

First record of *Ceratiomyxa morchella* A.L. Welden (Amoebozoa, Myxomycetes) to Southern Brazil

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Abstract: *Ceratiomyxa morchella*, characteristic of the Neotropical myxobiota, was first recorded in Brazil four decades ago in the northern region of the country. Since then, it has a known distribution only in the North and Northeast regions, occurring in the Amazon and Atlantic Forest biomes. Collecting carried out in a fragment of Mixed Ombrophylous Forest in the southern region of the country expands the known area of occurrence of the species and increases to 112 the number of species that make up the myxobiota of the state of Rio Grande do Sul.

Keywords: chorology, myxomycota, slime molds

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Introduction

Ceratiomyxa J. Schröt. is the only genus of the subclass Ceratiomyxomycetidae, whose main characteristic is the fact that it produces spores external to the sporophore, differing from all other orders of myxomycetes, which form their spores inside the sporophores (Martin et al. 1983; Poulain et al. 2011). Recently, Leontyev et al. (2019) suggested elevating the subclass to the class category (Ceratiomyxomycetes), based on the external formation of spores, restricting the class Myxomycetes to species with spores internal to the sporophore. However, this proposal was not accepted by some authors (Lado 2005-2024), with the group remaining as a subclass of the Myxomycetes, with a single family, the Ceratiomyxaceae.

The genus currently has 10 species, of which six were proposed in 2010 by Angela U. Ejale for Southern Nigeria (Lado 2005-2024). These are *C. alba* Ejale, *C. fruticulosa* (O.F. Müll.) T. Macbr., *C. hemisphaerica* L.S. Olive & Stoian., *C. lutea* Ejale, *C. morchella* A.L. Welden, *C. oblonga* Ejale, *C. opojii* Ejale, *C. rattanii* Ejale, *C. rosea* Ejale, and *C. sphaerosperma* Boedijn. Three of them are included among the myxomycetes commonly found in the tropics, with a confirmed occurrence in Brazil: *C. fruticulosa*, with wide distribution in the country, *C. morchella* and *C. sphaerosperma*, restricted to the North and Northeast (Cavalcanti et al. 2008, 2020; Maia et al. 2015; Rojas et al. 2008).

Ceratiomyxa morchella was included by Lado and Wrigley de Basanta (2008) in the set of characteristically Neotropical species of myxomycete, with records in strictly tropical countries. Research carried out in South America by Rojas et al. (2008) showed that differences in the type of forest play an important role in the distribution of species of *Ceratiomyxa*, as well as the type of substrate, with all specimens of *C. morchella* sporulating on wood, while 87% of specimens of *C. sphaerosperma* were found in the herbaceous leaf litter.

According to Stephenson et al. (2008), *C. morchella* should be more abundant in Amazonian forests than in Central America. In Brazil, in addition to the Amazon region (Acre, Amazonas, and Roraima), the equatorial climate zone, the species has records in Bahia, Paraíba, Pernambuco, and Sergipe, in areas of the Northeast Atlantic Forest, in the northeast tropical climatic zone (Cavalcanti et al. 2008; Maia et al., 2015). This paper reports the first record of its occurrence in the southern region of the country, in a remaining fragment of the Atlantic Forest, in the temperate climatic zone.

Materials and methods

Specimens of *C. morchella* were collected from a dead trunk of a yerba mate (*Ilex paraguariensis* A.St.-Hil.) tree at the beginning of January, during the summer of 2023/2024, in a fragment of Mixed Ombrophylous Forest located in the peri-urban area of the municipality of São Francisco de Paula (29°27'24.86" S and 50°34'16.35" W, 882 m.a.s.l.). The municipality is in the state of Rio Grande do Sul, in the Atlantic Forest biome.

The area where the samples were collected is approximately 2.5 hectares in size and is in the transition zone between Dense Ombrophylous Forest and Mixed Ombrophylous Forest. The soil is of the typical Aluminic Humic Cambisol type (Streck 2002). The climate is Cfb type according to Köppen classification, with average annual temperature and precipitation values below 18.5°C and 2468 mm, respectively (Moreno 1961).

After being collected, the material was stored in a cardboard box, along with the collector data, date and location, and sent to the Fungal Taxonomy Laboratory – LATAF, at the Universidade Federal do Pampa – UNIPAMPA, São Gabriel municipality campus, where the samples were studied using both macro- and micromorphological analyses to identify the species. A significant amount of the material was used to make an exsiccate, which was incorporated into the collection of the Bruno Edgar Irgang Herbarium, at the same institution.

The survey of the distribution of the species in Brazil was based on published articles and data from the “Flora e Funga do Brasil” projects and species links.

Results

Ceratiomyxa morchella A.L. Welden, Mycologia 46(1): 94 (1954). Fig. 1 (a-c)

Sporophores densely clustered, subglobose, watery white to milky white, 0.8-1.4 mm tall; stalk short, 1/4 to 1/3 of the total height, cylindrical, hyaline; spores hyaline, smooth, some ovoid, 5.5-8 µm in

diameter, others elliptical, $6 \times 9.5 \mu\text{m}$ in diameter, attached to a hilum, quite uniform in length throughout the sporophore.

Material examined: BRAZIL. Rio Grande do Sul: São Francisco de Paula, peri-urban area close to Lake São Bernardo, 02-I- 2024, J.R.P. Velloso 1745 (HBEI176).

The collected material formed extensive sporulation on the dead trunk of *Ilex paraguariensis*, after a week of heavy rain. The sporophores presented the morphological characteristics of the species according to the description by Farr (1976).



Figure 1. *Ceratiomyxa morchella*. a, c and d. Sporophores on dead trunk of *Ilex paraguariensis* A.St.-Hil. b and e. Appearance of the Mixed Ombrophylous Forest in the municipality of São Francisco de Paula, Rio Grande do Sul.

Discussion

Ceratiomyxa morchella was reported for the first time for Brazil by Farr (1985), based on specimens obtained by the author during expeditions in the states of Amazonas and Roraima, in the northern region of the country. After almost two decades of being recorded in the Amazon biome, the species was found in the Northeastern region, in areas of the Atlantic Forest in the state of Pernambuco, in fragments covered by Semideciduous Seasonal Forest and Dense Ombrophylous Forest (the Semideciduous Seasonal Forest is a type of forest that loses part of its leaves during the dry period, while the Dense Ombrophylous Forest is a type of forest that maintains its leaves throughout the year, due to the humid climate in which they are located) (Cavalcanti 2002; Cavalcanti et al. 2006). Still in the northeast

region, Cavalcanti et al. (2008) cited the species for the state of Sergipe, in a riverside forest, in the municipality of Areia Branca; in Paraíba State, *C. morchella* occurs in a Dense Ombrophilous Forest (Areia municipality) and in the Mata do Buraquinho Wildlife Refuge (João Pessoa municipality), in the Terras Baixas Semideciduous Seasonal Forest, with hot and humid climate (As', Köppen-Geiger), temperatures ranging from 21-30 °C and relative humidity between 73-82% (Cavalcanti et al. 2008; Moreira et al. 2020). The UFP Herbarium collection has 12 exsiccates of the species, all collected from fallen dead trunks, in very humid areas, close to rivers and streams. In the opinion of Cavalcanti et al. (2008) the species could be considered rare in Brazil.

In the present work, exsiccates of *C. morchella* were found in the state of Acre, northern region of the country (SpeciesLink.net), registered in the following herbaria: INPA-Fungos 100882, collected by Bernard Lowy, S. R. Lowrie, B. Nelson, C. A. Cid Ferreira and M. Morreira in the early 1980s, whose duplicates NY 02686054 and LSU00173694 are found in the United States. Also according to SpeciesLink, a specimen of *C. morchella* was collected in the state of Rondônia by A. J. Fife, in 1982, in the Santa Bárbara neighborhood, 15 km west of Mibrasa Mining Camp Rondônia, and determined by C. T. Rogerson, two years later, with exsicata listed at The New York Botanical Garden Herbarium, under number NY 02686056.

In the review carried out by Lado and Wrigley de Basanta (2008) of publications reporting records of myxomycetes in the Neotropics, *C. morchella* had a known distribution in 10 countries, including Brazil, occurring in Mexico (Caribbean region), Middle America (Honduras, Costa Rica, Panama, Jamaica, Puerto Rico) and South America (Brazil, Ecuador, Suriname, Venezuela). The presence of *C. morchella* in the northeast of the state of Rio Grande do Sul constitutes its first report for the southern region and shows that, although rare, it has a wide area of occurrence, with a geographic distance of around 3900 km between the extreme points in the Brazilian territory.

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