The South American Rice Miner, *Hydrellia wirthi* Korytkowski: A Case of a New Invasive Insect Pest of Rice in the United States

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ABSTRACT

The South American rice miner (SARM), *Hydrellia wirthi* Korytkowski (Diptera: Ephydridae), is a new invasive insect pest of rice in the United States. It was reported for the first time in the United States from rice fields in Jefferson Davis parish in Louisiana in 2004. The species was then reported in different rice areas of Louisiana and Texas. A field survey for the SARM was conducted in the most important rice producing areas of Louisiana and Texas in 2005. The objectives were to determine the current distribution of this new invasive species and to assess the severity of infestations in rice fields. Fifteen Louisiana parishes were surveyed for a total of 3023 acres of rice. Eight Louisiana parishes resulted positive for the presence of the SARM including Vermilion, Acadia, Jefferson Davis, Allen, St. Martin, Cameron, Concordia, and Tensas. In Texas, the SARM was found in rice areas of Calhoun, Jackson, Matagorda, Wharton, Colorado and Jefferson counties. Infestations were higher and associated with economic losses in isolated rice fields of coastal parishes in southwest Louisiana. These parishes included Vermilion, Acadia, Jefferson Davis, and Cameron. No specific preference was detected for the SARM to infest any particular rice variety. The species was collected from the following rice varieties: Cypress, Cheniere, CL161, and Cocodrie. The earliest adult collection in our survey was on May 6th in Vermilion parish and the latest was Aug 16th in Concordia parish. All areas where the species was found in this survey are first records for United States rice areas.

INTRODUCTION

The South American rice miner (SARM), *Hydrellia wirthi* Korytkowski, was first described from collections in rice fields from Peru and Colombia (Pantoja et al. 1993, Pantoja and Salazar 1993), Costa Rica (W.N. Mathis, unpublished data), and was reported for the first time in Louisiana and Texas in 2004 (Castro et. al 2005). It is possible the species was present in the United States several years before the first report. Recent submissions of specimens collected in Calhoun county, Texas, in July 2003 also resulted positive for the SARM (Mathis et al., submitted). The SARM is a shore fly (Diptera: Ephydridae). The only shore-fly species previously known to infest commercial rice in the United States was the smaller rice leafminer, *Hydrellia griseola* (Fallén).

SARM eggs are elongated, ribbed, white or creamy-white and approximately 0.5 mm long and 0.2 mm wide (Fig. 1). Eggs are laid singly on the upper surface of rice leaves, near the leaf margins. Larvae are small, white or yellowish legless maggots of approximately 5-7 mm in length (Fig. 2). The puparium is elongate, tapered at both ends and brown colored (Fig. 3). Adults are small, gray to dark-gray colored flies of about 2-3 mm in length (Fig. 4). Distinguishing between adult SARM and adult smaller rice leafminer is possible only after dissection and study of the internal reproductive structures of the adult male.

Economic losses occur in young rice from emergence until the tillering stages. All severely injured fields reported are from late planted rice (i.e. planted in May and June in central and southwest Louisiana). The observed injury to plants resembles that of the rice whorl maggot, *H. philippina* Ferino, which affects rice production in Asian countries (Dale 1994, Mueller 1970) but is not known from rice areas in the western hemisphere. Injury is caused by the larva or maggot whose feeding causes large, elongated lesions along the margins of emerging leaves. The maggot mines the leaf or rasps the leaf surface before the leaf unfurls. As the leaf expands, yellow damaged areas are more visible. Affected young leaves usually break off or display a ragged appearance (Fig. 5). The maggot continues to feed on the whorl tissue and enters the stem of developing plants. Because of the damage to the whorl of rice plants, the SARM also is termed “whorl maggot” by several rice producers in Louisiana. It is common to find one or two maggots in a single stem. However, in one affected field, five larvae were observed in the same tiller. Affected seedling plants are either killed or plant growth is severely retarded. Pupation occurs inside the affected stem, near the collar of the leaf. Field damage is distributed in large patches either in the center or along the margins of the field (Fig. 6).

A field survey for the SARM was conducted in the most important rice producing areas of Louisiana and Texas in 2005. The objectives were to determine the current distribution of this new invasive species and to assess the severity of infestations in rice fields.

Figure 1. SARM, eggs

Figure 2. SARM, larva

Figure 3. SARM puparium inside rice tiller, near the collar of the leaf.

Figure 4. SARM adult on affected leaf.

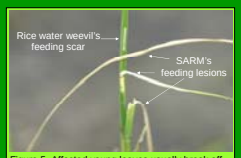

Figure 5. Affected young leaves usually break off or display a ragged appearance.

Figure 6. SARM infestation pattern in a rice field.

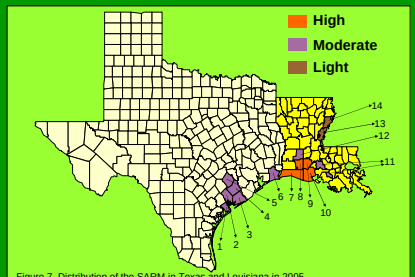

Figure 7. Distribution of the SARM in Texas and Louisiana in 2005. High infestation resulting in plant death = Cameron (7), Jefferson Davis(8), Acadia (9), and Vermilion (10) parishes in LA. Moderate infestations resulting in reduced tillering, some plant death and uneven maturity = Calhoun (1), Jackson (2), Matagorda (3), Wharton (4), Colorado (5) and Jefferson (6) counties in TX and St. Martin (11) and Allen (12) parishes in LA. Light infestations resulting in leaf scarring = Concordia (13) and Tensas (14) parishes in LA.

MATERIALS AND METHODS

The field survey was conducted during the 2005 rice growing season from April through October. Fifteen different Louisiana parishes were surveyed in 80 field visits for a total of 3023 acres of rice. The following parishes were surveyed in 2005: Vermilion (642 acres); Acadia (471 acres); Lafayette (30 acres); St. Landry (210 acres); Jefferson Davis (414 acres), Allen (254 acres); Calcasieu (110 acres); St. Martin (200 acres); Cameron (200 acres); Evangeline (30 acres); Avoyelles (90 acres); Concordia (328 acres); Tensas (7 acres); Franklin (5 acres); East Carroll (32 acres). The most important rice producing counties in Texas also were surveyed.

Efforts were focused to inspect rice fields from one to six weeks of emergence. However, some fields at green-ring stage also were included. Commercial rice fields in Louisiana were scouted using a standard 15-inch sweep net. Ten sweep passes at five different locations were performed in each field. Fly adults (dipterans) were collected from nets using a mouth insect-aspirator. Suspicious adult dipterans were preserved in 70% ethyl alcohol and forwarded to the USDA-ARS-Systematic Entomology Laboratory (SEL), Smithsonian Institution, Washington DC., for official confirmation to species level. In addition, suspected injured plants were taken to a laboratory and placed in reared chambers at 27 °C and a photoperiod of 14:10 (L:D). Larvae were reared inside affected plants until adult emergence. Fly adults and associated parasitoids emerged in lab were shipped in vials containing 70% ethyl alcohol to the SEL.

RESULTS

The following eight Louisiana parishes resulted positive for the presence of the SARM: Vermilion, Acadia, Jefferson Davis, Allen, St. Martin, Cameron, Concordia, and Tensas (Fig. 7). In Texas, the SARM was found in rice areas of Calhoun, Jackson, Matagorda, Wharton, Colorado and Jefferson counties. Field observations revealed that infestations of the SARM tended to be much higher and caused localized economic losses in rice fields of coastal parishes in southwest Louisiana including Vermilion, Acadia, Jefferson Davis, and Cameron Parishes. In those areas, infestations occurred from plant emergence and before plants reached tillering stages and usually resulted in plant death. The SARM was found at moderate densities in Texas and in Allen and St. Martin parishes of LA. These infestations tended to occur at the tillering stages of rice and resulted in reduced tillering and occasional plant death. Reduced plant and tiller densities often increased weed problems, retarded plant growth and caused uneven plant maturity. The SARM was present in Concordia and Tensas parishes in northeast Louisiana affecting rice at the green-ring stage. Plants affected at this stage showed leaf scarring but no significant impact was detected on final yields.

No specific preference was detected on the SARM to infest any particular rice variety. The species was collected from the rice varieties Cypress, Cheniere, CL161, and Cocodrie. The earliest adult collection in our survey was on May 6th in Vermilion parish and the latest was Aug 16th in Concordia parish. Larvae were observed in the whorl of rice plants in experimental plots in Tensas parish on Sept. 13th. All rice areas where the SARM was found in this survey constitute first official records for the United States. All parasitoids emerged in laboratory in this survey were forwarded to a specialist for identification to species level.

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