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J.L. NOTES

The occurrence of *Thelohania contejeani* Henneguy, a microsporidian parasite of the crayfish *Austropotamobius pallipes* (Lereboullet), in Liguria Region (NW Italy)

Mario MORI* and Sebastiano SALVIDIO

Dipartimento per lo studio del Territorio e delle sue Risorse (Dip.Te.Ris.), Università di Genova, C.so Europa 26, 16132 Genova, Italy
*e-mail corresponding author: mori@ulisse.it

ABSTRACT

The presence of the microsporidian parasite Thelohania contejeani *Henneguy, responsible for porcelain disease (thelohaniasis), is reported in several crayfish populations inhabiting the Liguria Region. The infestation rate of this parasite was low, ranging from 0.17 to 3.7 per cent, and in two water courses it remained constant through years. However, we recommend performing periodically sanitary controls on the infected populations of Liguria and extending such controls to other populations not yet monitored. In fact, the virulence of the pathogens could increase owing to environmental stresses such as pollution, increase in crayfish density, paucity of food etc. We underline the importance, already suggested by other authors, of creating a central disease register to check the diffusion of the pathogens and facilitate the adoption of countermeasures.*

Key words: thelohaniasis, Microspora*, disease, crayfish, distribution, north-western Italy*

1. INTRODUCTION

The members of the genus *Thelohania* are microsporidian parasites responsible for porcelain disease (thelohaniasis), which affects a number of decapod crustaceans including freshwater crayfish (Sprague & Couch 1971). Infection with *Thelohania* causes destruction of myofilaments, loss of the muscle function and then the crayfish death. The presence of this parasite may be easily recognized in the advanced phase of the disease, since the muscle fibres of the tail of infected individuals assume an opaque white colouration (Alderman & Polglase 1988). The route of transmission of the parasite is not yet resolved (Vogt 1999).

Crayfish diseases still lack detailed investigations (Alderman & Polglase 1988). Studies on infection rates are of great importance in determining the causes of separate death cases in crayfish, besides the reduction in their resources (Mazylis 1978). Vogt (1999) observes that there are various gaps of knowledge in crayfish pathology, particularly in relation to the geographical distribution of pathogens. The aim of this note is to assess the presence of the microsporidian parasite, *Thelohania contejeani* Henneguy in several populations of *Austropotamobius pallipes* (Lereboullet) inhabiting the Liguria region (north-western Italy).

2. MATERIALS AND METHODS

In this study, 5711 crayfish were captured, by hand or by means of baited traps, from 21 streams (Tab. 1) located in 9 basins of Liguria Region (Fig. 1). Gross examination of each crayfish was performed and the individuals infected with thelohaniasis were removed from their habitat and transferred to the laboratory. Here, the crayfish were sized as carapace length (from the posterior edge of the eye socket to the distal edge of the carapace) to estimate crayfish age from size frequency distributions, as reported by Lowery (1988). Life span of this species is about eleven years (Pratten 1980).

The spores present in crayfish muscles were examined under microscope for identification (Cossins 1973; Cossins & Bowler 1974).

Some tagged crayfish, living in the Arvigo stream, and infected with thelohaniasis were inspected bimonthly, for one year, to verify their longevity. The error deriving from gross observation might influence the results. However, Alderman & Polglase (1988) suggest that in the case of thelohaniasis, the results of gross examination may be considered accurate, since the only study that combined both this thechnique and histopathology (O'Keeffe & Reynolds 1983) found that microscopic examination revealed only a further 1.3% of infected animals.

One individual infected with thelohaniasis collected in the Arvigo stream was deposited in the Museum of Natural History "Giacomo Doria" of Genoa.

3. RESULTS AND DISCUSSION

The shape and size of the spores found in the infected crayfish were similar to those described by Cossins (1973) and Cossins & Bowler (1974) for *Thelohania contejeani* Henneguy 1892. The presence of this microsporidian parasite has been recorded only in some populations of *A. pallipes*, with low relative rates of in-

Tab. 1. Infestation rate of *Thelohania contejeani* in the crayfish populations of the Liguria Region (Italy). In parenthesis the percentage of infected individuals.

Stream	Basin	Year	N° Crayfish	N° Infected
Carpasina	Taggia	1993	186	0
"	"	1994	122	1 (0.82%)
"	"	1995	85	0
Tomena	"	1998	8	0
Regianco	"	1998	27	0
Bormida di Millesimo	Bormida	1997	26	0
Montenotte	"	1998	27	1 (3.7%)
Pinceto	Stura	1999	30	0
Berlino	"	1999	31	0
Angassino	"	1999	46	0
Masca	"	1999	102	1 (0.98%)
Arvigo	Bisagno	1994	323	1 (0.31%)
"	"	1995	60	0
"	"	1997	1730	3 (0.17%)
"	"	1998	1134	2 (0.17%)
"	"	1999	648	1 (0.15%)
Canate	"	1996	284	1 (0.35%)
"	"	1997	274	1 (0.36%)
Val Noci	Scrivia	1997	5	0
Brevenna	"	1994	165	1 (0.61%)
Nenno	"	1998	57	0
Feto	"	1997	29	0
Trebbia	Trebbia	1993	159	1 (0.63%)
Brugneto	"	1995	74	0
Gentile	Gentile	1998	21	0
Aveto	Aveto	1997	22	0
Chiusola	Vara	1997	30	0
Begarino	"	1997	6	0

festation ranging from 0.17 to 3.7 per cent (Tab. 1). The absence of thelohaniasis from some populations could be due to the low number of individuals examined. In some Spanish populations Diéguez Uribeondo *et al*. (1997) found a rate of infestation up to 1%, while in French populations Chartier and Chaisemartin (1983) up to 8.4%.

Skurdal *et al*. (1990) found a low level of infestation of *T. contejeani* in a population of *Astacus astacus* Linnaeus living in a Norwegian lake. These authors speculated that the cold climate might increase the time needed for clinical disease to develop. The low levels of infestation observed in warmer areas, such as in Spain, by Diéguez Uribeondo *et al*. (1997), and in NW Italy, by the present authors, seem to contradict this hypothesis.

Rates of infestation in the crayfish living of the Arvigo and Carpasina streams remained constant over the years (Tab. 1), indicating that these populations are not presumably influenced by the presence of the parasite. One infected crayfish of Arvigo Stream, with an estimated age of about four years, survived twelve months. From the literature it is known that the infected individuals can live for a period ranging from several months to about two years (Brown & Bowler 1977; Mazylis 1978; Skurdall *et al*. 1990).

Mazylis (1978) reported that in artificially infected crayfish (*Astacus astacus*) thelohaniasis appeared after five-six months. The spore of *Thelohania* may be also found in developing eggs (Voronin 1971) and in the connective tissue constituting the membrane of the ovary (Vey & Vago 1977). For these reasons Mazylis (1978) and Diéguez Uribeondo *et al*. (1997) suggested that during translocations, done for restocking purposes, great care should be taken to select parasite-free crayfish populations. In addition, Mazylis (1978) recommended that crayfish should be kept in quarantine basins, under periodical control, for at least six months before their introduction in natural habitats.

In nature, diseases play an important role as regulators of crayfish populations (Vogt 1999). As long as disease agents live in balanced relationships with their hosts, they have stabilizing effects on ecosystems and can therefore be considered as positive factors. However, as observed by Vogt (1999), permanent stress caused by pollution or high competition for food and space can irreversibly change this delicate equilibrium in favour of the pathogens, including *T. contejeani*. So, in agreement with the suggestion of Diéguez Uribeondo *et al*. (1997) regarding the Spanish populations, we also recommend performing long-term sanitary controls on the infected populations in Liguria and extending such

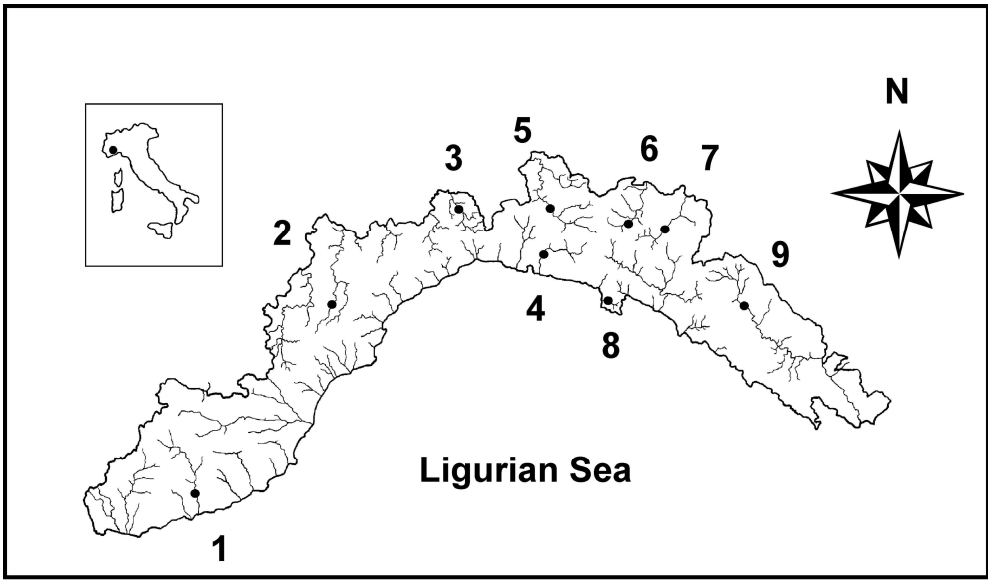

Fig. 1. Location of the basins in which the crayfish were sampled: (1) Taggia, (2) Bormida, (3) Stura, (4) Bisagno, (5) Scrivia, (6) Trebbia, (7) Aveto, (8) Gentile and (9) Vara.

controls to other populations not yet monitored. This biomonitoring will allow, together with the creation of a central disease register, to check the diffusion of crayfish pathogens and enable the necessary countermeasures to be adopted (Nylund & Westman 1995).

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