



<http://dx.doi.org/10.11646/zootaxa.3630.1.8>

<http://zoobank.org/urn:lsid:zoobank.org:pub:956DD80C-5902-49C7-B1F5-6D95561B609F>

## A new species of *Platygaster* Latreille (Hymenoptera: Platygasteridae) parasitizing *Chilophaga virgati* Gagné (Diptera: Cecidomyiidae)

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### Abstract

*Platygaster chilophagae*, new species, is described from specimens reared from larvae of *Chilophaga virgati* Gagné collected and reared in eastern South Dakota. The host larva feeds on the basal meristematic tissues of the inflorescence of *Panicum virgatum* L. This new species seems to lack immediate affinities with any described *Platygaster* species in its combination of characteristics, and is compared to and discriminated from six other species. Polyembryony is suggested by the presence of cocoon clusters containing 4–14 pupae from each host larva.

**Key words:** Platygasteridae, *Platygaster*, **new species**, *Chilophaga*, Cecidomyiidae, parasitoid, *Panicum virgatum*, switchgrass, polyembryony

### Introduction

*Platygaster* Latreille is the most species diverse genus in the Platygasteridae of North America, with 101 nominal species cataloged by Krombein *et al.* (1979) and Masner (1993) noting the presence of 255 described species and a number of known undescribed species. Many of the species are parasitoids of plant-feeding gall midges (Diptera: Cecidomyiidae) and though these flies are stereotypically specific to their plant hosts, the parasitoids are apparently not necessarily specific to their host midges (Hawkins & Gagné 1989).

During investigations on the life history of *Chilophaga virgati* Gagné (Diptera: Cecidomyiidae), a gall midge on *Panicum virgatum* L. (switchgrass) an undescribed species of *Platygaster* was reared from prepupal larvae. Subsequently, we were able to recognize this species in sweep samples taken in agronomic swards of *P. virgatum*. This new *Platygaster* is described below.

### Materials and Methods

**Specimens.** All wasps used in this study were obtained by field collection and by rearing from infested tillers the switchgrass cultivar ‘Dakotah’. Field specimens were swept from agronomic swards of switchgrass during early and mid morning hours (7:00–10:30 am). The host plant swards are research plots varying in size, ca. 45–120 m<sup>2</sup>, and representing 18 experimental cultivars planted separately and in mixtures. Sampling was generally conducted when plants were dry of condensation or precipitation, winds were ≤8 kph, and air temperatures at plant height were between 24–30°C.

Specimens reared in the laboratory came from field collected cocoon clusters of *Platygaster* n.sp. found with *C. virgati* larvae inside the sheath of the terminal leaf and at the inflorescence base of individual tillers of *P. virgatum*. Cocoon clusters were kept associated by tiller and placed between layers of brown paper toweling that were loosely rolled and inserted into 8 dram shell vials. The toweling was moistened with a few drops of deionized water and the vial capped with fine screening. The vials were kept at room temperature and shaded from direct

sunlight. Selected emergent adults were killed in either 80% or 98% ethyl alcohol as needed for morphological study and genomic assay, while others were kept alive and fed saturated sugar water to determine longevity and observe behavior.

In the following description the abbreviation A1–A10 refers to antennomeres 1–10, and T1–T6 refers to tergites 1–6.

Depository collections noted by abbreviations are: USNM, U.S. National Museum of Natural History, Washington, D.C.; SDSU, Severin-McDaniel Insect Research Collection, South Dakota State University, Brookings, South Dakota; and ZMUC, Zoological Museum, University of Copenhagen.

## Taxonomy

### *Platygaster chilophagae* Buhl, sp. nov.

(Figs. 1–7)

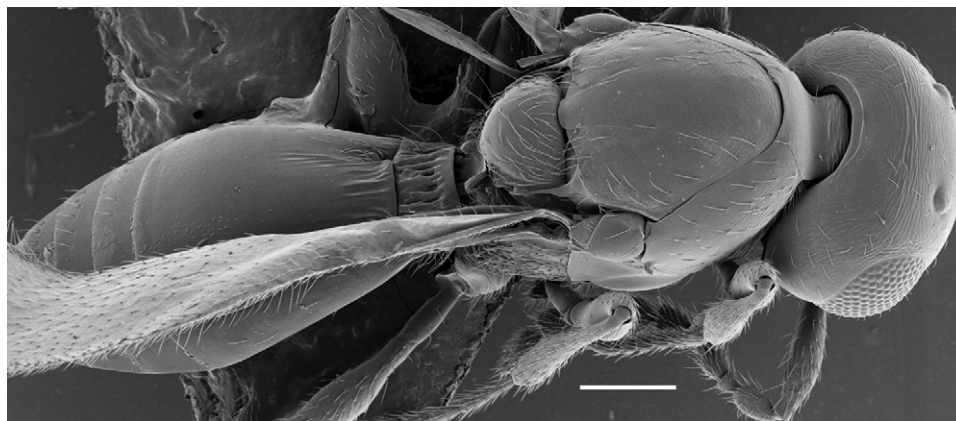
**Etymology.** The species name is based on the genus name, *Chilophaga*, the genus of the cecidomyiid host.

**Material examined.** Holotype ♀: USA, South Dakota, Brookings Co., Aurora Research Farm, 4 miles East of Brookings, 11.vii.2012, emerged 16.vii.2012 from *Chilophaga virgati*, V. Calles Torrez leg. (SDSU to USNM). Paratypes: 8 ♀ same data (Zoological Museum, University of Copenhagen); 46 ♀, 5 ♂ same data but collected 14.vii.2012, emerged in the laboratory 24.vii.2012; 47 ♀, 22 ♂ same data but collected 15.vii.2012, emerged in the laboratory 18.vii.2012 (South Dakota State University). Additional material: 3 ♀, same location as holotype and paratypes [44°15'14"N and at 96°40'17"W; el. 506 m], 12.vii.2012, swept from switchgrass, P.J. Johnson (SDSU).

**Diagnosis.** Head 1.75 times as wide as long; frons only weakly sculptured in lower part; preapical segments of female antennae 1.0–1.2 times as wide as long; notauli behind not widely separated; scutellum smooth, evenly convex; forewings very slightly surpassing tip of female metasoma, this fully twice as long as wide, slightly longer than rest of body, T2 striated to 0.4 length of tergite, much shorter medially.

**Description.** ♀. Body length 1.00–1.25 mm. Black; antennae and legs dark brown; base of A1, apex of A2, mandibles, coxae, trochanters, and base and apex of mid and hind tibiae slightly lighter brown; most of fore tibiae and segments 1–4 of all tarsi pale brownish.

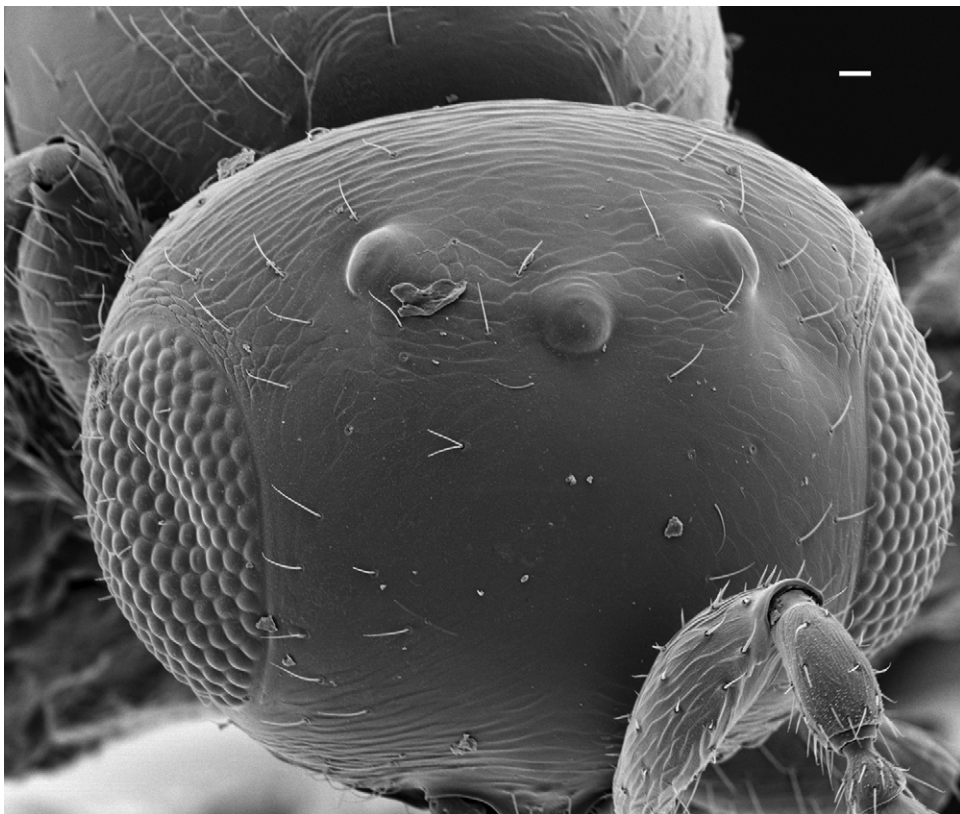
Head (Figs. 1–3) from above 1.75 times as wide as long, 1.15 times as wide as mesosoma; occiput very finely and densely transversely striated medially, curved towards sides and becoming more vertically reticulate-coriaceous, behind eyes smooth; hyperoccipital carina absent; vertex medially almost smooth, towards sides faintly reticulate-coriaceous; frons smooth, towards sides with sparse punctures, in slightly less than lower half with faint oblique reticulation. Ocello-ocular line equal to lateral ocellar line. Head in frontal view 1.25 times as wide as high. Antennae (Fig. 4) with A1 0.8 times as long as height of head, 1.1 times as long as distance between inner orbits; A9 from about as long as wide to 1.2 times as wide as long; A10 one and a third times as long as A2.



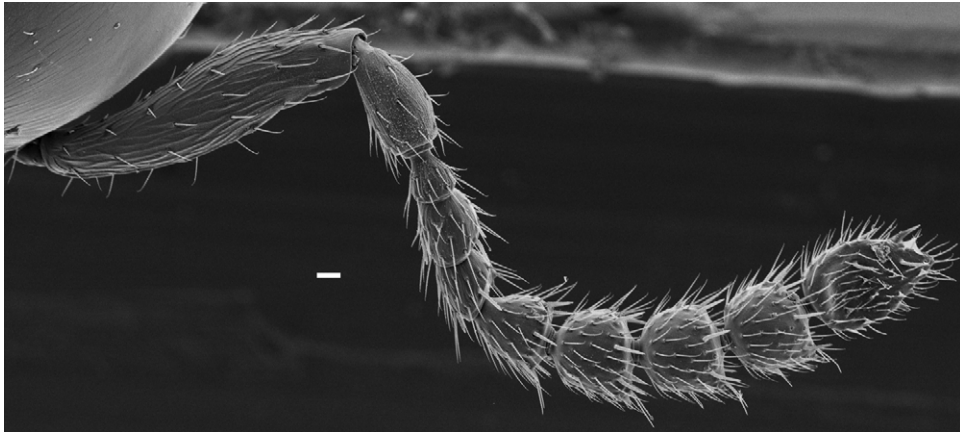
**FIGURE 1.** *Platygaster chilophagae*, ♀, body in dorsal view, scale bar = 100 µm.



**FIGURE 2.** *Platygaster chilophagae*, ♀, head and mesosoma in lateral view, scale bar = 10  $\mu$ m.



**FIGURE 3.** *Platygaster chilophagae*, ♀, head in frontal view, scale bar = 10  $\mu$ m.



**FIGURE 4.** *Platyaster chilophagae*, ♀, antenna, scale bar = 10  $\mu$ m.



**FIGURE 5.** Cocoon clusters of *P. chilophagae*; scale bar = 2.0 mm.

Mesosoma (Figs. 1–2) 1.4 times as long as wide, about as high as wide. Sides of pronotum finely longitudinally reticulate-coriaceous, smooth along wide upper and hind margins. Mesoscutum with few setae, most of them along margins and imaginary notaulic courses, smooth in more than posterior half, finely reticulate around ends of imaginary notaulic courses and along anterior margin; notauli weakly indicated in posterior half; mid lobe slightly prolonged to base of scutellum, touching this in a rather narrow point, at each side with about six setae above scuto-scutellar grooves. Mesopleuron smooth. Scutellum smooth, moderately densely setose, evenly convex. Metapleuron with pilosity all over. Propodeal carinae short, parallel, much transverse area between them smooth. Forewing very slightly surpassing tip of metasoma, slightly more than 0.7 times as long as entire body, 2.6 times as long as wide, clear, with dense and rather fine microtrichia in apical 0.6; marginal cilia 0.08 times width of wing. Hind wing 5.5 times as long as wide, with two hamuli; marginal cilia 0.3 width of wing.

Metasoma (fig. 1) from hardly longer than (32:31) to 1.1 times as long as head and mesosoma combined, about as wide as mesosoma. T1 with about seven rather even longitudinal carinae. T2 longitudinally striated in basal foveae to about 0.4 length of tergite, medially with four longitudinal carinae to hardly 0.15 length of tergite, rest of

tergite as well as T3–T6 smooth, each apical tergite with a transverse row of setae inserted in moderately deep punctures: eight on T3, ten on each of T4–T6.

♂. Body length 1.05 mm approx. Antenna with A5–A9 each as long as wide, flagellar pubescence half as long as width of segments. Metasoma 0.85 times as long as head and mesosoma combined, with seven visible tergites.



**FIGURE 6.** *Panicum virgatum* apical leaf sheath opened to show *P. chilophagae* coccons and a *C. virgati* larva in situ; scale bar = 5.0 mm.



**FIGURE 7.** *Platygaster chilophagae*, ♀ lateral habitus; scale bar = 0.5 mm.

**Comments.** This species differs from the somewhat similar *P. variabilis* Fouts, 1924, e.g., in having the head less transverse, female A4 not longer than A5, longer notauli and wings, and shorter basal foveae and shorter striation on T2. Another somewhat similar species, *P. rubi* (Ashmead, 1893), has female A2 as long as A10, head not wider than mesosoma, and mesosoma distinctly wider than metasoma with notauli widely separated. *Platygaster chilophagae* has longer female metasoma than similar species such as *P. affinis* Fouts, *P. astericola* (Ashmead 1893), *P. juniperina* MacGown, 1979 and *P. rhabdophagae* MacGown, 1979. In Fouts' (1924) key *P. chilophagae* traces to couplet 81, i.e. the mentioned *P. astericola* to *P. huachucae* (Ashmead, 1893), however, these species have the head slightly more than twice as wide as long but not wider than mesosoma, female A7–A9 each longer than wide, and slightly longer striation on T2 than in *P. chilophagae*. This species will also place in the same couplet area in the unpublished key by MacGown (1979) which is essentially Fouts' (1924) key reproduced with the addition of the new species by MacGown.

**Biology.** Species of *Platygaster* are most commonly recorded as parasitoids of Cecidomyiidae (Krombein *et al.* 1979, Gagné 1989, Hawkins and Gagné 1989, Masner 1993, Bullock *et al.* 2004). Microhymenoptera such as these have been locally termed "nano-hornets", in reference to their aggressive parasitism (A. Boe, pers. comm.). *Platygaster chilophagae* was reared from late instar prepupal larvae of *Chilophaga virgati*.

The midge larva is a predator on switchgrass feeding at the base of the peduncle of the developing panicle. A fungal infection is also initiated that eventually produces extensive necrosis of the peduncle and surrounding tissues, but it remains unclear whether the gall midge larvae also feed on the fungal mycelia. This portion of the developing inflorescence contains meristematic tissues that elongate as the panicle develops (Gagné 1989; Boe and Gagné 2010). Feeding occurs during early development of the inflorescence and prior to emergence of the inflorescence from the enclosing whorl of the apical leaf. No external oviposition marks are detectable and the ovipositor is of the soft non-piercing type (Boe and Gagné 2010). The ovipositor structure and egg distribution suggests that the gravid female wasp either gains access to the immature inflorescence or oviposits through gaps between overlapping parts of the whorled apical leaf. The gall midge larvae feed in groups from a few individuals to 60 or more, becoming tightly packed. As they mature the gall midge larvae consume the entirety of the peduncle base as well as adaxial tissues of the leaf sheath. This feeding causes stunting and premature death of the inflorescence (Boe and Gagné 2010), and sometimes of the terminal leaf. A diagnostic symptom of gall midge larval presence is a partially emerged witchesbroom-like malformation of the inflorescence. There is no development of a tissue structure that could be considered a gall formed from highly differentiated host cells, though sometimes there is a barely noticeable slight swelling of the culm at the point of the larval cluster within.

Adult *P. chilophagae* presumably locate and parasitize *C. virgati* eggs or first instar larvae by entering through either the laminar gaps of the wrapped leaf sheath and into the space within, or apically through the developing inflorescence. Though such behavior is yet to be directly observed it is consistent with observed behavior and phenological correlations. *Platygaster chilophagae* may be polyembryonic as there are 4–14 cocoons and pupae per prepupal midge larva that form a cluster with a single wasp pupa per cocoon (Fig. 5). *Platygaster chilophagae* pupal periods ranged from 5 to 15 days at 25°C and turn from light brown to partly dark brown with totally black at the end. Adults were easily reared by placing cocoon clusters in brown paper towel rolls in 8 dram shell vials capped with fine mesh screen, with emergent adults living 3–5 days.

## Acknowledgements

Our thanks to Arvid Boe, Raymond Gagné, and an anonymous reviewer for their helpful comments on the manuscript. Support for this project came from the U.S. Department of Energy through the North-Central Sun Grant Program at South Dakota State University.

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