Felid Cardiopulmonary Nematodes

Subjects: Zoology | Others

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Felid cardiopulmonary nematodes belong to the superfamily Metastrongyloidea and mainly to the species *Aelurostrongylus abstrusus*, *Troglostrongylus brevior*, *Oslerus rostratus* (parasites of the airways), and *Angiostrongylus chabaudi* (parasite of the pulmonary artery and right chambers of the heart).

cardiopulmonary nematodes | domestic cats | wildcats | Aelurostrongylus abstrusus | Troglostrongylus brevior | Troglostrongylus subcrenatus | Angiostrongylus chabaudi | Oslerus rostratus | epizootiology

1. The recent rise of scientific interest

In the early 2010s, the identification of *Troglostrongylus brevior* (until then considered a parasite of wild felids) as a cause of verminous bronchopneumonia in domestic cats was acknowledged[1][2]. This triggered a cascade of surveys, data accumulation, and scientific publications that led to new insights in the chapter of felid cardiopulmonary nematodes[3]. This rise of scientific interest resulted in further studies not only of the "new" cat parasite *T. brevior*, but also of the known cat lungworm, *Aelurostrongylus abstrusus,* and led to the “re-discovery” of some other parasites with the apparent ability to infect domestic cats (*Felis catus*), i.e. *Troglostrongylus subcrenatus*[2], *Oslerus rostratus*[4][5] and *Angiostrongylus chabaudi*[6][7].

2. Questions answered, doubts solved, and new interrogations posed in the light of new data

The amount of data generated by recent studies on felid cardiopulmonary nematodes has provided answers to various questions triggered over the previous years[8][9]. These data rely on new microscopic, genetic, epizootiological, and biological findings.

Aelurostrongylus abstrusus remains the primary nematode affecting the respiratory system of domestic cats, but it can also infect wild felids, especially the European wildcat (*Felis silvestris*), under occasional epizootiological pressure[10][11][12][13].

There is now evidence that the emergence of feline troglostrongylosis, is not due to misdiagnosis of past cases but rather relies on spillover from wildcats to domestic cats. *Trogostrongylus brevior* is now enzootic in populations of domestic cats of southern and insular Europe, as the European wildcat has played a crucial role in fostering its establishment[14][15][16][17][18] (Figures 1 and 2). The parasite may also circulate in domestic felids where the wild reservoir is absent. The movement of infected cats and the high adaptability of intermediate hosts to new areas

may further spread the infection (Figure 3)[18][19]. It is also now documented that clinical troglostrongylosis is often severe and fatal, especially in kittens and young cats[20][21][22].

Figure 1. Schematic representation of the *Troglostrongylus brevior* spillover from the European wildcat (*Felis silvestris*) to the domestic cat (*Felis catus*). Drawing by Dr. Mariasole Colombo

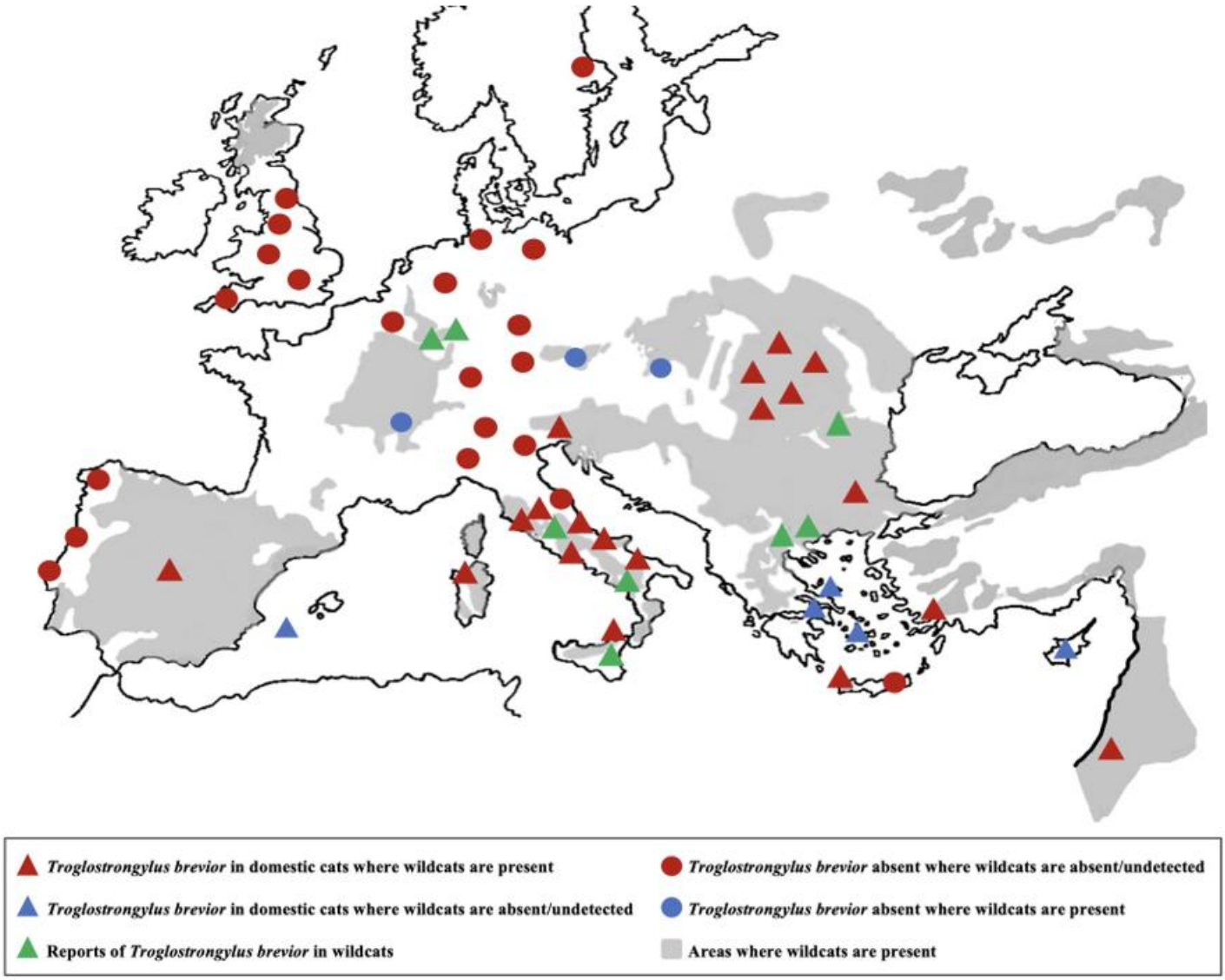

Figure 2. Geographic distribution of *Troglostrongylus brevior* in Europe and the Middle East. The geographic distribution of *Troglostrongylus brevior* in domestic cats (red triangles) reflects the distribution area of wildcats (in grey). *Troglostrongylus brevior* has been sporadically reported in touristic spots where wildcats are absent or undetected (blue triangles). Green triangles indicate reports of *Troglostrongylus brevior* in wildcats; areas, where the nematode has been not found in the absence or presence of wildcats, are indicated by red and blue circles respectively.

Figure 3. Migration, travels, and islands suitability. **a)** Complete annual migration routes, indicated in different colors, of key bird species between Europe and Africa. Part of Figure 2 from under the terms of the Creative Commons Attribution 4.0 International License. **b)** Statue of the famous Greek poet Nikos Kavadias (1910-1975), Argostoli harbour, Kefalonia, Greece (courtesy of Anna Votsi), who documented in his writings the tradition of cats living in boats and traveling long distances. **c)** Tourist traveling with her cat on a ferry boat. **d)** Cat on a boat traveling with its owners on holiday and moving between touristic spots (courtesy of Instagram @miss_rigby_boatkitty). **e)** Snails in a cat feeding station in Mykonos Island, Greece.

Trogostrongylus subcrenatus, *O. rostratus,* and *A. chabaudi* are only occasional parasites of *F. catus*. Their spreading in domestic cats is unlikely to happen under the current conditions, however, constant monitoring is essential. The actual existence of *T. subcrenatus* as a separate species needs to be confirmed by detailed microscopic and genetic analyses[2][3][23].

The impact of alternative routes of transmission, i.e. spontaneous release of L3 to the environment and the snail-to-snail L3 transmission[24][25][26] need to be evaluated in natural settings (Figure 4). Although vertical transmission of *T. brevior* has been documented[20][22], further data are warranted to elucidate how this occurs, i.e. *in utero* and/or lactogenically, and at what infection status of the maternal organism (established infection or infection acquired during pregnancy)[3].

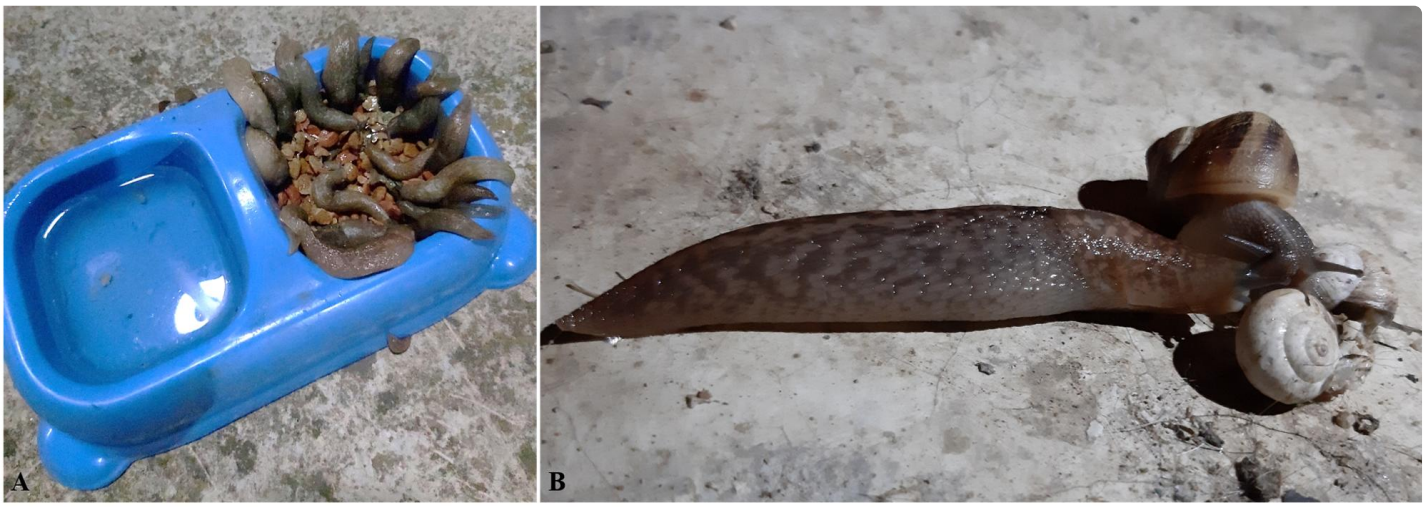

Figure 4. Hypothesized phenomena contributing to the biology of felid cardiopulmonary metastrongyloids. An experiment suggested that metastrongyloid third stage larvae (L3) may be released in the environment but it has never been demonstrated if this happens in natural conditions. If so, infected molluscs drown in a cat bowl, or mingling in cat food **(A)** may be a potential source of infection. Another laboratory study proposed the "intermediesis", i.e. the snail-to-snail transmission of L3, which is not known if occurs in the field. Regardless, it would be worth investigating if similar phenomena, e.g. gastropod cannibalism and interspecific predation **(B)**, may also occur.

The European wildcat has ultimately been shown to be the natural host of *T. brevior* and *A. chabaudi* [9][10][27]. Aspects of the life cycle of *A. chabaudi* have been revealed and important information on the development of the nematode in intermediate hosts and on the mollusc species involved in its biology have been generated[19][27]. The role of angiostrongylosis in cat parasitology (i.e. rare and negligible) has been elucidated, though undetected cases cannot be excluded[6][7][23][28].

Knowledge on the identity of cardiopulmonary nematodes in wild felids is still meagre. As an example, the species *Angiostrongylus felineus* has been described only once, and only microscopically, in a jaguarundi in Brazil[29], thus it is practically unknown and worth of investigation. Parasitological studies on elusive felids are hard for the inherent hindrances in collecting suitable samples, but further studies are encouraged to implement knowledge of their cardiopulmonary parasitoses.

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