THE ATTACHMENT OF *CLINOSTOMUM* SP. (DIGENEA, CLINOSTOMIDAE) TO THE OESOPHAGUS OF THE BIRD *ARDEA COCOI* (AVES, ARDEIDAE)

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Summary:

The attachment of *Clinostomum* sp. to the oesophagus of the bird definitive host *Ardea cocoi* is reported. The parasite attaches to the mucous layer of the oesophagus by the acetabulum, oral sucker, and oral collar. The mucous layer of the oesophagus engulfed by the oral sucker presents an intense liquefactive necrosis, and the engulfment is not likely to contribute significantly to the attachment of the parasite. The oral collar of the parasite, surrounding the oral sucker, is juxtaposed to the oesophagus mucous layer, showing a perfect fitting of both surfaces. It is concluded that the main attachment mechanism of the parasites to the oesophagus of the host is provided by the acetabulum and by the juxtaposition of the oral collar of the parasites to the oesophagus host surface.

KEY WORDS : *Clinostomum* sp., Digenea, *Ardea cocoi*, Ardeidae, attachment, Brazil.

Résumé : FIXATION DE *CLINOSTOMUM* SP. (DIGENEA, CLINOSTOMIDAE) À L'ŒSOPHAGE D'*ARDEA COCOI* (AVES, ARDEIDAE)

La fixation de *Clinostomum* sp. à l'œsophage de son hôte définitif *Ardea cocoi* (Oiseau) est décrite. Le parasite s'attache à la couche muqueuse de l'œsophage par l'acetabulum, la ventouse orale et la partie antérieure du corps. La couche muqueuse de l'œsophage de l'Oiseau recouverte par la ventouse orale présente une nécrose intense et liquéfiante, mais vraisemblablement ce recouvrement ne contribue pas de façon significative à la fixation du parasite. La partie antérieure du corps du parasite entourant la ventouse orale est juxtaposée à la couche muqueuse de l'œsophage montrant une adhésion parfaite des deux surfaces. En conclusion, le mécanisme principal intervenant dans la fixation du parasite à l'œsophage de l'hôte est fourni par l'acetabulum et par la juxtaposition de la partie antérieure du corps du parasite et de la surface œsophagienne de l'hôte.

MOTS CLÉS : *Clinostomum* sp., Digenea, *Ardea cocoi*, Ardeidae, attachement, Brésil.

Clinostomum spp. (Digenea, Clinostomidae) are common fish parasites in most parts of the world (Grabda-Kazubaska, 1974; Lo *et al.*, 1981, 1982; Britz *et al.*, 1985; Ukoli, 1966). The adult stage of the parasites is reached in a variety of birds that feed on the infected fish (Lo *et al.*, 1982; Chung *et al.*, 1995; Matthews & Cribb, 1998).

In Brazil these parasites were observed infecting several bird species at the floodplain of the high Paraná river (Thatcher, 1993; Machado, 2000; Extekoetter *et al.*, 2001; Dias *et al.*, 2001; Dias, 2002; Dias *et al.*, in press). The observation of infection of *Ardea cocoi* from that region showed some interesting attachment features, which are reported in this paper.

A total of 20 specimens of *A. cocoi* were captured at the floodplain of the high Paraná river, Paraná State, near Lagoa das Garças, Lagoa Figueira, Ressaco do Leo-

poldo, and Ressaco do Pau-Veio (hunting permission 044/99 from the IBAMA) between June, 1999 and June, 2000. All the digestive tract of the birds was inspected for the parasites. Nineteen specimens (95 %) were infected, the number of parasites per host varying between one and 140 (mean: 38.3). The parasites were distributed between the mouth and the first ten centimetres of the oesophagus. Samples of the oesophagus with attached parasites were fixed in formalin, routinely processed for histology, and stained with haematoxylin and eosin and Masson's trichrome.

Detailed examination of the parasites and comparison with data from other authors (Yamaguti, 1958; Grabda-Kazubaska, 1974; Kagei *et al.*, 1988; Matthews & Cribb, 1998; Chung *et al.*, 1995; Ukoli, 1966) provided strong evidence that they belong to the species *Clinostomum complanatum* Rudolphi, 1814. However, once the discussion of the taxonomy of the worms is not the aim of this paper, our material is designated as *Clinostomum* sp.

Observation of the parasites *in situ* showed that they were firmly attached by the acetabulum, the oral sucker and oral part of the body. The body of the parasites was bent, so that the oral sucker was close to the acetabulum, and all the anterior part of the body sur-

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rounding the oral sucker was in contact with the host tissue.

The attachment by the acetabulum was not observed histologically perhaps because it detached during the processing of the samples. However, the attachment by the anterior region of the body was clearly observed. The oral sucker engulfed a portion of the mucous layer of the oesophagus, filling the lumen of the sucker. Inside the sucker, the engulfed part of the mucous layer was substantially modified, presenting a pronounced liquefactive necrosis. All the engulfed tissue was completely necrotic with a jelly-like appearance. The necrosis was most intense near the inner parts of the sucker, suggesting its progression from the interior to the exterior of the organ (Fig. 1). Due to the jelly-like consistency of the engulfed tissue, it is likely that attachment by the oral sucker is not efficient.

The oral collar surrounding the oral sucker was in close contact with the mucous layer of the oesophagus. The surface of the parasite and the mucous layer of the oesophagus fitted together closely. This juxtaposition of both surfaces was so close that it was sometimes virtually impossible to distinguish the limits of the tissues of the host and the parasite (Fig. 2). As a consequence there was destruction of the epithelial layer of the oesophagus. However, the regions of the oesophagus near the parasite, but not in contact with the parasite, had a normal histological appearance.

Kagei *et al.* (1988) reported that the parasites were attached to the bird oesophagus mucous layer so firmly that some specimens were partially broken when they were removed. We made the same observation. An efficient attachment of the parasites is obviously useful because they need to resist the friction caused by the

Fig. 1. – Engulfment of the mucous layer of the oesophagus of *Ardea cocoi* (a) by the oral sucker of *Clinostomum* sp. (b). Note the intense liquefactive necrosis of the engulfed tissue. Haematoxylin and eosin. Bar = 150 μ m.

Fig. 2. – Detail of the contact between *Clinostomum* sp. (a) and the mucous layer of the oesophagus of *Ardea cocoi* (b). Masson's trichrome. Bar = 10 μ m.

fish which are predated by the birds (Cort, 1913). However, it is interesting to note that in young chicken, *Gallus gallus domesticus*, we infected experimentally, the parasites were not so firmly attached.

According to our observations, the principal mechanism of attachment is provided by the acetabulum and by the juxtaposition of the oral collar of the parasites to the oesophagus host surface. Apparently, the oral sucker plays a minimal role in the attachment of the parasites.

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