

RESEARCH NOTES

J. Parasitol., 94(4), 2008, pp. 946–948
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Parasites in Stranded Cetaceans of Patagonia

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ABSTRACT: There is an increasing interest in parasites of marine mammals of Argentina. Here, we examined several poorly known cetaceans, i.e., 2 spectacled porpoises and 1 Burmeister's porpoise (Phocoenidae), and 1 Gray's beaked whale and 1 Cuvier's beaked whale (Ziphiidae); we also updated the parasite information for 1 sperm whale (Physeteridae). These hosts strand only occasionally. We found *Anisakis simplex* s.l. in 2 spectacled porpoises and the Burmeister's porpoise, and recorded its distribution among the stomach chambers. *Anisakis physeteris* infected the sperm whale; *Corynosoma cetaceum* occurred in the duodenal ampulla of the Burmeister's porpoise; *Corynosoma australe* was found in the posterior-most region of the intestine of 1 spectacled porpoise, while another one had *Tetrabothrius* sp. in the anal crypts; *Corynosoma bullosum* and *Corynosoma* sp. were found in the sperm whale. The only digenean found was *Pholeter gastrophilus* in the Burmeister's porpoise. Merocercoids of *Phyllobothrium delphini* were present in the blubber of 1 spectacled porpoise, the sperm whale, and the Gray's beaked whale, while *Scolex pleuronectis* infected the Gray's beaked whale and 1 spectacled porpoise. No parasites were recovered from the Cuvier's beaked whale. Poor parasite-species assemblages are consistent in marine mammals of Patagonia. Given the conservation status of these hosts, the limited parasitological information gathered is valuable for conservation or management of these hosts in Patagonia.

In the last few years, there has been an increasing interest in parasites of marine mammals in Argentine waters, particularly in odontocetes, together with an increase in the knowledge of parasites in other host taxa, i.e., fish, from the same environment. The studies of marine mammal parasites are limited because they describe only helminth communities of by-caught or stranded hosts (see Aznar et al., 1994; Dans et al., 1999; Berón-Vera et al., 2001; Aznar et al., 2003; Berón-Vera et al., 2007).

In particular, the cetaceans discussed in this study correspond to the IUCN (1994) status of "data deficient or insufficiently known species". They rarely strand on the coast and, when they do, they are difficult to recover once they die. In particular, the spectacled porpoise (*Phocoena dioptrica*), which is distributed in coastal and offshore cold-temperate waters within the Southern Hemisphere (Jefferson et al., 1993) including Antarctic waters (Sekiguchi et al., 2006), rarely strands or is incidentally killed in fishing nets in the southwestern Atlantic Ocean (Jefferson et al., 1993). Parasite information for this host is lacking. Burmeister's porpoises (*Phocoena spinipinnis*), commonly caught in gill-nets (Brownell and Clapham, 1999), are also coastal and distributed off South America in both the Atlantic and Pacific Oceans, although genetic differentiation has been recently found between Peruvian and both Chilean and Argentinean stocks (Rosa et al., 2005). Gray's beaked whales (*Mesoplodon grayi*) are found in cool temperate waters of the Southern Hemisphere (Jefferson et al., 1993), and there is no published information on their parasites. Sperm whales (*Physeter macrocephalus*) and Cuvier's beaked whales (*Ziphius cavirostris*) are distributed in oceanic waters worldwide, but their parasites are little known. Our aim in the present paper is to provide information on parasites and parasite acquisition of these poorly known cetaceans from Argentina and to update preliminary information reported by Crespo et al. (1994).

The study is based on occasional strandings of: (1) a female Burmeister's porpoise (165 kg; 1.70 m) at Punta Bengoa, Chubut province, in September 1995; (2) a female Gray's beaked whale (4.66 m) at San Antonio Oeste, San Matías Gulf, Río Negro province in March 1998; (3) a female Cuvier's beaked whale (3.49 m) at Puerto Madryn, Chubut in December 2001; and (4) 2 spectacled porpoises, including 1 pregnant female (Pd1: 88 kg, 2.0 m) on Playa Unión beach, Chubut in January 2003, and another female (Pd2: 1.94 m) on El Doradillo beach, Chubut

in March 2007. Additionally, we reexamined the parasites found in 1 male sperm whale (15.86 m) that had stranded at Puerto Madryn, Chubut in September 1989 (Crespo et al., 1994).

The hosts were completely necropsied, either in the field or laboratory. Whenever it was possible, blubber and lungs were also examined. The complete digestive tracts were removed and examined for parasites. Each stomach chamber, i.e., forestomach, main stomach, pyloric stomach, and duodenal ampulla, was observed separately to assess nematode and digenean distribution. We isolated the parasites from food contents and recovered them with a 0.5-mm mesh sieve. We measured the intestines from the distal end of the duodenal ampulla to the anus. Then, we divided the intestines into 30 equal lengths and washed the contents of each section through a 0.5-mm mesh sieve to assess the linear distribution of parasites (Aznar et al., 1997). All parasites were fixed and preserved in 70% ethanol. Cestodes were stained in aluminium-carmin and mounted in Canada balsam, while nematodes and acanthocephalans were cleared in lactophenol. Nematodes were classified in 6 developmental stages (third-stage larvae [L3], fourth-stage larvae [L4], pre-adult male [PM], pre-adult female [PF], adult male [AM], and adult female [AF]) following Aznar et al. (2003). Ecological terminology corresponded to Bush et al. (1997). Voucher specimens are available from the collection of the Laboratorio de Mamíferos Marinos (LA-MAMA), Centro Nacional Patagónico, Puerto Madryn, Argentina.

The parasite species found in the hosts analyzed in this study are detailed in Table I. The parasites were recovered from the stomach, intestine, and blubber. All hosts except the Cuvier's beaked whale were parasitized by at least 1 of these species. The cystic *Phyllobothrium delphini* present in the Gray's beaked whale were located in the ventral posterior blubber, while the plerocercoids of *Scolex pleuronectis* (terminology according to Agustí et al., 2005) were inside the anal crypts of the intestine. We could not determine the total number of *P. delphini* and *S. pleuronectis* because this large host was field-examined and only a small sample could be collected. The helminths infecting the sperm whale had been identified by Crespo et al. (1994) as "cestoda cysts" in the blubber, "nematoda" in the mouth, and "acanthocephala" in the intestine. After reexamination, we identified the "cestoda" as merocercoids of *P. delphini*, the "nematoda" as *Anisakis physeteris*, and the "acanthocephala" as *Corynosoma bullosum* and *Corynosoma* sp., which could not be identified to species.

The intensity of *Anisakis simplex* s.l. in Pd1 was 119. Most were located in the forestomach (23 L4, 9 PM, 17 PF, 26 M, 6 F), while the 3 L3 appeared in the main stomach and the remaining individuals (1 L4, 2 PM, 6 PF, 4 M, 9 F) in the esophagus. Additionally, we observed several gastric ulcers in the forestomach associated with these nematodes (1 major ulcer and 10 smaller ones), but no food remains. For those individuals in the esophagus, we assumed post-mortem movement from the stomach. The intensity in Pd2 was 1,278 and included 46.5% L4, 39.4% AF, 10.9% AM, and only 1.9% and 1.3% L3 and PF, respectively. All the individuals infected the forestomach (590 L4, 500 AF, 139 PF, 17 PM, 14 L3), except for 4 AF, 4 L4, and 10 L3 that were in the main stomach. Intestinal infections in the Pd1 were represented by a few *Corynosoma australe*, i.e., 1 adult male collected from intestinal section 24, 3 non-gravid females from section 26, 1 adult male from section 28, and, finally, another immature female from section 30. In the duodenum of the Pd2, we found 2 *Tetrabothrius* sp., 1 complete specimen and 1 fragmented specimen. Additionally, 6 large and 4 small *S. pleuronectis* were located in the rectum. The intensity of *A. simplex* in the Burmeister's porpoise was 352 (351 L4, 1 PF). We also found 2 *Pholeter gastrophilus* encysted in the main stomach wall. In addition, 7 *Corynosoma cetaceum* were present in the duodenum, i.e., 6 females (2 gravid, 4 non-gravid) and 1 male. Also, 4 degenerate L3 and 1 de-

TABLE I. Host species, organs examined, and parasite species found in this study.

Host species	Stomach	Intestine	Blubber	Lungs
<i>Phocoena dioptrica</i> 1	<i>A. simplex</i>	<i>C. australe</i>
<i>P. dioptrica</i> 2	<i>A. simplex</i>	<i>Tetraphobrius</i> sp., <i>S. pleuronectis</i>
<i>P. spinipinnis</i>	<i>A. simplex</i> , <i>P. gastrophilus</i>	<i>C. cetaceum</i> , <i>A. simplex</i>	N/E	N/E
Cuvier's beaked whale
Gray's beaked whale	...	<i>S. pleuronectis</i>	<i>P. delphini</i>	N/E
Sperm whale	<i>A. physeteris</i>	<i>Corynosoma</i> sp., <i>C. bullosum</i>	<i>P. delphini</i>	N/E

* N/E, not examined. Ellipses (...) indicated no parasites found.

generate L4 *A. simplex* occurred in the posterior-most region of the intestine.

There are no parasitological records for spectacled porpoises or Gray's beaked whales. Unfortunately, helminths of Cuvier's beaked whales from Patagonia remain unknown. Although scarce, some parasite information is available for the Burmeister's porpoises; the present host carried the same parasites as those previously reported from Buenos Aires province by Corcuera et al. (1995). In the southern Pacific Ocean, they are infected by *Pseudoterranova* sp. and *Synthesium tursionis*, as well as *A. simplex* and *C. cetaceum* (Sarmiento and Tantalean, 1991; Torres et al., 1992; Torres et al., 1994; Reyes and Van Waerebeek, 1995).

The Burmeister's porpoise from the south Pacific is known to harbor the lungworms *Pseudalius inflexus*, *Stenurus minor*, and *Stenurus australis* (Sarmiento and Tantalean, 1991; Torres et al., 1994; Reyes and Van Waerebeek, 1995). Although they are reported from odontocetes throughout the world, most work has been done in the northern hemisphere, and their absence elsewhere may be due to a lack of study.

Parasitological information regarding the Cuvier's beaked whale is also very limited and corresponds to the Northern Hemisphere (Raga, 1994; Mignucci-Giannoni et al., 1998; Paggi et al., 1998; Fernández et al., 2004). According to the oceanic habits displayed by this host in Patagonia and to the parasites lately found in hosts distributed beyond the continental shelf, we expected to recover *A. simplex*, *P. delphini*, and *S. pleuronectis*, although we did not.

The structure of the *A. simplex* infrapopulations in the spectacled and Burmeister's porpoises follow the same pattern as for other Argentine odontocetes (Aznar et al., 2003) and the harbor porpoise, *Phocoena phocoena*, from eastern Canada (Bratney and Stenson, 1995). Thus, the majority are concentrated in the forestomach. Infections in various hosts along the continental shelf in the southern Atlantic Ocean correspond mostly to larval stages, suggesting that these species of porpoise may not be their most important final hosts in the area (Berón-Vera et al., 2001). The spectacled porpoises Pd1 and Pd2 are the only ones in which mostly adult and pre-adult individuals are found. *Anisakis simplex* intensities in its paratenic hosts within the Argentine continental shelf are low to moderate and show a latitudinal gradient, from moderate at lower latitudes to low at higher latitudes; the primary paratenic hosts are the Argentine shortfin squid *Illex argentinus* (González and Kroeck, 2000), the Argentine anchovy *Engraulis anchoita* (Timi et al., 2001; Timi and Poulin, 2003), and the Argentine hake *Merluccius hubbsi* (Sardella and Timi, 2004). These are part of the main prey of top predators in Patagonia, which include marine mammals such as the dusky dolphin *Lagenorhynchus obscurus* (Koen Alonso et al., 1998), the South American sea lion *Otaria flavescens* (Koen Alonso et al., 2000), and the hourglass dolphin *Lagenorhynchus cruciger* (Fernández et al., 2003). The low intensity of larval stages in paratenic hosts may explain the low to moderate infections of this nematode that we normally find in its final hosts of Patagonia.

Corynosoma australe is a common parasite in pinnipeds (Zdzitowiecki, 1991) that may accidentally infected other marine mammals through infected prey. The Pd1 porpoise may have been infected simply consuming common resources to sympatric hosts, as previously noted for other dolphins within the area (Dans et al., 1999). *Tetraphobrius* spp. are mainly found in pelagic cetaceans (Hoberg, 1987), although in this area we recovered them for the first time in a cetacean host, probably because previous surveys came from frozen carcasses and parasites might have been lost. *Corynosoma* sp. of the sperm whale could only

be identified to genus because the specimens were in poor condition. This cetacean is apparently an unsuitable host for other acanthocephalans, such as *C. bullosum*, which was recorded in the elephant seal *Mirounga leonina* (Zdzitowiecki, 1991). Finally, cetaceans infected by *S. pleuronectis* have been only recorded from the Northern Hemisphere (Agustí et al., 2005; Aznar et al., 2007). It is likely that the parasites may have been lost in previous South American surveys due to their small size and sampling frozen hosts.

We are thankful to A. Buren, M. Coscarella, M. Degradi, N. A. García, C. Gilardoni, F. Grandi, N. Gutiérrez, G. Svendsen, and R. González for their help in animal recovery and technical assistance, and F. J. Aznar and C. Agustí for their help in species identification and helpful comments on the manuscript. The study was supported by Fundación BBVA, PNUD ARG 02/018 and BID 1728/OC-AR PICT 11679. Institutional support was given by Centro Nacional Patagónico (CONICET, Argentina) and the Marine Zoology Unit at ICByBE (U. Valencia, Spain).

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