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Demersal Fish Community in the Near-Shelf Zone of the Cosmonaut Sea, Southern Ocean

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Abstract: Studies on the demersal fish composition of the East Antarctic nearshore region are very scarce due to the harsh physical geography of the East Antarctic region, which is covered in ice and snow year round, leading to a scarcity of scientific surveys. Based on the data from the bottom trawl survey conducted by the 37–38th Chinese National Antarctic Research Expedition (CHINARE) program in the Cosmonaut Sea, East Antarctica, the species of demersal fishes were identified, and the demersal fish composition and the characteristics of depth distribution were examined and analyzed. The basic biological information of highly abundant species was analyzed. The results from 97 individuals sampled within 30–60° E, south of −65° S, indicate that the fishes belong to 5 orders, 11 families, 19 genera, and 23 species. Most of the species are found in Myctophidae and Bathydraconidae, and the most common species is *Macrourus whitsoni* (Macrouridae). *Macrourus whitsoni* and *Prionodraco evansii* have a high abundance in the survey. *Macrourus whitsoni* has body lengths of 144–662 mm and body weights of 17.3–1425.1 g, and *Prionodraco evansii* has body lengths of 90.18–134.33 mm and body weights of 4.9–20.7 g. The length–weight relationships for *Macrourus whitsoni* and *Prionodraco evansii* are $y = 0.00002x^{2.748}$ and $y = 0.000006x^{3.353}$, respectively. All the *Macrourus whitsoni* samples were found in waters deeper than 1000 m, with the highest number of individuals captured at depths of 1500–2000 m. *Prionodraco evansii* was found only at stations less than 250 m deep. These results complement the demersal fish composition and distribution data of the Cosmonaut Sea, East Antarctica. These data can provide valuable basic information for characterizing regional assemblages and delineating zoogeographic boundaries.

Keywords: demersal fish; species composition; depth distribution; Cosmonaut Sea; East Antarctic

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1. Introduction

Pelagic and demersal fish assemblages are important for coastal marine ecosystems [1]. However, pelagic fishes are rare in the Southern Ocean [2,3], with only *Pleuragramma antarcticum* currently considered to be a fully pelagic fish [4]. The Antarctic fish fauna is unique in its dominance in terms of diversity (35%) and biomass by an endemic coastal demersal group [5]. The ecological role of demersal fish in the inshore area is more important than that of Antarctic krill [5]. There, demersal fish are the main consumers of benthic organisms and feed on phytoplankton, acting as a link between the bottom and the top of the food web and as prey for other organisms, such as seabirds and seals [5]. The demersal fish fauna of the Southern Ocean comprises approximately 200 species, mostly from six families; some fish species have adapted well to these conditions and are able to occupy a large number of very different ecological niches [6,7]. Historical studies have noted that the Antarctic fish community is very peculiar; sometimes, the fish are very similar in origin, endemism, species composition, and vertical and spatial distributions, and sometimes, they are very different [7]. Studies on the composition and species distribution of demersal fishes in the Southern Ocean can provide valuable basic information for characterizing regional assemblages and delineating zoogeographic boundaries. In addition, high-latitude continental shelf waters or near-shelf waters in the Southern Ocean are considered hotspots where evolution has occurred and may have experienced rapid adaptive radiation over a short period, resulting in the formation of multiple species [8]. Joseph et al. noted that fish biomass is not the most important factor in waters around the Antarctic continental shelf and that the nature of diversity is more important than biomass [9]. Therefore, the distribution and fish composition in high-latitude shelf waters also facilitate the study of geographic differentiation and adaptive evolution of Antarctic fish. Moreover, the climate has been changing rapidly in recent years, and benthic ecosystems in the Southern Ocean may be useful for monitoring climate change [10]. Additionally, biodiversity and species interactions provide important baseline information, the observation and study of which support the assessment of the health of marine ecosystems, as well as protected marine areas, which are new approaches for the protection of marine ecosystems [11].

In recent decades, scientists have investigated the demersal fish fauna of several typical marine areas in the Southern Ocean, such as the Antarctic Peninsula [12], the South Shetland Islands [13], South Georgia [14], the Weddell Sea [6] and the Ross Sea [1], but these sea areas are all part of the West Antarctic. However, the species composition differs between the seasonal pack ice of West Antarctica and the permanent pack ice of East Antarctica [15]. The shelf diversity peaks at 400–600 m in East Antarctica [15,16], a phenomenon attributable to glacial isostasy [7]. Given the larger ice sheet, the greater depth of maximum diversity is more pronounced in East Antarctica than in West Antarctica, where the diversity is the greatest at 200–400 m [12]. Currently, demersal fish surveys in East Antarctica are lacking, especially in near-shelf and deep-slope areas.

The Cosmonaut Sea is located in the southwestern Indian Ocean sector of the Southern Ocean and is the marginal sea off the coast of Enderby Land in the East Antarctic. This region is bordered by the Atlantic and Indian Oceans in the north, the Riiser–Larsen Sea and the Lazarev Sea in the west, and is connected to the Weddell Sea, the Cooperation Sea, and Prydz Bay in the east; additionally, this region is an important component of the Southern Ocean ecosystem [17,18]. There have been few human investigations and studies of demersal fishes in the East Antarctic Cosmonaut Sea compared to those in other parts of the Southern Ocean, such as the Amundsen Sea and the Ross Sea. The scientific sampling of demersal fishes is very difficult in the Cosmonaut Sea, and most of the sampling has been opportunistic due to the remoteness of the area and the presence of a permanent ice zone in this sea area, which poses a great challenge for large-scale survey efforts. Additionally, the impetus for studies of the biomass, diversity, and structure of slope fish communities was provided by the development of commercial fisheries at upper and mid-slope depths [19–22]. In contrast, while some Antarctic krill fisheries and toothfish fisheries exist in the Cosmonaut Sea, they are far less common than they are in the Ross Sea and Antarctic Peninsula. Therefore, from the perspective of environmental and social factors, the current scientific research on demersal fishes in the Cosmonaut Sea is very limited, and there are few studies on the composition and community structure of demersal fishes. Based on the 37–38th Chinese National Antarctic Research Expedition (CHINARE) program, this study obtained demersal fish samples from the near-shelf area of the Cosmonaut Sea. The obtained demersal fish species were identified, and the demersal fish composition and depth distribution characteristics were analyzed. The basic information of species with high abundances in the near-shelf area of the Cosmonaut Sea was analyzed. The purpose of this article was to complement Cosmonaut Sea demersal fish composition and distribution data and explore the characteristics of their community structure. This study provides basic data for studies of Southern Ocean fish fauna, characterizing regional assemblages and delineating zoogeographic boundaries. Moreover, this study provides a reference for future resource development and management decisions against the background of climate change.

2. Materials and Methods

2.1. Survey Area and Sampling

The study area is located in the Cosmonaut Sea, East Antarctica, one of the least explored regions in the Southern Ocean [23]. Both the Coastal Current, which flows westward in the southern region, and the Antarctic Circumpolar Current were analyzed in the 37–38th Chinese National Antarctic Research Expedition (CHINARE) program, in which a total of 18 trawl survey stations were used in the Cosmonaut Sea. The survey season ranged from January to February 2021 and 2022, and the survey area and station settings are shown in Figure 1. The cruise of the 37–38th Chinese National Antarctic Research Expedition (CHINARE) was aboard the polar research vessel Xue Long 2, with forward and astern two-way icebreaking technology. A 2.2 m wide triangle trawl with 20 mm mesh was employed to survey demersal fish, with tows lasting 15–20 min (bottom time) according to the bathymetric topography. The trawl speeds were approximately 2–3 knots, and the trawl distance ranged from 0.93 to 1.39 km. Depth data were collected using temperature, salt, and depth recorders (SBE 911 plus) produced by the Sea-Bird Company (Bellevue, the United States).

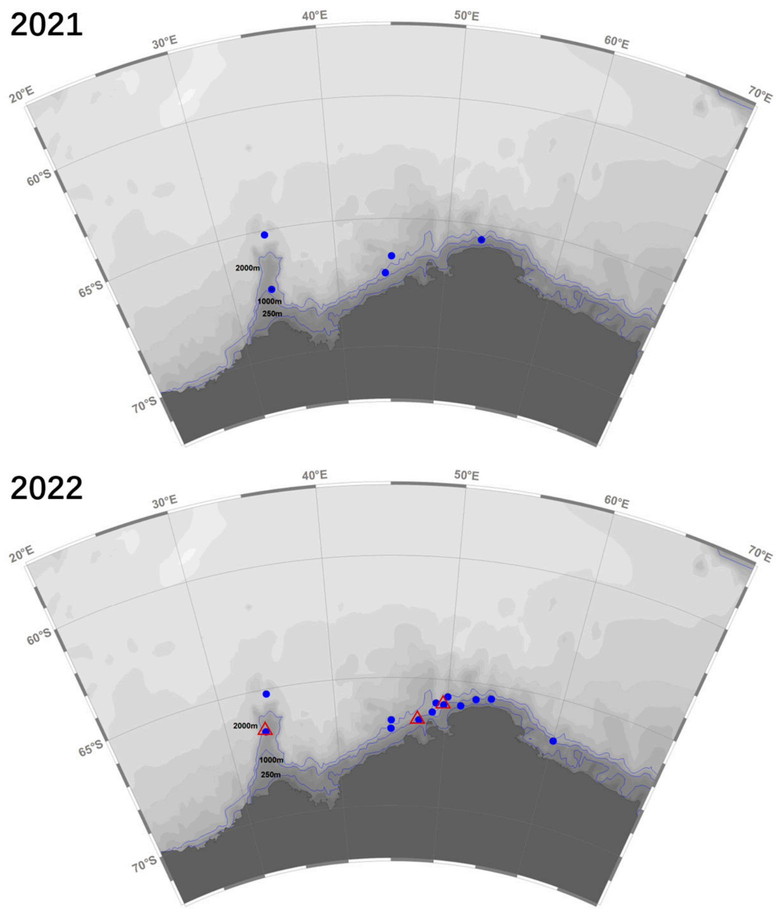

Figure 1. Survey stations of trawl in Cosmonaut Sea during 2021–2022. The solid blue circles are the trawl stations. Stations framed by red triangles are those where no benthic fish samples were captured due to gear damage during trawling.

Some explanation of the bathymetrical differentiation of samplings is needed here. Unlike in other areas of the Southern Ocean, the near-shelf area of the Cosmonaut Sea is often ice-covered and has a complex seafloor topography, and survey stations often need to adjust the data in real time according to sea ice conditions. Therefore, no special delineation of the depth range was made in this survey, as this delineation was used only to make stations closer to the shore more likely to be used.

2.2. Analytical Methods

2.2.1. Species Composition

The demersal fish samples caught on board were brought back to the laboratory for species identification under −20 °C storage conditions, and the body length and weight were measured (after defrosting). Species were identified primarily by morphology and corroborated by DNA barcoding methods. Based on the species identification results, a list of demersal fish species in the Cosmonaut Sea was compiled, and the vertical distribution of demersal fish species was mapped.

2.2.2. Basic Biology of the Species with a High Abundance

The distributions of the body length and weight of the species that had a high abundance (abundance in the top two) were plotted, and the length–weight relationships of the species were fitted based on the length–weight relationship Equation (1). The body length distribution as a function of water depth was plotted.

$$W = aL^b \quad (1)$$

W is the body weight in g; and L is the body length in mm.

3. Results

3.1. Species Composition

A total of 97 demersal fish samples were captured in the near-shelf area of the Cosmonaut Sea; these fish were identified as belonging to 23 species in 19 genera and 11 families in 5 orders, and the species list is shown in Table 1. The largest percentages of fish species were found in Myctophidae and Bathydraconidae, as shown in Figure 2. The largest percentage of individuals were found in Macrouridae and *M. whitsoni*, followed by Bathydraconidae and *P. evansii*, which accounted for 31.95% and 23.71%, respectively, of the total number of individuals, as shown in Table 1.

Table 1. List of demersal fish and their biomass proportion in 37–38th survey in the Cosmonaut Sea.

Order	Family	Species	Biomass Proportion
Argentiniformes	Bathylagidae	*Bathylagus antarcticus*	6.19%
Aulopiformes	Paralepididae	*Notolepis coatsi*	2.06%
Gadiformes	Macrouridae	*Macrourus whitsoni*	31.96%
		Coryphaenoides lecointei	1.03%
	Muraenolepididae	*Muraenolepis* spp.	2.06%
Myctophiformes	Myctophidae	*Electrona antarctica*	7.22%
		Gymnoscopelus opisthopterus	2.06%
		Gymnoscopelus braueri	1.03%
		Gymnoscopelus nicholsi	1.03%
Perciformes	Bathydraconidae	*Bathydraco antarcticus*	6.19%
		Cygnodraco mawsoni	1.03%
		Prionodraco evansii	23.71%
		Racovitzia glacialis	2.06%
	Zoarcidae	*Lycenchelys aratrirostris*	1.03%
		Lycodichthys antarcticus	1.03%
	Artedidraconidae	*Artedidraco shackletoni*	1.03%
		Artedidraco skottsbergi	1.03%
		Pogonophryne scotti	2.06%
	Liparidae	*Careproctus longipectoralis*	1.03%
	Channichthyidae	*Chionodraco hamatus*	1.03%
		Chionobathyscus dewitti	2.06%
	Nototheniidae	*Trematomus pennellii*	1.03%
		Trematomus scotti	4.12%

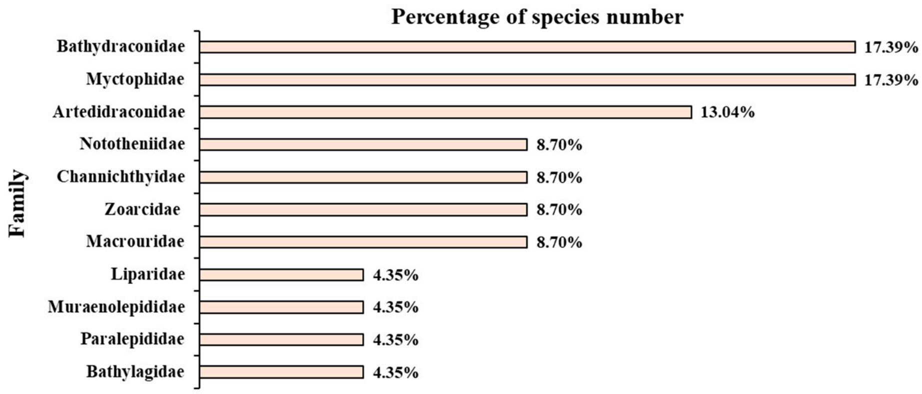

Figure 2. Percentage of species number per fish family, as established in Cosmonaut Sea by the 37–38th CHINARE program.

3.2. Depth Distribution of Demersal Fishes

The composition of demersal fishes at different water depths and the corresponding body lengths of each species are shown in Table 2. The four species with high abundances had different depth distributions.

Table 2. Depth distribution and body length distribution of demersal fish in the Cosmonaut Sea.

Species	Number of Samples	Max Body Length (mm)	Minimum Body Length (mm)	Mean Body Length (mm)	SD
Depth in 200–300 m, 3 trawling					
Artedidraco shackletoni	1	-	-	-	-
Chionodraco hamatus	1	-	-	-	-
Prionodraco evansii	23	134.33	90.18	113.86	11.2
Racovitzia glacialis	2	171.52	161.33	166.43	7.21
Lycodichthys antarcticus	1		-	-	-
Trematomus pennellii	1		-	-	-
Pogonophryne scotti	2	143.62	40.5	92.06	72.92
Trematomus scotti	4	93.37	52.03	81.92	19.97
Cygnodraco mawsoni	1	-	-	-	-
Artedidraco skottsbergi	1	-	-	-	-
Depth in 800–1000 m, 3 trawling					
Gymnoscopelus nicholsi	1	-	-	-	-
Electrona antarctica	1	-	-	-	-
Chionobathyscus dewitti	1	-	-	-	-
Depth in 1000–1500 m, 3 trawling					
Macrourus whitsoni	11	662	144	442.57	163.21
Muraenolepis spp.	1	-	-	-	-
Electrona antarctica	2	54	49	51.5	3.54
Bathylagus antarcticus	3	96	67.14	81.57	20.41
Bathydraco antarcticus	1	-	-	-	-
Depth in 1500–2000 m, 4 trawling					
Gymnoscopelus braueri	1	-	-	-	-
Gymnoscopelus opisthopterus	1	-	-	-	-
Macrourus whitsoni	13	599	175.46	420.36	114.95
Notolepis coatsi	2	44.6	40.97	42.79	2.57
Electrona antarctica	2	79.63	62.15	70.89	12.36

Table 2. *Cont.*

Species	Number of Samples	Max Body Length (mm)	Minimum Body Length (mm)	Mean Body Length (mm)	SD
Depth in >2000 m, 2 trawling					
Lycenchelys aratrirostris	1	-	-	-	-
Gymnoscopelus opisthopterus	1	-	-	-	-
Macrourus whitsoni	7	538	103.22	356.24	183.21
Coryphaenoides lecointei	1	-	-	-	-
Muraenolepis spp.	1	-	-	-	-
Electrona antarctica	2	72	71	71.5	0.71
Bathydraco antarcticus	5	153.39	109.18	124.64	18.13
Chionobathyscus dewitti	1	-	-	-	-
Careproctus longipectoralis	1	-	-	-	-

The most abundant *M. whitsoni* species were distributed in waters deeper than 1000 m, and the individuals with the largest average body length (442.57 mm) were distributed in waters from depths of 1000 to 1500 m. *P. evansii* was found in water depths of 200–300 m, with an average body length of 113.86 mm. *B. antarcticus* occurred in depths from 1000 to 1500 m and >2000 m. The mean body lengths of *B. antarcticus* at depths of 1000–1500 m and >2000 m were 236.17 mm and 124.64 mm, respectively. Compared with the other three species of demersal fish, *E. antarctica* has a wider depth distribution, and the mean body lengths at different depths are similar.

3.3. Main Species and Their Biological Characteristics

There were large numbers of *M. whitsoni* and *P. evansii* individuals in both surveys. The body lengths of the captured *M. whitsoni* ranged from 144 to 662 mm, with a mean body length of 423.56 mm and a dominant body length class of 400–450 mm; body weights ranged from 17.3–1425.1 g, with a dominant weight class of 200–400 g, as shown in Figure 3. The correlation between body length and weight is shown in Figure 4, and the relationship equation is as follows:

$$y = 0.00002x^{2.748} \quad (2)$$

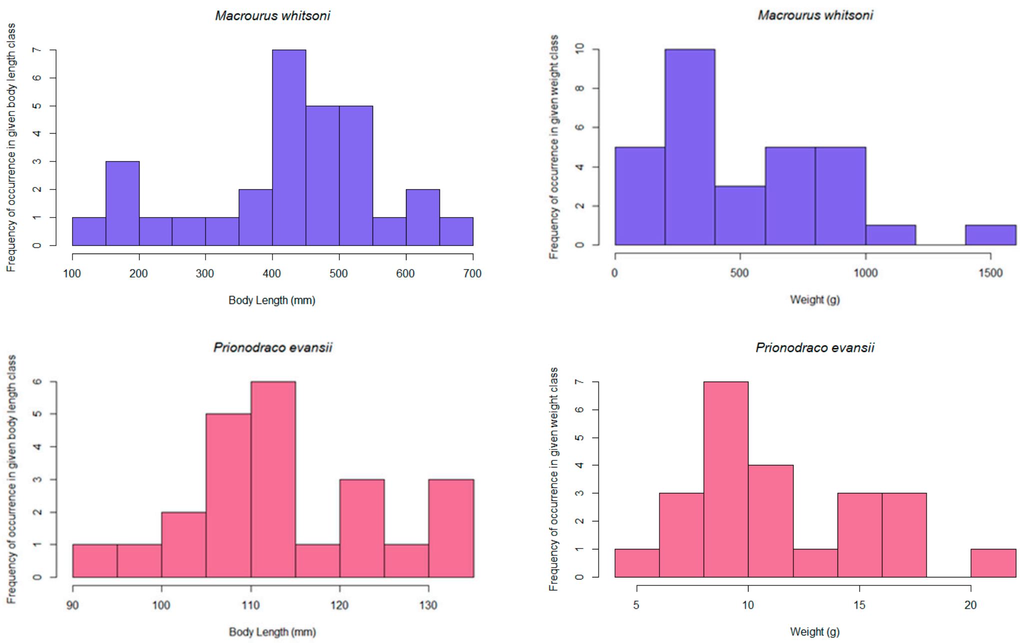

Figure 3. Length and weight distribution of *M. whitsoni* and *P. evansii*.

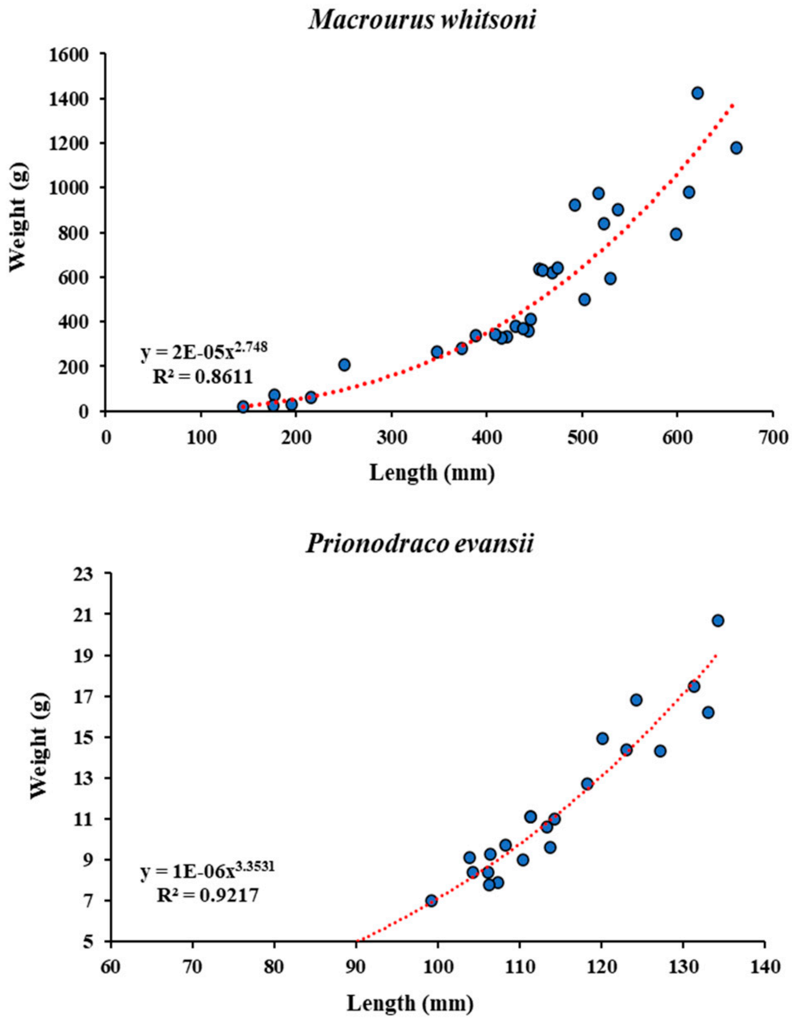

Figure 4. Body length–weight relationship of *M. whitsoni* and *P. evansii*.

The body lengths of the captured *P. evansii* ranged from 90.18 to 134.33 mm, with a mean body length of 113.86 mm and a dominant body length group of 110–115 mm; body weights ranged from 4.9 to 20.7 g, with a dominant body length group of 8–10 g, as shown in Figure 3. The correlation between body length and body weight is shown in Figure 4, and the relationship equation is as follows:

$$y = 0.000006x^{3.353} \quad (3)$$

where y and x in Equations (2) and (3) represent the body weight in g and the body length in mm, respectively.

In this survey, the *M. whitsoni* distribution depth was above 1000 m, and the greatest number of *M. whitsoni* was caught at depths of 1500–2000 m. However, the distributions of the body length of *M. whitsoni* at different water depths were not particularly distinctive. The *P. evansii* distribution depth was less than 250 m deep, and the fish had a large body length at deeper stations (Figure 5).

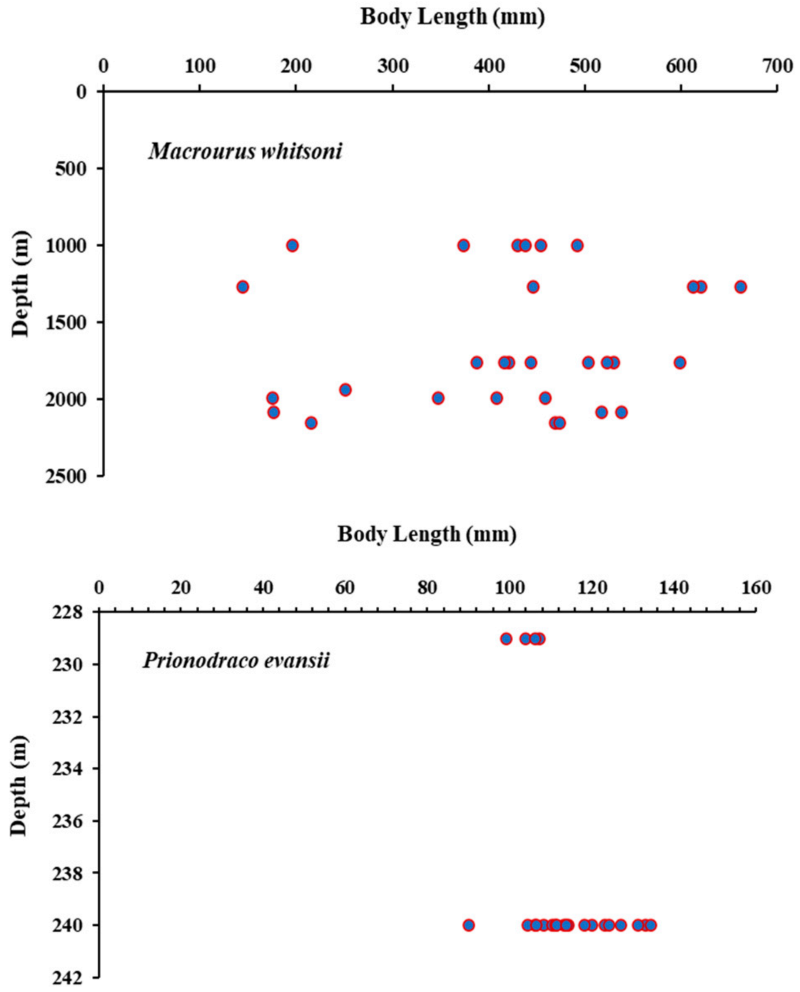

Figure 5. Relationship between body length and depth distribution of *M. whitsoni* and *P. evansii*.

4. Discussion

4.1. Demersal Fish in the Cosmonaut Sea

In comparison with the "Biogeographic Atlas of the Southern Ocean" [4], four fish species were found in both the historical survey (Table 3) and the 37–38th CHINARE survey, namely *Notolepis coatsi*, *M. whitsoni*, *Cygnodraco mawsoni*, and *Chionobathyscus dewitti*. Based on the comparative results, the findings of the species in this study add to the demersal fish composition of the near-shelf zone of the Cosmonaut Sea. Moreover, the results confirmed the higher diversity embodied in the fauna of East Antarctica [16].

Table 3. List of demersal fish in the Cosmonaut Sea (from the 37–38th survey and historical records).

Order	Family	Genus	Species	Record
Argentiniformes	Bathylagidae	*Bathylagus*	*Bathylagus* spp.	HS
			Bathylagus antarcticus	37–38th
Aulopiformes	Paralepididae	*Notolepis*	*Notolepis coatsi*	HS, 37–38th
Gadiformes	Muraenolepididae	*Muraenolepis*	*Muraenolepis marmorata*	HS
			Muraenolepis spp.	37–38th
		Notomuraenobathys	*Notomuraenobathys microcephalus*	HS
	Macrouridae	*Coryphaenoides*	*Coryphaenoides lecointei*	37–38th
		Macrourus	*Macrourus caml*	HS
			Macrourus whitsoni	HS, 37–38th
	Moridae	*Antimora*	*Antimora rostrata*	HS

Table 3. *Cont.*

Order	Family	Genus	Species	Record
Myctophiformes	Myctophidae	*Gymnoscopelus*	*Gymnoscopelus braueri*	37–38th
			Gymnoscopelus nicholsi	37–38th
			Gymnoscopelus opisthopterus	37–38th
		Electrona	*Electrona antarctica*	37–38th
Perciformes	Artedidraconidae	*Artedidraco*	*Artedidraco* spp.	HS
			Artedidraco shackletoni	37–38th
			Artedidraco skottsbergi	37–38th
		Pogonophryne	*Pogonophryne scotti*	37–38th
	Bathydraconidae	*Akarotaxis*	*Akarothaxis nudiceps*	HS
		Bathydraco	*Bathydraco antarcticus*	37–38th
		Cygnodraco	*Cygnodraco mawsoni*	HS, 37–38th
		Gymnodraco	*Gymnodraco acuticeps*	HS
		Prionodraco	*Prionodraco evansii*	37–38th
		Racovitzia	*Racovitzia glacialis*	37–38th
		Gerlachea	*Gerlachea australis*	HS
	Channichthyidae	*Cryodraco*	*Cryodraco* spp.	HS
		Chaenodraco	*Chaenodraco wilsoni*	HS
			Chionodraco hamatus	37–38th
		Chionobathyscus	*Chionobathyscus dewitti*	HS, 37–38th
	Liparidae	*Paraliparis*	*Paraliparis leobergi*	HS
		Careproctus	*Careproctus longipectoralis*	37–38th
	Nototheniidae	*Lepidonotothen*	*Lepidonotothen squamifrons*	HS
		Trematomus	*Trematomus* spp.	HS
			Trematomus pennellii	37–38th
			Trematomus scotti	37–38th
		Dissostichus	*Dissostichus mawsoni*	HS
		Pagothenia	*Pagothenia brachysome*	HS
	Zoarcidae	*Lycodichthys*	*Lycodichthys* spp.	HS
			Lycodichthys antarcticus	37–38th
			Lycenchelys aratrirostris	37–38th
		Pachycara	*Pachycara* spp.	HS
Rajiformes	Rajidae	*Amblyraja*	*Amblyraja georgiana*	HS
	Arhynchobatidae	*Bathyraja*	*Bathyraja eatonii*	HS
			Bathyraja maccaini	HS
Stomiiformes	Gonostomatidae	*Cyclothone*	*Cyclothone microdon*	HS
Lampriformes	Lampridae	/	/	HS

Note: HS: historical records [4]; 37–38th: 37–38th Chinese National Antarctic Research Expedition (37–38th CHINARE).

According to the analysis of the composition of the fish taxa, the demersal fish taxa in the Cosmonaut Sea mainly consisted of fishes from the families Macrouridae and Bathydraconidae; these fishes were also found in the nearshore deep-sea land slope of the Cosmonaut Sea and in the vicinity of the seamounts. While the demersal fish taxa of the Antarctic Peninsula and its surrounding waters and the Weddell Sea, which is in the West Antarctic, are mainly composed of fishes from the families Nototheniidae, Channichthyidae, and Bathydraconidae [24], the Cosmonaut Sea shows endemism in terms of fish taxa, which is highly important for the analytical study of biogeography and the boundaries of the region. In terms of the number of single species, the large number of demersal fish species in the nearshore area of the Cosmonaut Sea include *M. whitsoni* and *P. evansii*. *M. whitsoni* was found at stations above a depth of 1000 m, while *P. evansii* was found only at stations 200–300 m deep. *M. whitsoni* belongs to Macrouridae and is a large deep-sea demersal fish species, while *P. evansii* belongs to Bathydraconidae and is a common species in the Southern Ocean.

In terms of the vertical distribution, more species of demersal fishes were found in the 200–300 m depth range. It has also been previously noted that the richest known diversity of demersal fish species in East Antarctica occurs at depths of 200–300 m and that this geographic distribution is thought to be related to the sinking shelf and shelf depressions [15]. Many of the species in the Southern Ocean demersal fish taxa have a wide vertical distribution with no particularly distinct bathymetric boundaries. Currently, only *Pleuragramma antarcticum* is considered to belong exclusively to pelagic fishes of the Southern Ocean [4]. In the future, it is also important to study the vertical distribution characteristics and distribution mechanisms of demersal fishes to help understand their life history and ecological processes.

There is one more point in the analysis of the composition of demersal fishes that is worth noting here. In this study, it can be found that the sample size of demersal fish caught in the Southern Ocean is very small, which is quite different from the sample size obtained by the analysis of fish composition in other oceans. This is not because of a problem with the method we use to catch demersal fish in the Southern Ocean but because of the characteristics of demersal fish in the Southern Ocean. The Southern Ocean is different from other oceans in that its ecosystems are relatively barren compared to other oceans. The species, biomass, and distribution density of fish are much lower than in other oceans. The articles on the analysis of the composition of demersal fish using the method of submarine photography also point out that the distribution density of demersal fish is very low; 2736 photos were taken over an area of 11,317 square meters, but benthic fish were only found in just over 300 photos. After conversion, the distribution density of some demersal fish species is only 0.09 ind./100 m^2 [24].

4.2. Dominant Species

Based on historical data and parameters [25], we preliminary estimated that *M. whitsoni* caught in the Cosmonaut Sea was between 3 and 23 years old and was a long-life cycle fish. Previous studies of *M. whitsoni* in the Ross Sea revealed that the maximum body length of *M. whitsoni* ranged from 650 to 680 mm [26–28], and the maximum body weight was approximately 1300 g [28], which was similar to the results of our study. Bradley et al. calculated parameter b in their study of *M. whitsoni* in the Ross Sea and found that most of the *M. whitsoni* samples were distributed at depths of 1200–1400 m [28]. Moreover, *M. whitsoni* is a very abundant species and dominates the fish fauna of deep-sea slopes [26,29,30]. In contrast, the values of parameter b calculated in the present study are smaller than those calculated in that study, but the depth distributions are essentially the same. The two main reasons for the different parameter b values may be the insufficient sample size, i.e., the sampling does not distinguish between males and females, and the influence of the environment. *M. whitsoni* in the Ross Sea has been shown to have a longevity of more than 27 years, reaching sexual maturity at approximately 16 years of age, corresponding to a body length of 520 mm and a trophic level of 4.1–4.3 [27]. In the Ross Sea, *M. whitsoni* is a bycatch species of Antarctic toothfish (including both the economic species *Dissostichus eleginoides* and *D. mawsoni*), which has catch biomass that accounts for 10% of the total Antarctic toothfish catch biomass [31]. The yield of *M. whitsoni* was 100 tons in 1998, while it increased to 480 tons in 2005 [31]. Although *M. whitsoni* is a bycatch species, the species should be monitored and managed, but its biology is currently poorly understood [25]. In addition, *M. whitsoni* is a major prey organism for Antarctic toothfish [32,33] and is often found in the stomach contents of Antarctic toothfish. The demand for Antarctic toothfish increases as the length of the fish increases. It has been shown that the demand for Antarctic toothfish increases as the length of the fish increases [32].

The above background information shows that *M. whitsoni* occupies an important ecological position in the fish fauna of deep-sea slopes and plays a major role in the delineation of clusters; further studies on this topic will help to support research on the zoogeographic boundaries of the Southern Ocean. Moreover, *M. whitsoni* has a long life cycle and can record more "history", and this study can help us explore additional information about changes in the ecological environment, biological genetics, and evolution. Notably, there is a close correlation between the resource distribution of Antarctic toothfish and *M. whitsoni* [33]. There are likely Antarctic toothfish resources in the sea area where *M. whitsoni* lives, especially in nearshore areas with greater water depths, and these resources can be used as important indicator species for resource monitoring. It has been noted that the Cosmonaut Sea is experiencing large-scale climate change, which will affect the Antarctic Circumpolar Current (ACC) and the Antarctic Slope Current (ASC), and changes in the ASC may lead to changes in the ecology of the sloping shelf [34]. Therefore, studies of key species on slopes would be beneficial for understanding the mechanisms involved in the response of polar fishes to climate change. Analyzed from the perspective of pure ecology and ecological value, *M. whitsoni* is a key species in the Cosmonaut Sea. In future studies, the population age structure, suitable habitat, and spawning grounds of this species will be analyzed.

In addition to *M. whitsoni*, a species with a higher abundance, *P. evansii*, was also found in this survey. Compared with *M. whitsoni*, less research has focused on *P. evansii*, and more descriptions of this species have appeared in studies of the fish fauna in the common waters of the Southern Ocean. In this study, we found that the depth range of *P. evansii* was within 250 m, and the body length range was 90.18–134.33 mm, which was similar to the findings in the Weddell Sea [24,35], the Ross Sea [1,36], and the Antarctic Peninsula [37]. *P. evansii* is one of the most biomass-rich demersal fishes in the Southern Ocean; it is a schooling fish that is often distributed in the shallower nearshore region, and its biomass distribution is relatively uniform [35]. *P. evansii* prefers soft substrate environments that are free of rock and biological debris and contain a small number of algae, and they are often found with *Chorismus antarcticus* [35,38]. Several studies have also noted that the biomass of *Artedidraco skottsbergi* is inversely proportional to the biomass of *P. evansii* in the same sea area [37], and this view was also reflected in the present study. By analyzing and discussing the results of the survey and the background information on *P. evansii*, it was found that although *P. evansii* does not have very significant special characteristics in the study area, it is also a species that cannot be ignored. In terms of *P. evansii* biomass distribution characteristics and habitat characteristics, whether the biomass of *P. evansii* can be stably distributed depends on whether the condition of the benthic environment is stable. Several studies have noted that in the context of climate change, benthic communities may be affected by sea ice scouring, temperature changes, and, consequently, evolution [18]. Therefore, *P. evansii* has the potential to be a benthic fish species for monitoring whether the benthic environment is changing in the Cosmonaut Sea, a shallow area with a narrow shelf.

5. Conclusions

In this study, a total of 23 demersal fish species were found in the near-shelf area of the Cosmonaut Sea, and Myctophidae and Bathydraconidae had the greatest numbers of species. *M. whitsoni* and *P. evansii* had high abundances at different depths. The results of the analysis supplemented the data on the composition and distribution of demersal fishes in the East Antarctic. However, there are still limitations in the survey used in this article; for example, the survey method involved only bottom trawling, and the survey season was only the summer in Antarctica. In the future, it is necessary to adopt an integrated method for surveying and obtaining additional data.

Author Contributions: R.W. and R.Z. performed the data analyses and wrote the first draft. X.M. helped obtain the fish samples. H.L. and P.S. helped with data analyses and revised the manuscript. Y.L. and L.L. revised the manuscript. All authors participated in the discussion to finalize the manuscript. All authors have read and agreed to the published version of the manuscript.

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