

First Report of *Elaphria agrotina* and *Elaphria deltoides* (Lepidoptera: Noctuidae: Elaphriini) Feeding on Maize

ALEXANDRE SPECHT,¹ MIGUEL FERREIRA SORIA,² TALITA SAIARA MAFINI MABA,³ LUANA MARIA DE ROSSI BELUFI,³ BÁRBARA WESCHENFELDER GODOI,⁴ MÔNICA JOSENE BARBOSA PEREIRA,⁴ AND SILVANA V. PAULA-MORAES^{1,5}

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ABSTRACT This is the first report of *Elaphria agrotina* (Guenée, 1852) and *Elaphria deltoides* (Möschler, 1880) (Lepidoptera: Noctuidae) feeding on maize (*Zea mays* L.). The specimens were collected in maize fields during the crop season of 2012 and 2013 in three municipalities in Mato Grosso State, Brazil. Larvae were collected while feeding at the ear base, which often resulted in ears dropping to the ground. Larvae also were observed feeding on kernels in fallen ears. Ear injury often leads to reduced grain quality, and when the ears fall to the ground, reduced yield. A previous report of *Striacosta albicosta* (Smith, 1888) feeding on maize in Brazil was probably a misidentification of an *E. agrotina* male, which has wing pattern and coloration similarities with *S. albicosta*.

KEY WORDS owl caterpillar, polyphagia, maize, larval feeding behavior

Brazil cultivates maize (*Zea mays* L.) throughout the entire country and is ranked third in the international production of maize. The lepidopteran group is reported to cause injury, and several species cause significant economic impact (Gallo et al. 2002). During the crop season of 2012 and 2013, larvae were detected in several municipalities of Mato Grosso feeding on maize leaves, husks, drying silks, and boring the ear shank and feeding on drying kernels. However, the adults that emerged from the larval collection and reared in the laboratory neither had similarity with previously described species feeding on maize in Brazil nor with *Striacosta albicosta* (Smith, 1888), which was recently reported in Mato Grosso state (Rattes 2012).

The objectives of this work were to identify the owl moth species from the family Noctuidae whose larvae were collected on different maize tissues, and to describe feeding injury.

Materials and Methods

In the crop season of 2012 and 2013, larvae were collected in the state of Mato Grosso in the following municipalities: Nova Mutum ($n = 5$), Campo Verde

($n = 16$), and Tangará da Serra ($n = 53$). Collections of larvae feeding on ears were transported to the laboratory. Larvae were allowed to feed on kernels until pupation, and then the pupae were transferred to transparent containers (Gerbox 250 ml, 11 by 11 by 3.5 cm, containing moist filter paper) until adult emergence.

Taxonomic identification was conducted with emerged moths, based on wing patterns and coloration, following Hampson (1909), Zagatti et al. (1995), and Becker and Miller (2002).

Results and Discussion

The morphological analysis of the moths indicated they were *Elaphria agrotina* (Guenée, 1852) (Fig. 1a) and *Elaphria deltoides* (Möschler, 1880) (Fig. 1b) (Lepidoptera: Noctuidae). Voucher specimens of both species were deposited in the Embrapa Cerrados Entomology Collection, Planaltina, Distrito Federal (Brazil).

E. agrotina and *E. deltoides* are widely distributed in the Americas. There are reports from North to South America, including the United States (Kimball 1965), the extreme south of Brazil, in Rio Grande do Sul state, and northern Argentina (Becker and Miller 2002, Specht and Corseuil 2002, Pastrana 2004). Both species are reported in native Uruguayan Pampas vegetation (temperate savannahs; Specht et al. 2005). In Brazil, both species are also reported at high densities in crops in the state of São Paulo, municipalities of Piracicaba and Jaboticabal (Silveira Neto et al. 1977). Lower densities were reported in Rio Grande do Sul, in the Brazilian rain forest, and in municipalities of

¹ Embrapa Cerrados, BR 020 Km 18, Planaltina, DF, Brazil, 73310-970.

² Instituto Mato-grossense do Algodão. Rodovia BR 070 - KM 265 Zona Rural, Primavera do Leste, MT, Brazil, 78850-000.

³ Fundação de Pesquisa e Desenvolvimento Tecnológico Rio Verde - Rodovia da Mudança Km 08, Zona Rural, Lucas do Rio Verde, MT, Brazil, 78.455-000.

⁴ Universidade do Estado de Mato Grosso, Bairro Aeroporto, Tançaré da Serra, MT, Brazil, 78300-000.

⁵ Corresponding author, e-mail: silvana.moraes@embrapa.br.

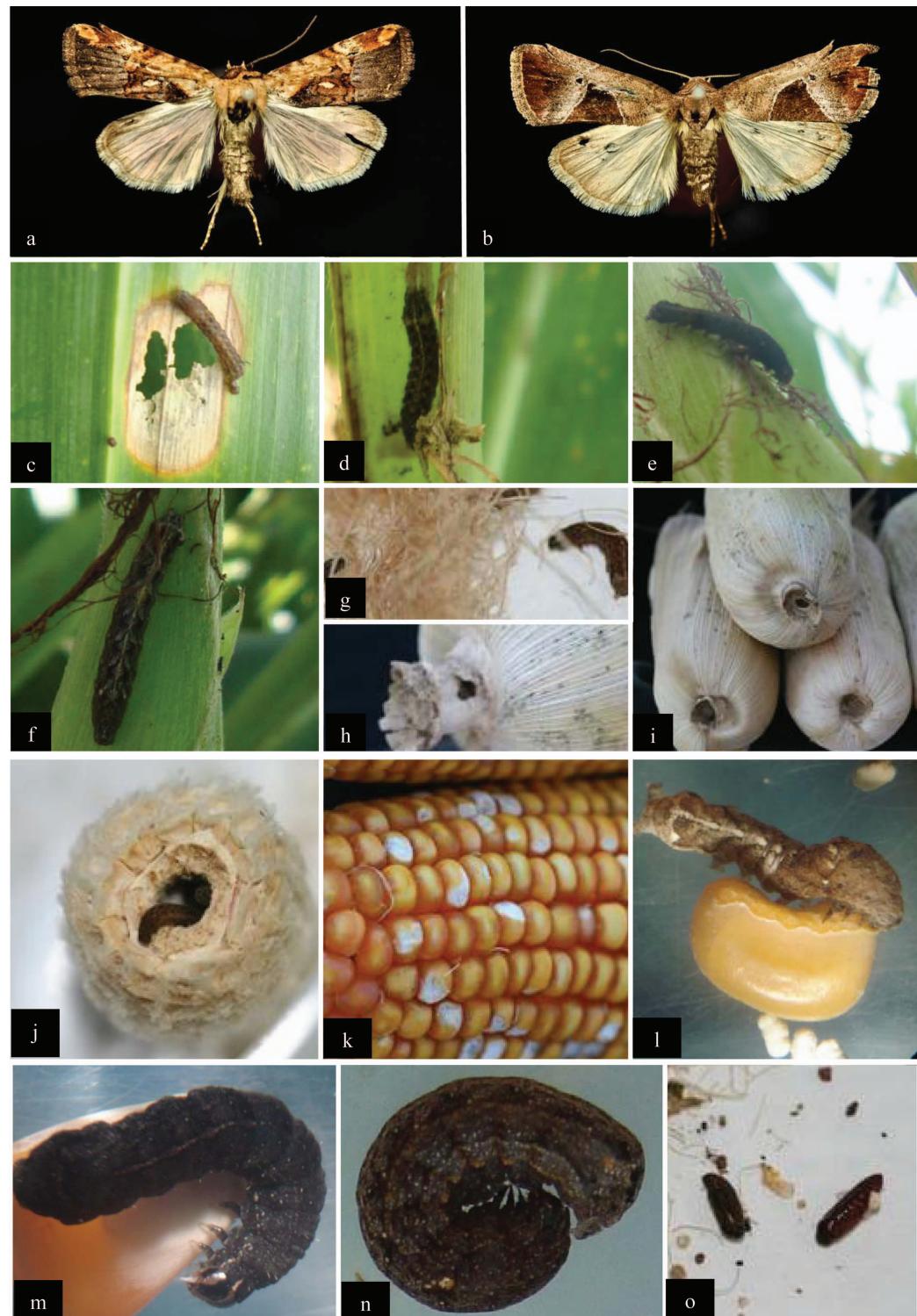


Fig. 1. (a) *E. agrotina* male adult; (b) *E. deltoides* male adult. (c-f) *Elaphria* spp. larvae in vegetative tissues of maize; (g) *Elaphria* spp. larvae in dried maize ear; (h and i) holes made by the *Elaphria* spp. larvae at the base of the maize ear; (j) *Elaphria* spp. larvae inside the dried ears; (k) dried maize kernels gnawed by *Elaphria* spp. larvae; (l and m) *E. agrotina* larval feeding behavior on kernels; (n) mature larvae of *E. agrotina*; (o) *E. agrotina* pupae. (Online figure in color.)

Santa Maria (Tarragó et al. 1975) and Salvador do Sul (Specht and Corseuil 2002). In the central part of Brazil, in savannahs areas, *E. agrotina* was predominant in crops and present at minor densities in natural vegetation (Camargo 2001).

Six crops are reported as host plants of *E. agrotina*, including soybean, *Glycine max* (L.) Merrill (Pastrana 2004); beans, *Phaseolus vulgaris* L. (Pastrana 2004); okra, *Abelmoschus esculentus* (L.) Moench (Pastrana 2004); cotton, *Gossypium hirsutum* L. (Pastrana 2004); sugarcane, *Saccharum officinarum* L. (Holloway 1936); and pineapple, *Ananas comosus* (L.) Merrill (Gallo et al. 2002).

The feeding habit of the larvae was variable as a function of the maize tissue (Fig. 1c–1l). On leaves, the larvae caused defoliation, especially feeding on necrotic tissue (Fig. 1c). On the ear, larvae feed on husks and drying silks (Fig. 1d–1g), and were collected feeding at the base of the ears (Fig. 1h–1j) and boring into the ear shank (Fig. 1j). Inside fallen ears, larvae were detected feeding on drying kernels (Fig. 1k–1m).

Previous of the present work, Rattes (2012) reported *S. albicosta* causing damage to maize in the same no-till areas where sampling was conducted for this study. However, Rattes (2012) did not report the morphological characters used to identify *S. albicosta* in Brazil and did not preserve voucher specimens.

S. albicosta, a moth native to North American, is a pest that causes economic impact in maize and dry bean in the United States Corn Belt and Canada (Michel et al. 2010). Larval feeding on the maize ear causes grain loss resulting in economic damage (Paula-Moraes et al. 2013). Since 1999, a northward and eastward expansion of this species in the United States Corn Belt was documented (Michel et al. 2010).

The *S. albicosta* moth is dark brown with a light brown or tan body, and the forewings are marked with creamy white stripes on the front edge (Hagen 1976). Even though males of *E. agrotina* are smaller (wing span around 1.5 cm; Becker and Miller 2002) when compared with *S. albicosta* males (wing span around 4.0 cm), both species have coloration similarities, especially considering the light stripe crossing the coastal region of the forewing (Michel et al. 2010).

During the current study, which was conducted after the publication of Rattes's report, *S. albicosta* was not detected in Mato Grosso. The absence of *S. albicosta* specimens in light trap and larval samples is a strong indication that the report of *S. albicosta* in Brazil is possibly a misidentification of a member of the *Elaphria* genus, especially considering the previously discussed coloration similarities between *S. albicosta* and *E. agrotina*.

The ecology and impact of the *Elaphria* genus have been documented. Moore of British Guiana (Holloway 1936) described the genus as the "dead cane moth," the caterpillar of which feeds on dead and decaying cane stumps and even on dry trash. In pineapple, larval feeding on leaves causes deformation of the plant (Gallo et al. 2002). *E. agrotina* and *E. del-*

toides present a similar feeding behavior to *Elaphria nucicolora* (Guenée, 1852) (Habeck 1965), and possibly have the same polyphagy, feeding on hairy beggar ticks (*Bidens pilosa* L.), chickweed (*Stellaria* sp.), rape (*Brassica napus* L.), mustard (*Brassica juncea* (L.) Czern.), turnip (*Brassica rapa* L.), lupine (*Lupinus* sp.), white clover (*Trifolium repens* L.), and rye (*Secale* sp.). Fresh leaves are not necessary for larval development, and larvae grew normally on old dead leaves and stems as long as sufficient moisture was present (Habeck 1965). The same behavior of larvae feeding on necrotic leaves was observed in the Mato Grosso collection.

E. agrotina and *E. deltooides* are phylogenetically related and have a similar ecology and geographical distribution. Both present the risk of economic impact to maize production. Economic damage is caused by larvae feeding at the base of the maize ear, often followed by the ear falling to the ground. The previous report of *S. albicosta* in Brazil is probably a misidentification of the genus *Elaphria*. Moreover, the observed injury caused from larval feeding of *S. albicosta* in maize in North America is typically concentrated on the ear tip (Paula-Moraes et al. 2013). Even in cases when larvae move to the outside of the maize ear, they chew through the husks and initiate feeding on kernels (Seymour et al. 2004). Larval boring inside the ear shank is not an observed behavior of *S. albicosta*.

Considering the economic importance of maize in Brazil and in other countries around the world, future studies should describe the biology, behavior, and potential economic impact of *E. agrotina* and *E. deltooides* in this crop. The identification of these species also clarifies a possible misidentification of a previous report of *S. albicosta* in Brazil, and how important it is to preserve voucher specimens.

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