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A new genus and species of Eucoilinae (Hymenoptera, Cynipoidea, Figitidae) parasitoid of *Euxesta eluta* Loew (Diptera, Otitidae) attacked *Bt* sweet corn in Argentina

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Abstract

Euxestophaga Gallardo, a new genus of Eucoilinae (Hymenoptera, Cynipoidea, Figitidae) and *Euxestophaga argentinensis* Gallardo, **sp. n.** from Argentina, are described and illustrated. This new genus belongs to the Ganaspini and morphologically resembles *Epicoela* Borgmeier and *Striatovertex* Schick, Forshage and Nordlander. A key to differentiate these genera is given. Specimens were reared from pupae of *Euxesta eluta* Loew (Diptera: Otitidae), attacked *Bt* sweet corn in Santa Fe province and other in Tucumán province (Argentina).

Keywords

New species, cynipoid wasp, natural enemy, Otitidae, *Zea mays* L.

Introduction

Eucoiline wasps are koinobiont endoparasitoids of dipterous Muscomorpha larvae and constitutes the most abundant and diverse subfamily of Figitidae. However, there has been poor taxonomic information on this subfamily in the Neotropical region,

the only key to eucoiline genera cited for this region was published by Buffington and Ronquist (2006) and an updated synthesis of the knowledge on this subfamily was given by Díaz et al. (2008). Forshage and Nordlander (2008) proposed a tribal classification recognizing the following taxa: Diglyphosemini, Kleidotomini, Trichoplastini, Eucoilini and Ganaspini. Later, Buffington (2009) added Zaeucoilini to the group. Species belonging to Ganaspini attack Agromyzidae, Calliphoridae, Canaceidae, Chloropidae, Drosophilidae, Ephydridae, Lauxaniidae, Lonchaeidae, Phoridae, Sarcophagidae, Sepsidae, Tephritidae and Otitidae. The larvae of Otitidae are generally saprophagous, but some of them have developed phytophagous habits, eg. species of *Euxesta* Loew (Artigas, 1994). Species of this genus are secondary pests on garlic, tomatoes, potatoes, plants fruits, cassava and sweet corn, among others. *Bt* sweet corn is a transgenic plant genetically modified to include genes of the naturally occuring soil bacterium *Bacillus thuringiensis* Berliner (or Bt)".

In Santa Fe province (Argentina), the crops of *Bt* sweet corn are attacked by species of *Euxesta* (Diptera: Otitidae) that are considered secondary pests, causing severe damage to sweet corn. Two species have been identified: *E. mazorca* Steycal and *E. eluta* Loew, both appearing simultaneously and producing serious losses (Bertolaccini et al., 2010). Larvae attack the silks and consume the kernel contents, especially in the tips, although they can extend to all the ear length. The activity of these larvae constitutes one way of entrance for saprophytic microorganisms, making the product unmarketable for direct consumption. In this context, a new natural enemy of *E. eluta* was found, belonging to the tribe Ganaspini. This paper describes the new monotypic genus *Euxestophaga* Gallardo n. gen., with a new species from Argentina.

Methods

We studied a total of 72 specimens (46 females and 27 males). The specimens from Santa Fe province were obtained from pupae of *Euxesta eluta* in the framework of the research project CAI +D 2011: 2011:501 201 101 00009 LI (Universidad Nacional del Litoral, Argentina). The larvae of *Euxesta eluta* were collected in a commercial crop of sweet *Bt* corn (hybrid=GSS0974). Each pupa was individually placed in Eppendorf® vials (1.5mm), with a damp paper inside in order to conserve moisture. The pupae were periodically reviewed to determine the emergence of adult flies or parasitoids. Once the parasitoids emerged, they were preserved in 70% EtOH, together with the host puparia, the adult specimens of the flies host emerging from other non attacked pupae were preserved in 70% EtOH. The terminology used in the description follows Buffington (2009). Morphological terms used in this revision were matched to the Hymenoptera Anatomy Ontology (HAO, Yoder et al. 2010) (see Appendix). Identifiers (URIs) in the format http://purl.obolibrary.org/obo/HAO_XXXXXXX represent anatomical concepts in HAO version. Biogeographical regions are in accordance with Morrone (2001, 2014). The collection localities were georeferenced with free software QGIS version 2.10.1- Pisa. The photographs were taken with a Canon Powershot

A 520 adapted to a Leica steromicroscope (S8APO). Type material is deposited at Museo de La Plata, Argentina (MLP) and United States National Museum (Smithsonian Institution), U.S.A (USNM). Type of *Epicoela seminigra* Díaz (MLP) and specimens compared to Type of *Epicoela rubicunda* Borgmeier (MLP) were studied.

Results

Systematic treatment

***Euxestophaga* Gallardo, gen. n.**
http://zoobank.org/4AE50295-A5F5-4733-9A31-D9426AD831B5
Figures 1–4

Diagnosis. This new genus can be separated from other Ganaspini by the following combination of characters: occiput diagonally striate; female antenna clavate, club consisting of six flagellomeres; male antenna with F1 modified and longer than F2; dorsal surface of scutellum areolate-punctate, posterior border of disc bluntly rounded; lateral bars of scutellum striate; dorsal surface of scutellar plate with midpit placed close posterior margin of plate, with two or three punctures on each side, with a setae on either side; forewings hyaline, apical margin with hair fringe, marginal cell closed; base of syntergum with hairy ring present; and micropunctures present on posterior1/3 of the syntergum.

Type species. *Euxestophaga argentinensis* Gallardo, sp. n.

Description. Body stout, shiny. Head massive, subcircular in anterior view, broader than mesosoma, nearly glabrous. Toruli not projecting. Ocellar tubercle not prominent. Ocellar hair patches absent. Compound eyes glabrous. Inner orbital furrows present. Posterior margin of gena distinct, but not carinate. Occiput diagonally striate. Malar spaces smooth, without conical protuberances. Malar sulci present. Female antenna with 13 segments, club consisting of six flagellomeres; male antennae 15 segments, filiform. Shape of dorsal margin of pronotal plate in anterior view broadly truncate, emarginate. Mesoscutum longer than wide, quite arcuate, without median mesoscutal carinae, with rows of punctures in position of notauli, parascutal impressions incomplete. Shape of posterior part of scutellum in dorsal view bluntly rounded. Lateral bars of scutellum striate. Scutellar foveae wider than long, deep and large. Dorsal surface of scutellum areolate-puntate. Scutellar plate suboval, posterior margin rounded, dorsal surface with midpit placed close posterior margin of plate, with punctures on each side, with a setae on either side. Anteroventral cavity of metapleuron subcircular, setose. Forewings of normal size, hyaline, apical margin with hair fringe, basal margin lacking hair fringe, with membrane pubescence mostly reduced hair bases, marginal cell closed, longer than broad. Metasoma sessile; base of syntergum with hairy ring present, remainder of metasoma glabrous. Micropunctures present on posterior 1/3 of the syntergum more or less visible.

Distribution. Neotropical region: Argentina. According to the biogeography scheme of Morrone (2001, 2014), this distribution belongs to the biogeographic provinces Chacoan and Pampean (Chacoan subregion).

Biology. Specimens of this new genus and species were reared from *Euxesta eluta* on *Zea mays* L. (*Bt* sweet corn). Bertolaccini et al. (2010) cited *Dettmeria* Borgmeier (Eucoilinae, Zaeucoilini) parasitizing larvae of *Euxesta* species on *Bt* sweet corn in Argentina, but, on reviewing the material mentioned in this paper, we concluded that the specimens were misidentified as *Dettmeria,* which belongs to the new genus and species here described.

Etymology. In reference to genus of the host, *Euxesta* and "phagein", to eat. Gender: feminine.

Remarks. Within Ganaspini, *Euxestophaga* is similar in morphology to *Epicoela* Borgmeier and *Striatovertex* Schick, Forshage and Nordlander, all of them present occiput diagonally striate, dorsal margin of pronotal plate emarginated, forewing with erect setae on subcostal and membrane with pubescence reduced. *Epicoela* includes two species known from Neotropical region, whereas *Striatovertex* is a genus widespread in the New World, with 13 species in total; one species in Australia, and other introduced in Hawaii from North America (Schick et al. 2011). With reference to their biology, host species of *Epicoela* are unknown, while representatives of *Striatovertex* attack dipterous Sarcophagidae, Muscidae and Calliphoridae.

The three genera can be separated by the following characters:

1 Female antenna with F5 or F6 to F11 moniliform, club consisting of 6 or 7 flagellomeres (Figure 5). Dorsal surface of scutellar plate with a triangular concave area in anterior part (Figure 6). Lateral bars of scutellum smooth .... ***Epicoela*** **Borgmeier**

– Female antenna with F4 or F6 to F11 moniliform, club consisting of 6 or 8 flagellomeres. Dorsal surface of scutellar plate with punctures on each side with setae either one. Lateral bars of scutellum striate **2**

2 Female antenna with F4 to F11 moniliform, club consisting of 8 flagellomeres. Scutellar plate posteriorly arched in lateral view (See Figure 1 in Schick et al. 2011). Posterior margin of scutellum rounded (See figure 5 in Schick et al. 2011). Apical margin of forewing lacking hair fringe, membrane with pubescence mostly reduced to punctiform hair bases (See figure 7 in Schick et al. 2011) ..... ***Striatovertex*** **Schick, Forshage & Nordlander**

– Female antenna with F6 to F11 moniliform, club consisting of 6 flagellomeres. Scutellar plate straight in lateral view (Figure 1). Posterior margin of scutellum bluntly rounded (Figure 4, see arrow). Apical margin of forewing with hair fringe (Figure 3, see arrow), membrane with pubescence mostly reduced hair bases ..... ***Euxestophaga*** **Gallardo, gen. n.**

***Euxestophaga argentinensis* Gallardo, sp. n.**
http://zoobank.org/70D48C8B-7669-44E5-9F5D-6303CA5A064F
Figures 1–4

Material examined. ARGENTINA. Santa Fe. Angel Gallardo. 31°33'18"S; 60°40'36.84"W (DMS). Holotype female (MLP No. 5728/1), 6 paratype females (MLP No. 5728/2-7) reared from *Euxesta eluta* (Diptera, Otitidae) on *Zea mays* L.(Bt sweet corn) (Poaceae), 13-VI-2005; 1 paratype female (MLP No. 5728/8) and 1 paratype male (MLP No. 5728/9),10-XII-2010, Bertolaccini and Curis colls. 36 females (MLP No. 5728/10-46) and 24 males (MLP No. 5728/47-61) reared from *Euxesta eluta* (Diptera, Otitidae) on *Zea mays* L. (Bt sweet corn) (Poaceae), 02-XII-2015, Bertolaccini coll. (), 1 paratype female (USNM) and 1 paratype male (USNM), same data. **Tucumán**. 27°0'0"S; 65°30'0"W (DMS), 1 female partype (MLP No. 5728/62), VI-1976, Figalgo coll. **San Javier**. 26°46'59"S; 65°23'6"W (DMS) 1 male (MLP No. 5728/63), 16-XI-1981, on herbaceous vegetation, Mulvany, Díaz, Fidalgo and Armesto colls.

Description. Female. Total length 1.85–2 mm. (Fig. 1). Head and mesosoma black, metasoma completely dark reddish brown. Antennae brown, mandibles, wings venation and legs yellowish brown.

Head (Figs 1–3) in anterior view as high as wide. Malar sulci simple. Antenna (Fig. 1) with 13 segments, pilose, subcylindrical, flagellomeres 1 and 2 subequal in length, F6 to F11 moniliform, club consisting of six flagellomeres, with rhinaria. Posterior margin of gena distinct, but not carinata (Fig. 2, see arrow).*Pronotum*. Pronotal plate (Fig. 2) wide, striate in anterior half as well as bridge that connect this half with posterior half. Posterior half with row of setae, lateral foveae open. Dorsal margin emarginate. Pronotal ridge absent. Sides of pronotum convex, with a pubescent area on upper half of ventral margin (beneath pronotal plate).

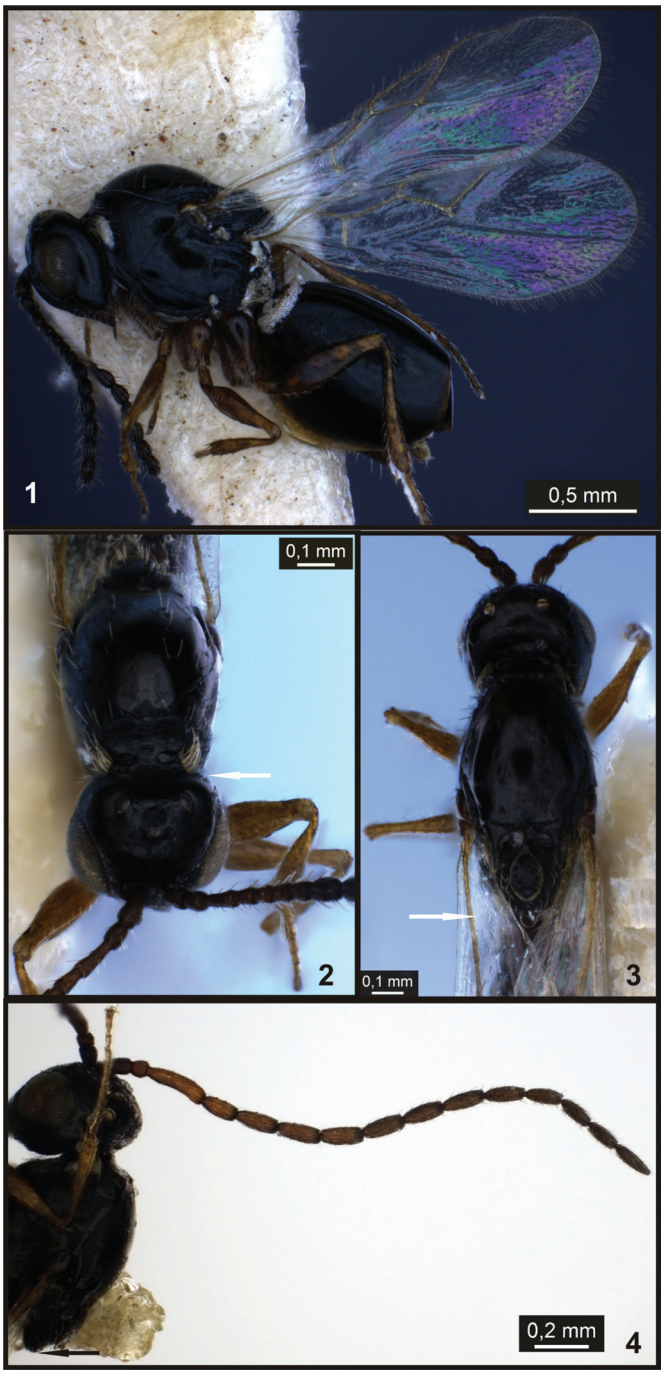
Mesoscutum. Strongly convex in profile (Fig. 1). Parapsidal ridges represented by hair lines (Figs 2, 3). Parascutal impressions incomplete. Notauli absent.

Mesopectus (Fig. 1). Upper part and lower part of mesopleuron smooth, glabrous. Mesopleural carina simple. Precoxal carina present. Subalar pit narrow and shallow. Mesopleural triangle undefined. Surcoxal depression absent.

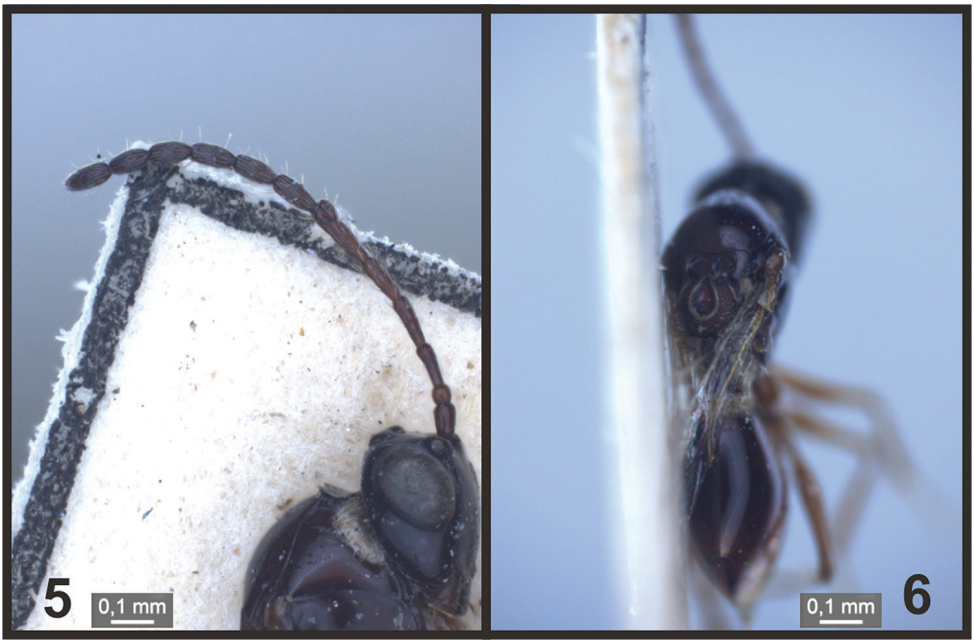
Mesoscutellum. Scutellar foveae (Fig. 3) deep, large, wider than long. Lateral bars of scutellum striate. Dorsal surface of scutellum (Fig. 3) areolate-punctate, posterior margin bluntly rounded. Scutellar plate (Figs 2, 3) suboval, posterior margin rounded, dorsal surface with midpit placed close to posterior margin of plate, with punctures on each side, with single setae in each one.

Metapectal-propodeal complex (Fig. 1). Posteroventral corner of metapleuron flat, rounded and pubescent, anteroventral cavity subcircular, setose. Propodeum covered with long, apressed setae. Lateral propodeal carinae semiparalell.

Wings. Forewings hyaline (Fig. 1), apical margin with hair fringe, basal margin lacking hair fringe, with membrane pubescence mostly reduced hair bases, marginal cell closed, longer than wide.



Figures 1–4. Holotype of *Euxestophaga argentinensis* Gallardo sp. n. Female. **1** Habitus (lateral view) **2** Head and mesosoma (dorsal view), arrow indicates posterior margin of gena distinct, but not carinata **3** Head (posterior view) and mesosoma (dorsal view), arrow indicates basal margin of forewing lacking hair fringe. Male **4** Antenna, arrow indicates posterior margin of scutellum bluntly rounded.



Figures 5–6. Holotype of *Epicoela seminigra* Díaz Female. **5** Antenna **6** Scutellar plate (dorsal view).

Legs (Fig. 1). Fore and mid coxa subequal in size, variously setose, hind coxa about twice the size of either fore or mid coxae, with a patch of woolly setae on posterior margin. Femora and tibiae sparsely setose, tibiae with more apprised setae; tarsomeres covered with dense appressed setae.

Metasoma (Fig. 1). Base of syntergum with hairy ring completed, remainder of metasoma glabrous.

Male. Similar to female. Male antennae (Fig. 4) filiform, 15 segments, F1 curved, longer than following flagellomeres, F2 shorter than other flagellomeres. Metasoma nearly squared posteriorly in lateral view. Metasoma completely dark reddish brown or ventrally yellowish brown. Base of syntergum with hairy ring interrupted apically.

Distribution. Argentina.

Type locality. Angel Gallardo (Argentina, Santa Fe province).

Hosts. Diptera Otitidae: *Euxesta eluta* Loew.

Etymology. In reference to the country where the specimen was collected: Argentina.

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Appendix

Term	Concept	URI	References	Preferred Term
antenna	The appendage that is composed of ringlike sclerites and the anatomical structures encircled by these sclerites and that is articulated with the cranium.	http://purl.obolibrary.org/obo/HAO_0000101	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	antenna
club	The anatomical cluster that is composed of apical flagellomeres bearing multiporous plates in female organism.	http://purl.obolibrary.org/obo/HAO_0000203	Masner, L. 1980. Key to genera of Scelionidae of the Holarctic region, with descriptions of new genera and species (Hymenoptera: Proctotrupoidea). Memoirs of the Entomological Society of Canada 113:1-54.	clava
	The a anatomical cluster that is composed of one or more enlarged flagellomeres.	http://purl.obolibrary.org/obo/HAO_0000208	Yoder, M. J. 2009. Curator. Hymenoptera Anatomy Ontology.	club
	The anatomical cluster composed of the apical flagellomeres that are differentiated by size from the basal flagellomeres.	http://purl.obolibrary.org/obo/HAO_0001185	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	clava
forewing	The wing that is located on the mesothorax.	http://purl.obolibrary.org/obo/HAO_0000351	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	fore wing
	The area that is located anteriorly on a wing.	http://purl.obolibrary.org/obo/HAO_0000352	Deans, A. R. 2009. HAO curator..	forewing
genal carina	The carina that extends on the gena from the lateral margin of the oral foramen.	http://purl.obolibrary.org/obo/HAO_0001755	Gibson , G. A. P., J. D. Read , and R. Fairchild. 1998. Chalcid wasps (Chalcidoidea): illustrated glossary of positional and morphological terms ..; Buffington, M. L. 2009. Description, circumscription and phylogenetics of the new tribe Zaeucoilini (Hymenoptera: Figitidae: Eucoilinae), including a description of a new genus . Systematic Entomology 34:162-187.; Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	genal carina
mesopleural triangle	The area that is limited dorsally by the subalar ridge, posteroventrally by the speculum and ends posteriorly in the subalar pit.	http://purl.obolibrary.org/obo/HAO_0000562	Buffington, M. L. 2009. Description, circumscription and phylogenetics of the new tribe Zaeucoilini (Hymenoptera: Figitidae: Eucoilinae), including a description of a new genus . Systematic Entomology 34:162-187.; Ronquist, F., and G. Nordlander. 1989. Skeletal morphology of an archaic cynipoid, Ibalia rufipes (Hymenoptera: Ibaliidae). Entomologica Scandinavica, Supplement 33:1-60.; Deans, A. R. 2009. HAO curator..	mesopleural triangle

Term	Concept	URI	References	Preferred Term
mesopleuron	The area that is located laterally of the mesodiscrimen.	http://purl.obolibrary.org/obo/HAO_0000566	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.; Vilhelmsen, L. B., I. Miko, and L. Krogmann. 2010. Beyond the wasp waist: structural diversity and phylogenetic significance of the mesosoma in apocritan wasps (Insecta: Hymenoptera). Zoological Journal of the Linnean Society [=Journal of the Linnean Society of London, Zoology] 159:22-194.; MikÃ³, I., L. Vilhelmsen, N. F. Johnson, L. Masner , and Z. PÃ©nzes. 2007. Morphology of Scelionidae (Hymenoptera: Platygastroidea): head and mesosoma. Zootaxa 1571:1-78.; Gibson , G. A. P., J. D. Read , and R. Fairchild. 1998. Chalcid wasps (Chalcidoidea): illustrated glossary of positional and morphological terms .	mesopleuron
	The pleuron that is located in the mesothorax.	http://purl.obolibrary.org/obo/HAO_0001354	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.; Snodgrass, R. E. 1935. Principles of insect morphology. McGraw-Hill Book Co., Inc., New York & London 667 pp.	mesopleuron
	The lateral (vertical) area that is anterior to the mesometapleural sulcus and posterior to the pronotum.	http://purl.obolibrary.org/obo/HAO_0002363	CsÅ‘sz, S. 2015. Synopsis of East-Mediterranean representatives of Temnothorax nylanderi species-group. in prep.	mesopleural area of the mesonoto-metanoto-mesopecto-metapecto-propodeal complex
mesoscutellum	The scutellum that is located on the mesonotum.	http://purl.obolibrary.org/obo/HAO_0000574	Snodgrass, R. E. 1935. Principles of insect morphology. McGraw-Hill Book Co., Inc., New York & London 667 pp.; Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.; Karlsson, D., and F. Ronquist. 2012. Skeletal Morphology of Opius dissitus and Biosteres carbonarius (Hymenoptera: Braconidae), with a Discussion of Terminology. PLoS ONE 7:e32573.	mesoscutellum
mesoscutum	The scutum that is located on the mesonotum.	http://purl.obolibrary.org/obo/HAO_0000575	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.; Karlsson, D., and F. Ronquist. 2012. Skeletal Morphology of Opius dissitus and Biosteres carbonarius (Hymenoptera: Braconidae), with a Discussion of Terminology. PLoS ONE 7:e32573.	mesoscutum

Term	Concept	URI	References	Preferred Term
metapleuron	The area of the metapectal-propodeal complex that is located laterally of the metadiscrimen.	http://purl.obolibrary.org/obo/HAO_0000621	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	metapleuron
	The area of the metapectal-propodeal complex that is located anterior to the metapleural carina and the ventral propodeal carina and lateral to the metadiscrimen.	http://purl.obolibrary.org/obo/HAO_0001271	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.; MikÃ³, I., L. Vilhelmsen, N. F. Johnson, L. Masner , and Z. PÃ©nzes. 2007. Morphology of Scelionidae (Hymenoptera: Platygastroidea): head and mesosoma. Zootaxa 1571:1-78.	metapleuron
metapleuron	The area of the metapectal-propodeal complex that is located anteriorly of the metapleural sulcus and laterally of the metadiscrimen.	http://purl.obolibrary.org/obo/HAO_0001272	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.; Vilhelmsen, L. B. 2000. Before the wasp-waist: Comparative anatomy and phylogenetic implications of the skeleto-musculature of the thoraco-abdominal boundary region in basal Hymenoptera (Insecta) . Zoomorphology [was Zeitschrift fÃ¼r Morphologie der Tiere] 119:185-221.	metapleuron
	The area that is located laterally of the meta-discrimen, this class is obsolete.	http://purl.obolibrary.org/obo/HAO_0001273	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.; Vilhelmsen, L. B. 2000. Before the wasp-waist: Comparative anatomy and phylogenetic implications of the skeleto-musculature of the thoraco-abdominal boundary region in basal Hymenoptera (Insecta) . Zoomorphology [was Zeitschrift fÃ¼r Morphologie der Tiere] 119:185-221.	metapleuron
	The area of the metapectal-propodeal complex that is limited ventrally by the ventral carina of the metapleuron and dorsally by the metapleural carina.	http://purl.obolibrary.org/obo/HAO_0001869	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	metapleuron
	The area of the metapectal-propodeal complex that is anterior to the metapleural carina and lateral to the metadiscrimen.	http://purl.obolibrary.org/obo/HAO_0002298	Buffington, M., and M. Forshage. 2014. The description of Garudella Buffington and Forshage, new genus (Hymenoptera: Figitidae: Eucoilinae)..	metapleuron
	The lateral (vertical) area that is posterior to the mesometapleural sulcus and anterior to the metapleural carina.	http://purl.obolibrary.org/obo/HAO_0002360	CsÅ‘sz, S. 2015. Synopsis of East-Mediterranean representatives of Temnothorax nylanderi species-group. in prep.	metapleural area of the mesonoto-metanoto-mesopec-to-metapecto-prop-odeal complex

Term	Concept	URI	References	Preferred Term
midpit	The depression that is located posteromedially on the mesoscutum.	http://purl.obolibrary.org/obo/HAO_0000637	Sharkey, M.J. and R.A. Wharton 1997. Morphology and terminology. Pages 19-38. In: Wharton, R.A., P.M. Marsh, and M.J. Sharkey (Eds), Manual of the New World genera of Braconidae (Hymenoptera). Special Publication of the International Society of Hymenopterists. Vol. 1: 1-439 pp.; Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	midpit
	The area that is concave is located medially on the scutellar plate and corresponds to the opening of an exocrine gland.	http://purl.obolibrary.org/obo/HAO_0001678	Buffington, M. L., and S. J. Sheffer. 2008. North American species of Agrostocynips Diaz (Hymenoptera: Figitidae: Eucoilinae), parasitoids of Agromyzidae (Diptera): bionomics and taxonomy . Zootaxa 1817:39-48.	scutellar midpit
occiput	The area that is concave and surrounds the postocciput.	http://purl.obolibrary.org/obo/HAO_0000658	Goulet, H., and J. T. Huber. 1993. Hymenoptera of the World: An Identification Guide to Families. Research Branch, Agriculture Canada Publication 1894/E., Ottawa, ON 668 pp.; Deans, A. R. 2009. HAO curator..	occiput
pronotal plate	The area of the pronotum that is median, raised and limited laterally by sharp edges.	http://purl.obolibrary.org/obo/HAO_0000838	Goulet, H., and J. T. Huber. 1993. Hymenoptera of the World: An Identification Guide to Families. Research Branch, Agriculture Canada Publication 1894/E., Ottawa, ON 668 pp.; Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	pronotal plate
pronotum	The notum that is located in the prothorax.	http://purl.obolibrary.org/obo/HAO_0000853	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.; Karlsson, D., and F. Ronquist. 2012. Skeletal Morphology of Opius dissitus and Biosteres carbonarius (Hymenoptera: Braconidae), with a Discussion of Terminology. PLoS ONE 7:e32573.	pronotum
scutellar fovea	The depression that is medially located on the scutoscutellar suture.	http://purl.obolibrary.org/obo/HAO_0000916	Ronquist, F., and G. Nordlander. 1989. Skeletal morphology of an archaic cynipoid, Ibalia rufipes (Hymenoptera: Ibaliidae). Entomologica Scandinavica, Supplement 33:1-60.; Buffington, M. 2007. The occurence and phylogenetic implications of the ovipositor clip with the Figitidae. Journal of Natural History 41:33-36.; Deans, A. R. 2009. HAO curator..	scutellar fovea
scutellar plate	The area that is located medially on the mesoscutellum, flat and surrounds the scutellar midpit.	http://purl.obolibrary.org/obo/HAO_0001230	Buffington, M. L. 2009. Description, circumscription and phylogenetics of the new tribe Zaeucoilini (Hymenoptera: Figitidae: Eucoilinae), including a description of a new genus . Systematic Entomology 34:162-187.; Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	scutellar plate

Term	Concept	URI	References	Preferred Term
scutellum	The scutellum that is located on the mesonotum.	http://purl.obolibrary.org/obo/HAO_0000574	Gibson , G. A. P., J. D. Read , and R. Fairchild. 1998. Chalcid wasps (Chalcidoidea): illustrated glossary of positional and morphological terms ..; Curators, H. A. O. 2009. The Hymenoptera Anatomy Ontology Curation Team. Hymenoptera Anatomy Ontology.	mesoscutellum
	The area that is located posteriorly of the transscutal line and is composed of the axillae and the mesoscutellum.	http://purl.obolibrary.org/obo/HAO_0000572	Masner, L., and J. L. GarcÃa. 2002. The genera of Diapriinae (Hymenoptera: Diapriidae) in the new world. Bulletin of the American Museum of Natural History 268:107-138.	mesoscutellar-axillar complex
	The area that is located posteriorly of the scutoscutellar suture.	http://purl.obolibrary.org/obo/HAO_0001229	Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	scutellum
subalar pit	The pit that is located posterodorsally on the mesopectus corresponds to the posterodorsal edge of the mesopleuron.	http://purl.obolibrary.org/obo/HAO_0000961	Gibson , G. A. P., J. D. Read , and R. Fairchild. 1998. Chalcid wasps (Chalcidoidea): illustrated glossary of positional and morphological terms ..; MikÃ³, I., L. Vilhelmsen, N. F. Johnson, L. Masner , and Z. PÃ©nzes. 2007. Morphology of Scelionidae (Hymenoptera: Platygastroidea): head and mesosoma. Zootaxa 1571:1-78.; Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.; Karlsson, D., and F. Ronquist. 2012. Skeletal Morphology of Opius dissitus and Biosteres carbonarius (Hymenoptera: Braconidae), with a Discussion of Terminology. PLoS ONE 7:e32573.	subalar pit
syntergum	The sclerite that is composed of fused abdominal terga.	http://purl.obolibrary.org/obo/HAO_0000987	MikÃ³, I., and A. R. Deans. 2009. Masner, a new genus of Ceraphronidae (Hymenoptera, Ceraphronoidea) described using controlled vocabularies. ZooKeys 20:127-153.; Miko, I. 2009. -2014 Curator. Hymenoptera Anatomy Ontology.	syntergum

Supplementary material 1

GBIF

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Data type: distribution