



## Article

# Parasitic Infections in Stranded Whales and Dolphins in Canary Islands (2018–2022): An Update

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**Simple Summary:** Cetaceans are considered indicator species for the health of the oceans. These wildlife animals are often parasitized by a wide range of species, including external and internal parasites. In turn, the parasites may provide valuable information in biological and ecological terms, where parasitic identification is a fundamental issue for etiological diagnosis, disease epidemiology and health assessment. Here, we update the record of parasites, by morphological identification, that are present in cetaceans stranded in the Canary Islands. Up to eighteen species and nine genera were identified in a wide range of hosts, both dolphins and whales, with different prevalence in each case. These data contribute and improve the general knowledge of the parasitic fauna in Canarian cetaceans, which requires special attention as an important source of information on host ecology and biology, as well as on the health status and imbalances that occur in the parasite–host association.

**Abstract:** The Canary Islands are considered a hot spot for marine species biodiversity. Each stranded cetacean has provided important scientific, biological and pathological information. The morphological identification of parasites in these stranded cetaceans is the main aim of the present article. An investigation to identify parasites was carried out in 233 stranded animals (2018–2022), which were submitted for necropsy. Adult and sub-adult/juvenile animals were the most parasitized age categories, and eighteen parasite species were morphologically identified, including nematodes (*Crassicauda grampicola*, *Crassicauda anthonyi*, *Halocercus delphini*, *Anisakis simplex*, *Stenurus globicephalae*, *Stenurus ovatus*), trematodes (*Nasitrema delphini*, *Oschmarinella rochebruni*, *Brachycladium atlanticum*, *Pholeter gastrophilus*), cestodes (*Clistobothrium delphini*, *Clistobothrium grimaldii*), acanthocephalans (*Bolbosoma vasculosum*, *Bolbosoma capitatum*), protists (*Toxoplasma gondii*) and crustaceans (*Conchoderma auritum*, *Xenobalanus globicipitis*, *Pennella balaenoptera*), as well as nine genera: *Crassicauda* sp., *Halocercus* sp., *Anisakis* sp., *Stenurus* sp., *Nasitrema* sp., *Oschmarinella* sp., *Dyphyllobothrium* sp., *Cyamus* sp., *Conchoderma* sp., and *Sarcocystis* sp. These could not be identified at the species level. Differences in the host specificity of some parasites were observed, varying in prevalence. The accurate morphological identification of the parasites affecting these marine mammals is essential to understanding disease epidemiology, assessing cetacean populations' health status, and developing effective conservation and management strategies.

**Keywords:** cetaceans; conservation; parasites; identification; health



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## 1. Introduction

Marine mammals in the Canary Islands, particularly cetaceans, serve as invaluable bioindicators of the marine ecosystem's environmental status, providing insights into pollution levels and ecological shifts [1–3]. Their health is impacted by various stressors, including parasitic infections [4–7], which may involve internal parasites (such as protozoists, nematodes, cestodes, trematodes, and acanthocephalans) and external parasites like crustaceans [8–10].

Parasites exert a substantial influence on the health of marine mammals and provide critical insights from both biological and ecological perspectives. They are considered indicators of health at the individual, population, and environmental levels [11–13]. Although parasitism is common in wildlife, host–parasite interactions can become unbalanced, leading to negative effects that range from debilitation to mortality and, in some instances, contribute to stranding events [14–17]. The severity of these effects depends on several factors, such as the host's immune status, parasite species and burden and the presence of additional pathogens [13,18,19].

Although few marine mammal parasites exhibit high pathogenicity, those with significant prevalence have been implicated in strandings and mortality [8,14,17]. For instance, worms such as the genus *Crassicauda* Leiper and Atkinson, 1914 [14,20–22] and various Pseudaliids Railliet & Henry, 1909 were found in the lungs and the pterygoid sacs [15,23]. Moreover, trematodes of the genus *Nasitrema* Ozaki, 1935, have been observed in these sacs, which may be implicated in severe central nervous system lesions, directly leading to stranding and death [16,24–28]. In addition, other hepatic and pancreatic trematodes have been identified in a wide range of host species [29–33]. Some of these parasites in cetaceans have an important zoonotic relevance, posing risks to human health and the economy [3,12]. Notable examples include the nematode genus *Anisakis* Dujardin, 1845 and the zoonotic protist *Toxoplasma gondii* Nicolle & Manceaux, 1908 [34–37]. While cetaceans are not typically consumed directly by humans in most regions, infections can be associated with the ingestion of larvae through the consumption of raw or undercooked fish [38]. Additionally, cetaceans play an important role as potential reservoirs and sentinels for zoonotic parasitic agents, contributing to their maintenance and distribution within aquatic environments and participating in the natural transmission cycles of parasites and other infectious agents transmissible to humans [39,40].

Historically, research on the parasitic fauna in marine mammals has been limited, with most studies focusing on parasites found in stranded carcasses, often in advanced stages of decomposition, which complicates analysis [8,18,19,41,42]. Despite these challenges, this manuscript provides new records of parasite species and host interactions in cetaceans from the Canary Islands, contributing novel insights into previously undescribed associations in the region. In total, 31 different species of cetaceans, including 24 odontocetes and 7 mysticetes, have been identified in the Canary Islands by 2022 [43].

The accurate morphological identification of parasites infecting these marine mammals is essential for determining the etiology of parasitic diseases, conducting epidemiological investigations and assessing the health status of both individual animals and their populations [5]. In this study, we updated the genera and parasitic species that affect cetaceans in the Canary Islands, including odontocetes and mysticetes stranded between 2018 and 2022.

## 2. Materials and Methods

### 2.1. Necropsied Animals and Biological Data

Necropsies were performed on 233 stranded animals in the Canary Islands during the period 2018–2022. The necropsy protocol was carried out according to standard and innovative technological procedures [5,6]. Biological data, including species identification, biometrics, age category, sex and body condition, were recorded (Table 1). Age ranges were based on total body length and gonadal development, with individuals categorized as fetus/neonate, calf, juvenile, subadult or adult [5,6,44]. Body condition was assessed according to anatomical parameters and classified into four categories: good, moderate, poor and very poor [45].

**Table 1.** Prevalence of different species according to sex, age, body condition and total prevalence of infected animals stranded in Canary Islands between 2018 and 2022. A: adult; C: calf; F: female; G: good; J-Sad: juvenile–subadult; M: male; Md: moderate; N: neonate; ND: not determined; P: poor; VP: very poor.

	Parasitized Animals (%)	Sex (%)				Age (%)				Body Condition (%)				
		F	M	ND	N	C	J-Sad	A	ND	VP	P	Md	G	ND
<i>Stenella coeruleoalba</i> (n = 53/61)	87	40	58	2		11	29	58	2	6	30	47	8	9
<i>Stenella frontalis</i> (n = 44/51)	86	52	48		5	29	18	48		2	18	50	14	16
<i>Delphinus delphis</i> (n = 25/29)	86	52	48			16	16	68		8	56	16	4	16
<i>Tursiops truncatus</i> (n = 15/17)	88	47	53				33	60	7	13	33	27	13	14
<i>Globicephala macrorhynchus</i> (n = 13/15)	87	54	46			23	31	46			31	23	23	23
<i>Grampus griseus</i> (n = 7/11)	64	57	43			57	29		14	43	14	14		29
<i>Kogia breviceps</i> (n = 9/11)	82	33	67			11	33	56						
<i>Physeter macrocephalus</i> (n = 4/8)	50	75	25				75	25					50	50
<i>Ziphius cavirostris</i> (n = 8/8)	100	50	50				37	50	13	13	13	25	12	37
<i>Steno bredanensis</i> (n = 5/6)	83	60	40		20		20	60		20	40	20		20
<i>Balaenoptera physalus</i> (n = 1/3)	33		100			100					100			
<i>Mesoplodon densirostris</i> (n = 2/3)	67	50	50					100				100		
<i>Mesoplodon europaeus</i> (n = 1/3)	33		100					100				100		
<i>Balaenoptera acutorostrata</i> (n = 1/2)	50	100						100			100			
<i>Lagenodelphis hosei</i> (n = 1/2)	50		100			100						100		
<i>Balaenoptera edeni</i> (n = 1/1)	100		100				100						100	
<i>Kogia sima</i> (n = 1/1)	100	100						100						100
<i>Peponocephala electra</i> (n = 1/1)	100		100				100			100				

## 2.2. Parasite Analysis

Data on the parasite occurrence were obtained from the necropsy reports for all 233 animals examined. Each case included in this study was diagnosed through routine pathological and cause-of-death analyses of stranded cetaceans, performed at the Division of Histology and Animal Pathology, Institute for Animal Health (IUSA), within the Veterinary School at the Universidad de Las Palmas de Gran Canaria. Tissue samples were systematically collected during necropsy, fixed in 10% neutral buffered formalin, carved, routinely processed, embedded in paraffin, sectioned at 5 µm and stained with hematoxylin and eosin (HE) for light microscopic examination (Olympus BX51, Tokyo, Japan). Imaging was conducted using Camera software for DP21 (Ver.02.01.01.93) for pictures or figures (Olympus DP21, Tokyo, Japan). Direct parasite collection, however, was only possible for 57 animals stranded between 2020 and 2022. Complete individual parasites from these cases were preserved in 70% ethanol for subsequent laboratory morphological identification. Nematodes and acanthocephalans were cleared with a lactophenol solution to facilitate better observation of internal structures. Cestodes and trematodes were initially stained with acetocarmine, then dehydrated through a graded ethanol series, cleared with dimethyl phthalate and mounted in a permanent preparation using Canada balsam, following the methods previously used [46]. For detailed observation, a magnifying glass and, primarily, an optical microscope equipped with a monitor were employed. Motic® Images Plus 2.0 ML software and a Moticam digital camera were used to measure parasite length in µm. Parasites were morphologically identified using specific taxonomic guides and keys [25,47–58].

Microscopic protists were identified in histopathological tissue sections, with particular focus on tissues and organs known to harbor *Sarcocystis* (Lankester, 1882) and *Toxoplasma gondii* cysts [26,59,60]. *Toxoplasma gondii* was identified molecularly using a recently developed real-time PCR method described by Sierra et al. [26]. The PCR products obtained from positive cases were processed and sequenced according to Sierra et al. [26], and a BLAST search was performed to verify the identity of the PCR amplicons.

## 3. Results

### 3.1. Necropsied Animals and Biological Data

In the period 2018–2022, 233 animals were necropsied in the Canary Islands belonging to 18 different cetacean species. Animals in a very advanced state of decomposition were not included in this study. In total, 61 striped dolphins (*Stenella coeruleoalba*), 51 Atlantic spotted

dolphins (*Stenella frontalis*), 29 common dolphins (*Delphinus delphis*), 17 bottlenose dolphins (*Tursiops truncatus*), 15 short-finned pilot whales (*Globicephala macrorhynchus*), 11 Risso's dolphins (*Grampus griseus*), 11 pygmy sperm whales (*Kogia breviceps*), 8 sperm whales (*Physeter macrocephalus*), 8 Cuvier's beaked whales (*Ziphius cavirostris*), 6 rough-toothed dolphins (*Steno bredanensis*), 3 fin whales (*Balaenoptera physalus*), 3 Blainville's beaked whales (*Mesoplodon densirostris*), 3 Gervais's beaked whales (*Mesoplodon europaeus*), 2 common minke whales (*Balaenoptera acutorostrata*), 2 Fraser's dolphins (*Lagenodelphis hosei*), 1 Bryde's whale (*Balaenoptera edeni*), 1 dwarf sperm whale (*Kogia sima*) and 1 melon-headed whale (*Peponocephala electra*) were analyzed. Stranded necropsied cetaceans and their respective biological data and stranding location are presented in Supplementary Table S1.

### 3.2. Parasite Analyses

Among the 233 animals necropsied, 192 (82%) were found to be parasitized by one or more species, including nematodes, trematodes, cestodes, acanthocephalans, crustaceans and protists. From the total parasitized animals, parasites were only obtained from 30% of the animals, and 18 parasitic species were identified. Many parasites could not be identified at the species level due to the poor condition of the preservation of the specimens. Table 1 shows the prevalence of parasitism among animals, categorized by sex, age and body condition. Generally, similar prevalence was observed between female and male animals, with the exception of sperm whales, likely due to the higher number of female than male strandings. In addition, adult and juvenile/sub-adult animals showed a higher parasitism rate among species with the most frequent strandings, such as the *D. delphis*, *S. frontalis*, *S. coeruleoalba* and *T. truncatus*. Furthermore, variable differences were observed in the body condition of these animals.

#### 3.2.1. Nematodes

The nematode genus *Crassicauda* had a global prevalence of 43%. The highest prevalence was observed in *Z. cavirostris* (100%) and *S. frontalis* (61%) (Table 2). In *Z. cavirostris*, *Crassicauda anthonyi* Chabaud, 1962 was morphologically identified as responsible for renal parasitosis and vascular damage (Figure 1A), and *Crassicauda grampicola* Johnston & Mawson, 194 was identified parasitizing the pterygoids sacs in two *S. frontalis*, one *T. truncatus* and four *G. griseus* (Figure 1B). *Crassicauda* sp. was also found in the mammary glands, prostate and subcutaneous tissue of several odontocete species and one mysticete (*B. edeni*) (Table 3).

Additionally, the lungs of various stranded odontocetes were frequently parasitized, with the highest prevalence observed in *T. truncatus* (88%) and *D. delphis* (52%) (Table 2). *Halocercus delphini* Baylis & Daubney, 1925 was morphologically identified in two *S. coeruleoalba* (Figure 1C), while *Stenurus ovatus* (von Linstow, 1910) Baylis & Daubney, 1925 was found in four *T. truncatus*, diagnosed by its characteristic cuticle inflammation (Figure 1D). Although not identified at the species level, *Halocercus* sp. and *Stenurus* sp. were also detected in one *S. frontalis* and *S. coeruleoalba*, respectively. Nematodes in the pterygoid sacs were observed in 13% of the animals, with the highest prevalence in *G. macrorhynchus* (67%) (Table 2). *Stenurus globicephalae* Baylis et Daubney, 1925 was the only nematode species identified in the pterygoid sacs of three *G. macrorhynchus* and one *G. griseus* (Image 1e). The zoonotic nematode *Anisakis* sp. had an overall prevalence of 35% across 14 different odontocete species (Table 3), with the highest frequency observed in *K. breviceps* (72%) (Table 2). Both the dwarf sperm whale and melon-headed whale had a 100% prevalence of anisakiasis, although the number of strandings for these species was low ( $n = 1$  for each). Adults of *A. simplex* were identified in one *D. delphis* (Figure 1F) and in the *P. electra*, leading to ulcerated areas. In addition, a species likely to be *A. conf. physeteris* was found in a *K. breviceps*, but confirmation was not possible due to the decomposition state of the carcass and the parasites.

**Table 2.** Numbers of host individuals parasitized over the number of animals analyzed according to each stranded cetacean species in the Canary Islands. B.a: *Balaenoptera acutorostrata*; B.e: *Balaenoptera edeni*; B.p: *Balaenoptera physalus*; D.d: *Delphinus delphis*; G.m: *Globicephala macrorhynchus*; G.g: *Grampus griseus*; K.b: *Kogia breviceps*; K.s: *Kogia sima*; L.h: *Lagenodelphis hosei*; M.d: *Mesoplodon densirostris*; M.e: *Mesoplodon europaeus*; P.e: *Peponocephala electra*; P.m: *Physeter macrocephalus*; S.c: *Stenella coeruleoalba*; S.f: *Stenella frontalis*; S.b: *Steno bredanensis*; T.t: *Tursiops truncatus*; Z.c: *Ziphius cavirostris*.

Parasites	S.c	S.f	D.d	T.t	G.m	G.g	K.b	P.m	Z.c	S.b	B.p	M.d	M.e	B.a	L.h	B.e	K.s	P.e
<b>Nematodes</b>																		
<i>Crassicauda</i> sp.	15/61	31/51	7/29	9/17	4/15	3/11	3/11	-	8/8	-	-	-	-	-	-	1/1	-	-
<i>Crassicauda anthonyi</i>	-	-	-	-	-	-	-	-	8/8	-	-	-	-	-	-	-	-	-
<i>Crassicauda grampicola</i>	-	2/51	-	1/17	-	4/11	-	-	-	-	-	-	-	-	-	-	-	-
<i>Halocercus</i> sp.	-	1/51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Halocercus delphini</i>	2/61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Stenurus</i> sp.	1/61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Stenurus ovatus</i>	-	-	-	4/17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Stenurus globicephalae</i>	-	-	-	-	3/15	1/11	-	-	-	-	-	-	-	-	-	-	-	-
<i>Anisakis</i> sp.	20/61	9/51	8/29	4/17	6/15	1/11	8/11	3/8	3/8	2/6	-	-	1/3	-	1/2	-	1/1	1/1
<i>Anisakis simplex</i>	-	-	1/29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1/1
<b>Trematodes</b>																		
<i>Nasitrema</i> sp.	7/61	8/51	9/29	12/17	-	-	1/11	-	-	3/6	-	-	-	-	-	-	-	-
<i>Nasitrema delphini</i>	2/61	-	1/29	3/17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Brachycladium atlanticum</i>	3/61	-	1/29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Oschmarinella</i> sp.	-	-	-	-	-	-	-	-	2/8	-	-	-	-	-	-	-	-	-
<i>Oschmarinella rochebruni</i>	2/61	2/51	1/29	1/17	-	-	-	-	-	1/6	-	-	-	-	-	-	-	-
<i>Pholeter gastrophilus</i>	36/61	11/51	11/29	10/17	7/15	1/11	-	-	-	3/6	-	-	1/3	-	-	-	1/1	-
<b>Cestodes</b>																		
<i>Dyphyllobothrium</i> sp.	7/61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Clistobothrium delphini</i>	36/61	25/51	12/29	7/17	9/15	1/11	5/11	2/8	6/8	3/6	-	1/3	1/3	1/2	-	-	1/1	-
<i>Clistobothrium grimaldii</i>	38/61	11/51	12/29	5/17	7/15	1/11	4/11	-	-	2/6	1/3	-	-	-	-	-	-	-
<b>Acanthocephalans</b>																		
<i>Bolbosoma vasculosum</i>	2/61	-	1/29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Bolbosoma capitatum</i>	-	-	-	-	4/15	-	-	-	-	-	-	-	-	-	-	-	-	1/1
<b>Crustaceans</b>																		
<i>Cyamus</i> sp.	-	-	-	-	-	-	-	-	2/8	-	-	-	-	-	-	-	-	-
<i>Pennella balaenoptera</i>	2/61	-	-	1/17	-	-	1/11	-	1/8	1/6	-	-	-	-	-	1/1	-	1/1
<i>Conchoderma</i> sp.	-	1/51	2/29	1/17	1/15	-	-	-	2/8	-	-	-	-	-	-	-	-	-
<i>Conchoderma auritum</i>	-	-	-	-	-	-	-	-	1/8	-	-	-	-	-	-	-	-	-
<i>Xenobalanus globicipitis</i>	7/61	8/51	11/29	2/17	5/15	4/11	-	-	-	1/6	-	-	-	-	-	-	-	1/1
<b>Protists</b>																		
<i>Sarcocystis</i> sp.	4/61	4/51	6/29	-	-	-	-	2/8	-	-	-	-	-	-	-	-	-	-
<i>Toxoplasma gondii</i>	2/61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**Table 3.** Endoparasites and ectoparasites reported in the parasitized cetaceans during the period 2018–2022.

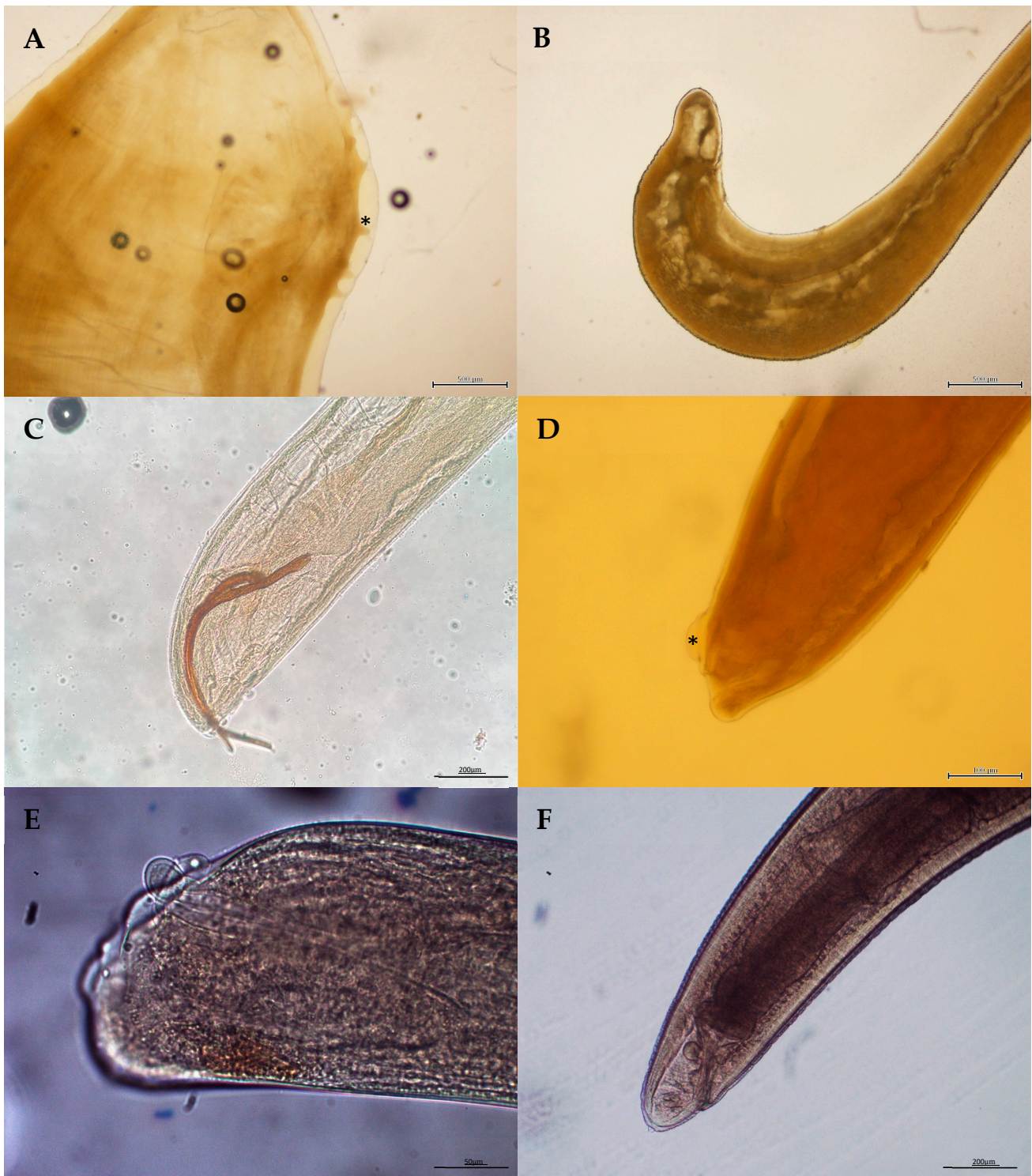
Parasites	Host	Site
<b>Nematodes</b>		
<i>Crassicauda</i> sp.	<i>B. edeni</i> , <i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>G. griseus</i> , <i>K. breviceps</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>T. truncatus</i> , <i>Z. cavirostris</i>	Mammary gland, Kidney, subcutaneous tissue, prostate, pterygoid sacs
<i>C. anthonyi</i>	<i>Z. cavirostris</i>	Kidney
<i>C. grampicola</i>	<i>G. griseus</i> , <i>S. frontalis</i> , <i>T. truncatus</i>	Pterygoid sacs
Non-identified lungworms	<i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>G. griseus</i> , <i>M. europaeus</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>S. bredanensis</i> , <i>T. truncatus</i>	Lung
<i>H. delphini</i>	<i>S. coeruleoalba</i>	Lung
<i>S. ovatus</i>	<i>T. truncatus</i>	Lung
<i>Stenurus globicephalae</i>	<i>G. macrorhynchus</i> , <i>G. griseus</i>	Pterygoid sacs
Non-identified pterygoid sacs nematodes	<i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>G. griseus</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>S. bredanensis</i> , <i>T. truncatus</i>	Pterygoid sacs
<i>Anisakis</i> sp.	<i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>G. griseus</i> , <i>K. breviceps</i> , <i>K. sima</i> , <i>L. hosei</i> , <i>M. europaeus</i> , <i>P. electra</i> , <i>P. macrocephalus</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>S. bredanensis</i> , <i>T. truncatus</i> , <i>Z. cavirostris</i>	Digestive tract
<i>A. simplex</i>	<i>D. delphis</i> , <i>P. electra</i>	Digestive tract

Table 3. Cont.

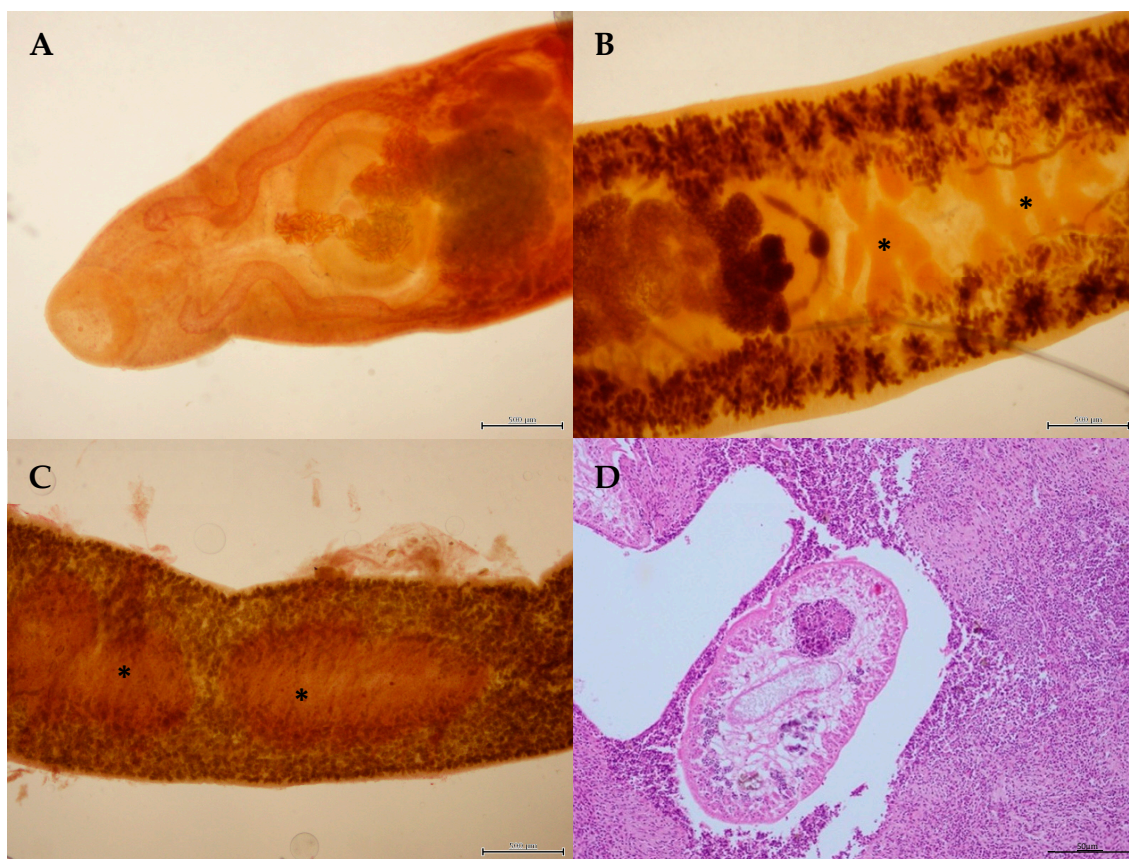
Parasites	Host	Site
<b>Trematodes</b>		
<i>Nasitrema</i> sp.	<i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>K. breviceps</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>S. bredanensis</i> , <i>T. truncatus</i>	Pterygoid sacs, CNS
<i>N. delphini</i>	<i>D. delphis</i> , <i>S. coeruleoalba</i> , <i>T. truncatus</i>	Pterygoid sacs
Non-identified hepatic trematodes	<i>B. edeni</i> , <i>D. delphis</i> , <i>M. europaeus</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>T. truncatus</i> , <i>Z. cavirostris</i>	Bile ducts
Non-identified pancreatic trematodes	<i>D. delphis</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>T. truncatus</i>	Pancreas
<i>B. atlanticum</i>	<i>D. delphis</i> , <i>S. coeruleoalba</i>	Bile ducts, pancreas
<i>O. rochebruni</i>	<i>D. delphis</i> , <i>S. coeruleoalba</i> , <i>S. bredanensis</i> , <i>S. frontalis</i> , <i>T. truncatus</i>	Bile ducts, pancreas
<i>P. gastrophilus</i>	<i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>G. griseus</i> , <i>K. sima</i> , <i>M. europaeus</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>Steno bredanensis</i> , <i>T. truncatus</i>	Stomach
<b>Cestodes</b>		
Non-identified digestive cestodes	<i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>G. griseus</i> , <i>P. electra</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>T. truncatus</i>	Digestive tract
<i>Diphyllobothrium</i> Cobbold, 1858	<i>S. coeruleoalba</i>	Digestive tract
<i>C. delphini</i>	<i>B. acutorostrata</i> , <i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>G. griseus</i> , <i>K. breviceps</i> , <i>K. sima</i> , <i>M. densirostris</i> , <i>M. europaeus</i> , <i>P. macrocephalus</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>S. bredanensis</i> , <i>T. truncatus</i> , <i>Ziphius cavirostris</i>	Blubber
<i>C. grimaldii</i>	<i>B. physalus</i> , <i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>G. griseus</i> , <i>K. breviceps</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>S. bredanensis</i> , <i>T. truncatus</i>	Abdominal serous
<b>Acanthocephalans</b>		
Non-identified acanthocephalans	<i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>M. europaeus</i> , <i>P. electra</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i>	Digestive tract
<i>B. vasculosum</i>	<i>D. delphis</i> , <i>S. coeruleoalba</i>	Digestive tract
<i>B. capitatum</i>	<i>G. macrorhynchus</i> , <i>P. electra</i>	
<b>Ectoparasites</b>		
Non-identified cyamids	<i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>M. europaeus</i> , <i>P. macrocephalus</i> , <i>S. coeruleoalba</i> , <i>T. truncatus</i> , <i>Z. cavirostris</i>	Skin
<i>Cyamus</i> sp.	<i>Z. cavirostris</i>	Skin
Non-identified copepods	<i>B. edeni</i> , <i>K. breviceps</i> , <i>P. electra</i> , <i>S. coeruleoalba</i> , <i>S. bredanensis</i> , <i>T. truncatus</i> , <i>Z. cavirostris</i>	Skin
<i>Pennella balaenoptera</i>	<i>B. edeni</i> , <i>K. breviceps</i> , <i>P. electra</i> , <i>S. coeruleoalba</i> , <i>S. bredanensis</i> , <i>T. truncatus</i> , <i>Z. cavirostris</i>	Skin
Non-identified cirripedes	<i>D. delphis</i> , <i>G. griseus</i> , <i>P. macrocephalus</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>T. truncatus</i>	Skin
<i>Conchoderma</i> sp.	<i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>S. frontalis</i> , <i>Z. cavirostris</i>	Skin
<i>C. auritum</i>	<i>Z. cavirostris</i>	Buccal commissure
<i>Xenobalanus globicipitis</i>	<i>D. delphis</i> , <i>G. macrorhynchus</i> , <i>G. griseus</i> , <i>P. electra</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i> , <i>S. bredanensis</i> , <i>T. truncatus</i>	Skin
<b>Protists</b>		
<i>Sarcocystis</i> sp.	<i>D. delphis</i> , <i>P. macrocephalus</i> , <i>S. coeruleoalba</i> , <i>S. frontalis</i>	Skeletal muscle
<i>T. gondii</i>	<i>S. coeruleoalba</i>	Systemic infection

### 3.2.2. Trematodes

The prevalence of *Nasitrema* spp. was 23%, predominantly affecting the pterygoid sacs and occasionally the central nervous system (CNS) in odontocetes (Table 3). The highest prevalence was observed in *T. truncatus* (71%) and *S. bredanensis* (50%) (Table 2). *Nasitrema delphini* Neiland, Rice, & Holden, 1970 was morphologically identified in three *T. truncatus*, two *S. coeruleoalba* and one *D. delphis* (Table 2 and Figure 2A).



**Figure 1.** Microscopic views of the nematodes (A) Posterior end of a male (papillae in asterisk) of *Crassicauda anthonyi*. (B) Posterior end of a male of *Crassicauda grampicola* in the pterygoid sacs of *Grampus griseus*. (C) Posterior end of a male of *Halocercus delphini*. (D) Posterior end of a female of *Stenurus ovatus* (inflammation of the cuticle in asterisk). (E) Posterior end of a female *Stenurus globicephalae*. (F) Posterior end of a female of *Anisakis simplex*.



**Figure 2.** (A) Anterior end of *Nasitrema delphini*. (B) Detail of the posterior third quarter of the body of *Brachycladium atlanticum* showing the genitalia (testes in asterisks). (C) Detail of the middle third quarter of the body of *Oschmarinella rochebruni* showing the testes (asterisks). (D) Histological view of *Pholeter gastrophilus* in pyloric stomach leading to granulomatous gastritis. H-E stain.

Hepatic trematodes were found in 23% of the stranded marine mammals, primarily affecting the bile ducts, while pancreatic trematodes were detected in 24% of the animals. Varied prevalence was observed for liver flukes, with *D. delphis* and *G. macrorhynchus* showing higher infection rates in the pancreas. Among the stranded species, *S. coeruleoalba* and *S. frontalis* were the most frequently parasitized by liver and pancreatic trematodes. *Brachycladium atlanticum* (Abril, Balbuena and Raga, 1991) Gibson, 2005 (Figure 2B) was identified in *D. delphis* and three *S. coeruleoalba*, while *Oschmarinella rochebruni* (Poirier, 1886) Gibson & Bray, 1997 was morphologically identified in one *S. bredanensis*, two *S. coeruleoalba*, two *S. frontalis*, one *D. delphis* and one *T. truncatus*, affecting both the bile ducts and pancreas (Figure 2C). Brachycladiid trematodes, with an everted cirrus, compatible with the genus *Oschmarinella* were also collected in the bile ducts of two *Z. cavirostris*; however, their specific identity was not obtained. In addition, cysts of *Pholeter gastrophilus* (Kossack, 1910) Odhner, 1914 were found embedded in the mucosa, mainly in the glandular and pyloric regions of the stomach (Figure 2D), with the highest prevalences observed in *S. coeruleoalba* (59%) and *T. truncatus* (59%) (Table 2).

### 3.2.3. Cestodes

Cestodes were identified in the intestine of 16% of the stranded cetaceans analyzed in this study. However, only the genus *Diphyllobothrium* Cobbold, 1858 was identified in seven *S. coeruleoalba* (Table 2) due to the advanced decomposition state of these parasites and the absence of scolex and mature proglottids (Figure 3A). In addition, larval forms of the cestodes of *Clistobothrium delphini* (Bosc, 1802) Caira, Jensen, Pickering, Ruhnke & Gallagher, 2020 were detected in 14 different species, mainly in the anogenital region



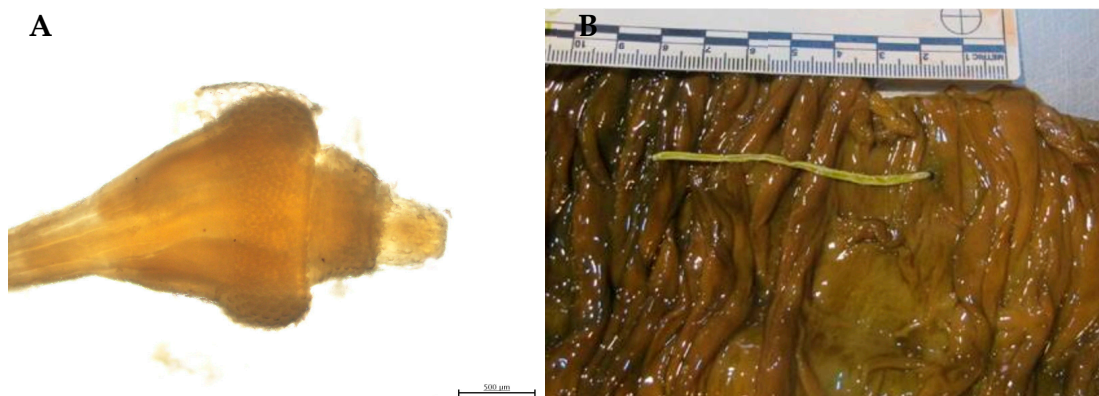
(Figure 3B). *Clistobothrium grimaldii* (Moniez, 1889) Caira, Jensen, Pickering, Ruhnke & Gallagher, 2020 larvae were mainly observed in the abdominal serosa (Figure 3C). Both types of metacestodes were present in mysticetes and odontocetes, with varying prevalence across different host species (Table 2).



**Figure 3.** (A) Gravid proglottid of *Diphyllbothrium* sp. (B) *Clistobothrium delphini* cyst at subcutaneous tissue. (C) *Clistobothrium grimaldii* cyst in the abdominal serosa.

### 3.2.4. Acanthocephalans

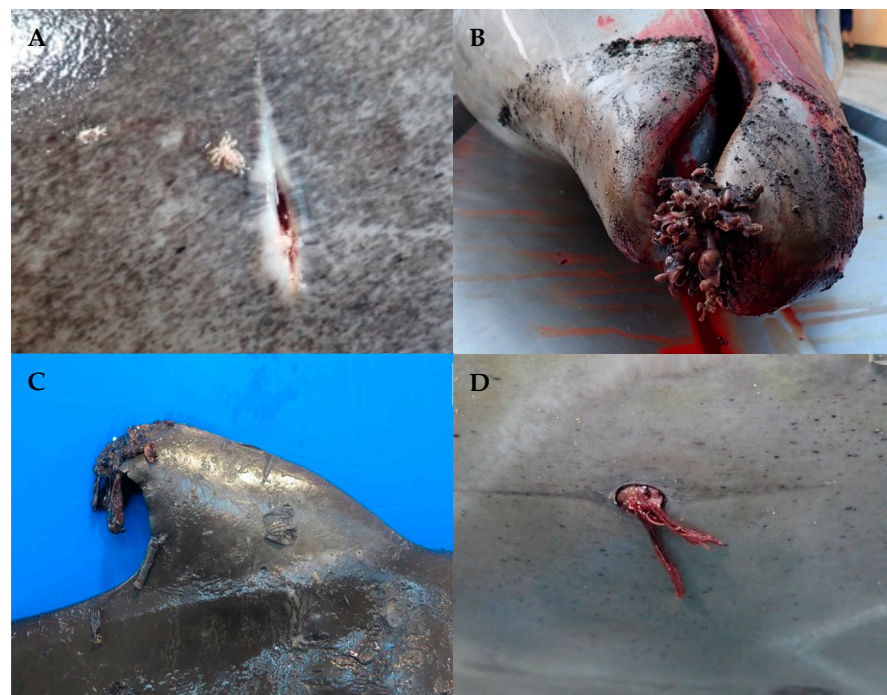
Acanthocephalans were detected in only 8% of the stranded animals in seven different odontocete species (Table 3). Specifically, immature specimens of *Bolbosoma vasculosum* (Rudolphi, 1819) Porta, 1908 (Figure 4A) were identified in one *D. delphis* and two *S. coeruleoalba* (Table 2), while *Bolbosoma capitatum* (von Linstow, 1880) Porta, 1908 was identified in four *G. macrorhynchus* and one *P. electra* (Figure 4B). These parasites were embedded by their cephalic end in the gastric and intestinal mucosa.



**Figure 4.** (A) Anterior end of *Bolbosoma vasculosum*. (B) *Bolbosoma capitatum* embedded in the intestinal mucosa of one short-finned pilot whale during necropsy.

### 3.2.5. Crustaceans

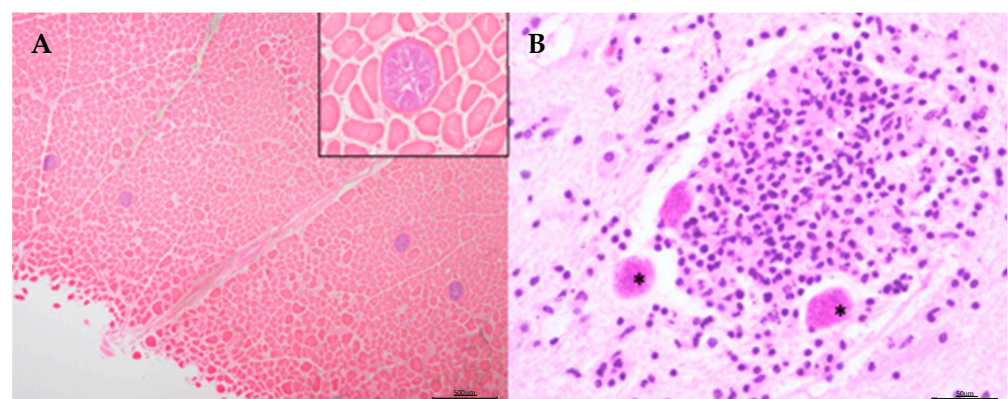
Ectoparasitic crustaceans were found in 44% of the stranded cetaceans, including cyamids, barnacles and copepods. Table 3 shows the parasitized host species and their location. Two specimens of the genus *Cyamus* Latreille, 1796 were identified in one *Z. cavirostris* (Figure 5A). Among the barnacles, *Conchoderma auritum* Linnaeus, 1767 was identified on a *Z. cavirostris* (Figure 5B), based on its ear-like extension in the capitulum, and *Conchoderma* sp. in five different species of odontocetes (Table 2). *Xenobalanus globicipitis* Steenstrup, 1852 was identified on eleven *D. delphis*, five *G. macrorhynchus*, four *G. griseus*, one *P. electra*, seven *S. coeruleoalba*, eight *S. frontalis*, one *S. bredanensis* and two *T. truncatus* (Table 2), primarily on the caudal, dorsal and pectoral fins (Figure 5C). At the same time, large-size copepods, *Pennella balaenoptera* Koren & Danielssen, 1877, were seen attached to the skin and embedded on the muscle (Figure 5D) in seven different host species (Tables 2 and 3).



**Figure 5.** (A) *Cyamus* sp. associated with a linear injury in one *Ziphius cavirostris* during necropsy. (B) *Conchoderma auritum* attached to the rostral border of the mandible of a *Ziphius cavirostris*. (C) *Xenobalanus globicipitis* attached to the dorsal tail in a *Delphinus delphis*. (D) *Pennella balaenoptera* associated with ulceration in a *Ziphius cavirostris*.

### 3.2.6. Protists

Infection with the genus *Sarcocystis* was diagnosed in 8% of the animals based on histological examination, with revealed multifocal cysts within myofibers (Figure 6). No associated inflammatory processes were observed in any of the cases. *Toxoplasma gondii* was detected in two *S. coeruleoalba* during 2018–2022, with a total prevalence of 3% in this odontocete species (Table 2). Systemic toxoplasmosis was associated with an inflammatory reaction, and intracellular protist cysts were observed in the CNS (Figure 6B), as well as in the heart, skeletal muscle, adrenal glands, pancreas, liver, lung, spleen, pituitary, thyroid, genitourinary and digestive tracts through histopathological analysis in both animals. Molecular testing confirmed the presence of *T. gondii* in both animals.



**Figure 6.** (A) Histological views of cysts of *Sarcocystis* sp. in the skeletal muscle. H-E stain. Inset: details of the cyst.  $\times 40$  H-E. (B) Lymphohistiocytic to granulomatous inflammation with some associated *T. gondii* protist cysts (asterisk) of the CNS. H-E stain.

#### 4. Discussion

The Canary Islands are recognized for their high natural value, attributed to their oceanographic characteristics, substantial cetacean biodiversity (comprising 31 species) and their strategic location along the migratory routes of numerous seasonal and a few resident cetacean species [43]. Parasitism in wildlife is prevalent, with cetaceans often hosting multiple parasitic species throughout their lives. In addition, these animals may experience infectious processes due to other pathogens, toxic exposure and various natural or anthropogenic factors, which can disrupt the balance in parasite–host interactions [10,18,61]. Anthropogenic activity in the Canary Islands has significantly increased, exposing marine mammals to various threats such as fishing nets, the ingestion of marine litter and vessel collisions [62–64]. The interaction between cetaceans and their parasites may have implications for disease transmission to other marine species and humans [65,66]. Therefore, comprehensive research on cetacean-associated parasites is crucial for understanding the ecological dynamics of these populations and for developing effective conservation and management strategies to preserve marine biodiversity in the region while assessing animal health. During the period 2018–2022, 233 cetacean carcasses from eighteen different marine mammal species were necropsied. The stranding of cetaceans in the Canary Islands can result from both natural and anthropogenic causes [5,6,67]. Of the cetaceans examined, 82% were found to be parasitized, with neonates being less frequently parasitized compared to juveniles/sub-adults or adults. This pattern likely reflects the increasing exposure to parasites that wildlife encounters throughout their lives [68]. While parasite prevalence was similar between males and females, in some cases, high parasite burdens were noted, compromising the health of the infected organ and the overall condition of the animal, depending on the parasite involved. However, no clear relationship was observed between parasitism and body condition in this study, which contrasts with findings from other research that have identified such associations [69].

Nematodes identified as *Crassicauda* spp. were associated with higher parasite burdens in this survey and severe lesions on host individuals. Relevant inflammatory responses were observed in the kidneys, muscles, prostate, mammary glands and pterygoid sacs of parasitized cetaceans, consistent with previous studies [20–22,70–73]. Despite the extensive lesions in the kidneys, characterized by a predominant eosinophilic response, parasitism did not alter the body condition. Special attention should be given to the inflammation of the pterygoid sacs, as lesions in this area have been proposed as a potential cause of strandings [74,75]. Nematodes of this genus were highly prevalent in the studied carcasses. Although crassicaudid species have been reported in a wide range of organs and tissues, including the vasculature, urogenital organs, placenta, mammary glands, cranial sinuses, lungs, musculature and subcutaneous fat layer [19], each species appears to exhibit a distinct tissue-specific localization and variability in host specificity. Thus, *Crassicauda anthonyi* appears to be a species-specific parasite of *Z. cavirostris*, primarily affecting the kidneys, as recently reported in Brazil [76], the Mediterranean Sea [77] and Japan [78]. Similarly, *Crassicauda grampicola* is known to have a strong affinity for *G. griseus*, particularly inhabiting the pterygoid sacs, where it can induce local inflammation, potentially contributing to strandings [15,21,79,80]. In our study, *C. grampicola* was identified in the pterygoid sacs of three odontocete species: *G. griseus*, *S. frontalis* and *T. truncatus*. The absence of nematodes in the pterygoid sacs of mysticete cetaceans in our study may be explained by the less frequent examination of their cranial regions, primarily due to logistical constraints. Additionally, this parasite species has been reported in other organs, such as the mammary gland of Atlantic white-sided dolphin (*Lagenorhynchus acutus*) [81] and the prostate gland in four different odontocete species in the Canary Islands [73]. However, in the present study, the identification of *C. grampicola* in reproductive organs was not possible. Finally, *C. boopis* is commonly known to parasitize the urinary tract of *B. physalus* [71,72,77,82], though in this case, the species-level identification of the *Crassicauda* sp. found in the fin whale was not achieved.

Pulmonary nematodes from the family Pseudaliidae are among the most commonly encountered parasites in cetaceans, with species of the genera *Halocercus*, *Stenurus* and *Pseudalius* being frequently reported [83]. In this study, *Halocercus delphini*, *Stenurus globicephala* and *Stenurus ovatus* were identified in four cetacean species. To the authors' knowledge, this represents the first morphological identification of these species in the Canary Islands. On the northwest coast of Spain, nematodes of the genus *Stenurus* were found to be the most prevalent in the lungs of stranded odontocetes, although they were also observed in the pterygoid sacs [84]. In the present study, *Stenurus globicephalae* was identified in *G. macrorhynchus* and *G. griseus*, while *Stenurus ovatus* and *Halocercus delphini* were exclusively found in *T. truncatus* and *S. coeruleoalba*, respectively. This aligns with the existing literature, which indicates that *Stenurus globicephala* is host-restricted to the clade Globicephalinae, whereas *Stenurus ovatus* and *Halocercus delphini* are associated with the clade Delphininae [84,85]. The findings of this survey support this observation; however, the low prevalence of these nematodes in our study underscores the need for further data to strengthen this hypothesis and provide more comprehensive insights into host–parasite relationships.

*Anisakis* spp. were commonly found in the forestomach of various hosts in this survey, as expected, across fourteen odontocete species. These nematodes were sometimes observed free in the stomach lumen, while in other cases, they were attached to the gastric mucosa. In some instances, inflammatory and ulcerated areas, hemorrhages and necrotic lesions were observed in the stomach, as previously described [36,86–88]. Such lesions caused by *Anisakis* spp. have also been documented in the Canary Islands [89]. Unfortunately, as noted in other studies [90], the poor conservation status of many of these worms made species identification difficult. However, *A. simplex* was identified in two animals from our study, a *D. delphis* and a *P. electra*, marking the first recorded instance of adult *A. simplex* in the *P. electra*, to the authors' knowledge. A clear pattern of host preference has been reported for *Anisakis simplex*, with a predominant infection in delphinids [91]. The presence of this zoonotic nematode in the Canary Islands is of particular importance, as it poses potential risks to the local fishing industry and public health and should be considered in local food safety regulations. Further investigation into the prevalence and impact of *Anisakis* spp. in this region is warranted.

Several trematodes are well-known pathogens in marine mammals, with some species causing significant health impacts. *Nasitrema delphini* has been previously reported, in a stranded *Mesoplodon densirostris* in the Canary Islands, associated with mild to severe sacculitis, neuritis, otitis and meningoencephalitis [27]. In this study, *N. delphini* was also detected in *D. delphis*, *S. coeruleoalba*, *T. truncatus* and, frequently in association with inflammatory lesions. In the liver and pancreas, *Brachycladium atlanticum* was primarily observed, as expected, in *S. coeruleoalba*, in line with previous findings from the Mediterranean Sea [92], and in *D. delphis*. *Oschmarinella rochebruni* was detected in several other members of the Delphinidae family, consistent with reports from other studies worldwide [19,92,93]. Less frequent is the presence of trematodes in the liver of *Z. cavirostris* [48,49,53,54]. Even though the trematode specimens were found in good conditions and some but not all specimens, had an everted cirrus, they were identified within the genus *Oschmarinella*, but specific identification was not possible. A more accurate diagnosis is necessary to confirm the species involved.

*Diphyllobothrium* Cobbold, 1858 is the only zoonotic cestodes known to infect marine mammals [94,95]. Although it has previously been recorded in the Canary Archipelago in *D. delphis*, *S. coeruleoalba* and *S. frontalis* [89]. However, during the five years of this study, it was only identified in *S. coeruleoalba*. Unsurprisingly, cysticercosis caused by *Clistobothrium delphini* and *Clistobothrium grimaldii* was commonly found in odontocetes in this survey. The presence of *C. grimaldii* in mysticetes, though less frequent [96], was also recorded, with this study marking the first documentation of this metacestode in a fin whale in the region.

Additionally, several other parasites were identified, including the lower-occurring acanthocephalans—eight percent in this survey—such *Bolbosoma vasculosum* and *Bolbosoma*

*capitatum*. *Bolbosoma capitatum* has been documented in large odontocete species, being well known in *G. macrorhynchus* [97,98]. In addition, its presence in *P. electra* is considered in a new report within the Canary Islands, as previously described [98]. In contrast, *Bolbosoma vasculosum* has been reported in a wider range of odontocete species [97–101], reported in this survey in *D. delphis* and *S. coeruleoalba*. Additionally, accidental infections in humans involving parasites of this genus, particularly *Bolbosoma capitatum*, have been documented. The zoonotic potential of these acanthocephalans, similar to that of anisakiasis, is worth highlighting, especially in regions where raw fish consumption is common [37,102,103].

Concerning cyamids, only one specimen could be identified as *Cyamus* sp. Given the limited identification of these parasites, the use of other diagnostic techniques may be useful to confirm the species involved. Furthermore, this study presents the first recorded identification of *Conchoderna auritum* in a *Z. cavirostris* from the Canary Islands, previously reported only in Greek waters [104]. Similarly, *Xenobalanus globicipitis*, a barnacle frequently found in various odontocete species worldwide [97,105–110], including those in the Canary Islands, was also observed. These findings broaden the understanding of host–parasite interactions in the region and contribute to the growing body of knowledge on marine mammal parasitology.

Finally, protist cysts of *Sarcocystis* sp. were identified in the muscles of fifteen animals. This prevalence aligns with previous observations, and no inflammatory processes were associated with the presence of these cysts, suggesting that *Sarcocystis* sp. may not have significant pathological relevance [111]. The presence of *Toxoplasma gondii* was confirmed in two *S. coeruleoalba* through molecular and histopathological analyses, making the first reported case of *T. gondii* in *S. coeruleoalba* in the Canary Islands. Prior reports have identified *T. gondii* in *S. frontalis* within the region [5,6,26], where it has been associated with systemic infections and lesions similar to those observed in the current study. *T. gondii* is a notable pathogen and zoonotic protozoan that can cause severe lesions, significantly impacting animal health and potentially leading to stranding and death [26,59,112–116].

The parasitic fauna of cetaceans provides critical insights into host ecology and biology, serving as a valuable tool for understanding the impacts of parasites on cetacean health, which can influence stranding and mortality rates. Accurate parasite identification and health assessment are essential for elucidating imbalances in parasite–host interactions and serve as important biological and environmental indicators. This study has contributed to the knowledge of parasitic species affecting cetaceans stranded in the Canary Islands, including new reports of parasitic species and novel host records, thereby advancing our understanding of the parasitic fauna in this region.

## 5. Conclusions

The present study represents an update of the parasitic species and genera present in cetaceans, both odontocetes and mysticetes, stranded in the Canary Islands over the period between 2018 and 2022. At least eighteen parasitic species and nine genera were identified morphologically in cetaceans during this time.

Significant differences in parasitic prevalence were observed among the analyzed animals, with adult and juvenile/sub-adult animals being the most commonly parasitized, and the genus *Crassicauda*, the most frequently detected (43%).

These findings provide an overview of the current parasitism in cetaceans of the Canary Islands. Collection information on parasite diversity in cetaceans provides an important basis for understanding the impacts on the host and the ecology of the ecosystem. In addition, it allows us to carry out the monitoring of environmental changes over time, offering insights into potential shifts in the marine waters surrounding the Canary Islands, as well as the monitoring of the individual and population health of cetacean populations and their possible impact on human health.

**Supplementary Materials:** The following supporting information can be downloaded at <https://www.mdpi.com/article/10.3390/ani14233377/s1>: Table S1: Biological data and strand-

ing location of 233 stranded and necropsied cetaceans. Sex: female (F), male (M), not determined (ND). Age: neonate (N), calf (C), juvenile–subadult (J), adult (A). Type of stranding (TS): dead (D), alive (Al). Body condition (BC): good (G), moderate (Md), poor (P), very poor (VP), not determined (ND). Conservation status (CS): very fresh (VF), fresh (F), moderate autolysis (MA), advanced autolysis (AA). Stranding location, islands (IS): Gran Canaria (GC), Fuerteventura (FV), Lanzarote (LZ), Tenerife (TF), La Gomera (LG), El Hierro (EH), La Palma (LP), La Graciosa (LGra).

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**Institutional Review Board Statement:** Under current Spanish legislation (Real Decreto 53/2013), ethical review was not required for this study. The research did not involve live animal experimentation; it was conducted on dead, stranded animals.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** The data presented in this study are available within the article and the Supplementary Materials.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

## References

1. Bossart, G.D. Marine mammals as sentinel species for oceans and human health. *Vet. Pathol.* **2011**, *48*, 676–690. [[CrossRef](#)] [[PubMed](#)]
2. Martín, V.; Servidio, A.; Tejedor, M.; Arbelo, M.; Brederlau, B.; Neves, S.; Perez-Gil, M.; Urquiola, E.; Perez-Gil, E.; Fernández, A. Cetaceans and conservation in the Canary Islands. In Proceedings of the 18th Biennial Conference on the Biology of Marine Mammals, Quebec City, QC, Canada, 12–16 October 2009; p. 153.
3. Perrin, W.F.; Würsig, B.; Thewissen, J.G.M. *Encyclopedia of Marine Mammals*; Academic Press: Cambridge, MA, USA, 2009; ISBN 9780123735539.
4. Domiciano, I.G.; Domit, C.; Broadhurst, M.K.; Koch, M.S.; Bracarense, A.P.F.R.L. Assessing disease and mortality among small cetaceans stranded at a world heritage site in Southern Brazil. *PLoS ONE* **2016**, *11*, e0149295. [[CrossRef](#)] [[PubMed](#)]
5. Díaz-Delgado, J.; Fernández, A.; Sierra, E.; Sacchini, S.; Andrada, M.; Vela, A.I.; Quesada-Canales, O.; Paz, Y.; Zucca, D.; Groch, K.; et al. Pathologic findings and causes of death of stranded cetaceans in the Canary Islands (2006–2012). *PLoS ONE* **2018**, *13*, e0204444. [[CrossRef](#)] [[PubMed](#)]
6. Arbelo, M.; De Los Monteros, A.E.; Herráez, P.; Andrada, M.; Sierra, E.; Rodríguez, F.; Jepson, P.D.; Fernández, A. Pathology and causes of death of stranded cetaceans in the Canary Islands (1999–2005). *Dis. Aquat. Org.* **2013**, *103*, 87–99. [[CrossRef](#)] [[PubMed](#)]
7. Berón-Vera, B.; Crespo, E.A.; Raga, J.A. Parasites in stranded cetaceans of Patagonia. *J. Parasitol.* **2008**, *94*, 946–948. [[CrossRef](#)]
8. Aznar, F.J.; Balbuena, J.A.; Fernández, M.; Raga, J.A. *Living Together: The Parasites of Marine Mammals*; Springer: Boston, MA, USA, 2002; pp. 385–423. ISBN 9781461505297.
9. Dailey, M.D. Parasites of Marine Mammals. In *Marine Parasitology*; Rohde, K., Ed.; CSIRO Publishing (Commonwealth Scientific and Industrial Research Organization): Collingwood, Australia, 2005; pp. 408–414. ISBN 0-643-09025-8.
10. Raga, J.A.; Fernández, M.; Balbuena, J.A.; Aznar, F.J. Parasites. In *Encyclopedia of Marine Mammals*; Academic Press: Cambridge, MA, USA, 2009; pp. 821–830.
11. Balbuena, J.A.; Aznar, F.J.; Fernández, M.; Raga, J.A. Parasites as indicators of social structure and stock identity of marine mammals. In *Whales, Seals, Fish and Man*; Elsevier Science: Amsterdam, The Netherlands, 1995; Volume 4, pp. 133–139. ISBN 0163-6995.
12. Evans, P.; Raga, J. *Marine Mammals: Biology and Conservation*; Springer: Berlin/Heidelberg, Germany, 2001; ISBN 978-0-306-46573-4.
13. Vidal-Martínez, V.M.; Pech, D.; Sures, B.; Purucker, S.T.; Poulin, R. Can parasites really reveal environmental impact? *Trends Parasitol.* **2010**, *26*, 44–51. [[CrossRef](#)]
14. Balbuena, J.A.; Simpkin, A. role of *Crassicauda* sp. in natural mortality of pantropical spotted dolphins *Stenella attenuata*: A Reassessment. *Dis. Aquat. Org.* **2014**, *108*, 83–89. [[CrossRef](#)]

15. Cuvertoret-Sanz, M.; López-Figueroa, C.; O'Byrne, A.; Canturri, A.; Martí-García, B.; Pintado, E.; Pérez, L.; Ganges, L.; Cobos, A.; Abarca, M.L.; et al. Causes of cetacean stranding and death on the Catalanian Coast (Western Mediterranean Sea), 2012–2019. *Dis. Aquat. Org.* **2020**, *142*, 239–253. [CrossRef]
16. Dailey, M.; Walker, W.A. Parasitism as a Factor (?) In Single Strandings of Southern California Cetaceans. *J. Parasitol.* **1978**, *64*, 593–596. [CrossRef]
17. O'Shea, T.J.; Homer, B.L.; Greiner, E.C.; Layton, A.W. *Nasitrema* sp. associated encephalitis in a striped dolphin (*Stenella coeruleoalba*) stranded in the gulf of Mexico. *J. Wildl. Dis.* **1991**, *27*, 706–709. [CrossRef]
18. Dailey, M.D. Parasitic Diseases. In *CRC Handbook of Marine Mammal Medicine*; CRC Press: Boca Raton, FL, USA, 2001; pp. 407–430.
19. Gibson, D.I.; Harris, E.A.; Bray, R.A.; Jepson, P.D.; Kuiken, T.; Baker, J.R.; Simpson, V.R. A survey of the helminth parasites of cetaceans stranded on the coast of England and Wales during the Period 1990–1994. *J. Zool.* **1998**, *244*, 563–574. [CrossRef]
20. Perrin, W.F.; Powers, J.E. Role of a nematode in natural mortality of spotted dolphins. *J. Wildl. Manag.* **1980**, *44*, 960–963. [CrossRef]
21. Zucca, P.; Di Guardo, G.; Pozzi Mucelli, R.; Scaravelli, D.; Francese, M. Use of computer tomography for imaging of *Crassicauda grampicola* in a Risso's dolphin (*Grampus griseus*). *J. Zoo. Wildl. Med.* **2004**, *35*, 391–394. [CrossRef]
22. Díaz-Delgado, J.; Fernández, A.; Xuriach, A.; Sierra, E.; Bernaldo de Quirós, Y.; Mompeo, B.; Pérez, L.; Andrada, M.; Marigo, J.; Catão-Dias, J.L.; et al. Verminous arteritis due to *Crassicauda* sp. in Cuvier's beaked whales (*Ziphius cavirostris*). *Vet. Pathol.* **2016**, *53*, 1233–1240. [CrossRef]
23. Moser, M.; Rhinehart, H. The lungworm, *Halocercus* spp. (Nematoda: Pseudaliidae) in cetaceans from California. *J. Wildl. Dis.* **1993**, *29*, 507–508. [CrossRef]
24. Degollada, E.; André, M.; Arbelo, M.; Fernández, A. Incidence, pathology and involvement of *Nasitrema* species in odontocete strandings in the Canary Islands. *Vet. Rec.* **2002**, *150*, 81–82. [CrossRef]
25. Neiland, K.A.; Rice, D.W.; Holden, B.L. Helminths of marine mammals, I. The genus *Nasitrema*, air sinus flukes of delphinid cetacea. *J. Parasitol.* **1970**, *56*, 305–316. [CrossRef]
26. Sierra, E.; Fernández, A.; Felipe-Jiménez, I.; Zucca, D.; Díaz-Delgado, J.; Puig-Lozano, R.; Cámara, N.; Consoli, F.; Díaz-Santana, P.; Suárez-Santana, C.; et al. Histopathological differential diagnosis of meningoencephalitis in cetaceans: Morbillivirus, Herpesvirus, *Toxoplasma gondii*, *Brucella* sp., and *Nasitrema* sp. *Front. Vet. Sci.* **2020**, *7*, 650. [CrossRef]
27. Felipe-Jiménez, I.; Fernández, A.; de Quirós, Y.B.; Arregui-Gil, M.; Puig-Lozano, R.; Arbelo, M.; Sierra, E. Cerebral nasitremiasis in a Blainville's beaked whale (*Mesoplodon densirostris*) stranded in the Canary Islands. *Res. Vet. Sci.* **2023**, *158*, 56–64. [CrossRef]
28. Phillips, A.C.N.; Suepaul, R. *Nasitrema* Species: A frequent culprit in melon-headed whale (*Peponocephala electra*) strandings in Trinidad. *Aquat. Mamm.* **2017**, *43*, 547–557. [CrossRef]
29. Abril, E.; Balbuena, J.A.; Raga, J.A. A new species of the genus *Zalophotrema* (Digenea: Campulidae), *Zalophotrema atlanticum* n. sp., from the liver of the striped dolphin *Stenella coeruleoalba* (Meyen, 1833) (Cetacea: Delphinidae) in Atlantic Waters. *Syst. Parasitol.* **1991**, *18*, 133–138. [CrossRef]
30. Demaree, R.S.; Critchfield, R.L.; Tinling, S.P. Liver sinuses of a beaked whale, *Mesoplodon stejnegeri* (Cetacea: Ziphiidae). *J. Helminthol. Soc. Wash.* **1997**, *64*, 183–187.
31. Fraija-Fernández, N.; Olson, P.D.; Crespo, E.A.; Raga, J.A.; Aznar, F.J.; Fernández, M. Independent host switching events by digenean parasites of cetaceans inferred from ribosomal DNA. *Int. J. Parasitol.* **2015**, *45*, 167–173. [CrossRef] [PubMed]
32. Jaber, J.R.; Pérez, J.; Arbelo, M.; Andrada, M.; Hidalgo, M.; Gómez-Villamandos, J.C.; Van Den Ingh, T.; Fernández, A. hepatic lesions in cetaceans stranded in the Canary Islands. *Vet. Pathol.* **2004**, *41*, 147–153. [CrossRef]
33. Raga, J.A. *Oschmarinella mascomai* n. Sp. (Trematoda: Campulidae) Parasite des canaux biliaires de *Stenella coeruleoalba* (Meyen, 1833) (Cetacea: Delphinidae) en Méditerranée. *Ann. Parasitol. Hum. Comp.* **1986**, *61*, 633–636. [CrossRef]
34. Jones, J.L.; Dubey, J.P. Waterborne Toxoplasmosis—Recent developments. *Exp. Parasitol.* **2010**, *124*, 10–25. [CrossRef]
35. Dubey, J.P.; Jones, J.L. *Toxoplasma gondii* infection in humans and animals in the United States. *Int. J. Parasitol.* **2008**, *38*, 1257–1278. [CrossRef]
36. Mattiucci, S.; Nascetti, G. Molecular systematics, phylogeny and ecology of anisakid nematodes. *Parasite* **2006**, *13*, 99–113. [CrossRef]
37. Arizono, N.; Kuramochi, T.; Kagei, N. Molecular and histological identification of the acanthocephalan *Bolbosoma* cf. *capitatum* from the human small intestine. *Parasitol. Int.* **2012**, *61*, 715–718.
38. Shamsi, S. Seafood-borne parasitic diseases: A “one-health” approach is needed. *Fishes* **2019**, *4*, 9. [CrossRef]
39. Specht, N.R.; Keve, G.; Fernández-Maldonado, C.; Caro, A.C.; Takács, N.; Kontschán, J.; Hornok, S. Molecular investigation of endoparasites of marine mammals (Cetacea: Mysticeti, Odontoceti) in the Western Mediterranean. *Front. Vet. Sci.* **2024**, *11*, 1431625. [CrossRef] [PubMed]
40. Dubey, J.P.; Zarnke, R.; Thomas, N.J.; Wong, S.K.; Van Bonn, W.; Briggs, M.; Thulliez, P. *Toxoplasma gondii*, *Neospora caninum*, *Sarcocystis neuronum*, and *Sarcocystis canis*-like infections in marine mammals. *Vet. Parasitol.* **2003**, *116*, 275–296. [CrossRef] [PubMed]
41. Raga, J.; Balbuena, J.A.; Aznar, F.; Fernández, M. The impact of parasites on marine mammals: A review. *Parassitologia* **1997**, *39*, 293–296. [PubMed]
42. Gulland, F.M.D.; Hall, A.J. Is marine mammal health deteriorating? Trends in the global reporting of marine mammal disease. *Ecohealth* **2007**, *4*, 135–150. [CrossRef]
43. Cetáceos de Canarias. Secac. Available online: <https://www.cetaceos.org/es/cetaceos-de-canarias/> (accessed on 1 August 2024).

44. Ijsseldijk, L.L.; Brownlow, A.C.; Mazzariol, S. European best practice on cetacean post mortem investigation and tissue sampling. In Proceedings of the Joint ASCOBANS/ACCOBAMS 2019, 25th Meeting of the Advisory Committee, Stralsund, Germany, 17–19 September 2019.
45. Joblon, M.J.; Pokras, M.A.; Morse, B.; Harry, C.T.; Rose, K.S.; Sharp, S.M.; Niemeyer, M.E.; Patchett, K.M.; Sharp, W.B.; Moore, M.J. Body condition scoring system for delphinids based on short-beaked common dolphins (*Delphinus delphis*). *J. Mar. Anim. Ecol.* **2014**, *7*, 5–13.
46. Fraija-Fernández, N.; Aznar, F.; Raga, J.; Gibson, D.; Fernández, M. A new brachycladiid species (Digenea) from Gervais' beaked whale, *Mesoplodon europaeus* in North-Western Atlantic Waters. *Acta Parasitol.* **2014**, *59*, 510–517. [[CrossRef](#)]
47. Dailey, M.; Gilmartin, W. Diagnostic key to the parasites of some marine mammals. *Nav. Ocean. Syst. Cent.* **1980**, *41*.
48. Delyamure, S.L. *Helminthofauna of Marine Mammals (Ecology and Phylogeny)*; Skrjabin, K.I., Ed.; Izdatel'stvo Akiademii Nauk SSSR: Moscow, Russia, 1955.
49. Gibson, D. Family Brachycladiidae Odhner, 1905. In *Keys to the Trematoda: Volume 2*; CABI Publishing: Wallingford, UK, 2005; pp. 641–652. ISBN 9780851995878.
50. Rajaguru, A.; Shantha, G. Association between the sessile barnacle *Xenobalanus globicipitis* (Coronulidae) and the bottlenose dolphin *Tursiops truncatus* (Delphinidae) from the bay of Bengal, India, with a summary of previous records from cetaceans. *Fish. Bull.* **1992**, *90*, 197–202.
51. Yamaguti, S. The Digenetic trematodes of vertebrates. *Syst. Helminthum* **1958**, *1*, 1–1575.
52. Nakagun, S.; Shiozaki, A.; Ochiai, M.; Matsuda, A.; Tajima, Y.; Matsuiishi, T.; Kobayashi, Y. Prominent hepatic ductular reaction induced by *Oschmarinella macrorchis* in a Hubbs' beaked whale *Mesoplodon carlhubbsi*, with biological notes. *Dis. Aquat. Org.* **2018**, *127*, 177–192. [[CrossRef](#)]
53. Dailey, M.D. A new species of Digenea (Trematoda: Brachycladiidae) from the Gervais' beaked whale, *Mesoplodon europaeus*, with comments on other cetacean liver flukes. *Comp. Parasitol.* **2007**, *74*, 229–232. [[CrossRef](#)]
54. Skryabin, K.L. *Oschmarinella sobolevi* n. gen. n. sp. A New trematode from the liver of whales. *Dokl. Akad. Nauk. SSSR* **1947**, *57*, 857–859.
55. Chan, B.K.; Chen, Y.H. Distinguishing long-discussed cryptic species of the epibiotic goose-neck barnacle of the genus *Conchoderma* (Thoracicalcare: Lepadidae) with integrative taxonomy. *Diversity* **2022**, *14*, 593. [[CrossRef](#)]
56. Hogans, W.E. Review of *Pennella* Oken, 1816 (Copepoda: Pennellidae) with a description of *Pennella benzi* sp. nov., a parasite of Escolar, *Lepidocybium flavobrunneum* (Pisces) in the northwest Atlantic Ocean. *Zootaxa* **2017**, *4244*, 1–38. [[CrossRef](#)]
57. Leung, Y.M. An illustrated key to the species of whale-lice (Amphipoda, Cyamidae), ectoparasites of Cetacea, with a guide to the literature. *Crustaceana* **1967**, *12*, 279–291. [[CrossRef](#)]
58. Costa, G.; Chubb, J.C.; Veltkamp, C.J. Cystacanths of *Bolbosoma vasculosum* in the black scabbard fish *Aphanopus carbo*, oceanic horse mackerel *Trachurus picturatus* and common dolphin *Delphinus delphis* from Madeira, Portugal. *J. Helminthol.* **2000**, *74*, 113–120. [[CrossRef](#)]
59. Díaz-Delgado, J.; Groch, K.R.; Ramos, H.G.C.; Colosio, A.C.; Alves, B.F.; Pena, H.F.J.; Catão-Dias, J.L. Fatal systemic toxoplasmosis by a novel non-archetypal *Toxoplasma gondii* in a Bryde's whale (*Balaenoptera edeni*). *Front. Mar. Sci.* **2020**, *7*, 336. [[CrossRef](#)]
60. Sierra, E.; Sánchez, S.; Saliki, J.T.; Blas-Machado, U.; Arbelo, M.; Zucca, D.; Fernández, A. Retrospective study of etiologic agents associated with nonsuppurative meningoencephalitis in stranded cetaceans in the Canary Islands. *J. Clin. Microbiol.* **2014**, *52*, 2390–2397. [[CrossRef](#)]
61. Moeller JR, R. Pathology of marine mammals with special reference to infectious diseases. In *Toxicology of Marine Mammals*; CRC Press: Boca Raton, FL, USA, 2002; pp. 15–49.
62. Puig-Lozano, R.; Fernández, A.; Saavedra, P.; Tejedor, M.; Sierra, E.; De la Fuente, J.; Xuriach, A.; Díaz-Delgado, J.; Rivero, M.A.; Andrada, M.; et al. Retrospective study of traumatic intra-interspecific interactions in stranded cetaceans, Canary Islands. *Front. Vet. Sci.* **2020**, *7*, 107. [[CrossRef](#)]
63. Puig-Lozano, R.; Fernández, A.; Sierra, E.; Saavedra, P.; Suárez-Santana, C.M.; De la Fuente, J.; Díaz-Delgado, J.; Godinho, A.; García-Álvarez, N.; Zucca, D.; et al. Retrospective study of fishery interactions in stranded cetaceans, Canary Islands. *Front. Vet. Sci.* **2020**, *7*, 567258. [[CrossRef](#)]
64. Sierra, E.; Fernández, A.; Espinosa De Los Monteros, A.; Arbelo, M.; Díaz-Delgado, J.; Andrada, M.; Herráez, P. Histopathological muscle findings may be essential for a definitive diagnosis of suspected sharp trauma associated with ship strikes in stranded cetaceans. *PLoS ONE* **2014**, *9*, e88780. [[CrossRef](#)] [[PubMed](#)]
65. Di Guardo, G.; Centelleghé, C.; Mazzariol, S. Cetacean host-pathogen interaction(s): Critical knowledge gaps. *Front. Immunol.* **2018**, *9*, 2815. [[CrossRef](#)] [[PubMed](#)]
66. Tomoo, O.; Kliks, M. Effects of marine mammal parasites on human health. *Int. J. Parasitol.* **1987**, *17*, 415–421. [[CrossRef](#)]
67. Santana, P.J.D. Patologías y causas de la muerte de los cetáceos varados en las Islas Canarias 2013–2018. Ph.D. Dissertation, University of Las Palmas de Gran Canaria, Las Palmas, Spain, 2023.
68. Kołodziej-Sobocińska, M. Factors affecting the spread of parasites in populations of wild european terrestrial mammals. *Mamm. Res.* **2019**, *64*, 301–318. [[CrossRef](#)]
69. Sánchez, C.A.; Becker, D.J.; Teitelbaum, C.S.; Barriga, P.; Brown, L.M.; Majewska, A.A.; Hall, R.J.; Altizer, S. On the relationship between body condition and parasite infection in wildlife: A Review and meta-analysis. *Ecol. Lett.* **2018**, *21*, 1869–1884. [[CrossRef](#)]
70. Baylis, H.A. LV.—Observations on the genus *Crassicauda*. *Ann. Mag. Nat. Hist.* **1920**, *5*, 410–419. [[CrossRef](#)]



71. Lambertsen, R. Taxonomy and distribution of a *Crassicauda* species (Nematoda: Spirurida) infecting the kidney of the common fin whale (*Balaenoptera physalus* Linne, 1758). *J. Parasitol.* **1985**, *71*, 485–488. [[CrossRef](#)]
72. Lempereur, L.; Delobelle, M.; Doom, M.; Haelters, J.; Levy, E.; Losson, B.; Jauniaux, T. *Crassicauda boopis* in a fin whale (*Balaenoptera physalus*) ship-struck in the Eastern North Atlantic Ocean. *Parasitol. Open* **2017**, *3*, e9. [[CrossRef](#)]
73. Suárez-Santana, C.M.; Sierra, E.; Díaz-Delgado, J.; Zucca, D.; de Quirós, Y.B.; Puig-Lozano, R.; Câmara, N.; De la Fuente, J.; de los Monteros, A.E.; Rivero, M.; et al. Prostatic lesions in odontocete cetaceans. *Vet. Pathol.* **2018**, *55*, 466–472. [[CrossRef](#)]
74. Nepote, F.T.A. *Lesões causadas pelos parasitas do gênero Crassicauda em crânios do boto Tursiops truncatus*; Federal University of Santa Catarina, Centre for Biological Sciences, Undergraduate Degree in Biological Sciences: Florianópolis, Brazil, 2020.
75. Van Bresseem, M.-F.; Reyes, J.C.; Félix, F.; Echegaray, M.; Siciliano, S.; Di Benedetto, A.P.; Flach, L.; Viddi, F.; Avila, I.C.; Herrera, J.C.; et al. A preliminary overview of skin and skeletal diseases and traumata in small cetaceans from South American Waters. *Lat. Am. J. Aquat. Mamm.* **2007**, *6*, 7–42. [[CrossRef](#)]
76. Febronio, A.M.B.; Boos, G.S.; Batista, R.L.G.; Amorim, D.B.; Guimarães, J.P.; Bianchi, M.V.; Mariani, D.B.; Koproski, L.; Mari, C.; Parente, J.E.V.; et al. Crassicaudiasis in three geographically and chronologically distant Cuvier's beaked whales (*Ziphius cavirostris*) stranded off Brazil. *Int. J. Parasitol. Parasites Wildl.* **2021**, *16*, 262–269. [[CrossRef](#)] [[PubMed](#)]
77. Marcer, F.; Negrisolo, E.; Franzo, G.; Tessarin, C.; Pietrobelli, M.; Marchiori, E. Morphological and molecular characterization of adults and larvae of *Crassicauda* spp. (Nematoda: Spirurida) from Mediterranean fin whales *Balaenoptera physalus* (Linnaeus, 1758). *Int. J. Parasitol. Parasites Wildl.* **2019**, *9*, 258–265. [[CrossRef](#)] [[PubMed](#)]
78. Kumagai, T.; Shiozaki, A.; Tajima, Y. Molecular characterization of the parasitic nematode genus *Crassicauda*; larvae parasitic on the firefly squid and adults on beaked whales off the coast of Japan. *Int. J. Parasitol. Parasites Wildl.* **2023**, *20*, 56–62. [[CrossRef](#)] [[PubMed](#)]
79. Morimitsu, T.; Koono, M.; Hirai, T.; Kurita, T. Degeneration of the octavus nerve observed in a stranded Risso's dolphin (*Grampus griseus*), infested with *Crassicauda grampicola*. *Jpn. Cetology* **2010**, *20*, 7–12. [[CrossRef](#)] [[PubMed](#)]
80. Raga, J.A. Redescription of *Crassicauda grampicola* Johnston et. Mawson, 1941, (Nematoda: Spirurida), parasite of *Grampus griseus* (Cuvier, 1812) (Cetacea: Delphinidae). *Vie Milieu/Life Environ.* **1987**, 215–219.
81. Geraci, J.R.; Dailey, M.D.; St. Aubin, D.J. Parasitic mastitis in the Atlantic White-Sided Dolphin, *Lagenorhynchus acutus*, as a probable factor in herd productivity. *J. Fish. Res. Board Can.* **1978**, *35*, 1350–1355. [[CrossRef](#)]
82. Lambertsen, R.H. Crassicaudosis: A parasitic disease threatening the health and population recovery of large baleen whales. *Rev. Sci. Technol.* **1992**, *11*, 1131–1141. [[CrossRef](#)]
83. Measures, L.N. Lungworms of marine mammals. In *Parasitic Diseases of Wild Mammals*; John Wiley & Sons, Inc.: Hoboken, NJ, USA, 2001; pp. 279–300. ISBN 9780470377000.
84. Saldaña, A.; López, C.M.; López, A.; Covelo, P.; Remesar, S.; Martínez-Calabuig, N.; García-Dios, D.; Díaz, P.; Morrondo, P.; Díez-Baños, P.; et al. Specificity of *Stenurus* (Metastrongyloidea: Pseudaliidae) infections in odontocetes stranded along the North-West Spanish Coast. *Int. J. Parasitol. Parasites Wildl.* **2022**, *19*, 148–154. [[CrossRef](#)]
85. Pool, R.; Romero-Rubira, C.; Raga, J.A.; Fernández, M.; Aznar, F.J. Determinants of lungworm specificity in five cetacean species in the Western Mediterranean. *Parasit. Vectors* **2021**, *14*, 196. [[CrossRef](#)]
86. Geraci, J.R.; Aubin, D.J.S. Effects of parasites on marine mammals. *Int. J. Parasitol.* **1987**, *17*, 407–414. [[CrossRef](#)]
87. Motta, M.R.A.; Pinheiro, D.C.S.N.; Carvalho, V.L.; Viana, D.D.A.; Vicente, A.C.P.; Iñiguez, A.M. Gastric Lesions associated with the presence of *Anisakis* spp. Dujardin, 1845 (Nematoda: Anisakidae) in cetaceans stranded on the coast of Ceara, Brazil. *Biota Neotrop.* **2008**, *8*, 91–95. [[CrossRef](#)]
88. Van Beurden, S.J.; Ijsseldijk, L.L.; Cremers, H.J.W.M.; Gröne, A.; Verheije, M.H.; Begeman, L. *Anisakis* Spp. Induced Granulomatous Dermatitis in a harbour porpoise *Phocoena phocoena* and a bottlenose dolphin *Tursiops truncatus*. *Dis. Aquat. Org.* **2015**, *112*, 257–263. [[CrossRef](#)] [[PubMed](#)]
89. Jaber, J.R.; Pérez, J.; Arbelo, M.; Zafra, R.; Fernández, A. Pathological and immunohistochemical study of gastrointestinal lesions in dolphins stranded in the Canary Island. *Vet. Rec.* **2006**, *159*, 410–414. [[CrossRef](#)] [[PubMed](#)]
90. Di Azevedo, M.I.N.; Carvalho, V.L.; Iñiguez, A.M. First Record of the anisakid nematode *Anisakis nascettii* in the Gervais' beaked whale *Mesoplodon europaeus* from Brazil. *J. Helminthol.* **2016**, *90*, 48–53. [[CrossRef](#)]
91. Cipriani, P.; Palomba, M.; Giuliotti, L.; Marcer, F.; Mazzariol, S.; Santoro, M.; Alburquerque, R.A.; Covelo, P.; López, A.; Santos, M.B.; et al. Distribution and genetic diversity of *Anisakis* spp. in cetaceans from the northeast Atlantic Ocean and the Mediterranean Sea. *Sci. Rep.* **2022**, *12*, 13664. [[CrossRef](#)]
92. Mateu, P.; Raga, J.A.; Aznar, F.J. Host specificity of *Oschmarinella rochebruni* and *Brachycladium atlanticum* (Digenea: Brachycladiidae) in five cetacean species from western mediterranean waters. *J. Helminthol.* **2011**, *85*, 12–19. [[CrossRef](#)]
93. LeDuc, R. Delphinids, Overview. In *Encyclopedia of Marine Mammals*; Elsevier Ltd.: Amsterdam, The Netherlands, 2009; pp. 298–302. ISBN 9780123735539.
94. Dupouy-Camet, J.; Peduzzi, R. Helminth-trematode: *Diphyllobothrium*. *Encycl. Food Saf.* **2014**, *2*, 130–133. [[CrossRef](#)]
95. Fraija-Fernández, N.; Waeschenbach, A.; Briscoe, A.G.; Hocking, S.; Kuchta, R.; Nyman, T.; Littlewood, D.T.J. Evolutionary transitions in broad tapeworms (Cestoda: Diphyllbothriidea) revealed by mitogenome and nuclear ribosomal operon phylogenetics. *Mol. Phylogenetics Evol.* **2021**, *163*, 107262. [[CrossRef](#)]
96. Aznar, F.J.; Agustí, C.; Littlewood, D.T.J.; Raga, J.A.; Olson, P.D. Insight into the role of cetaceans in the life cycle of the Tetraphyllideans (Platyhelminthes: Cestoda). *Int. J. Parasitol.* **2007**, *37*, 243–255. [[CrossRef](#)]

97. Carvalho, V.L.; Bevilaqua, C.M.L.; Iñiguez, A.M.; Mathews-Cascon, H.; Ribeiro, F.B.; Pessoa, L.M.B.; de Meirelles, A.C.O.; Borges, J.C.G.; Marigo, J.; Soares, L.; et al. Metazoan parasites of cetaceans off the northeastern coast of Brazil. *Vet. Parasitol.* **2010**, *173*, 116–122. [[CrossRef](#)]
98. Colón-Llavina, M.M.; Mignucci-Giannoni, A.A.; Mattiucci, S.; Paoletti, M.; Nascetti, G.; Williams, E.H. Additional records of metazoan parasites from caribbean marine mammals, including genetically identified anisakid nematodes. *Parasitol. Res.* **2009**, *105*, 1239–1252. [[CrossRef](#)] [[PubMed](#)]
99. Pendergraph, G.E. First report of the acanthocephalan *Bolbosoma vasculosum* (Rudolphi, 1819) from the pygmy sperm whale, *Kogia breviceps*. *J. Parasitol.* **1971**, *57*, 1109. [[CrossRef](#)] [[PubMed](#)]
100. McAlpine, D.F.; Murison, L.D.; Hoberg, E.P. New records for the pygmy sperm whale, *Kogia breviceps* (Physeteridae) from Atlantic Canada with notes on diet and parasites. *Mar. Mamm. Sci.* **1997**, *13*, 701–704. [[CrossRef](#)]
101. Mignucci-Giannoni, A.A.; Hoberg, E.P.; Sigel-Causey, D.; Williams, E.H., Jr. Metazoan parasites and other symbionts of cetaceans in the Caribbean. *J. Parasitol.* **1998**, *84*, 939–946. [[CrossRef](#)] [[PubMed](#)]
102. Kaito, S.; Sasaki, M.; Goto, K.; Matsusue, R.; Koyama, H.; Nakao, M.; Hasegawa, H. A case of small bowel obstruction due to infection with *Bolbosoma* sp. (*Acanthocephala: Polymorphidae*). *Parasitol. Int.* **2019**, *68*, 14–16. [[CrossRef](#)]
103. Beaver, P.C.; Otsuji, T.; Otsuji, A.; Yoshimura, H.; Uchikawa, R.; Sato, A. Acanthocephalan, probably *Bolbosoma*, from the peritoneal cavity of man in Japan. *Am. J. Trop. Med. Hyg.* **1983**, *32*, 1016–1018. [[CrossRef](#)]
104. Foskolos, I.; Tourgeli Provata, M.; Frantzis, A. First record of *Conchoderma auritum* (Cirripedia: Lepadidae) on *Ziphius cavirostris* (Cetacea: Ziphiidae) in Greece. *Ann. Ser. Hist. Nat.* **2017**, *27*, 29–34. [[CrossRef](#)]
105. Carrillo, J.M.; Overstreet, R.M.; Raga, J.A.; Aznar, F.J. Living on the edge: Settlement patterns by the symbiotic barnacle *Xenobalanus globicipitis* on small cetaceans. *PLoS ONE* **2015**, *10*, e0127367. [[CrossRef](#)]
106. Flach, L.; Van Bressema, M.-F.; Pitombo, F.; Aznar, F. Emergence of the epibiotic barnacle *Xenobalanus globicipitis* in Guiana dolphins after a morbillivirus outbreak in Sepetiba Bay, Brazil. *Estuar. Coast. Shelf. Sci.* **2021**, *263*, 107632. [[CrossRef](#)]
107. Oliveira, J.B.; Morales, J.A.; González-Barrientos, R.C.; Hernández-Gamboa, J.; Hernández-Mora, G. Parasites of cetaceans stranded on the pacific coast of Costa Rica. *Vet. Parasitol.* **2011**, *182*, 319–328. [[CrossRef](#)]
108. Ryazanov, S.; Ryazanova, T. Risso's Dolphin (*Grampus griseus*) in Russia with note on *Xenobalanus globicipitis*. *Mar. Biodivers.* **2023**, *53*, 71. [[CrossRef](#)]
109. Ten, S.; Moreno-Colom, P.; Raga, J.; Aznar, F. *Xenobalanus globicipitis* as an indicator of cetacean hydrodynamics: Spatial distribution and aggregation on the flukes of striped dolphins, *Stenella coeruleoalba*. In Proceedings of the 21th European Association of Aquatic Mammals Conference (Virtual EAAM, 2021), Virtual, 11–13 March 2021.
110. Whitehead, T.O.; Rollinson, D.P.; Reisinger, R.R. Pseudostalked barnacles, *Xenobalanus globicipitis*, attached to killer whales, *Orcinus orca*, in South African waters. *Mar. Biodivers.* **2015**, *45*, 873–876. [[CrossRef](#)]
111. Sierra, E.; Espinosa de los Monteros, A.; Fernández, A.; Díaz-Delgado, J.; Suárez-Santana, C.; Arbelo, M.; Sierra, M.A.; Herráez, P. Muscle pathology in free-ranging stranded cetaceans. *Vet. Pathol.* **2017**, *54*, 298–311. [[CrossRef](#)] [[PubMed](#)]
112. Resendes, A.R.; Almería, S.; Dubey, J.P.; Obón, E.; Juan-Sallés, C.; Degollada, E.; Alegre, F.; Cabezón, O.; Pont, S.; Domingo, M. Disseminated toxoplasmosis in a mediterranean pregnant Risso's dolphin (*Grampus griseus*) with transplacental fetal infection. *J. Parasitol.* **2002**, *88*, 1029–1032. [[CrossRef](#)]
113. Costa-Silva, S.; Sacristán, C.; Gonzales-Viera, O.; Díaz-Delgado, J.; Sánchez-Sarmiento, A.M.; Marigo, J.; Groch, K.R.; Carvalho, V.L.; Ewbank, A.C.; Colosio, A.C.; et al. *Toxoplasma gondii* in cetaceans of Brazil: A histopathological and immunohistochemical survey. *Rev. Bras. De Parasitol. Vet.* **2019**, *28*, 395–402. [[CrossRef](#)]
114. Mazzariol, S.; Marcer, F.; Mignone, W.; Serracca, L.; Goria, M.; Marsili, L.; Di Guardo, G.; Casalone, C. Dolphin Morbillivirus and *Toxoplasma gondii* coinfection in a mediterranean fin whale (*Balaenoptera physalus*). *BMC Vet. Res.* **2012**, *8*, 20. [[CrossRef](#)]
115. Dubey, J.P.; Murata, F.H.A.; Cerqueira-Cézar, C.K.; Kwok, O.C.H.; Grigg, M.E. Recent epidemiologic and clinical importance of *Toxoplasma gondii* infections in marine mammals: 2009–2020. *Vet. Parasitol.* **2020**, *288*, 109296. [[CrossRef](#)]
116. Di Guardo, G.; Proietto, U.; Di Francesco, C.E.; Marsilio, F.; Zaccaroni, A.; Scaravelli, D.; Casalone, C. Cerebral toxoplasmosis in striped dolphins (*Stenella coeruleoalba*) stranded along the Ligurian Sea coast of Italy. *Vet. Pathol.* **2010**, *47*, 245–253. [[CrossRef](#)]

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