

Parasite communities of *Merluccius hubbsi* from the Argentinian–Uruguayan common fishing zone

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Abstract

This study is based on parasitological examinations of 159 specimens of *Merluccius hubbsi* (common hake) from the Argentinian–Uruguayan common fishing zone between June and December 1993.

The examination extended the list of parasite species previously known from this host in the study area to the following taxa: *Anthocotyle merluccii* van Beneden and Hesse, 1863; *Chondracanthus palpifer* Wilson, 1912; *Neobrachiella insidiosa* f. *lageniformis* Kabata, 1979; *Trifur tortuosus* Wilson, 1917; cysts of unknown etiology in gills; *Corynosoma* spp.; *Grillotia* spp.; *Hepatoxylon trichiuri* Holten, 1802; *Anisakis* spp.; *Pseudoterranova* spp.; *Contracaecum* spp.; *Hysterothylacium* spp.; *Microsporidium ovoideum* Thélohan, 1895; *Elytrophalloides oatesi* Leiper and Atkinson, 1914; *Derogenes varicus* Müller, 1784; *Cleistobothrium crassiceps* Rudolphi, 1802; *Scolex polymorphus* Müller, 1784; Gorgorhynchidae gen. spp.; *Aporocotyle argentinensis* Smith, 1969; *Kudoa rosenbuschi* (Gelormini) Szidat, 1966.

The prevalence and intensity of infestation were calculated for each parasite species as related to the body size and sex of the host. The distribution pattern of parasites in hake was also analyzed. Parasite communities of hake examined in the present paper comprises one group of parasite species specific at host family, genus or species level, and another belonging to the local fauna. Component and satellite parasite species were also found.

Keywords: Argentinian–Uruguayan continental shelf; Fish parasites; Hake; *Merluccius hubbsi*

1. Introduction

The parasite fauna of *Merluccius* spp. from different localities comprises approximately 70 species, ranging from protozoans to isopods (Szidat, 1955; Kabata and Ho, 1981; Love and Moser, 1983; Sankurathri et al., 1983; Fernández, 1985; Botha, 1986; Scott, 1986; Esch and Fernández, 1993).

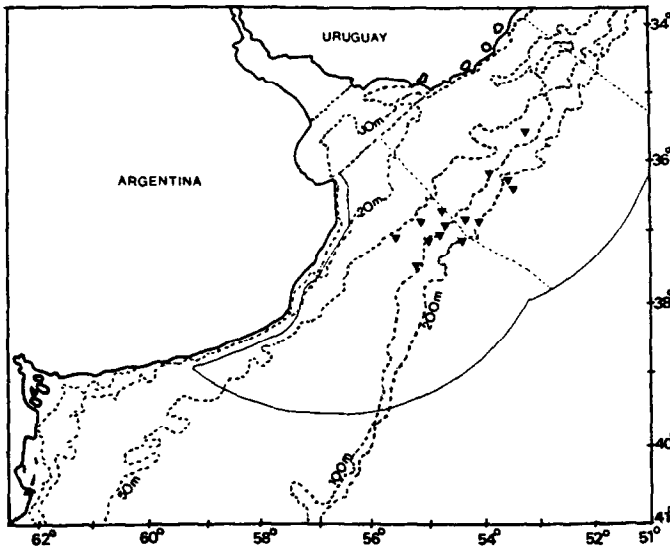


Fig. 1. Geographic location of the sampling area.

Merluccius hubbsi is one of the most important economic components of the Argentine fishery. Nevertheless, knowledge about its parasites mainly consists of systematic studies.

Previous records of parasites of *M. hubbsi* belonging to the Argentine Sea show one monogenean species (Suriano and Martorelli, 1984), three species of copepods (Ringuelet, 1947; Szidat, 1955; Kovaleva and Gaevskaya, 1975; Reimer and Jessen, 1981; Etchegoin and Sardella, 1990), three myxozoan species (Sardella, 1984; Kalavati et al., 1995), one microsporidian species (Reimer and Jessen, 1981; Gaevskaya et al., 1985), four digenean species (Smith, 1969; Gibson, 1976; Reimer and Jessen, 1981; Suriano and Sutton, 1981), four cestode species and four species of larval anisakid nematodes (Szidat, 1955; Reimer and Jessen, 1981).

The aim of this paper is to analyze the parasitism on *Merluccius hubbsi* (common hake) inhabiting the area between 34 and 40°S from the Rioplatense population (Argentinian–Uruguayan common fishing zone) (Pérez Comas, 1990; Perrotta and Sánchez, 1992) in terms of the component community species (Holmes and Price, 1986).

2. Materials and methods

The study is based on parasitological examinations of 159 specimens of common hake from the Argentinian–Uruguayan common fishing zone (Fig. 1). Samples were collected with bottom-trawl survey gear during cruises of RV Cap. Oca Balda and Dr. E. Holmberg between June and December 1993.

Fish were measured for total length and sexed. Buccal cavity, together with the branchial cavities and external body surface of each hake were checked. As each fish

was dissected, examinations were made of heart, liver, spleen, stomach, caeca, intestine and its contents, gall bladder, swim bladder, gonads and somatic musculature. Gall bladder smears were examined for myxosporean protoctistans. Parasites were collected, fixed in AFA and stored in ethanol (70%).

The prevalence and intensity of infestation (Margolis et al., 1982) were calculated for each parasite species in relation to the body size (divided into six groups) and sex of the host. The distribution pattern of each parasite species in the host population was calculated (Morales and Pino, 1987; Rojas, 1964). Spearman rank correlations between fish length and both prevalence and intensity were calculated. The significance of sex differences on prevalence was assessed by the X^2 test. The Mann–Whitney U -test was used to compare the effect of sex differences on intensity (Siegel, 1990).

3. Results

A total of 20 parasite species was found in *Merluccius hubbsi* from the Argentinian–Uruguayan common fishing zone. Each parasitized hake harboured at least one of the parasites listed in Table 1.

The following parasites are reported for the first time from *M. hubbsi* in these waters, providing new host and locality records: *Corynosoma* spp. and Gorgorhynchidae gen. spp. (Acanthocephala), *Grillotia* spp. (Cestoda) and *M. ovoideum* (Microspora).

The parasites *Alatospora merlucii* Kalavati, Longshaw and MacKenzie, 1995, *Myxidium baueri*, Kovaleva and Gaevskaya, 1982 (Myxozoa), *Dissosaccus gravidus*, Looss, 1907 (Digenea), and *Aega magnifica* Dana (Isopoda), previously found in common hake, were absent from samples examined.

The values of parasite prevalence are high for all length classes examined; the intensity of the infestation shows a cumulative effect with an increase in host length (Table 2). Both prevalence and mean intensity for each parasite species are given in Table 3.

Neobrachiella insidiosa f. *lageniformis*, gill cysts, *Grillotia* spp., *Anisakis* spp., *Hysterothylacium* spp., *D. varicus*, *A. argentinensis* and *K. rosenbuschi*, with prevalences higher than 10%, are component species (core species) in the parasite community of hake in the area studied; parasites with prevalences of less than 10% are considered to be accidental species (satellite species) (Bush et al., 1990).

When prevalences are treated in relation to host length, *C. palpifer* is a component species of the higher length classes of hake, microsporidians are found in hake of medium to long lengths, and *E. oatesi* in fish of intermediate length classes.

Mean intensities are, in general, relatively, low with the exception of gill cysts and *Grillotia* spp.

The distribution pattern of parasites in the host population is contagious for all the component parasite species ($CV = \sigma^2/\bar{x} > 1$ and $K < 8$, except for *A. merlucii*, *Pseudoterranova* spp., Gorgorhynchidae gen. spp. and *H. trichiuri*).

Comparisons of parasitism in relation to host sex showed no significant differences for either prevalence or mean intensity ($P > 0.05$). Correlation analysis was also carried out for both sexes together.

Table 1
Parasites of *Merluccius hubbsi*; stage and location in the host

Parasites	Stage	Location in host
Cysts of unknown etiology	–	Gills
Microspora		
<i>Microsporidium ovoideum</i> Thélotan, 1895	Spores	Liver
Myxozoa		
<i>Kudoa rosenbuschi</i> (Gelormini) Szidat, 1966	Spores	Musculature
Monogenea		
<i>Anthocotyle merlucii</i> van Beneden et Hesse, 1863	Adult	Gills
Digenea		
<i>Elytrophalloides oatesi</i> Leiper and Atkinson, 1914	Adult	Stomach
<i>Derogenes varicus</i> Müller, 1784	Adult	Stomach
<i>Aporocotyle argentinensis</i> Smith, 1969	Adult	Bulbus arterious
Cestoda		
<i>Grillotia</i> sp.	Plerocerci	Mesenteries
<i>Hepatoxylon trichiuri</i> Holten, 1802	Plerocerci	General cavity
<i>Cleistobothrium crassiceps</i> Rudolphi, 1802	Adult	Intestine
<i>Scolex polymorphus</i> Müller, 1784	Plerocerci	Intestine
Nematoda		
<i>Anisakis</i> spp.	Larvae III	Mesenteries
<i>Pseudoterranova</i> spp.	Larvae III	Mesenteries
<i>Contracaecum</i> spp.	Larvae III	Mesenteries
<i>Hysterothylacium</i> spp.	Larvae III	Mesenteries
<i>Hysterothylacium</i> spp.	Larvae IV	Swim bladder wall
<i>Hysterothylacium</i> spp.	Larvae IV, adult	Intestine
Acanthocephala		
<i>Corynosoma</i> spp.	Cystacanth	Mesenteries
Gorgorhynchidae gén. spp.	Adult	Intestine
Copepoda		
<i>Chondracanthus palpifer</i> Wilson, 1912	Adult	Buccal cavity
<i>Neobrachiella insidiosa</i> f. <i>lageniformis</i> Kabata, 1979	Adult	Gills
<i>Trifur tortuosus</i> Wilson, 1917	Adult	External body area

Table 2
Parasitism of *M. hubbsi* by size classes

Size classes	NHE	NHP	NP	Prevalence (%)	Mean intensity
16–20 cm	19	19	96	100	5.0
21–25 cm	26	21	132	80.8	6.3
26–30 cm	25	21	470	84.0	22.4
31–35 cm	35	35	930	100	26.6
36–40 cm	28	28	1111	100	39.7
> 40 cm	26	26	1357	100	52.2
Total	159	150	4096	94.3	24.9

NHE, number of hosts examined; NHP, number of hosts parasitized; NP, number of parasites.

Table 3
List of parasites of *M. hubbsi* in relation to host length classes

Parasite	6–20 cm			21–25 cm			26–30 cm			31–35 cm			36–40 cm			> 40 cm			Total			
	HP	P	I	HP	P	I	HP	P	I	HP	P	I	HP	P	I	HP	P	I	HP	P	I	
<i>A. merluccii</i>	–	–	–	–	–	–	–	–	–	–	–	–	1	3.6	1	–	–	–	1	0.6	1	
<i>C. palpifer</i>	–	–	–	–	1	3.8	1	2	8.0	1	2	5.7	1.5	3	10.7	1.6	6	23.1	2.87	14	8.8	2
<i>N. insidiosus</i> f. <i>lageniformis</i>	9	47.4	1.3	4	15.4	1.7	8	32.8	2.9	8	22.9	1.9	2	14.3	2	1	3.8	2	34	21.4	2	
<i>T. tortuosus</i>	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	3.8	1	0.6	1	
Cysts	5	26.3	2.2	5	19.2	4	5	20.0	66.0	13	37.1	42.8	13	46.4	36.8	9	34.6	67.5	50	31.4	40.1	
<i>Corynosoma</i> spp.	–	–	–	–	–	–	4	16.0	2.5	5	14.3	1.6	6	21.4	1.8	10	38.5	8.1	25	15.7	4.4	
<i>Grillotia</i> spp.	5	26.3	3.6	11	42.3	3.8	12	48.0	4.2	18	51.4	8	17	60.7	22.6	17	65.4	26.1	80	50.3	13.5	
<i>H. trichiuri</i>	–	–	–	–	–	–	–	–	–	–	–	–	2	7.1	1	1	3.8	1	3	1.9	1	
<i>Anisakis</i> spp.	–	–	–	2	7.7	1	1	4.0	1	6	17.1	1.3	7	25.0	3.9	8	30.8	2.5	24	15.1	2.4	
<i>Pseudoterranova</i> spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	3.8	1	0.6	1	1	
<i>Contracaecum</i> spp.	–	–	–	1	3.8	2	–	–	–	–	–	–	–	1	3.6	1	–	–	2	1.3	1.5	
<i>Hysterothylacium</i> spp.	11	57.9	3.2	18	69.2	2.4	11	44.0	2.6	26	74.3	4.8	20	71.4	5.6	21	80.7	5.4	107	67.3	4.2	
<i>M. ovoides</i>	–	–	–	–	–	–	3	12.0	–	5	14.3	–	3	10.7	–	4	15.4	–	15	9.4	–	
<i>E. oatesi</i>	1	5.3	2	1	3.8	1	3	12.0	1.7	4	11.4	2	3	10.7	2.7	1	3.8	1	13	8.2	1.9	
<i>D. varicus</i>	4	21.0	2.2	3	11.5	2.3	1	4.0	3	4	11.4	2	6	21.4	3	6	23.1	2.7	24	15.1	2.5	
<i>C. crassiceps</i>	1	5.3	3	–	–	–	–	–	–	2	5.7	1	3	10.7	1	2	7.7	1	8	5.0	1.2	
<i>S. polymorphus</i>	–	–	–	1	3.6	2	2	8.0	3	4	11.4	4.5	1	3.6	2	1	3.8	4	9	5.6	3.6	
Gorgothynchidae	4	21.0	1	5	19.2	1	–	–	–	–	–	–	–	–	–	–	–	–	9	5.6	1	
<i>A. argentinensis</i>	–	–	–	–	–	–	2	8.0	2.5	5	14.3	1.8	8	28.6	2	10	38.5	2	25	15.7	1.9	
<i>K. rosenbuschi</i>	1	5.3	–	1	3.8	–	3	12.0	–	4	11.4	–	5	17.9	–	2	7.7	–	16	10.1	–	

HP, hosts parasitized; P, prevalence; I, mean intensity.

Significant correlations between host length and prevalence were positive for *C. palpifer*, *Corynosoma* spp., *Grillotia* spp., *Anisakis* spp. and *A. argentinensis*, and negative for *N. insidiosa* f. *lageniformis*. Mean intensity showed a significant positive correlation with length for *C. palpifer*, *Grillotia* spp. and *Anisakis* spp.

Food items found in the stomachs of hake were mainly crustaceans (90.79%) (*Peisos petrunkevitchi*, euphausiids) followed by fish: *Engraulis anchoita* (anchovy) and myctophids.

4. Discussion

Some parasite species, which were reported by Esch and Fernández (1993) to be specific at host family or genus level (*C. crassiceps*, *A. merluccii* and *C. palpifer*) or at host species level (*A. argentinensis* and *N. insidiosa* f. *lageniformis*), were found in *M. hubbsi*. *Trifur tortuosus* and *K. rosenbuschi* can be included in the second group. Nevertheless, *C. crassiceps* was cited by Schmidt (1986) in fish other than Merlucciidae.

The remaining group of parasites belongs to local faunas, not specific species, some of which have previously been recorded in various hosts living in the Argentinian–Uruguayan common fishing zone: *Corynosoma* spp. (sciaenids, *Acanthistius brasiliensis*, *Scomber japonicus*, etc.); *Grillotia* spp. (*Cynoscion striatus*, *Micropogonias furnieri*, etc.) (unpublished personal data).

The endoparasite component species *Grillotia* spp., *Corynosoma* spp., *Anisakis* spp., *Hysterothylacium* spp., *D. varicus* and *A. argentinensis* are acquired by feeding on crustaceans, which harbour the early larval stages of nematodes, cestodes, digeneans and acanthocephalans. The distribution pattern, in relation to the number and distribution of the ectoparasites *C. palpifer* and *N. insidiosa* f. *lageniformis* in hake, agrees with that reported by Etchegoin and Sardella (1990).

Some of the accidental species (*A. merluccii*, *T. tortuosus*, and the adult acanthocephala), in spite of their specificity to the genus *Merluccius*, showed relatively low values for prevalence and intensity. This could be due to a seasonal pattern in their life cycles and/or host diet as well as to heterogeneity in geographical distributions. Similar factors could explain low values for *C. crassiceps* and *E. oatesi*.

In the study area, *K. rosenbuschi* showed lower prevalences and intensities than Patagonian hake populations which were studied by Sardella (1984).

Contracaecum spp. and *Pseudoterranova* spp. are parasites which are widely distributed in the local fauna. Their status as accidental species in the hake examined could be attributed to an occasional ingestion of the intermediate host for this species (probably fish). The larval metacestode *Scolex polymorphus* was found together with fish being digested in the gut. These larvae may be in transit in hake.

Hysterothylacium spp. were present in the swim bladder, intestine and body cavity, indicating that *M. hubbsi* could act as both intermediate and definitive host for this nematode, which was found in an advanced reproductive stage in the intestine.

Positive correlations between parasite indices and host length for *Grillotia* spp., *Corynosoma* spp., *Anisakis* spp. and *A. argentinensis* shows a cumulative effect as a result of continuous reinfestation by feeding. They remain in fish hosts long enough to accumulate as they grow.

An increase in correlation with host length for *C. palpifer* and a decrease for *N. insidiosa* f. *lageniformis* agree with the findings of Etchegoin and Sardella (1990).

Contagious distribution is a common feature of parasitism, and is probably related to heterogeneity in host susceptibility in relation to age, sex, immunity or genetic causes (Rohde, 1984). In addition to host factors, the variability of parasite infective stages can be an important cause of overdispersion (Morales and Pino, 1987).

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