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Nota

THE WILD RODENT *Akodon azarae* (CRICETIDAE: SIGMODONTINAE) AS INTERMEDIATE HOST OF *Taenia taeniaeformis* (CESTODA: CYCLOPHYLLIDEA) ON POULTRY FARMS OF CENTRAL ARGENTINA

Mariela H. Miño[1], Elba J. Rojas Herrera[1], and Juliana Notarnicola[2]

[1] Laboratorio de Ecología de Poblaciones, Departamento de Ecología, Genética y Evolución, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires – IEGEBA (UBA-CONICET), Ciudad Universitaria, Pabellón II, 4to piso, C1428EGA Buenos Aires, Argentina [correspondence: Mariela H. Miño <mminio@ege.fcen.uba.ar>].
[2] Centro de Estudios Parasitológicos y de Vectores CEPAVE (CCT La Plata-CONICET-UNLP), Calle 2 N° 584, 1900 La Plata, Buenos Aires, Argentina.

ABSTRACT. This work reports strobilocerci of *Taenia taeniaeformis* in the rodent *Akodon azarae*. A total of 289 rodents were captured on poultry farms in Central Argentina, belonging to the following species: *A. azarae*, *Calomys laucha*, *C. musculinus*, *Oligoryzomys flavescens*, and *Mus musculus*. All rodents were examined for parasites. Only *A. azarae* was parasitized with strobilocerci larvae. Prevalence, mean intensity, and mean abundance of the infection in the liver were 8.33%, 2.09 and 0.17, respectively. No differences were observed between the sexes of the infected rodents. Since in natural environments no cysts were reported, *A. azarae* is susceptible to get infected with *T. taeniaeformis* when frequents domestic and peridomestic habitats. *Taenia taeniaeformis* may have three different life cycles in the studied area: 1) one domestic cycle between *Rattus norvegicus* and pets in the surrounding of the farms, since *R. norvegicus* was observed to be parasitized; 2) another domestic cycle between *A. azarae* and the pets when such pets come to the farm fences; and 3) a wild cycle between *A. azarae* and *Leopardus geoffroyi* (Carnivora: Felidae), since it was observed that *A. azarae* is preyed by this felid and their feces were found parasitized with eggs of *Taenia* sp. in the study area.

RESUMEN. **El roedor silvestre *Akodon azarae* (Cricetidae: Sigmodontinae) como hospedador intermediario de *Taenia taeniaeformis* (Cestoda: Cyclophyllidea) en granjas avícolas del centro de Argentina**. Este trabajo informa la presencia de estrobilocercos de *Taenia taeniaeformis* en el roedor *Akodon azarae*. Un total de 289 roedores pertenecientes a las especies *A. azarae*, *Calomys laucha*, *C. musculinus*, *Oligoryzomys flavescens* y *Mus musculus* fueron capturados en granjas avícolas del centro de Argentina. Todos los roedores fueron examinados en busca de parásitos. Sólo *A. azarae* presentó quistes de cestodes en el hígado. Los valores de prevalencia, intensidad media y abundancia media de la infestación fueron 8.33%, 2.09 y 0.17, respectivamente, y no se observó ninguna diferencia entre los sexos de los roedores infectados. Se concluye que *A. azarae* es susceptible de infectarse con *T. taeniaeformis* cuando frecuenta hábitats domésticos y peridomésticos, ya que en ambientes naturales nunca fue registrada su presencia en estos roedores. Los resultados de este estudio sugieren que *T. taeniaeformis* mantiene tres tipos diferentes de ciclos de vida en el área estudiada: 1) un ciclo doméstico entre *Rattus norvegicus* y mascotas (perros y gatos), ya que *R. norvegicus* ha sido encontrada parasitada en las granjas; 2) otro ciclo doméstico entre *A. azarae* y mascotas cuando estas últimas se acercan a los alambrados de las granjas; y 3) un ciclo silvestre entre *A. azarae* y *Leopardus geoffroyi* (Carnivora: Felidae), ya que se ha

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observado en el área de estudio que *A. azarae* es predado por este felino en cuyas heces se han encontrado huevos de *Taenia* sp.

Key words. Argentina. Cestodes. *Strobilocercus fasciolaris.*

Palabras clave. Argentina. Cestodes. *Strobilocercus fasciolaris.*

Many cestode species, especially the Cyclophyllidea, complete their life cycle using predator-prey interactions. This is the case of the cosmopolitan *Taenia taeniaeformis* Batsch, 1786 (Cestoda: Cyclophyllidea) whose adult stages parasitize the small intestine of felids, viverrids, and canids including domestic dogs and mainly domestic cats (Miyasaki, 1991; Loos-Frank, 2000). Intermediate hosts are rodents, but they can also be lagomorphs, insectivores and sporadically, even the man (Loos-Frank, 2000; Bowman et al., 2002). The intermediate hosts get infected by ingesting eggs from the contaminated environment, and they develop a characteristic strobilocercus-type larva called *Strobilocercus fasciolaris* encysted in the liver.

Rodents that are more frequently found parasitized with *T. taeniaeformis* around the world are murids like *Mus musculus* Linnaeus, 1758, *Rattus norvegicus* Berkenhout, 1769, *Rattus rattus* Linnaeus, 1758, *Bandicota bengalensis* Gray, 1835 and *Meriones persicus* Blanford, 1875 (Bowman et al., 2002; Singla et al., 2003), and cricetids like *Arvicola terrestris* (Linnaeus, 1758), *Peromyscus maniculatus* Wagner, 1845 and *Microtus* sp. (Theis and Schwab, 1992; Bowman et al., 2002; Pétavy et al., 2003). In Argentina, strobilocerci have been found in the liver of the synantropic *R. norvegicus* (Hancke et al., 2011), but it has not been found in any cricetid yet.

The Azara's grass mouse, *Akodon azarae* (Fischer, 1829) is a sigmodontine rodent widely distributed from the southernmost Brazil to central Argentina (Pardiñas et al., 2006). In the northeast of Buenos Aires province, it is the most captured rodent species along crop field borders (rural environments) and poultry farm borders (peridomestic environments) (Zuleta et al., 1988; Miño et al., 2001). Its diet mainly consists of insects, leaves, and seeds varying the proportion according with the environmental availability (Bilenca et al., 1992; Bilenca and Kravetz, 1998: Ellis et al., 1998).

The nematodes *Pterygodermatites (Paucipectines) azarai* Sutton, 1984, *Protospirura numidica criceticola* Sutton, 1989, *Stilestrongylus azarai* Durette-Desset and Sutton, 1985, *Trichuris laevitestis* Suriano and Navone, 1994, and *Syphacia carlitosi* Robles and Navone, 2007, and the trematodes *Echinoparyphium scapteromae* (Sutton, 1983) and *Zoonorchis oxymycterae* Sutton, 1983 were reported in individuals of *A. azarae* from central Argentina (Sutton, 1984, 1989; Durette-Desset and Sutton, 1985; Robles and Navone, 2006, 2007; Navone et al., 2009; Miño et. al, 2012). No cestodes have been mentioned in *A. azarae* in natural environments; however, Miño et al. (2012) recently mentioned the presence of adults and cysts of Cyclophyllidea parasitizing *A. azarae* on poultry farms.

The purpose of the present study is to report the presence of strobilocerci of *T. taeniaeformis* in *A. azarae* and to discuss the different ways in which *A. azarae* could acquire and maintain this parasitosis on the poultry farms.

Rodents were captured along the perimetral wire fencing and around the poultry sheds of farms, in seasonal samplings carried out between July 1998 and July 2000, and in March 2001, on 30 poultry farms in Exaltación de la Cruz (34° 17' 38" S, 59° 5' 58" W), Buenos Aires Province, Argentina. The area belongs to the Pampean region, Rolling Pampa subdivision, characterized by a gentle slope and good water drainage (Soriano et al., 1991).

Poultry farms of about 1 ha have a variable amount of poultry sheds (1 to 12, mode = 3)

and a human housing. The farms are usually surrounded by crop fields, from which they separate by means of wire fencing, generally covered by spontaneous vegetation. Usually, one or more dogs live on the farms and in some of them also cats. They are utilized as watchdogs and hunters, mainly to control the murids and the white-eared opossum *Didelphis albiventris* Lund, 1840 which attack chickens, producing important economic losses.

The digestive track and annexed glands of the rodents were fixed in 10% formalin and examined for helminthes. Ten out of the 23 cysts collected were dissected under stereoscopic microscopy. The strobilocerci were measured and the hooks counted. Some large and small rostellar hooks were removed, examined microscopically and measured.

Over the total hosts collected, 15 host voucher specimens were deposited at the Colección Mamíferos del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina. One out of these host specimens, the number MACN 24023, was parasitized with cysts. Two cysts were deposited as voucher specimens at the Colección Helmintológica del Museo de La Plata, Buenos Aires, Argentina (MLP 6277).

Indices of prevalence, intensity, mean intensity, and mean abundance were calculated according to Bush et al. (1997).

The rodents trapped in the present study (n = 289) correspond to the following species: *A. azarae* (n = 132), *Calomys laucha* (Fisher, 1814) (n = 86), *M. musculus* (n = 53), *Oligoryzomys flavescens* (Waterhouse, 1837) (n = 11), and *C. musculinus* (Thomas, 1913) (n = 7). Only *A. azarae* was found parasitized with cysts of cestodes. The 23 larval forms (strobilocerci) were found in 11 individual hosts. All cestodes were encysted in the liver, forming whitish to yellowish cysts of 7 ± 2.07 (5-10) mm long by 6 ± 0.50 (5-6) mm wide (n = 10). Inside each cyst, there was a strobilocercus of 28 ± 10.90 (18-40) mm long by 2 ± 1.06 (1-2.5) mm wide (n = 10), including a well developed scolex of 1.23 ± 22.74 (1-1.5) mm diameter, and a long segmented body ended in a bladder. The scolex had four prominent round suckers of 349 ± 44.79 (325-400) μm of diameter, and a rostellum of 735 ± 82.79 (633-833) μm of diameter, armed with two alternating crowns of 17-19 hooks each (**Fig. 1A**), with the larger hooks measuring 347 ± 45.23 (293-443) μm (n = 20) and the smaller ones 228 ± 22.45 (193-253) μm (n = 20) (**Figs. 1B** and **1C**). They were identified as *S. fasciolaris*.

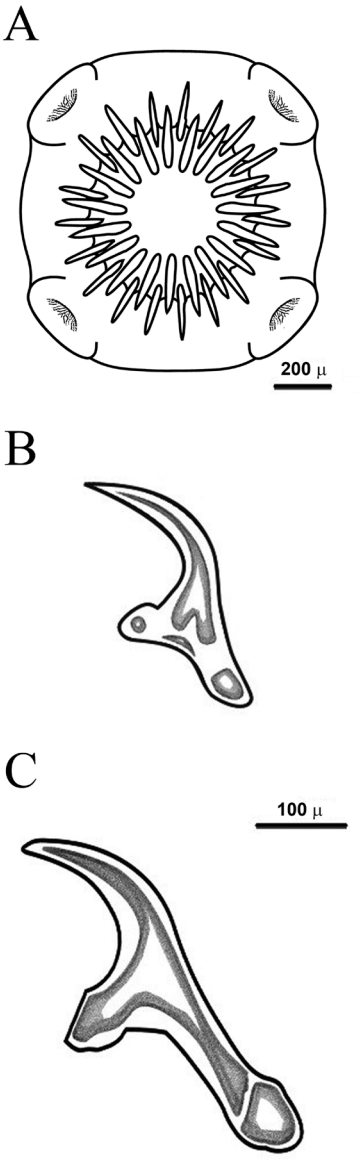

Fig. 1. Strobilocercus of *Taenia taeniaeformis* from the liver of *Akodon azarae* captured on poultry farms (Buenos Aires, Argentina). (A) Scolex, apical view. (B) Small rostellar hook. (C) Large rostellar hook.

Prevalence, mean intensity, and mean abundance were: 8.33%, 2.09 and 0.17, respectively. One rodent specimen had 10 cysts, while there were eight specimens with 1 cyst, one with 2 cysts and one with 3 cysts.

Five female rodents and 6 males were parasitized. Seven of these specimens were trapped along the wire fencing and the remaining four came from traps set up around the poultry sheds. Among the rodents coming from the sheds, two were caught in sheds built very close to the wire fence (less that 2 m), with weeds forming a continuum between the shed and the wiring.

This is the second report of cysts of *T. taeniaeformis* in rodents for Argentina (the first one having been from *R. norvegicus*) (Hancke et al., 2011), and the first time this parasite has been found in a sigmodontine rodent. The prevalence value observed in this work (8.33%) is within the range documented for other sigmodontine species known to be natural intermediate hosts of *T. taeniaeformis* (Theis and Schwab, 1992; Jones and Pybus, 2001). Thus, our data showed that *A. azarae* is susceptible of infection by *T. taeniaeformis* around poultry farm facilities. Interestingly, this parasite was not detected in a sample of *A. azarae* (n = 23) from natural environments in the wetlands of the Río de la Plata (Navone et al, 2009).

Rossin et al. (2010) reported the presence of cysts of *Taenia talicei* Dollfus, 1960 in *Ctenomys talarum* Thomas, 1898 and *C. australis* Rusconi, 1934 (Rodentia: Ctenomyidae) in the coast of Buenos Aires Province (Argentina). However, the specimens observed here are quite different from those of *T. talicei* because of the less number of the rostellar hooks (34-38 vs. 44-48 in *T. talicei*) and the larger size of the hooks (large hooks: mean of 347 vs. 225-244 µm in *T. talicei*; small hooks: mean of 228 vs. 150-161 µm in *T. talicei*) (Rossin et al., 2010). In contrast, the number, size and shape of the rostellar hooks observed here agree with the descriptions of *T. taeniaeformis* by Voge (1954), Verster (1969), and Loos-Frank (1999).

Adults of *T. taeniaeformis* have been mentioned parasitizing *Leopardus geoffroyi* (d'Orbigny and Gervais, 1844) (Carnivora: Felidae) in a protected area of central Argentina (Lihué Calel National Park) (Beldomenico et al., 2005). In the study area, one of the authors (Miño, unpublished data) has found eggs of *Taenia* sp. in feces samples of individuals of *L. geoffroyi* inhabiting small woodlands near the poultry farms. Moreover, those feces samples contained also bones of *A. azarae* (Guidobono JS, unpublished data). These observations suggest that *A. azarae* could be an intermediate host in the life cycle of *T. taeniaeformis*.

The most abundant rodent species around the poultry sheds are the sigmodontine *C. laucha* and the murines *M. musculus* and *R. norvegicus* (Gómez Villafañe and Busch, 2007; Miño et al., 2007). In this work, only *A. azarae* was found parasitized with strobilocerci. However, in a study about the populations of *R. norvegicus* carried out in these poultry farms by Gómez Villafañe and Busch (2007), liver cysts were also observed (unpublished data).

On the poultry farms, domestic dogs and cats move about freely among the sheds as well as through the fields surrounding farms. Thus, they approach the habitats occupied by *A. azarae*, which is frequently captured along wire fences (Zuleta et al., 1988; Miño et al., 2007). Moreover, we have observed domestic cats as well as dogs eating wild rodents. Therefore, life cycle of *T. taeniaeformis* could be maintained through this predator-prey interaction, with *A. azarae* getting infected by eating the vegetation contaminated with feces from dogs and cats.

Taenia taeniaeformis may have three different life cycles in the studied area: 1) one domestic cycle between *R. norvegicus* and pets in the surroundings of the farms; 2) another domestic cycle between *A. azarae* and the pets when such pets come to the farm fences; and 3) a wild cycle between *A. azarae* and *L. geoffroyi* when the rodent is preyed by this felid.

Finally, poultry farms are environments of zoonotic importance in central Argentina, since humans can be infected with *T. taeniaeformis* through their pets, as was reported in a child from Buenos Aires, Argentina (Bowman et al., 2002). Future parasitological studies on murid rodents inhabiting the poultry farms as well as

on domestic cats and dogs will be necessary to a better understanding of the sanitary condition for this zoonosis.

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