

Zoogeographical patterns of flatfish (Pleuronectiformes) parasites in the Northeast Atlantic and the importance of the Portuguese coast as a transitional area

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Supplementary material

APPENDIX 1. – Macroparasites recorded from the Pleuronectiformes species considered in the present study in the North Sea (NS), north Northeast Atlantic (NA), Portuguese coast (PC), Mediterranean Sea (MS) and Northwest coast of Africa (NW). Citharidae (C): CL, *Citharus linguatula*. Bothidae (B): AL, *Arnoglossus laterna*; AT, *Arnoglossus thori*; AI, *Arnoglossus imperialis*. Scophthalmidae (S): LB, *Lepidorhombus boscii*; LW, *Lepidorhombus whiffiagonis*; SR, *Scophthalmus rhombus*; SM, *Scophthalmus maximus*; PR, *Phrynorhombus*

Parasite	CL	AL	AT	AI	LB	LW	SR	SM	PR	ZP
Monogenea										
<i>Entobdella soleae</i> (van Beneden and Hesse, 1864)										
<i>Entobdella hippoglossi</i> (Mueller, 1776)								NS		
Digenea										
<i>Helicometra fasciata</i> (Rudolphi, 1819)					PC					
<i>Cainocreadium labracis</i> (Dujardin, 1845)							MS			
<i>Aporocotyle simplex</i> Odhner, 1900								NS		
<i>Podocotyle atomon</i> (Rudolphi, 1802)							NA			
<i>Podocotyle angulata</i> (Dujardin, 1845)										
<i>Macvicaria soleae</i> (Dujardin, 1845)*										
<i>Lecithochirium rufoviride</i> (Rudolphi, 1819)	PC	PC			PC		NA,PC	NA,PC		
<i>Lecithochirium musculus</i> (Looss, 1907)						NA				
<i>Lecithochirium fusiforme</i> Lühe, 1901					NA	NA		NA		
<i>Lecithochirium microstomum</i> Chandler, 1935					NA	NA				
<i>Steringophorus furciger</i> (Olsson, 1867)										
<i>Synaptobothrium caudiporum</i> (Rudolphi, 1819)					NA	NA		NA		
<i>Lecithaster gibbosus</i> (Rudolphi, 1802)										
<i>Hemiurus communis</i> Odhner, 1905										NA
<i>Hemiurus levinseni</i> Odhner, 1905						NA				
<i>Stephanostomum lophii</i>										
Quinteiro, Tojo, Nunez, Santamarina and Sanmartin, 1993						NA				
<i>Prosorhynchus crucibulum</i> (Rudolphi, 1819)										
<i>Proctoeces maculatus</i> (Looss, 1901)										
<i>Homalometron senegalese</i> Fitschthal and Thomas, 1972*										
<i>Homalometron galaiacus</i>										
(Sanmartin, Alvarez, Quinteiro and Paniagua, 1995)*										
<i>Lomasoma stephanskii</i> Dollfus, 1960*					NA					
<i>Cryptocotyle lingua</i> Creplin, 1825										
<i>Cryptocotyle concava</i> (Creplin, 1825)										
<i>Zoogonus rubellus</i> (Olsson, 1868)										
<i>Zoogonoides viviparus</i> (Olsson, 1868)										
<i>Opechona bacillaris</i> (Molin, 1859)							NA			
<i>Derogenes varicus</i> (Müller, 1784)							NA,PC	NA		
Cestoda										
<i>Nybelinia lingualis</i> (Cuvier, 1817)	MS,PC,NW				NA,PC	NA	PC		PC	
<i>Progrillotia dasyatidis</i> (Beveridge Neifar and Euzet, 2004)					PC					
<i>Didymobothrium rudolphii</i> (Monticelli, 1890) Nybelin, 1922*										
<i>Bothrimonus sturionis</i> Duvernoy, 1842						NA				
<i>Bothrimonus nylandicus</i> (Schneider, 1902)*						NA				
<i>Bothriocephalus scorpii</i> (Muller, 1776)					MS,NA,PC	MS,NA	NA,NS	MS,NA,NS		
<i>Bothriocephalus gregarius</i> Renaud, Gabrion and Pasteur, 1983								MS,NS,PC		
<i>Bothriocephalus andresi</i> Porta, 1911*	MS,PC,NW									
<i>Bothriocephalus clavibothrium</i> Ariola, 1899*		MS,NA,PC								
<i>Bothriocephalus barbatus</i> Renaud, Gabrion and Pasteur, 1983							MS,NA,PC			
<i>Scolex pleuronectis</i> Müller, 1788						NA		NA		
Acanthocephala										
<i>Acanthocephaloides propinquus</i> (Dujardin, 1845)					NA,PC		NA,PC			
<i>Acanthocephaloides incrassatus</i> (Molin, 1858)										
<i>Acanthocephaloides geneticus</i> (Buron, Renaud and Euzet, 1985)*		MS			PC					
<i>Echinorhynchus gadi</i> Zoega in Müller, 1776	PC				PC		NA			
<i>Acanthocephalus clavula</i> Dujardin, 1845										
<i>Pomphorhynchus laevis</i> (Zoega in Müller, 1776)							NA			
<i>Sphyrion lumpi</i> (Krøyer, 1845)										
Nematoda										
<i>Anisakis simplex</i> s.l. (Rudolphi, 1809)	PC	PC		PC	NA,PC	NA,PC		NA	PC	
<i>Anisakis typica</i> (Diesing, 1860)										
<i>Hysterothylacium reliquens</i> (Norris and Overstreet, 1975)										
<i>Hysterothylacium aduncum</i> (Rudolphi, 1802)	MS	MS			MS,NA	MS,NA	NA	MS,NA		
<i>Hysterothylacium fabri</i> (Rudolphi, 1819)	MS	MS								
<i>Hysterothylacium amoglossi</i> Petter and Maillard, 1988		MS	MS							
<i>Pseudoteranova decipiens</i> (Krabbe, 1878)								MS		
<i>Raphidascaris acus</i> (Bloch, 1779)										
<i>Capillaria gracilis</i> (Bellingham, 1840)										
<i>Cucullanus campanae</i> Lebre and Petter, 1984*										
<i>Cucullanus heterochrous</i> Rudolphi, 1802								NA		
<i>Dichelyne minutus</i> (Rudolphi, 1819)										
<i>Cosmocephalus obvelatus</i> (Creplin, 1825)										
<i>Ascaris minuta</i> Molin, 1858*							MS			

regius; ZP, *Zeugopterus punctatus*. Pleuronectidae (P): PF, *Platichthys flesus*. Soleidae (L): BL, *Buglossidium luteum*; DC, *Dicologlossa cuneata*; MA, *Microchirus azevia*; MV, *Microchirus variegatus*; MB, *Microchirus boscanion*; MH, *Monochirus hispidus*; SK, *Solea kleinii*; SL, *Solea lascaris*; SN, *Solea senegalensis*; SS, *Solea solea*; SY, *Synaptura lusitanica*. (*) indicates parasites which have only been found infecting flatfishes.

PF	BL	DC	MA	MV	MB	MH	SK	SL	SN	SS	SY	Records
		PC						NA	PC	NA,NS		marine fishes marine fishes
												marine fishes marine fishes mostly Pleuronectiformes marine and freshwater fishes
NA,NS NA NA,PC PC	NS	PC	PC PC	PC				NA NA PC NA NA	PC	NA,PC NA NA,PC NA NA		marine and freshwater fishes Pleuronectiformes marine fishes marine fishes marine fishes marine fishes marine fishes marine fishes marine and freshwater fishes marine fishes
NS										MS		marine fishes marine and freshwater fishes
NA,NS NS										PC		marine fishes marine fishes
				NA								
NA NA,PC		PC						PC	PC	MS NA	PC	marine fishes marine fishes marine fishes Pleuronectiformes
							MS					
		PC	PC	NA,PC NA,PC		MS		NA	PC			Soleidae Soleidae marine and freshwater fishes, birds and mammals marine and freshwater fishes, birds and mammals marine fishes
NA NA NA,PC NS		PC							PC			marine fishes marine fishes marine fishes
										NA,NS		
NA,NS,PC	NS	PC		NA			PC	NA,PC	PC	MS,NA,NS		marine and freshwater fishes
		PC PC	PC	MS,NA PC				PC PC PC NA NA	PC PC PC	PC		marine fishes Pleuronectiformes, <i>Dasyatis</i> sp. Soleidae marine and freshwater fishes Pleuronectiformes
PC		PC							PC			marine fishes Gobiidae & Scophthalmidae <i>C. linguatula</i> <i>A. laterna</i>
NA,PC		PC	PC	NA				MS,NA	PC	NA,PC		<i>Acartia</i> sp., <i>Eurytemora</i> sp. and <i>S. rhombus</i> marine fishes
NA		PC,NW	PC	PC		PC		NA PC PC	PC	PC NA,MS		marine fishes marine fishes <i>A. laterna</i>
NS									PC	PC		marine fishes
NA										PC		marine and freshwater fishes marine and freshwater fishes marine fishes
										MS		
NS PC		PC		NA			PC	PC	PC			marine fishes marine fishes marine fishes
NS,PC	NS		PC	NA,PC MS,NA,PC	PC			PC				marine fishes marine fishes marine fishes marine fishes marine and freshwater fishes marine fishes
NS NS NA,NS PC NA,NS NA,NS,PC	NS	PC	PC PC	NA				PC	PC	MS,NA,PC MS,NA,NS NA,NS,PC NA,NS		Soleidae marine fishes marine fishes marine and freshwater fishes Scophthalmidae

Parasite	CL	AL	AT	AI	LB	LW	SR	SM	PR	ZP
<i>Goezia ascaroides</i> (Goeze, 1782)										
<i>Philometra globiceps</i> (Rudolphi, 1819)	MS								MS	
Crustacea										
<i>Lepeophtheirus pectoralis</i> (Müller, 1776)*										
<i>Lepeophtheirus europaensis</i>										
Zeddari, Berrebi, Renaud, Raibaut and Gabrion, 1988*							MS,PC			
<i>Lepeophtheirus thompsoni</i> Baird, 1850*								MS		
<i>Bomolochus solea</i> Claus, 1864*										
<i>Caligus brevicaudatus</i> A.Scott, 1901*										
<i>Caligus elongatus</i> von Nordmann, 1832										
<i>Lerneacera branchialis</i> (Linnaeus, 1758)										
<i>Acanthochondria soleae</i> (Krøyer, 1838)*										
<i>Acanthochondria cornuta</i> (Müller, 1776)*										
<i>Nerocila orbignyi</i> (Guérin-Ménéville, 1832)										
Hirudinea										
<i>Hemibdella soleae</i> (van Beneden and Hesse, 1863)*										

PF	BL	DC	MA	MV	MB	MH	SK	SL	SN	SS	SY	Records
NS												marine fishes marine fishes
NA,NS,PC									PC			Pleuronectiformes
		PC										Pleuronectiformes
		PC					PC	PC	PC	MS,PC		Pleuronectiformes
			PC					PC	PC	PC		Soleidae
NA,NS	NS									PC		Pleuronectiformes
NA,NS,PC											MS,NS	marine fishes
											PC	marine fishes
												Soleidae
						PC						Pleuronectidae
												marine fishes
		PC	PC				PC	PC	PC	PC	PC	Soleidae