Author for correspondence:
M.H. dos Santos Reis,
E-mail: mhrs.helenagmail.com

Checklist of nematodes parasitizing fish in the Brazilian Amazon

M.H. Santos Reis[1,2] (ID), C.P. Santos[3], J.L.S. Nunes[4] and R. Mugnai[1]

[1]Laboratório BIOCICLOS, Universidade Federal do Maranhão, Br 222 - KM 04, S/N, Chapadinha, MA CEP: 65500-000, Brazil; [2]Programa de Pós-Graduação em Saúde e Ambiente, Universidade Federal do Maranhão, Praça Madre Deus n° 02 - 2° andar – Bairro Madre Deus, São Luís, MA CEP:65025-560, Brazil; [3]Laboratório de Avaliação e Promoção da Saúde Ambiental, Instituto Oswaldo Cruz, Fundação Oswaldo Cruz, Av. Brasil 4365, Rio de Janeiro 21045-900, Brazil and [4]Laboratório de Organismos Aquáticos, Departamento de Oceanografia e Limnologia, Universidade Federal do Maranhão, UFMA, São Luís, MA, Brazil

Abstract

This study presents a list of parasitic fish nematodes from the Brazilian Amazon based on the previous Brazilian list including scientific assessments carried out between 2010 and 2021. A total of 16 families, 48 species and 28 undetermined species of nematodes associated with fish are included in the checklist, in addition to 93 host species and 15 geographical records.

Introduction

Studies on fish parasitic nematodes from the Brazilian Amazon are extremely relevant, especially in this tropical area, which still lacks taxonomic distribution and ecological data (Centers for Disease Control, 2021). Poulin (2021) discusses functional biogeography as the study of distributional or spatial patterns in biodiversity and their generating processes, where geographical patterns in parasite traits probably emerged in parallel patterns in their hosts, with the direct influence of bioclimatic factors playing a secondary role. The climate in the Amazon biome is humid equatorial with well-defined rainy and dry seasons. River levels rise and according to rainfall intensity, and some areas can become flooded, probably affecting host–parasite interactions and distributions. Updated fish nematode inventories in this specific biome are, therefore, paramount considering host–parasite interactions and their spatial distributions, especially one decade after the last checklist reported by Luque *et al.* (2011).

It is also relevant to outline that zoonotic species as food resources for low-income populations are based on artisanal fishing activities, and that health surveillance services in markets are still precarious (Cardia & Bresciani, 2012; Rodrigues *et al.*, 2017a). The generated data can be useful for planning, implementing and managing fish breeding systems and planning pest management protocols in the investigated areas, in addition to comprising an essential basis for human food security monitoring (Jennings *et al.*, 2016).

In Brazil, Rudolphi (1819), carried out the first studies on parasitic marine fish nematodes, describing a *Thunnus thynnus* (Linnaeus, 1758) parasite. Concerning freshwater fish, the first study was carried out by Diesing (1839) on *Arapaima gigas* (Schinz, 1823) nematodes, followed by Travassos *et al.* (1928) who carried out the first review of freshwater nematode fish in Brazil. More recently reviews and checklists have been published by Vicente *et al.* (1985), Thatcher (1991, 2006), Moravec (1998), Eiras *et al.* (2010) and Luque *et al.* (2011). Since then, several species have been recorded and new ones described.

Despite being considered a megadiverse area, with estimates of three million fish species (Reis *et al.*, 2016), knowledge about parasitic fish nematodes in the Amazon region are still incipient. After Moravec (1998), Thatcher (2006) reported 19 species of fish parasitic nematodes for the area, and Luque *et al.* (2011) reported 140 named species for Brazil and 41 for the Brazilian Amazon region in a review. In this context, the aim of this study is to present an updated list of fish nematodes for the Brazilian Amazon biome in addition to data contained in the last parasitic fish nematode review (Luque *et al.*, 2011), with data on hosts and geographical distribution separated by Brazilian States.

Materials and methods

A bibliographical survey on fish nematode species, host records and geographical distributions was performed considering studies in the Brazilian Amazon region from 2010 to 2021, adding these new data to those previously recorded by Luque *et al.* (2011). The searches were carried out in Zoological Records Index, PubMed, Google Scholar, Scopus and Periodicals Capes database, which makes international scientific production available for teaching and research institutions in Brazil (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, 2021).