

Expanded abstract

Gastropod hosts of *Elaphostrongylus* spp. (Protostrongylidae, Nematoda)

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Introduction

The population of moose (*Alces alces* L.) on the island of Utö in the Stockholm archipelago (Fig 1) is dense with approximately 20 animals per 10 square kilometers (Bergström *et al.*, 1990).

The calves and yearlings are in general in poor nutritional state or emaciated. Examination of carcasses from the hunting season 1989–1990 and 1990–1991 revealed a high incidence of cerebral nematodiasis with *Elaphostrongylus* sp. (83 %).

Elaphostrongylus sp. utilize gastropods as intermediate hosts. To unravel the occurrence of elaphostrongyline larvae in terrestrial gastropods and to determine the potential intermediate hosts on the island of Utö, a field study was performed.

Materials and methods

Eighteen sampling squares (10 x 12 meters) representing three biotopes (Table 1) were investigated for gastropods. Once a month from June to September 1990 one section (2 x 10 m) of

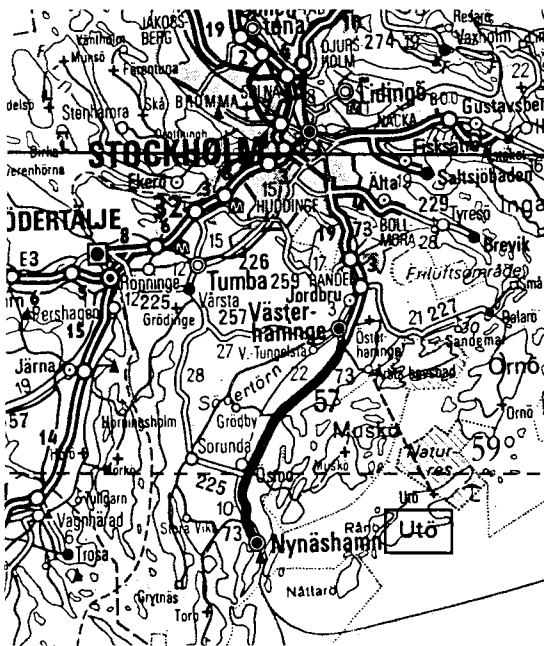


Fig. 1. The archipelago of Utö, longitude 18°15', latitude 59°N, 50 km from Stockholm, Sweden, main island Utö 23 square kilometers.

Table 1. Biotopes investigated, each sampling square 10 x 12 meters.

| Biotpe | No. of squares | Vegetation |
|--------|----------------|---------------------------|
| 1 | 4 | Coniferous forest - bog |
| 2 | 5 | Deciduous forest - marsh |
| 3 | 9 | Deciduous forest - meadow |

Table 2. Number of gastropods found June to September 1990.

| Species | Biotope 1 | Biotope 2 | Biotope 3 | Total | Infected gastropods |
|------------------------------|-----------|-----------|-----------|-------|---------------------|
| Arionidae | | | | | |
| <i>Arion ater</i> | 1 | 1 | 23 | 25 | 0 |
| <i>A. circumscriptus</i> | 0 | 5 | 4 | 9 | 0 |
| <i>A. fasciatus</i> | 0 | 2 | 0 | 2 | 0 |
| <i>A. hortensis</i> * | 0 | 2 | 0 | 2 | 0 |
| <i>A. intermedius</i> | 2 | 5 | 5 | 12 | 0 |
| <i>A. silvaticus</i> * | 0 | 2 | 0 | 2 | 0 |
| <i>A. subfuscus</i> * | 10 | 4 | 6 | 20 | 0 |
| Limacidae | | | | | |
| <i>Limax cinereoniger</i> | 1 | 1 | 1 | 3 | } 1 |
| <i>L. tenellus</i> | 1 | 1 | 4 | 6 | |
| <i>Deroceras agreste</i> | 0 | 2 | 14 | 16 | 0 |
| <i>D. laeve</i> * | 4 | 7 | 28 | 39 | 0 |
| <i>D. reticulatum</i> * | 0 | 2 | 18 | 20 | 0 |
| Clausilidae | | | | | |
| <i>Clausilia bidentata</i> * | 0 | 0 | 2 | 2 | 0 |
| <i>Cochlodina laminata</i> | 0 | 0 | 1 | 1 | 0 |
| Cochlicopidae | | | | | |
| <i>Cochlicopa lubrica</i> * | 0 | 1 | 21 | 22 | 0 |
| Succineidae | | | | | |
| <i>Succinea spp.</i> * | 1 | 24 | 48 | 73 | 3 |
| Vitrinidae | | | | | |
| <i>Vitrina pellucida</i> * | 1 | 0 | 20 | 21 | 2 |
| Zonitidae | | | | | |
| <i>Nesovitrea hammonis</i> * | 5 | 12 | 12 | 29 | 0 |
| <i>N. petronella</i> * | 0 | 5 | 4 | 9 | 0 |
| <i>Zonitoides nitidus</i> * | 1 | 20 | 17 | 38 | 1 |
| Euconulidae | | | | | |
| <i>Euconulus alderi</i> | 1 | 5 | 8 | 14 | 0 |
| <i>E. fulvus</i> * | 3 | 2 | 3 | 8 | 0 |
| Bradybaenidae | | | | | |
| <i>Bradybaena fruticum</i> * | 0 | 0 | 12 | 12 | 0 |
| Helicidae | | | | | |
| <i>Cepea hortensis</i> | 0 | 0 | 19 | 19 | 0 |
| Total | 31 | 103 | 270 | 404 | 7 |

* Reported as potential intermediate hosts for *Elaphostrongylus* spp. (Mitskevich, 1964; Panin, 1964; Hale, 1980; Skorping and Halvorsen, 1980; Watson and Kean, 1983; Demiaszkiewicz, 1987).

each square was searched. The gastropod species were identified and examined for elaphostrongyline larvae. The gastropods were compressed between two glasslides and their tissues examined in a trichinoscope.

Results

A total of 404 terrestrial gastropods (snails 61 %, slugs 39 %) representing 10 families and 24 species were found (Table 2). Elaphostrongyline larvae were found in totally 7 gastropods belonging to *Succinea* spp., *Vitrina pellucida*, *Zonitoides nitidus*, and *Limax* sp. (Table 2). Infected gastropods were detected in 6 out of 18 squares representing the deciduous forest – marsh and deciduous forest – meadow biotopes (biotope 2 and 3).

Conclusions

A total of seven gastropods belonging to *Succinea* spp., *Vitrina pellucida*, *Zonitoides nitidus*, and *Limax* sp. showed infection with elaphostrongyline larvae. *Succinea* spp., *Vitrina pellucida*, and *Zonitoides nitidus* are earlier reported as potential intermediate hosts for *Elaphostrongylus* spp. (Table 2) (Mitskevich, 1964; Panin, 1964; Skorping and Halvorsen, 1980; Demiaszkiewicz, 1987). The rate of infection in the investigated material was 1.7 % (7 gastropods of totaly 404). The number of possible intermediate hosts found at Utö as well as the rate of 1.7 % clearly indicates an effective transmission of the parasite to the intermediate host. With the high incidence of cerebral nematodiasis (83 %) in the material from the hunting season 1989–1990 and 1990–1991 we expected to find a higher level of elaphostrongyline larvae in the intermediate hosts. Lankester and Anderson (1968) and Maze and Johnstone (1986) discussed the influence of foci with higher density of infected gastropods as compared to other areas on the transmission of *Parelaphostrongylus tenuis* to deer. Local infectious foci has not been found in the areas studied at Utö.

Mitskevich (1964) and Skorping (1985) showed that aquatic snails can act as intermediate hosts for *Elaphostrongylus* spp. The presence of aquatic snails at Utö has not been studied, their role in the transmission can therefore not be evaluated.

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