

PREVALENCE OF *TRYPANOSOMA GRANULOSUM* IN *ANGUILLA ANGUILLA* IN PORTUGAL

C. CRUZ AND J. C. EIRAS

Instituto de Zoologia, Faculdade de Ciências, Universidade do Porto.
Praça Gomes Teixeira, 4050 Porto, Portugal.

Abstract

Prevalence values of *Trypanosoma granulosum* were recorded in European eel, *Anguilla anguilla*, from 10 Portuguese rivers. 91.8% of the eels captured (n= 743) were infected. The infection prevalence in each sample varied between 50% and 100%. *Hemiclepsis marginata* and *Piscicola geometra*, the reported vectors for this parasite, were not found. The long period of infection, observed in captive eels held in aquarium, can partially explain the high prevalences. The probability of parasite occurrence is higher in longer hosts.

Introduction

Trypanosomes are parasitic flagellates widely distributed. Their life cycle takes place in the blood and tissues of vertebrates and in the digestive tract of an invertebrate vector.

Fish trypanosomes have been recorded in the blood of many freshwater and marine fish species. The leeches are the known vectors for these parasites.

Trypanosoma granulosum, first described by Laveran & Mesnil (1902) in France, is a common parasite of European eel reported in several countries (Minchin, 1909; Bykhovskaya-Pavlovskaya, 1964; Boon *et al.*, 1990; Davies *et al.*, 1992), including Portugal (França, 1907; Eiras, 1988). *Hemiclepsis marginata* and *Piscicola geometra* are the vectors of this parasite. These leech species may transmit indiscriminately several flagellate species, and they are the reported vectors of trypanosome species infecting European freshwater fish (Lom & Dyková, 1992).

This paper describes the prevalence of *Trypanosoma granulosum* in the European eel (*Anguilla anguilla*) captured in 10 Portuguese rivers, and also the relationship between the occurrence of the parasite and the vector population. The relationship between prevalence and the vertebrate host length is also discussed.

Materials and Methods

Eels (*Anguilla anguilla*) were captured by electrofishing at rivers Âncora (Âncora hy-

drographical basin), Tamente (Lima hydrographical basin), Cávado (Cávado hydrographical basin), Este (Ave hydrographical basin), Febros, Sousa, Ferreira, Ardena (Douro hydrographical basin), Meão (a tributary of Esmoriz lagoon, which occasionally opens to the sea) and Olivais (Tejo hydrographical basin). Monthly samplings were carried out from January 1988 to December 1989 at river Este, 11 samples were made at river Febros from May 1993 to July 1994, and only 1 sample was made at river Âncora (June 1990), river Tamente (October 1992), river Cávado (June 1989), river Sousa (June 1989), river Ferreira (June 1989), river Ardena (May 1994), river Meão (June 1989) and river Olivais (March 1990). Blood was taken by caudal puncture or caudal cut, and smears were made and stained by May Grunwald and Giemsa. The presence of *Trypanosoma granulosum* was assessed by the examination of 300 to 1000 microscopical fields under 400x magnification.

Leeches were collected from submerged stones and macrophytes in the river Febros in March, April, May, June and July 1994, and identified according to Elliott and Mann (1989).

Results

Trypanosoma granulosum was found in 91.8% of the eels (total length range: 8.0 - 67.0 cm) captured in 10 rivers (Table 1).

Table 1 - Number of eels examined (N) in 10 Portuguese rivers, host length and infection prevalence.

River	Date (month/year)	N	Host length (cm) average (range)	Prevalence (%)
Este	1/88	10	28.0 (19.5 - 40.0)	100.0
	3/88	14	20.5 (15.5 - 34.8)	92.9
	4/88	15	21.0 (17.2 - 27.0)	100.0
	5/88	11	19.9 (12.5 - 31.5)	90.9
	6/88	15	23.4 (15.5 - 41.0)	93.3
	7/88	6	27.6 (21.0 - 36.4)	100.0
	8/88	15	27.6 (13.5 - 51.0)	100.0
	10/88	15	22.8 (13.0 - 67.0)	93.3
	11/88	12	32.7 (14.5 - 64.5)	91.7
	12/88	15	26.6 (17.2 - 41.0)	100.0
	1/89	14	20.6 (17.0 - 30.0)	100.0
	2/89	3	25.0 (19.0 - 34.0)	100.0
	3/89	14	34.2 (20.5 - 55.0)	100.0
	4/89	14	31.0 (24.5 - 51.0)	100.0
	5/89	15	35.2 (28.0 - 47.0)	100.0
	6/89	14	33.3 (22.5 - 48.0)	100.0
	7/89	15	30.1 (23.0 - 40.0)	100.0
	8/89	15	27.9 (18.5 - 45.0)	93.3
9/89	15	25.8 (18.0 - 35.0)	100.0	
10/89	13	39.1 (18.5 - 54.0)	100.0	
11/89	12	29.0 (19.0 - 51.0)	100.0	
12/89	11	27.9 (19.5 - 59.0)	81.8	
Febros	5/93	19	24.6 (16.0 - 37.0)	89.5
	6/93	20	25.6 (13.0 - 44.5)	70.0
	9/93	14	25.5 (19.5 - 36.0)	100.0
	10/93	33	24.6 (12.0 - 42.0)	90.9
	12/93	19	22.4 (18.0 - 29.5)	94.7
	2/94	10	23.9 (13.0 - 43.0)	90.0
	3/94	23	25.5 (16.0 - 36.5)	100.0
	4/94	39	21.3 (9.0 - 37.0)	89.7
	5/94	51	22.5 (15.5 - 35.0)	98.0
	6/94	23	24.9 (15.5 - 35.0)	78.3
7/94	11	30.1 (21.0 - 50.0)	100.0	
Âncora	6/90	20	30.4 (23.8 - 36.0)	70.0
Tamente	10/92	18	26.9 (19.5 - 36.5)	88.9
Cávado	6/89	28	20.9 (16.1 - 35.0)	89.3
Sousa	6/89	36	23.5 (8.0 - 44.3)	80.6
Ferreira	6/89	45	25.4 (14.3 - 41.4)	91.1
Ardena	5/94	30	26.5 (18.0 - 36.0)	96.7
Meão	6/89	12	16.7 (9.8 - 26.0)	50.0
Olivais	3/90	13	19.5 (14.9 - 24.5)	92.3
TOTAL		743	25.5 (8.0 - 67.0)	91.8

The parasite was found in all the samples (Table 1). The infection prevalence showed a variation between 50% (in river Meão) and 100% (some samples from river Febros and from river Este). The minimum length of infected specimens was 11.4 cm and all the eels longer than 34 cm were infected. The infected specimens showed an average length higher than the non infected specimens (table 2).

The intensity of the infection was low. The infected eels presented between 1 and 1000 parasites per 1000 microscopical fields. 50% of the infected eels presented less than 70 parasites per 1000 microscopical fields.

Out of 200 leeches collected during spring and summer in river Febros, none haematophagous leech was found. Furthermore, no attached leeches were observed on the eels examined.

Discussion

According to our results *Trypanosoma granulosum* is widely distributed in Portuguese rivers and it can be easily found during all the year round.

Table 2 - Host length of infected and non infected eels.

	Host length (cm) average (range)	Number of speci- mens examined
Infected eels	26.1 (11.4 - 67.0)	682
Non infected eels	18.8 (8.0 - 34.0)	61

The high prevalences observed, with the exception of river Meão sample, are similar to those observed in England (Davies *et al.*, 1992), Netherlands (Boon *et al.*, 1990) and Portugal (Eiras, 1988).

Although these values might suggest an abundant vector population, the vector was not found through spring and summer, a time of the year when abundant populations would be like to occur due to the hatching (Elliott and Mann, 1979; Letch and Ball, 1979). Moreover, previous findings reported by Fontoura (1989) showed that haematophagous leeches are very scarce at the study area. This author found just one specimen of *Hemiclepsis* sp. out of 775 leech specimens collected at 22 sites at Cávado basin at all seasons during a sampling programme of two years.

The high prevalences observed can be partially explained by a long period of infection. Our observations on captive eels, which had been held in aquarium for 6 months, support this explanation, since all the eels remained infected during all that period. It must be stressed out that long periods of infection are reported for other trypanosome species (Khan, 1985; Letch, 1980; Lom, 1979).

The probability of parasite occurrence is higher in the longer specimens as it can be seen by the length of infected and non infected fish. This relationship is reported for other trypanosome species (Letch & Ball, 1979; Pulsford, 1984) and probably reflects a longer exposure of older fish to the vector in addition to the tendency of fish to remain infected for long periods. Therefore, the values obtained for the infection prevalence in each sample depend, at least partially, on the length of the specimens. This may explain the small prevalence value obtained for river Meão, once the average length of the eels captured in this river is the smallest one.

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