Trichuris sp. from 1,040 +/- 50-year-old Cervidae coprolites from the archaeological site Furna do Estrago, Pernambuco, Brazil

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We present results of the paleoparasitological analysis of Cervidae coprolites that were recovered from the archaeological site Furna do Estrago, Pernambuco, Brazil. Trichuris *sp. eggs were recovered from the coprolite samples dated 1,040 ± 50 years before present. This is the first record of* Trichuris *sp. in semiarid Cervidae, unexpectedly recorded in archaeological material.*

Key words: Cervidae - coprolites - paleoparasitology

The archaeological site Furna do Estrago was used as a dwelling and burial place by prehistoric populations during different periods between 9,000-2,000 years before present (BP). This site is located in an upland forest in northeastern Brazil, a mesic enclave in a semiarid region in the state of Pernambuco. Currently, the average annual temperature in the region is 20.4ºC, with highs of 29.6ºC in November and December and lows of 16.6ºC during July and August (Lima 1985).

During excavations performed in 1982 by a team from the Catholic University of Pernambuco and conducted by archaeologist Jeannette Lima, 86 coprolites were collected. The coprolites were sent to our Laboratory of Paleoparasitology and three were identified by shape and size as belonging to the family Cervidae, probably *Mazama* or *Ozotoceros*. *Blastocerus* was ruled out based on the pellet size (JMB Duarte, unpublished observation). *Ozotoceros* and *Mazama* faeces are identical in size and shape. Therefore, a more accurate species assignment could not be achieved.

Because of their small size no fragments were taken and the coprolites were rehydrated in an aqueous 0.5% trisodium phosphate solution for 72 h (Callen & Cameron 1960). After this period, the samples were sieved through thrice-folded gauze for spontaneous sedimentation (Lutz 1919) as recommended by Araujo et al. (1989). The sediment obtained was prepared for observation under an optical microscope at 100X and 400X magnifications.

Three coprolites from different layers were examined. One of the coprolites dated 1,040 ± 50 years BP (Lima 1985) was positive for *Trichuris* sp. eggs (Figure). The average size of the eggs (length x width) was 63.36 µm [standard deviation (SD) 4.92] x 33.92 µm (SD 1.68) (n = 20). The range in the length with the polar plugs and the range in the width were 53.28-69.93 µm x 29.97-36.63 µm, respectively.

Trichuris ovis has been found in *Alces alces, Capreolus capreolus* and *Cervus elaphus* in Belarusian Polesie and in Scotland (Shimalov & Shimalov 2003, Irvine et al. 2006). *Trichuris* sp. has been documented in *C. elaphus* and *Dama dama* in Portugal (Maia 2001). *Trichuris capreoli* has been found in Cervidae, but no genus or location were reported (Taylor et al. 2010). In the Americas, *Trichuris* sp. has been found parasitizing *Odocoileus virginianus* in the United States (Nascimento et al. 2000) and Mexico (Montes Pérez et al. 1998) and *T. ovis* has been found in *Mazama gouazoubira* in Bolivia (Deem et al. 2004). In North America, where *A. alces* arrived across Beringia, there are records of *Trichuris discolor* and *T. ovis*, both attributed to domestic livestock (Hoeve et al. 1988).

There are no articles reporting the presence of *Trichuris* in *Mazama americana* or *Ozotoceros bezoarticus*. *Trichuris* sp. and *T. ovis* have been found in *Blastocerus dichotomus* (Muniz-Pereira et al. 2009) with eggs with sizes of 50-80 µm x 30-40 µm (Pinto 1945) and *Trichuris globulosa* (Fowler & Cubas 2001) has been observed with eggs with sizes of 59-69 µm x 27-36 µm (NEHU 2011). Although the eggs of *T. ovis* and *T. globulosa* are similar in size to the eggs observed in this study, these species are parasites of domestic ruminants (Pinto 1945, Vicente et al. 1997) and there is no record of sheep, goat or cattle in this region prior to American colonisation.

Trichuris tenuis has been found in llamas and its eggs are 64 x 32 µm (Foreyt & Foreyt 2001), consistent with the size of the eggs found in this study. However, the only camelid present in northeastern Brazil was *Palaeolama* spp, which became extinct around 10,000 years BP (Guérin & Faure 2006). Given the possibility of the occurrence of this parasite in *Palaeolama*, true infection by this worm in deer and this worm's survival in the region are also possibilities.

Trichuris suis eggs range in size from 46.6-71.2 µm (Beer 1976), which is consistent with those found in the coprolites. However, the natural host of this parasite is the domestic pig (*Sus scrofa domestica*), which was introduced to the Americas during colonial times.

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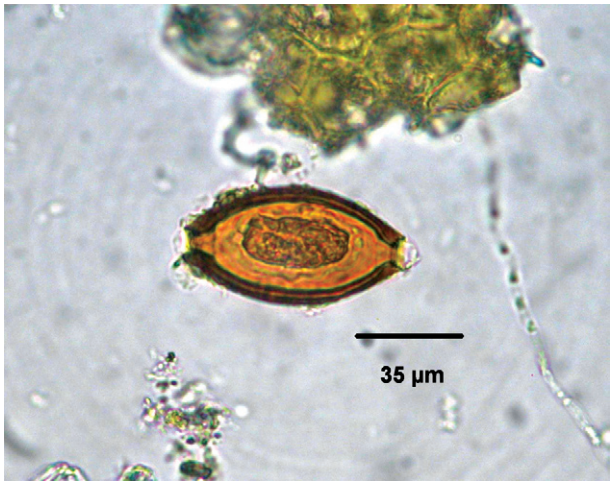

Trichuris sp. egg found in Cervidae coprolites from archaeological site of Furna do Estrago, state of Pernambuco, Brazil.

Eggs of *Trichuris trichiura* are slightly smaller (50-60 µm x 21-25 µm) (Sloss & Kemp 1978) than those found in deer coprolites. Although deer were probably an important protein source in prehistoric human nutrition (Lima 1985), the possibility that the eggs from the coprolites belong to this species can be ruled out based on the host specificity, which has its origins in a common ancestor of primates and humans that transferred the parasite to humans in the early relationship of these species, as discussed in the review by Confalonieri (1988).

Therefore, the presence of these eggs in archaeological material demonstrates the existence of a previously unknown natural host, dating back 1,000 years and the possible occurrence of a new *Trichuris* species. The existence of new species of parasites in cervids was previously suggested by paleoparasitology studies, with the discovery of *Eimeria* sp. in 9,000-year-old cervid coprolites, after confirmation of *Eimeria* in faeces collected from zoo deer (Ferreira et al. 1992). However, it can not be ruled out that *T. tenuis* parasitism of modern deer species originated from parasitism of extinct *Palaeolama*. Host sympatry ended 10,000 BP and the parasite switch may have occurred while both the host and parasite occupied the same environment. Paleoparasitology data, in this case, indicate a possible case of parasitism in an extinct host that has persisted to the present in a sympatric host.

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