . Unknown.

Etymology. This species is dedicated Dmitri R. Kasparyan, a very productive ichneumonologist, on the occasion of his 75th birthday.
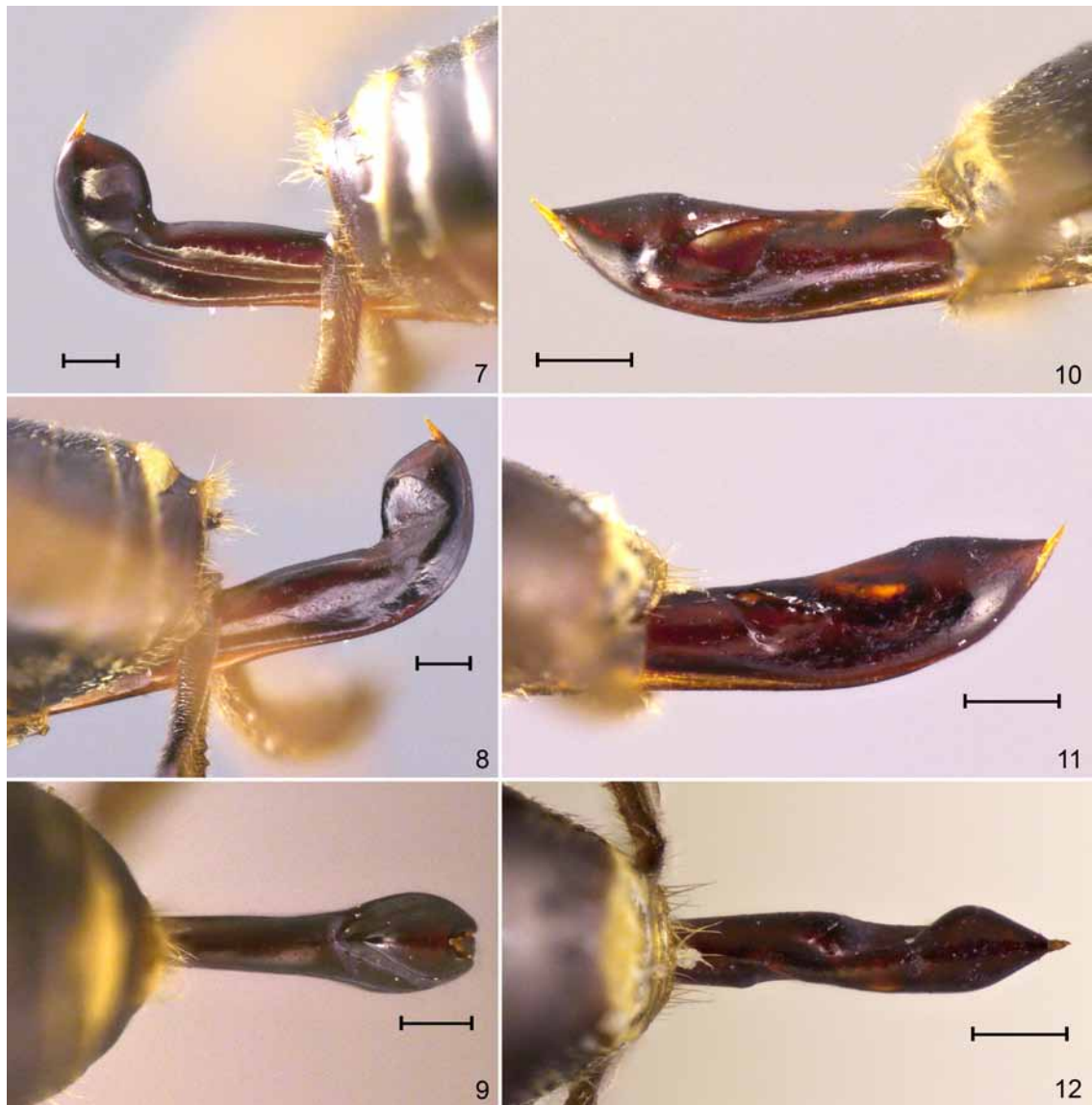
Figures 7–12. Ovipositor of *Cubocephalus kasparyani* **sp. n.** (holotype) (7–9) and *Cubocephalus crassivalvus* Hinz (10–12). 7, 10 – right side; 8, 11 – left side, 9, 12 – dorsal view. Scale bars – 0.1 mm.

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Discussion

Since in all three known specimens of *C. crassivalvus* Hinz the ovipositor is formed asymmetrically in the same way, a deformation can be excluded. It can be assumed that this is also the case in the closely related *C. kasparyani* **sp. n.**, of which only one specimen is known. There are no other Ichneumonidae known to the author with asymmetric ovipositors. The function of this asymmetry and of the deep depressions are unknown. Hosts have so far not become known. Townes (1970) mentions Symphyta as hosts for *Cubocephalus*. Yu *et al.* (2005) and Sawoniewicz (2008) list Hymenoptera (Symphyta, Ichneumonidae, Aculeata), Coleoptera and Lepidoptera, but some of these host records are probably erroneous. The short, robust and upcurved ovipositor with the enlarged dorsal valve resembles roughly *Barycnemis gravipes* (Gravenhorst) (Ichneumonidae: Tersilochinae). Unfortunately there is no reliable host record for this species either, but Tersilochinae are mainly assumed to be parasitoids of Coleoptera (e.g. Townes, 1971). *Barycnemis gravipes* (Gravenhorst) is probably searching for hosts on the ground as observations by the author suggest. Therefore it is supposed that these two species of the *C. brevicornis* group with asymmetric ovipositors may oviposit into a similar substrate in which the host is sought. Hosts may be Coleoptera, which are probably searched for on the ground.

Acknowledgements

References

Fitton M.G., Shaw M.R., Gauld I.D. 1988. Pimpline ichneumon flies. Hymenoptera, Ichneumonidae (Pimplinae). *Handbooks for the Identification of British Insects*, **7**(1): 1–110.

Habermehl H. 1917. Superrevision der Cryptiden-Gattung *Cratocryptus* C. G. Thoms. mit einer Tabelle zur Bestimmung der Arten (Hym.). *Deutsche Entomologische Zeitschrift*, **1917**: 61–64.

Hinz R. 1969. Drei neue Ichneumoniden aus Nordeuropa (Hym., Ichneumonidae). *Entomologiske Meddelelser*, **37**: 280–284.

Jonaitis V.P. 1981. 7. Subfam. Gelinae (Cryptinae). *In*: Medvedev G.S. (Ed.). *Key to insects of the USSR European part. Hymenoptera. Leningrad: Nauka*. **3**(3): 175–274. (In Russian.)

Meyer N.F. 1933. *Parasitic Hymenoptera of the family Ichneumonidae of the USSS and contiguous countries. Subfamily Cryptinae*. Leningrad: USSR Academy of Sciences Publishing House, **15**(2): 1–325. (In Russian.)

Sawoniewicz J. 2008. *Hosts of the world Aptesini (Hymenoptera, Ichneumonidae, Cryptinae)*. Olsztyn: Wyd. Mantis. 150 p.

Schmiedeknecht O. 1905. Opuscula Ichneumonologica. II. Band. (Fasc. VIII–XI) Cryptinae. Blankenburg in Thüringen: 563–882.

Townes H.K. 1969. The genera of Ichneumonidae, Part 1. *Memoirs of the American Entomological Institute*, **11**: 1–300.

Townes H.K. 1970. The genera of Ichneumonidae, Part 2. *Memoirs of the American Entomological Institute*, **12**: 1–537.

Townes H.K. 1971. The genera of Ichneumonidae, Part 4. *Memoirs of the American Entomological Institute*, **17**: 1–372.

Townes H.K., Gupta V.K. 1962. *Ichneumon*-flies of America north of Mexico: 4. Subfamily Gelinae, tribe Hemigasterini. *Memoirs of the American Entomological Institute*, **2**: 1–305.

Yu D.S., van Achterberg C., Horstmann K. 2005. *World Ichneumonoidea 2004. Taxonomy, biology, morphology and distribution*. Taxapad, 1–96 + CD-ROM.

Illustrated notes on the biology of two European species of *Euceros* Gravenhorst (Hymenoptera: Ichneumonidae: Eucerotinae)

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Иллюстрированные заметки по биологии двух европейский видов *Euceros* Gravenhorst (Hymenoptera: Ichneumonidae: Eucerotinae)

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Abstract. Observational notes and photographs taken in the course of rearing *Euceros albitarsus* Curtis and *E. pruinosus* (Gravenhorst) in captivity from the egg stage are given. The bizarre biology of these obligate hyperparasitoids involves a planidial larval stage that attaches to caterpillars or sawfly larvae, followed by a short phase of internal parasitism of a primary parasitoid if already or subsequently present, followed in turn by the principle growth period of external parasitism on the primary parasitoid, as shown by Tripp (1961). Observations on aspects of this that were not illustrated by Tripp are given and, although these transitions are not fully elucidated here, it is speculated that the number of larval instars had hitherto been overestimated. Investigations on the behaviour and fate of the planidial phase suggest that it is best able to transfer to primary parasitoids that are associated with the prepupal state of the lepidopteran host. Planidia on caterpillars that are not themselves parasitised end up in the host pupa, usually occupying the subalar cavity of the exuvial space (that is, just below the pupal cuticle at the wing cases), but do not develop further in the absence of a primary parasitoid. A summary of some aspects of the biology of *Euceros* that are not yet understood is given: the main uncertainties are the number and feeding positions of larval instars, the timing and nature of the planidium's transfer to the primary parasitoid, and the function of the unusual male antenna.

Key words. Planidium, hyperparasitoid, host relations, life history, *Euceros albitarsus*, *Euceros pruinosus*.

Резюме. Приведены заметки и иллюстрации, сделанные в процессе выведения собранных в природе ихневмонид *Euceros albitarsus* Curtis и *E. pruinosus* (Gravenhorst). Необычная биология этих облигатных гиперпаразитоидов связана с особенностями их первой планидиальной личиночной стадии, развивающейся на первичном паразитоиде бабочки. В статье обсуждаются в первую очередь те особенности биологии этих наездников, которые не были изучены Триппом (Tripp, 1961).

Ключевые слова. Планидия, гиперпаразитоид, связи с хозяевами, жизненный цикл, *Euceros albitarsus*, *Euceros pruinosus*.

Introduction

The ichneumonid subfamily Eucerotinae has a practically worldwide distribution (apparently absent from south east Asia and the neotropics) but contains relatively few species, all – apart from the monotypic Chilean genus *Barronia* Gauld et Wahl – classified as *Euceros* Gravenhorst (Yu *et al.*, 2012).

The known biology of *Euceros* is extraordinary for an ichneumonid, as eggs are laid on vegetation and the resulting first instar larvae are highly specialized; they attach to passing caterpillars or sawfly larvae, but can only complete their development as obligatory secondary parasitoids. Finlayson (1960), following up a pers. comm. from G.S. Walley, was the first to report this, confirmed also by Varley (briefly in 1960, more completely in 1965), but by far the fullest and most detailed account is given by Tripp (1961). He studied and illustrated a Nearctic species, *E. frigidus* Cresson, developing on the primary parasitoids of the diprionid sawfly *Neodiprion swainei* Middleton on *Pinus*, and gave a particularly detailed morphological account of the heavily sclerotised first instar larva, termed a planidium (cf. Clausen, 1940), as well as assessing the further developmental progress of the parasitoid by dissecting sawfly cocoons from which *Euceros* had emerged. Apart from host data given by Barron (1976, 1978) in his taxonomic revision of world *Euceros*, no further biological details appear to have been published. Kasparyan (1996), however, discusses the biology of *Euceros* in an evolutionary light in a far-reaching essay that, among other things, emphasises the importance as well as the difficulties of the use of sawfly hosts in the early evolution and progression of parasitism by Hymenoptera.

In 1990 and 1995 I had the opportunity to make limited biological observations on two European species, *E. albitarsus* Curtis and *E. pruinosus* (Gravenhorst) respectively, both parasitising the primary parasitoids of Lepidoptera. At the time my aim was rather trivial: just to see if I could successfully rear these species from egg to adult under entirely captive circumstances, and unfortunately I was unable to give the project sufficient undivided attention to attempt to solve the riddles that remained (in particular the precise number of larval instars and the manner of their development). Nevertheless, some of the incidental observations made extended or slightly disagreed with those given by Tripp (1961), and the photographs I was able to take sometimes covered different aspects of the life history and, although mostly of regrettably low quality, they do illustrate it clearly enough to be worth presenting. This paper simply recounts those experiences, drawing attention to departures from (or extensions to) Tripp's (1961) observations.

Material and methods

Two adult females of *Euceros albitarsus* emerged on 22 and 23.IV.1990 from cocoons of *Ophion minutus* Kriechbaumer (Ichneumonidae: Ophioninae) resulting from larvae of *Agriopis aurantiaria* (Hübner) collected at Fontainebleau (France: Seine-et-Marne) on 15.V.1989 by T.H. Ford, that had been given to me as *O. minutus* cocoons. A single adult female of *E. pruinosus* was swept at Chippenham Fen NNR (England: Cambridgeshire) on 9.V.1995 by M.G. Fitton, and the eggs laid by her, on 12–14.V.1995, were sent through the post and received by me on 22.V.1995. These females and their progeny were the source of all observations recorded here.

The females were confined individually in 7.5×2.5 corked glass tubes, onto the inside of which small spots of dilute honey were touched and replenished daily. At intervals estimations of the eggs laid were made, and a fresh tube was supplied. After the planidial larvae had hatched, Lepidoptera larvae were passed briefly into the tube and examined for adhering planidia. In all the cases from which adult *Euceros* were later reared, these caterpillars were cultured from the egg stage in captivity and had previously been parasitised by captive reared females of a regular parasitoid: in the case of *E. albitarsus*, the geometrid *Theria primaria* (Haworth) parasitised by the campoplegine ichneumonid *Dusona erythrogaster* (Foerster); for *E. pruinosus*, the geometrid *Operophtera brumata* (Linnaeus) parasitised by the tryphonine ichneumonid *Netelia* (*Bessobates*) *latungula* (Thomson). In both cases supposedly parasitised caterpillars resulted from observed single apparent ovipositions by the primary parasitoid, but only in the case of the ectoparasitoid *Netelia* Gray was it possible to be certain that oviposition had actually occurred, or indeed that a primary parasitoid larva successfully established itself. A range of other potential caterpillar hosts (collected wild in England at Gait Barrows, North Lancashire on 13.V.1990, and Chippenham Fen, Cambridgeshire on 9.V.1995) were also introduced and received planidia of *E. albitarsus* and *E. pruinosus*, respectively, but were either unparasitised or produced only the primary parasitoid they already contained; however, they are the source of some of the observations and photographs recorded, and the rearing results in the case of those exposed to *E. albitarsus* will be briefly enumerated.

Caterpillars were fed on suitable foliage, and all livestock was maintained in a shaded and airy detached shed and carefully monitored under nearly outdoor conditions (cf. Shaw, 1997).

Results

1. *Euceros albitarsus* Curtis, 1837

The females started to oviposit two to three days after emergence, then for about the next ten days they increasingly copiously laid white eggs about 0.22 mm long attached to a fine white pedicel about 0.35 mm long or a little longer at one, presumably the caudal, end (Figs 1, 2). Although difficult to measure, pedicel length seemed rather uniform; however, the angle of the egg with respect to the pedicel varied (possibly changing over time) from distinctly tilted upwards (Fig. 1) to horizontal (Fig. 2). It appeared that at least 200 and perhaps more than 300 eggs were laid in most 24 hour periods within this time, but accurate daily checks were not made. Subsequently very few eggs were laid over the next week, despite the females feeding well on dilute honey, after which one female died but the other lived on and resumed ovipositing (about 150 eggs on the 20th day after emergence; a few on others days, sporadically) but died on the 32nd day after emergence following 12 days of at most very low egg production. The total number of eggs laid was probably not more than 3000 by either female, but it is not clear if this corresponds to a real maximum.

Figures 1–6. *Euceros albitarsus*. 1 – eggs on pedicels, tilted upwards; 2 – egg on pedicel, horizontal; 3, 4 – development of planidium inside egg; 5, 6 – planidium on pedestal.

The egg was depressed dorsally, and after a few days the planidium could be seen developing within, the head evidently at the other end from the pedicel (Figs 3, 4). This orientation would be expected from Hallez's (1886) Law, which predicts that the caudal end of the egg would issue first from the female, and it is clear from Tripp's (1961) figures that the end attached to what becomes the pedicel issues first. About six days after oviposition, the planidium hatched from the egg, but unfortunately this event was not witnessed directly. However, in doing so the planidium must somehow reverse its orientation, possibly by hatching on its back and looping over, to rest on the platform formed by the collapsed chorion with its head now at the pedicel end (Figs 5, 6), and in fact usually projecting slightly beyond it. This is the position in which the planidium waits for its carrier host and, in response to any activity in its immediate environment, the planidium projects further, rearing and waving its head end around. Mostly the planidia remained on their platforms, from which they efficiently transferred to passing caterpillars

Figures 7–12. *Euceros albitarsus.* 7, 8 – planidia on abdominal intersegmental membranes of *Orthosia gothica*; 9 – planidium on anal proleg of *Orthosia gothica*; 10, 11 – planidium in *Theria primaria* pupa, under wing cases; 12 – planidium in *Operophtera brumata* pupa, near antennae and legs.

(and were very easily able to move along setae, when present, to reach the host's body). Some, however, were seen moving on the sides of the tubes, having left their pedestals for unknown reasons (perhaps accidental, or as a result of suboptimal conditions), and these too were able to transfer to caterpillars – though less readily than those still on their platforms. Dismounted planidia placed manually on hosts also attached successfully. Some unattached planidia were still alive and able to transfer at least 40 days after hatching, but there was appreciable mortality well before this (though possibly the result of suboptimal conditions in the tubes), many of the dead planidia still being on their pedestals. After transferring to the caterpillar, the planidium moves over its body until it settles on an integumental membrane, most often intersegmental and laterally (Fig. 7 shows two planidia, one at each of two adjacent intersegmental membranes, in these especially favoured sites), where it forms a small pocket (Fig. 8), but sometimes ventrally around the prolegs (Fig. 9) and occasionally the true legs or behind the head. At rest and before settling, the planidium is about 0.2 mm long, almost as long as the egg (0.22 mm), but once it settles on a suitable host membrane it imbibes a little haemolymph and swells slightly, to about 0.3 mm at rest (green fluid then being visible in its gut). A small darkened lesion on the host also betrays this activity (Fig. 9). Settled planidia stay in situ without growing further, but are able to survive host ecdysis by boring through the old and attaching to the fresh cuticle; the great majority of settled planidia under observation before and after host ecdysis were seen to have accomplished this successfully and without other displacement.

Planidia settled on unparasitised caterpillars remained in situ until host pupation, but were then seen to be quiescent inside the host pupa, just beneath the cuticle. The planidia observed in (3 different) *Theria primaria* pupae were each near or under the wing case (Figs 10, 11), but one in *Operophtera brumata* was among the antennae and legs (Fig. 12). The use of this exuvial space, and in particular the subalar cavity, is seen also in various early instar Diptera parasitoid larvae [e.g. the tachinids *Gonia cinerascens* Rondani (Baronio, Sehnal, 1980) and *Senometopia pollinosa* (Mesnil) (Herrebout, 1969), and the bombyliid *Villa brunnea* Becker (Du Merle, 1979)]. The *Euceros* planidia were not so easily visible through the pupal cuticle after it had hardened; however, it is presumed that they remained in that position until the moths emerged, when planidia were certainly not left behind in the pupal exuvium. They had presumably transferred to the adult moths (cf. Tripp, 1961), but (following a search that was only rather cursory, and much hampered by the copious scales of the adult moths) they were not rediscovered on the moths that emerged successfully (1, *O. brumata*) or developed to the pharate adult stage and died (1, *T. primaria*) the following spring. The two other pupae with planidia in situ were preserved.

The main experimental host was *Theria primaria* parasitised by *Dusona erythrogaster*, and, of the 27 exposed to planidia in spring 1990 and reared normally, eight died as *Theria* prepupae without parasitism being evident (this level of mortality and its timing is not unusual in routine cultures of *T. primaria*, which has a somewhat prolonged prepupation period, and they probably had not contained viable *Dusona* parasitoids). A further six of the 27 produced moth pupae (of which three had no visible planidia and were allowed to progress to produce adult moths, a further one with a planidium died as a pharate adult, and two with planidia were preserved), and 13 produced *Dusona* cocoons. Of the latter, ten were kept intact, to yield a series of five males of *E. albitarsus*, emerging between 22 and 29.IV.1991, and two male *D. erythrogaster*, emerging between 13 and 15.V.1991, leaving three from which nothing emerged: by the time they were opened it was unclear what had befallen the *Dusona* prepupa that had died inside, but there was no clear evidence of the presence of *Euceros*. These results indicate firstly that not all of the *Dusona* apparent ovipositions were successful (whether failing at attempted oviposition or within the host), and secondly that the *Euceros* planidia were not always successful in establishing themselves in or on the primary parasitoid. Three further *Dusona* cocoons were opened in an effort to trace the development of the *Euceros*.

The first *Dusona* cocoon was opened on 6.VII.1990, about 6 weeks after exposure of the caterpillar to both *Dusona* and *Euceros*, and probably about 5 weeks after the *Theria* had formed its cocoon. Transversely just under the cuticle of the head capsule of the *Dusona* prepupa was a planidium about 0.35 mm long, but almost certainly this was a cast skin (Fig. 13). What appeared to be a *Euceros* larva, evidently having shed its planidial stage skin, but apparently not having grown much if at all, was faintly visible in the still living *Dusona* prepupa, just under the cuticle, dorsally, and about two thirds towards the caudal end of the *Dusona* (Fig. 14) – though the interpretation of this observation is not certain. The *Dusona* prepupa was then placed in a gelatine capsule. On 14.VIII,1990, after a period during which I was unable to make observations, the *Dusona* prepupa had spun a quantity of white silk and defecated, and was now

dead, with a small but similarly now dead ectoparasitoid on its head (it is unclear whether or not this position is only coincidentally near the cast skin of the planidium) with a rather pronounced and rounded head capsule about 0.25 mm wide (Fig. 15). It appeared that this larva had fed, and probably also moulted, near that position – but again this interpretation is not certain. If the supposed observations are correct, however, it might suggest that the post-planidial larva had moved around and spent some time inside the host, but then erupted and moulted (with or without first feeding internally, for which there is no evidence either way), and that the dead larva in Fig. 15 was third instar (i.e. two instars beyond the planidial stage). The size of the head capsule suggests that it must be at least two instars after the planidium, and its small body size as well as the only slight extent of its feeding externally on the *Dusona* prepupa would suggest that it was not more advanced than that, although if it had died without much feeding since its last moult it could conceivably have been at the very start of its fourth instar. All of this is, however, conjectural.

Figures 13–18. *Euceros albitarsus* (13–17) and *Euceros pruinosus* (18). 13 – planidium (probably its cast skin) in head capsule of prepupal *Dusona erythrogaster*; 14 – probable post-planidium instar larva within prepupal *Dusona erythrogaster*; 15 – dead larva, ectoparasitoid phase, on prepupal *Dusona erythrogaster*; 16, 17 – prepupa; 18 – planidia on venter of *Amphipyra pyramidea*.

The second *Dusona* cocoon was opened on 2.X.1990, and contained prepupal remains and faeces of the consumed *Dusona*, and a *Euceros* prepupa that had not yet defecated, although with the development of imaginal features (eyes) well visible (Figs 16, 17). A third *Dusona* cocoon was opened on 24.III. 1991 and by that time contained a *Euceros* pupa, which went on to produce a normal adult male on 23.IV.1991.

Among the wild-collected caterpillars exposed to the planidia were several that produced primary parasitoids which either developed successfully to the adult stage, or at any rate did not produce *Euceros*. These were (Geometridae): three *Epirrita dilutata* (Denis et Schiffermüller), one *Operophtera brumata* and one *Agriopis marginaria* (Hübner) that all produced Tachinidae; four *A. marginaria* that produced *Casinaria* sp. (2), *Hyposoter clausus* (Brischke) (1) and *Protapanteles immunis* (Haliday) (1); one *O. brumata* that produced *Netelia (Bessobates) latungula*; 26 *Theria primaria* that produced *Aleiodes* sp. (15), various small solitary Microgastrinae (9) and *Hyposoter brischkei* (Bridgman) (2); and (Noctuidae) one *Orthosia gracilis* (Denis et Schiffermüller) that produced *Scirtetes robustus* (Woldstedt). While many of these primary parasitoids may have been simply too small to support *E. albitarsus* (at least *Scirtetes* and *Netelia*, however, should certainly be big enough), a high proportion did in fact get to the adult stage (including the *Scirtetes* and *Hyposoter*) [although not always emerging from the cocoon successfully; however, this is believed to be simply an artefact of suboptimal conditions], suggesting a failure of the *Euceros* to transfer to them successfully. Almost all of the above (except *Netelia*; also the Tachinidae, from which, however, *Euceros* appears never to have been recorded) killed the caterpillar host before it had completed its feeding. While it is true that in many cases the primary parasitoid then spun its cocoon substantially away from the host remains, perhaps thereby isolating itself from the planidium, this was not the case for the numerous *Aleiodes* that killed *Theria* larvae and pupated inside the dead host's skin. It may be that biochemical cues associated with the caterpillar's pupation are what normally induces the *Euceros* to attempt transfer – including entering freshly pupal Lepidoptera if no fully fed primary parasitoid arises within its pupation chamber. This is slightly supported by the observation of planidia still active on the outside of *Aleiodes* mummies, having evidently failed to bore through the caterpillar's cuticle to reach the primary parasitoid that was mummifying it at a time when it was still only partly grown and not in proecdysis. It is also supported by the observation that planidia were still on the outside of rather advanced prepupae (this was best observed in *Orthosia* species, which do not construct such tight cocoons as *Theria*), suggesting that the planidium probably only moves to enter the host at the exact time of pupation – soft fresh cuticle then being available for penetration. Although a possible cue for this (that could function also if a primary parasitoid were to erupt) might be simply the host's movement or the rupturing of its skin, biochemical cues seem more probable.

Penultimate instar larvae of the nematine sawflies *Pristiphora crassicornis* (Hartig) and *Nematus lucidus* (Panzer) (Hymenoptera: Tenthredinidae) were also exposed to the planidia, which attached and successfully transferred to the final instar, but primary parasitoids were absent and only adult sawflies resulted. Unfortunately no observations were made concerning the position of the planidium in or on the sawfly pupa.

2. *Euceros pruinosus* (Gravenhorst, 1829)

Observations with this species were less extensive, but generally did not materially disagree with the findings reported above for *E. albitarsus*, with the possible exception of the behaviour of the planidium in relation to its eggshell.

Ovipositions took place in daylight mostly on the side of the glass tube and its cork facing the light (a *Quercus robur* leaf placed in the tube was hardly used), but continued in darkness and eggs were then placed apparently at random (M.G. Fitton, pers. comm.). No comparable observations on this were made for *E. albitarsus*.

The egg was more aligned with the pedicel than in *E. albitarsus*, deviating by at most only about 30°. Measurements were not made at the same time (nor in the same way) but it appeared to be slightly smaller, at 0.18 mm, and on a slightly shorter pedicel, 0.31 mm, than found for *E. albitarsus*. The planidium was also measured to be smaller, at 0.16×0.05 mm. Iwata (1960) estimated a total egg load of about 5000 for this species, but no estimation could be made in the present case, not least because the adult female was collected from the wild and may already have been ovipositing (although in captivity she did not do so over the first three days).

A possibly major difference between the two sets of observations was that by the time the tubes containing the eggs of *E. pruinosus* reached me (see Methods, above), the eggs had all hatched and the *Euceros* planidia were all dismounted, actively moving on the sides of the tubes, leaving the collapsed eggshell unoccupied and indeed not really seeming to comprise a secure platform through not being horizontal. This might suggest that, unlike *E. frigidus* (Tripp, 1961) and *E. albtarsus*, this species habitually actively searches for hosts by crawling. However, the possibility cannot be ruled that the dismounting that occurred (although extensive) was just the result of a traumatic journey through the post: indeed, some of the planidia were seemingly dead on arrival. Whatever the reason, it did mean that in the present study the planidia of *E. pruinosus* more usually gained initial access to an experimentally introduced caterpillar via its venter [Fig. 18, on *Amphipyra pyramidea* (Linnaeus)] as it walked among them, and it was notable that settlement was much more likely to occur around the prolegs and true legs than was seen in *E. albitarsus*.

Figures 19–21. *Euceros pruinosus*. 19 – planidia inside (small arrows) and remaining external on (large arrows) pupa of *Theria primaria*; 20 – many planidia on arrested prepupa of *Theria primaria*; 21 – adult male.

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By far the majority of various wild caterpillars exposed to the planidia proved to be unparasitised. The only adult *E. pruinosus* reared was a male that emerged unobserved in spring 1996, from a cocoon of *Netelia* (*Bessobates*) *latungula* that resulted around 24.VI.1995 from an *Operophtera brumata* larva bearing an egg as a result of exposure to a female *N.* (*B.*) *latungula* before exposure to the planidia on 23.V. 1996. From another (similar) sequence of exposures, a *Netelia* cocoon from which there had been no emergence was opened several years later, and was found to contain a dead *Netelia* prepupa with a dead seemingly intact planidium externally, possibly attached, near its caudal end; and at the head end an external dead *Euceros* larva with a rounded head capsule 0.51 mm wide. This *Euceros* larva was about 0.10–0.15 times the bulk of the remaining mass of the *Netelia* larva.

As with *E. albitarsus*, planidia in unparasitised Lepidoptera pupae were seen immediately under the wing case, and were easily seen only when the host pupa was still fresh and had not fully darkened. In one instance a *Theria primaria* pupa was seen to have planidia still mobile on the outside (Fig. 19, large arrows), presumably having failed to join the two or possibly more that were visible within the pupa, having entered during the window of opportunity as it pupated (Fig. 19, small arrows). It is unclear whether these external planidia were by then certainly doomed, having missed all chances, or whether they might have been able to transfer to a late-arriving ectoparasitoid should one arise. However, it seems improbable that they would live long enough to do so and that the individuals internally settled in the host's exuvial cavity would be in a better position in that event. This bears on the findings of Finlayson (1960) and Tripp (1961) that *E. frigidus* could successfully develop on idiobiont cryptine ectoparasitioids parasitising the cocooned stage of *Neodiprion swainei* Middleton. The subject of Fig. 19 died as a pharate adult, but in other cases adult moths emerged successfully from pupae of both *Theria primaria* and *Operophtera brumata* that contained planidia. In none of these cases were the planidia left inside the pupal exuvium, but neither were they recovered from the bodies of the adult moths where, it is presumed (cf. Tripp, 1961), they must have ended up; however, the search for them externally on adult moths was much hampered by scales and setae, and was not thorough.

Largely because the planidia were mostly crawling on the walls of the tube, some experimental exposures were done by rolling a caterpillar around in the tube – sometimes with the result that large numbers of planidia were picked up. In many cases the planidia did not seem to distribute themselves on intersegmental membranes, although (quite apart from the issue of competition) the viability of such individuals may have been poor: unsettled planidia were certainly lost in large numbers during host ecdysis. It was also seen that large loads of planidia had an adverse effect on the host, sometimes arresting its development in an early prepupal state (Fig. 20). The reason for this is unclear, but (in retrospect) it may also have occurred in some of the exposures of caterpillars to excessive numbers of *E. albitarsus* planidia.

Discussion

These observations complement those of Tripp (1961), perhaps helping to account for some of the anomalies he perceived (such as finding planidia both on and in unparasitised hosts), and also extending knowledge in some directions. Rather than summarise the results in relation to Tripp's (1961) work in detail, this discussion concentrates on the uncertainties that remain.

Tripp (1961) concluded that *Euceros frigidus* has seven or eight larval instars, but the evidence he presented for this was not strong. It seems clear from his work that there is at least one post-planidium instar that lives within the host, but his estimation of three such instars before an external moult, to be followed by a further three or four external instars, seems excessive. The perceived number of internal instars in particular appears to have been deduced just from the large disparity in widths of the heads of planidial and the first detected external instars; however, this might alternatively be explained by the vastly different functions of these larval stages. Although in the present work very little was done to shed light on this, the external instar of *E. albitarsus* seen was still small, and the consumption of the host by that time had been very slight. The same was true of the only external larva of *E. pruinosus* that was seen: although larger and probably more advanced to judge from its head width, this larva had by then also consumed only a rather small proportion of its host. It seems most likely that the *E. albitarsus* seen represented the earliest actively feeding ectoparasitoid instar, probably having just moulted from a single post-

planidium internally feeding instar (but note that it is simply a parsimonious assumption, based on minimum functional necessity, that there should be only one such instar; no other evidence is advanced here). If Tripp's lower estimation of three externally feeding instars is accepted, this would amount to just 5 instars, including the planidium, which seems more in line with Ichneumonidae in general. However, this suggestion requires testing, a task that could only realistically be undertaken during a study in which each carrier host was constrained to bear just one planidium. Unfortunately the remains that are to hand from the present study are not in this category, and also they are now mostly in rather poor condition.

It has been clear in the present work that the planidium stays on the exterior of its lepidopteron carrier until (if no primary parasitoid is present) the latter pupates, when the planidium immediately enters the host pupa and rests in its exuvial space. When primary koinobiont endoparasitoids are present it seems only (or at any rate, best) able to transfer to those that erupt from the prepupal lepidopteron (as many primary parasitoid taxa do), which might suggest that it comes under the influence of the same broad suite of hormonal and biochemical changes that lead to this timing in the relationship between many primary parasitoids and their host (e.g. Baronio, Sehnal, 1980; see also Schneider, 1950, 1951). The planidium then presumably enters the fully-grown primary parasitoid larva. However, this process was not actually observed, and the possibility that a parasitised carrier host is entered, and the primary parasitoid is sought, at an earlier stage – although seeming unlikely – has not been positively ruled out. Although no *Euceros* adults resulted from endoparasitoids that erupted from, or mummified, partially grown caterpillars bearing planidia, these primary parasitoids might simply have been too small for the *Euceros* to use. It would be of interest to repeat the trials using a clearly large enough species of koinobiont primary endoparasitoid that leaves the host only partially grown – though it is difficult to think of a suitable candidate.

In the case of development of *E. pruinosus* on *Netelia*, which is a koinobiont ectoparasitoid that undergoes practically all of its larval development on a cocooned prepupa, there is no certainty about the timing of the planidium's transfer to the primary parasitoid, and knowing this would obviously be of considerable interest. All that is clear is that the *Netelia* was able to reach full growth and construct its cocoon, as in the case of the koinobiont endoparasitoids, although finding a (dead) planidium on the exterior of a (dead) *Netelia* prepupa (that had been partially consumed by another, externally feeding, *Euceros* larva) might be taken as weak evidence that the planidium does not transfer to *Netelia* until the latter is fully grown. The same lack of information is true of transfer to idiobiont ectoparasitoids such as the Cryptinae found by Finlayson (1960) and Tripp (1961) to be able to serve as the primary parasitoid host of *E. frigidus* in cocoons of *Neodiprion swainei*; it might be presumed (but is not certain) that the planidium had rested either on the sawfly prepupa or, if it had pupated, in its pupal exuvial space prior to parasitism by the cryptine, but there is nothing to suggest the timing and nature of its transfer to the latter, which undergoes its full development in the sawfly cocoon. *Euceros* species are also recorded from larval-pupal endoparasitoids such as Anomaloninae (Finlayson, 1960; Yu *et al*., 2012), and again there are similar interesting questions arising from this relationship that are completely uninvestigated.

The position, in the head capsule, of the only planidial exuvium (of *E. albitarsus*: Fig. 13) seen inside a primary parasitoid in this study might or might not have significance. First instar endoparasitoid larvae of some ichneumonid taxa are known to migrate to the anterior end of the host, either to come together for the elimination of supernumary competitors (Jørgensen, 1975), to disrupt further host development by destroying its brain (Führer, Killincer, 1972), or to enter the head for unclear reasons (Heitland, Pschorn-Walcher, 2005). Whether the head is a site for dealing with supernumary competitors by *Euceros*, or whether the planidium's presence there in some way prevented its host's further development, are both unknown – although in the present case the host certainly spun more silk (presumably in response only to being removed from its cocoon) and defecated following the entry of its head capsule by the planidium.

It is disappointing that the relationship between the planidium and its eggshell in *E. pruinosus* remains tantalisingly unclear: this simple matter of whether the planidium of this species waits on a platform comprising its eggshell, or habitually leaves it to seek its carrier host by crawling, could rather easily be elucidated by anyone fortunate enough to rear or collect a fecund adult female of this species alive.

Finally, as far as I am aware there has been no investigation of the use, presumably in courtship, of the extraordinary flattened and expanded male antennae (Fig. 21), developed to a differing extent in all species of *Euceros*.

Acknowledgements

References

B a r o n i o P . , S e h n a l F . 1980. Dependence of the parasitoid *Gonia cinerascens* on the hormones of its lepidopterous host. *Journal of Insect Physiology*, **26:** 619–626.

B a r r o n J . R . 1976. Systematics of Nearctic *Euceros* (Hymenoptera: Ichneumonidae: Eucerotinae). *Naturaliste Canadien*, **103:** 285–375.

B a r r o n J . R . 1978. Systematics of the world Eucerotinae (Hymenoptera, Ichneumonidae). Part II: non-Nearctic species. *Naturaliste Canadien*, **105:** 327–374.

C l a u s e n C . P . 1940. *Entomophagous insects*. New York and London: McGraw-Hill (Reprinted 1972. New York: Hafner Publishing Company). x + 688 p.

D u M e r l e P . 1979. Biologie de la larve planidium de *Villa brunnea*, Diptère Bombyliidae, parasite de la processionnaire du pin. III. Le début de la vie endoparasitaire du planidium, les réactions de l'hôte et les échecs du parasitisme. *Annales de la Société Entomologique de France (N.S.)*, **15:** 525–551.

F i n l a y s o n T . 1960. Taxonomy of cocoons and puparia, and their contents, of Canadian parasites of *Neodiprion sertifer* (Geoff.) (Hymenoptera: Diprionidae). *The Canadian Entomologist*, **92**: 20–47.

F ü h r e r E . , K i l l i n c e r N . 1972. Die motorische Aktivität der endoparasitischen Larven von *Pimpla turoniella* und *Pimpla flavicoxis* in der Wirtspuppe. *Entomophaga*, **17:** 149–163.

H a l l e z P . 1886. Loi de l'orientation de l'embryon chez les insectes. *Compte Rendu de l'Academie des Sciences, Paris*, **103:** 606–608.

H e r r e b o u t W . M . 1969. Some aspects of host selection in *Encarcia rutilla* Vill. (Diptera: Tachinidae). *Netherlands Journal of Zoology*, **19:** 1–104.

H e i t l a n d W . , P s c h o r n - W a l c h e r H . 2005. Biology and parasitoids of the peculiar alder sawfly, *Platycampus luridiventris* (Fallen) (Insecta, Hymenoptera, Tenthredinidae). *Senckenbergiana Biologica*, **85:** 215–231.

I w a t a K . 1960. The comparative anatomy of the ovary in Hymenoptera. Part V. Ichneumonidae. *Acta Hymenopterologia*, **1:** 115–169.

J ø r g e n s e n O . F . 1975. Competition among larvae of *Pimplopterus dubius* Hgn. (Hymenoptera: Ichneumonidae), a parasitoid of *Epinotia tedella* Cl. (Lepidoptera: Tortricidae). *Zeitschrift für Angewandte Entomologie*, **79:** 301–309.

K a s p a r y a n D . R . 1996.The main trends in evolution of parasitism in Hymenoptera. *Entomologicheskoe Obozrenie*, **75:** 756–789. (In Russian. English translation in *Entomological Review*, **76:** 1107–1136.)

S c h n e i d e r F . 1950. Die Entwicklung des Syrphidenparasiten *Diplazon fissorius*, Grav. (Hym., Ichneum.) in uni-, oligo- und polyvoltinen Wirten und sein Verhalten bei parasitärer Aktivierung der Diapause-larven durch *Diplazon pectoratorius* Grav. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, **23:** 155–194.

S c h n e i d e r F . 1951. Einige physiologische Beziehungen zwischen Syrphidenlarven und ihren Parasiten. *Zeitschrift für Angewandte Entomologie*, **33:** 150–162.

S h a w M . R . 1997. *Rearing parasitic Hymenoptera*. Orpington: Amateur Entomologist's Society. 46 p.

T r i p p H . A . 1961. The biology of a hyperparasite, *Euceros frigidus* Cress. (Ichneumonidae) and description of the planidial stage. *The Canadian Entomologist*, **93:** 40–58.

V a r l e y G . C . 1960. No title. *Proceedings of the Royal Entomological Society of London (C)*, **25:** 7.

V a r l e y G . C . (1964) 1965. A note on the life-history of the ichneumon fly *Euceros unifasciatus* Voll. with a description of its planidium larva. *Entomologist's Monthly Magazine*, **100:** 113–116.

Y u D . S . K . , v a n A c h t e r b e r g C . , H o r s t m a n n K . 2012. *Taxapad 2012, Ichneumonoidea 2011*. Database on flash-drive. www.taxapad.com, Ottawa, Ontario, Canada.

A new species of the genus *Sinophorus* Förster (Hymenoptera: Ichneumonidae: Campopleginae) from China

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Новый вид рода *Sinophorus* Förster (Hymenoptera: Ichneumonidae: Campopleginae) из Китая

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Abstract. A new species, *Sinophorus impunctatus* **sp. n.**, belonging to the subfamily Campopleginae (Ichneumonidae), from Jiangxi Province, China, is described. The species is placed within existing keys to species.

Key words. Campopleginae, *Sinophorus*, new species, key, host, China.

Резюме. Из провинции Цзянси в Китае описан новый вид *Sinophorus impunctatus* **sp. n.** из подсем. Campopleginae (Ichneumonidae). Показано положение нового вида в имеющихся определительных ключах.

Ключевые слова. Campopleginae, *Sinophorus*, новый вид, определительный ключ, хозяин, Китай.

Introduction

Sinophorus Förster, 1869 belongs to the subfamily Campopleginae (Hymenoptera: Ichneumonidae) and comprises 113 species (Yu *et al.*, 2012), of which 46 are from Palaearctic region (one species is also known from the Afrotropical region, and eight species from Oriental region), ten from Oriental region (one is also known in the Palaearctic and Afrotropical regions), one is the Afrotropical, and 63 occur in the Nearctic region (three are also distributed in the Palaearctic region). Eight species were known from China hitherto (Sheng, Sun, 2010; Yu *et al.*, 2012).

Status of the genus was discussed by Townes (1970), Sanborne (1984) and Sheng and Sun (2010). Sanborne revised and keyed the world fauna of *Sinophorus* (Sanborne, 1984), provided a supplement to this revision (Sanborne, 1986), and later described a new species from Taiwan (Sanborne, 1990). *Sinophorus fuscicarpus* (Thomson, 1887) is known as parasitoid of *Dioryctria rubella* Hampson (Lepidoptera: Pyralidae), and its biology was reported by Sun with co-authors (2006) and Sheng and Sun (2010). One Japanese species parasitizing *Amphipoea* spp. (Lepidoptera: Noctuidae) was described by Kusigemati (1993).

Material and methods

Specimens were collected with intercept traps (IT) (Li *et al.*, 2012) in the forests of Shuangjiang Forest farm, Ji'an County, and Quannan County, Jiangxi Province of China. Forest of Shuangjiang Forest

farm is composed of mixed deciduous angiosperms and evergreen conifers, mainly Pinus massoniana (Lamb.), Quercus spp. and Cinnamomum spp. Forest of Quannan is composed of mixed deciduous angiosperms and evergreen conifers, mainly Quercus spp., Castania spp., Castanopsis fabri Hance, Cinnamomum spp. and Pinus massoniana (Lamb.).

Image of whole insect (Fig. 1) was taken using a Canon Power Shot A650 IS. Other images were taken using a Cool SNAP 3CCD attached to a Zeiss Discovery V8 Stereomicroscope and captured with QCapture Pro version 5.1.

Type specimens are deposited in the Insect Museum, General Station of Forest Pest Management, State Forestry Administration, People's Republic of China.

Taxonomic part

Sinophorus Förster, 1869

Sinophorus Förster, 1869: 153.

Type species: (*Limneria canarsiae* Ashmead, 1898) = *Mesoleptus*? *validus* Cresson, 1864.

Diagnosis. Propodeum with area superomedia completely fused with area petiolaris and forming a broad median longitudinal trough. Apex of propodeum not reaching middle of hind coxa. Fore wing with areolet present. Basal half of first metasomal segment more or less prismatic, the suture separating tergite from sternite a little below the mid-height. Ovipositor sheath approximately 3.0 times as long as apical height of metasoma.

In Sanborne's (1984: 63) key to species, the new species can be inserted as follows:

10a. Ovipositor 2.5–2.7 times as long as hind femur, with an unusually small dorsal notch. Median longitudinal carina of propodeum not distinctly indented at junction with basal transverse carina. Hind wing with nervellus usually intercepted. Holarctic ....***S. nitidus*** (Brischke)

10b Ovipositor 2.1–2.3 times as long as hind femur, with dorsal notch of normal size. Median longitudinal carina of propodeum (Fig. 107) often distinctly indented near junction with basal transverse carina. Hind wing with nervellus usually not intercepted. Sweden ....***S. tibialis*** Sanborne

10c Ovipositor 2.0–2.1 times as long as hind femur, dorsal notch small, sharp. Median longitudinal carina of propodeum not distinctly indented at junction with basal transverse carina. Hind wing with nervellus intercepted. Oriental...***S. impunctatus*** sp. n.

In Sanborne's (1990: 110) key to species, the new species can be inserted as follows:

38a(37a). Ovipositor strongly upcurving (Fig. 156), with height at mid-length less than width of hind basitarsus. Hind femur 4.4–4.6 times as long as high. China, Mongolia, Japan....................................
....***S. exartemae*** (Uchida)

38b. Ovipositor moderately upcurving (Fig. 155), with height at mid-length equal to width of hind basitarsus. Hind femur 4.6–5.0 times as long as high. Taiwan............................... ***S. wushensis*** Sanborne

38c. Ovipositor slightly upcurving (Fig. 1), with height at mid-length about 0.7–0.8 times width of hind basitarsus. Hind femur 5.1–5.3 times as long as high. Oriental ....***S. impunctatus*** sp. n.

Sinophorus impunctatus sp. n.
(Figs 1–7)

Material examined. Holotype: female, China, Jiangxi Province, Ji'an County, Shuangjiang Forest farm, 174 m, 16 April 2009, IT.
Paratype. 1 female, China, Jiangxi Province, Quannan County, 1 December 2010, IT.

Diagnosis. Face with dense, indistinct punctures, near inner orbit with fine leathery texture. Hind femur 5.1–5.3 times as long as deep. First tergite without lateral longitudinal groove, suture separating petiolar tergite from sternite at midheight of petiole. Tergites impunctate, with fine coriaceous texture.

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Figure 1. *Sinophorus impunctatus* **sp. n.** (female, holotype), habitus, lateral view.

Ovipositor 2.0–2.1 times as long as hind femur, height at mid-length about 0.7–0.8 times width of hind basitarsus. Hind femur reddish brown. Median portion of hind tibia yellowish brown, basal and apical portions darkish brown.

Comparison. The new species is similar to *S. wushensis* Sanborne, 1990, but can be distinguished from the latter by the following combination of characters: hind femur 5.1–5.3 times as long as high, first tergite without impressed lateral longitudinal groove. Suture separating petiolar tergite from sternite approximately at midheight of petiole. Ovipositor 2.0–2.1 times as long as hind femur, height at mid-length 0.7–0.8 times width of hind basitarsus. *Sinophorus wushensis*: hind femur about 4.7 times as long as high; first tergite with moderately impressed lateral, longitudinal groove. Suture separating petiolar tergite from sternite about 0.3 below midheight of petiole. Ovipositor about 2.3 times as long as hind femur and 1.6 times as long as mesosoma, height at mid-length about equal to width of hind basitarsus.

Description. F e m a l e . Body length 9.5–10.0 mm. Fore wing length 5.8–6.0 mm. Ovipositor sheath about 3.7 mm.
H e a d . Face (Fig. 2) 1.5–1.7 times as wide as high, rugulose with dense, indistinct punctures, near inner orbit with fine leathery texture. Clypeus weakly and evenly convex, 1.7–1.8 times as wide as high, with fine leathery texture, irregularly punctate, with apical margin slightly convex. Mandible wide, rough, with indistinct longitudinal striae. Upper tooth of mandible slightly longer than lower tooth. Malar space roughly sculptered, 0.4–0.5 times as long as basal width of mandible. Gena with fine leathery texture, temples strongly convergent posteriorly. Vertex (Fig. 3) and frons finely sculptured, covered by conspicuous felt-like pubescence. Postocellar line 1.6–1.8 times as long as ocular-ocellar line. Lower portion of frons with very fine transverse wrinkles. Antenna with 35 flagellomeres. Ratio of length of flagellomeres first to fifth: 11.0 : 8.0 : 7.0 : 7.0 : 6.9. Occipital carina complete, its lower end reaching base of mandible.
M e s o s o m a . Anterior margin of pronotum sharp, as a longitudinal carina, near anterior margin with fine longitudinal striations; lateral concavity shiny, with distinct oblique transverse wrinkles; dorsal-porsterior portion with fine leathery texture. Epomia short, distinct. Mesoscutum (Fig. 4) slightly convex, coriaceous with rough punctures; sublateral-median portion with dense, fine, indistinct punctures. Notaulus obscurely vestigial on anterior margin of mesoscutum, indicated as

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more roughly sculptured shallow furrows. Scuto-scutellar groove deep, wide, crossed by distinct keels. Scutellum evenly convex, with fine leathery texture, and/or sparse and fine punctures. Postscutellum transverse, anterior-lateral portion deeply concave. Mesopleuron (Fig. 5) with fine leathery texture and sparse punctures, and distinct oblique impression from mesopleural fovea to subalar ridge, sculptered by distinct oblique wrinkles. Mesopleural fovea deep, connected with mesopleural suture by shallow transverse groove. Subalar ridge with fine transverse wrinkles. Speculum comparatively large, smooth, shiny. Epicnemial carina half height of mesopleuron, reaching anterior margin of mesopleuron. Metapleuron weakly and evenly convex, roughly sculptured. Submetapleural carina complete. Area basalis of propodeum (Fig. 6) short, slightly convergent backwardly. Area superomedia combined with area petiolaris, with dense transverse wrinkles. Posterior section of median longitudinal carina behind basal transverse carina straight, not distinctly indented at junction with basal transverse carina. Area externa and area dentipara with fine granular texture, or the latter rugulose. Area lateralis with fine transverse wrinkles. Remaining areas with dense irregular wrinkles. Propodeal spiracle oval, located approximately at anterior 0.2 of propodeum.
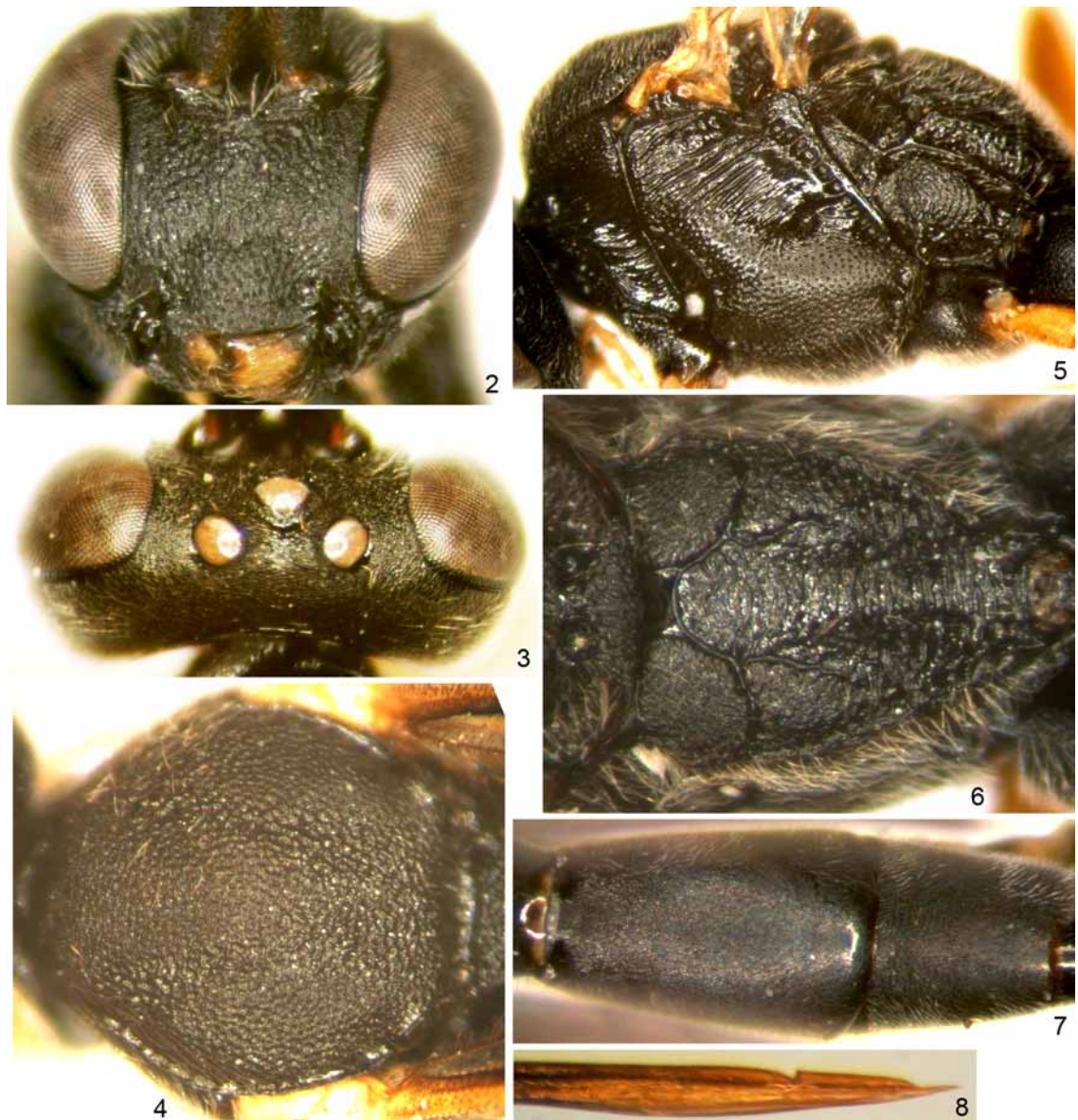
Figures 2–7. *Sinophorus impunctatus* **sp. n.** (female), holotype (2–5, 7) and paratype (6). 2 – head, front view; 3 – head, dorsal view; 4 – mesoscutum, dorsal view; 5 – mesopleuron, lateral view; 6 – propodeum, dorsal view; 7 – second and third tergites, dorsal view; 8 – apex of ovipositor, lateral view.

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L e g s . Hind coxa with fine granular texture. Hind femur 5.1–5.3 times as long as high. Ratio of length of hind tarsomeres 9.0 : 3.7 : 2.6 : 1.8 : 2.2. All tarsal claws sparsely pectinate, hind tarsal claws with teeth almost extend to base of tip.

W i n g s . Wings slightly yellowish. Vein 1*cu-a* opposite 1*M*. Areolet slanting quadrangular, petiolate, meeting vein 2*m-cu* approximately at lower posterior 0.25. Postnervulus intercepted at or slightly below its middle. Nervellus intercepted at lower 0.3.

M e t a s o m a . All tergites impunctate. First tergite 3.1–3.3 times as long as apical width, almost glossy and shiny; petiole with fine longitudinal aciculate texture; postpetiole with fine leathery texture. Spiracle small, circular, situated in apical 0.4 of tergite. Second tergite (Fig. 7) approximately 2.9 times as long as basal width; following tergites strongly compressed. Ovipositor sheath 2.0–2.1 times as long as hind femur, approximately 1.7 times as long as hind tibia. Ovipositor slightly upcurved, strongly compressed, with distinct dorsal notch (Fig. 8), depth at mid-length 0.7–0.8 times as long as width of hind basitarsus.

C o l o u r (Fig. 1). Black. Antenna brownish black. Median portion of mandible, maxillary and labial palpi, fore leg except basal half of coxa, middle leg except coxa and fifth tarsomere, tegula and base of forewing yellowish brown. Hind trochanter brown, femur reddish brown. Basal and apical portions of hind tibia darkish brown, median portion and tarsomeres 1 and 2 (except slightly darkish brown apex) yellowish brown. Hind tarsomeres 3 to 5 brown. Pterostigma and wing veins brown.

Etymology. The specific name is derived from impunctate tergites.

Acknowledgements

References

K u s i g e m a t i K . 1993. Description of a new Ichneumonfly (Hymenoptera) parasitic on *Amphipoea* spp. (Lepidoptera, Noctuidae) from Japan. *Memoirs of the Faculty of Agriculture, Kagoshima University*, **29**(38): 89–91.

L i T , S h e n g M . - L . , S u n S . - P . , C h e n G . - F . , G u o Z . - H . 2012. Effect of the trap dolor on the capture of ichneumonids wasps (Hymenoptera). *Revista Colombiana de Entomología*, **38**(2): 338–342.

S a n b o r n e M . 1984. A revision of the world species of *Sinophorus* Förster (Ichneumonidae). *Memoirs of the American Entomological Institute*, **38**: 1–403.

S a n b o r n e M . 1986. A revision of the world species of *Sinophorus* Förster (Ichneumonidae): Supplement 1. *Contributions to the American Entomological Institute*, **22**(11): 1–8.

S a n b o r n e M . 1990. Description of *Sinophorus wushensis*, a new species of Ichneumonidae from Taiwan (Hymenoptera). *The Canadian Entomologist*, **122**: 109–111.

S h e n g M . - L . , S u n S . - P . 2010. *Parasitic ichneumonids on woodborers in China (Hymenoptera: Ichneumonidae)*. Beijing: Science Press. 338 p.

S u n S . - P . , G u o Z . - H . , Z h a n g Y . - Q . , S h e n g M . - L . , C h e n G . - F . 2006. Ichneumonids (Hymenoptera: Ichneumonidae) parasitizing *Dioryctria rubella* in Shengyang. *Forest Pest and Disease*, **25**(2): 11–13.

T o w n e s H . K . (1969) 1970. The genera of Ichneumonidae, Part 3. *Memoirs of the American Entomological Institute*, **13**: 1–307.

Y u D . S . K . , v a n A c h t e r b e r g C . , H o r s t m a n n K . 2012. *Taxapad 2012, Ichneumonoidea 2011*. Database on flash-drive. www.taxapad.com, Ottawa, Ontario, Canada.

New Palaearctic species of the subfamily Metopiinae (Hymenoptera: Ichneumonidae)

V.I. Tolkanitz

Новые палеарктические виды наездников-метопиин (Hymenoptera: Ichneumonidae, Metopiinae)

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Abstract. Four new species of Metopiinae, *Trieces kasparyani* **sp. n.** from Belgorod Province of Russia, *Exochus ignobilis* **sp. n.** from Primorskiy Territory of Russia, *E. dilutus* **sp. n.** from South Kazakhstan Province (Kazakhstan) and *E. callus* **sp. n.** from Uzbekistan, Tajikistan and Almaty Province of Kazakhstan, are described. Female of *E. pilosus* Tolkanitz is recorded for the first time.

Key words. Metopiinae, *Trieces*, *Exochus*, new species, Russia, Kazakhstan, Usbekistan, Tajikistan.

Резюме. Описаны 4 новых для науки вида: *Trieces kasparyani* **sp. n.** из Белгородской области России, *Exochus ignobilis* **sp. n.** из Приморского края России, *E. dilutus* **sp. n.** из Южно-Казахстанской области Казахстана и *E. callus* **sp. n.** из Узбекистана, Таджикистана и Казахстана. Впервые отмечена самка *E. pilosus* Tolkanitz.

Ключевые слова. Metopiinae, *Trieces*, *Exochus*, новые виды, Россия, Казахстан, Узбекистан, Таджикистан.

This paper is addition to my previous reviews of the Palaearctic species of the genera *Exochus* Gravenhorst (Tolkanitz, 2007) and *Trieces* Townes (Tolkanitz, 2010). Type specimens of new species are deposited in the I.I. Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine (Kiev, Ukraine; SIZK) and the Zoological Institute of the Russian Academy of Sciences (St Petersburg, Russia; ZISP).

Trieces kasparyani **sp. n.**
(Fig. 1)

Comparison. This species belongs to the *integer* species-group because it has bare metapleuron, but differs from other members of this group by its entirely wrinkled metapleuron (Fig. 1) and very weak longitudinal carinae on metasomal tergites 2 and 3.

Description. F e m a l e . Body length 3.5 mm. Fore wing length 2.3 mm.

Head in dorsal view weakly transverse, distinctly tapered behind eyes. Temple not convex, in lateral view as long as transverse diameter of eye. Occipital carina distinct. Distance between hind ocellus and eye margin equal to one diameter of hind ocellus. Face in lateral view not convex, in front view transverse, distinctly narrowed ventrally, coarsely and densely

Figure 1. Metapleuron of *Trieces kasparyani* **sp. n.** (holotype, female).

punctate. Clypeus weakly separated from face by shallow depression, almost flat, its lower margin slightly rounded. Mandible small, evenly narrowed towards apex. Malar space half as long as basal width of mandible. Antenna 0.5 times as long as body; flagellum with 22 segments, all flagellomeres elongate.

Pronotum not impressed in dorsal part. Notaulus absent. Mesoscutum and mesopleuron punctate (punctures are finer and sparser than on face). Scutellum with distinct lateral carinae. Metapleuron entirely with dense longitudinal striae, bare (Fig. 1). Propodeum with parallel dorsal longitudinal carinae. Propodeal spiracle small, round, adjacent to pleural carina. Fore wing with nervulus almost interstitial.

Metasoma in dorsal view with lateral edges subparallel, coarsely and densely punctate. Tergite 1 with distinct dorsal and lateral longitudinal carinae. Tergites 2 and 3 with weak and hardly visible (finer on tergite 3) dorsal and lateral longitudinal carinae.

C o l o u r . Body black; face, clypeus, malar space, lateral marks in lower part of frons, mandible, labial and maxillary palpi, scape and pedicel ventrally yellow; tegula, flagellum of antenna and pterostigma black; fore and mid legs yellowish brown, fore coxa and femur black; hind leg black, base of tibia and first tarsomere basally yellow.

M a l e . Unknown.

Type material. Holotype: female (SIZK), Russia, Belgorod Province, env. Nagol'noe, Aydar River, crenaceous slopes, 19.VII.2007 (A.G. Kotenko).

Etymology. The new species is named in honour of the well-known Russian entomologist Dmitri R. Kasparyan.

Exochus ignobilis **sp. n.**

(Figs 2, 5)

Comparison. The new species resembles *E. pilosus* Tolkanitz by having similar structure of the head and propodeum (costula absent, dorsal longitudinal carinae in anterior part of propodeum not curved, second lateral area of propodeum with setae), but differs by its bare metapleuron and other colour pattern of hind leg (hind femur and tibia entirely yellow-red, not darkened apically).

Description. M a l e . Body length 5.5 mm. Fore wing length 4.5 mm.

Head in dorsal view transverse, not narrowed behind eyes, its sides subparallel. Temple not convex, its length in lateral view somewhat less than transverse diameter of eye. Occipital carina dorsally not developed. Antenna as long as head

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and mesosoma combined; flagellum with 25 segments, all flagellomeres elongate. Clypeus not delineated from face, its lower margin weakly rounded below; height of clypeus and face combined larger than width of face. Face densely and coarsely punctate, shining; punctures on face denser than punctures on clypeus. Median triangular projection of face (between antennal sockets) short. Malar space as long as basal width of mandible.

Notaulus weak. Metapleuron shining, bare. Propodeum as in Fig. 5: areola fused with basal area; costula absent; dorsal longitudinal carina not curved, just slightly approaching each other in anteior part of propodeum; second lateral area with setae; propodeal spiracle small and round. Fore wing with nervulus weakly postfurcal. Hind leg with outer tibial spur shorter than apical width of tibia. Hind femur 2.6 times as long as broad.

Tergite 1 of metasoma with dorsal longitudinal carinae in its basal half. Tergite 3 with epipleura wedge-shaped, narrow.

C o l o u r . Body black. Face black, with transverse yellow band in upper part (Fig. 2); frons black, without yellow marks laterally, upper eye orbits without yellow marks. Mandible (except fuscous teeth), labial and maxillary palpi yellow. Flagellum and pterostigma fuscous. Tegula yellow. Legs yellow-red, hind coxa black.

F e m a l e . Unknown.

Type material. Holotype: male (ZISP), Russia, Primorskiy Territory, Spassk-Dal'niy, forest, meadows, 3–6.VII.1993 (S.A. Belokobylskij).

Etymology. From the Latin *ignobilis* (obscure).

Exochus dilutus sp. n.

(Fig. 7)

Comparison. Similar to *E. flavomarginatus* Holmgren and *E. limbatus* Tolkanitz by having the tergite 3 with wedge-shaped epipleura and yellow frontal eye orbits joining to yellow marks at top of eyes, but differs by the head and mesosoma extensively white-marked, whitish legs and propodeum without costula.

Description. F e m a l e . Body length 6.0 mm. Fore wing length 4.9 mm.

Head in dorsal view weakly transverse, strongly narrowed behind eyes; temple straight, in lateral view as long as transverse diameter of eye. Occipital carina developed laterally. Antenna slightly longer than head and mesosoma combined; flagellum not thickened basally, with 30 segments; all flagellomeres elongate. Face and clypeus fused, height of clypeus and face combined larger than width of face, face in profile weakly and evenly convex, densely punctate. Dorsal triangular projection of face (between antennal sockets) short. Clypeus with lower margin straight. Malar space 0.75 times as long as basal width of mandible.
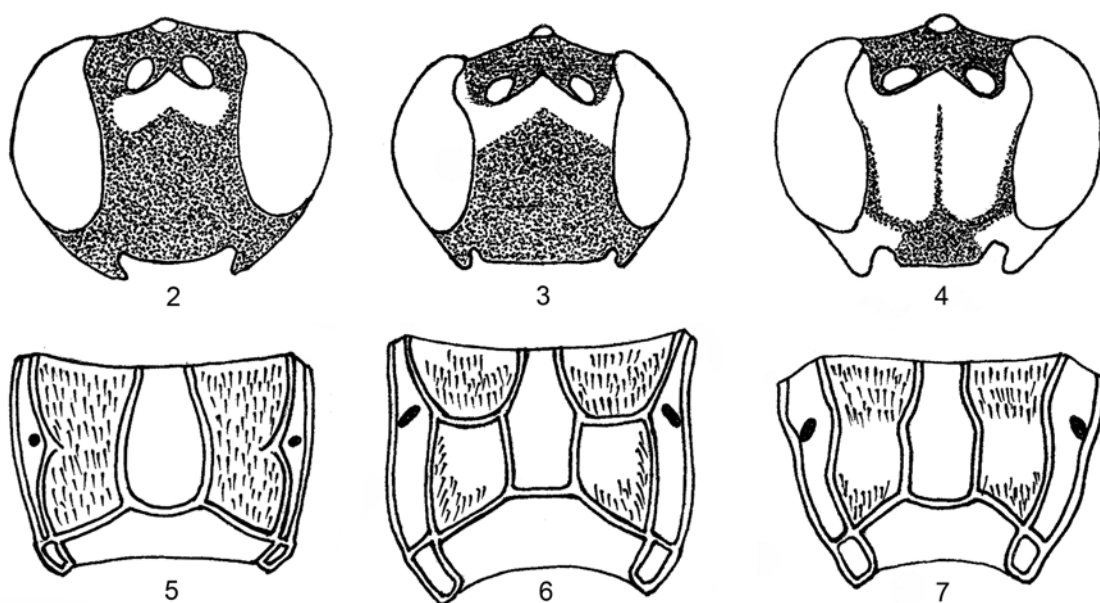
Figures 2–7. *Exochus ignobilis* **sp. n.** (2, 5), *E. dilutus* **sp. n.** (7) and *E. callus* **sp. n.** (3, 4, 6). 2–4 – head, front view; 5–7 – propodeum.

Notaulus as small rounded impression. Metapleuron smooth and shining, setose on its upper part. Propodeum as in Fig. 7: areola fused with basal area; costula absent; dorsal longitudinal carina curved at level of costula; second lateral area with a few setae on lower outer corner; propodeal spiracle small and oval. Fore wing with nervulus postfurcal. Hind leg with outer tibial spur shorter than apical width of tibia. Hind femur twice as long as broad.

Metasoma. Tergite 1 with dorsal longitudinal carinae in basal half. Tergite 3 with epipleura wedge-shaped, broad, with its inner margin straight.

Colour. Body predominantly black, with numerous pale marks on head and mesosoma; face, clypeus, malar space, mandible (except brownish teeth), labial and maxillary palpi, broad bands on frons laterally joining to marks at top of eyes, small mark on frons before middle ocellus, scape of antenna, margins of pronotum, pair of elongate marks on mesoscutum, tegula, subtegular ridge, lateral margins and mark in center of scutellum, and postscutellum yellowish. Flagellum yellow-red. Pterostigma fuscous. Metasomal tergites on hind margins and epipleura yellowish brown. All legs whitish, mid coxa darkened basally, hind coxa black.

M a l e . Unknown.

Type material. Holotype: female (ZISP), Kazakhstan, South Kazakhstan Province, Tulkibas District, ex *Pandemis chondrillana* (Herrich-Schaffer, 1860) (Tortricidae), V.1964 (Gudov).

Etymology. From the Latin *dilutus* (light).

Exochus callus sp. n.

(Figs 3, 4, 6)

Comparison. Similar to *E. castaniventris* Brauns and *E. aenigmatosus* Tolkanitz by having metasoma extensively red, but differs from both by the metapleuron with numerous setae (especially in male). Also differs from *E. castaniventris* by the face not convex and (in male) extensively yellow in upper part.

Description. F e m a l e . Body length 5.0 mm. Fore wing length 4.2 mm.

Head in dorsal view weakly transverse, narrowed behind eyes. Temple straight, in lateral view almost as long as transverse diameter of eye. Occipital carina present laterally and absent dorsally. Antennae broken. Face not convex, fused with clypeus, both coarsely and densely punctate; height of clypeus and face combined somewhat larger than width of face. Median triangular projection of face between antennal sockets short. Clypeus with lower margin straight. Malar space 0.75 times as long as basal width of mandible.

Notaulus weak. Metapleuron with short and sparse setae. Propodeum as in Fig. 6: areola fused with basal area; costula present; dorsal longitudinal carinae curved at level of costulae; second lateral area with setae in lower external corner; propodeal spiracle oval. Fore wing with nervulus weakly postfurcal. Hind leg with outer tibial spur as long as apical width of tibia. Hind femur 2.4 times as long as broad.

Tergite 1 with dorsal longitudinal carinae developed only in its basal half. Epipleura of tergite 3 semirounded.

C o l o u r . Head and mesosoma predominantly black; metapleuron and propodeum red; upper part of face (Fig. 3), frons laterally, triangular marks on upper eye orbits, malar space, mandible, labial and maxillary palpi, marks in posterior corners of pronotum, tegula and postscutellum yellow. Metasoma, all legs (hind tarsomeri slightly darkened apically), flagellum of antenna and pterostigma yellow-red.

M a l e . Fore wing length 3.5–5.0 mm. Flagellum with 31–33 segments. Differs from female by the metapleuron densely pubescent; upper part of face and lateral marks on clypeus (Fig. 4) and prepectus yellow; fore and mid coxae and trochanters; fore and mid femora apically and all tibiae basally paler than remaining part of legs, yellowish.

Etymology. From the Latin *callus* (pubescent).

Type material. Holotype: female (ZISP), Uzbekistan, Toshkent Province, Lunacharskoe, 12.VII.1955 (A. Luzhetskiy).

Paratypes. Tajikistan: 2 males (SIZK), Shaartuz District, Chelicherchashme, 5.IV.1979 (V. Odnosum); 1 male (SIZK), same locality, 8.IV.1979 (A.G. Kotenko); 1 male (ZISP), same locality, 9.IV.1979 (M. Nesterov); 1 male (SIZK), Maruzorskie Lakes, Khut'er Lake, 9.VI.1986 (V. Dolin). Kazakhstan: 2 males (SIZK), Almaty Prov., Uygur District, Charynskiy Nature Reserve, 22.V.1990 (V.M. Ermolenko).

Distribution. Uzbekistan, Tajikistan, South Kazakhstan.

Exochus pilosus Tolkanitz, 2003

Material examined. 1 female (ZISP), Russia, Primorskiy Territory, 30 km SE Ussuriysk, Ussuriysk Nature Reserve, forest, meadows, 13–14.VI.1993 (S.A. Belokobylskij).

Remarks. Female is recorded here for the first time. Female is similar to male (Tolkanitz, 2003) except following characters: fore and middle legs uniformly yellowish red, but coxae black; hind femur and tibia yellowish red, but darkened apically; flagellum not thickened with elongated flagellomeres.

References

T o l k a n i t z   V . I . 2003. New species of parasitoid wasps of the genus *Exochus* (Hymenoptera, Ichneumonidae, Metopiinae) from Far East of Russia. Report 1. *Zoologicheskiy Zhurnal*, **82**(9): 1075–1085. (In Russian.)

T o l k a n i t z   V . I . 2007. Ichneumon flies of the genus *Exochus* Gravenhorst (Hymenoptera: Ichneumonidae: Metopiinae) of the fauna of the Palaearctic region. *Russian Entomological Journal*, **16**(3): 339–358. (In Russian.)

T o l k a n i t z   V . I . 2010. Ichneumon flies of the genus *Trieces* (Hymenoptera, Ichneumonidae, Metopiinae) of the fauna of the Palaearctic region. *Zoologicheskiy Zhurnal*, **89**(6): 1–8. (In Russian.)

Study of Xoridinae (Hymenoptera: Ichneumonidae) in the Ukrainian Carpathians. Genera *Odontocolon* Cushman and *Ischnoceros* Gravenhorst

A. Varga

Исследование Xoridinae (Hymenoptera: Ichneumonidae) Украинских Карпат. Роды *Odontocolon* Cushman и *Ischnoceros* Gravenhorst

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Abstract. Species of the genera *Odontocolon* Cushman, 1942 and *Ischnoceros* Gravenhorst, 1829 in the Ukrainian Carpathians are reviewed. All eight found species are new records for this region. *Ischnoceros caligatus* (Gravenhorst, 1829), *Odontocolon punctulatum* (Thomson, 1877), *O. rufiventris* (Holmgren, 1860) and *O. spinipes* (Gravenhorst, 1829) are new records for the fauna of Ukraine. Diagnostic features, illustrations and key to species are provided.

Key words. Parasitoids, Ichneumonidae, Xoridinae, Ukraine, Carpathians, new records, key.

Резюме. Дан обзор родов *Odontocolon* Cushman, 1942 и *Ischnoceros* Gravenhorst, 1829 Украинских Карпат. Все 8 приведенных видов являются новыми для этого региона. *Ischnoceros caligatus* (Gravenhorst, 1829), *Odontocolon punctulatum* (Thomson, 1877), *O. rufiventris* (Holmgren, 1860) и *O. spinipes* (Gravenhorst, 1829) впервые указаны для фауны Украины. В статье приводятся диагностические признаки, иллюстрации и таблица для определения видов.

Ключевые слова. Паразитоиды, Ichneumonidae, Xoridinae, Украина, Карпаты, новые находки, определительный ключ.

Introduction

Xoridinae is one of the smallest subfamilies of Ichneumonidae, being represented by four genera and 220 species worldwide, with only three genera and 49 species in Western Palaearctic (Yu *et al.*, 2012).

Three species of the genus *Odontocolon*, *O. geniculatum* (Kriechbaumer, 1889), *O. dentipes* (Gmelin, 1790) and *O. quercinum* (Thomson, 1877), were recorded from Ukraine by Meyer (1934). Kasparyan (1981) recorded eleven Xoridinae species from the territory of Ukraine: *Ischnoceros rusticus* (Geoffroy, 1785), *Odontocolon quercinum* (Thomson, 1877) and *O. thomsoni* (Clément, 1938), and eight species of *Xorides*. The present study provides a list of species belonging to the genera *Odontocolon* and *Ischnoceros*, which includes eight species firstly recorded from the territory of the Ukrainian Carpathians, four of them are new records for Ukraine.

Probably all species of these genera, like all xoridines, are idiobiont ectoparasitoids of larvae of wood-boring beetles, mainly Cerambycidae and Buprestidae (Campadelli, Scaramozzino, 1994; Aubert, 1969; Hilszczanski, 2002; Constantineanu, Pisica, 1977; Sheng, Sun, 2010).

Material and methods

This study is mainly based on specimens collected by the author in the Ukrainian Carpathians in 2009–2013 by sweep netting and using Tereshkin's traps (TT) (Tereshkin, 1990) and yellow pan traps (YPT). The material of the collection of the Vasyl Stefanyk Precarpathian National University in Ivano-Frankivsk also was studied. *Ovipositor – hind tibia index* (OTI) is the ratio of the length of ovipositor projecting beyond the apex of metasoma to length of hind tibia. Specimens were identified using Kasparyan's (1981) key. Species diagnosis are mainly based on material examined by the author. General distribituonal is given after Yu with co-authors (2012). Key to species of *Odontocolon* is based on the key by Kasparyan (1981).

Key to genera of Xoridinae of Ukrainian Carpathians

1. Hind femur with strong median ventral tooth .... ***Odontocolon***
–   Hind femur without a strong median ventral tooth..2
2. Frons without strong median horn. Mandible with one tooth .... ***Xorides***
–   Frons with a strong median horn. Mandible with two teeth...***Ischnoceros***

Key to European species of *Ischnoceros*

1. Frons between horn and inner margin of eye sparsely punctate (Fig. 1). Hind leg with femur fuscous apically; coxa of male black, first tarsal segment pale basally......................***I. caligatus*** (Gravenhorst)
–   Frons between horn and inner margin of eye rugulose-punctate (Fig. 2). Hind leg with femur entirely red; coxa of male red, first tarsal segment not pale basally................................. ***I. rusticus*** (Geoffroy)
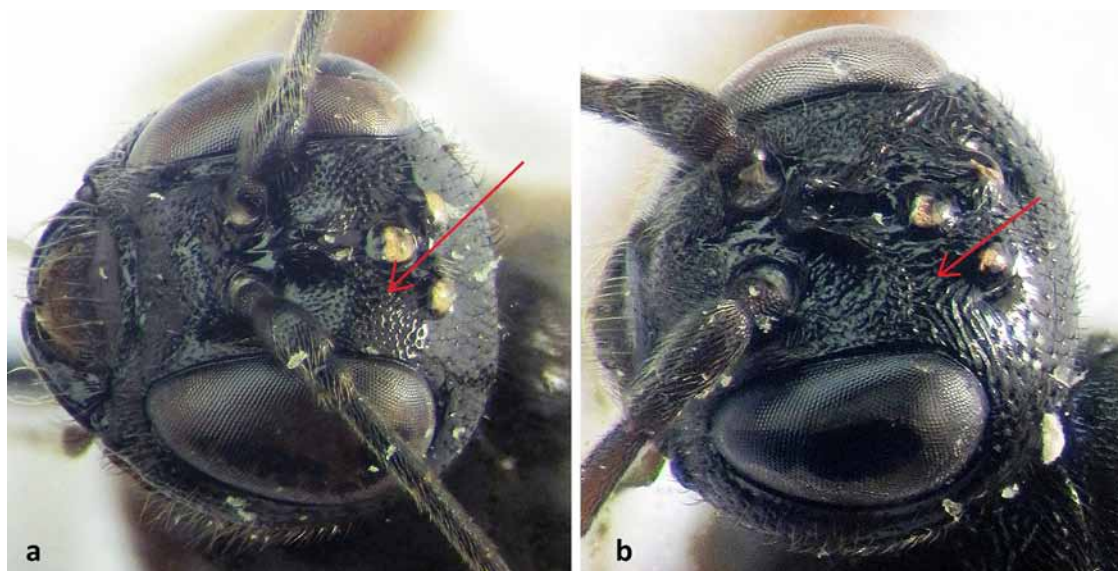
Figures 1, 2. Head of female, dorsal view of *Ischnoceros caligatus* (1) and *I. rusticus* (2).

Ischnoceros caligatus (Gravenhorst, 1829)

(Fig. 1)

Material examined (6 ♀♀, 12 ♂♂). Ukraine, Ivano-Frankivsk Province, Bogorodchany District: Mochary, 5 km NE of Bogorodchany, 48°50'51.17"N, 24°35'26.91"E, 300–350 m, mixed forest, YPT, TT; Zhbyr, 7–8 km SW of Bogorodchany, 48°47'4.92"N, 24°28'46.45"E, 400 m, mixed forest, YPT; Dibrova, 5 km SW of Bogorodchany, 48°46'10.35"N, 24°30'20.28"E, 310 m, oak forest (Varga coll.).

Diagnosis. F e m a l e . Fore wing length 7.0–10.0 mm. Antenna with 29–33 flagellomeres. Head with temples parallel to widened backwards. Face finely and frons between horn and inner margin of eye sparsely punctate (Fig. 1). Pronotum rugose, additionally sparsely punctate. Mesopleuron with blurred punctation and mesoscutum rugulose-punctate. Propodeum with well defined carinae and weak lateromedian apophyses; dorsal surface of propodeum rugulose-punctate; areola pentagonal, elongate. Metapleuron rugose, matt. Tergites of metasoma aciculate, without punctation, sometimes tergite 1 rugulose. Body and antenna black. Legs generally reddish except fuscous last tarsomeres, hind femur apically, tibia and tarsus entirely fuscous, tibia basally cream colour. Pterostigma fuscous. OTI 0.9–1.4.

M a l e . Fore wing length 6.0–7.0 mm. Antenna with 26–28 flagellomeres. Body sculpture and colouration mostly as in female. Dorsal surface of propodeum finely punctate, polished. All tibiae and tarsomere 1 of hind tarsus basally cream, hind coxa and trochanter black.

Flight period in Carpathians. From mid of April to mid of July, with peak in the second third of May.

Hosts. Cerambycidae: *Acanthocinus xanthoneurus* Mulsant et Rey, *Callidiellum rufipenne* (Motschulsky) (Campadelli, Scaramozzino, 1994); *Arhopalus rusticus* L. (Ozols, 1961); *Aromia moschata* L., *Leiopus nebulosus* L., *Rhagium bifasciatum* F., *Rh. inquisitor* L., *Rh. mordax* De Geer (Aubert, 1969); *Molorchus minor* L., *Oplosia fennica* Paykull, *Tetropium gabrieli* Weise (Hilszczanski, 2002); *Saperda carcharias* L. (Constantineanu et Pisica, 1977).

Distribution. Ukraine (**first record**); Europe, Caucasus, Russia (Western Siberia).

Ischnoceros rusticus (Geoffroy, 1785)

(Fig. 2)

Material examined (7 ♀♀, 12 ♂♂). Ukraine, Ivano-Frankivsk Province, Bogorodchany District: Mochary, 5 km NE of Bogorodchany, 48°50'51.17"N, 24°35'26.91"E, 300–350 m, mixed forest, TT; Zhbyr, 7–8 km SW of Bogorodchany, 48°47'4.92"N, 24°28'46.45"E, 400 m, mixed forest, TT; Dibrova, 5 km SW of Bogorodchany, 48°46'10.35"N, 24°30'20.28"E, 310 m, oak forest; Gorgany, 5 km SW of Stara Guta, 48°36'42.77"N, 24°09'10.69"E, 1200 m, coniferous forest (Varga coll.).

Diagnosis. F e m a l e . Fore wing length 8.0–11.0 mm. Antenna with 30–34 flagellomeres. Head with temples parallel to slighty narrowed backwards. Face and frons between horn and inner eye margin rugulose-punctate (Fig. 2). Pronotum rugose, sparsely punctate. Mesopleuron and mesoscutum finely punctate, polished, shiny. Propodeum with well defined carinae and lateromedian apophyses, dorsal surface of propodeum rugulose-punctate; areola pentagonal. Metapleuron rugose, matt. Tergites of metasoma aciculate, without punctation. Body black, antenna brownish. Fore and mid legs generally reddish yellow except fuscous last tarsomeres, hind legs red, tibia and tarsus fuscous, tibia basally cream. Pterostigma fuscous. OTI 1.3–1.7.

M a l e . Fore wing length 7.0–9.0 mm. Antenna with 29 flagellomeres. Body sculpture and colouration mostly as in female. Tergite 1 of metasoma rugulose.

Flight period in Carpathians. From end of April to early August, with peak in second third of May.

Hosts. Reared in Europe from *Acanthoderes clavipes* Schrank, *Aromia moschata* L., *Morimus asper* (Sulzer), *Rhagium inquisitor* L. (Cerambycidae), *Buprestis haemorrhoidalis araratica* Marseul (Buprestidae) (Campadelli, Scaramozzino, 1994), *Saperda carcharias* L. (Hilszczanski, 2002), *S. punctata* L., *S. scalaris* L. (Cerambycidae) (Campadelli, Scaramozzino, 1994). Reared in China from *Acanthocinus aedilis* L. and *Stenocorus* sp. (Cerambycidae) (Sheng, Sun, 2010).

General distribution. Europe, China.

Key to European species of *Odontocolon*
(modified from Kasparyan, 1981)

1. Female 2
– Male 10
2. Mid tibia with an oblique groove postero-ventrally 3
– Mid tibia without an oblique groove postero-ventrally 8
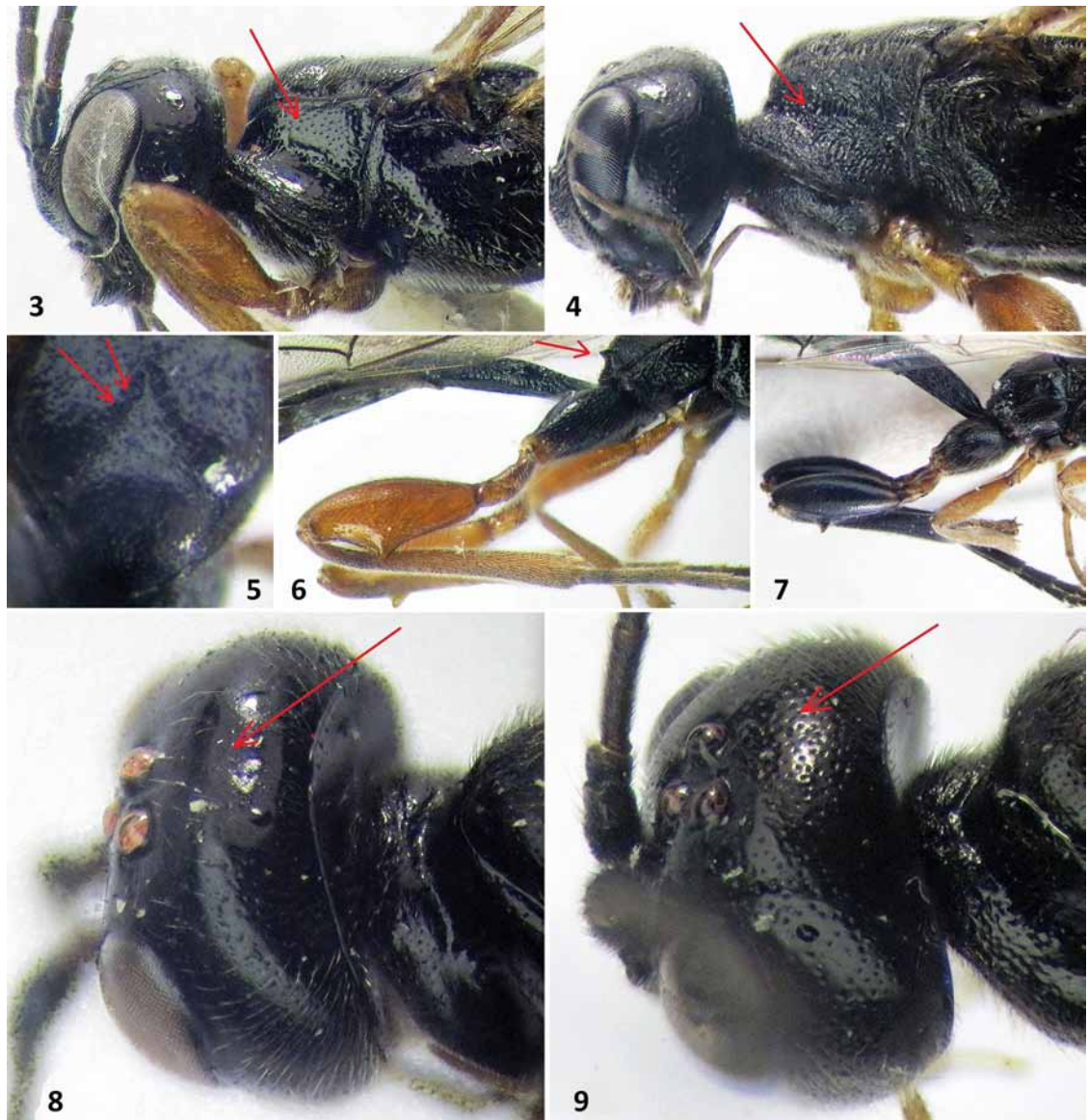
Figures 3–9. *Odontocolon dentipes* (3, 6), *O. punctulatum* (4), *O. quercinum* (5), *O. geniculatum* (7, 9) and *O. spinipes* (8). 3, 4 – head and anterior part of mesosoma, lateral view (female); 5 – mesoscutum, dorsal view (male); 6, 7 – propodeum and hind legs, lateral view (male); 8, 9 – vertex (male).

3. Metasoma (exept tergite 1) red. Hind femur black, hind tibia red.................***O. rufiventris*** (Holmgren)
– Metasoma entirely black or brownish. If hind femur black, then hind tibia also black 4
4. Hind femur entirely, fore and mid femora at least partly black..5
– All femora entirely red 6
5. Pronotum laterally rugose. Ovipositor as long as body .... ***O. hungaricum*** (Clément)
– Pronotum laterally smooth, shiny. Ovipositor shorter than body. – OTI 2.5–2.7..... ***O. spinipes*** (Grav.)
6. Hind tibia fuscous, apically cream. Hind femur in apical 0.15–0.2 usually fuscous ....
   ....***O. geniculatum*** (Kriechbaumer)
– Hind tibia entirely red...7

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7. Pronotum laterally (Fig. 4) and dorsal surface of propodeum rugose, matt..***O. punctulatum*** (Thomson)
– Pronotum laterally smooth, shiny, apically sparsely punctate and sometimes with single wrinkles (Fig. 3) ....***O. dentipes*** (Gmelin)

8. Hind tibia without long erect setae. Tergite 1 longitudinally wrinkled .... ***O. appendiculatum*** (Grav.)
– Hind tibia with single long erect setae. Tergite 1 punctate 9

9. First flagellomere apically swollen. Tergite 2 transverse, sparsely punctuate..***O. quercinum*** (Thomson)
– First flagellomere not swollen apically. Tergite 2 quadrate, closely punctate ....***O. thomsoni*** (Clément)

10. Hind femur black (Fig. 7). Notauli without transverse wrinkles 11
– Hind femur red to brownish (Fig. 6).. 13

11. Metasoma (except tergite 1 or sometimes tergite 2) red .... ***O. rufiventris*** (Holmgren)
– Metasoma black... 12

12. Fore and mid femora at least partly fuscous. Vertex anteriorly very sparsely punctate, behind ocelli impunctate, shiny (Fig. 8) ....***O. spinipes*** (Gravenhorst)
– Fore and mid femora yellowish red. Vertex more densely punctate, including surface behind ocelli (Fig. 9) ....***O. geniculatum*** (Kriechbaumer)

13. Notauli without transverse wrinkles 14
– Notauli with transverse wrinkles (Fig. 5).. 15

14. Body generally and hind coxa black. Propodeum with strong lateromedian apophyses (Fig. 6). Antenna with 33–36 flagellomeres ....***O. dentipes*** (Gmelin)
– Body at least partly and hind coxa reddish brown (the same colouration as hind femora). Small specimens. Propodeum without strong lateromedian apophyses. Antenna with 29–31 flagellomeres... ***Odontocolon*** sp.

15. Pronotum laterally and dorsal surface of propodeum rugose, matt. – Tergite 2 basally longitudinally wrinkled ....***O. punctulatum*** (Thomson)
– Pronotum laterally and dorsal surface of propodeum smooth, shiny 16

16. Tergite 2 rugulose medially. Pterostigma yellowish brown .... ***O. appendiculatum*** (Gravenhorst)
– Tergite 2 at least partly punctate. Pterostigma fuscous 17

17. Tergite 2 basally very sparsely punctate. Metasoma brownish .... ***O. quercinum*** Thomson
– Tergite 2 rugulose-punctate. Metasoma black..***O. thomsoni*** (Clément)

Odontocolon dentipes (Gmelin, 1790)

(Figs 3, 6)

Material examined (11 ♀♀, 141 ♂♂). Ukraine, Ivano-Frankivsk Province, Bogorodchany District: Mochary, 5 km NE of Bogorodchany, 48°50′51.17″N, 24°35′26.91″E, 300–350 m, mixed forest; Zhbyr, 7–8 km SW of Bogorodchany, 48°47′4.92″N, 24°28′46.45″E, 400 m, mixed forest, YPT, TT; Dibrova, 5 km SW of Bogorodchany, 48°46′10.35″N, 24°30′20.28″E, 310 m, oak forest; Zhuraky, 8 km S of Bogorodchany, 48°44′26.65″N, 24°30′13.46″E, 450–500 m, mixed forest; Gorgany, 5 km SW of Stara Guta, 48°36′42.77″N, 24°09′10.69″E, 1200 m, coniferous forest. Nadvirna District: Gorgany, Yavirnuk, 7–8 km SW of Yaremche, 48°24′53.86″N, 24°29′01.78″E, 1300–1350 m (Varga coll.).

Diagnosis. F e m a l e . Fore wing length 6.0–11.0 mm. Antenna with 27–31 flagellomeres. Face densely and frons sparsely punctate, shiny, vertex behind ocelli without punctation. Pronotum smooth, shiny, apically sparsely punctate and sometimes with single wrinkles (Fig. 3). Mesopleuron and mesoscutum sparsely punctate, polished, shiny. Propodeum with well defined carinae, dorsal surface of propodeum polished, shiny; metapleuron rugose, matt. Tergite 1 of metasoma wrinkled, apically smooth and sometimes reddish, tergites 2 and 3 entirely and tergite 4 basally aciculate. Body black, antenna brownish to black. Fore coxa red, mid coxa red, black basally, hind coxa brownish to black, all trochanters, femora, tibiae and tarsi red. Pterostigma fuscous. OTI 4.0–5.0.

M a l e . Fore wing length 6.0–8.0 mm. Antenna with 31–34 flagellomeres. Colouration and sculpture of head and mesosoma as in female. Notauli without transverse wrinkles. Propodeum with well defined carinae and strong lateromedian apophyses (Fig. 6), dorsal surface of propodeum polished, shiny, metapleuron sometimes rugulose. Tergites 1–3 of metasoma slightly wrinkled, tergite 1 sometimes reddish apically, tergite 3 apically and tergite 4 basally aciculate. Body and antenna black. Fore and mid coxae brownish, hind coxae black, all trochanters red to fuscous, all femora, fore and mid tibia and tarsus red, hind femur sometimes brown, hind tibia ventrally red, dorsally fuscous, hind tarsus fuscous (Fig. 6). Pterostigma brownish.

Flight period in Carpathians. From the end of April to the end of August, with peak in May.

Hosts. Cerambycidae: *Anastrangalia dubia* Scop., *Arhopalus rusticus* L. (Hilszczanski, 2002), *Spondylis buprestoides* L. (Aubert, 1969).

General distribution. Palaearctic region.

Odontocolon geniculatum (Kriechbaumer, 1889)

(Figs 7, 9)

Material examined (40 ♀♀, 270 ♂♂). Ukraine, Ivano-Frankivsk Province, Bogorodchany District: Mochary, 5 km NE of Bogorodchany, 48°50'51.17"N, 24°35'26.91"E, 300–350 m, mixed forest; Zhbyr, 7–8 km SW of Bogorodchany, 48°47'4.92"N, 24°28'46.45"E, 400 m, mixed forest, YPT, TT; Dibrova, 5 km SW of Bogorodchany, 48°46'10.35"N, 24°30'20.28"E, 310 m, oak forest; Gorgany, 11–12 km SW of Stara Guta, 48°33'32.30"N, 24°07'41.34"E, 1250–1300 m; 5 km SW of Stara Guta, 48°36'42.77"N, 24°09'10.69"E, 1200 m, coniferous forest; Nadvirna District: Gorgany, Yavirnuk, 7–8 km SW of Yaremche, 48°24'53.86"N, 24°29'01.78"E, 1300–1350 m; Gorgany, Elmy, 15 km SW of Yaremche, 48°24'39.50"N, 24°24'50.28"E, 800–900 m, coniferous forest; Chornogora, 48°08'09.63"N, 24°32'32.14"E, 1600 m, coniferous forest; Transcarpathian Province, Rakhiv District: slopes of Sheshul Mt., 6–7 km E of Kvasy, 48°09'23.13"N, 24°21'27.15"E, 1400–1500 m, subalpine zone (Varga coll.).

Diagnosis. F e m a l e . Fore wing length 7.0–12.0 mm. Antenna with 35–40 flagellomeres. Face densely, frons sparsely punctate, shiny, vertex behind ocelli finely punctate (Fig. 9). Pronotum smooth, shiny, with single wrinkle. Mesopleuron and mesoscutum finely punctate. Propodeum with well defined carinae, dorsal surface of propodeum polished, shiny, metapleuron rugulose-punctate. Tergite 1 of metasoma rugulose, tergite 2 rugulose-punctate, remaining metasoma polished. Body and antenna black. Fore and mid coxa reddish brown, hind coxa black, sometimes red apically, remaining fore and mid legs and hind trochanters, trochantelli and femora red, hind tibia fuscous, basally cream, hind tarsus and femur apically fuscous. Pterostigma fuscous. OTI 4.4–4.7.

M a l e . Fore wing length 5.0–11.0 mm. Antenna with 37–41 flagellomeres. Sculpture and colouration of head and mesosoma as in female. Propodeum without well defined lateromedian apophyses. Tergite 1 of metasoma rugulose, with vague punctation, tergite 2 rugulose centrally and punctate apically, remaining metasoma polished. Fore and mid coxae reddish brown, remaining fore and mid legs red, hind coxa, femur and tibia black, trochanter and trochantellus red with fuscous spots (Fig. 7). Pterostigma brownish.

Flight period in Carpathians. From the begining of May to the mid of July, with peak in the second half of May.

Hosts. Reared in China from *Acanthocinus* sp. and *Monochamus saltuarius* (Gebler) (Cerambycidae) (Sheng, Sun, 2010).

General distribution. Central and Eastern Europe, Eastern Palaearctic.

Odontocolon punctulatum (Thomson, 1877)

(Fig. 4)

Material examined (4 ♀♀, 7 ♂♂). Ukraine, Ivano-Frankivsk Province, Bogorodchany District: Dibrova, 5 km SW of Bogorodchany, 48°46'10.35"N, 24°30'20.28"E, 310 m, oak forest; Zhbyr, 7–8 km SW of Bogorodchany, 48°47'4.92"N, 24°28'46.45"E, 400 m, mixed forest; Gorgany, 5 km SW of Stara Guta, 48°36'42.77"N, 24°09'10.69"E, 1200 m, coniferous forest. Nadvirna District: Gorgany, Elmy, 15 km SW of Yaremche, 48°24'39.50"N, 24°24'50.28"E, 800–900 m, coniferous forest (Varga coll.).

Diagnosis. F e m a l e . Fore wing length 6.0–8.0 mm. Antenna with 31–33 flagellomeres. Face densely, frons and vertex sparsely punctate, shiny. Pronotum rugose (Fig. 4). Mesoscutum sparsely, mesopleuron very sparsely punctate, centrally without punctation, shiny. Propodeum with well defined carinae, dorsal surface and metapleuron rugulose-punctate. Tergite 1 of metasoma rugulose, tergites 2 and 3 basally finely aciculate. Body, pterostigma and antenna brownish, legs red. OTI 5.1–5.8.

M a l e . Fore wing length 5.0–6.0 mm. Antenna with 31–33 flagellomeres. Sculpture and colouration of head and mesosoma as in female. Epomia absent. Notauli with transverse wrinkles. Tergite 1 rugulose, black, tergite 2 entirely and tergite 3 basally with longitudinal wrinkles. Head, mesosoma and antenna brownish to black. Coxae brownish.

Flight period in Carpathians. From the end of May to the mid of July.

Hosts. *Mesites tardyi* (Curtis) (Curculionidae) (Aubert, 1969).

General distribution. Ukraine (**first record**); Western Palaearctic (rare species).

Odontocolon quercinum (Thomson, 1877)

(Fig. 5)

Material examined. Ukraine, Ivano-Frankivsk Province, Bogorodchany District, unknown locality, VII.2011, 1 ♂.

Diagnosis. M a l e . Fore wing length 5.0 mm. Antenna with 20 flagellomeres. Face densely, frons and vertex sparsely punctate, shiny. Pronotum with single wrinkle, polished. Mesoscutum punctate, notauli with transverse wrinkles (Fig. 5), mesopleuron sparsely punctate, shiny. Propodeum with well defined carinae, dorsal surface and metapleuron with indistinct transverse stripes, shiny. Tergite 1 longitudinally wrinkled, basally black, remaining metasoma very sparsely punctate, smooth and shiny, reddish brown. Head and mesosoma black, antenna brownish. Fore and mid legs reddish brown, hind legs red, coxae brownish. Pterostigma brownish.

Hosts. *Buprestis haemorrhoidalis araratica* Marseul (Buprestidae), *Hylotrupes bajulus* L. (Cerambycidae) (Campadelli, Scaramozzino, 1994), *Monochamus galloprovincialis* (Olivier) (Cerambycidae) (Meyer, 1934; Constantineanu, Pisica, 1977).

General distribution. Western Palaearctic.

Odontocolon rufiventris (Holmgren, 1860)

Material examined. Ukraine, Ivano-Frankivsk Province, Bogorodchany District, Zhbyr, 7–8 km SW of Bogorodchany, 48°47'4.92"N, 24°28'46.45"E, 400 m, mixed forest, 18.V.2011 (Varga coll.), 1 female.

Diagnosis. F e m a l e . Fore wing length 7.0 mm. Antenna with 28 flagellomeres. Face densely, frons sparsely punctate, shiny, vertex behind ocelli without punctation. Pronotum and mesopleuron sparsely punctate, shiny, polished, centrally without punctation. Mesoscutum sparsely punctate. Propodeum with well defined carinae and strong lateromedian apophyses, dorsal surface polished, shiny, metapleuron with indistinct transverse stripes. Tergite 1 with indistinct sculpture, slighty wrinkled, black, remaining metasoma smooth and shiny, reddish. Head, mesosoma and antenna black. All coxae, hind trochanters and femora black, fore and mid femora and trochanters brownish, tibia and tarsus yellowish brown, hind trochantellus and tibia red, hind tarsus fuscous. Pterostigma brownish. OTI 3.95.

Hosts. *Conopalpus testaceus* (Olivier), *Hypulus bifasciatus* F. (Melandryidae) (Hilszczanski, 2002).

General distribution. Ukraine (**first record**); Western Palaearctic (rare species).

Odontocolon spinipes (Gravenhorst, 1829)

(Fig. 8)

Material examined (6 ♀♀, 33 ♂♂). Ukraine, Ivano-Frankivsk Province, Bogorodchany District: Mochary, 5 km NE of Bogorodchany, 48°50'51.17"N, 24°35'26.91"E, 300–350 m, mixed forest; Zhbyr, 7–8 km SW of Bogorodchany, 48°47'4.92"N, 24°28'46.45"E, 400 m, mixed forest; Gorgany, 5 km SW of Stara Guta, 48°36'42.77"N, 24°09'10.69"E, 1200 m, coniferous forest; 11–12 km SW of Stara Guta, 48°33'32.30"N, 24°07'41.34"E, 1250–1300 m, coniferous forest; Nadvirna District: Gorgany, Elmy, 15 km SW of Yaremche, 48°24'39.50"N, 24°24'50.28"E, 800–900 m, coniferous forest, TT (Varga coll.).

Diagnosis. F e m a l e . Fore wing length 7.0–9.0 mm. Antenna with 35–36 flagellomeres. Face densely, frons sparsely punctate, shiny, vertex behind ocelli very sparsely punctate (Fig. 8). Pronotum smooth, shiny, with single wrinkle. Mesopleuron and mesoscutum sparsely punctate. Propodeum with well defined carinae, dorsal surface polished, shiny, metapleuron with blurred punctation. Tergites 1 and 2 slightly rugose, apically polished, tergite 3 slightly aciculate, remaining metasoma polished. Body generally, antenna, fore and mid coxae, trochanters and trochantelli black, tibiae and tarsi entirely, femora partly brownish, hind legs black. Pterostigma fuscous. OTI 2.5–2.7.

M a l e . Fore wing length 5.0–11.0 mm. Antenna with 33–39 flagellomeres. Body as in female. Propodeum with weak lateromedian apophyses. Fore and mid coxae brownish apically, hind trochanter and trochantellus from red to black.

Flight period in Carpathians. From the begining of May to the mid of July, with peak in the second half of May.

Hosts. *Pogonocherus hispidus* L. (Constantineanu, Pisica, 1977), *Rhagium inquisitor* L., *Rh. sycophanta* (Schrank) (Cerambycidae) (Kazmierczak, 1993).

General distribution. Ukraine (**first record**); Palaearctic region.

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***Odontocolon* sp.**

Material examined (46 ♂♂). Ukraine, Ivano-Frankivsk Province, Bogorodchany District: Mochary, 5 km NE of Bogorodchany, 48°50'51.17"N, 24°35'26.91"E, 300–350 m, mixed forest; Zhbyr, 7–8 km SW of Bogorodchany, 48°47'4.92"N, 24°28'46.45"E, 400 m, mixed forest; Dibrova, 5 km SW of Bogorodchany, 48°46'10.35"N, 24°30'20.28"E, 310 m, oak forest; Gorgany, 11–12 km SW of Stara Guta, 48°33'32.30"N, 24°07'41.34"E, 1250–1300 m, coniferous forest. Nadvirna District: Gorgany, Elmy, 15 km SW of Yaremche, 48°24'39.50"N, 24°24'50.28"E, 800–900 m, coniferous forest. Transcarpathian Region, Rakhiv District: slopes of Sheshul Mt., 6–7 km E of Kvasy, 48°09'23.13"N, 24°21'27.15"E, 1400–1500 m, subalpine zone; Svydovets, 2–3 km NW of Kvasy, 48°09'08.89"N, 24°15'58.35"E, 850–900 m, beech forest, TT (Varga coll.).

Flight period in Carpathians. Begining of May to mid of July, with peak in May.

Remarks. Several small male specimens with fore wing length 4.0–6.0 mm and antenna with 29–31 flagellomeres were collected. The body colouration varies but always at least hind femur entirely and metasoma partly reddish brown. These specimens is closely related to *O. spinipes* and *O. geniculatum* and it's probably only the brownish forms of these two species, but with very variable punctation of vertex and colouration of fore and mid femora. These small brownish (at least with reddish brown hind femur) specimens differ from black ones with the same size (at most with metasoma apically brownish) in the number of flagellomeres (at least 35–36 flagellomeres, the same number as in the typical specimens of *O. spinipes* and *O. geniculatum*). So, based on this fact, I can't include these specimens to any known species of the genus *Odontocolon*.

Acknowledgements

References

A u b e r t J . F . 1969. *Les Ichneumonides ouest-palearctiques et leurs hotes 1. Pimplinae, Xoridinae, Acaenitinae*. Paris: Laboratoire d'Evolution des Etres Organises. 302 p.

C a m p a d e l l i G . , S c a r a m o z z i n o P . L . 1994. Imenotteri parassitoidi di insetti xilofagi in in Romagna. *Bollettino dell'Istituto di Entomologia della Universita degli Studi di Bologna*, **48:** 115–121.

C o n s t a n t i n e a n u M . I . , P i s i c a C . 1977. Hymenoptera. Familia Ichneumonidae. Subfamiliile Ephialtinae, Xoridinae si Acaenitinae. Xoridinae si Acaenitinae. *Fauna Republicii Socialiste Romania*, **9**(7): 1–305.

H i l s z c z a n s k i J . 2002. Polish xoridines and their host associations (Hymenoptera: Ichneumonidae: Xoridinae). *In*: M e l i k a G . , T h u r o c z y C . *Parasitic wasps: evolution, systematics, biodiversity and biological control. International Symposium: "Parastic Hymenoptera: Taxonomy and Biological Control" (14–17 May 2001, Koszeg, Hungary)*: 294–298.

K a s p a r y a n D . R . 1981. Subfamily Xoridinae. *In*: M e d v e d e v G . S . (Ed.). *Key to insects of European part of the USSR. Volume 3. Hymenoptera. Part 3*. Leningrad: Nauka: 168–174. (In Russian.)

K a z m i e r c z a k T . 1993. Ichneumonidae (Hymenoptera) of selected regions of southern Poland. *Acta Zoologica Cracoviensia*, **36**(1): 77–120.

M e y e r N . F . 1934. *Parasitic Hymenoptera of the family Ichneumonidae of the USSR and adjacent countries. Volume 3*. Leningrad: USSR Academy of Sciences Publishing House. 271 p. (In Russian.)

O z o l s E . Y a . 1961. Parasitic wasps of the family Ichneumonidae reared from insects of Latvia. *Latvijas Entomologs*, **3:** 1–18. (In Russian.)

S h e n g M . L . , S u n S . P . 2010. *Parasitic ichneumonids on woodborers in China (Hymenoptera: Ichneumonidae)*. Beijing: Science Press. 338 p. (In Chinese with English summary.)

T e r e s h k i n A . M . 1990. *A trap for the xylobiontes and theirs parasites*. http://tereshkin.info/papers/a-trap-for-the-xylobiontes-and-theirs-parasites.html

T o w n e s H . K . 1969. The genera of Ichneumonidae, part 1. *Memoirs of the American Entomological Institute*, **11:** 1–300.

Y u D . S . K . , v a n A c h t e r b e r g C . , H o r s t m a n n K . 2012. *Taxapad 2012, Ichneumonoidea 2011*. Database on flash-drive. www.taxapad.com, Ottawa, Ontario, Canada.

A new subgenus of the genus *Callihormius* Ashmead, 1900 (Hymenoptera: Braconidae: Doryctinae) from Mexico

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Новый подрод рода *Callihormius* Ashmead, 1900 (Hymenoptera: Braconidae: Doryctinae) из Мексики

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Abstract. New subgenus *Dmitriohormius* **subgen. n.** of the genus *Callihormius* Ashmead, 1900, with the type species *C. (D.) kasparyani* **sp. n.**, are described and illustrated from Mexico. The status and morphological peculiarities of new subgenus are discussed.

Key words. Braconidae, Doryctinae, *Callihormius*, *Aphelopsia*, Neotropical region, new subgenus, new species.

Резюме. Описан и иллюстрирован новый подрод *Dmitriohormius* **subgen. n.** рода *Callihormius* Ashmead, 1900 с типовым видом *C. (D.) kasparyani* **sp. n.** из Мексики. Обсуждаются статус и морфологические особенности нового подрода.

Ключевые слова. Braconidae, Doryctinae, *Callihormius*, *Aphelopsia*, Неотропическая область, новый подрод, новый вид.

Introduction

The Doryctinae (Hymenopters: Braconidae) is one of the most diverse braconid subfamilies in the Neotropical region, with numerous undescribed taxa at different taxonomic levels. The keys for New World genera (Marsh, 1993, 1997, 2002) does not cover the currently recognized doryctine generic diversity, especially for Central and South America, since several new genera have been already described after these publications (Braga *et al*., 2002; Gomes, Penteado-Dias, 2006; Nunes *et al*., 2012; Marsh *et al*., 2013; Zaldivar-Riveron *et al*., 2014).

The New World doryctine genus *Callihormius* Ashmead, 1900 was originally described from USA based on its type species *Pambolus bifasciatus* Ashmead, 1892 (Ashmead, 1900). Nine species of this genus are currently described for the American continent, which have been recorded to occur from USA (4 spp.), Costa Rica (3 spp.), Mexico (1 sp.), and St Vincent (1 sp.) (Marsh, 1966, 2002; Yu *et al*., 2012).

One species from India previously assigned to this genus, *C. orientalis* Kurhade (Kurhade, 2006), actually belongs to *Rhaconotus* Ruthe, 1854 (**comb. n.**).

The Neotropical genus *Aphelopsia* Marsh, 1993 (Marsh, 1993) was originally separated from *Callihormius* by the presence of a partly smooth surface of mesosoma. However, study of the Mexican as well as Neotropical material assigned to *Callihormius* has revealed that this genus is considerably polymorphic, having a high level of variation in various diagnostic morphological characters. Species of this genus considerably vary in the condition and property of such features as notauli, sternauli, scutellum, wing venation, body sculpture, and length of acrosternite (basal sternal plate) of the first metasomal segment. All these features, some of which had been previously noticed (Marsh, 2002: 58–59), suggest that *Aphelopsia* might represent a synonym of *Callihormius*.

On the other hand, morphological characters of described here a new subgenus *Dmitriohormius* **subgen. n.** of the genus *Callihormius* are very distinctive it from the nominative subgenus of *Callihormius*. Two most significant features of this subgenus are scutellum concave medially and with high lateral lobes, and mediocubital vein medially with oval sclerotised spot densely covered by long and thickened black setae forming subpyramidal construction (Figs 8, 9, 12). Both these characters are not only unknown for the members of *Callihormius*, but also have never been recorded in other doryctine genera and might be of generic level significance. Further material for this subgenus as well as additional molecular data will reveal the actual taxonomic status of this new taxon in future.

This paper as well as the names of described here the new subgenus and species are dedicated to the famous Russian hymenopterist Dr Dmitri R. Kasparyan, in honor to his valuable contribution to the study of Hymenoptera and to his 75th anniversary.

Taxonomic part

Genus *Callihormius* Ashmead, 1900

Ashmead, 1900: 148; Marsh, 1966: 240; Shenefelt, Marsh, 1976: 1268; Marsh, 2002: 58; Yu *et al.*, 2012.

Type species: *Pambolus bifasciatus* Ashmead, 1892.

Subgenus *Dmitriohormius* subgen. n.

Type species: *Callihormius* (*Dmitriohormius*) *kasparyani* sp. n.

Description. H e a d (Figs 3, 5, 6) not depressed, transverse. Ocelli arranged in triangle with base slightly larger than sides. Frons slightly concave, without median carina or furrow. Eyes glabrous. Occipital carina dorsally complete, not fused below with hypostomal carina and widely obliterated. Malar suture absent. Clypeus with distinct but short lower flange. Hypoclypeal depression medium size and round. Postgenal bridge very narrow. Maxillary palpi medium length, 6-segmented, labial palpi 4-segmented, third labial segment not shortened. Scape of antenna rather narrow and long, without apical lobe and basal constriction, its ventral margin (lateral view) shorter than dorsal margin. First flagellar segment subcylindrical, slightly curved outer, longer than second segment (Fig. 4).

M e s o s o m a not depressed (Fig. 8). Neck of prothorax rather short, without pronope. Pronotum dorsally distinctly convex; pronotal carina distinct and situated in anterior third; anterior flange wide and curved up. Propleural dorsoposterior flange long and wide. Mesonotum not highly and gently-roundly elevated above pronotum. Median lobe of mesonotum without median longitudinal furrow, without anterolateral corners. Notauli completely absent (Fig. 9). Prescutellar depression deep, with numerous (seven) carinae. Scuto-scutellar suture distinct and complete. Lateral longitudinal flanges on the level of prescutellar depression low. Scutellum distinctly concave on wide area, with high lateral lobes (Figs 10, 11). Subalar depression rather deep and wide. Mesopleural pit absent. Metanotum without median tooth (lateral view). Sternaulus (precoxal sulcus) shallow or very shallow, narrow, long, slightly curved. Prepectal carina distinct, almost absent laterally. Postpectal carina absent. Metapleural flange short, wide, rounded apically. Propodeum without areas delineated completely by carinae; lateral propodeal tubercles low and wide; propodeal bridge absent. Propodeal spiracles very small and round. Metapleural suture distinct; propodeum laterally near suture with wide concave longitudinal depression.

W i n g s (Figs 13–15). Pterostigma of fore wing wide. Radial vein arising before middle of pterostigma. Radial cell not shortened. Both radiomedial veins present. Second radiomedial cell long and rather wide. Recurrent vein slightly postfurcal. Nervulus distinctly postfurcal. Discoidal cell long petiolate anteriorly, strongly narrowed forwards. Recurrent vein very short; recurrent and basal veins distinctly divergent posteriorly. Mediocubital vein strongly curved towards anal vein in apical half, medially with oval sclerotised spot densely covered by long, erect, thickened black setae forming subpyramidal construction (Figs 12, 13, 15). Parallel vein interstitial. Brachial cell widely open postero-apically. Transverse anal veins

absent. Hind wing with three hamuli. First abscissa of costal vein 0.7 times as long as second abscissa. Radial vein arising from costal vein far from basal vein. Radial cell indistinct; radial vein very hyaline and developed only basally. Medial cell narrow, slightly widened towards apex, 0.3 times as long as hind wing. Nervellus present, oblique. Submedial cell large. First abscissa of mediocubital vein 1.8 times longer than second abscissa. Recurrent vein short, unsclerotised, almost perpendicular to mediocubital vein.
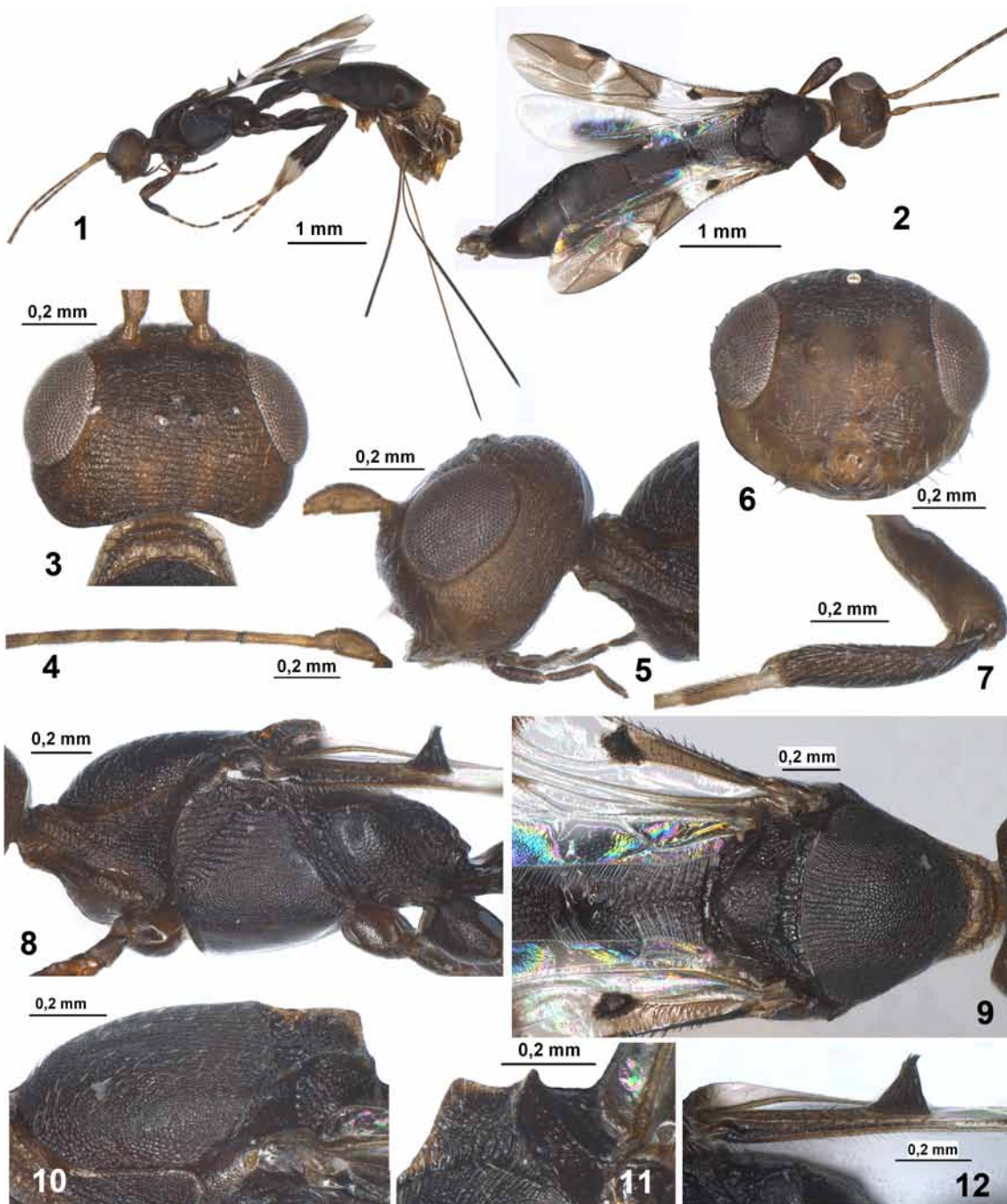
Figures 1–12. *Callihormius* (*Dmitriohormius*) *kasparyani* **sp. n.** (female, holotype). 1 – habitus, lateral view; 2 – habitus, dorsal view; 3 – head, dorsal view; 4 – basal segments of antenna; 5 – head, lateral view; 6 – head, front view; 7 – fore femur and tibia; 8 – mesosoma, lateral view; 9 – mesosoma, dorsal view; 10 – mesonotum, dorsolateral view; 11 – scutellum, anterolateral view; 12 – bunch of setae on fore wing.

L e g s . All tibia distinctly thickened, claviform (Figs 7, 16). Fore tibia with numerous, dense, short and thick spines arranged in almost single line. Middle tarsal segments long. Hind coxa short and rather wide, with distinct basoventral corner and tooth. Hind femur wide, slightly curved, without dorsal protuberance. Basitarsus of hind tarsus long, 0.55 times as long as second-fifth segments combined.

M e t a s o m a (Figs 19, 20). First tergite not petiolate, rather long and wide. Acrosternite of first segment elongated, about 0.3 times as long as first tergite, slightly not reaching spiracular levels. Dorsope of first tergite (Fig. 17) small and narrow, basolateral lobes absent. Spiracular tubercles fine, situated in basal 0.3 of tergite; dorsal carinae complete and rather distinct. Second tergite with very shallow and oblique sublateral furrows. Suture between second and third tergites (Fig. 17) shallow and narrow, but distinct, distinctly convex medially, with rather deep lateral breaks. Third tergite without transverse furrow. Second-sixth tergites with separate laterotergites. Fourth-sixth tergites submedially with transverse line of short, semi-erect pale setae. Hypopygium with short double process on medioposterior margin. Ovipositor long, longer than metasoma. Apical part of ovipositor dorsally with very shallow nodes (Fig. 18).

Distribution. Neotropical region (Mexico).

Etymology. Combination of the first name by Dr Dmitri R. Kasparyan and the second part of *Callihormius* generic name.

Key to subgenera of the genus *Callihormius*

1. Scutellum more or less distinctly convex, without lateral lobes. Mediocubital vein medially without sclerotised spot and without bunch of dense long, erect, and thickened black setae ....
....*Callihormius* s. str.

– Scutellum distinctly concave on wide median area, with high subvertical lateral lobes (Figs 10, 11). Mediocubital vein medially with oval sclerotised spot densely covered by long, erect, thickened black setae forming subpyramidal construction (Figs 12, 13, 15) ....***Dmitriohormius* subgen. n.**

Callihormius (*Dmitriohormius*) *kasparyani* sp. n.

(Figs 1–20)

Type material. Holotype: female, "México: Morelos, Tlaquiltenango, 2 km N Huaxtla, 18.390840° N 99.04836° W, Alt. 1142 m", "Selva Baja Caducifolia, Trampa de luz, 13–XI–2009, Cols. Campos, Reza, Martinez" (IB-UNAM).

Description. F e m a l e . Body length about 5.0 mm; fore wing length 2.4 mm.

Head width 1.75 times median length, 1.1 times larger than width of mesoscutum. Head behind eyes (dorsal view) slightly roundly narrowed. Transverse diameter of eye 1.7 times longer than temple (dorsal view). Ocelli medium-sized, in triangle with base 1.15 times its sides. POL 1.5 times Od, 0.4 times OOL. Eyes without emargination opposite antennal sockets, 1.2 times as high as broad. Malar space height 0.55 times height of eye, 1.2 times basal width of mandible. Face convex, its minimum width 1.2 times height of eye and 2.0 times height of face and clypeus combined. Hypoclypeal depression width 0.6 times distance from edge of depression to eye, 0.3 times width of face. Head below eyes (front view) distinctly and roundly narrowed. Hypostomal flange fine and narrow.

Antennae rather slender, slightly claviform, more than 12-segmented (apical segments missing). Scape long, 1.75 times longer than its maximum width. First flagellar segment 5.7 times longer than its apical width, 1.3 times longer than second segment. Submedian segments 2.4–2.7 times longer than their width.

Mesosoma not depressed, its length 1.9 times maximum height. Pronotum with distinct pronotal carina in anterior third. Maximum width of mesoscutum 1.1 times its length. Mesoscutum strongly convex anteriorly (dorsal view). Prescutellar depression rather short, deep, rugulose between seven carinae, 0.4 times as long as scutellum. Scutellum width 1.15 times median length. Subalar depression coarsely striate, with additional fine and dense reticulation between striae. Sternaulus very shallow, slightly deeper medially, finely striate-reticulate, running along median half of lower part of mesopleuron. Propodeum (lateral view) distinctly and almost linearly inclined from base to apex.

Wings. Fore wing 4.1 times longer than its maximum width. Pterostigma 2.5 times longer than wide. Metacarp 1.5 times longer than pterostigma. First radial abscissa arising from basal 0.4 of pterostigma, 1.1 times longer than maximum width of pterostigma. Second radial abscissa 1.8 times longer than first abscissa, 0.6 times as long as the sinuate third abscissa, 1.6 times longer than first radiomedial vein. Second radiomedial cell 3.4 times longer than wide. First medial abscissa distinctly sinuate. Recurrent vein twice longer than second abscissa of medial vein. Discoidal cell almost 3.0 times longer than maximum width. Distance from nervulus to basal vein almost equal to nervulus length; nervulus straight and slightly inclivous. Hind wing 4.6 times longer than wide. Length of medial cell 11.5 times longer than maximum width. First abscissa of mediocubital vein twice longer than second abscissa (till basal vein). Recurrent vein unsclerotised, strongly antefurcal.

Legs. Hind coxa 1.3 times longer than maximum width. Hind femur 3.1 times longer than wide. Hind tibia strongly thickened, 5.0 times longer than maximum width. Hind tarsus 1.3 times longer than hind tibia. Hind basitarsus slender, without ventral keel, with very dense golden setae in lower half. Second tarsal segment 0.7 times as long as basitarsus, 2.0 times longer than fifth segment (without pretarsus).
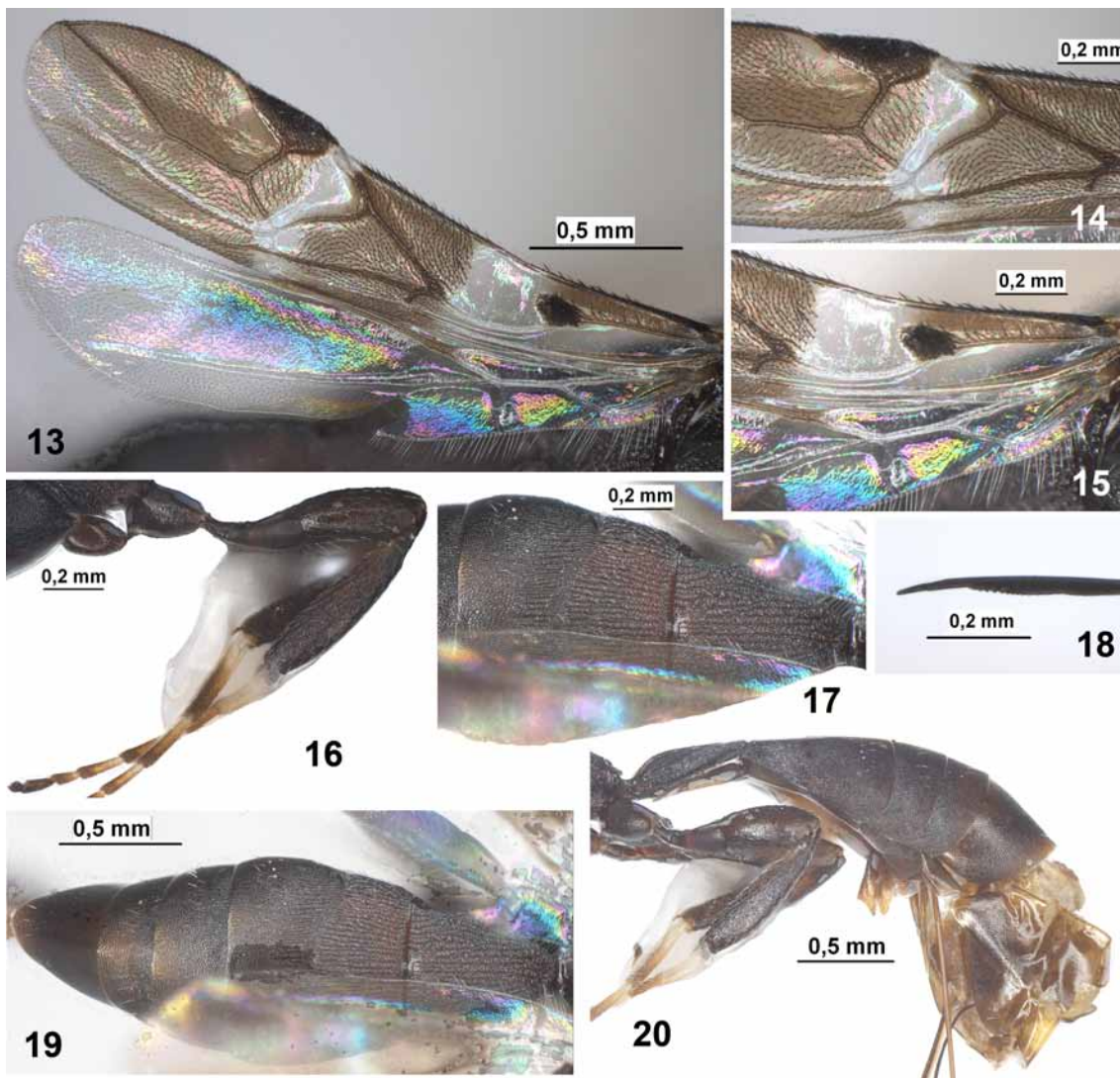
Figures 13–20. *Callihormius* (*Dmitriohormius*) *kasparyani* **sp. n.** (female, holotype). 13 – fore and hind wings; 14 – median part of fore wing; 15– basal parts of fore and hind wings; 16 – hind leg; 17 – three basal segments of metasoma; 18 – apex of ovipositor; 19 – metasoma, dorsal view; 20 – metasoma. lateral view.

Metasoma about 1.5 times longer than head and mesosoma combined. First tergite strongly and slightly-curvedly widened from base to apex, with slightly convex median area. Maximum subapical width of first tergite 2.5 its minimum width; length of tergite 1.3 times its maximum width, 1.5 times length of propodeum. Median length of second tergite 0.6 times its basal width, equal to length of third tergite. Ovipositor sheath about 1.2 times longer than metasoma, 2.3 times longer than mesosoma, 1.4 times longer than fore wing.

Sculpture and pubescence. Vertex entirely, densely and distinctly transverse striate, with fine and dense reticulation between striae; frons densely and finely rugose-reticulate, with fine and irregular striation partly; temple densely rugulose-reticulate in anterior third , with distinct vertically striation and with fine rugosity between striae in posterior two thirds; face densely rugulose-reticulate in upper half, curvedly transverse striate with reticulation in lower half. Mesoscutum very densely and small reticulate and with fine additional irregular striation, distinctly longitudinally striate with rugulosity in medioposterior half. Scutellum entirely and densely rugose. Mesopleuron densely and small areolate-reticulate, with additional striation upper and anteriorly. Propodeum without delineated areas, with incompletely separated areola, entirely coarsely and irregularly striate with fine rugosity between striae. Hind coxae and femur entirely densely and small reticulate-coriaceous. Hind tibia densely reticulate-granulate. First, second and basal 0.4 of third tergites longitudinally striate with dense rugulosity between striae. Third tergite in apical 0.6 and all other visible tergites very densely and small reticulate-areolate, sculpture becoming finer towards apex of metasoma; their laterotergites densely coriaceous. Vertex almost entirely

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with sparse, short and semi-erect pale setae. Mesoscutum with rather dense, semi-erect and short pale setae arranged in two wide submedian stripes and in single line laterally, glabrous on remaining part. Metapleuron glabrous on wide area. Hind tibia dorsally with very short, sparse and semi-erect pale setae; length of these setae 0.10–0.15 times maximum width of hind tibia.

Colour. Head reddish brown, face and anterior part of temple light reddish brown, malar space yellow. Mesosoma and metasoma dark reddish brown to black, mesosoma anteriorly reddish brown. Antenna yellow to light reddish brown. Palpi dark reddish brown. Legs dark reddish brown, fore femur partly paler, all tarsal segments (besides dark last one) whitish yellow in basal halves and light brown to brown in apical halves; all tibiae basally dark. Fore wing distinctly infuscate and covered by dark setae, with hyaline and glabrous most basal parts of anal and submedial cells, with wide transverse stripe in centre of medial cell and narrow transverse stripe before pterostigma. Pterostigma almost entirely dark brown, parastigma whitish.

Acknowledgements

References

Ashmead W.H. 1900. Classification of the Ichneumon flies, or the superfamily Ichneumonoidea. *Proceedings of the United States National Museum*, **23**(1206): 1–220.

Braga S.M.P., Barbalho S.M., Penteado-Dias A.M. 2002. *Glauca* gen. nov. (Hymenoptera: Braconidae: Doryctinae) from Brazil. *Zoologische Mededelingen*, **76**(7): 79–82.

Gomes S.A.G., Penteado-Dias A.M. 2006. Description of a new genus of Doryctinae wasps (Hymenoptera: Braconidae) from Brazil. *Zoologische Mededelingen*, **81**(5): 115–119.

Kurhade S.M. 2006. First record of genus *Callihormius* Ashmead (Hymenoptera: Braconidae) from India, with description of a new species. *Zoos' Print Journal*, **21**(4): 2209–2210

Marsh P.M. 1966. The Nearctic Doryctinae, III. The genus *Callihormius* Ashmead (Hymenoptera: Braconidae). *Proceedings of the Entomological Society of Washington*, **68**(3): 240–246.

Marsh P.M. 1993. Descriptions of new Western Hemisphere genera of the subfamily Doryctinae (Hymenoptera: Braconidae). *Contributions of the American Entomological Institute*, **28**(1): 1–58.

Marsh P.M. 1997. Doryctinae. *In*: Wharton R.A., Marsh P.M., Sharkey M.J. (Eds). Manual of the New World genera of the family Braconidae (Hymenoptera). International Society of Hymenopterists. Special Publication, **1:** 207–233

Marsh P.M. 2002. The Doryctinae of Costa Rica (excluding the genus *Heterospilus*). *Memoirs of the American Entomological Institute*, **70:** 1–319.

Marsh P.M., Wild A.L., Whitfield J.B. 2013. The Doryctinae (Braconidae) of Costa Rica: genera and species of the tribe Heterospilini. *ZooKeys*, **347:** 1–474.

Nunes J.F., Zaldívar-Riverón A., de Castro C.S., Marsh P.M., Penteado-Dias A., Briceno R., Martinez J.J. 2012. *Doryctopambolus* Numes & Zaldívar-Riverón (Braconidae), a new neotropical doryctine wasps genus with propodeal spines. *ZooKeys*, **223:** 53–67.

Shenefelt R.D., Marsh P.M. 1976. *Hymenopterorum Catalogus. Pars 13. Braconidae 9. Doryctinae.* 's-Gravenhage: Dr W. Junk: 1263–1424.

Yu D.S.K., van Achterberg C., Horstmann K. 2012. *Taxapad 2012, Ichneumonoidea 2011.* Database on flash-drive. www.taxapad.com, Ottawa, Ontario, Canada.

Zaldívar-Riverón A., Martinez J.J., Belokobylskij S.A., Pedraza-Lara C., Shaw S.R., Hanson P.E., Varela-Hernandez F. 2014. Systematic and evolution of gall formation in the plant-associated wasp genera of the subfamily Doryctinae (Hymenoptera: Braconidae). *Systematic Entomology*. In press.

A new species of the genus *Trioxys* Mackauer (Hymenoptera: Aphidiidae) from Sverdlovsk Province of Russia

E.M. Davidian

Новый вид рода *Trioxys* Mackauer (Hymenoptera: Aphidiidae) из Свердловской области России

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Abstract. A new species, *Trioxys kasparyani* **sp. n.**, with short prongs on the terminal metasomal sternite is described from Sverdlovsk Province of Russia. Until now, only two Palaearctic species with short prongs, *T. bicuspis* Mackauer, 1960 and *T. microceratus* Mackauer, 1960, were known. *Trioxys kasparyani* **sp. n.** differs from these species by the spiracular tubercles situated in centre of the first tergite, shape of the ovipositor sheath, and prongs with apical and preapical setae hair-like and similar to each other.

Key words. Aphidiidae, *Trioxys*, new species, Russia.

Резюме. Из Свердловской области России описан новый вид *Trioxys kasparyani* **sp. n.** с короткими пронгами на последнем стерните метасомы. До настоящего времени среди палеарктических видов *Trioxys* короткие пронги были известны только у *T. bicuspis* Mackauer, 1960 и *T. microceratus* Mackauer, 1960. *Trioxys kasparyani* **sp. n.** отличается от них расположенными посередине первого тергита дыхальцевыми бугорками, формой створок яйцеклада и пронгами с одинаковыми волосковидными преапикальными щетинками.

Ключевые слова. Aphidiidae, *Trioxys*, новый вид, Россия.

Introduction

The genus *Trioxys* Mackauer comprises about 70 species distributed worldwide (Fulbright *et al*., 2007), of them 27 species are known to occur in Russia (Davidian, 2007). Species of *Trioxys*, as well as all other Aphidiidae, are endoparasitoids of aphid nymphs and adults. This genus is characterized by first tergite with a pair of spiracular tubercles and terminal metasomal sternite with two posterior prongs. Most species have prongs distinctly longer than ovipositor sheath. In the Palaearctic region, only two species, *T. bicuspis* Mackauer, 1960 and *T. microceratus* Mackauer, 1960, have short prongs. The aim of this work is to describe a third Palaearcic species with short prongs from the Russian Urals.

Material and methods

Following abbreviations are used: POL (distance between hind ocelli), Od (maximum diameter of hind ocellus), F1 and F2 (first and second flagellar segments). Prongs are processes of the terminal metasomal sternite.

All photographs were taken from slides in glycerine at Axio Imager M-1 microscope (Carl Zeiss) at the Biological Method Laboratory of the All-Russian Scientific-Research Institute of Plant Protection (St Petersburg, Russia). Holotype of *T. kasparyani* **sp. n.** is deposited in the collection of the Zoological Institute, Russian Academy of Sciences, St Petersburg, Russia.

Taxonomic part

Trioxys Haliday, 1833

Antenna with 10–13 segments in female and 11–15 segments in male. Fore wing venation strongly reduced. Propodeum with or without areola. First tergite with one pair of spiracular tubercles. Ovipositor sheath distinctly curved downwards. Terminal metasomal sternite with two posterior prongs (free or fused in their basal 0.25–0.8), not widened subapically on dorsal side. Each prong apically usually with one or two setae, or with one or two conical or claw-like bristles.

Portion of key to Palaearctic species of *Trioxys*

1. Prongs longer than ovipositor sheath...**other species of *Trioxys***
– Prongs shorter than ovipositor sheath...2
2. Spiracular tubercles situated in centre of the first tergite. Ovipositor sheath gradually narrowed towards apex, slightly pointed apically. Prongs with apical and preapical setae hair-like, similar to each other...***T. kasparyani* sp. n.**
– Spiracular tubercles situated in basal third of the first tergite. Ovipositor sheath strongly narrowed towards apex. Prongs not as above..3
3. Antenna with 10 segments. Prongs with two thin and long setae apically............***T. bicuspis* Mackauer**
– Antenna with 10(11) segments. Prongs with two short, thickened, claw-like bristles............................ ....***T. microceratus* Mackauer**

Trioxys kasparyani sp. n.

(Figs 1–6)

Type material. Holotype: female, Russia, Sverdlovsk Province, Sysertsk District, Dvuretchensk, Biological Station of the Ural State University, light traps, 14–15.VI.2012 (A.V. Kvashnina).

Description. F e m a l e . Body length 2.4 mm; length of antenna 1.7 mm; length of fore wing 2.0 mm.

Head in dorsal view transverse, wider than mesosoma (measured at level of tegulae). Eyes large, oval, not protruding laterally, convergent downwards in front view. Temple, in dorsal view, 0.9 times as long as eye. POL 3.5 times Od. Width of face 1.4 times its height and 0.36 times width of head. Clypeus 3.3 times as wide as high. Tentorio-ocular line 0.3 times as long as intertentorial line. Maxillary palpi 4-segmented, labial palpi 2-segmented. Antenna with 11 segments. F1 and F2 slightly narrower than subsequent segments. F1 4.4 times and F2 4.0 times as long as wide, both these segments without longitudinal placodes. Flagellum behind F2 filiform (Fig. 1).

Mesosoma with notauli distinct in anterior third of mesoscutum. Propodeum with wide pentagonal areola (Fig. 5). Fore wing 2.4 times as long as wide. Apical margin of fore wing with moderately long hairs which are twice longer than hairs on the wing membrane (Fig. 2). Pterostigma 3.0 times as long as wide and 1.8 times longer than metacarpus.

First tergite centrally with distinctly protruding spiracular tubercles, 1.7 times as long as its width at level of tubercles (Fig. 6). Ovipositor sheath 3.0 times as long as wide in basal part, strongly and gradually narrowed towards apex, triangular, distinctly curved downwards and pointed apically (Fig. 3). Ventral margin of ovipositor sheath with three short preapical setae and six long setae centrally and basally. Prongs on terminal metasomal sternite free, almost straight, short (0.8 times as long as ovipositor sheath), with weak aberration (one prong slightly broader in preapical part) (Fig. 4). Dorsal margin of prong with five uniform strong preapical setae (one seta is broken) and three setae basally; ventral margin with three long setae basally (middle seta is longest) and four setae in preapical half. Apical and preapical setae of prongs similar to each other, hair-like.

C o l o u r . Mouthparts, scape, pedicel, F1, F2, legs, prongs and basal part of ovipositor sheath yellowish. Head, apical part of antenna and mesosoma dark brown, almost black. Metasoma, including petiole, and apical part of ovipositor sheath brown.

M a l e a n d h o s t . Unknown.

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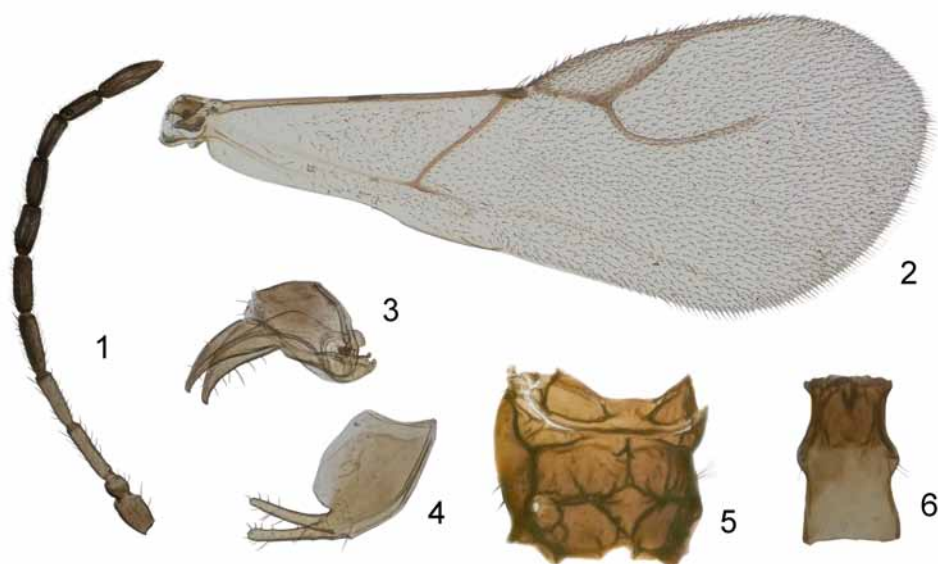
Figures 1–6. *Trioxys kasparyani* **sp. n.** (holotype). 1 – antenna; 2 – fore wing; 3 – ovipositor sheath; 4 – terminal sternite and prongs; 5 – propodeum; 6 – first metasomal segment.

Comparison. Trioxys kasparyani **sp. n.** is similar to *T. bicuspis* and *T. microceratus* as only these three Palaearctic species possess short prongs. It differs from these two species by the following features: spiracular tubercles situated in centre of the first tergite (in basal third in *T. bicuspis* and *T. microceratus*); ovipositor sheath gradually narrowed towards apex and slightly pointed apically (more sharply narrowed in *T. bicuspis* and *T. microceratus*); apical and preapical hair-like setae of prongs similar to each other (*T. bicuspis* with two thin and long setae apically; *T. microceratus* with two short, thickened, claw-shaped bristles which differ well from preapical setae).

Etymology. The new species is named in honour of well-known Russian expert in Ichneumonidae, Dr Dmitri R. Kasparyan.

Acknowledgements

References

D a v i d i a n E . M . 2007. The family Aphidiidae. *In*: L e l e j A . S . (Ed.). *Key to the insects of Russian Far East. Volume 4. Neuropteroidea, Mecoptera, Hymenoptera. Part 5*. Vladivostok: Dal'nauka: 192–254. (In Russian.)

F u l b r i g h t J . L . , P i k e K . S . , S t a r ý P . 2007. A key to North American species of *Trioxys* Haliday (Hymenoptera: Braconidae: Aphidiinae), with a summary of the geographic distribution, hosts, and species diagnostic features. *Proceedings of the Entomological Society of Washington*, **109**(4): 779–790.

M a c k a u e r M . 1960. Zur Systematik der Gattung *Trioxys* Haliday (Hymenoptera: Braconidae, Aphidiinae). *Beiträge zur Entomologie*, **10**(1/2): 137–160.

M a c k a u e r M . 1968. Die aphidiiden (Hymenoptera) Finnlands. *Fauna Fennica*, **22**: 1–40.

New species of *Dzhanokmenia* Kostjukov and *Kolopterna* Graham (Hymenoptera: Eulophidae: Tetrastichinae) from Russia

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Новые виды *Dzhanokmenia* Kostjukov и *Kolopterna* Graham (Hymenoptera: Eulophidae: Tetrastichinae) из России

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Abstract. Two new species of two genera of Tetrastichinae (Eulophidae: Tetrastichinae), *Dzhanokmenia kasparyani* **sp. n.** and *Kolopterna kasparyani* **sp. n.**, are described from the Asiatic part of the Stavropol Territory of Russia.

Key words. Eulophidae, Tetrastichinae, *Dzhanokmenia*, *Kolopterna*, new species, Russia.

Резюме. Два новых вида *Dzhanokmenia kasparyani* **sp. n.** и *Kolopterna kasparyani* **sp. n.** (Eulophidae: Tetrastichinae) описаны из азиатской части Ставропольского края России.

Ключевые слова. Eulophidae, Tetrastichinae, *Dzhanokmenia*, *Kolopterna*, новые виды, Россия.

Introduction

Tetrastichinae is the largest subfamily in the family Eulophidae. It is represented by 97 genera and about 1800 species distributed throughout the world. (Noyes, 2010; Kosheleva, 2013). Kostjukov (1977) discussed the morphology, types of parasitism, and host-parasite relationships in the genus *Tetrastichus* Haliday, 1844 (s.l.) with 17 subgenera including *Dzhanokmenia* Kostjukov (type species *Tetrastichus bibikovae* Dzhanokmen, 1971). Later. Kostjukov (1978, 1984) described six species in *Dzhanokmenia*, *D. kurdjumovi* Kostjukov, *D. nikolskajae* Kostjukov, *D. kozlovi* Kostjukov, *D. antonovae* Kostjukov, *D. demakovi* Kostjukov and *D. zadepskyi* Kostjukov. Graham (1991) published a revision of the European Tetrastichinae with 28 valid genera and *Dzhanokmenia* Kostjukov upgraded to generic level. *Dzhanokmenia* differs from the *B. evonymellae*-group of the genus *Baryscapus* Förster in having the mid lobe of mesoscutum with only a single row of adnotaular setae on each side; submarginal vein with one dorsal setae; marginal vein very short, much shorter than costal cell (0.6–0.7); marginal and stigmal veins very thick (Figs 1, 2); forewing very short, 1.9–2.1 times as long as broad, with apex bare; often first tergite of gaster yellow.

Graham (1987) described the genus *Kolopterna* with three species, *K. salina* Graham, *K. quartensis* Graham and *K. kohatensis* Graham from Spain, Italy and Pakistan respectively. Later, Askew (1997) described by *K. blascoi* from Spain, Khomchenko and Kostjukov (2004) by *K. grahami* from the Asiatic part of Stavropol Territory, and Yegorenkova and Kostjukov (2007) by *K. nikolskayae* and *K. kurdjumovi* from the Middle Volga Region. Kostjukov and Kosheleva (2006) additionally transferred *Tetrastichus*

desulcatus Kostjukov to the genus *Kolopterna*. Species of *Kolopterna* have the following diagnostic features: first segment of mid and hind tarsi much shorter than second segment; fore wing with marginal vein shorter than, or at most as long as costal cell; malar sulcus with an oblong or sublinear fovea below eye; body black and yellow or mainly yellow (Graham, 1987).

Two new species, *Dzhanokmenia kasparyani* **sp. n.** and *Kolopterna kasparyani* **sp. n.** are described below from the Asiatic part of Stavropol Territory.

Material and methods

Morphological terminology follows Graham (1987, 1991). Abbreviations used in the text are: POL – post-ocellar line, the shortest distance between lateral ocelli; OOL – ocular-ocellar line, the shortest distance between lateral ocellus and eye margin; F_1, F_2, F_3, F_4 – funicular segments of antenna; C_1, C_2, C_3 – claval segments of antenna; *SM* – submarginal vein of fore wing; *M* – marginal vein of fore wing; *ST* – stigmal vein of fore wing.

All type material is deposited in the Zoological Institute, Russian Academy of Sciences, St Petersburg, Russia.

Taxonomic part

Dzhanokmenia kasparyani sp. n.

(Figs 1, 2)

Type material. Holotype: female, Russia, Stavropol Territory, Achikulak, sweeping on Artemisia, Alhagi, Elaeagnus, Haloxylon, Tamarix and Ulmus, 2.IX.2002 (Kostjukov leg.).

Paratypes. Russia, Stavropol Territory: 4 females, 5 males, same label as holotype.

Description. F e m a l e (holotype). Head 2.15 times as broad as long, 1.25 times broader than its height, 1.05 times broader than mid lobe of mesoscutum. POL 1.5 times OOL. Eyes 2.1 times as high as broad. Malar space 0.6 times maximum diameter of eye. Toruli above level of lower margin of eyes. Antennal scape not reaching level of median ocellus, 3.1 times as long as broad; pedicellus 1.6 times as long as broad, as long as F_1; F_1 2.5 times as long as broad, as long as F_2; F_2 1.7 times as long as broad, 1.2 times as broad as F_1, 1.3 times longer than F_3; F_3 1.4 times as long as broad; clava 3-segmented, 2.6 times as long as broad, twice longer than F_1, as long as F_1 plus F_2, 1.6 times broader than F_1. Mesosoma 1.4 times as long as broad. Pronotum transverse. Mid lobe of mesoscutum 1.2 times as broad as long, with a median line, with a single row of adnotaular setae. Scutellum 1.4 times as broad as long, 0.6 times as long as mesoscutum. Dorsellum 3.6 times as broad as long. Propodeum medially as long as dorsellum. Hind femora 3.15 times as long as broad; spur of mid tibia 0.65 times as long as width of mid tibia. Fore wing 1.95 times as long as broad; costal cell 1.6 times as long as *M*, *SM* with one dorsal seta; *M* 3.75 times longer than *ST* (Fig.1), with eight frontal setae, which is 0.7 times length of *ST*. Hind wing 8.8 times as long as broad; cilia 0.4–0.7 times breadth of hind wing, apex rounded. Gaster 1.75 times as long as broad, 1.4 times as long as mesosoma; extending part of ovipositor sheaths less than 0.3 times length of hind tibia. Head and mesosoma dark-green with strong metallic tints; antenna yellow; tegulae, legs and venation pale yellow; gaster yellow, with dark tergite VI. Length of body 1.5 mm.

V a r i a t i o n . Head 1.1–1.2 times as broad as long. POL 1.45–1.6 times OOL. Eyes 2.05–2.15 times as broad as long. Malar space 0.6–0.65 length of eye. Mesosoma 1.35–1.5 times as long as broad. Scutellum 1.4–1.45 times as broad as long. Hind femora 3.10–3.15 times as long as broad, spur of mid tibia 0.6–0.7 times width of mid tibia. Fore wing 1.9–2.1 times as long as broad; costal cell 1.5–1.65 times as long as *M*; *M* 3.7–3.75 times longer than *ST*, with seven to nine frontal setae. Hind wing 8.0–9.5 times as long as broad. Gaster 1.65–1.8 times as long as broad, 1.35–1.5 times as long as mesosoma. Length 1.4–1.5 mm.

M a l e . Head 2.1–2.15 times as broad as long; 1.05 times as broad as mesosoma, 1.15–1.2 times as broad as mid lobe of mesoscutum and 1.2–1.25 broader than its own height. POL 1.45–1.65 times OOL. Eyes 1.45–1.65 times as broad as long. Toruli placed above level of the lower margin of eyes. Antenna with scape 3.1–3.5 times as long as broad, reaching level of median ocellus; pedicellus 1.6–1.65 times as long as broad, as long as F_1; F_1 1.1–1.15 times as long as broad, as long as F_2; F_2 1.05–1.1 times as long as broad, F_3 and F_4 quadrate; clava 2.1–2.25 times as long as broad, 1.2–1.25 times longer than F_3 plus F_4; 1.15–1.2 times broader than F_4; C_1 as long as broad, 1.2–1.25 times longer than C_2; C_2 as long as broad, 1.25–1.35 times longer than C_3; C_3 1.05 times as long as broad. Mesosoma 1.45–1.6 times as long as broad. Pronotum crescentic. Mid lobe of mesoscutum 1.05–1.1 times as broad as long, with strong median line, with one row of adnotaular setae. Scutellum 1.2–1.25 times as broad as long, 0.7 times length of mesoscutum; distance between submedian lines 3.2–3.5 times shorter than maximum length of scutellum. Dorsellum 2.3–2.9 times as broad as long. Propodeum medially as long as dorsellum; callus with three pale long setae. Hind femora 3.2–3.3 times as long as broad; spur of mid tibia 0.65–0.75 length of mid tibia. Forewing 2.0–2.05 times as long as broad; costal cell 1.95–2.05 times as long as *M*; *SM* with one dorsal seta;
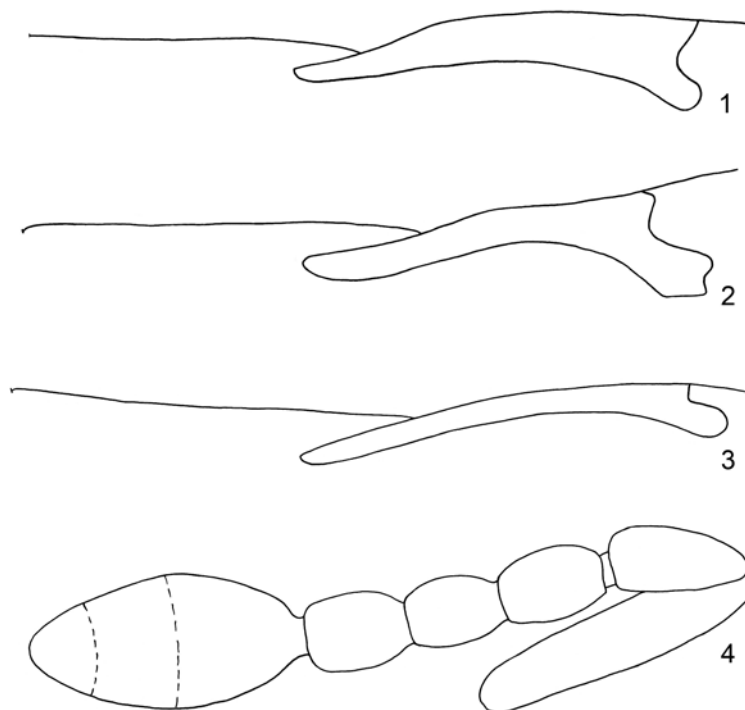
Figures 1–4. *Dzhanokmenia kasparyani* **sp. n.** (1, 2) and *Kolopterna kasparyani* **sp. n.** (3, 4). 1–3 – marginal and stigmal veins (1, 3 – female; 2 –male); 4 – antenna of female.

M 2.9–3.1 times longer than *ST* (Fig. 2), with seven to eight frontal setae which is 0.9–0.95 times length of *ST*. Apex of forewing bare. Hind wing 6.1–6.3 times as long as broad, cilia 0.5–0.7 times breadth of wing. Gaster 1.9–2.0 times as long as broad, 0.8–0.9 times length of mesosoma.

Head and mesosoma dark-green, with strong metallic tints, antenna yellow; tegulae, legs (except 0.25–0.5 of hind coxae and fourth segment of tarsus infuscate) pale yellow; venation pale yellow; gaster yellow with dark tergites III–VII. Length of body 1.2–1.4 mm.

Comparative diagnosis. *Dzhanokmenia kasparyani* **sp. n.** differs from *D. bibikovae* (Dzhanokmen, 1971) by the characters shown in the table below:

	D. bibikovae	**D. kasparyani sp. n.**
Female		
Marginal vein	4.1–4.2 times as long as stigmal vein	3.7–3.75 times as long as stigmal vein
Scutellum	1.0–1.05 times as broad as long	1.4–1.45 times as broad as long
Gaster	as long as mesosoma	1.35–1.5 times as long as mesosoma
Body length	1.9–2.0 mm	1.4–1.5 mm
Male		
Mid lobe of mesoscutum	with a weak median line	with a strong median line
Gastral tergites	IV–VII yellowish brown.	III–VII with strong metallic tints.
Marginal vein	4.1–4.2 times as long as stigmal vein	2.9–3.1 times as long as stigmal vein
Body length	1.9–2.0 mm	1.2–1.4 mm

Host. Unknown.

Etymology. The new species is named in honour of Dr Dmitri R. Kasparyan, a prominent Russian entomologist.

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Kolopterna kasparyani **sp. n.**

(Figs 3, 4)

Type material. Holotype: female, Russia, Stavropol Territory, Achikulak, sweeping on Artemisia, Alhagi, Elaeagnus, Haloxylon, Tamarix and Ulmus, 3.VI.2002 (Kostjukov leg.).

Paratypes. Russia, Stavropol Territory: 4 females, same label as holotype; 2 females, Terkum, sweeping on Artemisia, 22.VII.2004 (Kosheleva leg.); 2 females, Velichaevskoe, sweeping on Artemisia, Euphorbia, Alhagi and Elitrigia, 23.VII.2004 (Kosheleva leg); 5 females, Arzgir, sweeping on Artemisia, 17.VII.2005 (Kosheleva leg.).

Description. F e m a l e (holotype). Head 2.3 times as broad as long, slightly broader than its height, 1.15 times broader than mid lobe of mesoscutum. POL 2.0 times OOL. Eyes 1.05 times as high as broad. Malar space 1.05 times maximum diameter of eye. Malar sulcus with sublinear fovea situated below eye, 0.5 times malar space. Mouth 1.1 times as wide as malar space. Toruli placed above level of lower margin of eyes. Antennal scape 1.1 times length of eye, 3.4 times as long as broad, 2.55 times as long as F_1, not reaching median ocellus; pedicellus plus flagellum 1.3 times as long as breadth of mesosoma; pedicellus 1.05 times as long as broad, 1.05 times as long as F_1; F_1 1.1 times as long as broad, as long as F_2; F_2 as long as broad, as long as F_3, F_3 1.05 times as long as broad. Clava 3-segmented, 2.3 times as long as broad, 1.5 times longer than F_2 plus F_3, 1.55 times broader than F_3 (Fig. 4). Mesosoma 1.15 times as long as broad. Pronotum 0.8 times length of mesoscutum, 1.1 times as broad as long. Mid lobe of mesoscutum 1.4 times as broad as long, without median line, with two row of adnotaular setae. Scutellum 1.25 times as broad as long, 0.9 times length of mid lobe of mesoscutum, with weak submedian lines, distance between submedian lines 1.3 times shorter than longest length of scutellum, seta of scutellum pale. Dorsellum 2.7 times as broad as long. Propodeum medially 1.15 times as long as dorsellum; median carina fine; spiracles oval, touching anterior margin of propodeum, callus with tree dark setae. Hind femora 3.2 times as long as broad; second segment of hind tarsus 1.35 times longer than first segment; second segment of mid tarsus 1.25 times longer than first segment. Fore wing with apical margin bare, 2.05 times as long as broad; costal cell 1.25 times as long as *M*; *SM* with four dorsal setae; *M* 5.2 times longer than *ST* (Fig. 3), with six frontal setae; speculum closed, narrow, but extending as a broad strip below *M* and reaching *ST*; cilia 0.1–0.3 times length of *ST*. Hind wing 4.6 times as long as broad, apex rounded. Gaster oval, as long as mesosoma, 0.7 times as long as of head plus mesosoma, 2.4 times as long as broad; extending part of ovipositor sheaths less than 0.3 of length of hind tibia; last tergite 1.2 times as long as broad.

Body pale yellow, mesoscutum with brown area medially; middle part of pronotum, axillae and propodeum brown; vertex with brown spots around ocellus; antenna yellow, except brownish ventral part of scape and pedicellus. Tegulae yellow. Gaster yellow with transverse brown stripes Legs yellow except infuscate basal half of hind coxae and fourth tarsal segment. Length of body 1.05 mm.

V a r i a t i o n. POL 1.9–2.1 times OOL. Clava 2.2–2.4 times as long as broad. Fore wing 1.95–2.15 times as long as broad; *M* with five to seven frontal setae. Hind femur 3.2–3.3 times as long as broad. Mesosoma 1.15–1.25 times as long as broad. Pronotum 0.7–0.85 times length of mesoscutum, 1.1–1.2 times as broad as long. Gaster 2.3–2.45 as long as broad, 0.9–1.1 times as long as mesosoma. Length of body 0.9–1.05 mm.

M a l e a n d h o s t. Unknown.

Comparative diagnosis. *Kolopterna kasparyani* **sp. n.** and *K. kohatensis* Graham are only species in the genus with a bare apex of the fore wing. The differences between females of these two species are shown in the table below:

K. kohatensis	*K. kasparyani* **sp. n.**
F_1 2.75 times as long as broad	F_1 1.8 times as long as broad
F_2 twice as long as broad	F_2 as long as broad
F_3 1.5 times as long as broad	F_3 1.05 times as long as broad
Scutellum 1.5 times as long as broad	Scutellum 1.25 times as long as broad
Gaster 1.7 times as long as mesosoma	Gaster as long as mesosoma

Etymology. The new species is named in honour of Dr Dmitri R. Kasparyan, a prominent Russian entomologist.

Acknowledgements

References

A s k e w R . R . 1997. *Kolopterna* Graham (Hym., Eulophidae, Tetrastichinae) in Spain, with description of a new species. *Entomologist Monthly Magazine*, **133**: 243–245.

D z h a n o k m e n K . A . 1971. New species *Tetrastichus* (Hymenoptera, Tetrastichidae) from eastern Kazakhstan. *Journal of Zoology*, **50**(12): 1883–1885.

G r a h a m M . W . R d e V . 1987. A reclassification of the European Tetrastichinae (Hymenoptera, Eulophidae), with a revision of certain genera. *Bulletin of the British Museum (Natural History) (Entomology Series)*, **55**(1): 1–392.

G r a h a m M . W . R d e V . 1991. A reclassification of the European Tetrastichinae (Hymenoptera, Eulophidae): revision of the remaining genera. *Memoirs of the American Entomological Institute*, **149**: 1–323.

K h o m c h e n k o E . V . , K o s t j u k o v V . V . 2004. Chalcid wasps of Achikulak Research Station of Forest. Message II. *Kolopterna* Graham 1987 (Hymenoptera, Eulophidae), a new genus for the fauna Russia from the Asiatic part of Stavropol Territory. *In*: N a d y k t o V . D . , I s m a i l o v V . Ya . , L e v a s h o v a G . I . , S u g o n y a e v E . S . (Eds). *Biological protection as the basic for stabilizing agroecosystems*. Krasnodar. **1**: 78–81. (In Russian.)

K o s h e l e v a O . V . 2013. Oligomerization and other evolutionary changes in the tetrastichine-wasp antennae (Hymenoptera, Eulophidae). *Entomologicheskoe obozrenie*, **92**(1): 70–84. (In Russian.)

K o s t j u k o v V . V . 1977. Comparative morphology of the chalcid subfamily Tetrastichinae and system of the *Tetrastichus* Haliday, 1844 (Hymenoptera, Eulophidae). *Entomologicheskoe obozrenie*, **92**(1): 70–84. (In Russian.).

K o s t j u k o v V . V . 1978. Subfam. 5. Tetrastichinae. *In*: M e d v e d e v G . S . (Ed.). *Key to insects of the European part of USSR. Volume III. Hymenoptera. Part 2*. Leningrad: Nauka: 430–467. (In Russian.)

K o s t j u k o v V . V . 1984. New species of the genus *Tetrastichus* Haliday, 1844 (Hymenoptera, Eulophidae) from Turkmenistan. In: *Entomophages of the orchards pests*. Kishinev: Shtiintsa: 30–35. (In Russian.)

K o s t j u k o v V . V . , K o s h e l e v a O . V . 2006. Taxonomic status of the species described in the genus *Tetrastichus* Haliday (s. l.) from the USSR and description *Trjapitzinichus* gen. n. *In*: *Biological protection as the basic for stabilizing agroecosystems*. Krasnodar: 103–111. (In Russian.)

N o y e s J . S . 2010. *Universal Chalcidoidea Database*. World wide web electronic publication. Available from: http://www.nhm.ac.uk/entomology/chalcidoids/index.html

Y e g o r e n k o v a E . N . , K o s t j u k o v V . V . 2007. New species of the genus *Kolopterna* Graham, 1987 (Hymenoptera: Eulophidae: Tetrastichinae) from Midle Volga Region of Russia. *Russian Entomological Journal*, **16**(1): 103–107.

A new species of *Encarsia* Förster (Hymenoptera: Chalcidoidea: Aphelinidae) from Altamira, Tamaulipas, Mexico

S.N. Myartseva

Новый вид рода *Encarsia* Förster (Hymenoptera: Chalcidoidea: Aphelinidae) из Альтамиры, Тамаулипас, Мексика

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Abstract. A new aphelinid species *Encarsia dimai* **sp. n.** is described and illustrated. It was reared from whitefly *Aleurothrixus* sp. (Aleyrodidae) collected on epiphyte plant Struthanthus sp. (Loranthaceae) in Altamira, State of Tamaulipas, Mexico. The genus Struthanthus is recorded for the first time as a host plant for whitefly genus *Aleurothrixus*.

Key words. Aphelinidae, Aleyrodidae, Struthanthus, new species, taxonomy, host.

Резюме. Описан новый вид афелинид *Encarsia dimai* **sp. n.** Вид выведен из белокрылки *Aleurothrixus* sp. (Aleyrodidae), собранной на растении-эпифите Struthanthus sp. (Loranthaceae) в Альтамире, штат Тамаулипас, Мексика. Род Struthanthus впервые зарегистрирован как растение-хозяин для белокрылок рода *Aleurothrixus*.

Ключевые слова. Aphelinidae, Aleyrodidae, Struthanthus, новый вид, таксономия, хозяин.

Introduction

The world fauna of the family Aphelinidae consists of about 1350 species distributed in 36 genera (Noyes, 2012). Aphelinid species are primary or secondary parasitoids, principally of Hemiptera (Sternorrhyncha: Aleyrodidae, Aphididae, Diaspididae, Coccidae and Pseudococcidae) (Woolley, 1997). This family is economically important for the biological control of insect pests of agricultural crops and for biological equilibrium in natural ecosystems, because it comprises many natural enemies of phytophagous insects, including pests.

The Aphelinidae is one of the most extensively studied families of the Chalcidoidea in Mexico. From 2000 to 2012, the known fauna of aphelinids in Mexico increased from 74 species in 9 genera to 185 species in 13 genera (Myartseva *et al.*, 2012; Kim, Heraty, 2012).

The most species rich genus of the Aphelinidae is *Encarsia* Förster, 1878. At present, the known world fauna of this genus includes about 400 species (Noyes, 2013). Species of *Encarsia* usually develop as primary endoparasitoids of Aleyrodidae and Diaspididae. Given their host specificity and enormous diversity, *Encarsia* species represent an important resource for biological control of whitefly and armoured scale pests (Polaszek *et al.*, 2009). According to Polaszek *et al.* (2009), the potential for new species discovery in this genus appears to be greater than that for any other known genus of Hymenoptera.

In Mexico, 188 species of the Aphelinidae are known to occur. Of these, 98 belong to the genus *Encarsia*, including 57 species described by Myartseva and co-authors in 2001–2013 (Myartseva *et al*., 2012, 2013). In this paper one more species of *Encarsia* is described.

Material and methods

Parasitic wasps were reared from *Aleurothrixus* sp. collected on leaves of epiphyte Struthanthus sp. (Loranthaceae). Plant leaves infested with whiteflies were placed in plastic containers in laboratory. The emerged insects were placed in vials with 75% alcohol. Some specimens were mounted in Canada balsam on microslides, and studied with Leica CME compound microscope. Measurements were made at a magnification of 400 times.

Four keys to *Encarsia* species were used to identify the species and compare the new species to similar species in the genus (Hayat, 1998, 2012; Huang, Polaszek, 1998; Myartseva *et al*., 2012).

The holotype and two paratypes are deposited in the Entomological Museum of the University of California, Riverside, USA (UCRC), one paratype in the Entomological Collection of the University of Tamaulipas, Ciudad Victoria, Mexico (UAT), and two paratypes in the Zoological Institute of Russian Academy of Sciences, St Petersburg, Russia (ZISP).

Results and taxonomy

A new species, *Encarsia dimai* **sp. n.,** was reared from *Aleurothrixus* sp. (Aleyrodidae), collected on an epiphyte plant, Struthanthus sp. (Loranthaceae) in Altamira, State of Tamaulipas, Mexico. The world flora of this host plant genus includes 20 species and is most species rich in the Neotropical region, being represented in this region by 15 species (75% of the world flora). Evans (2008) in his paper on whiteflies and their hosts did not include this information on the number of host plant in this plant genus.

Three species of the genus *Aleurothrixus* Quaintance et Baker, 1914 are known to occur in Mexico. All of the *Aleurothrixus* species are native to the Neotropical region (Evans, 2008). The wooly whitefly, *A. floccosus* (Maskell), is a polyphagous, cosmopolitan species known as an important pest of citrus in the Western Hemisphere (Rose, DeBach, 1994), including Mexico (Varela-Fuentes *et al*., 2013). In Mexico, *A. floccosus* was collected on Citrus spp. and various fruit and ornamental plants (Myartseva *et al*., 2012). An epiphyte plant, Phoradendron sp. (Loranthaceae) is also recorded as a host plant of this whitefly (Evans, 2008). Another species, *Aleurothrixus similis* Sampson et Drews, is known only from Mexico, where it was collected on Loranthus sp. (Loranthaceae), an epiphyte plant on Acacia sp. (Fabaceae) (Evans, 2008). The host plant for the third Mexican whitefly species, *Aleurothrixus chivelensis* Sampson et Drews, is unknown.

The family Loranthaceae, excluding the genus Struthanthus, contains about 70 genera with 950 species, occurring mainly in tropical regions. Hemiparasitic plants of the genus Struthanthus originated in the Americas (Arruda *et al*., 2006).

Three *Encarsia* species, *E. americana* DeBach et Rose, *E. dimai* **sp. n.** and one unidentified species, were reared in Mexico from *Aleurothrixus* nymphs on Struthanthus sp. This is the first record of the genus *Aleurothrixus* on the Struthanthus.

Encarsia dimai sp. n.

(Figs 1–4)

Description. F e m a l e . Length of body: 0.6–0.7 mm.

C o l o r a t i o n . Frontovertex yellow, face whitish, occiput infuscate around foramen. Antennae yellow, radicle and scape whitish. Pronotum black. Mesoscutum yellow, only anterior margin black. Fore wings infuscate below marginal vein, venation slightly infuscate. Legs light yellow. Petiolus and gaster brownish black, apical tergite whitish yellow.

S t r u c t u r e . Head as wide as mesosoma, about 1.3 times as wide as high. Frontovertex transversely striate, about 0.7 times as wide as head width. Distance between posterior ocelli about 0.7 times as long as distance from ocellus to eye margin. Eye 1.6 times as long as cheek. Mandible 3-dentate. Antennae (Fig. 1) inserted at the level of lower margin of eyes. Distance between toruli 0.7 times as long as distance from torulus to eye. Antennal radicle 2.6 times as long as wide. Scape 4.2–4.5 times as long as wide. Pedicel 1.6 times as long as wide. First segment of funicle slightly shorter than pedicel (12 :

15) and 1.6 times as long as wide. Segments 2–5 of flagellum equal in length; segments of funicle 2.4 times as long as wide; segments of club 2.1 times as long as wide. Club 3-segmented, slightly wider and slightly longer than funicle, with short scattered setae. Segments 2–5 of flagellum with two long sensilla, sixth segment with one long sensillum. Mid lobe of mesoscutum with eight (sometimes nine) setae. Side lobe with three setae, axilla with one long seta. Scutellum about 0.7 times as long as mid lobe of mesoscutum and about 1.7 times as wide as long. Scutellar placoid sensilla closely spaced, distance between sensilla less than two diameters of sensillum. Distance between anterior scutellar setae 0.7 times as long as distance between posterior setae. Fore wing uniformly setose, 2.5–2.6 times as long as wide, its marginal fringe 0.3 times as long as maximum width of wing, base with 4–5 setae. Marginal vein (Fig. 2) slightly shorter than submarginal vein and with 6 long setae along anterior margin. Hind wing very narrow, 11.0 times as long as maximum width of wing, its marginal fringe about twice as long as width of wing. Tarsal formula 5–5–5. Mid tibial spur as long as basitarsus (Fig. 3). Gastral tergites 2–7 with 2, 2, 2, 4, 5 and 4 setae, respectively. Ovipositor (Fig. 4) exserted, originate on second tergite, 1.5–1.7 times as long as mid tibia. Third valvula 0.5 times as long as second valvifer.

M a l e . Unknown.

Type material. Holotype: female (UCRC), Mexico, Tamaulipas, Altamira, ex *Aleurothrixus* sp. on Struthanthus sp. on unknown tree, 22.V.2013 (S.N. Myartseva coll.).

Paratypes. Same data as holotype, 5 females (UCRC, UAT, ZISP).

Etymology. The new species is named in honour of my friend, a well-known Russian entomologist Dmitri R. Kasparyan, who has made valuable contribution to the study of the family Ichneumonidae (Hymenoptera) of Mexico.
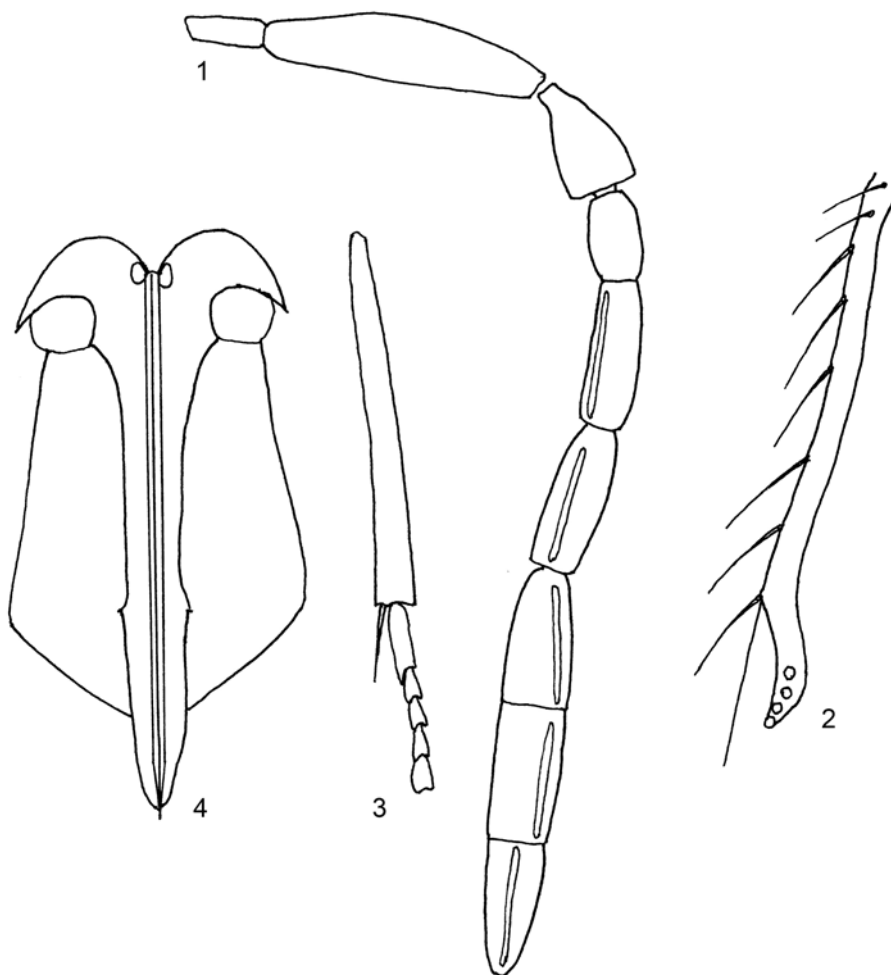
Figures 1–4. *Encarsia dimai* **sp. n.** (female). 1 – antenna; 2 – marginal vein; 3 – mid tibia and tarsus; 4 – ovipositor.

Comparison. Encarsia dimai **sp. n.** is distinguished from other members of the genus by the following combination of morphological characters: mesosoma light yellow and metasoma brownish black; ovipositor long, 1.5–1.7 times as long as mid tibia, and third valvula twice shorter than the second valvifer; hind wing very narrow, 11.0 times as long as its maximum width, with marginal fringe twice as long as wing width; first funicular segment shorter than pedicel; scutellar placoid sensilla very closely spaced; fore wing uniformly setose and infuscate below marginal vein; tarsal formula 5–5–5.

The new species does not correspond to any species in the keys by Hayat (1998, 2012) and Huang, Polaszek (1998). In the key to Mexican species of *Encarsia* (Myartseva *et al.*, 2012), the new species runs to the couplet 38 (*E. mahoniae* Myartseva et Evans and *E. azteca* Myartseva) and couplet 57 (*E. portoricensis* Howard and *E. citricola* Myartseva), but does not correspond to any species in these couplets. The new species is similar to *E. azteca* and *E. citricola* in its contrasting color of mostly light yellow mesosoma and brown black metasoma and having a long ovipositor (1.5–1.6 times as long as mid tibia). Its differences from these species are shown in the table below:

Character / species	*E. dimai* sp. n.	*E. azteca*	*E. citricola*
Antennal club	3-segmented	2-segmented	2-segmented
Base of fore wing	with four setae	with one seta	bare
Hind wing	11.0 times as long as wide	9.0 times as long as wide	7.0 times as long as wide
Marginal fringe of hind wing	twice as long as wing width	about as long as wing width	1.3 times as long as wing width
Mid and hind coxae and hind femora	yellow	yellow	brown

Acknowledgements

References

Arruda R., Nobre Carvalho L., Del-Claro K. 2006. Host specificity of a Brazilian mistletoe, Struthanthus aff. polyanthus (Loranthaceae) in cerrado tropical savanna. *Flora*, **201**: 127–134.

Evans G.A. 2008. *The whiteflies (Hemiptera: Aleyrodidae) of the world and their host plants and natural enemies*. Computer version 2008-09-23. 703 p.

Hayat M. 1998. Aphelinidae of India (Hymenoptera: Chalcidoidea): a taxonomic revision. *Memoirs on Entomology*, **13**: 1–416.

Hayat M. 2012. Additions to the Indian Aphelinidae (Hymenoptera: Chalcidoidea) – III: the genus *Encarsia* Förster. *Oriental Insects*, **45**(2–3): 202–274.

Huang J., Polaszek A. 1998. A revision of the Chinese species of *Encarsia* Foerster (Hymenoptera: Aphelinidae): parasitoids of whiteflies, scale insects and aphids (Hemiptera: Aphelinidae, Diaspididae, Aphidoidea). *Journal of Natural History*, **32**: 1825–1966.

Kim J.-W., Heraty J. 2012. A phylogenetic analysis of the genera of Aphelininae (Hymenoptera: Aphelinidae), with a generic key and descriptions of new taxa. *Systematic Entomology*, **37**: 497–549.

Myartseva S.N., Ruíz-Cancino E., Coronado-Blanco J.M. 2012. *Aphelinidae (Hymenoptera: Chalcidoidea) de importancia agrícola en México. Revisión y claves.* Serie Avispas Parasíticas de Plagas y otros Insectos, No. 8. Universidad Autónoma de Tamaulipas. México. 413 p. Published on CD.

Myartseva S.N., Ruíz-Cancino E., Coronado-Blanco J.M. 2013. Four new species of Aphelinidae (Hymenoptera: Chalcidoidea) from Mexico. *Zootaxa*, **3641**(3): 223–232.

Noyes J.S. 1982. Collecting and preserving chalcid wasps (Hymenoptera: Chalcidoidea). *Journal of Natural History*, **16:** 315–334.

Noyes J.S. 2012. An inordinate fondness of beetles, but seemingly even more fond of microhymenoptera! *Hamuli (The Newsletter of the International Society of Hymenopterists)*, **3**(2): 5–8.

Noyes J.S. 2013. *Universal Chalcidoidea Database [online]*. Worldwide Web electronic publication. www.nhm.ac.uk/entomology/chalcidoids/index.html (Last updated: October 2013).

Polaszek A., Hernández-Suárez E.M., Manzari S., Pedata P.A., Schmidt S. 2009. Megadiversity of *Encarsia* (Chalcidoidea, Aphelinidae): macroevolution in a microhymenopteran. *Memoria de Taller Internacional sobre Recursos Naturales (21 al 23 de Octubre, 2009, Cd. Victoria, Tamaulipas, México)*: 87–92.

Rose M., DeBach P. 1994. The woolly whitefly of citrus, *Aleurothrixus floccosus* (Homoptera: Aleyrodidae). *Vedalia*, **1:** 29–60.

Varela-Fuentes S.E., Ruíz-Cancino E., Coronado-Blanco J.M., Orozco-Santos M. 2013. Aleyródidos. *In*: Varela-Fuentes S.E., Orozco-Santos M., Torres-Acosta R.I., Silva-Aguirre G.L. (Eds). *Guía técnica para la identificación y manejo de plagas y enfermedades en cítricos. Fomento Editorial de la UAT, México*: 32–74.

Woolley J.B. 1997. Aphelinidae. *In*: Gibson G.A.P., Huber J.T., Woolley J.B. (Eds). *Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera). NRC Research Press, Ottawa, Canada*: 134–150.

Nepolynema, a new genus of Mymaridae (Hymenoptera: Chalcidoidea), and its two new species from Costa Rica and Papua New Guinea

S.V. Triapitsyn

Nepolynema – новый род мимарид (Hymenoptera: Chalcidoidea: Mymaridae) с двумя новыми видами из Коста-Рики и Папуа Новой Гвинеи

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Abstract. A new fairyfly (Hymenoptera: Mymaridae) genus, *Nepolynema* **gen. n.**, is described and diagnosed. Its type species, *Barypolynema grandis* Taguchi, 1971, for which a neotype is designated, is redescribed as *N. grande* (Taguchi) (**comb. n.**, from *Polynema* Haliday) based on specimens from Japan and Taiwan (China, new record). Two new species, *N. kasparyani* **sp. n.** (Papua New Guinea) and *N. shatenka* **sp. n.** (Costa Rica), are described and illustrated. The new genus is compared with *Agalmopolynema* Ogloblin, *Polynema*, *Stephanodes* Enock and other relevant genera.

Key words. Chalcidoidea, Mymaridae, taxonomy, new genus, *Nepolynema*, new species.

Резюме. Описан новый род мимарид *Nepolynema* **gen. n.** (Hymenoptera: Mymaridae). Для типового вида нового рода (*Barypolynema grandis* Taguchi, 1971) обозначен неотип, вид переописан и перемещен в новый род [*N. grande* (Taguchi), **comb. n.**] из рода *Polynema* Haliday на основе изученных экземпляров из Японии и Тайваня (Китай, новая находка). Описаны 2 новых вида: *N. kasparyani* **sp. n.** из Папуа Новой Гвинеи и *N. shatenka* **sp. n.** из Коста-Рики. Новый род сравнивается с *Agalmopolynema* Ogloblin, *Polynema*, *Stephanodes* Enock и другими близкими родами.

Ключевые слова. Chalcidoidea, Mymaridae, таксономия, новый род, *Nepolynema*, новые виды.

Introduction

Here I describe a new, very distinctive fairyfly (mymarid) (Hymenoptera: Mymaridae) genus and its two new species. The type species of *Nepolynema* **gen. n.**, described as *Barypolynema grandis* Taguchi from the single specimen from Honshu Island, Japan (Taguchi, 1971) and later listed under *Polynema* Haliday by Noyes (2013), has not been studied by taxonomists ever since. Unfortunately, the entire Hidenari Taguchi collection of Mymaridae, including the holotype female of *B. grandis*, is lost (Kenzou Yamagishi, personal communication). However, availability of freshly collected specimens of this species, which can be recognized by matching them to the original description and illustrations, make it possible to re-assess its proper generic placement. Obviously, for the reasons indicated below in the diagnosis of *Nepolynema*, it does not fit in *Polynema* and its subgenus *P.* (*Doriclytus* Foerster), of which *Barypolynema* Ogloblin is a synonym (Schauff, 1984; Triapitsyn, Fidalgo, 2006). The discovery of other congene-

ric species in other parts of the world such as Papua New Guinea and Costa Rica has made it possible to expand diagnosis of the new genus beyond its type species, which is also newly recorded from Taiwan (China). Most of specimens of *Nepolynema* were collected in forests in the mountainous areas. It is likely that it may eventually be found in similar habitats of Luzon Island, the Philippines, at least, and possibly also in some easternmost parts of the mainland Asian continent.

Material and methods

The following acronyms are used to designate depositories of specimens examined: AEI – American Entomological Institute, Gainesville, Florida, USA; CNC – Canadian National Collection of Insects, Ottawa, Ontario, Canada; UCDC – R.M. Bohart Museum of Entomology, University of California, Davis, California, USA; UCRC – Entomology Research Museum, University of California, Riverside, California, USA.

Terms used for morphological features are those of Gibson (1997). All measurements were taken from slide-mounted specimens, unless stated otherwise, and are given in micrometers (µm), as length or, for the wings, as length : width. Abbreviations used in the text are: F – funicle segment(s) of the female antenna; mps – multiporous plate sensillum or sensilla on the antennal flagellar segments (= longitudinal sensillum or sensilla or sensory ridge(s) of authors).

Taxonomic part

Genus *Nepolynema* gen. n.

Type species: *Barypolynema grandis* Taguchi, 1971.

(Figs 1–21)

Figure 1. *Nepolynema grande*, female (neotype), habitus, lateral view.

Description. F e m a l e . Body length 990–1320 μm (point-mounted, critical point-dried specimens); body light to dark brown.

Head (Figs 2, 7, 12) a little wider than high in frontal view. Toruli at or near transverse trabecula, face almost always with a deep, narrowly triangular subtorular depression below each torulus (best seen in dry-mounted specimens) except with a subtorular ridge in one specimen from Papua New Guinea. Ocelli in an obtuse triangle, vertex with a small, shallow depression outside (anterior to) each ocellus; stemmaticum absent. Mandibles tridentate, crossing each other medially. Antenna (Figs 3, 8, 13) with a very short radicle fused with scape; funicle 6-segmented; clava large, entire, with 9 mps.
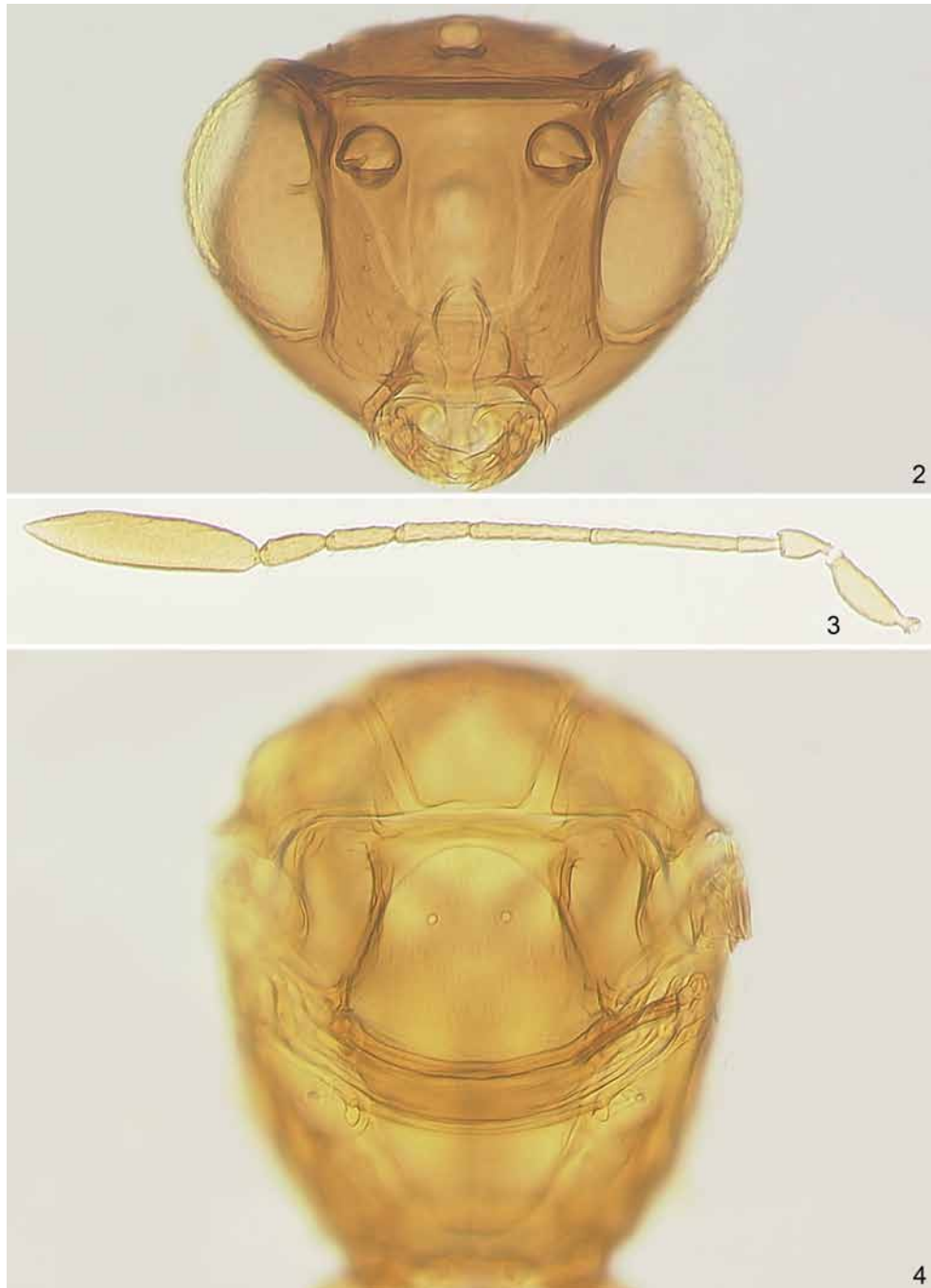
Figures 2–4. *Nepolynema grande*, female (Mt. Hayachine, Iwate Prefecture, Honshu Island, Japan). 2 – head, front view; 3 – antenna; 4 – mesosoma.

Mesosoma (Figs 1, 4, 9, 14, 18) shorter than metasoma, its dorsum strongly curved in lateral view, thus pronotum and propodeum not in the same plane as mesoscutum or scutellum. Pronotum smooth, strap-like, very short, entire, not or hardly visible in dorsal view; remainder of mesosoma either smooth or mesoscutum and scutellum with faint but conspicuous, mesh-like sculpture, or mesoscutum reticulate. Propleura abutting each other anteriorly along midline, the prosternum thus closed anteriorly. Mesoscutum with well-defined, wide notauli, its midlobe without adnotaular setae. Axillae well differentiated, each with 1 seta. Scutellum with a frenal line but without frenal foveae, frenum very short. Dorsellum of metanotum very short. Propodeum without median or submedian carinae; propodeal spiracle small and round. Fore wing (Figs 5, 10, 15, 19) wide, with marginal setae rather long; venation extending to about 0.23 length of wing; marginal vein very long, with two strong, short dorsal macrochaetae, hypochaeta between them but close to proximal one; disc with a brownish tinge throughout, more conspicuously so behind and beyond venation along the margins, densely setose except in some species with a bare area behind and just beyond venation. Hind wing (Figs 5, 10, 15, 19) much shorter than fore wing, with disc very narrow. Legs very long, lighter colored than body; tarsi 4-segmented.

Metasoma (Figs 6, 11, 16, 20) with petiole long (much longer than wide), attached posteriorly to gastral tergum. Ovipositor not or at most barely exserted beyond gastral apex.

M a l e (known for only one species, *N. shatenka* **sp. n.**). Antenna (Fig. 17) 13-segmented, extremely long (much longer than body). Genitalia as in Fig. 21.
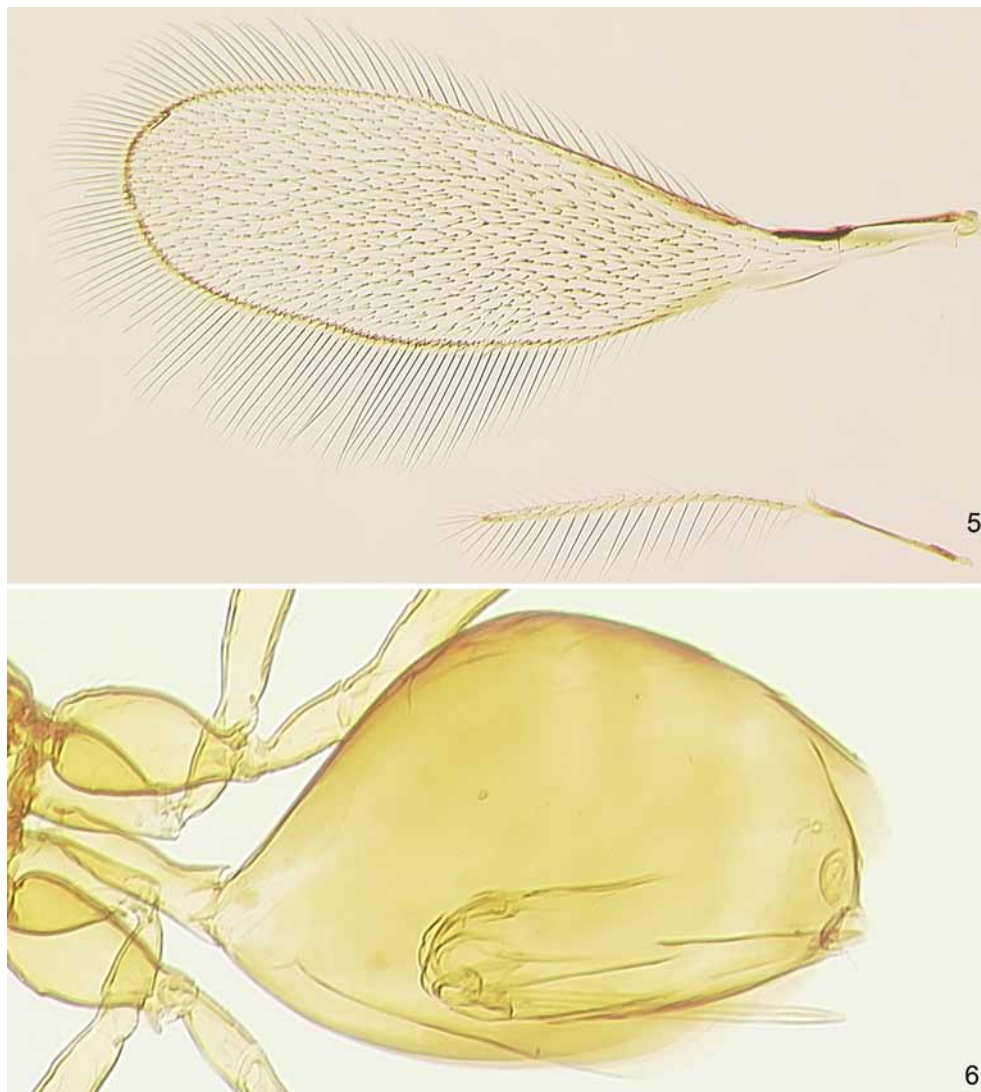
Figures 5, 6. *Nepolynema grande*, female (Mt. Hayachine, Iwate Prefecture, Honshu Island, Japan). 5 – wings; 6 – metasoma.

Diagnosis. Nepolynema clearly belongs to the *Polynema*-group of genera; it keys either to *Stephanodes* Enock or to *Polynema* in Triapitsyn and Huber's (2000) key to the Palaearctic genera of Mymaridae. It differs from *Polynema* s.l., as defined by Triapitsyn and Fidalgo (2006), by a longer marginal vein of the fore wing and also by the position of the hypochaeta relative to its two dorsal macrochaetae: in this new genus the hypochaeta is between them but close to the proximal one whereas in *Polynema* s.l. it is proximal to both macrochaetae. Also in *Polynema* s.l. the vertex lacks a small, shallow depression outside (anterior to) each ocellus. *Nepolynema* differs from *Polynema* (*Polynema* Haliday) and *P.* (*Dorypolynema* Hayat et Anis) by the prosternum closed anteriorly by the propleura abutting each other anteriorly along
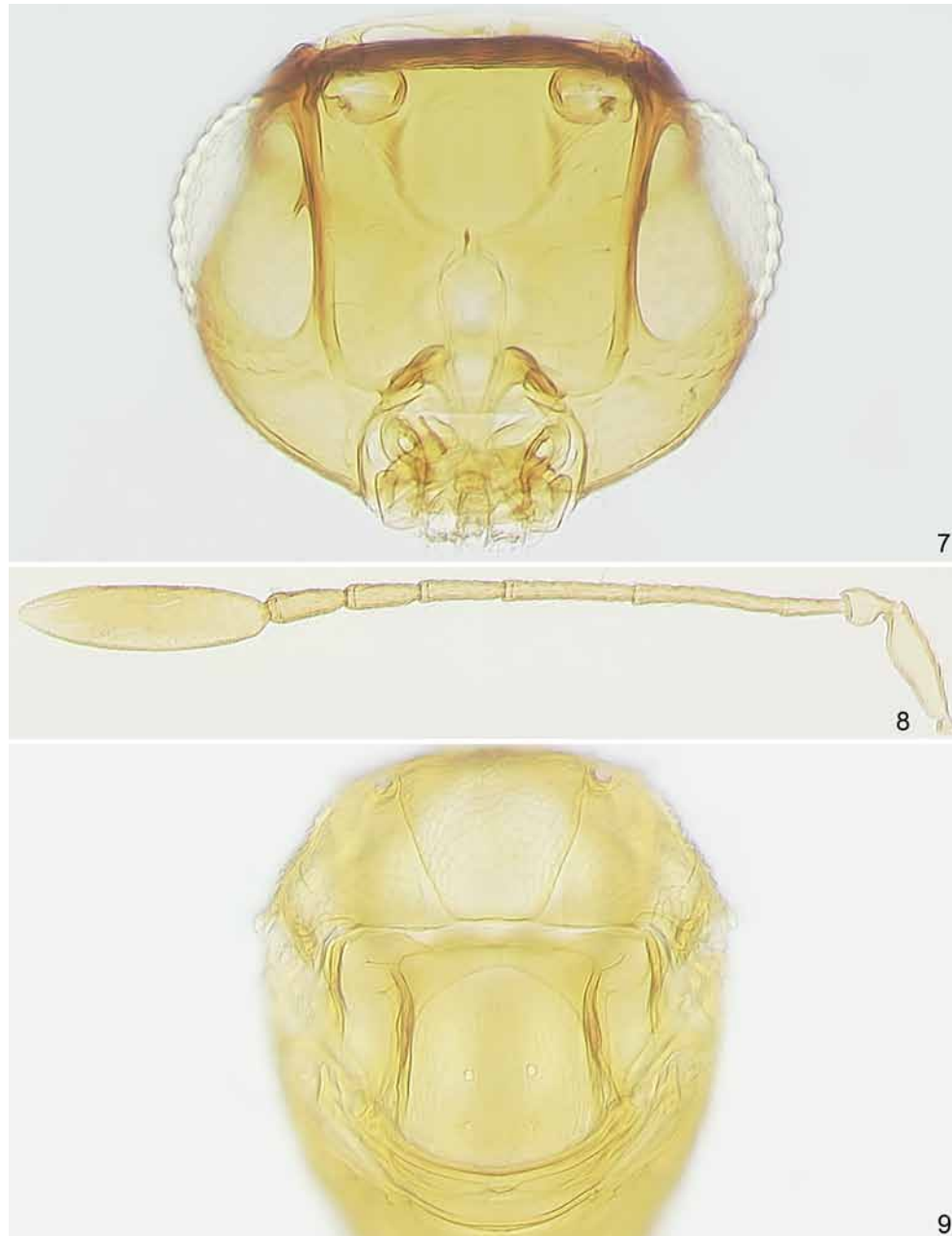
Figures 7–9. *Nepolynema kasparyani*, female (holotype). 7 – head, front view; 8 – antenna; 9 – mesosoma.

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midline whereas in these subgenera the prosternum is open, and from the subgenus *P.* (*Doriclytus* Foerster) in lacking a pit next to each torulus on the face (Triapitsyn, Fidalgo, 2006). It differs from *Stephanodes* and *Agalmopolynema* Ogloblin, to which it is most similar, by the way the petiole is attached posteriorly to the gastral tergum, not to the gastral sternum as in these two related genera (Huber, Fidalgo, 1997). *Nepolynema* also differs from *Stephanodes* in lacking two pits above and between toruli on the face. From the Holarctic genus *Caraphractus* Walker, *Nepolynema* differs in having the propodeum smooth, without carinae whereas in *Caraphractus*, the propodeum has two complete submedian keels (Triapitsyn, 2012); from another Holarctic genus, *Eustochus* Haliday, it differs in having an entire clava of the female antenna whereas in *Eustochus*, the clava of the female antenna is 2- or 3-segmented (Huber, Baquero, 2007); from the fossil genus *Eoeustochus* Huber, *Nepolynema* differs in having an entire clava of the female antenna whereas it is 3-segmented in *Eoeustochus* (Huber, Greenwalt, 2011), and from the southern Neotropical genus *Vladimir* Triapitsyn, *Nepolynema* differs in lacking a median carina on the propodeum which is present and well-developed in *Vladimir* (Triapitsyn, 2013).

Etymology. The genus name is composed of "ne" (meaning "not a" in Russian) plus "*Polynema*", thus stating it is not a *Polynema*. Gender: neutral.

Distribution. So far known from Japan, Taiwan, Papua New Guinea, and Costa Rica.

Hosts. Unknown.

Key to females of *Nepolynema*

1. Vertex smooth; scape long, at least 6.6 times as long as wide; F2 about as long as F3; fore wing with a large bare area behind and just beyond marginal vein (Fig. 15) ....*N. shatenka* **sp. n.**

– Vertex with reticulate sculpture; scape short, at most 3.0 times as long as wide; F2 longer than F3; fore wing at most with a small bare area behind and just beyond marginal vein (Fig. 10) or without such an area (Fig. 5)... 2

2. F1 longer than pedicel; fore wing with a small bare area behind and just beyond marginal vein (Fig. 10) .... *N. kasparyani* **sp. n.**

– F1 slightly shorter than pedicel; fore wing without a bare area behind and just beyond marginal vein (Fig. 5) .... *N. grande* (Taguchi), **comb. n.**

Synopsis of the species

Nepolynema grande (Taguchi, 1971), comb. n.
(Figs 1–6)

Barypolynema grandis Taguchi, 1971: 57–59. Holotype female (not examined: lost from the Entomological Laboratory, College of Agriculture, Ehime University, Matsuyama, Japan, see "Type material" below). Original type locality: Komagahara, Aichi Prefecture, Honshu Island, Japan (Google Earth gives this location as "Komagahara Nishinagura, Shitara-chō, Kitashitara-gun, Aichi-ken", elevation 882 m).
Polynema grande (Taguchi, 1971): Noyes, 2013 (online database).

Type material. Neotype female (Fig. 1) [CNC], here designated in accordance with Article 75.3 ([ICZN] 1999) to avoid any possible ambiguity regarding the identity of this species (it was incorrectly described in *Barypolynema* and then de-facto, by an implied transfer, found itself in *Polynema* after Schauff (1984) synonymized the former genus under the latter, but it does not belong in there either), to define this nominal taxon objectively and clarify its taxonomic status, and because the original type (i.e., the holotype) of this species is lost along with the entire Hidenari Taguchi collection of Mymaridae (Kenzou Yamagishi, personal communication), on card labeled: 1. "JAPAN: Aichi, 900 m, Shitara, Uradani, 23.VI-3.VII.1994, K. Yamagishi, YPT [yellow pan trap], Beech forest"; 2. "N. genus nr. *Eustochus* ♀ [*Barypolynema*] *grandis* Taguchi Det. S. V. Triapitsyn 2001". The neotype (Fig. 1) is in excellent condition, complete. It comes from a locality (a hill in Dando-Uradani virgin forest) which is within about 4 km from the original type locality of this species and almost at the same elevation; Google Earth gives it as near "Uradani Damine, Shitara-chō, Kitashitara-gun, Aichi-ken" [Kitashitara District, Aichi Prefecture, Honshu Island]).

Material examined. Japan: Honshu Island: 1 female (CNC), Iwate Prefecture, Mt. Hayachine, 400 m, Malaise trap, 19–25.vii.1989, coll. H. Makihara, M.J. Sharkey. Kyushu Island: 1 female (AEI), Fukuoka Prefecture, Mt. Hiko, 700 m, 19–29.vi.1989, coll. K. Takeno, M.J. Sharkey. 1 female (CNC), Miyazaki Prefecture, Aya, Teruha Suspension Bridge, 32°01'N 131°11'E, 200 m, forest, 20–22.ix.1996, coll. L. Masner. Taiwan (China), Nantou County: 1 female (AEI), Ren-ai Township, Mei Feng, 2150 m, 10.v.1983, coll. H. Townes. 1 female (AEI), Wushe, 1150 m, 26.iv.1983, coll. H. Townes.

Re-description. F e m a l e (neotype and non-type specimens from Japan and Taiwan). Body length 1123–1320 μm (dry-mounted specimens, that of the neotype 1320 μm). Face, malar space, and gena brown, remainder of head dark brown (except in Taiwanese specimens head entirely dark brown); mesosoma brown; metasoma either light brown with first gastral tergum and anterior part of second tergum brown or almost entire gaster brown; antenna either mostly light brown with F6 and clava brown or clava, scape, and pedicel light brown and funicle brown; legs light brown.

Head (Fig. 2) slightly wider than mesosoma; face with fine, inconspicuous sculpture, toruli close to but not touching transverse and preorbital trabeculae; vertex with reticulate sculpture, occiput with finer sculpture. Antenna (Fig. 3) with scape minus radicle 2.6 times as long as wide, finely longitudinally striate; pedicel slightly longer than F1 (the shortest funicle segment); F2 the longest funicle segment, following funicle segments at least a little shorter than preceding segment; F6 the widest funicle segment, with 1 mps; clava 4.3 times as long as wide, a little longer than or about as long as combined length of F4–F6.
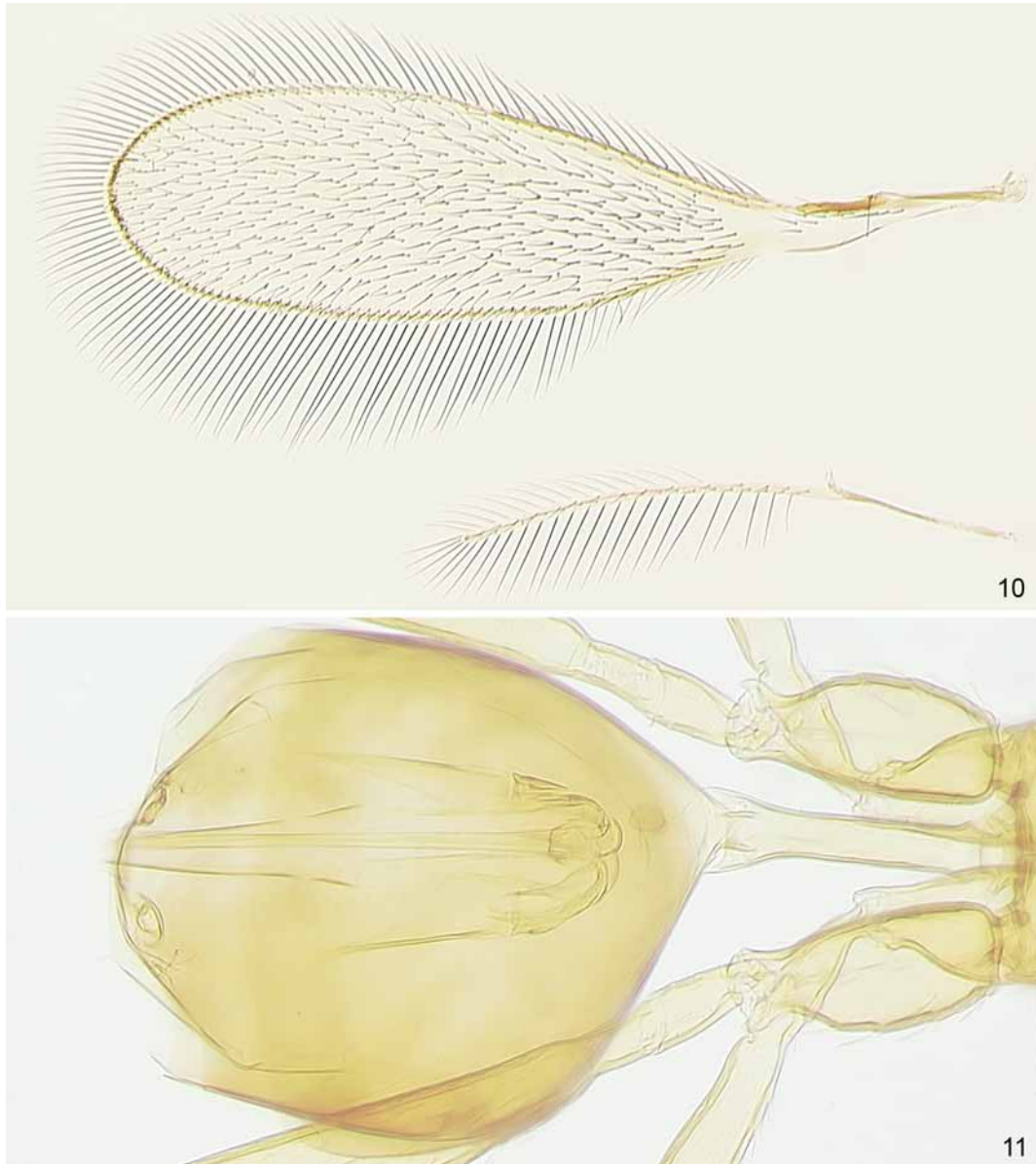
Figures 10, 11. *Nepolynema kasparyani*, female (holotype). 10 – wings; 11 – metasoma.

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Mesosoma (Fig. 4) about 1.2 times as long as wide. Mesoscutum and scutellum with fine but conspicuous sculpture; scutellar placoid sensilla not very close to anterior and lateral margins of scutellum. Fore wing (Fig. 5) 3.4 times as long as wide; longest marginal seta 0.65 times maximum wing width; hypochaeta extending to wing's posterior margin; disc notably infuscate, particularly along margins basally, densely setose with setae also present behind and just beyond marginal vein. Hind wing (Fig. 5) about 37 times as long as wide; longest marginal seta 7.0 times maximum wing width; disc infuscate, with two complete and one incomplete rows of setae.
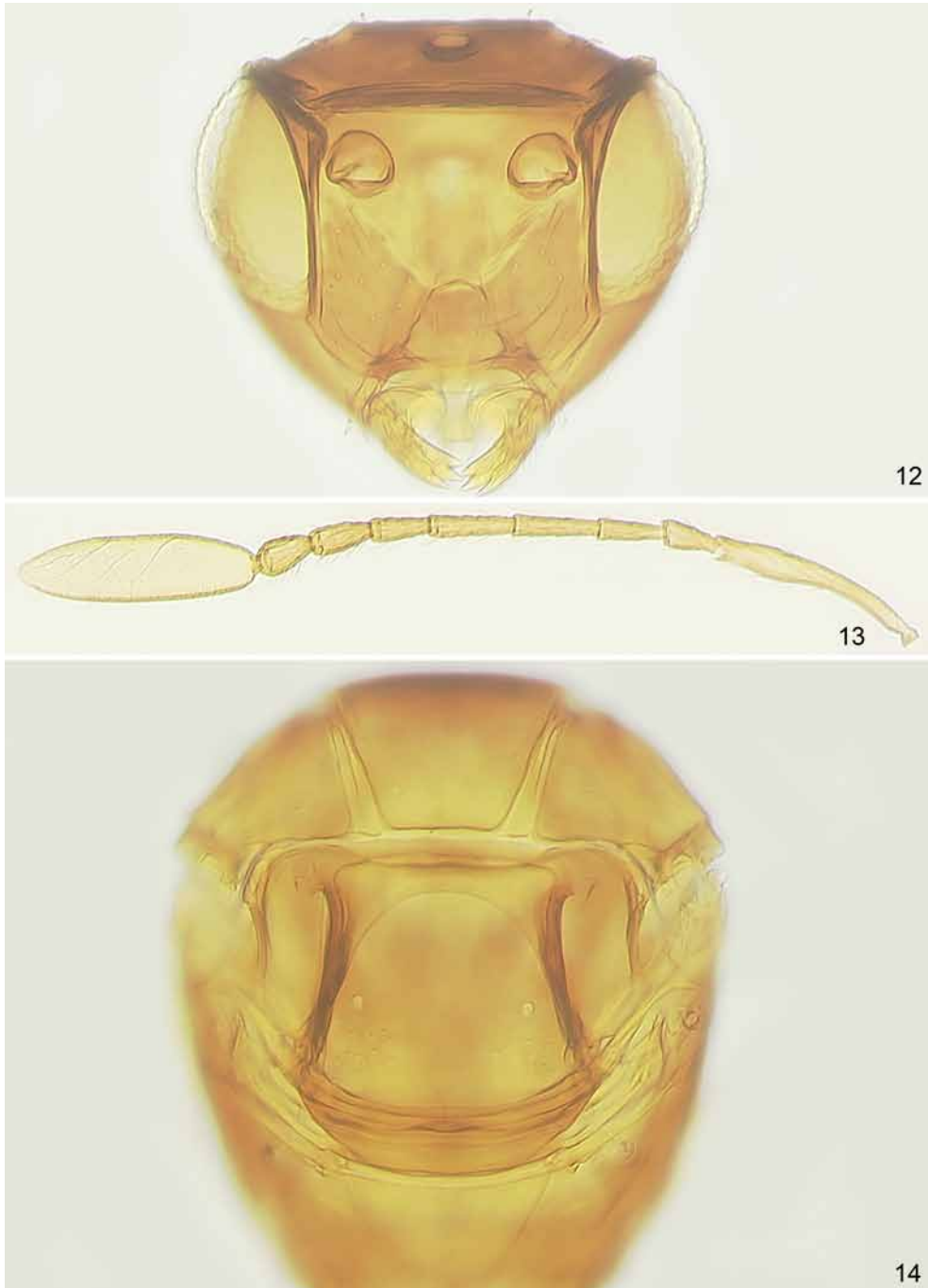
Figures 12–14. *Nepolynema shatenka*, female (holotype). 12 – head, front view; 13 – antenna; 14 – mesosoma.

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Metasoma (Fig. 6) with petiole about as long as metacoxa. Ovipositor occupying about 0.6 length of gaster and not exserted beyond gastral apex; ovipositor length: metatibia length ratio 0.65 : 1.

M a l e . Unknown.

Diagnosis. In addition to the distinguishing characters mentioned in the key, female of *N. grande* differs from that of *N. shatenka* in having a conspicuous (yet fine) sculpture on the mesoscutum (smooth in *N. shatenka*); from *N. kasparyani* it differs also in having the toruli not touching the transverse trabecula (touching in *N. kasparyani*).

Distribution. Japan (Taguchi, 1971), Taiwan (China) (**new record**).
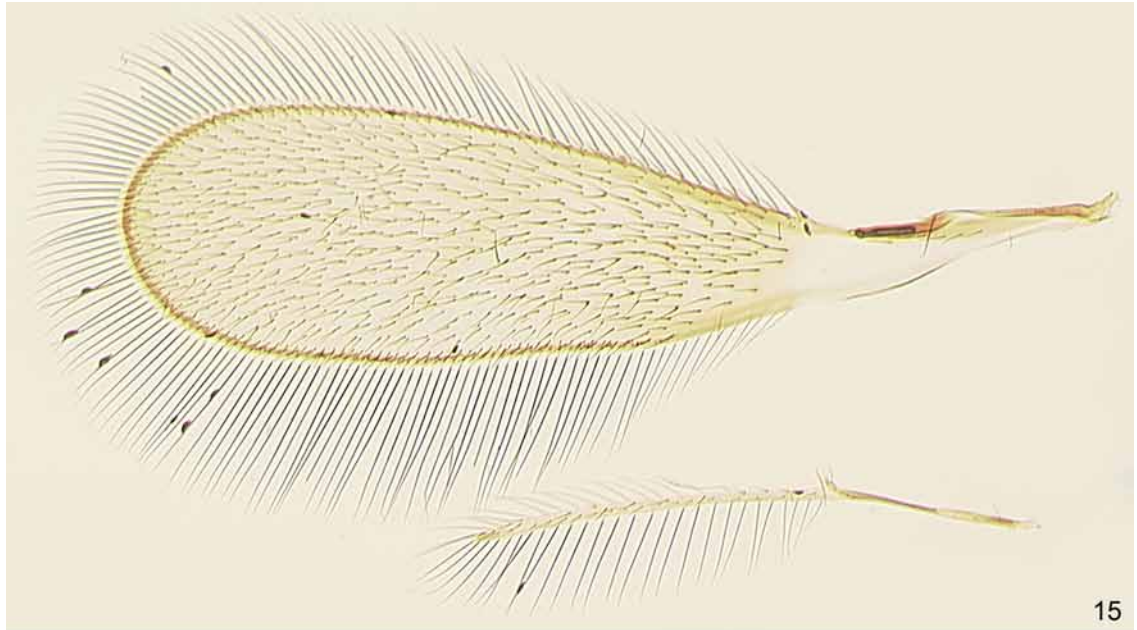
Figures 15, 16. *Nepolynema shatenka*, female (holotype). 15 – wings; 16 – metasoma.

Nepolynema kasparyani sp. n.

(Figs 7–11)

Type material. Holotype female (UCDC) on slide: Papua New Guinea, New Guinea Island, Gulf Province, Ivimka Research Station, Lakekamu Basin, 7°44'S 146°30'E, 120 m, 10–12.ii.2000, T.A. Sears, Malaise trap. The holotype is in good condition, complete, dissected under four coverslips.

Paratypes. Same data as the holotype except collected 7–8.iii.2000 (1 female on point, UCDC), 10–12.iii.2000 (1 female on point, UCDC), and 30.iii–1.iv.2000 (1 female on slide, UCRC).

Non-type material. Papua New Guinea, New Guinea Island, Southern Highlands Province, Mt. Giluwe, 2800 m, 3.i–8.ii.1979, J. Sedlacek (1 female, AEI). Although tentatively identified as *N. kasparyani*, this specimen is not included in its type series because it may possibly belong to a separate, undescribed taxon which is very close to *N. kasparyani*: its clava is notably darker than funicle, the toruli are not touching the transverse trabecula, and it has a subtorular ridge (rather than a narrow subtorular depression) on the face below each torulus.

Description. F e m a l e (holotype and paratypes). Body length 991–1057 μm (dry-mounted paratypes). Head dark brown; mesosoma and petiole brown; gaster darker than mesosoma (brown to dark brown); scape, pedicel and clava light brown, funicle brown; legs light brown.

Head (Fig. 7) about as wide as mesosoma; face smooth, toruli touching transverse trabecula; vertex and occiput with reticulate sculpture. Antenna (Fig. 8) with scape minus radicle 2.8–3.0 times as long as wide, faintly longitudinally striate; pedicel shorter than F1 (the shortest funicle segment); F2 the longest funicle segment, following funicle segments at least a little shorter than preceding segment except F6 about as long as or slightly longer than F5, F6 the widest funicle segment; mps on F5 (0 or 1) and F6 (1); clava 3.8–4.4 times as long as wide, slightly longer than combined length of F4–F6.

Mesosoma (Fig. 9) about 1.2 times as long as wide. Mesoscutum with reticulate sculpture, scutellum with finer, less conspicuous sculpture; scutellar placoid sensilla about in the middle of scutellum, as close to each other as to its lateral margins. Fore wing (Fig. 10) 3.8–3.9 times as long as wide; longest marginal seta 0.68–0.7 times maximum wing width; hypochaeta extending to wing's posterior margin; disc markedly infuscate, particularly along margins basally, densely setose but leaving a small bare area behind and just beyond marginal vein (a few setae present just behind marginal vein), discal setae stronger on about basal half or so of the wing. Hind wing (Fig. 10) 47–49 times as long as wide; longest marginal seta 9.2–9.3 times maximum wing width; disc infuscate, with 2 complete rows of setae.

Metasoma (Fig. 11) with petiole about as long as metacoxa. Ovipositor occupying 0.7–0.8 length of gaster and not or barely exserted beyond gastral apex; ovipositor length: metatibia length ratio 0.63–0.66 : 1.

Measurements (μm) of the holotype. Mesosoma 369; petiole 158; gaster 370; ovipositor 303. Antenna: radicle 15; remainder of scape 154; pedicel 61; F1 79; F2 194; F3 173; F4 109; F5 100; F6 103; clava 324. Fore wing 1445:375; longest marginal seta 258. Hind wing 885:18; longest marginal seta 166.

M a l e. Unknown.

Diagnosis. In addition to the distinguishing characters mentioned in the key and the diagnosis of *N. grande*, female of *N. kasparyani* differs from that of *N. shatenka* in having a conspicuous, reticulate sculpture on the mesoscutum (smooth in *N. shatenka*).

Etymology. The species is named in honor of Dr Dmitri R. Kasparyan.

Nepolynema shatenka sp. n.

(Figs 12–21)

Type material. Holotype female (UCRC) on slide: Costa Rica, Puntarenas Prov., Las Cruces Biological Station, 8.80°N, 82.97°W, 1200 m, 14–19.ix.2005, G. Kung, A. Kreuter, "Malaise trap #1" (UCRC ENT 394398). The holotype is in good condition, complete, dissected under four coverslips.

Paratypes. Costa Rica, Cartago Prov., 4 km NE of Cañon Genesis II, 2350 m, ii–iii.1995, P. Hanson (1 male on slide, CNC). No locality indicated, 17–20.vii.2000, J. Ashe *et al.*, flight interception trap (1 female on point, UCRC). Puntarenas Prov., Monteverde, 1700 m, 28.v–1.vi.1987, B.V. Brown (1 female on point, AEI).

Description. F e m a l e (holotype and paratypes). Body length 990–1057 μm (point-mounted, critical point-dried paratypes). Face, malar space, and gena brown, remainder of head dark brown; mesosoma and metasoma brown except petiole and base of gaster light brown; scape light brown to brown, pedicel and funicle brown, and clava yellowish or pale brownish, contrastingly lighter than funicle; legs light brown to brown.

Head (Fig. 12) slightly narrower than mesosoma; face smooth, toruli very close to but not touching transverse and preorbital trabeculae; vertex and occiput smooth. Antenna (Fig. 13) with scape minus radicle 6.6–6.7 times as long as wide, faintly longitudinally striate; pedicel shorter than F1; F2 about as long as F3 (the longest funicle segments), F4 the shortest and F6 the widest funicle segments, mps on F5 (1) and F6 (1); clava 3.5 times as long as wide, notably longer than combined length of F4–F6.

Mesosoma (Fig. 14) slightly less than 1.2 times as long as wide, smooth; scutellar placoid sensilla about in the middle of scutellum and close to its lateral margins. Fore wing (Fig. 15) 3.7 times as long as wide; longest marginal seta about

0.7 times maximum wing width; hypochaeta not extending to wing's posterior margin; disc strongly infuscate (particularly the setose areas), densely setose but leaving a large bare area behind and just beyond marginal vein (several setae present just behind marginal vein), discal setae stronger on about basal half or so of the wing. Hind wing (Fig. 15) about 40 times as long as wide; longest marginal seta 7.6 times maximum wing width; disc strongly infuscate, with one complete and one more or less complete rows of setae.

Metasoma (Fig. 16) with petiole shorter than metacoxa. Ovipositor occupying a little less than 0.9 length of gaster and barely exserted beyond gastral apex; ovipositor length: metatibia length ratio about 0.9 : 1.0.

Measurements (μm) of the holotype. Mesosoma 393; petiole 123; gaster 430; ovipositor 409. Antenna: radicle 15; rest of scape 303; pedicel 79; F1 94; F2 127; F3 127; F4 87; F5 90; F6 88; clava 340. Fore wing 1464:393; longest marginal seta 272. Hind wing 843:21; longest marginal seta 160.

Figures 17–19. *Nepolynema shatenka*, male (paratype). 17 – antenna; 18 – mesosoma; 19 – wings.

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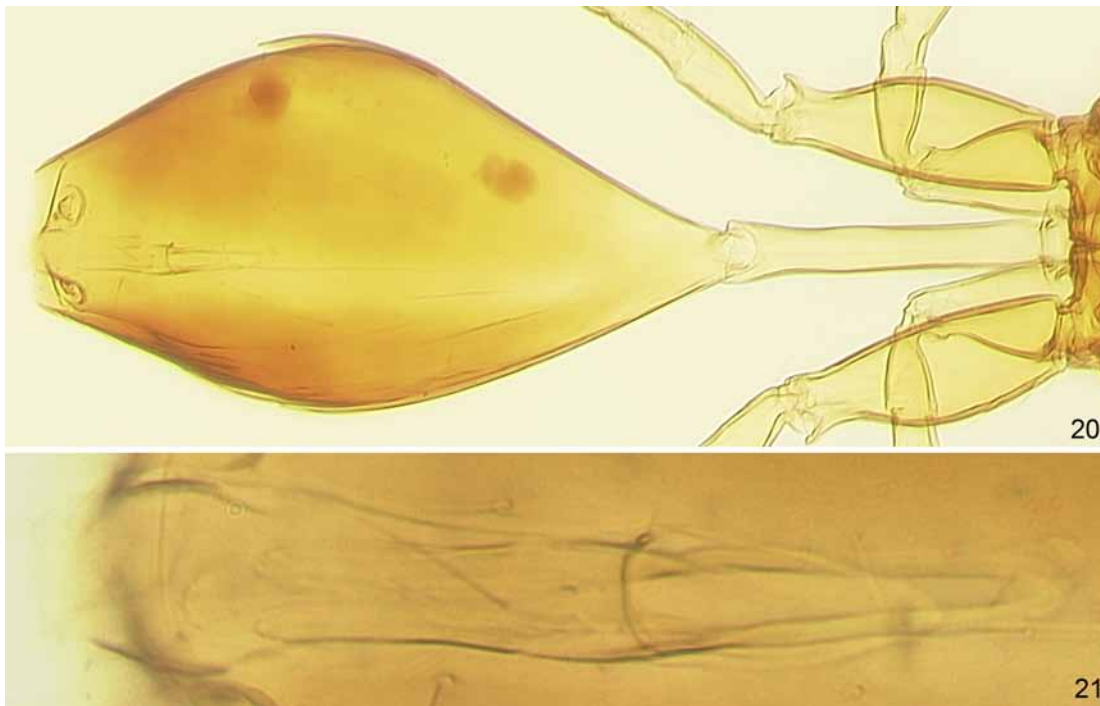
Figures 20, 21. *Nepolynema shatenka*, male (paratype). 20 – metasoma; 21 – genitalia.

M a l e (paratype). Body length about 1780 μm (slide-mounted specimen). Similar to female (although the only known male much larger) except for the normal sexually dimorphic characters such as a 13-segmented antenna (Fig. 17) and genitalia (Fig. 21), and also the following. Toruli almost touching transverse trabecula. Antenna (Fig. 17) extremely long (length 4650 μm, much longer than body); scape minus short radicle 2.5 times as long as wide, faintly longitudinally striate (almost smooth); F6 the shortest and F7 the longest among the flagellomeres, all of which much longer than wide and with numerous mps, F11 pointed apically. Mesosoma (Fig. 18) about 1.3 times as long as wide, much shorter than metasoma (Fig. 20). Fore wing (Fig. 19) 3.8 times as long as wide; longest marginal seta 0.72 times maximum wing width; venation extending to about 0.25 length of wing; discal setae not as strong on about basal half or so of the wing as in female. Hind wing (Fig. 19) about 36.0 times as long as wide; longest marginal seta 6.8 times maximum wing width; disc with two complete and one incomplete rows of setae. Petiole slightly longer than metacoxa.

Diagnosis. See the key and the diagnoses of *N. grande* and *N. kasparyani*.

Etymology. The species name is a noun in apposition; "shatenka" stands for a female with brownish or chestnut hair color in Russian.

Acknowledgments

References

Gibson G.A.P. 1997. Chapter 2. Morphology and terminology. *In*: Gibson G.A.P., Huber J.T., Woolley J.B. *Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera)*. Ottawa: NRC Research Press: 16–44.

Huber J.T., Baquero E. 2007. Review of *Eustochus*, a rarely collected genus of Mymaridae (Hymenoptera). *Journal of the Entomological Society of Ontario*, **138**: 3–31.

H u b e r J . T . , F i d a l g o P . 1997. Review of the genus *Stephanodes* (Hymenoptera: Mymaridae). *Proceedings of the Entomological Society of Ontario*, **128**: 27–63.

H u b e r J . T . , G r e e n w a l t D . 2011. Compression fossil Mymaridae (Hymenoptera) from Kishenehn oil shales, with description of two new genera and review of Tertiary amber genera. *ZooKeys*, **130**: 473–494.

I n t e r n a t i o n a l C o m m i s s i o n o n Z o o l o g i c a l N o m e n c l a t u r e . 1999. International Code of Zoological Nomenclature (ICZN). Fourth Edition adopted by the International Union of Biological Sciences. The International Trust for Zoological Nomenclature c/o The Natural History Museum, Cromwell Road, London: Tipografia La Garangola, Padova, Italy. I–XXIX + 306 pp.

N o y e s J . S . 2013. *Universal Chalcidoidea database*. World Wide Web electronic publication, the Natural History Museum, London, http://www.nhm.ac.uk/chalcidoids (last accessed 10 December 2013).

S c h a u f f M . E . 1984. The Holarctic genera of Mymaridae (Hymenoptera: Chalcidoidea). *Memoirs of the Entomological Society of Washington*, **12**: 1–67.

T a g u c h i H . 1971. Mymaridae of Japan, I (Hymenoptera: Chalcidoidea). *Transactions of the Shikoku Entomological Society*, **11**(2): 49–59.

T r i a p i t s y n S . V . (2011) 2012. Taxonomic notes on *Caraphractus* (Hymenoptera: Mymaridae). *Sahlbergia*, **17**(2): 20–29.

T r i a p i t s y n S . V . 2013. A new genus and two new species of Mymaridae (Hymenoptera: Chalcidoidea) from Chile. *Russian Entomological Journal*, **22**(3): 223–226.

T r i a p i t s y n S . V . , F i d a l g o P . 2006. Definition of *Doriclytus*, stat. rev. as a subgenus of *Polynema* and redescription of its type species, *P. (Doriclytus) vitripenne* (Hymenoptera: Mymaridae). *Zootaxa*, **1362**: 55–68.

T r i a p i t s y n S . V . , H u b e r J . T . 2000. 51 Fam. Mymaridae – mymarids. *In*: L e h r P . A . (Ed.) *Keys to the insects of Russian Far East in six volumes. Volume IV. Neuropteroidea, Mecoptera, Hymenoptera. Part 4*. Vladivostok: Dal'nauka: 603–614. (In Russian.)

A new species of the genus *Encyrtus* Latreille, 1809 (Hymenoptera: Encyrtidae) from Montenegro

V.A. Trjapitzin

Новый вид рода *Encyrtus* Latreille, 1809 (Hymenoptera: Encyrtidae) из Черногории

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Abstract. Seven species of the encyrtid wasp genus *Encyrtus* Latreille, characterized by the facial scrobes not meeting dorsally, are reviewed and keyed. One new species, *E. kasparyani* **sp. n.**, is described from Montenegro. An updated diagnosis of the genus is provided.

Key words. Encyrtidae, *Encyrtus*, taxonomy, key, Montenegro.

Резюме. Дан обзор 7 видов рода *Encyrtus* Latreille, характеризующихся несоединяющимися сверху лицевыми бороздками, и предложен их определительный ключ. Описан новый вид *E. kasparyani* **sp. n.** из Черногории. Дан обновленный диагноз рода.

Ключевые слова. Encyrtidae, *Encyrtus*, таксономия, определительный ключ, Черногория.

Introduction

I collected a new species of the genus *Encyrtus* Latreille, 1809 with facial scrobes not meeting dorsally (Fig. 2) in Montenegro in 2009. Species with such structure of the head have never been known from the Palaearctic region, but previously five species having this morphological feature had been described from the Afrotropical region and one from the Neotropical region. This contribution contains a key to such species with their synopsis, including description of *E. kasparyani* **sp. n.**

The most recent diagnosis of *Encyrtus* was published by Noyes (2010) in his monograph on the encyrtids of Costa Rica. Herein I include in the updated diagnosis of the genus also some important characters of the gastral structures discovered recently by Sugonyaev (1999, 2009).

An abbreviation used in the text is: F – an antennal funicular segment.

Results

Genus *Encyrtus* Latreille, 1809

Type species: *Chrysis infida* Rossi, 1790.

F e m a l e. Body usually more or less elongate, not flattened, in some species myrmecomorphous, and in one case (*E. ludmilae* Sugonyaev, 1998) gaster very long. Head hypognathous. Frontovertex occupying 1/3–1/2 head width. Ocelli in an obtuse triangle. Facial scrobes delimited dorsally and laterally by a sharp frontofacial ridge. Antennal scape long, not

broadened; funicle 6-segmented; clava 3-segmented (in most species) or 2-segmented (in *E. ravenna* Noyes, 2010). Mandible without teeth, apically rounded. Palpal formula 4–3. Pronotum transverse, short. Mesoscutum without notauli. Axillae touching each other. Scutellum more or less convex, with subapical or apical tuft of long dark setae, however not always developed. Mesopleuron separated from base of gaster by lateral parts of propodeum. Fore wing usually long, but sometimes strongly abbreviated; submarginal vein curved ventrally near apex, below with a rather long and broad stripe of long dark setae; marginal vein 2.0–6.0 times longer than wide, but may be punctiform or absent; stigmal vein strongly curved, its apex rounded, without uncus; postmarginal vein about as long as stigmal vein, apically connected to the latter by a hyaline naked streak. Disk of fore wing infuscate with a hyaline base and a transverse or oblique hyaline stripe; linea calva opened or closed (by setae) posteriorly. Mesotibial spur as long as mesobasitarsus. Metasomal petiole short, in *E. fuliginosus* Compere, 1940 with spiracles. Hypopygium (VII metasomal or fifth gastral sternite) as long as 2/3 of gaster, or reaching its apex and sometimes overpassing it. Ovipositor apparatus either entirely occupying all length of gaster or small, limited to its apical part or even its apex only. Sheaths of ovipositor not or hardly exserted. Body color from completely yellow to entirely black, usually without a pronounced metallic luster. Length of body 1.1–3.4 mm.

M a l e . Antenna with funicular segments covered with long setae (except in *E. fuliginosus*); clava entire. Fore wing usually hyaline; postmarginal vein longer than stigmal vein. Genitalia with long parameres; each digital sclerite with 2–6 strong spines. Length of body 1.1–3.3 mm.

Biology. Primary endoparasitoids of Coccidae.

Systematic position. The genus *Encyrtus* belongs to the tribe Encyrtini of the subfamily Encyrtinae.

Distribution. Cosmopolitan; 87 species are known in the world fauna.

Key to species of *Encyrtus* with facial scrobes not meeting dorsally (females)

1(4) Scutellum without a compact tuft of long black setae at or near apex.

2(3) Setae on scutellum occupying 2/3 of its posterior part. Body entirely black. Apical segment of maxillary and labial palpi not enlarged. Length of female body unknown; length of male body 1.8–2.2 mm ....***E. bedfordi***

Figure 1. *Encyrtus kasparyani* **sp. n.** (female, holotype), habitus.

3(2) Setae on scutellum arranged as a broad transverse stripe near apex. Body yellowish brown with some dark parts. Apical segment of maxillary and labial palpi strongly enlarged. Length of body of both sexes 2.2–2.4 mm ....*E. palpator*

4(1) Scutellum with a compact tuft of long black setae at or near apex.

5(6) Genae with long black setae. Length of body 1.7–2.4 mm.. **E. barbiger**

6(5) Genae with short setae.

7(8) Marginal vein of fore wing punctiform. Length of body 2.7 mm. ....*E. kasparyani* **sp. n.**

8(7) Marginal vein of fore wing longer than wide.

9(10) Only F1 and F2 longer than wide. Fore and hind coxae white. Length of body 2.3–2.8 mm. ....*E. kerzhneri*

10(9) F1–F3 or F1–F4 longer than wide. All coxae brownish black or black.

11(12) F1–F3 longer than wide. Lateral margins of frontofacial ridges not reaching eyes. Length of body 2.25 mm. ....*E. melas*

12(11) F1–F4 longer than wide. Lateral margins of frontofacial ridges reaching eyes. Length of body 2.75 mm. ....*E. aquilus*

Encyrtus aquilus **Prinsloo, 1982**

Prinsloo, 1982: 145–148; 1991: 4, 18; Noyes, 2010: 102.

Distribution and biology. Republic of South Africa. Reared from *Ceroplastes destructor* (Newstead) on Lachnea penicillata (Thymelaeaceae), and *Ceroplastes* spp. on Anthospermum sp. (Rubiaceae) and Erica sp. (Ericaceae).

Encyrtus barbiger **Pinsloo, 1991**

Prinsloo, 1991: 3, 4, 25–28.

Distribution and biology. Republic of South Africa. Reared from *Parasaissetia litorea* De Lotto on Chrysanthemoides monilifera (Asteraceae) and Passerina rigida (Thymeliaceae), also from Coccidae on P. vulgaris.

Encyrtus bedfordi **Annecke, 1963**

Annecke, 1963: 175–178; Prinsloo, 1991: 3, 4, 7–9; Noyes, 2010: 102.

Distribution and biology. Republic of South Africa. Reared from *Waxiella mimosae* (Signoret) on Acacia karroo (Fabaceae).

Encyrtus kasparyani **sp. n.**
(Figs 1, 2)

Type material. Holotype: female, Montenegro, Petrovac, shore of Adriatic Sea, road to monastery, pine forest, on a bush (?Vaccinium sp.), 23.IX.2009 (V.A. Trjapitzin coll.). Deposited in the Zoological Institute RAS, St Petersburg, Russia). The holotype is point-mounted.

Description. F e m a l e (holotype). Head as wide as high. Occipital margin smoothly concave, sharp, bordered by a rather shallow ditch. Eye about 1.4 times as high as wide and higher than malar space; posterior margin of eye almost touching occipital margin. Minimum width of vertex somewhat more than half of maximum head width. Ocelli arranged in an obtuse triangle with apical angle slightly more than 90°; distance between posterior ocelli more than distance from them to anterior ocellus (18 : 11), and distance from posterior ocellus to eye margin and to occiput somewhat more than diameter of an ocellus. Toruli immediately below level of lower eye margin. Facial scrobes narrow, straight, converging above at an acute angle but not meeting dorsally (Fig. 2); outer border of each scrobe forming a rounded bolster extending horizontally as a sharp margin of facial cavity and touching lower margin of eye. Interantennal prominence weakly convex, continuing somewhat beyond level of lower margins of toruli. Margins of genae forming a sharp keel. Subocular suture present, but not well discernible. Width of oral aperture about 0.25 maximum head width, its upper margin strongly concave. Antennal scape
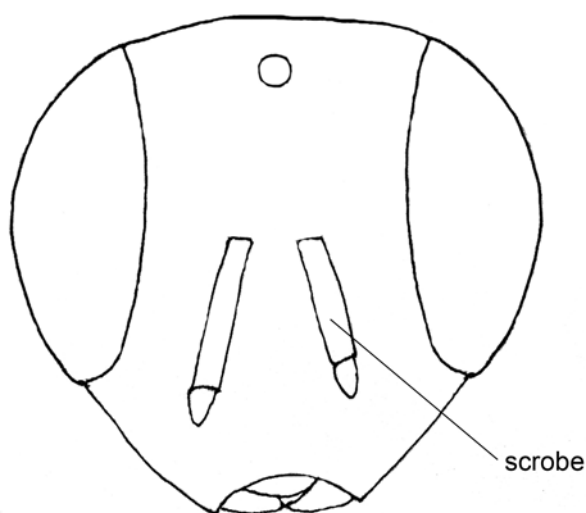
Figure 2. *Encyrtus kasparyani* **sp. n.** (female, holotype), head in frontal view.

nearly linear, slightly broadening towards apex, 6.0 times as long as wide at apex; pedicel 2.5 times as long as wide at apex and as long as F1, the latter 2.5 times as long as wide; F2 somewhat shorter than F1 (4 : 5) and twice or less (8 : 5) as long as wide; F3 the same size as F2; F4 slightly shorter than F3 (7 : 8) and a little longer than wide (7 : 6); F5 scarcely shorter than F4 and hardly wider that long; F6 a little shorter than F5 and wider than long (7 : 5); clava 1.5 times as long as wide, oval, with a rounded apex, as long as F5, F6, and half of F4 combined. Mesoscutum twice as wide as long. Scutellum as wide as long and 1.4 times longer than mesoscutum. Wings not abbreviated; fore wing 2.6 times as long as wide; costal cell approximately 16.0 times as long as wide; marginal vein punctiform; postmarginal vein hardly shorter than stigmal vein; angle between stigmal vein and anterior margin of wing somewhat less than 45°. Mesotibial spur a little longer than mesobasitarsus. Propodeum medially 3.0 times shorter than scutellum. Gaster oval, slightly longer than wide, a little shorter than mesosoma. Pygostyli nearer to apex than to base of gaster (3 : 4). Posterior margin of IX metasomal syntergite transverse and almost straight. Ovipositor sheaths not exserted.

Head black-brown with a greenish bronze luster, more pronounced on black vertex. Anterior ocellus black, posterior ocelli light. Antennal radicle light brown; rest of scape mostly of similar colour but black apically and dorsally (especially on the inner side); pedicel, funicle and clava black. Palpi dark. Pronotum (dorsal part), mesoscutum, tegula and gaster black (mesoscutum with a greenish bronze-violet luster). Axilla brown with black lateral and posterior (vertical) parts. Sclerites of metanotum (in dorsal view) black, bordered narrowly by yellowish brown. Mesopleura blackish brown. Veins of fore wing dark except for submarginal vein white distad of the tranverse dark stripe for about 0.15 of its length; disc of wing hyaline in its basal half and infuscate apically; with a transverse dark stripe at level of 0.65 of the basal hyaline part of wing: the dark stripe not reaching posterior margin of wing and 4.0 times as long as wide; costal cell hyaline, darkened towards submarginal vein starting from basal 0.25 of cell length. Fore leg: coxa yellowish white, as well as basal 0.35 of femur; apical 0.65 of femur, tibia and tarsus black. Middle leg: coxa black, femur blackish brown, tibia of same colour except apex brown, spur and tarsus blackish brown. Hind leg: black with bronze luster, basal 0.35 of first tarsal segment black, the rest of it and second to fourth segments white. Fifth segment of middle and hind tarsi dark.

Frontovertex with reticulate sculpture and small scattered pits. Mesoscutum reticulate. Tegulae minutely reticulate with punctation. Axillae and scutellum with minute cellular sculpture.

Setae on frontovertex short. Mesoscutum with rather long light setae, more or less adhering to its surface. Axillae with scattered black setae. Scutellum with a tuft of long black setae and with light adherent setae on its black part; setae shorter than those on mesoscutum. Submarginal vein of fore wing with chaetotaxy of two types: long and strongly inclined setae beginning from basal 0.15 of vein and reaching its white stretch, and short, more or less erect, rather dense setae in the same part of vein. Transverse dark stripe of the fore wing covered with black setae. Linea calva narrow, present only in the anterior quarter of wing. Length of body 2.7 mm.

M a l e and h o s t unknown.

Etymology. The species is named after Dr Dmitri Rafaelovich Kasparyan, an outstanding researcher of the world Ichneumonidae.

Encyrtus kerzhneri Trjapitzin et Sitdikov, 1993

Trjapitzin, Sitdikov, 1993: 165–167; Trjapitzin, Myartseva, 2004: 19–23; Noyes, 2010: 95, 102.

Distribution and biology. Costa Rica, Cuba. Host unknown.

Encyrtus melas Prinsloo, 1982

Prinsloo, 1982: 148–150; 1991: 3, 4, 18–19.

Distribution and biology. Republic of South Africa. Reared from *Ceroplastes tachardiaeformis* (Brain) on Elythropappus rhinocerotis (Asteraceae).

Encyrtus palpator **Prinsloo, 1991**

Prinsloo, 1991: 3, 6–7; Noyes, 2010: 102.

Distribution and biology. Cameroon. Host unknown.

Discussion

The above listed seven species do not constitute a monophyletic group. *Encyrtus bedfordi* and *E. palpator* both have a plesiomorphic chaetotaxy of scutellum without a tuft of setae, however this symplesiomorphy does not indicate that they are related. Indeed, they are very different in other features, for example in structure of the palpi. The Neotropical *E. kerzhneri* differs from the Afrotropical species in having a pubescent base of the fore wing and in this respect is archaic; according to structure of the gaster with a long hypopygium it is similar to *E. mexicanus* (Girault, 1917). A punctiform marginal vein of *E. kasparyani* is apomorphous comparing with an elongate vein of *E. melas* and *E. aquilus*.

Asknowledgements

References

A n n e c k e D . P . (1962) 1963. Records and descriptions of African Encyrtidae – 1 (Hymenoptera Chalcidoidea). *Journal of the Entomological Society of Southern Africa*, **25**(2): 170–191.

N o y e s J . S . 2010. Encyrtidae of Costa Rica (Hymenoptera: Chalcidoidea), 3. Subfamily Encyrtinae: Encyrtini, Echthroplexiellini, Discodini, Oobiini, and Ixodiphagini, parasitoids associated with bugs (Hemiptera), insect eggs (Hemiptera, Lepidoptera, Coleoptera, Neuroptera) and ticks (Acari). *Memoris of the American Entomological Institute*, **84:** 1–848.

P r i n s l o o G . L . 1982. Two new African species of *Encyrtus* Latreille (Hymenoptera: Encyrtidae) parasitic in wax scales (Hemiptera: Coccidae). *Journal of the Entomological Society of Southern Africa*, **45**(2): 145–150.

P r i n s l o o G . L . 1991. Revision of the Afrotropical species of *Encyrtus* Latreille (Hymenoptera: Encyrtidae). *Entomology Memoir, Department of Agricultural Development, Republic of South Africa*, **84**: i–iii, 1–30.

S u g o n y a e v E . S . 1999. [Chalcid wasps (Hymenoptera, Chalcidoidea) parasites on soft scales (Homoptera, Coccidae) in Vietnam. VII. A new peculiar species of the genus *Encyrtus* Latr. (Encyrtidae) inhabiting ants' nests (Hymenoptera, Formicidae)]. *Entomologicheskoe obozrenie*, **78**(2): 453–456. (In Russian.)

S u g o n y a e v E . S . 2009. Functional significance of variation in the shape of mandibles, wings, ovipositor, and metasoma of chalcidoid wasps. *Entomologicheskoe Obozreniye*, **88**(1): 56–64. (In Russian. English translation: *Entomological Review*, **89**(2): 150–156.)

T r y a p i t z i n V . A . , M y a r t s e v a S . N . (2002) 2004. Especies del género *Encyrtus* Latreille (Hymenoptera: Encyrtidae) en México, América Central y Bermudas. *Vedalia (Chapingo, México)*, **11:** 17–33.

T r j a p i t z i n V . A . , S i t d i k o v A . A . 1993. Description of a new species of the genus *Encyrtus* Latreille (Hymenoptera, Encyrtidae) from Cuba and a brief account of Cuban encyrtids. *Entomologicheskoe Obozrenie*, **72**(1): 165–173. (In Russian.)

A new species of the genus *Ormyrus* Westwood (Hymenoptera: Ormyridae) from the Russian Far East

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Новый вид рода *Ormyrus* Westwood (Hymenoptera: Ormyridae) с Дальнего Востока России

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Abstract. A new species, *Ormyrus kasparyani* **sp. n.**, is described from the Russian Far East. It differs from the similar species *O. orientalis* Walker, 1871 in having a longer gaster (with particularly long epipygium), more distinct sculpture on the gastral terga in both sexes, less sharp longitudinal median carina in female, and bright blue-violet colour of the gaster, especially in female.

Key words. Hymenoptera, Ormyridae, *Ormyrus*, new species.

Резюме. С Дальнего Востока России описан новый вид *Ormyrus kasparyani* **sp. n.** Новый вид близок к *O. orientalis* Walker, 1871, но отличается от него более длинным брюшком со значительно более длинным эпипигием, более четкой скульптурой на тергитах брюшка у обоих полов, менее острым и высоким продольным дорсальным килем на брюшке самки и ярко сине-фиолетовым цветом брюшка, особенно у самки.

Ключевые слова. Hymenoptera, Ormyridae, *Ormyrus*, новый вид.

A new species of *Ormyrus* Westwood, 1832 was found among the material reared from cynipid galls on *Saussurea neopulchella* Lipsh. (Asteraceae) collected in Primorskiy Territory of Russia. According to our review (Zerova, Seryogina, 2006), the Palaearctic taxa of *Ormyrus* are divided between the two species groups: the *O. diffinis* species group (female gaster without a dorsal median keel) and the *O. orientalis* species group (female gaster with a dorsal median keel). The new species described in this paper belongs to the *O. orientalis* species group.

Ormyrus kasparyani sp. n.
(Figs 1–7)

Description. F e m a l e (Figs 1, 2, 4–7). Body length 3.3 mm. Head and mesosoma bright metallic blue-green, gaster violaceous; antenna brown; all coxae bluish-green, metafemur brown with a violet tinge, fore- and mesofemora and all tibiae brown, tarsi yellow; wings hyaline with some yellowish tinge.

Head in dorsal view slightly broader than pronotum, wider than long (in ratio 55 : 26); POL almost twice longer than OOL (12 : 5); occipital carina distinct, sharp. Head in front view wider than high (55 : 40); eyes bare; gena twice shor-

ter than vertical eye diameter (11 : 25). Face faintly transversely striate, with rather dense sub-decumbent pubescence (better seen on lower face); gena very finely, but distinctly striate. Antennae inserted a little below the middle of face; scape long and slender; pedicel almost as long as first funicular segment; first anellus thin, second anellus wider than the first one, very thin; first funicular segment a little longer than wide; funicular segments 2–6 almost square; clava not wider than funicle.

Mesosoma in lateral view convex, in dorsal view pronotum 3.0 times as broad as long; pronotum, mesoscutum and scutellum with cross striation formed by numerous fine strips, and with short fine setae. Scutellum short, as long as broad, its apex rounded, with fine punctured rim. Mesopleuron smooth, bare. Propodeum medially with three thin striae, laterally with longitudinal reticulation. Metacoxa with thin punctation in the middle, dorsally with five long setae, ventraly with long keel and four short setae. Metatibia dorsally with numerousshort bristles. Fore wing with rather dense pilosity, speculum in the same pubescence as on the disc; basal cell with two rows of bristles. Lengths of marginal, postmarginal, and radial veins as 50 : 15 : 6.

Metasoma. Gaster in lateral view fully twice as long as mesosoma (85 : 40), with distinct median keel from tergites 2 to 5. Tergite 1 with very small basal foveae and fine punctation; sculpture on tergites 2 to 5 deeply alveolate with deep foveae, covered with long bristles; tergite 6 with thin punctation; tergite 2 shorter than tergites 3 and 4 which are equal in length, tergite 5 the longest, tergite 6 shorter than epipygium; the latter weakly raised. Ovipositor exserted a little beyond apex of gaster.

M a l e (Fig. 3). Length 2.2–2.5 mm. Gaster long, oval, slightly longer than mesosoma and head combined; gastral tergite 1 dorsally with fine reticulation, tergites 1 to 5 with the same sculpture as in female. Colour as in female.
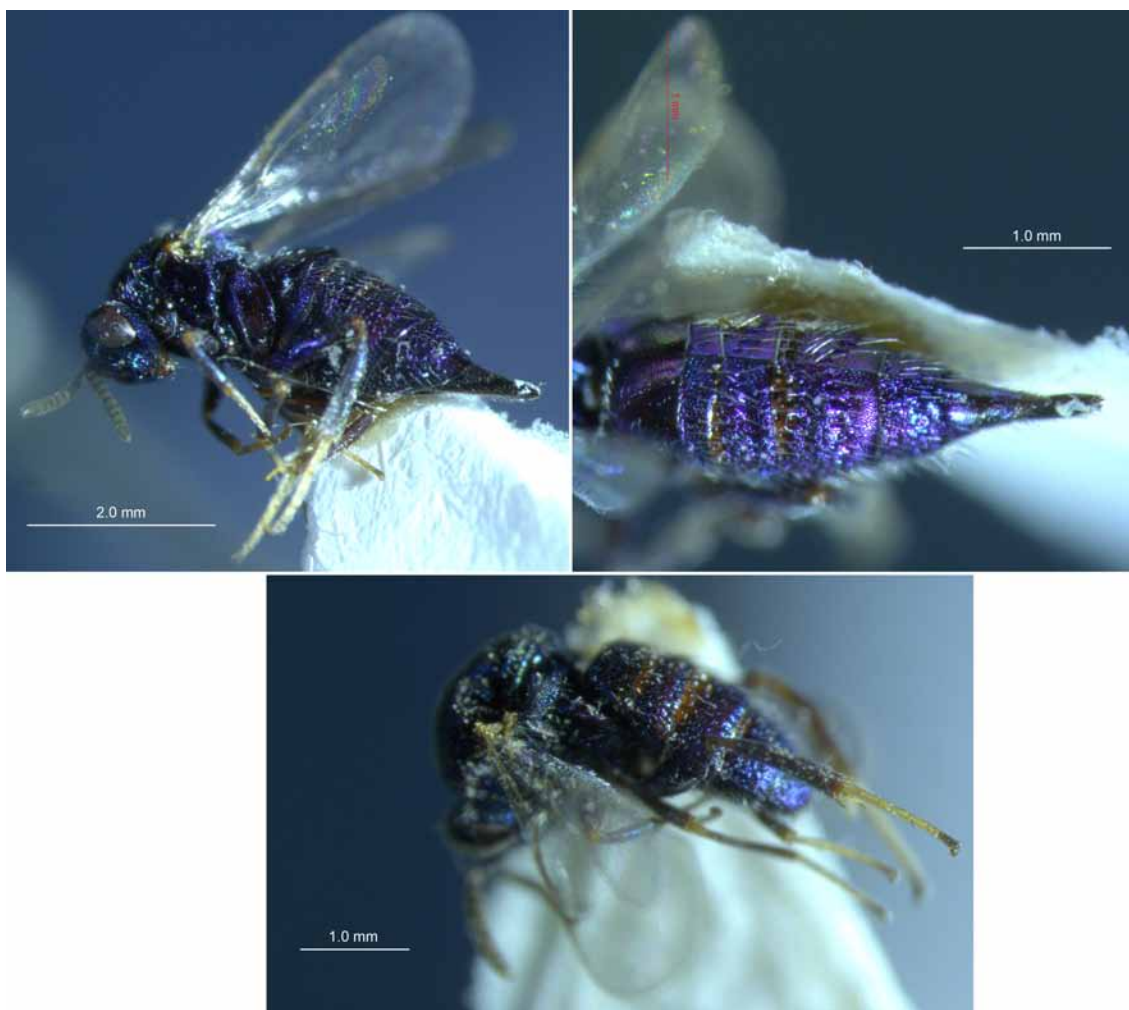
Figures 1–3. *Ormyrus kasparyani* **sp. n.** 1 –habitus of female, lateral view; 2 – gaster of female, dorsal view; 3 – habitus of male, lateral view.

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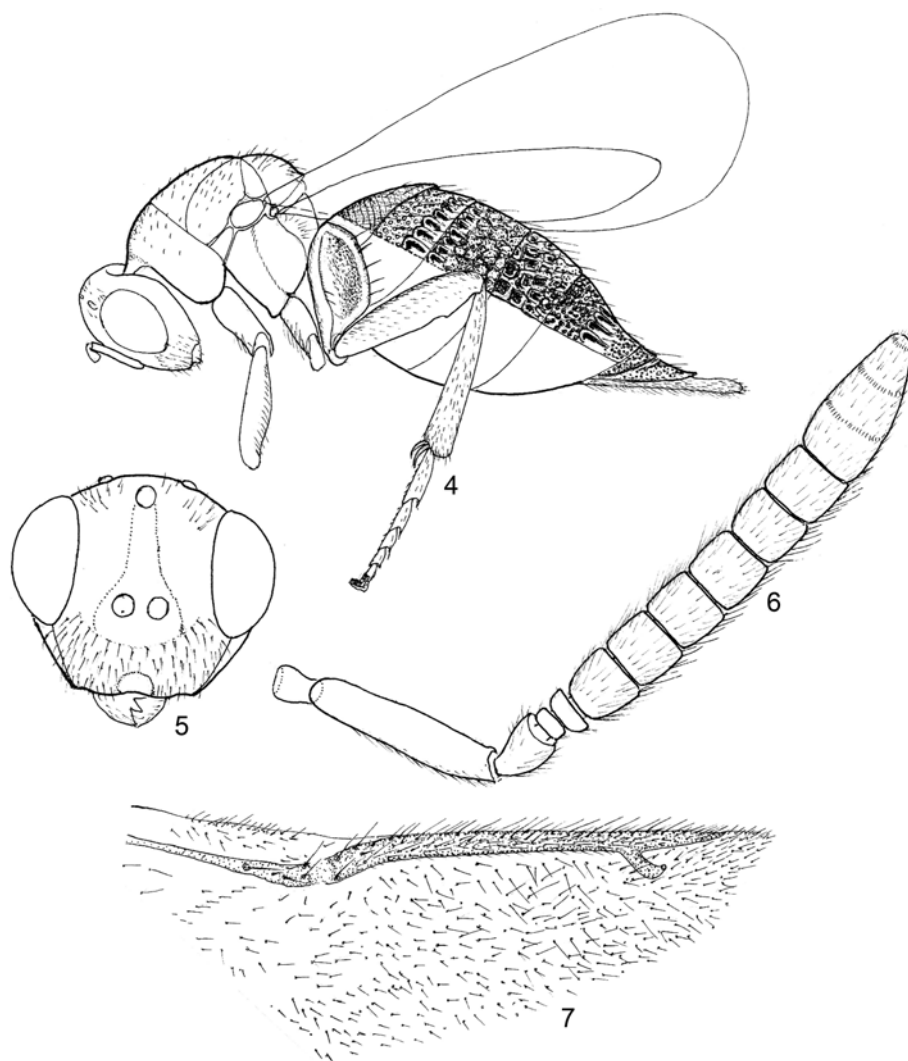
Figures 4–7. *Ormyrus kasparyani* **sp. n.** (female). 4 – habitus, lateral view; 5 – head, front view; 6 – antenna; 7 – fore wing venation.

Type material. Holotype: female, Russia, Primorskiy Territory, "Kedrovaya pad" Nature Reserve, from galls of *Dona* sp. (Hymenoptera: Cynipidae) in flower heads of Saussurea neopulchella Lipsh. (Asteraceae), 21.IV.1983 (M. Zerova coll.). *Paratypes*. 2 males, with the same label as in holotype. The holotype and paratypes are deposited in I.I. Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine, Kyiv, Ukraine.

Diagnosis. The new species is similar to *O. orientalis* Walker, 1871 from which it differs by the longer gaster (2.1 times as long as head and mesosoma combined in *O. kasparyani* **sp. n.** *vs* 1.4 times in *O. orientalis*), stronger sculpture (with deep foveae) of gaster in both sexes, and bright blue-violet colour of gaster (dark green in *O. orientalis*).

Etymology. The new species is named after Dr Dmitri R. Kasparyan, a famous hymenopterist, on his 75th anniversary.

References

Z e r o v a M . D . , S e r y o g i n a L . Y a . 2006. Review of Palearctic Ormyridae (Hymenoptera, Chalcidoidea), with description of two new species. *Vestnik zoologii*, **40**(1): 27–40.

Genus *Entomacis* Foerster, 1856 (Hymenoptera: Diapriidae) in the fauna of Russia, with description of two new species

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Род *Entomacis* Foerster, 1856 (Hymenoptera: Diapriidae) в фауне России с описанием двух новых видов

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Abstract. A review of the Russian fauna of the genus *Entomacis* Foerster is provided. Two species of this genus, *E. curticera* **sp. n.** and *E. kasparyani* **sp. n.**, are described from the Russian Far East. *Entomacis penelope* Nixon, *E. graeffei* Kieffer and *E. hajeki* Macek are recorded for the first time from Russia, *E. perplexa* (Haliday) from the Russian Far East, and *E. platyptera* (Haliday) from the European part of Russia. Key to seven species of *Entomacis* occurring in Russia is also provided.

Key words. Hymenoptera, Diapriidae, *Entomacis*, parasitoids, Russia, fauna, new species, new records, key.

Резюме. Дан обзор видов рода *Entomacis* Foerster фауны России. Два новых вида (*E. curticera* **sp. n.** и *E. kasparyani* **sp. n.**) описаны с Дальнего Востока России. *Entomacis penelope* Nixon*, E. graeffei* Kieffer и *E. hajeki* Macek впервые указаны для России, *E. perplexa* (Haliday) – для Дальнего Востока России и *E. platyptera* (Haliday) – для европейской части России. Также дан ключ для определения обитающих в России 7 видов *Entomacis*.

Ключевые слова. Hymenoptera, Diapriidae, *Entomacis*, паразитоиды, Россия, фауна, новые виды, новые находки, определительный ключ.

Introduction

The genus *Entomacis* Foerster, 1856 includes the smallest wasps of the Diapriidae tribe Spilomicrini. This genus consists 49 species from the World fauna (Jonson, 1992; Macek, 2000; Yoder, 2004; Rajmohana, 2006). Until recently only six species of *Entomacis* were known in the Palaearctic region (Johnson, 1992; Macek, 2000), and all of them were described from the Europe: *E. perplexa* (Haliday, 1857), *E. penelope* Nixon, 1980, *E. graeffei* Kieffer, 1909, *E. platyptera* (Haliday, 1857), *E. hajeki* Macek, 2000 and *E. muscorum* (Dahl, 1912) (Macek, 2000). Kozlov (1978) recorded four species of *Entomacis* in the fauna of Russia, *E. perplexa*, *E. platyptera*, *E. biguttata* Kieffer, 1911 and *E. cordata* Kieffer, 1911. During recent revision of the European species of the genus *Entomacis* (Macek, 2000), *E. biguttata* was synonymized with *E. perplexa*, and *E. cordata* with *E. platyptera*. Thereby only two species of this genus were previously known in the Russian fauna, of which *E. perplexa* was only collected in the European part of Russia, and *E. platyptera* in the Russian Far East. During study of material

from the collections of Zoological Institute of the Russian Academy of Sciences (St Petersburg, Russia) and Canadian National Collection of Insects (Ottawa, Canada), several specimens were found belonging to two undescribed species. Furthermore, *E. penelope*, *E. graeffei* and *E. hajeki* are recorded for the first time from Russia, *E. perplexa* first time found in the Russian Far East, and *E. platyptera* in the European part of Russia.

Material and methods

Material of this genus (327 specimens) was collected in the different localities of Russia. Type specimens of new species are deposited at the collection of Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia (ZISP) and Canadian National Collection of Insects, Ottawa, Canada (CNCI). The morphological terminology used following Masner and Garcia (2002), Yoder (2004) and Miko *et al.* (2007), and abbreviations for wing venation following by Yoder (2004). The next abbreviations are used for the collectors of material: S.B. – S. Belokobylskij, E.Ts. – E. Tselikh, D.R. – D. Rachin, V.Ch. – V. Chemyreva, K.T. – K. Tomkovich, V.K. – V. Kolyada, M.M. – M.V. Michailovskaya, D.K. – D.R. Kasparyan. In the descriptions the following additional terms and abbreviations are used: MGS – multiporous gustatory sensilla on ventral side of female clavomeres; *A1–A13* – antennomeres; *T2* and *S2* – the largest metasomal tergite and sternite respectively; POL – posterior ocellar line, the minimum distance between the posterior ocelli; OOL – ocellar-ocular line, the minimum distance between posterior ocellus and compound eye.

Taxonomic part

Genus *Entomacis* Foerster, 1856

Foerster, 1856: 121, 123.
Hemilexis Foerster, 1856: 122, 123, 127 (Type species: *Hemilexis mellipetiolata* Ashmead, 1887, first included species).
Glyphidopria Haliday, 1857: 170, 172 [Type species: *Diapria* (*Glyphidopria*) *platyptera* Haliday, 1857, designated by Muesebeck, Walkley, 1951].
Hemilexodes Ashmead, 1893: 386, 399 (Type species: *Hemilexodes floridana* Ashmead, 1893, by original designation).
Adeliopria Ashmead, 1902: 15 (Type species: *Adeliopria longii* Ashmead, 1902, by original designation).
Schizopria Kieffer, 1912: 5, 17 (Type species: *Schizopria fallax* Kieffer, 1912, designated by Kiffer, 1916).

Type species: *Diapria* (*Glyphidopris*) *platyptera* Haliday, 1857 (designated by Muesebeck, Walkley, 1951).

Key to species of *Entomacis* occurring in Russia

1. Upper mesonotal suture setose; propodeum setose dorsally; at least four apical clavomeres with MGS sensilla on ventral side; connection between clavomeres situated dorsally 2

– Upper mesonotal suture asetose; propodeum bare dorsally; MGS sensilla present only on *A*13; connection between clavomeres situated medially 4

2. Distal margin of forewings deeply emarginated; notauli complete .... *E. platyptera* (Haliday)

– Distal margin of forewings truncate or rounded; notauli absent..3

3. Head and mesonotum covered by numerous setae (Figs 13, 14); blade of median propodeal keel and plical process very reduced (Fig. 13); mesonotum as long as wide...................... *E. kasparyani* **sp. n.**

– Head and mesonotum bare; blade of median propodeal keel and plical process well developed; mesonotum longer than wide...*E. penelope* Nixon

4. Notauli complete throughout; propodeum in dorsal view prolonged; *A*13 of male longer than *A*12.......
....*E. graeffei* Kieffer

– Notauli absent or not complete; propodeum in dorsal view transverse or sometimes subquadrate; *A*13 of male shorter than *A*12...5

5. Head in lateral view distinctly higher than length (15 : 11), with weakly protrusive antennal shelf (Fig. 4); female *A*4 half as long as *A*3; *A*11 and *A*12 transverse (Fig. 3); medial keel of metanotum and plical process much projecting (Fig. 6); male *A*5–*A*13 shortened, *A*12 subquadrate (Fig. 1)...........
....***E. curticera* sp. n.**

– Head in lateral view slightly higher than length (10 : 9), with distinctly prominent antennal shelf (Fig. 5); female *A*4 0.7 or more times as long as *A*3; *A*11 and *A*12 subquadrate (Fig. 2); medial keel of metanotum not high, plical process moderately projecting (Fig. 7); male *A*5–*A*13 not shortened, *A*12 elongated 6

6. Syntergite finely striate basolaterally to median furrow; *A*4 in males conspicuously swollen; *A*5–*A*13 shortened, *A*12 subquadrate...***E. hajeki* Macek**

– Syntergite without basal striation; *A*4 in males usual shape; all antennomeres distinctly elongated (Fig. 8) ....***E. perplexa* (Haliday)**

Entomacis curticera sp. n.

(Figs 1, 3, 4, 6)

Type material. Holotype: female, Russia, Primorskiy Territory, vicinity of Spassk-Dal'niy, Vasilievka, 13.VII.1993 (S.B.) (ZISP).

Paratypes. Russia: Primorskiy Territory: Spassk-Dal'niy, 4–10.IX.2001 (S.B.), 16 females, 1 male (CNCI, ZISP); Kamenushka, 25–27.VII.2010 (E.Ts., D.R.), 1 female (ZISP); vicinity of Spassk-Dal'niy, Evseevka, 17.IX.1987 (S.B.), 1 female (ZISP); Ussuriysk District, Gornotayozhnoye, 43˚66'N, 132˚25'E, 11–12.IX.1999 (M.M.), 1 male (CNCI); Gorno-tayozhnoe, 17–23.VII.2003 (M.M.), 2 females (ZISP); Lazo Nature Reserve, VII.2007 (K. Makarov), 5 females (ZISP); Amur Province, Zeya Nature Reserve, 7–10.VII.1981 (V. Alekseev), 2 females (ZISP).

Etymology. Derived from Greek *curtis* (short) and *ceros* (horn).

Description. F e m a l e (holotype). Length of body 1.3 mm; length of fore wing 1.3 mm; length of antenna 0.8 mm.

C o l o u r . Body mainly dark brown; tegulae and petiole brown; antennal, palpi and legs yellowish brown, but apical segments of antennae slightly darker; matt spot pale brown.

H e a d . Head smooth, covered by long setae, in dorsal view transverse (11 : 13), not wider than mesosoma. Head in lateral view higher than length (14 : 11), with weakly protrusive antennal shelf (Fig. 3); vertex distinctly prominent. Tentorial pits distinct, not large. Malar sulcus absent. Clypeus transverse (8 : 5), smooth; epistomal sulcus flattened. Face above clypeus smooth. Labrum not visible. Ratio of distance between pleurostoma and width of head as 10 : 27. Mandibles not long, bidentate, teeth overlapping in 0.7 of its length. Eye bare, large, oval (9 : 11); malar space shorter than eye height (10 : 11). Eye about 0.4 times as long as head (11 : 30). Vertex gradually sloping behind ocelli. Temple broad behind eyes. Ocelli not large, round, triangular, distant between ocelli at least twice longer than width of front ocellus. POL much shorter than OOL (3 : 7). Occipital flange very narrow. Postgena without cushion.

A n t e n n a . Antenna short, covered by dense whitish setae. Scape smooth, cylindrical, slightly narrowed medially, with apical rim simple. Ratios of length and width of all antennomeres as 40 : 7; 14 : 7; 10 : 5; 6 : 5; 6 : 6; 8 : 6; 8 : 7; 8 : 8; 8 : 9; 9 : 9; 9 : 9; 9 : 9; 16 : 9.

M e s o s o m a . Mesosoma in dorsal and lateral views distinctly longer than wide (17 : 13). Neck bare, with irregular pressure. Pronotum smooth, with sparse long setae; pronotal shoulders rounded and slightly convex. Propleuron and mesopleuron on ventral side covered by silvery dense pubescence. Mesopleuron smooth and bare, median oblique line flattened. Matt mesopleural spot above mesocoxa large, round, pale. Acetabular carina distinctly visible. Epicnemial pit without pilosity, area posterior to epicnemial pit slightly rugulose. Tegula completely covered fore wing base, reaching posterior margin of axilla. Mesonotum wider than long (18 : 23), without notauli; humeral sulcus developed, covered by numerous setae. Anterior scutellar pit transverse (7 : 5). Lateral scutellar pits not deep. Posterior scutellar pits small, continued laterally of scutellum. Axillla posteriorly, axillar depression, metanotum and lateral side of propodeum covered by setae. Upper mesopleural suture asetose. Metanotum narrow, pubescent, with high medial and low lateral keels. Propodeum dorsally smooth and bare, transverse (5 : 4). Median propodeal keel well developed, its blade high. Upper plica and lower plica well developed, plical process distinctly projecting, triangular.

W i n g s . Fore wing apex truncate, with long setae along margin, these setae 0.2 times as long as maximum width of wing. Costal vein absent. Submarginal vein tubular, sclerotized. Distal *RS*, distal *M* and distal *CU* absent, *M+CU* absent, basal vein and 1*CU* nebulous. Marginal vein longer than wide (9 : 5), shorter than stigmal vein (3 : 5). Ratio of maximum width and length of wing as 10 : 31.

M e t a s o m a . Petiole short, in dorsal view slightly longer than wide (11 : 9), cylindrical, with longitudinal grooves and long setae on ventral and lateral side. *T2* smooth and bare, *T2* notch distinct, *T2* lateral grooves shallow. Followed three tergites smooth and bare; apical tergite covered by setae. *S2* with lateral grooves, with setose line in half of *S2* length and long setae medially. *S3*–*S5* with separate setae, smooth, apical sternite with numerous and different length setae.

M a l e . Similar to female, differences only in antennal structures. *A3* and *A4* slightly swollen, equal in length or *A3* shorter than *A4*; emargination of *A4* extending a little beyond 0.7 of segment length. Keel on *A4* curved. Ratios of length and width of antennomeres as 36 : 6; 12 : 9; 20 : 8; 20 : 8; 12 : 7; 12 : 7; 12 : 7; 12 : 7; 12 : 7; 10 : 7; 10 : 7; 10 : 7; 14 : 7.

Variation. Colour of body black or mesosoma and metasoma dark brown and only black posteriorly; sometimes petiole and propodeum paler than remaining body. Matt mesopleural spot pale brown and distinctly visibly, but some specimens with weakly visible matt spot the same colouration as mesopleuron. Fore wing apex truncate to rounded.
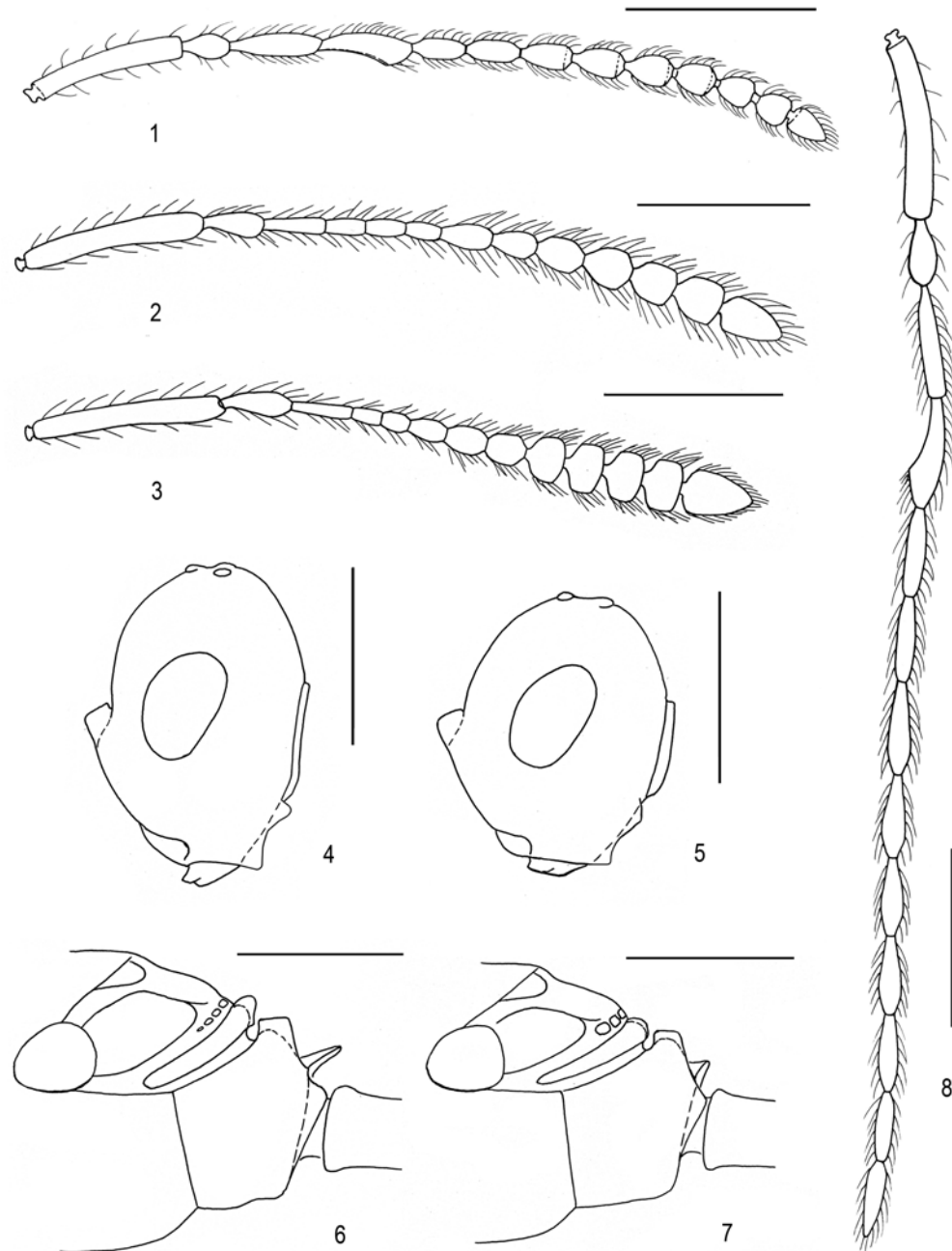
Figures 1–8. *Entomacis perplexa* (Haliday) (2, 5, 7, 8) and *E. curticera* **sp. n.** (1, 3, 4, 6). 1, 8 – antenna of male, dorsal view; 2, 3 – antenna of female, dorsal view; 4, 5 – head of female, lateral view; 6, 7 – mesosoma of female, lateral view. Scale bar – 0.2 mm.

Comparative diagnosis. Entomacis curticera **sp. n.** is related to *E. perplexa*, but differs by the shape of head, the structural features of male and female antennae, the absence of notauli, and the size of plical process of propodeum.

Entomacis kasparyani sp. n.

(Figs 9–14)

Type material. Holotype: female, Russia, Primirskiy Territory, Ussuriysk District, Gornotayozhnoye, N 43°66', E 132°25', 16–18.IX.1999 (M.M.) (ZISP).

Paratypes. Russia: Primorskiy Territory: Lazo Nature Reserve, 10.VIII.1972 (M. Kozlov), 1 male (ZISP); same locality, 4–10.VIII.1999 (M.M.), 1 female, 1 male (CNCI).

Etymology. Named in honor of the famous Russian hymenopterist and expert for Ichneumonidae Dr Dmitri R. Kasparyan.

Description. F e m a l e (holotype). Length of body 1.3 mm; length of fore wing 1.4 mm; length of antenna 1.0 mm.
C o l o u r. Body brown; palpi, legs, scape and pedicel yellowish brown.
H e a d. Head in dorsal view transverse (24 : 18), wider than mesosoma, antennal shelf very weakly developed. Head in lateral view as long as high, covered by numerous setae. Tentorial pits distinct and large. Malar sulcus not developed. Clypeus transverse (7 : 5), smooth and pubescent; epistomal sulcus visible only laterally. Face smooth and pubescent. Labrum narrow, with row of setae. Ratio of distance between pleurostoma and head width as 11 : 23. Mandibles short, bidentate, teeth equal sizes, much overlapping. Eyes large, oval (10 : 9), with a few shot setae. Eye half as high as head. Vertex abruptly sloping behind ocelli. Temple broad behind eyes. Ratio of height of eye and malar area as 10 : 6. Ocellar triangle large, distant between posterior ocelli equal to width of anterior ocellus. POL much shorter than OOL (3 : 7). Occipital flange narrow. Postgena without cushion of setae.
A n t e n n a. Antennomeres without tiloids covered by long setae. Scape smooth, curved, slightly broadened apically, with apical rim simple. Clavomeres not flattened, on ventral side without MGS brush. Ratios of length and width of antennomeres as: 32 : 5; 18 : 6; 10 : 3; 8 : 3; 8 : 3; 8 : 3; 10 : 4; 12 : 5; 10 : 7; 10 : 8; 10 : 8; 10 : 9; 16 : 10.
M e s o s o m a. Mesosoma not depressed dorsoventrally, in dorsal view distinctly longer than wide (32 : 18), in lateral view distinctly longer than high (32 : 22). Neck bare, without sculpture. Pronotum smooth, with sparse setae medially on dorsal side. Propleuron and mesopleuron on ventral side covered by dense silver pubescence. Mesopleuron smooth and bare, median oblique line flattened. Matt mesopleural spot above mesocoxa absent. Acetabular carina distinctly visible.
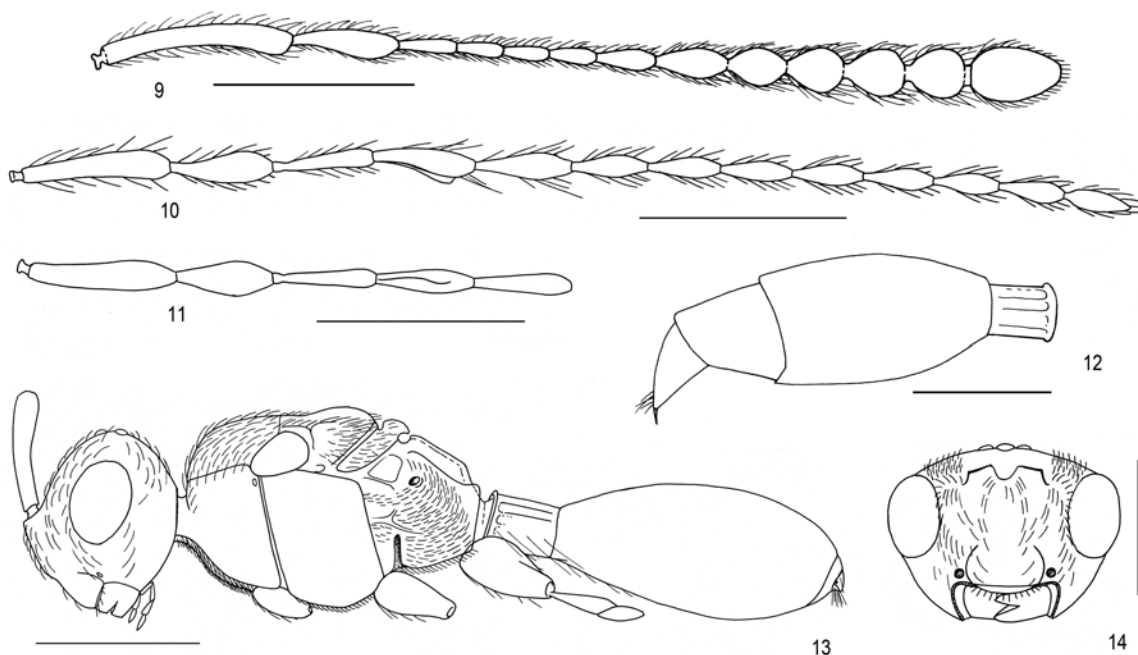
Figures 9–14. *Entomacis kasparyani* **sp. n.** 9 – antenna of female, lateral view; 10 – antenna of male, dorsal view; 11 – segments 1–5 of male antenna, lateral view; 12 – metasoma of female; 13 – habitus of male; 14 – face of male. Scale bar – 0.2 mm.

Epicnemial pit without pilosity. Tegula completely covered fore wing base, not reached posterior margin of axilla. Mesonotum as long as wide, without notauli and humeral sulcus, covered by numerous setae. Anterior scutellar pit transverse (5 : 3). Lateral scutellar pits absent. Axillla posteriorly, axillar depression and lateral margins of scutellar disk setose. Posterior scutellar pits flattened. Metanotum narrow, smooth, pubescent, with medial keel much projecting, lateral delimitation of dorsellum without carina. Mesopleural suture entire setose. Propodeum smooth, setose, convex dorsally. Median propodeal keel complete, evenly projected, its blade reduced. Upper plica, lower plica and plical process developed, but plical process very small.

W i n g s . Fore wing apex rounded, with long setae along margin, these setae 0.2 times as long as maximum width of wing. Costa and submarginal vein tubular, strongly sclerotized. Distal *RS*, distal *M* and distal *CU* absent, *M+CU* absent, basal vein and 1*CU* nebulous. Marginal vein longer than wide (5 : 2), as long as stigmal vein. Ratio of maximum width and length of wing as 4 : 9.

M e t a s o m a . Petiole in dorsal view longer than its median width (3 : 2), cylindrical, with longitudinal groove, covered by long setae ventrally and laterally. Apex of metasoma compressed laterally. *T2* smooth and bare, *T2* notch and *T2* lateral grooves absent. *T3–T5* fused together, it unified tergite moderately long, bare and smooth; apical tergite long, with few setae. Two last tergites fused immovably, long and narrow. *S2* without lateral and medial grooves, with short setose line.

M a l e . Antenna longer than length of body. Ratios of length to width of antennal segments as: 13 : 2.5; 7 : 3; 8.5 : 1.5; 8 : 2.5; 7 : 2; 6 : 2; 6 : 2.5; 6 : 2.5; 6 : 3; 5 : 3; 5 : 3; 5 : 3; 5 : 3. Apex of metasoma not compressed laterally. *T3–T5* fused together, but it unified tergite not long.

Comparative diagnosis. Entomacis kasparyani **sp. n.** differs from all known species of this genus by presence of pubescent on head and mesonotum, the structural features of antennae and propodeum, and the shape of metasomal apex of female.

Entomacis platyptera (Haliday, 1857)

Material examined (22 females, 17 males). Russia, Belgorod Province: Nature Reserve "Les na Vorskle", 25.VI.2012 (V.Ch.), 1 female. Moscow Province: Bitsa Park, 10.VII.1994, 25–30.VI.1988 (V.K.), 1 female, 1 male. Samara Province: Parfenovka, 2.VIII.2009 (V.Ch.), 1 female; National Park "Samarskaya Luka", 26.VII.2009 (V.Ch.), 1 female. Kirov Province: Bol'sheromanovo, 4–15.VIII.1994 (V.K.), 1 female, 2 males. Khanty-Mansi Autonomous Area: Mukhrino, 7–13.VIII. 2010 (K.T.), 4 females, 4 males. Krasnoyarsk Territory: Kuraginsky District, Sisim River, 13–14.VII.2012 (V.Ch.), 2 females. Amur Province: Zeya District, Sosnov Bor village, 1.IX.1981 (V. Alekseev), 1 female. Primorskiy Territory: Sichote-Alin' Nature Reserve, 6–11.VIII.2012 (V. Loktionov), 2 females, 8 males; Roschino, 21.VII.1976 (V. Zherikhin), 1 female; Evseevka, 17.VII.1995 (S.B.), 1 female; Lazo Nature Reserve, 10.VIII.1972 (M. Kozlov), 3 females; Ussuriysk District, Gornotayozhnoye, N 43°66', E 132°25', 4.VIII.–18.IX.1999 (M.M.), 3 females, 2 males. Sakhalin Province: Kunashir I., caldera of Golovnina Volcano, 25.VII.2011 (E.Ts., D.R.), 2 males.

Variations. Colour of body and antennae black to brown; petiole of brownish specimens distinctly paler than remaining body. Notauli divergent anteriorly or subparallel; petiole of female 1.1–1.6 times and male 1.3–2.8 times longer than its width.

Distribution. Ireland, United Kingdom, Sweden, Finland, Poland, Czech Republic, Austria, Russia (European part, Western and Eastern Siberia, Far East).

Entomacis graeffei Kieffer, 1909

Material examined (35 females, 17 males). Russia. Samara Province: Domashka, 19.VIII.2008 (V.Ch.), 1 female. Moscow, 1–15.VI.2004 (V.K.), 5 females. Kirov Province: Bol'sheromanovo, 4–15.VIII.1994 (V.K.), 1 female, 7 males. Khanty-Mansi Autonomous Area: Mukhrino, 7–13.VIII.2010 (K.T.), 3 females, 1 male. Altay Territory: vicinity of Zmeinogorsk, Novoaleyskoe, 5–8.VIII.2007 (S.B.), 1 female, 1 male. Krasnoyarsk Territory: Nature Reserve "Stolbi", 14.VIII.2003 (A. Kuvaev), 2 females; 70 km E Kryuchkov Station, 14–23.VII.2009 (K.T.), 1 female; Sisim River, 13–26.VII.2012 (V.Ch.), 4 females. Irkutsk Province: Irkutsk, 21–31.VII.1970 (D.K.), 1 male. Amur Province: Zeya, 1.IX.1981 (V. Alekseev), 3 females. Primorskiy Territory: Tachingouza (= Prosyolochnaya) Bay, 18.VIII.1961 (M. Kozlov), 1 male; Vladivostok, 10.VIII.1961 (M. Kozlov), 1 male; Ussuriysk Nature Reserve, 1.VIII.1961 (O. Kovalev), 2 males; Evseevka, 17–18.VII.1991 (S.B.), 1 female; Gornotayozhnoe, 19.VI–12.IX.1999 (M.M.), 14 females, 8 males; Lazo Nature Reserve, VII.2007 (K. Makarov), 1 female. Sakhalin Province: Sakhalin I., Nevel'sk, 9.VI.1972 (M. Kozlov), 1 female; Sakhalin I., Naiba River, 10–20.VIII.1991 (V. Zherikhin), 3 females; Kunashir I., caldera of Golovnina Volcano, 25.VII.2011 (E.Ts., D.R.), 2 males. Kamchatka Territory: Mil'kovo, 7.VII.1985 (S.B.), 1 female.

Variation. Colour of body black to pale brown; petiole and propodeum of pale specimens conspicuously paler; head darker than remaining body. *A13* only, *A12–A13, A11–A13* or *A10–A13* of female clava subquadrate, all remaining antennomeres elongate. Sinsternite lateral grooves deep to shallow.

Distribution. United Kingdom, Sweden, Czech Republic, Austria, Italy, Russia (European part, Western and Eastern Siberia, Far East) (**new record**).

Entomacis perplexa (Haliday, 1857)

(Figs 2, 5, 7, 8)

Material examined (131 females, 24 males). Russia. Leningrad Province: Sosnovo, 25.VIII.1985 (V. Trjapitsin), 41 females. Belgorod Province: Nature Reserve "Les na Vorskle", 25.VI.2012 (V.Ch.), 1 female. Krasnodar Territory: NW Krinitsi, Chankhot Mt., 4.VII.2004 (K.T.), 2 females; Sochi, Lazarevskoe, 25.V.1981 (V. Tobias), 1 male. Adygeya Republic: Dolochovskiy District, Belaya River, 19–24.VIII.2009 (K.T.), 1 female. Kaluga Province: Kaluga, 31.VII.1980 (V. Trjapitsin), 1 female. Moscow Province: Mamontovka, 28.VIII.1964 (V. Trjapitsin), 1 female; Moscow, 20.VII–20.VIII.1978 (V. Alekseev), 1 female, 1 male; Kolomna, Moscow River, 9.VII.1995 (M. Mostovskiy), 3 females; Malakhovka, 9.IX.1994 (M. Mostovskij), 3 females, 2 males; Pavlovskaya Sloboda, 1.VII–18.IX.1993 (V.K.), 10 females, 1 male; Bitsa Park, 16–30.IX.1993 (V.K.), 2 females; Opalikha Station, 12.VIII.1993 (V.K.), 1 female. Vladimir Province: Ostrovishchi, 21–27.VII.1971 (V. Alekseev), 3 females. Samara Province: Domashka, 8–27.V.2011 and 8–16.VI.2012 (V.Ch.), 9 females. Kirov Province: Bol'sheromanovo, 4–15.VIII.1994 (V.K.), 6 females, 4 males. Chelyabinsk Province: Ilmen' Nature Reserve, 13.VII.1958 (V. Tobias), 1 female. Khanty-Mansi Autonomous Area: Mukhrino, 7–13.VIII.2010 (K.T.), 1 male. Altai Territory: Novoaleyskoe, 5–8.VIII.2007 (S.B.), 1 female, 1 male; 20 km SE from Onguday, 20.VII.2007 (S.B.), 1 female; Kolyvanskoe Lake, 31.VII.2007 (S.B.), 1 female. Krasnoyarsk Territory: Sisim River, 13–26.VII.2012 (V.Ch.), 1 female, 7 males. Irkutsk Province: Kovykta gas field, 23–26.VIII.2002 (M. Mostovskiy), 1 female. Amur Province: Zeya Nature Reserve, 17.VIII–2.IX.1981 (V. Alekseev), 3 females. Khabarovsk Territory: Vyazemskiy, 20.VII.1961 (E. Shuvakhina), 1 female; Khabarovsk, Amur River, 23.VIII.1970 (D.K.), 1 female. Primorskiy Territory: Novokachalinsk, shore of Khanka Lake, 11.VIII.2001 (S.B.), 3 females; Vasilyevka, 13.VII.1993 (S.B.), 3 females; 30 km SW Ussuriysk, 17–19.VII.2001 (S.B.), 1 female; Ussuriysk District, Gornotayozhnoye, N 43°66', E 132°25', 4–10.VIII.1999 (M.M.), 1 female; Spassk-Dal'niy, 10.VII–20.VIII.1991 (S.B.), 3 females; Evseevka, 19.VIII–22.IX.1987 (S.B.), 19 females; Lazo Nature Reserve, 5–25.VII.2005 (K. Makarov), 1 female; same locality, 10.VIII.1972 (M. Kozlov), 1 female. Kamchatka Territory: Mil'kovo, 7.VII.1985 (S.B.), 1 female; Kozyrevsk, 21.VII.1985 (S.B.), 1 female.

Variation. Colour of body black to pale brown; in brown specimens petiole, base of metasoma and propodeum distinctly paler than remaining body; in dark specimens matt mesopleural spots pale brown or the same colour as mesopleuron; in pale brown specimens matt spots mainly same colour as mesopleuron. Antenna brown or yellow. Head in dorsal view narrower to wider than mesosoma. Notauli one-third of mesonotum length or sometimes as small pits. Dorsal area of propodeum transverse to subsquare. Plical process projecting to scarcely developed. Fore wing apex truncate to rounded. Antennomeres of female from elongated to subsquare, but not transverse. Antennomeres of male elongated with various length of segments. Petiole cylindrical or narrowed posteriorly, with different ration of length and width (from 7 : 12 to 8 : 10). Base of *S2* laterally smooth, with flattened grooves or irregularly rugulose.

Distribution. Germany, Czech Republic, Slovakia, Austria, Hungary, Poland, Moldova, Russia (European part, North Caucasus, Urals, Western and Eastern Siberia, Far East); USA, Canada.

Entomacis penelopa Nixon, 1980

Material examined (11 females, 2 males). Russia. Kirov Province: Bol'sheromanovo, 4–15.VIII.1994 (V.K.), 1 female. Krasnoyarsk Territory: Kryuchkovo VII.2009 (K.T.), 1 female; Sisim River, 26.VII.2012 (V.Ch.), 2 females, 2 males. Primorskiy Territory: Lazo Nature Reserve, 16–20.VIII.2010 (E.Ts., D.R.), 1 female; same locality, 10.VIII.1972 (M. Kozlov), 2 females; same locality, 5–25.VII.2005 (K. Makarov), 1 female; Anisimovka, 10.VIII.1991 (S.B.), 1 female; Nezhino, 16–18.VII.1993 (S.B.), 1 female; Spassk-Dal'niy, 20.VIII.1961 (O. Kovalev), 1 female.

Variation. Colour of body pale brown to black, sometimes petiole and propodeum faintly paler than remaining body. Antennae with various length of antennal segments.

Distribution. Ireland, Czech Republic, Austria, Russia (European part, Eastern Siberia, Far East) (**new record**).

Entomacis hajeki Macek, 2000

Material examined (2 females, 1 male). Russia. Yaroslavl' Province: Yaroslavl' (Kokujev), 2 females. Irkutsk Province: Irkutsk, 21–31.VII.1970 (D.K.), 1 male.

Distribution. Czech Republic, Austria, Russia (European part, Eastern Siberia) (**new record**).

Acknowledgements

References

A s h m e a d W . H . 1887. Studies of the North American Proctotrupidae, with description of new species from Florida. *The Canadian Entomologist*, **19:** 192–198.

A s h m e a d W . H . 1893. A monograph of the North American Proctotrypidae. *Bulletin of the United States National Museum*, **45:** 1–472.

A s h m e a d W . H . 1902. A new genus of diapriids from Texas. *Biological Bulletin*, **3:** 15.

D a h l F . 1912. Tierwelt. *Beiträge zur Naturdenkmalpflege*, **3:** 339–638.

F o e r s t e r A . 1856. *Hymenopterologische Studien. II Heft. Chalcidiae und Proctotrupii.* Aachen: Ernst ter Meer. 152 p.

H a l i d a y A . H . 1857. Note on a peculiar form of the ovaries observed in a hymenopterous insect, constituting a new genus and species of the family Diapriidae. *Natural History Review*, **4:** 166–174.

J o h n s o n N . 1992. Catalog of world Proctotrupoidea excluding Platygasteridae. *Memoirs of the American Entomological Institute*, **51:** 1–825.

K i e f f e r J . J . 1909. Description de nouveaux diapriides et belytides d'Europe. *Annales de la Societe Scientifique de Bruxelles. Memoires*, **33:** 381–393.

K i e f f e r J . J . 1911. Species des Hymenopteres d'Europe et d'Algerie. *In*: E . A n d r e (Ed.). *Librarie Scientifique (A. Hermann & Pils)*, **10:** 753–912.

K i e f f e r J . J . 1912. Hymenoptera. Family Diapriidae. *Genera Insectorum*, **124:** 1–75.

K i e f f e r J . J . 1916. *Diapriidae. Das Tierreich. Vol. 44.* Berlin: R. Friedlander and Sohn. 627 p.

K o z l o v M . A . 1978. Fam. Diapriidae. *In*: M e d v e d e v G . S . (Ed.). *Keys to insects of the European part of USSR, Volume 3. Hymenoptera. Part 2*: 548–608. (In Russian).

M a c e k J . 2000. Revision of the genus *Entomacis* in Europe (Hymenoptera: Diapriidae). *Folia Heyrovskyana*, **8**(2): 119–126.

M a s n e r L . , G a r c i a J . L . 2002. The genera of Diapriinae (Hymenoptera: Diapriidae) in the New World. *Bulletin of the American Museum of Natural History*, **268:** 1–138.

M i k o I . , V i l h e l m s e n L . , J o h n s o n N . F . , M a s n e r L . , P e n z e s Z . 2007. Skeletomusculature of Scelionidae (Hymenoptera: Platygastroidea): head and mesosoma. *Zootaxa*, **1571:** 1–78.

M u e s e b e c k C . F . W . , W a l k l e y L . M . 1951. Superfamily Proctotrupoidea. *In*: M u e s e b e c k C . F . W . , K r o m b e i n K . V . , T o w n e s H . K . (Eds). *Hymenoptera of America North of Mexico. Synoptic Catalog. United States Department of Agriculture Monograph*, **2:** 655–718.

N i x o n G . E . J . 1980. Diapriidae (Diapriinae). Hymenoptera, Proctotrupoidea. *Handbooks for the Identification of British Insects*, **8**(3di): 1–55.

R a j m o h a n a K . 2006. Studies on Proctotrupoidea and Platygastroidea Hymenoptera: Insecta of Kerala. *Memoirs of the Zoological Survey of India*, **21**(1): 1–153.

Y o d e r M . J . 2004. Revision of the north American species of the genus *Entomacis* (Hymenoptera: Diapriidae). *The Canadian Entomologist*, **136:** 323–405.

New Trematothoracinae (Hymenoptera: Sepulcidae) from the Lower Cretaceous of Transbaikalia

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Новые трематоторацины (Hymenoptera: Sepulcidae: Trematothoracinae) из нижнего мела Забайкалья

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Abstract. Two species of Trematothoracinae, *Trematothorax kasparyani* **sp. n.** and *T. demeter* **sp. n.**, are described from the Lower Cretaceous of Transbaikalia. The morphological features of Trematothoracinae, namely structure of mesonotum, size of metanotum, and "double" costal vein, are discussed.

Key words. Hymenoptera, Symphyta, Cephoidea, Sepulcidae, Trematothoracinae, *Trematothorax*, Lower Cretaceous, Transbaikalia, new taxa, fossil insects.

Резюме. Из нижнего мела Забайкалья описаны два новый вида сепулек из подсемейства Tremato-thoracinae – *Trematothorax kasparyani* **sp. n.** и *T. demeter* **sp. n.** Обсуждаются морфологические особенности, характерные для данного подсемейства: строение мезонотума, размеры метанотума и «двойная» костальная жилка.

Ключевые слова. Hymenoptera, Symphyta, Cephoidea, Sepulcidae, Trematothoracinae, *Trematotho-rax*, сепульки, нижний мел, Забайкалье, новые таксоны, ископаемые насекомые.

Introduction

Sepulcidae is a large family of sawflies, which lived from the Early Jurassic to Late Cretaceous. The first four genera of sepulcids (*Sepulca* Rasnitsyn, 1968, *Sepulenia* Rasnitsyn, 1968, *Parapamphilius* Rasnitsyn, 1968 and *Shurabisca* Rasnitsyn, 1968) were described by Rasnitsyn (1968) from the Jurassic of Central Asia (Karatau in Kazakhstan and Shurab III in Kyrgyzstan) as representatives of different Symphyta families or as genera of uncertain systematic position. Later Rasnitsyn (1988) revised these fossils and grouped them together with three other genera, *Ghilarella* Rasnitsyn, 1988, *Trematothorax* Rasnitsyn, 1988 and *Thoracotrema* Rasnitsyn, 1988, from the Cretaceous of Mongolia (Bon-Tsagaan), Transbaikalia (Baissa) and Magadan Province (Obeshchayushchiy Creek) in the family Sepulcidae. A suggestion about the origin of Cephidae from sepulcid-like ancestors has also been proposed. Nowadays the family Sepulcidae includes 17 genera and more than 40 species grouped into five subfamilies: Sepul-cinae Rasnitsyn, 1968, Parapamphiliinae Rasnitsyn, 1968, Trematothoracinae Rasnitsyn, 1988, Ghilarel-linae Rasnitsyn, 1988 and Xyelulinae Rasnitsyn, 1993 (Rasnitsyn, 1993). Sepulcids are known from Ka-

zakhstan (Rasnitsyn, 1968), Kyrgyzstan (Rasnitsyn, 1968, 1993), Mongolia (Rasnitsyn, 1988, 1993), Transbaikalia and the Russian Far East (Rasnitsyn, 1988, 1990, 1993), China (Ren *at al.*, 1995; Zhang *et al.*, 2007), India (Rasnitsyn, 2008), Britain (Rasnitsyn *et al.*, 1998), Spain (Rasnitsyn, Martinez-Delclos, 2000; Rasnitsyn, Ansorge, 2000), Germany (Rasnitsyn *et al.*, 2003) and Brazil (Darling, Sharkey, 1990; Martins-Neto *et al.*, 2007).

In 2004 and 2009, expeditions of the Borissiak Palaeontological Institute RAS (PIN), have collected extensive material on the Lower Cretaceous fossil insects, crustaceans and plants of the recently discovered locality Khasurty in southwestern Transbaikalia. The insect assemblage of Khasurty is very rich in hymenopterans, including eight representatives of Sepulcidae: two in *Trematothorax* Rasnitsyn, 1988, *Ghilarella* Rasnitsyn, 1988, and *Onokhoius* Rasnitsyn, 1990, one in Parapamphiliinae (new genus) and Sepulcidae (undetermined subfamily). It is noteworthy that such modest collection from one site includes all four subfamilies known from the Cretaceous. This paper deals with the most notable sawflies of that assemblage, the subfamily Trematothoracinae.

Trematothoracines are the sepulcids with a unique structure of mesonotum. It consists of two coarsely sculptured lateral lobes divided by a large non-sclerotised "hole" in the centre of the mesonotum (the structure of the mesonotum and other Trematothoracinae features are discussed below). Trematothoracinae is the largest subfamily of Sepulcidae. It includes 19 species grouped into four genera: *Trematothorax* Rasnitsyn, *Prosyntexis* Sharkey, 1990, *Thoracotrema* Rasnitsyn, and *Trematothoracoides* H. Zhang *et al.*, 2001. The genus *Sinosepulca* Ren *et al.*, 1995 described as member of Trematothoracinae (Ren *et al.*, 1995) was also included in this subfamily, but it should be correctly placed in Praesiricidae (Blank *et al.*, 2009). The genus *Trematothorax* includes six species: *T. baissensis* Rasnitsyn, 1988 (Baissa, Lower Cretaceous of Transbaikalia; Fig. 11), *T. ingodensis* Rasnitsyn, 1993 (Semen, Lower Cretaceous of Transbaikalia; Figs 12 and 13), *T. clementsi* Rasnitsyn et Jarzembowski, 1998 (Purbeck, Lower Cretaceous of Britain), *T. valdensis* Rasnitsyn et Jarzembowski, 1998 (Wealden, Lower Cretaceous of Great Britain), and two new species from two well-preserved imprints of Khasurty locality described below. Two more species previously placed in *Trematothorax, T. gobiensis* Rasnitsyn, 1993 and *T. okhotensis* Rasnitsyn, 1993, are transferred into the genus *Prosyntexis* (Rasnitsyn *et al.*, 1998). Two new species described here are remarkable in their fore wing length over 13 mm, the largest in known Trematothoracinae.

Material and methods

The studied material was collected in Khasurty locality situated in a roadway excavation near Khasurta farm, 25 km E Zakamensk, Zakamensk District, Republic of Buryatia, Russia (N 50°21', E 103°37'). The age is dated to lowermost Lower Cretaceous (Kopylov, 2011, 2012; Sinitshenkova, 2011). The fossils were collected by two palaeoentomological expeditions of PIN headed by D.E. Shcherbakov in 2004 and D.S. Kopylov in 2009.

The specimens were collected, prepared and studied using standard palaeoentomological methods. The photographs were made with a Leica MZ 9.5 microscope and Leica DFC 420 camera. The line drawings were made using CorelDraw X5 software.

Taxonomic part

Order Hymenoptera
Family Sepulcidae Rasnitsyn, 1968
Subfamily Trematothoracinae Rasnitsyn, 1988
Genus *Trematothorax* Rasnitsyn, 1988

Trematothorax kasparyani **Rasnitsyn et Kopylov, sp. n.**
(Figs 1–3, 6, 7, 10)
Etymology. The species is named in honour of Dr Dmitri R. Kasparyan.

Type material. Holotype: female, PIN, no. 5026/676, part and counterpart; head, anterior part of thorax and legs absent, wings and ovipositor well preserved. Russia, Buryatia, Khasurty; Lower Cretaceous.

200
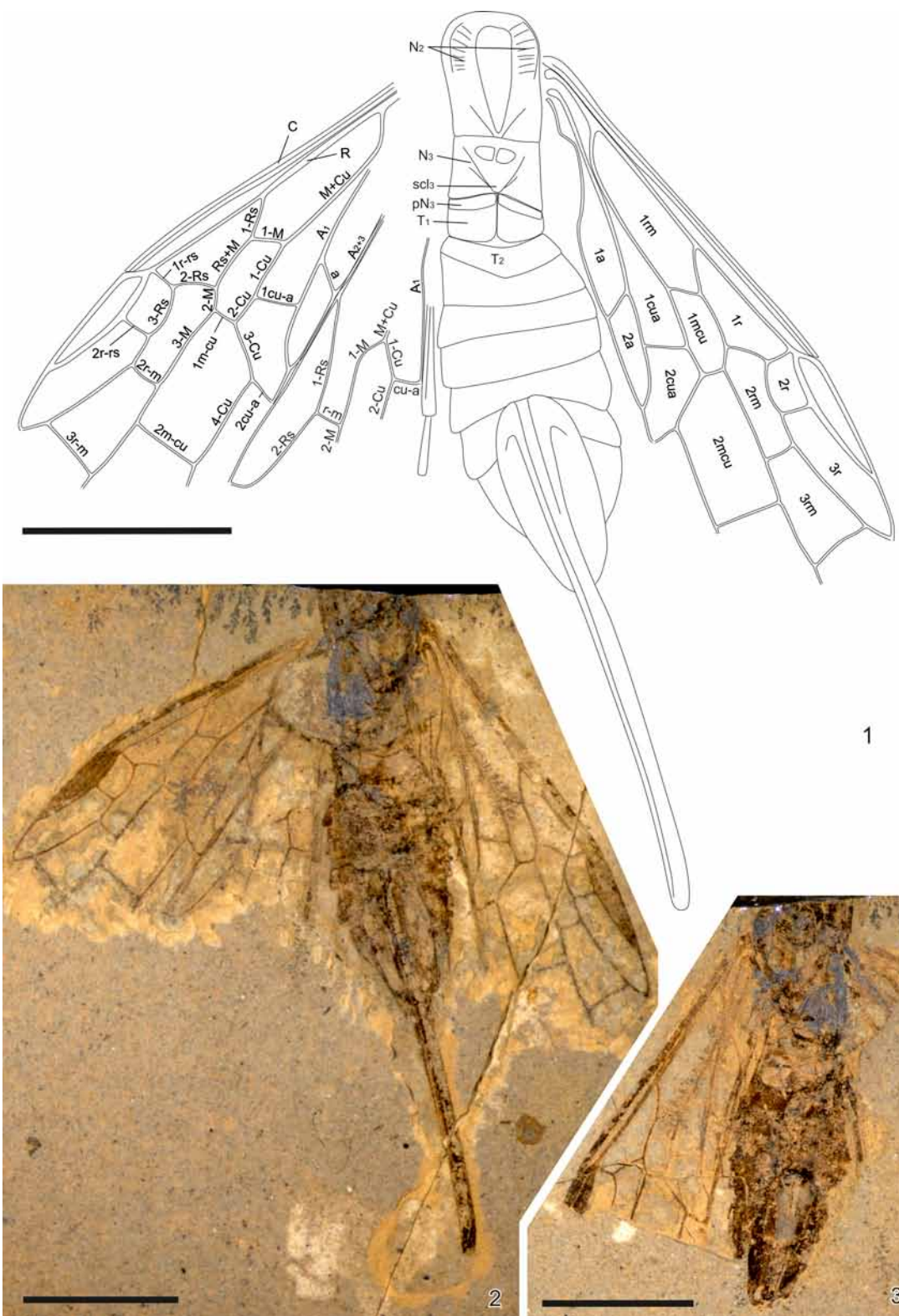
Figures 1–3. *Trematothorax kasparyani* **sp. n.** (holotype, no. 5026/676, Lower Cretaceous, Khasurty). 1 – habitus drawing (N₂ – mesonotum, N₃ – metanotum, scl₃ – metascutellum, pN₃ – metapostnotum, T₁, T₂ – first and second abdominal terga, cell and vein names are given as in text); 2, 3 – part and counterpart, photographs. Scale bar – 5.0 mm.

Description. Body (at least thorax and abdomen), veins of wings and ovipositor dark. Fore wing with *C* appearing as double vein, with longitudinal groove almost over its entire length; pterostigma sclerotised, with distinct traces of bordering veins, long and narrow, 4.5 times as long as wide and slightly narrower than cell 2*r*; 1-*Rs* 1.4 times as long as 1-*M*; 1-*M* oblique, not parallel to 1*m-cu*; cell 1*mcu* 2.5 times as long as wide, with 2-*Rs* and 1*cu-a* strongly shifted apically, *Rs+M* 2.8 times as long as 2-*M*, 1-*Cu* 2.1 times as long as 2-*Cu*; 2-*Rs* 1.7 times as long as 1*r-rs*; 1*r-rs* well before pterostigmal midlength; 2*r-rs* 1.1 times longer than 1*r-rs*. Thorax short, fusiform in dorsal view; ovipositor almost as long as fore wing.

Size. Fore wing length 13.3 mm, width 4.7 mm; abdomen length 8.8 mm; ovipositor length 12.7 mm.

Comparison. Trematothorax kasparyani **sp. n.** differs from other species of this genus in having 2-*Rs* and 1*cu-a* strongly shifted apically; the larger body size and narrow pterostigma (except *T. demeter* **sp. n.**); 2*r-rs* longer than 1*r-rs* and longer cell 1*mcu* (except *T. baissensis* and *T. demeter* **sp. n.**); and 2-*Rs* much longer than 1*r-rs* (except *T. ingodensis*). The new species also differs from *T. baissensis* in having short 1-*Rs*, and from *T. ingodensis* in having longer ovipositor (not known in the other species).
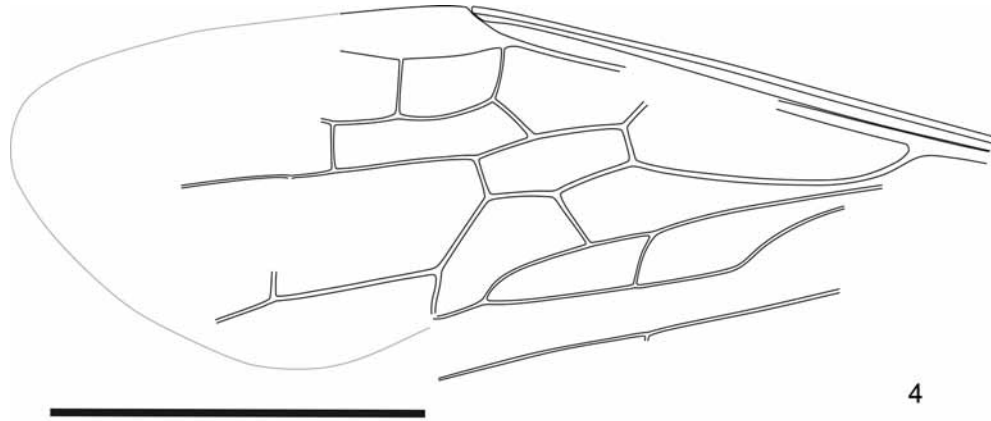
Figures 4, 5. *Trematothorax demeter* **sp. n.** (holotype, no. 5026/682, Lower Cretaceous, Khasurty). 4 – fore wing drawing; 5 – fore wing photograph. Scale bar – 5.0 mm.
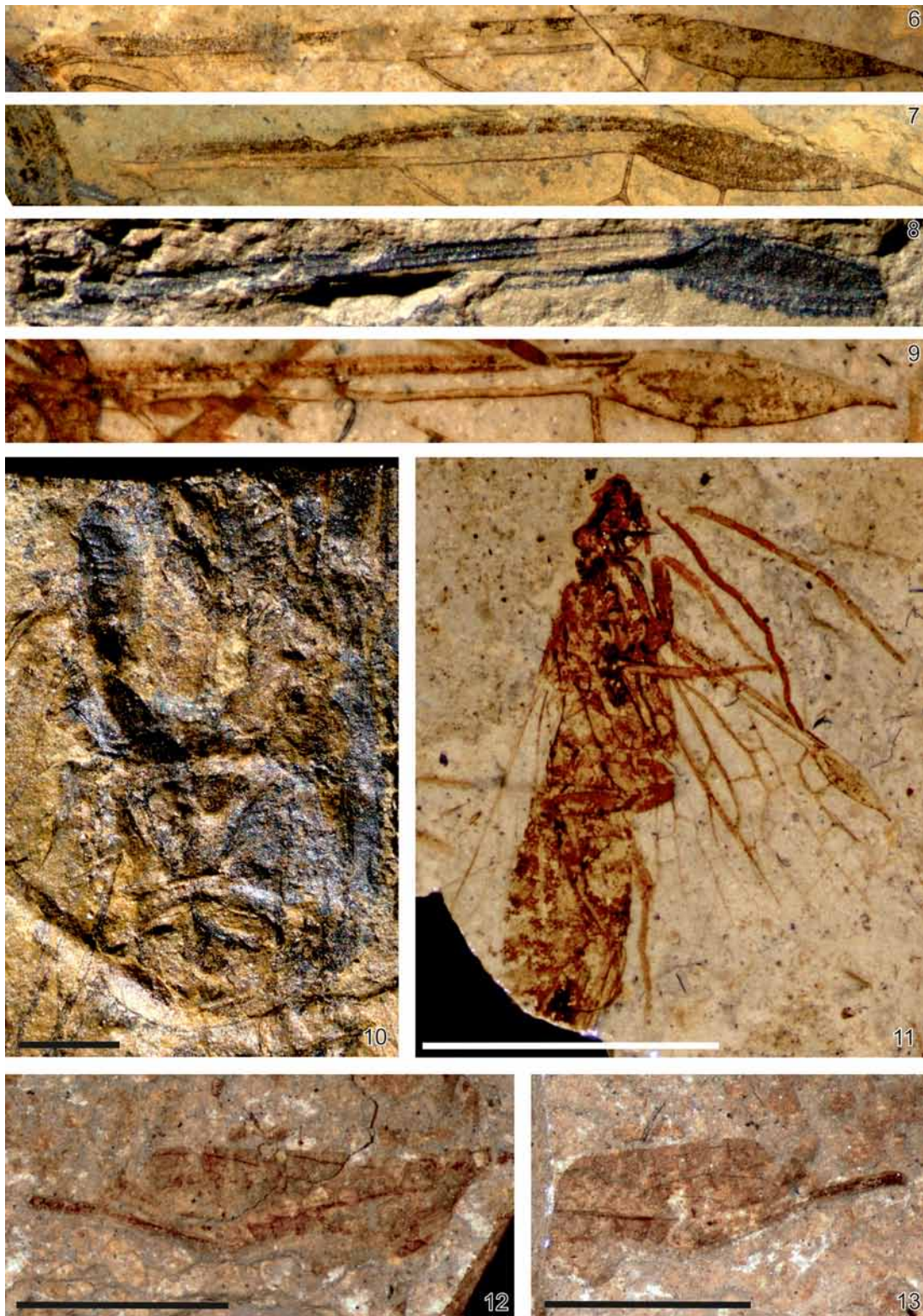
Figures 6–13. *Trematothorax kasparyani* **sp. n.** (6, 7, 10), *T. demeter* **sp. n.** (8), *T. baissensis* Rasnitsyn (9, 11) and *T. ingodensis* Rasnitsyn (12, 13). 6–9 – costal vein (6 and 7 – left and right wings of same specimen); 10–13 – structure of thorax (12 and 13 – part and counterpart). Scale bar: 6–9 and 11–13 – 5.0 mm; 10 – 1.0 mm.

Trematothorax demeter **Rasnitsyn et Kopylov, sp. n.**

(Figs 4, 5, 8)

Etymology. Demeter, the name of the Greek goddess of the earth and its fertility (alluding to the origin of the Russian name Dmitry). Noun in apposition.

Type material. Holotype: female, PIN, no. 5026/682, part without counterpart; body poorly preserved; head, legs, hind wings absent, fore wing incomplete, coloration not preserved, some veins secondarily coloured with manganese salt. Russia, Buryatia, Khasurty; Lower Cretaceous.

Description. Fore wing with *C* appearing as double vein; pterostigma with strong traces of bordering veins, narrow, slightly narrower than cell 2*r*; 1-*M* vertical, parallel to 1*m-cu*; cell 1*mcu* 2.5 times as long as wide, with 2-*Rs* and 1*cu-a* near its midlength (*Rs*+*M* 1.5 times as long as 2*M*, 1-*Cu* 1.2 times as long as 2-*Cu*); 2-*Rs* as long as 1*r-rs*; 2*r-rs* slightly longer than 1*r-rs*. Size. Fore wing length 13.2 mm, width 4.7 mm.

Comparison. *Trematothorax demeter* **sp. n.** differs from other species of this genus by the large body size and narrow pterostigma (except *T. kasparyani* **sp. n.**); and 2*r-rs* longer than 1*r-rs*, longer cell 1*mcu* and 1-*Cu* longer than 2-*Cu* (except *T. baissensis* and *T. kasparyani* **sp. n.**). It also differs from *T. kasparyani* **sp. n.** by the cell 1*mcu* with 2*Rs* and 1*cu-a* near its midlength, vertical 1-*M* and shorter 2-*Rs*.

Discussion

The genus *Trematothorax* shares with other Trematothoracinae several unusual characters, which should be discussed. One of them is the unique structure of the mesonotum, which appears in fossils as a large ovate medial orifice encircled with hard, transcarinate cuticle (Fig. 11). The nature of this strange structure cannot be reliably explained until better preserved fossils become available. At present we can provisionally hypothesize that this is an original way to secure reliable eclosion of a newly hatched adult insect from the wood in which the larva fed and developed. It is well known that xylobiont hymenopterans (either feeding on hard wood themselves or parasitising xylophagous hosts) often display special morphological devices that help them to fix their thorax within a tunnel in the wood to provide sufficient support for the propleura and head while using the mandibles to clear the way out. The most widespread of such devices are transverse ridges on the mesonotum (a popular example is the extant Rhyssinae, Ichneumonidae), sometimes supplemented or replaced either with a caudal horn and femoral ridges (in Siricidae) or a trans-ridged head (as in the Lower Cretaceous *Andrenelia* Rasnitsyn et Martínez-Delclòs (Rasnitsyn, Martínez-Delclòs, 2000). Supposedly, Trematothoracinae have enhanced their mesothoracic fixating device by replacing the entire ridged plate with two more flexible and independently movable ridged stripes. This helps them to attach better to tunnel walls and thus to cling with their ridges more reliably onto the wood at higher blood pressure, which widens the thorax and pushes apart the ridged mesothoracic sclerites.

Another unusual character of many, if not all, Trematothoracinae is the structure of the costal vein (Figs. 6–9). Both new species have the costal vein with a vein-long submedian longitudinal groove, which is either distinct throughout or at least locally traceable. Some other representatives of the group display different parts of the vein coloured differently. For instance, *Thoracotrema mongolicum* Rasnitsyn, 1993 has the costa lengthwise dark internally (on the side that faces *R*) and pale (and barely visible) externally. A precise morphological interpretation of this structure also requires better preserved fossils. Provisionally it can be explained as an alternative way of costalisation of the wing, i.e., strengthening the anterior margin of the wing (its aerodynamically cutting edge), which is important for increasing flight velocity, particularly at higher wing beat frequency (Rohdendorf, 1949; Rasnitsyn, 1969). A more common way of costalisation of hymenopteran wings is direct strengthening of *R*, which can eventually result in complete loss of *C* in insects of smaller body size (Cynipoidea, Chalcidoidae and Platygastroidea; we consider large representatives of these taxa as secondarily large). Another common way to reach the same end is *C* and *R* forming a functionally single strong vein: they both become straight and tightly aligned to each other (in Ichneumonoidea and Rhopalosomatidae) or completely fused (in higher Ceraphronoidea, namely Megaspilidae, Ceraphronidae and Stigmaphronidae). Only rarely (in various Tenthredinoidea) high costalisation effect is reached by thickening of *C*. However, the latter way of costalisation is characterised by uneven (increasing towards apex) incrassation of *C*, in contrast to the more even thickening in Trematothoracinae. As far as we know, the adaptation developed by Trematothoracinae could be unique among Hymenoptera.

The third pevuliar feature of *T. kasparyani* **sp. n.**, and possibly also of some or even all Tremato-thoracinae, is the unusually long metanotum, which is nearly half as long as the mesonotum and only about 1.5 times as wide as long, a ratio unknown in any other Hymenoptera. Again, better preserved fossils are required to confirm the above conclusion concerning the subfamily as a whole, but at least for *T. kasparyani* **sp. n.** the uniquely hypertrophied metanotum is present beyond serious doubts, in spite of the fact that its relative size resemble rather the insects with functionally four-winged flight, such as neuropteroids or mecopterans (even though it is far from identical to their relative size). This similarity may indicate the cause of the hypertrophy. The above-described modification of the mesonotum with wide central desclerotisation inevitably weakens it as part of the flight apparatus, which, bending from constriction of the inner dorsal longitudinal thoracic muscles, causes the downstroke of the wing (as explained in more detail in any textbook of entomology). Thus, we can hypothesize that the reason for the counterbalancing hypertrophy of the trematothoracine hind wing flight motor was to secure sufficient flight capacity of the insect.

Acknowledgements

References

Blank S.M., Taeger A., Liston A.D. 2009. Studies toward a World Catalog of Symphyta (Hymenoptera). *Zootaxa*, **2254:** 1–96.

Darling D.C., Sharkey M.J. 1990. 7. Order Hymenoptera. *In*: Grimaldi D.A. (Ed.), Insects from the Santana Formation, Lower Cretaceous of Brazil. *Bulletin of the American Museum of Natural History*, **195:** 123–153.

Gromov V.V., Dmitriev V.Yu., Zherikhin V.V. 1993. Cretaceous entomofaunas of Ulia River basin. *In*: Ponomarenko A.G. (Ed.), Mesozoic insects and ostracods of Asia. *Proceedings of the Paleontological Institute RAS*, **252:** 5–60. (In Russian.)

Kopylov D.S. 2011. *Ichneumon* wasps of the Khasurty Locality in Transbaikalia (Insecta, Hymenoptera, Ichneumonidae). *Paleontological Journal*, **45**(4): 406–413. (Original Russian text was published in *Paleontologicheskiy Zhurnal*, **4:** 49–54.)

Kopylov D.S. 2012. New species of Praeichneumonidae (Hymenoptera, Ichneumonoidea) from the Lower Cretaceous of Transbaikalia. *Paleontological Journal*, **46**(1): 406–413. (Original Russian text was published in *Paleontologicheskiy Zhurnal*, **1:** 65–70.)

Martins-Neto R.G., Melo A.C., Prezoto F. 2007. A new species of wasp (Symphyta, Sepulcidae) from the Santana Formation (Lower Cretaceous, Northeast Brazil). *Journal of the Entomological Research Society*, **9**(1): 1–6.

Rasnitsyn A.P. 1968. New Mesozoic sawflies (Hymenoptera, Symphyta). *In*: Rohdendorf B.B. (Ed.), Jurassic insects of Karatau. Moscow: Nauka: 190–236. (In Russian.)

Rasnitsyn A.P. 1969. Origin and evolution of Lower Hymenoptera. *Proceedings of the Paleontological Institute of the USSR Academy of Sciences*, **123:** 1–196. (In Russian. Translated to English in 1979.)

Rasnitsyn A.P. 1988. Sepulcids and the origin of Cephidae (Hymenoptera: Cephidae, Sepulcidae). *In*: Tobias V.I. (Ed.), Systematics of insects and mites. *Proceedings of All-Union Entomological Society*, **70:** 68–73. (In Russian.)

Rasnitsyn A.P. 1990. Hymenopterans. Vespida. *In*: Rasnitsyn A.P. (Ed.), Later Mesozoic insects of Eastern Transbaikalia. *Proceedings of the Paleontological Institute of the USSR Academy of Sciences*, **239:** 177–205. (In Russian.)

Rasnitsyn A.P. 1993. New taxa of sepulcids (Vespida: Sepulcidae). *In*: Ponomarenko A.G. (ed.). Mesozoic insects and ostracods of Asia. *Proceedings of the Paleontological Institute RAS*, **252:** 80–99. (In Russian.)

Rasnitsyn A.P. 2008. New hymenopteran insects (Insecta: Vespida) from the Lower or Middle Jurassic of India. *Paleontological Journal*, **42**(1): 81–85. (Original Russian text was published in *Paleontologicheskiy Zhurnal*, **1:** 84–87.)

Rasnitsyn A.P., Ansorge J. 2000. New Early Cretaceous hymenopterous insects (Insecta, Hymenoptera) from Sierra del Montsec (Spain). *Paläontologische Zeitschrift*, **74**(3): 335–341.

Rasnitsyn A.P., Martinez-Delclos X. 2000. Wasps (Insecta: Vespida = Hymenoptera) from the Early Cretaceous of Spain. *Acta Geologica Hispanica*, **35**(1–2): 65–95.

Rasnitsyn A.P., Jarzembowski E.A., Ross A.J. 1998. Wasps (Insecta: Vespida = Hymenoptera) from the Purbeck and Wealden (Lower Cretaceous) of southern England and their biostratigraphical and palaeoenvironmental significance. *Cretaceous Research*, **19:** 329–391.

Rasnitsyn A.P., Ansorge J., Zessin W. 2003. New hymenopterous insects (Insecta: Hymenoptera) from the Lower Thoracean (Lower Jurassic) of Germany. *Neues Jahrbuch für Geologie und Paläontologie*, **227**(3): 321–342.

Ren D., Lu L., Guo Z., Ji S. 1995. Fauna and stratigraphy of Jurassic and Cretaceous in Beijing and the adjacent areas. Beijing: Seismic Publishing House. 222 p. (In Chinese.)

Rohdendorf B.B. 1949. The evolution and classification of the flying apparatus of insects. *Proceedingsof the Paleontological Institute of the USSR Academy of Sciences*, **16**: 1–176. (In Russian.)

Sinitshenkova N.D. 2011. New stoneflies (Insecta: Perlida=Plecoptera) from the Late Mesozoic locality Khasurty, Transbaikalia. *Paleontological Journal*, **45**(5): 552–558. (Original Russian text was published in *Paleontologicheskiy Zhurnal*, **5:** 76–81.)

Zhang H., Zhang J., Wei D. 2001. Discovery of Trematothoracinae (Insecta) in the Upper Jurassic of W. Liaoning, China with a discussion of its phylogeny. *Acta Palaeontologica Sinica*, **40**(2): 224–228.

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