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**RESUMEN**


_Palabras clave_: Hipógeas, Coccoidea, órgano genital, descripciones.

**SUMMARY**

Previously, Cox (1978) synonymized *Rhizoecus perprocerus* De Lotto, 1961 with *Morrisonella graminis* Hambleton, 1946 (now known as *Rhizoecus graminis*), based on a morphological comparative study of the adult female. Later, Kozár & Konczné Benedicty (2007) considered the synonymy by Cox (1978) as an incorrect synonymy. In the present study, *R. perprocerus* is once more synonymized with *R. graminis* after reexamination of the morphology of the type material of *R. graminis* and *R. perprocerus*. The taxonomic value of the shape and length of the genitalia, the distribution of ventral triturular ducts on the abdomen, and the size of the clavate sensory setae in the antennae are discussed.

_**Key words**: hypogeic, Coccoidea, genitalia, descriptions._

**INTRODUCTION**

*Rhizoecus graminis* was originally described by Hambleton (1946) in the genus *Morrisonella* Hambleton, 1946, based on the length and shape of apical segment of the antenna, absence of circuli, and presence, number, and distribution of multilocular disc pores. This species has been found in roots of Convolvulaceae: *Dichondra repens*, and Poaceae: *Agrostis tenuis*, *Festuca rubra*, *Lolium perenne*, and reported from different regions, including the Afrotropical: South Africa, and Tanzania; Australasian: New Zealand; and Nearctic: The United States.
of America (Ben-Dov et al. 2014).

*Rhizoecus perprocerus* was described by De Lotto (1961) separating it from *R. immisi* James, 1935, by the absence of circuli and the presence of a small sclerotized area near the setae on the cerarii of the anal lobe. De Lotto studied four specimens, collected on roots of an unknown host, from South Africa (De Lotto 1961). Therefore, the species is only known from the type material (Ben-Dov et al. 2014).

Cox (1978), synonymized *R. perprocerus* with *R. graminis*. Her judgment was based on the presence of a cephalic plate and a sclerotized area on the anal lobes in the studied specimens. These traits were considered lacking by De Lotto (1961). Cox (1978) indicated that the observation of these traits is highly dependent on slide-mounting techniques, because the excessive heating with potassium hydroxide solution would have removed them.

Almost thirty years after Cox’s work, Kozár & Konczné Benedicty (2007) studied the holotype of *R. perprocerus* and revived the name based on the presence of an extra submedian row of ventral tritubular ducts on the abdomen, the size of clavate sensory setae and length of the genital organ. They redescribed *R. graminis* and *R. perprocerus* as having different shapes of genitalia (Kozár & Konczné Benedicty 2007).

After studying the variation in the number and distribution of rows of ventral tritubular ducts on the abdomen in a number of specimens, including type material of both species, it was found that this character state is variable. Furthermore, the shape of the genitalia in both species are very similar.

**MATERIALS AND METHODS**

Measurements and illustrations were made using the image analysis program Axion Vision Carl Zeiss on a phase-contrast Carl Zeiss microscope. The number and distribution of tritubular ducts on the venter of the abdominal segments, length and shape of the genitalia and the length and shape of the proximal clavate sensory setae on the antenna were studied. Illustrations of the genitalia were based on images taken from the type material of *R. perprocerus*. All material studied is deposited at the USNM, National Museum of Natural History, Entomological Collection, Washington, DC, USA (Coccoidea collection held at the US Department of Agriculture, Beltsville, Maryland).

**Terminology used.** In the literature, there is no agreement for the name assigned to the three-ducted cuticular structures, which are present in all of the species belonging to the genus *Rhizoecus*. Some names include: “tritubular ceror” (Hambleton 1946, Cox 1978, and Hodgson & Williams 2008); “tritubular pores” (McKenzie 1967, Williams 1985, Williams & Granara de Willink 1992, and Kozár & Konczné Benedicty 2007). On the other hand, Ferris (1953) and De Lotto (1961) call them “tritubular ducts”. Herein the term “tritubular ducts” is used following Foldi (1983, 1991).

Accordingly, the three very distinctive basic units of cuticular structures, transporting and discharging wax secretions, could be pores, ducts, and ductules. **Pores** are cuticular structures that cover
the wax gland and are specialized for the extrusion of the wax secretion; externally, they have either a simple or a loculate opening (loculus), generally with geometric arrangement. The pores are called simple, bi-, tri-, quadri-, quinque- or multilocular pores depending on the number of loculi present. **Ducts** are cuticular tubules, cylindrical or flat, and invaginated into the body. Structurally, a duct always has an inner ductule which transports the secretion from the central glandular cell to the inner end of the duct. The distinction between a duct and a pore lies in the presence or absence of an inner ductule. Sometimes the inner ductule is very fragile and may often be destroyed during the preparation of the slide mounted specimen (Foldi 1991). Finally, the **ductules** are cuticular tubes, small, 0.2–1 \( \mu \text{m} \) in diameter and generally 1–4 \( \mu \text{m} \) long; they assure the direct transport of the secretion from the receptor ductule to the exterior.

**Material Examined.**


**RESULTS AND DISCUSSION**

**Distribution of ventral tritubular ducts on the abdomen.** There are two longitudinal rows of ventral tritubular ducts on the venter of the abdomen; a submarginal row and a lateral row between abdominal segments III to VII. In addition to the longitudinal rows, a variable number of tritubular ducts are present on the median area on the venter of abdominal segment VI, ranging between 0–4, with 1 being the most common in *R. graminis* (n=9). In *R. perprocerus* the submarginal and lateral rows of tritubular ducts on the venter of the abdomen are also present, with 0–2 (usually 0) tritubular ducts present on venter of abdominal segment VI, like specimens of *R. graminis* (n=5). This observation shows the variability of this character state. The influence of environmental factors on variation in the number of structures such as multilocular disc pores and tubular ducts was studied by Cox (1983).

**Length and shape of genitalia.** *Rhizoecus graminis* and *R. perprocerus* have the same distinct shape of genitalia (Fig. 1A, C & E). The description of the genitalia given by Kozár & Konczné Benedicty (2007) for *Rhizoecus perprocerus* (Fig. 1B) and *R. graminis* (Fig. 1D) do not match the morphology of their respective type specimens. The shape of *R. perprocerus* and *R. graminis* are very similar if not identical (see Fig. 1A & C); and the length of the genitalia in both species overlap, 177–210 \( \mu \text{m} \) (n=6) in *R. graminis* and 190 \( \mu \text{m} \) (n=2) in *R. perprocerus*. 
Ramos-Portilla, Second time synonymy of *Rhizoecus perprocerus* with *R. graminis*

**Figure 1.** A. Genitalia of *Rhizoecus perprocerus* (Paratype). B. Genitalia of *R. perprocerus*, as drawn by Kozár & Konczné Benedicty (2007). C. Genitalia of *R. graminis* (Holotype) D. Genitalia of *R. graminis* as drawn by Kozár & Konczné Benedicty (2007). E. Genitalia of *Rhizoecus perprocerus* (Paratype), original drawing. Photos of genitalia (Fig. 1A & C) taken by A. Ramos.

**Length and shape of the proximal clavate sensory setae of antennae.** The sensory setae of the antennae of *R. graminis* are filiform (n=2) to slightly clavate (n=5). In *R. perprocerus* the shape of the sensory setae of the antennae is slightly clavate (n=5). The length of the sensory setae of the antennae in *R. graminis* is 19–22 \( \mu \text{m} \) (n=6), whereas the length is 19–21 \( \mu \text{m} \) in *R. perprocerus* (n=3), clearly overlapping.

**CONCLUSIONS**

Kozár & Konczné Benedicty (2007) revived *R. perprocerus* from its synonymy with *R. graminis* based on highly variable morphological character states. As shown above, the character states used to separate *R. perprocerus* and *R. graminis* overlap, thus there is no basis to consider *R. perprocerus* as a separate species. The observations in the present study added to the information provided Cox (1978) is enough evidence to consider *R. perprocerus* as a junior synonym of *R. graminis*.

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**Literature cited**


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