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Helminth parasites of some coastal fishes from Madeira, Portugal.

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Abstract

One hundred and fifty-one fish belonging to six different species, from Madeira, Atlantic Ocean, were examined for helminth infections. All the fish examined shared the same type of littoral habitat characterized by rocky and sandy bottoms. However their feeding ecology was slightly different resulting in variations in their parasite composition. In the blue damselfish, *Abudefduf luridus*, which is mostly herbivorous but ingesting also the associated invertebrate fauna, the digeneans dominated, while the Atlantic damselfish, *Chromis limbata*, which preys on planktonic and benthic organisms, was infected mainly by anisakid nematodes, larval acanthocephalans and digenean lepocreadids, usually transmitted by planktonic and benthic invertebrates. Similarly in the Turkish wrasse, *Thalassoma pavo*, pelagically transmitted parasites clearly dominated (*Hysterothylacium, Scolex pleuronectis*, acanthocephalans). Despite the similarities in both habitat and feeding ecologies of the two sparids, *Boops boops* and *Diplodus vulgaris*, some differences were found in their parasite faunas. Both species shared the acanthocephalans and *Hysterothylacium* sp. but differed in the presence of *Meinertia parallela* in B. *boops* and its absence in D. *vulgaris*.

Introduction

Several helminth parasites have complex life cycles, involving invertebrates as intermediate hosts, fishes as paratenic hosts and marine mammals or birds as definitive hosts (Marcogliese, 1995; Williams and Jones, 1994). Many helminth parasites, in particular members of the trematodes, cestodes, nematodes and acanthocephalans, are transmitted to fish through the ingestion of zooplankton elements (Koie, 1975, 1993; Marcogliese, 1995). As noted by Rohde *et al*. (1995) studies of parasite communities of marine fishes deal in most cases with fish from cold-temperate seas, and less work has been done on the parasites of fish from warmer waters. A number of papers have examined the helminth fauna of coastal fishes from northern European Atlantic coasts and from the Mediterranean (Fetter and Cabaret, 1995; Petter and Maillard, 1988; Reversat *et al*. 1992; Zander 1993; Zander *et al*. 1999). In contrast the helminth fauna of coastal fishes in Madeira is not well known. There have been some studies of the parasites of commercial fish species in recent years (see Costa *et al*. 1996, 2000, 2003) but only one paper was published on the helminth parasites of coastal fishes (Gibson and Costa, 1997). The present work examined the helminth fauna of some coastal fishes in Madeira, being the first of a series of related researchs on the characterization of the parasites of small-sized littoral fishes and on the elucidation of their life cycles and effects on their fish hosts.

Materials & Methods

Fish were caught from April 1998 to March 1999 using crest nets or line fishing, at three different locations on the southern coast of Madeira island, Atlantic Ocean. Some fish were examined fresh, others were frozen and later defrosted and examined. Fish were dissected open and the visceral cavity and digestive tract examined for the presence of helminths, with the aid of a Leica stereomicroscope. Recovered helminths were fixed in either 70% ethanol or 4% buffered formalin and stored in 70% ethanol. Morphological features of the parasites were examined after clearing in lactophenol and mounting in Entellan (Merck). Identification and measurements were done using a Zeiss Axioplan photomicroscope. Prevalence, mean intensity and abundance indices were calculated according to Bush *et al.* (1997).

Results

A total of 151 fish belonging to six different species of four different families were examined for the presence of helminth parasites. Nine helminth parasite taxa were recovered from the fish examined (Table 1). In the bluefin damselfish, *Abudefduf luridus a* high mean intensity with digeneans and a relative high prevalence were found, with a lower prevalence and intensity with anisakid nematodes and *Scolex pleuronectis*. The Atlantic damselfish, *Chromis limbata* was infected with digeneans and larval Acanthocephala. The two damselfish species shared the infection with digeneans, but differed in the occurrence of larval acanthocephalans in C. *limbata,* while both larval anisakids and *Scolex pleuronectis* were found in *A. luridus.* The parasite composition of the two sparids, *Boops boops* and *Diplodus vulgaris*, were similar in respect to the occurrence of larval Acanthocephala and *Hysterothylacium* sp., but differed in the absence of *Meinertia parallela* in *D. vulgaris* and of Digenea in *B. boops.* In the Turkish wrasse, *Thalassoma pavo, Hysterothylacium* sp. was the dominant species, followed by the tetraphyllidean *Scolex pleuronectis*. Acanthocephalans were also found with a lower prevalence and intensity.

Discussion

Differences in both the taxonomic compositions and levels of infection of parasites between fish species are common and reflect the feeding ecology of the fish (Rohde, 1993; Williams and Jones, 1994; Williams *et al.* 1992). The Turkish wrasse, T. *pavo*, feeding on small crustaceans, echinoderms, polychaetes and molluscs (Quignard and Pras, 1986a) was infected with anisakid nematodes, *Scolex pleuronectis* and acanthocephalans which are transmitted by pelagic zooplanktonic elements (Euzet, 1959; Marcogliese, 1995; Smith, 1983). The species *Hysterothylacium fabri* and *Scolex pleuronectis* were previously reported from this fish species (Petter and Maillard, 1988; Costa *et al.*, 1998). *A. luridus* preys on invertebrates associated with algae (Quignard and Pras, 1986b), which could explain the high prevalence and intensity with digeneans, transmitted to fish by the ingestion of both molluscs and crustaceans usually associated with algae (Marcogliese, 1995; Williams and Jones, 1994). On the other hand C. *limbata* also a pomacentrid sharing the same habitat, showed a predominance in infection by larval Acanthocephala, derived from its diet rich

Host species	No. examined	Parasite species	No. infected	Prevalence (%)	Total no. parasites	Mean intensity	Mean abundance
Pomacentridae							
Abudefduf luridus (9.1-14.4 cm)	27	Lepocreadiidae (D)	18	66.7	217	12.1	8.03
	27	Larval Anisakids (N)	3	11.1	6	2.0	0.22
	27	*Scolex pleuronectis* (C)	5	18.5	10	2.0	0.19
Chromis limbata (11.1-17.7 cm)	10	Acanthocephala sp. (A)	5	50.0	23	4.6	2.3
	10	Lepocreadiidae (D)	3	30.0	54	18.0	5.4
Sparidae							
Boops boops (11.8-15.6 cm)	10	Acanthocephala sp. (A)	10	100	32	3.2	3.2
	10	*Hysterothylacium* sp.(N)	1	10.0	1	1.0	0.10
	10	*Meinertia oestroides* (I)	2	20.0	2	1.0	0.20
Diplodus vulgaris (10.2-16.5 cm)	4	Acanthocephala sp. (A)	2		15	7.5	3.75
	4	Digenea (D)	1		?	?	?
	4	*Hysterothylacium* sp. (N)	1		1	1.0	0.25
Tetraodontidae							
Sphoeroides marmoratus (9.5-14.8 cm)	5	*Scolex pleuronectis* (C)	3		5	1.67	1.0
Labridae							
Thalassoma pavo (9.0-16.7 cm)	95	*Hysterothylacium* sp.(N)	46	48.4	91	1.98	0.96
	95	*Scolex pleuronectis* (C)	19	20.0	66	3.47	0.69
	95	Acanthocephala sp. (A)	7	7.4	38	5.43	0.40
Totals	151		126	83.4	561	4.45	3.72

Table I: Prevalence, mean intensity and mean abundance of metazoan parasites of some coastal fish species in Madeira, Atlantic Ocean. (A) Acanthocephala; (C) Cestoda; (D) Digenea; (I) Isopoda; (N) Anisakid Nematoda.

in planktonic and benthic organisms, ideal intermediate hosts for acanthocephalans, as well as nematodes. Young *B. boops* are carnivorous (Bauchot and Hureau, 1986) therefore its parasite fauna should be rich and diverse. Co-infections with acanthocephalans (P= 100%), *Hysterothylacium* sp. (P=10%) and *Meinertia parallela* (P=20%) were found in this host. *B. boops* is known as host for a number of helminth parasites, namely anisakid nematodes, *Hysterothylacium aduncum* (Petter and Maillard, 1988) and several digeneans (Papoutsoglou, 1976). Curiously no digeneans were found in the fish examined in the present work, but only ten fish were examined. The other sparid, *D. vulgaris*, is also a carnivorous fish feeding on crustaceans, molluscs and worms. This diet, reflected the parasite composition found, including larval Acanthocephala, digeneans and anisakids. Several helminth parasites have been reported from this species, in particular digeneans and anisakid nematodes (Papoutsoglou, 1976; Bartoli *et al.* 1989; 1993) It was interesting the finding that *Meinertia parallela* was only found in *B. boops*. Two isopod species, *Meinertia parallela* and *M. oestroides* were previously reported occurring in the mouth of *B. boops* from the Atlantic Ocean, including at the Azores, Madeira and Canary Islands (Koebel, 1892; Romestand and Trilles, 1977; Trilles *et al.*, 1989). The most abundant helminth group

was the Digenea (8.03 in *A. luridus)* followed by the Acanthocephala group (3.2 and 3.75) in the two sparid fishes examined (Table 1). The anisakid nematodes showed lower abundance values in all the fish species examined. Low intensity and abundance values are not unusual for small-sized fish. As an example we refer to the work of Zander *et al.* (1999), who examined the parasite composition of small-sized littoral fish from the Baltic Sea, finding several intensity values close to 1.0. The anisakid nematode, *Hysterothylacium* sp. was found in three different hosts in the present work and in the literature it is known as a parasite of some other hosts (Fetter and Maillard, 1988). It is possible that more than one species is involved, therefore identification by molecular methods will be done in a future work, to quantify the number of species present and decide on their specificity. The same applies for the larval tetraphyllidean *Scolex pleuronectis*, a colective term embracing a large number of tetraphyllidean species, which is found in a number of different fish hosts (Euzet, 1959; Scholz *et al.* 1998). Several individuals of the tetraphyllidean *Pelichnibothrium speciosum* were found in the stomach and intestine of two *Akpisaurus ferox* (pers. observ.) It is quite possible that *Scolex pleuronectis* found in the small-sized fish are larval stages of P. *speciosum*, a parasite of the shark, *Prionace glauca*, but found also in *A. ferox* (Scholz *et al.* 1998). Although we were unable to identify the acanthocephalan specimens, occurring in some of the fish examined, their morphology characterized by a long cylindrical proboscis and trunk spined anteriorly, clearly indicate that they belong to the Rhadinorhynchidae (Yamaguti, 1963). The acanthocephalan *Rhadinorhynchus pristis* is common in the intestine of *Scomber japonicus* from Madeiran waters (Costa and Rego, 2002). Furthermore Vassiliades (1982) refers to the occurrence of *R. pristis* in *B. boops* from Senegal.

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