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The genus *Sipha* Passerini (Hemiptera: Aphididae) in North America

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Abstract. Five species of the aphid genus *Sipha* Passerini (Hemiptera: Aphididae) are reported in North America and are reviewed herein. Of these species, three are adventive species and include: *Sipha elegans* del Guercio, *Sipha glyceriae* (Kaltenbach), and *Sipha maydis* Passerini. *Sipha maydis* was discovered in California in 2007 and now has been found in Georgia. The genus also includes two native species: *Sipha agropyronensis* (Gillette) and *Sipha flava* (Forbes). *Sipha maydis* can be distinguished easily from all the other species in the genus that occur in North America because it is black. All the species except *S. agropyronensis* have been implicated in damage to crop plants. A key to the apterae and alatae of *Sipha* found in North America is included.

Key Words: *Sipha*, North America, *Sipha maydis*

Introduction

Sipha Passerini (Hemiptera: Aphididae) is a small genus of aphids that live on Gramineae, and possibly also on Juncaceae. Adults are characterized by having a spiny integument, short, truncate siphunculi, and five-segmented antennae. Five species of *Sipha* are reported from North America. Three species belong to the subgenus *Sipha* and two species belong to the subgenus *Rungsia* Mimeur. Three are adventive and two are native. *Sipha maydis* Passerini 1860 was detected in California in 2007 (Sorensen 2007). It also has been detected on wheat in a greenhouse in Georgia, and several phoretic winged *S. maydis* also were intercepted on produce from California at Agricultural Interdiction Stations in Florida. The purpose of this paper is to provide identification information for *Sipha* species in North America with emphasis on recognition of the newly adventive *S. maydis*, which can be a serious pest of cereals.

Materials and Methods

We examined slide mounted specimens of the various species from the United States National Museum (USNM) and from the Florida State Collection of Arthropods (FSCA). Specimens of *S. maydis* from Georgia, and specimens from California intercepted on lettuce at Florida Agricultural Interdiction Sta-

tions were assigned FSCA accession numbers, mounted on slides and deposited in the FSCA. FSCA numbers are interpreted as EYEAR-XXXX, where XXXX is the sequential accession number for that year.

Sipha Passerini (Hemiptera: Aphididae) in North America

Species of *Sipha* can be distinguished from other species of aphids that feed on Gramineae by their spiny setae, very short siphunculi, short cauda, and their five-segmented antennae. A closely related genus, *Atheroides* Haliday, is represented by a single exotic species in British Columbia (Forbes and Chan 1989), Quebec (Richards 1972), and New Brunswick (Jensen et al. 2008), CANADA, and Montana, U.S.A. (Jensen et al. 2008). *Atheroides* can be separated from *Sipha* by its poriform siphunculi and long narrow body. One obscure genus on Gramineae, *Cryptaphis* Hille Ris Lambers, also has spiny setae, but the antennae are six-segmented, and the siphunculi are tubular.

Both subgenera of *Sipha* are represented in North America. Species placed in *Sipha sensu stricto* have knobbed caudas. In North America, these include our two native species, *Sipha agropyronensis* (Gillette 1911) and *Sipha flava* (Forbes 1884). The latter species, the yellow sugarcane aphid, is a significant pest on numerous grasses and cereal crops. A third species in the nominate subgenus, *Sipha glyceriae* (Kaltenbach 1843), was reported in North America in 1909 (Patch 1910). In other parts of the world, it is a serious pest of rice (Olmi and Villani 1975). So far, there are no observations of similar damage to the North American rice crop.

Species placed in *Sipha* (*Rungsia*) have short, unconstricted caudas. Both North American species in this subgenus are exotic. They include *Sipha* (*Rungsia*) *elegans* del Guercio 1905, which has been established at least since 1949 (Foottit et al. 2006), and the recently reported *S. maydis* (Sorensen 2007). Both species are known pests.

Biology of *Sipha* species

During the growing season, all individuals are parthenogenetic females. They can be winged or wingless. Known males (*S. flava*, *S. elegans*, and *S. glyceriae*) are apterous (Blackman and Eastop 2006). Males of *S. elegans* are much darker and have longer appendages than other apterous forms. Oviparae, but not males, are known for *S. agropyronensis* (Palmer 1952). Males and oviparae of *Sipha* spp. with known holocycles occur in the fall on grasses and cereal crops. There is no known host alternation to a woody winter host. Fundatrices of *S. elegans* are similar to summer apterae. In the tropics and subtropics, anholocyclic parthenogenetic forms persist throughout the year. Curiously, laboratory cultures of *S. elegans* in Idaho required natural sunlight to grow (observation by SEH). *Sipha flava* cultures in Florida also required natural sunlight (Matthew Hentz, USDA/ARS, Ft. Pierce, FL, personal communication, by permission).

Species discussion

Sipha (*Sipha*) *agropyronensis* (Gillette 1911) (Fig. 1)

This is an obscure native species known from Colorado (Smith and Parron 1978; Palmer 1952), California and Montana (Jensen et al. 2008). It is characterized by its smooth body, and by a very short processus terminalis on the antennae (Palmer 1952; Blackman and Eastop 2006).

Sipha (*Sipha*) *flava* (Forbes 1884) (Fig 2–4, 17)

This species is the well-known yellow sugarcane aphid (Fig. 2-4). It probably is native to North America, but has become established in Central and South America and in the Caribbean (Blackman and Eastop 2006). It was found in Hawaii in 1988 (Hall 2000), where it became a serious pest of pasture

grasses and sugarcane (Kindler and Dalrymple 1999). Schenk and Lehrer (2000) were unable to obtain transmission of Sugarcane Yellow Leaf Virus by this species. The processus terminalis is at least 1.8 times as long as the base of antennal segment VI, and the body is smooth. The long processus terminalis will separate this species from other North American *Sipha* (*Sipha*) species.

***Sipha* (*Sipha*) *glyceriae* (Kaltenbach 1843) (Fig. 5–7, 16)**

This species is a serious rice pest in the Palearctic region, where it is native (Olmi and Villani 1975). It causes dark brown feeding spots on the leaves (Fig. 5). It is very similar to *S. agropyronensis* but has denticles on the cuticle. Although *S. glyceriae* was reported in North America more than a century ago, it has not become a rice pest in North America. The Edith Patch Collection (currently housed in the Canadian National Collection, Ottawa) was examined to locate Patch's specimens of *S. glyceriae* for comparison. Unfortunately, no Patch specimens were found in the collection (R. Foottit, personal communication). Whether *Sipha glyceriae* constitutes a species complex, or whether host races occur, is not known. Re-collection of North America *S. glyceriae* for comparison with the Italian rice pest would be important to determine if they are conspecific.

***Sipha* (*Rungsia*) *elegans* del Guercio 1905 (Fig. 8–11)**

This is an Old World species that is well-established in the northern parts of the USA. It is common in the Pacific Northwest and can be found on various temperate grasses such as *Agropyron* spp. (Fig. 8) and also on wheat (Fig. 9). Colonies on wheat tend to occur later in the season after the plants bolt to produce a head. Sometimes the first colonization of wheat occurs in colonies of *Schizaphis graminum* (Rondani), which causes similar necrotic damage. It is a vector of the BYD virus complex (Jedlinski 1981). As is characteristic of the subgenus *Rungsia*, the cauda is not constricted. *Sipha elegans* is bright yellow in warm sunshine and olive green under cooler, more shaded conditions. It is distinguished easily from the dark brown or black *S. maydis*, the only other species in the subgenus that occurs in North America.

***Sipha* (*Rungsia*) *maydis* Passerini 1860 (Fig. 12–15)**

This species is known to be a pest of cereal crops, particularly in drier/warmer climates. It is reported to be a vector of the BYD virus complex (El Yamani and Hill 1991) and can cause direct feeding damage (Fig 12–13). It is reported throughout the Mediterranean region, into Central and South Asia, South Africa, and South America (Blackman and Eastop 2000, 2006; Corrales et al. 2007). This species is recognized easily by its black color and completely sclerotized dorsum.

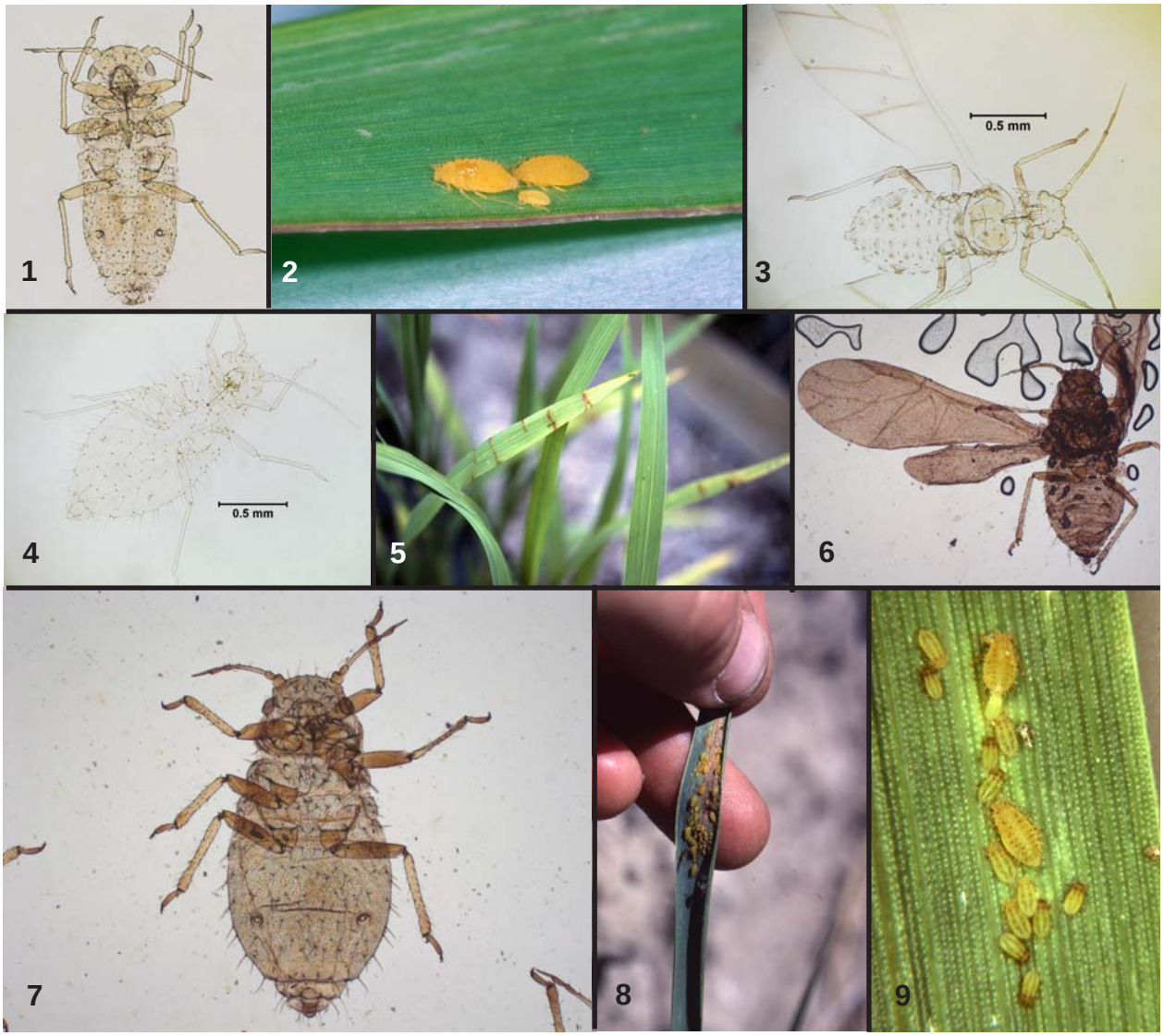
This species was discovered in North America in California in 2007 (Sorensen 2007). It was found in Georgia in November 2012 on wheat in a greenhouse (observation by LMA, FSCA# E2012-9123). *Sipha maydis* also has been intercepted at the Florida Agricultural Interdiction Stations as phoretic alatae on lettuce from California in 2011 and 2012 (FSCA#s E2011-5477, E2012-3133, E2012-3195). The New World and African records indicate that this species probably moves readily in commerce.

Key to *Sipha* species in North America.

1. Cauda knobbed (Fig. 3) **(subgenus *Sipha*)** **2**
— Cauda not knobbed (Fig. 11) **(subgenus *Rungsia*)** **4**

2(1). Body with denticles on the dorsum (Fig. 16) ..... ***Sipha glyceriae* (Kaltenbach)**
— Body without denticles on the dorsum (Fig. 17) **3**

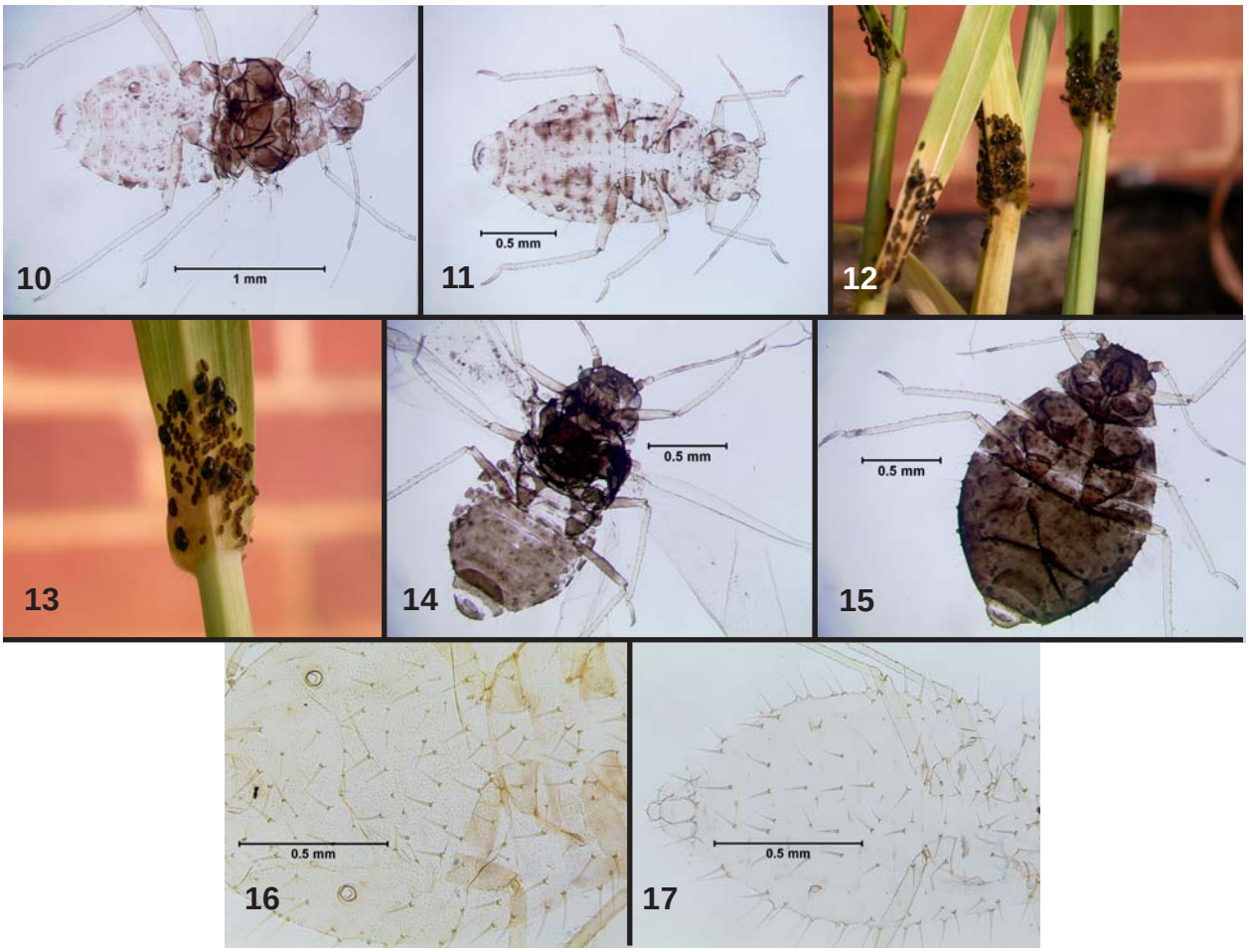
3(2). Processus terminalis more than 1.5 times as long as the base of antennal segment VI (Fig. 3, 4) ..... ***Sipha flava* (Forbes)**
— Processus terminalis less than 1.5 times as long as the base of antennal segment VI (Fig. 1) ... . ***Sipha agropyronensis* (Gillette)**



Figures 1-9. 1) Slide mounted *Sipha agropyronensis* (Gillette). Photograph: Gary Miller. **2)** Colony of *Sipha flava* (Forbes). Photograph: David J. Voegtlin, Illinois Natural History Survey, Champaign, IL. **3)** Slide mounted *Sipha flava* (Forbes) alate. Photograph: Susan Halbert and Lyle J Buss, University of Florida, Gainesville. **4)** Slide mounted *Sipha flava* (Forbes) aptera. Photograph: Susan Halbert and Lyle J Buss, University of Florida, Gainesville. **5)** Damage from *Sipha glyceriae* (Kaltenbach) on rice in Italy. Photograph: Susan Halbert. **6)** Slide mounted *Sipha glyceriae* (Kaltenbach) alate from North America. Photograph: Gary Miller. **7)** Slide mounted *Sipha glyceriae* (Kaltenbach) aptera from North America. Photograph: Gary Miller. **8)** *Sipha elegans* del Guercio on *Agropyron* sp. in Idaho. Photograph: Susan Halbert. **9)** *Sipha elegans* del Guercio on *Triticum aestivum* (wheat) in Idaho. Photograph: Susan Halbert and Guy W. Bishop, University of Idaho, emeritus.

4(1). Abdominal dorsum almost completely dark brown to black and sclerotic (Fig. 12–15) .... ***Sipha maydis* Passerini**

— Abdominal dorsum at most with sclerotic patches under the setae (Fig. 8–11) .... ***Sipha elegans* de. Guercio**



Figures 10-17. 1) Slide mounted *Sipha elegans* del Guercio alate. Photograph: Susan Halbert and Lyle J Buss, University of Florida, Gainesville. **11)** Slide mounted *Sipha elegans* del Guercio aptera. Photograph: Susan Halbert and Lyle J Buss, University of Florida, Gainesville. **12)** Colony of ant -tended *Sipha maydis* Passerini on wheat. Photograph: Lisa M. Ames. **13)** Close up of *Sipha maydis* Passerini colony with adults, immature stages, and feeding damage. Photograph: Lisa M. Ames. **14)** Slide mounted *Sipha maydis* Passerini alate. Photograph: Susan Halbert and Lyle J Buss, University of Florida, Gainesville. **15)** Slide mounted *Sipha maydis* Passerini aptera. Photograph: Susan Halbert and Lyle J Buss, University of Florida, Gainesville. **16)** Dorsum of *Sipha glyceriae* (Kaltenbach) from Europe, showing denticles. Photograph: Susan Halbert. **17)** Dorsum of *Sipha flava* (Forbes) showing lack of denticles. Photograph: Susan Halbert.

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