

Platynosomum fastosum (Digenea: Dicrocoeliidae) infection in a domestic cat in northeastern Brazil: high fluke burden and associated lesions

Infecção por *Platynosomum fastosum* (Digenea: Dicrocoeliidae) em gato doméstico no nordeste do Brasil: alta carga parasitária e lesões associadas

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Abstract

Introduction: *Platynosomum fastosum* is a dicrocoeliid fluke that infects birds and mammals, especially wild and domestic cats. **Case report:** A middle-aged male domestic cat was euthanized and examined. Its clinical features had included apathy, emaciation, hepatomegaly and mild jaundice on the mucosae. At necropsy, we noticed enlarged liver and dilated gallbladder. After opening the gallbladder lengthwise, multiple whitish flattened ellipsoidal structures were observed and identified as *P. fastosum*. The larger parasites were found in gallbladder, with significant different size from cystic duct and intrahepatic biliary ducts ($p < 0.05$). Histopathological analysis revealed fluke-induced suppurative cholecystitis and chronic cholangitis. Precursor lesions of cholangiocarcinoma were reported. **Conclusion:** This report was part of the first prevalence survey of *P. fastosum* in municipality of Maracanaú, state of Ceará, northeastern Brazil.

Keywords: Cats. Cholangitis. Trematodes.

Resumo

Introdução: *Platynosomum fastosum* é um trematódeo dicrocelídeo que infecta aves e mamíferos, especialmente felídeos domésticos e silvestres. **Relato do caso:** Um gato doméstico macho, apresentando apatia, emaciação, hepatomegalia e icterícia leve nas mucosas, foi submetido à eutanásia e subsequente necropsia. Ao exame macroscópico foi observada hepatomegalia e dilatação da vesícula biliar. Após abertura da vesícula, foram observadas múltiplas estruturas foliáceas esbranquiçadas, posteriormente identificadas como *P. fastosum*. Os maiores exemplares foram encontrados na vesícula, com tamanho estatisticamente diferente daqueles encontrados no ducto cístico e nos ductos biliares intrahepáticos ($p < 0.05$). Análise microscópica revelou colecistite supurativa e colangite crônicas induzidas pela infecção parasitária. Lesões precursoras de colangiocarcinoma foram reportadas. **Conclusão:** este relato está inserido no primeiro estudo de prevalência de *P. fastosum* no município de Maracanaú, Ceará, nordeste do Brasil.

Palavras-chave: Gatos. Colangite. Trematódeos

INTRODUCTION

Platynosomum fastosum (Kossack, 1910, sin. *P. iliciens*, *P. concinnum*) is a dicrocoeliid fluke that infects birds and mammals, notably wild and domestic cats¹. Its lifecycle is indirect, involving two intermediate invertebrate hosts – the terrestrial mollusk *Subulina octona* and terrestrial isopods – a gecko lizard as a paratenic host, and cats as the main group of definitive hosts². *P. fastosum* is distributed across tropical and subtropical areas of the Americas, Africa and Asia, with prevalence ranging from 15 to 85%³. In Brazil, the papers that have been published present a wide range of prevalence rates: in fecal examinations, the rate has varied from 1 to 33%^{4,5,6}; and in necropsy findings, it has fluctuated between 26 and 40%^{3,7,8,9,10}.

The lesions have been shown to be proportional to the fluke burden, but most of the infections are asymptomatic. Severe cases have been correlated with chronic infection and obstruction of the cats' biliary tract by mature flukes, which can cause cholecystitis, cholangitis and cystic liver disease^{11,12,13}, and also cholangiocarcinoma^{14,15}. The clinical features include apathy, jaundice, vomiting, weight loss, hepatic encephalopathy

and death by liver failure¹⁵.

The objective of this paper was to report on the pathological findings and fluke burden of a domestic cat infected with *P. fastosum*. This report was part of the first prevalence study of *P. fastosum* from the municipality of Maracanaú, in the state of Ceará, Northeastern Brazil.

CASE REPORT

Free roaming domestic cats are routinely euthanized by Zoonosis Control Center staff if not claimed by the owner after seven days. A middle-aged male cat weighing 2.2 kg, had shown apathy, emaciation, hepatomegaly and mild jaundice on the soft palate and ocular mucous membrane. Euthanasia was performed by intravenous injection of potassium chloride in conjunction with sodium thiopentone, with prior sedation using ketamine/xylazine¹⁶. This study was approved by the Ethical Review Board for Animals of the Federal University of Ceará (Protocol#40/2014).

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Partial necropsy was performed, in which the abdominal cavity and organs were evaluated macroscopically, and the liver and gallbladder were collected. The organs were refrigerated and then taken to the Federal University of Ceará. The liver was cut into slices of about 0.5 cm in thickness and were immersed in warm water in order to recover mature flukes that escaped from the biliary tract¹⁷. The gallbladder was opened lengthwise for inspection. The samples were fixed in 10% formaldehyde, serial paraffin sections (5.0 μm) were stained with hematoxylin-eosin (HE), and Masson trichrome. The flukes were identified according to Basu and Charles¹⁸

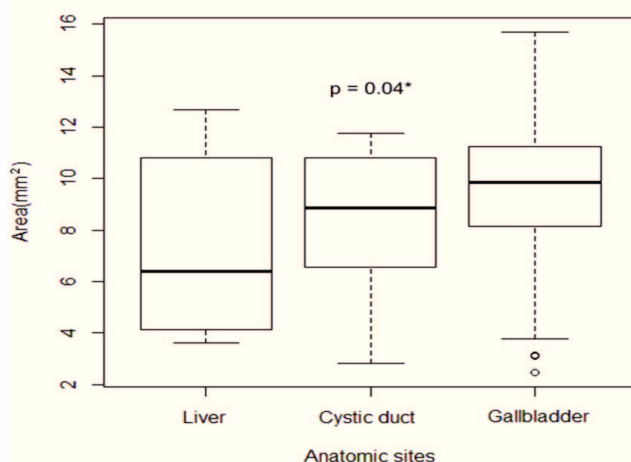
The flukes recovered were counted, measured in length and width using digital calipers, fixated and clarified in AFA solution and stained with Ziehl Fucine. Fluke burden was statistically analyzed according to the Kruskal-Wallis test to determine the significance of the calculated areas of trematodes from different anatomical sites.

At necropsy, the liver was enlarged, weighing 111 g, with whitish multifocal fibrous lesions, seen on the capsule and at the cut surface, especially around the bile ducts. The gallbladder was dilated, measuring 5.3 x 2.7 x 1.5 cm.

When cutting the gallbladder lengthwise, a yellowish clear bile fluid, pale mucosa and multiple whitish flattened ellipsoidal structures were observed. These structures were identified as the dicrocoeliid fluke *P. fastosum*, in accordance with the morphology described by Basu and Charles¹⁸. We counted 184 flukes: 148 inside the gallbladder, 22 in the cystic duct and 14 in the intrahepatic biliary tract.

The overall mean fluke size was 5.39 mm (range: 2.73-7.25) x 1.66 mm (range: 0.76-2.38). The fluke size in different anatomical sites from which they were recovered are presented in Figure 1.

Figure 1. Boxplot comparing the areas of flukes from each original anatomical site. It is important to note that the majority of the larger flukes were located in the gallbladder, while most of the smaller flukes were in the liver.



The Kruskal-Wallis test showed significant difference (Kruskal-Wallis chi-squared = 6.07, df = 2, p = 0.04) in fluke areas between the anatomical sites.

Liver histopathological analysis (Figure 2) revealed the following: presence of mature flukes inside the biliary tract, moderate bridging hepatic fibrosis, suppurative cholangitis, multifocal mononuclear infiltrate in the hepatic parenchyma, and ductular proliferation. Microscopic examination of the gallbladder presented thickening of the wall, vascular congestion with recent hemorrhage, and predominance of neutrophils in inflammatory infiltrates in the wall. The microscopic findings were consistent with gross lesions of acute cholecystitis and cholangitis secondary to *P. fastosum* infection.

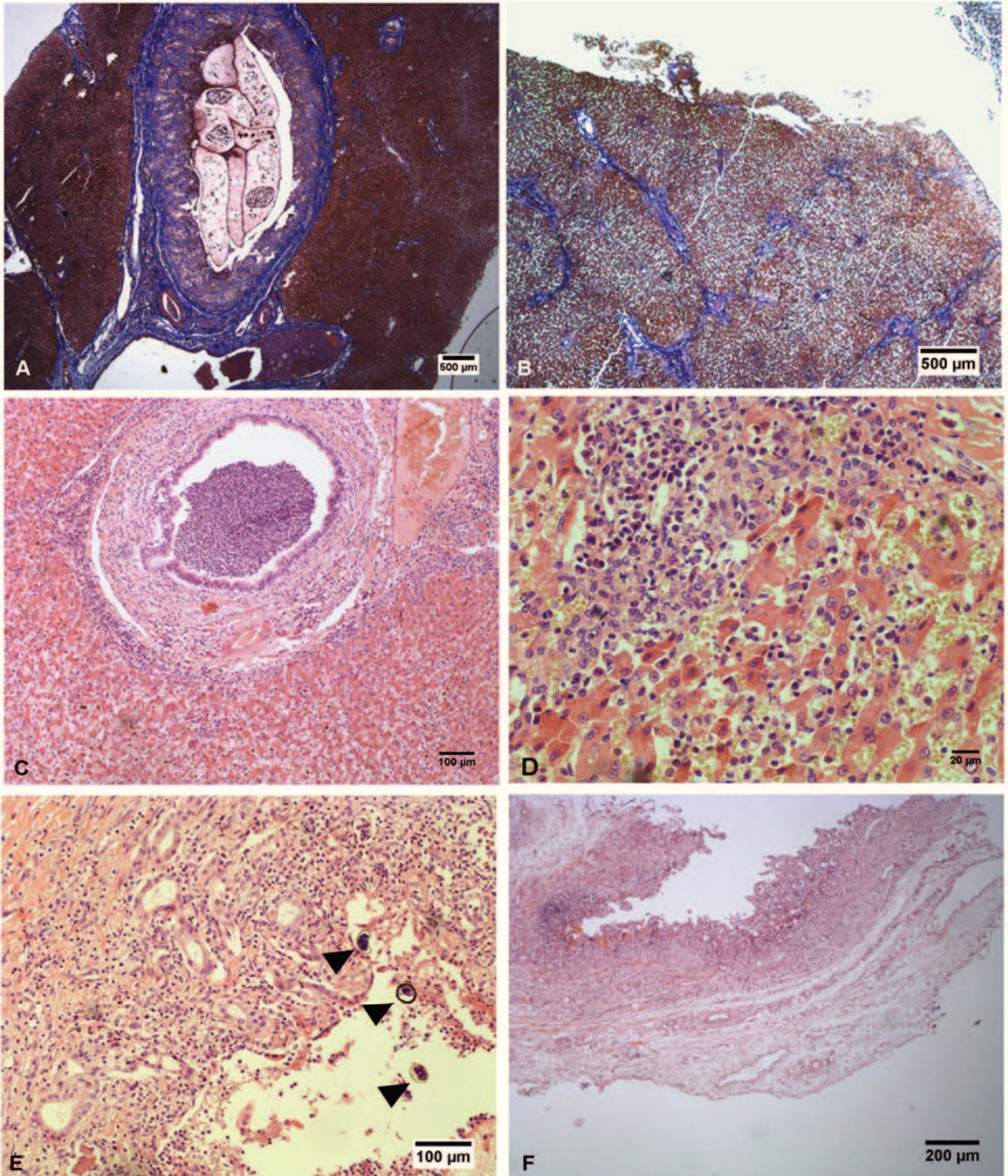
DISCUSSION

Recently, *P. fastosum* infection was examined in a sample of free roaming cats in Maracanaú, northeast of Brazil, resulting in 42% of prevalence, high intensity burden (>125), most of flukes measuring in average 5.29 x 1.75 mm, and significant association with high degrees of intrahepatic ductular proliferation¹⁹. The current paper analyzes thoroughly the parasitic load and its effects in one of those cats.

Like Ferreira et al³, we classified the mean fluke size as medium (5.0-5.4 x 1.5-1.8 mm). The intensity of infection was considered high (> 125)²⁰. The Kruskal-Wallis test found statistical differences among the fluke areas in each anatomical site. The median fluke area was seen to be greater at each localization (liver, cystic duct and gallbladder) suggesting association of larger trematodes to the gallbladder site. We also deduced that the wide range of fluke sizes at each anatomical site was associated with chronic infection due to multiple ingestions of infecting forms, as Pinto et al²¹ could observe in the experimental *Platynosomum* infection in the mouse model: significant different morphometric patterns in each biliary compartment and in different points of time post infection.

In Brazil, the species involved in the lifecycle of these flukes are the following: 1) first intermediate host: the terrestrial mollusk *Subulina octona*; 2) second intermediate host: the terrestrial isopods *Oniscidea* and *Nagurus nanus*; 3) paratenic host: the gekkonid lizard *Hemidactylus mabouia*, which is the species most often reported among lizards and anurans; and 4) definitive host: domestic and wild cats². The mollusk and the gekkonid lizard species of intermediate hosts implicated in the lifecycle of *P. fastosum* mentioned above are present in the state of Ceará^{19,22,23}. The terrestrial isopods are distributed in Brazil, including in states of the Northeastern region²⁴. They have already been registered as food items of lizards in Ceará²⁵. The gekkonid lizard *H. mabouia* is commonly observed in Maracanaú, and it has already been registered in an official scientific collection (Herpetological Collection of Federal University of Ceará – CHUFC L6073). Bezerra et al²³ observed *Platynosomum* sp. in gallbladders of *H. mabouia* in Ceará and Piauí states.

Figure 2. Histological sections from cat liver and gallbladder. (A) Perihilar bile duct containing five specimens of *P. fastosum* (Pf); note the epithelial atrophy. Masson trichrome, 40x. (B) Bridging fibrosis between the central veins affected and portal spaces. Masson trichrome, 40x. (C) Suppurative cholangitis with neutrophilic accumulation in a bile duct lumen, showing periportal neutrophilic inflammation. HE, 100x. (D) Chronic hepatitis, characterized by necroinflammatory reaction with mononuclear infiltrates. HE, 400x. (E) Ductular proliferation, which is a common reaction in obstructive processes; note the fluke eggs (arrowheads) placed peripherally. HE, 100x. (F) Thickened gallbladder wall, with predominant neutrophil infiltrates. HE, 100x.



Regarding histopathology, the most frequent published findings are periductal fibrosis and mononuclear infiltrate, followed by duct dilation and adenomatous hyperplasia^{3,7,11,12,13,14,15,26}. In general, hepatic lesions are reported more often than cholecystitis. The present findings are in agreement with the published papers, although neutrophilic infiltrates and portal congestion induced by hemorrhage have been less often reported. According to Cullen²⁷, chronic cholangitis associated with liver fluke infection is commonly observed in cats. In chronic infections, adenomatous hyperplasia and periductal fibrosis are considered precursors of cholangiocarcinoma²⁸. Cholangiocarcinoma in *P. fastosum* infected cats was already registered, in middle aged to senior cats^{14,15}. However, the short lifespans of free roaming cats probably are not enough to chronic injuries turn into neoplastic lesions. Case reports from Brazil have presented high morbidity due to chronic *P. fastosum* infection, with a high risk of requiring surgical treatment, and difficulty in preventing and controlling the disease^{11,12,13,29,30}.

In conclusion, this report was part of the first prevalence study of *P. fastosum* infection in the municipality of Maracanaú, in the state of Ceará, Northeastern Brazil. The high intensity of fluke burden observed has caused severe disease in the cat that was examined. To prevent infection, pet cats should be kept indoors and fed with commercial diet. The Zoonosis Office of Maracanaú often catches or receives stray cats. An epidemiological survey is needed in order to ascertain the prevalence rate of *P. fastosum* in this municipality.

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