SHILAP Revista de lepidopterología, 52 (208) diciembre 2024: 677-681 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.1010 https://shilap.org

Contribution to the biology of *Coleophora namaqua* Baldizzone & van der Wolf, 2015 from South Africa (Lepidoptera: Coleophoridae)

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Abstract

Larvae of *Coleophora namaqua* Baldizzone & van der Wolf, 2015 were collected on their foodplant and reared to imagines. It is the first documented breeding of a *Coleophora* Hübner, 1822 species from South Africa. The larval case is described, and COI sequences were obtained. Further, variations in male and female genitalia are briefly discussed and illustrated.
Keywords: Lepidoptera, Coleophoridae, COI, *Coleophora namaqua*, foodplant, larval case, South Africa.

Contribución a la biología de *Coleophora namaqua* Baldizzone & van der Wolf, 2015 de Sudáfrica (Lepidoptera: Coleophoridae)

Resumen

Se recogieron larvas de *Coleophora namaqua* Baldizzone & van der Wolf, 2015, en su planta nutricia y se criaron hasta imagos. Se trata de la primera cría documentada de una especie de *Coleophora* Hübner, 1822 de Sudáfrica. Se describe el estuche larvario y se obtuvieron secuencias COI. Además, se discuten e ilustran brevemente las variaciones en la genitalia del macho y de la hembra.
Palabras clave: Lepidoptera, Coleophoridae, COI, *Coleophora namaqua*, planta nutricia, estuche larvario, Sudáfrica.

Introduction

During the last decades, lots of collection efforts for Microlepidoptera were done in Southern Africa. Amongst other groups, focus was also put on the genus *Coleophora* Hübner, 1822 (Coleophoridae), which turned out to be very diverse in that region, with more than 80 species reported so far (e.g. Baldizzone, 2021, 2022a, 2022b; Baldizzone & van der Wolf, 2011, 2015, 2020). *Coleophora* is one of the largest genera of Lepidoptera with more than 1550 species described worldwide. The big majority is distributed in the Holarctic region, but a substantial number is also known from tropical and subtropical regions, mainly in Africa (Baldizzone et al. 2006; Baldizzone, 2021). The imagines of *Coleophora namaqua* Baldizzone & van der Wolf, 2015, have a wingspan of 13-16 mm and brownish forewings with a distinct white line along the costa (Figure 1a), a habitus which they share with a number of other Afrotropical species and also with Palearctic species of the 9th species group of Toll's system (Baldizzone & van der Wolf, 2015; Toll, 1953). The differentiation of

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these species can be done with the morphology of the genitalia, the most similar species is *C. aarviki* Baldizzone & van der Wolf, 2011 (Baldizzone & van der Wolf, 2015). Here, we describe the larval case and report the foodplant of *C. namaqua*, both hitherto unknown, based on the first rearing of a *Coleophora* species in South Africa.

Materials and methods

Eight larvae were found on their foodplant on 03-XI-2014 during a search specifically for *Coleophora* larvae in the Cedar Mountains and kept in a carton container covered with gauze. For two days, twigs with leaves were added into the container, as two larvae were still feeding. Thereafter, all larvae remained in the same container during pupation, first for about ten days in South Africa and thereafter at room temperature in Switzerland.

For the genitalia, the abdomens were at first treated with heated KOH, the dissection was done in Cellosolve (2-Ethoxyethanol) with subsequent mounting on slides with Euparal liquid, using an Olympus SZX7 stereomicroscope.

The DNA of part of the specimens was extracted using a hindleg of two different specimens. We amplified a 658 bp fragment of the mitochondrial gene cytochrome oxidase subunit 1 (COI) using the primers LCO 1490 and HCO 2198 (Folmer et al. 1994). Sequencing was done with Sanger's method (Sanger et al. 1977). The genetic variability between two specimens was estimated using Kimura-2-parameter distances (K2P; Kimura, 1980), calculated with the program MEGA 11 (Tamura et al. 2021, http://www.megasoftware.net).

Photograph of an imago in toto was taken using a Canon EOS 6D camera and processed with the programs Adobe Photoshop Lightroom (http://www.adobe.com) and Helicon Focus version 5.3 (http://www.heliconsoft.com). Pictures of parts of genitalia were taken with an Olympus BX43 microscope, processed with the program Olympus Cell Sense v. 3.2. Photographs were subsequently enhanced with Adobe Photoshop Elements 13.

Results

Material examined: South Africa, Cedar Mountains, near Kagga Kamma Lodge; 32º44'45''S, 19º33'46''E; 1.073 m; 1 ♂, 2 ♀; 03-XI-2014; e. l. *Wiborgia obcordata* 02-03-XII-2014; leg. Th. Kaltenbach; genitalia preparations GBIFCH01221758, GBIFCH01221757.

Remarks to variations in the genitalia: The male genitalia show variations in the sacculus and the cornuti (Baldizzone & van der Wolf, 2015, figs 35-38). The male specimen in this study has genitalia identical to Figure 37 in Baldizzone & van der Wolf (2015), but cornuti, which are different in number and orientation (Figure 1e). The female genitalia of a specimen in this study are as shown in the original description (Baldizzone and van der Wolf, 2015, figs 40-41). However, the signum has a small spine (Figure 1d), which was also discovered in the genitalia of a paratype (GP BLDZ 15005).

Description of larval case and remarks to life-history: Eight larval cases in final stage were found on their foodplant *Wiborgia obcordata* (P. J. Bergius) Thunb. (Fabaceae). Two of the larvae were still feeding by mining the very small leaves from beneath. Abandoned mines in the leaves were also observed in the neighborhood.

One case of the young larva (Figure 1b) was found nearby a feeding mature larva, attached to a twig. It is made of two segments of leaf cuticle, flattened laterally, length ca. 4 mm, color yellow brown. The anal opening is bivalve, the oral opening is set at ca. 45º to the long axis. We assume that the first case initially is made from one segment of leave cuticle and later completed with a second segment. However, it remains unclear, if the first case is used by the larva for the construction of the final case or just abandoned and left behind during the construction of the final case.

The case in its final form (Figure 1c) is elongate tubular, slightly flattened laterally. It is composed of mostly three segments of leaf cuticle; anal segment conical, partially with a ventral keel consisting of the leaf cuticle margin; length 9-11 mm, color yellow brown to brown. The anal opening is bivalve, the

oral opening is set at ca. 40º to the long axis. Pupation as usually in the case, attached to twigs of the foodplant or adjacent places.

The habitat where the specimens were collected in the Cedar Mountains above 1000 m is a semi desert scrub with sandstone rock formations and sandy soil of reddish color (Figure 1f). Nearby are areas of Mediterranean fynbos, typical for this region in South Africa. It is hot and arid during summer and cold with some rainfall during winter. The vegetation is loose, and drought adapted with shrubs like *Wiborgia obcordata* as highest plants.

Genetics: The two COI sequences obtained from two specimens of *C. namaqua* from the same location have a genetic distance of 0% (K2P), as it is expected in such a case. The sequences are accessible on GenBank with the following numbers: PP297496, PP297497.

Discussion

Not much is known about the larval cases and the foodplants of Afrotropical species of *Coleophora* in general. Apart from *C. namaqua* treated in this study, only the larval case and foodplant of *C. enchitis* Meyrick, 1920 from Kenya are known (Baldizzone & van der Wolf, 2015). The foodplant of *C. namaqua*, *Wiborgia obcordata*, belongs to the family Fabaceae. Interestingly, the known larvae of species belonging to the 9th group of Toll (Toll, 1953), to which *C. namaqua* has affinities, also feed on Fabaceae. The knowledge on larval cases, foodplants and life-history of this megadiverse genus is an important prerequisite to better understand the phylogeny of this group in future studies (see Bauer et al. 2012). Therefore, it is recommended to also focus on the collection and rearing of *Coleophora* larvae during future field trips in the Afrotropical region.

Acknowledgements

We sincerely thank Céline Stoffel (MZL, UNIL) for her support with lab work and preparation of the COI barcodes. Further we are very grateful to Dr. Antonio Vives for the translation of the abstract into Spanish language. We are also thankful to the reviewers for their valuable comments.

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(Recibido para publicación / *Received for publication* 9-II-2024)
(Revisado y aceptado / *Revised and accepted* 19-III-2024)
(Publicado / *Published* 30-XII-2024)

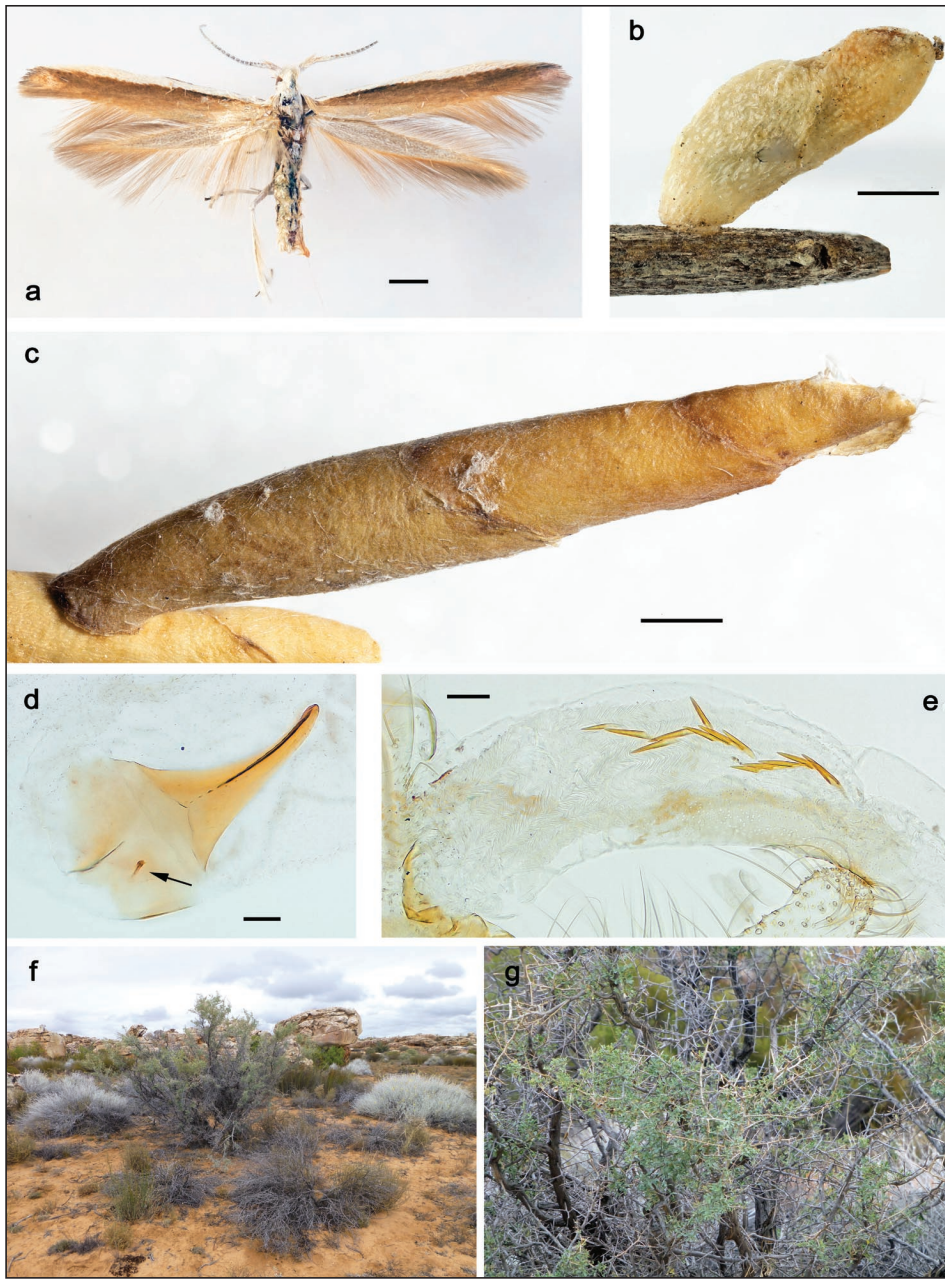

Figure 1. *Coleophora namaqua*: **a.** female. **b.** first larval case. **c.** final larval case. d**.** signum of female genitalia (arrow: small spine) **e** cornuti of male genitalia **f** habitat in Cedar Mountains, with shrubs of *Wiborgia obcordata* **g** *Wiborgia obcordata*. Scale bars: 1 mm (a, b, c), 20 µm (d, e).