diversity

MDPI

Article

Metazoan Parasites of *Antimora rostrata* (Günther, 1878) (Gadiformes: Moridae) from the Deep Sea in the Southeastern Pacific Ocean

Luis A. Ñacari [1,2], Ruben Escribano [2] and Marcelo E. Oliva [2,3,*]

[1] Laboratorio de Ecología y Evolución de Parásitos, Facultad de Ciencias del Mar y Recursos Biológicos, Universidad de Antofagasta, Antofagasta 1200000, Chile; luis.nacari.enciso@ua.cl
[2] Instituto Milenio de Oceanografía, Universidad de Concepción, Concepción 4030000, Chile; ruben.escribano@imo-chile.cl
[3] Instituto Ciencias Naturales Alexander von Humboldt, Universidad de Antofagasta, Antofagasta 1200000, Chile
* Correspondence: marcelo.oliva@uantof.cl; Tel.: +56-55-2637404

Abstract: A total of 127 specimens of the "Blue Antimora" *Antimora rostrata* (Günther, 1878) were obtained from 2015 to 2019 as bycatch from the artisanal fishery of the Patagonian toothfish (*Dissostichus eleginoides* (Smitt, 1898)) at depths between 1000 and 2200 m in Northern Chile (app. 22° S 70° W). All individuals were examined for parasites. A total of seventeen parasite taxa, two Copepoda, two Monogenea, seven Digenea, three Nematoda, and three Cestoda, were found, and twelve taxa were found as adults while five taxa were found at the larval stage. *Anisakis* sp. (Nematoda) and Trypanorhyncha gen. sp. (Cestoda) were the predominant species with a prevalence of 53.5% and 11.8%, respectively. The high prevalence of *Anisakis* sp. (>50%) suggests that *A. rostrata* may play a significant role in the life cycle of *Anisakis* sp. in the southeastern Pacific Ocean. The detected parasite community, consisting predominantly of parasites from pelagic environments rather than benthopelagic, suggests that *A. rostrata* may fulfill a crucial role as a predator of pelagic organism communities. Additionally, it may undertake vertical migrations in the southeastern Pacific Ocean.

Keywords: deep-sea fishes; parasites; vertical migrations; southeastern Pacific Ocean; blue antimoral

Citation: Ñacari, L.A.; Escribano, R.; Oliva, M.E. Metazoan Parasites of *Antimora rostrata* (Günther, 1878) (Gadiformes: Moridae) from the Deep Sea in the Southeastern Pacific Ocean. *Diversity* **2024**, *16*, 636. https://doi.org/10.3390/d16100636

Academic Editor: Simon Blanchet

Received: 31 August 2024
Revised: 3 October 2024
Accepted: 7 October 2024
Published: 12 October 2024

1. Introduction

The deep sea, encompassing depths from 200 to 11,000 m, is the largest biotope on Earth; yet. it remains largely unexplored [1]. Its biodiversity is still poorly understood, with many species yet to be discovered. Fishes are a crucial component of these ecosystems, including members of the family Moridae, which play essential roles in food webs as both intermediate trophic levels and top predators [2]. This family comprises 19 genera and over 110 species distributed across shallow coastal areas and deep waters below 3000 m [3].

In the southeastern Pacific Ocean (SEPO herein and after), knowledge of the biology of deep-sea fishes is scarce. Only 10 species of morids have been recorded [4,5]. In the SEPO, *Antimora rostrata* (Günther1878) was caught as bycatch in the fishery of the notothenid *Dissostichus eleginoides,* Smitt 1898, the "Patagonian toothfish" [6]. *Antimora rostrata* has a nearly cosmopolitan distribution, except in the North Pacific, where it is replaced by the sister species *Antimora micropepis,* Bean 1890 [7]. They inhabit depths from 300 to 3000 m and have a generalist diet consisting of benthopelagic fish and invertebrates, such as Decapoda, Amphipoda, Chaetognatha, and Polychaeta [8].

A comprehensive compilation of parasitological data for *A. rostrata* was given by Klimpel et al. [9] and Gordeev et al. [10], with most studies focusing on reports and descriptions of new species, particularly from the North Atlantic. Few studies have examined the parasite community of *A. rostrata* [6,11–13]. To date, 57 species of metazoan parasites have been recorded parasitizing *A. rostrata* worldwide, distributed across seven taxonomic groups: Cestoda (3), Digenea (24), Nematoda (12), Monogenea (5), Acanthocephala (3), Copepoda (9), and Isopoda (1) (Supplementary Materials Table S1).

This study aims to investigate the community of metazoan parasites and explore their role as potential tools for understanding the feeding behavior of *A. rostrata* in the deep waters of the SEPO.

2. Materials and Methods

One hundred and twenty-seven adult specimens of *A. rostrata* were obtained, non-periodically, between 2015 and 2017 as bycatch from the artisanal longline fishery of *D. eleginoides* in northern Chile (app. 22° S 70° W), at depths between 1000 and 2200 m. The fish were immediately frozen onboard at −18 °C and transported to the parasitology laboratory at the Universidad de Antofagasta for further analysis. After thawing, fish were measured (total length to nearest cm), weighed, dissected, and examined for metazoan parasites (both ectoparasites and endoparasites). Parasites were recorded for each fish, fixed in AFA (alcohol–formalin–acetic acid), and then preserved in 70° alcohol. Nematoda and Acanthocephala were cleared with Amann lactophenol. Digenea, Monogenea, and Cestoda were stained (Acetic Carmin) and cleared with clove oil (Sigma-Aldrich, Steinheim, Germany), and then mounted in Eukitts (O. Kindler GmBH, Freiburg, Germany). Parasites were identified to the lowest taxonomic level possible. The prevalence and mean intensity of infection were calculated according to Bush et al. [14].

3. Results

The average sizes of males (range: 36.3–61.6 cm, mean = 48.8 cm) and females (range: 32.7–81.1 cm, mean = 50.8 cm) of *A. rostrata* did not differ significantly (U test = 6550, $p = 0.2424$) for the whole sample. Females were more predominant than males, comprising 81% of the sample.

A total of 241 parasite specimens, belonging to 17 species, were collected, of which 11.8% were Copepoda, 11.8% were Monogenea, 41.2% were Digenea, 17.6% were Cestoda, and 17.6% were Nematoda (Table 1). Trophically transmitted parasites (TTPs) (Digenea, Cestoda and Nematoda) represented 76.4% of the parasite richness. Some parasites were not identified to a species level due to their inherent morphological characteristics, absence of male (in the case of adult Nematoda), or unreliable identification based on morphological features (in the case of the larval stages of Cestoda and Nematoda). The prevalence, intensity, and site of infection for each parasite species are detailed in Table 1.

Table 1. Metazoan parasites of *Antimora rostrata* from the southeastern Pacific Ocean. Prevalence (P), mean intensity (MI), development stage, and site of infection (n = 127).

	Species	Development Stage	P (%)	MI	Site of Infection
Copepoda					
	Chondracanthidae gen. sp.	Adult	0.8	4.0	Gill
	Parabrachiella pinguis	Adult	0.8	1.0	Gill arch
Monogenea					
	Cyclocotiloides sp.	Adult	0.8	2.0	Gill
	Diclidophoridae gen. sp.	Adult	4.0	1.2	Gill
Digenea					
	Glomericirrus macrouri	Adult	0.8	1.0	Intestine
	Dinosoma sp.	Adult	7.9	1.5	Intestine
	Gonocerca physidis	Adult	0.8	1.0	Intestine
	Gonocerca sp.	Adult	7.1	2.8	Intestine

Table 1. *Cont.*

	Species	Development Stage	P (%)	MI	Site of Infection
	Bathycreadium sp.	Adult	1.6	1.5	Intestine
	Podocotyle sp.	Adult	3.2	3.3	Intestine
	Digenea gen. sp.	Adult	4.7	1.2	Intestine
Cestoda					
	Hepatoxylon sp.	Larvae	1.6	1.0	Visceral cavity
	Trypanorhyncha gen. sp.	Larvae	11.8	1.0	Visceral cavity
	Cestoda gen. sp.	Larvae	0.8	1.0	Visceral cavity
Nematoda					
	Hysterothylacium sp.	Third-stage Larvae	0.8	1.0	Visceral cavity
	Anisakis sp.	Third-stage Larvae	53.5	2.1	Visceral cavity
	Cysticollidae gen. sp.	Adult	0.8	1.0	Intestine

The single specimen of the lernaeopodid *Parabrachiella pinguis* (Wilson, 1915) [15] was a gravid female attached to the gill arch. Meanwhile, five specimens of Chondracanthidae gen. sp., also isolated from the gill arch, were gravid females with attached males. Monogenea of the family Diclidophoridae were found on the gill filaments with low prevalence.

Among the TTP, Digenea were the predominant group of parasites, with seven species (Table 1). All Digenea were adult stage and located in the digestive tract (stomach and intestine). The three species of Cestoda were found in the visceral cavity at larval stages; two belonged to the order Trypanorhyncha, and one specimen (Cestoda gen. sp.) was found encysted in the liver. Among Nematoda, larvae *Anisakis* sp. had the highest prevalence, found in the visceral cavity along with the larval *Hysterothylacium* sp. Additionally, a single female specimen of Cystidicolidae gen. sp. was isolated from the intestine.

4. Discussion

A total of 241 parasites, belonging to 17 species, were collected, of which 11.8% were Copepoda, 11.8% were Monogenea, 41.2% were Digenea, 17.6% were Cestoda, and 17.6% were Nematoda (Table 1).

Four studies have reported quantitative aspects and parasite richness of *A. rostrata*. Three of these studies are from the North Atlantic [11,13,16], and one is from the SEPO [6]. Both Campbell et al. [11] and Chambers [16] examined large sample sizes (124 and 432 specimens, respectively) at depths of 400–2967 m, resulting in high parasite richness (18 and 22 species, respectively). Meanwhile, Gordeev et al. [13] examined 26 specimens from depths of 809–2089 m, finding 14 species. For the SEPO, Ñacari and Oliva [6] examined 39 specimens off the northern coast of Chile at depths of 1000–2000 m, finding only eight parasite species There is not a significant correlation between sample size and parasites richness (Spearman rho = 0.844; p = 0.072). Digenea was the predominant group, and it explained 41.2% of the richness. Higher values were found by Chambers [16] and Ñacari and Oliva [6] (Table 2).

Table 2. Richness obtained from quantitative survey of metazoan parasites of *Antimora rostrata*.

Reference	[11]	[16]	[13]	[6]	This Study
Locality	**North Atlantic**	**North Atlantic**	**North Atlantic**	**Southern Pacific**	**Southern Pacific**
Copepoda	5	3	2		2
Monogenea	2	2		2	2
Digenea	5	11	4	4	7
Cestoda	1	1		1	3
Nematoda	5	3	7	1	3
Acanthocephala		2	1		
Species richness	18	22	14	8	17

This pattern has also been observed in other deep-sea fishes in the SEPO, such as *M. holotrachys* (Gadiformes: Macrouridae), for which 44% of the richness was explained by Digenea [6].

The helminth parasites now reported for *A. rostrata* have unknown life cycles. Digenea, Nematoda, and Cestoda exhibit complex life cycles, whereas vertebrates and invertebrates from both pelagic and benthic environments can act as intermediate hosts. Understanding the life cycles of deep-sea parasites is challenging due to the difficulty in accessing the larval stages of parasites and their intermediate hosts. However, it is possible to extrapolate their potential life cycles following the suggestions of Bray [17] and Ñacari et al. [18], who use knowledge of the life cycles of shallow-water parasite taxa.

It is well known that feeding habits are a critical factor that explains the abundance and diversity of parasites [18,19]. In our research, over 90% of the specimens showed everted stomachs, with only cephalopod beaks being observed, preventing stomach content analysis. However, previous studies have indicated that *A. rostrata* is a generalist predator, consuming copepods, amphipods, decapods, polychaeta, cephalopods, and fish [16,20,21], which can explain the high richness of TTPs.

All records with available parasitological data on *A. rostrata* show that three groups of parasites can be found (Supplementary Materials Table S1), reflecting the role of *A. rostrata* as an intermediate host and its habitat: pelagic, benthic, or benthopelagic [22].

Digenea have a complex life cycle, including mollusks as obligatory first hosts, pelagic or benthic invertebrates as second hosts, and teleost as intermediate or definitive hosts, particularly in deep-sea environments [17]. In *A. rostrata*, Digenea was the most predominant, represented by members of the families Opecoelidae, Hemiuridae, and Gonocercidae. Opecoelidae are benthopelagic parasites, with amphipods and decapods as their second intermediate hosts [23], whereas Hemiuridae are known to have pelagic intermediate hosts, such as copepods and chaetognaths [24]. Unfortunately, the life cycle of Gonocercidae remains unknown, but it is likely similar to that of the Hemiuridae [17].

Members of the order Trypanorhyncha mature in the stomach and spiral valve of elasmobranchs [25] and are considered pelagic parasites, with copepods serving as the first intermediate hosts, larger invertebrates (as cephalopods) acting as the second intermediate hosts, and teleost fishes as a paratenic host [18].

Similarly, *Anisakis* sp. (Anisakidae) follow a pelagic life cycle, using invertebrates as the first intermediate host and larger crustaceans or teleosts as second intermediate hosts [26]. The adults are found in cetaceans and sometimes in pinnipeds [27]. The high prevalence of *Anisakis* sp. (>50%) suggests that *A. rostrata* may play a significant role in the life cycle of *Anisakis* in the SEPO. In contrast, species of the genus *Hysterothylacium* (Raphidascarididae) are found as adults in the digestive tracts of teleosst. Their larval stages have been reported from invertebrates (crustaceans) and fish [28], suggesting that *Hysterothylacium* has a pelagic life cycle, as indicated by Ñacari et al. [18].

Additionally, Cystidicolidae nematodes may have benthopelagic life cycles [18], with demersal crustaceans (such as amphipods and decapods) acting as intermediate hosts. The found specimens of Cystidicolidae gen. sp. from *A. rostrata* might represent a new species in this often host-specific genus [29].

Therefore, of the 13 species of TTPs that parasitize *A. rostrata*, 46% can be considered as pelagic, 23% as benthopelagic, and 31% have unknown life cycles.

Pioneering studies indicate that demersal fish typically have a generalist diet, where pelagic food is important, especially for those that are ecologically dominant on the lower continental slope and rise [20]. For instance, *A. rostrata* appears to feed mostly on pelagic prey rather than benthic prey [20,21], possibly exhibiting vertical migrations. (Figure 1).

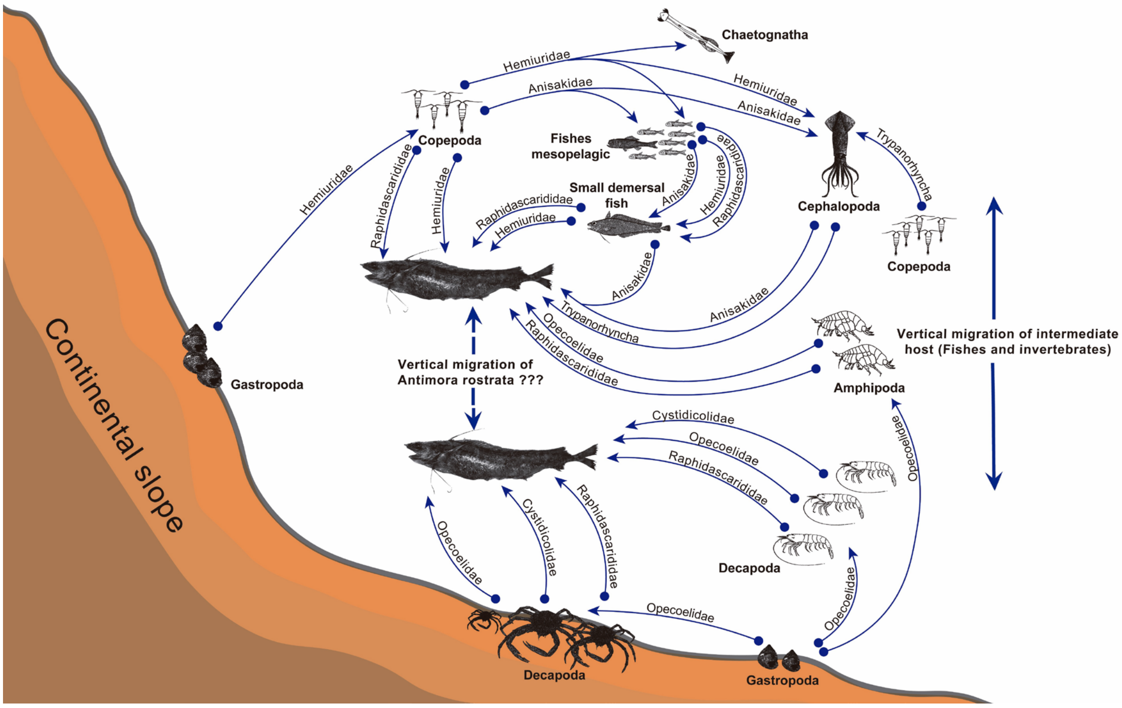

Figure 1. Schematic illustration showing potential pathway of the TTPs in *Antimora rostrata* from SEPO.

5. Conclusions

The metazoan parasite fauna of *A. rostrata* was diverse, consisting of 17 species. For the first time, larval *Hepatoxylon* sp. (Eucestoda) is reported as a parasite of this fish species, adding a new species to the biodiversity of parasites recorded worldwide from this fish species (Supplementary Materials Table S1).

Our results highlight the important roles that TTPs and their possible life cycles (pelagic, benthic, or benthopelagic) can play in inferring the feeding behavior of some species in the SEPO. This suggests that *A. rostrata* may undertake vertical migrations, enabling it to consume both pelagic and benthopelgic organisms, as suggested by Ñacari et al. [18]. The combined use of carbon, nitrogen, and sulfur stable isotopes indicate a significant energy source from pelagic pathways for this species [30]. Supplementary Materials includes a list of the known parasite taxa for *Antimora rostrata* worldwide [31–40]. These observations, made through their parasites, reinforce the idea that *A. rostrata* exhibits a flexible feeding strategy, contributing to its ecological success in deep-sea environments in the SEPO.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/d16100636/s1, Table S1: Parasite taxa recorded from *Antimora rostrata* (Gadiformes: Moridae). References [6,10,11,13,16,21,30–40] are cited in the Supplementary Materials.

Author Contributions: Conceptualization, M.E.O. and L.A.Ñ.; methodology, M.E.O. and L.A.Ñ.; validation, M.E.O., L.A.Ñ. and R.E.; formal analysis, M.E.O. and L.A.Ñ.; investigation, M.E.O., L.A.Ñ. and R.E.; resources, M.E.O. and R.E.; data curation, L.A.Ñ.; writing—original draft preparation, M.E.O. and L.A.Ñ.; review and editing, M.E.O., L.A.Ñ. and R.E.; funding acquisition, M.E.O. and R.E. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by grants MINEDUC-UA project ANT 1855; Plan de Fortalecimiento Universidades Estatales—Chile RES21992 (to M.E.O.) and AIM23-0003-Instituto Milenio de Oceanografia, ANID-Chile (to R.E.).

Data Availability Statement: Data available on request.

Acknowledgments: We appreciate the support of the crew of the fishing boat "Huayca" and its Captain, Dani Manso.

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

References

1. Korostelev, N.B.; Frey, P.H.; Orlov, A.M. Using Different Hard Structures to Estimate the Age of Deep-Sea Fishes: A Case Study of the Pacific Flatnose, *Antimora Microlepis* (Moridae, Gadiformes, Teleostei). *Fish. Res.* **2020**, *232*, 105731. [CrossRef]
2. Drazen, J.C.; Sutton, T.T. Dining in the Deep: The Feeding Ecology of Deep-Sea Fishes. *Ann. Rev. Mar. Sci.* **2017**, *9*, 337–366. [CrossRef] [PubMed]
3. Fricke, R.; Eschmeyer, W.N.; Van der Laan, R. Eschmeyer's Catalog of Fishes: Genera, Species, References. Available online: http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp (accessed on 5 August 2024).
4. Kong, I.; Meléndez, R. Estudio Taxonómico y Sistemático de La Ictiofauna de Aguas Profundas Capturada Entre Arica e Isla Mocha (18°30′–38°30′ Lat. S.). *Estud. Ocean.* **1991**, *10*, 1–81.
5. Pequeño, G. Peces de Chile. Lista Sistemática Revisada y Comentada: Addendum. *Rev. Biol. Mar. Oceanogr.* **1997**, *32*, 77–94.
6. Ñacari, L.A.; Oliva, M.E. Metazoan Parasites of Deep-Sea Fishes from the South Eastern Pacific: Exploring the Role of Ecology and Host Phylogeny. *Deep. Res. Part I Oceanogr. Res. Pap.* **2016**, *115*, 123–130. [CrossRef]
7. Cohen, D.M.; Inada, T.; Iwamoto, T.; Scialabba, N. *FAO Species Catalogue. Vol. 10. Gadiform Fishes of the World (Order Gadiformes). An Annotated and Illustrated Catalogue of Cods, Hakes, Grenadiers and Other Gadiform Fishes Known to Date*; FAO: Rome, Italy, 1990; p. 442.
8. Gordon, J.D.M.; Duncan, J.A.R. The Biology of Fish of the Family Moridae in the Deep-Water of the Rockall Trough. *J. Mar. Biol. Assoc. U. K.* **1985**, *65*, 475–485. [CrossRef]
9. Klimpel, S.; Busch, M.W.; Kellermanns, E.; Kleinertz, S.; Palm, H.W. *Metazoan Deep Sea Fish Parasites*; Acta Biologica Benrodis, Verlag Natur & Wissen: Solingen, Germany, 2009; p. 384.
10. Gordeev, I.I.; Sokolov, S.G.; Orlov, A.M. Macroparasites of Blue Hake *Antimora rostrata* and Pacific Flatnose *Antimora microlepis* (Gadiformes, Moridae): Current State of Exploration. *Uchenye Zap. Kazan. Univ. Seriya Estestv. Nauk.* **2017**, *159*, 468–479.
11. Campbell, R.A.; Haedrich, R.L.; Munroe, T.A. Parasitism and Ecological Relationships among Deep-Sea Benthic Fishes. *Mar. Biol.* **1980**, *57*, 301–313. [CrossRef]
12. Chambers, C.A.; Dick, T.A. Trophic Structure of One Deep-Sea Benthic Fish Community in the Eastern Canadian Arctic: Application of Food, Parasites and Multivariate Analysis. *Environ. Biol. Fishes* **2005**, *74*, 365–378. [CrossRef]
13. Gordeev, I.; Sokolov, S.; Bañón, R.; Morales, X.; Orlov, A. Parasites of the Blue Antimora, *Antimora rostrata* and Slender Codling, *Halargyreus Johnsonii* (Gadiformes: Moridae), in the Northwestern Atlantic. *Acta Parasitol.* **2019**, *64*, 489–500. [CrossRef]
14. Bush, A.O.; Lafferty, K.D.; Lotz, J.M.; Shostak, A.W. Parasitology Meets Ecology on Its Own Terms: Margolis et al. Revisited. *J. Parasitol.* **1997**, *83*, 575. [CrossRef]
15. Wilson, C.B. North American Parasitic Copepods Belonging to the Lernaeopodidae, with a revision of the Entire Family. *Proc. U. S. Natl. Mus.* **1915**, *47*, 565–729. [CrossRef]
16. Chambers, C. Determining Deep-Sea Fish Community Structure in the Arctic: Using Species Assemblages, Stomach Contents, Parasite Infracommunities and Stable Isotopes to Evaluate Trophic Interactions. Ph.D. Dissertation, University of Manitoba, Winnipeg, MB, Canada, 2008. Available online: https://mspace.lib.umanitoba.ca/bitstreams/c4f1ae57-e36b-4f51-bea2-dbe986c45acf/download (accessed on 1 June 2024).
17. Bray, R.A. Digenean Parasites of Deep-Sea Teleosts: A Progress Report. *Int. J. Parasitol. Parasites Wildl.* **2020**, *12*, 251–264. [CrossRef] [PubMed]
18. Ñacari, L.A.; Escribano, R.; Oliva, M.E. Endoparasites and Diet of the "Bigeye Grenadier" *Macrourus Holotrachys* Günther, 1878 from the Deep Sea in the Southeastern Pacific Ocean. *Deep Sea Res. Part I Oceanogr. Res. Pap.* **2022**, *190*, 103903. [CrossRef]
19. Dallarés, S.; Moyà-Alcover, C.M.; Padrós, F.; Cartes, J.E.; Solé, M.; Castañeda, C.; Carrassón, M. The Parasite Community of *Phycis Blennoides* (Brünnich, 1768) from the Balearic Sea in Relation to Diet, Biochemical Markers, Histopathology and Environmental Variables. *Deep. Res. Part I Oceanogr. Res. Pap.* **2016**, *118*, 84–100. [CrossRef]
20. Sedberry, G.R.; Musick, J.A. Feeding Strategies of Some Demersal Fishes of the Continental Slope and Rise off the Mid-Atlantic Coast of the USA. *Mar. Biol.* **1978**, *44*, 357–375. [CrossRef]
21. Mauchline, J.; Gordon, J.D.M. Feeding and Bathymetric Distribution of the Gadoid and Morid Fish of the Rockall Trough. *J. Mar. Biol. Assoc. U. K. Plymouth* **1984**, *64*, 657–665. [CrossRef]
22. Houston, K.A.; Haedrich, R.L. Food Habits and Intestinal Parasites of Deep Demersal Fishes from the Upper Continental Slope East of Newfoundland, Northwest Atlantic Ocean. *Mar. Biol.* **1986**, *92*, 563–574. [CrossRef]
23. Martin, S.B.; Downie, A.J.; Cribb, T.H. A New Subfamily for a Clade of Opecoelids (Trematoda: Digenea) Exploiting Marine Fishes as Second-Intermediate Hosts, with the First Report of Opecoelid Metacercariae from an Elasmobranch. *Zool. J. Linn. Soc.* **2020**, *188*, 455–472. [CrossRef]
24. Campbell, R.A. Parasitism in the Deep Sea. In *The Sea*; Rowe, G., Ed.; Wiley: New York, NY, USA, 1983; Volume 8, pp. 473–552.
25. Palm, H.W.; Caira, J.N. Host Specificity of Adult versus Larval Cestodes of the Elasmobranch Tapeworm Order Trypanorhyncha. *Int. J. Parasitol.* **2008**, *38*, 381–388. [CrossRef]

26. Klimpel, S.; Kellermanns, E.; Palm, H.W. The Role of Pelagic Swarm Fish (Myctophidae: Teleostei) in the Oceanic Life Cycle of *Anisakis* Sibling Species at the Mid-Atlantic Ridge, Central Atlantic. *Parasitol. Res.* **2008**, *104*, 43–53. [CrossRef] [PubMed]
27. Cipriani, P.; Palomba, M.; Giulietti, L.; Marcer, F.; Mazzariol, S.; Santoro, M.; Alburqueque, 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] [PubMed]
28. Klimpel, S.; Rückert, S. Life Cycle Strategy of *Hysterothylacium Aduncum* to Become the Most Abundant Anisakid Fish Nematode in the North Sea. *Parasitol. Res.* **2005**, *97*, 141–149. [CrossRef]
29. Moravec, F.; Klimpel, S.; Kara, E. *Neoascarophis macrouri* n. sp. (Nematoda: Cystidicolidae) from the Stomach of *Macrourus berglax* (Macrouridae) in the Eastern Greenland Sea. *Syst. Parasitol.* **2006**, *63*, 231–237. [CrossRef] [PubMed]
30. Ñacari, L.A.; Escribano, R.; Harrod, C.; Oliva, M.E. Combined Use of Carbon, Nitrogen and Sulfur Stable Isotopes Reveal Trophic Structure and Connections in Deep-Sea Mesopelagic and Demersal Fish Communities from the Southeastern Pacific Ocean. *Deep Sea Res. Part I Oceanogr. Res. Pap.* **2023**, *197*, 104069. [CrossRef]
31. Suriano, D.M.; Sutton, C.A. Contribución al conocimiento de la fauna parasitológica argentina VII digeneos de peces de la plataforma del Mar Argentino. *Rev. Mus. La Plata.* **1981**, *12*, 261–271.
32. Campbell, R.A.; Munroe, T.A. New hemiurid trematodes from deep-sea benthic fishes in the western North Atlantic. *J. Parasitol.* **1977**, *63*, 285–294. [CrossRef]
33. Gaevskaya, A.V.; Rodjuk, G.N. New and rare Trematoda species from deep-sea fishes of the South-West Atlantic. *Vestn. Zool.* **1988**, *5*, 11–15.
34. McCauley, J.E. Six species of *Lepidapedon* Stafford, 1904 (Trematoda: Lepocreadiidae) from deep-sea fishes. *J. Parasitol.* **1968**, *54*, 496–505. [CrossRef]
35. Bray, R.A.; Campbell, R.A. New plagioporines (Digenea: Opecoelidae) from deep-sea fishes of the North Atlantic Ocean. *Syst. Parasitol.* **1996**, *33*, 101–113. [CrossRef]
36. Bray, R.A.; Campbell, R.A. Fellodistomidae and Zoogonidae (Digenea) of deep-sea fishes of the NW Atlantic Ocean. *Syst. Parasitol.* **1995**, *31*, 201–213. [CrossRef]
37. Ho, J.S. Copepod parasites of deep-sea benthic fishes from the western North Atlantic. *Parasitology* **1985**, *90*, 485–497. [CrossRef]
38. Boxshall, G.A. A new genus and two new species of Pennellidae (Copepoda: Siphonostomatoida) and an analysis of evolution within the family. *Syst. Parasitol.* **1986**, *8*, 215–225. [CrossRef]
39. Quattrini, A.M.; Demopoulos, A.W. Ectoparasitism on deep-sea fishes in the western North Atlantic: In situ observations from ROV surveys. *Int. J. Parasitol. Parasites Wildl.* **2016**, *5*, 217–228. [CrossRef] [PubMed]
40. Hogans, W.E. The appendages of *Lophoura tetraphylla* Ho, 1985 (Copepoda: Sphyriidae) a parasite of *Antimora rostrata* in deep waters of the northwest Atlantic Ocean. *Proc. N. S. Inst. Sci.* **1986**, *36*, 127–130.