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1 Micronektonic fish species over three seamounts in the southwestern  
2 Indian Ocean

3

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24

25 ABSTRACT

26

27 Taxonomic composition, abundance and biological features of micronektonic fish were  
28 investigated using pelagic trawls conducted near and over the summits of three seamounts  
29 located in the western Indian Ocean (La Pérouse, MAD-Ridge and Walters Shoal).  
30 Mesopelagic fish from three families accounted for 80% by number of the total catch (5714  
31 specimens, 121 taxa), namely myctophids (59%), gonostomatids (12%) and sternoptychids  
32 (9%). Whereas the gonostomatid *Sigmops elongatus* was the most abundant species around  
33 La Pérouse seamount, myctophids were the most diverse and dominant group by number in  
34 all three studied areas. Most myctophids were high-oceanic species, which included the  
35 numerically dominant *Benthosema suborbitale*, *Ceratoscopelus warmingii*, *Diaphus*  
36 *perspicillatus*, *Hygophum hygomii*, and *Lobianchia dofleini*. The few remaining myctophids  
37 (*Diaphus suborbitalis* being the most abundant) were pseudoceanic fish, highlighting the  
38 association with landmasses. The study adds one myctophid species new to the Indian Ocean  
39 (*Diaphus bertelseni*), and a second record in the literature of the recently described  
40 sternoptychid *Argyripnus hulleyi*.

41

42 *Keywords:* *Ceratoscopelus warmingii*, *Diaphus suborbitalis*, *Sigmops elongatus*, lanternfish,  
43 tropical waters

44

## 45 **1. Introduction**

46

47         Micronektonic fish are the most abundant fish on Earth and the most abundant  
48 vertebrates in the biosphere ([Irigoiien et al., 2014](#)). They play a key role in biogeochemical  
49 cycling including in the export of organic carbon from surface waters to the deep (the  
50 'biological pump'; [Bianchi et al., 2013](#)), and as a trophic link between zooplankton and top  
51 predators in oceanic waters ([Potier et al., 2007](#); [Cherel et al., 2010](#)). From an economic  
52 perspective, their large biomass and nutritional quality render these fish among the few  
53 marine resources available worldwide that new commercial fisheries could exploit ([Catul et](#)  
54 [al., 2011](#)). Relatively few investigations have targeted organisms living in the oceanic  
55 domain, so contrasting with the numerous studies that have focused on coastal and neritic  
56 waters. The lack of information on micronekton is especially critical in the Indian Ocean, the  
57 less well known of the three major oceans. Moreover, because most recent oceanographic  
58 studies have tended to focus on relationships between physical oceanography and  
59 micronekton, and on the structure of the trophic web (e.g. [Annasawmy et al., 2019, 2020a, b](#)),  
60 they do not detail the taxonomic composition of the communities, including that of  
61 mesopelagic fish.

62         Near landmasses, pelagic organisms enter and accumulate in the benthopelagic layer,  
63 where they interact with continental, insular and seamount slopes ([Porteiro and Sutton, 2007](#)).  
64 There, they form mesopelagic boundary communities, which consist of assemblages of open-  
65 ocean species together with pseudoceanic taxa. Pseudoceanic fish are members of primarily  
66 pelagic families that associate consistently with the benthopelagic layer of the slopes ([Porteiro](#)  
67 [and Sutton, 2007](#)). The presence of aggregations of both oceanic and pseudoceanic species  
68 over seamounts lead to a large micronektonic biomass that, in turn, favours the development  
69 of diverse benthic communities and attracts significant numbers of top predators, including

70 large carnivorous fish and marine mammals (Pitcher et al., 2007). Consequently, seamounts  
71 are now recognized as biological hotspots that need protection and management (Rogers et  
72 al., 2017; Rogers, 2018). However, despite the pivotal trophic role of micronekton, most  
73 biological studies of seamounts have been on zooplankton or larger, commercially exploited  
74 nektonic and benthic fish, with relatively few studies on small pelagic fish (Moore et al.,  
75 2004; Porteiro and Sutton, 2007; Sutton et al., 2008). For example, a recent investigation of  
76 seamount communities focused only on large pelagic shrimps and mysids (Letessier et al.,  
77 2017) or cephalopods (Laptikhovsky et al., 2017), and provided no available detailed  
78 information on the co-occurring micronektonic fish, whereas they were obviously also  
79 collected by the pelagic trawl (Rogers et al., 2017).

80         Seamount ecosystems of the southwestern Indian Ocean are still poorly known despite  
81 decades of fisheries and research (Collette and Parin, 1991; Parin et al., 2008), and basic  
82 information on pelagic species presence, biogeography and ecology is still in short supply  
83 (Rogers et al., 2017). Within that context, the main goal of this manuscript was to detail the  
84 micronektonic fish that were collected over and close to the summits of three shallow  
85 seamounts, La Pérouse, MAD-Ridge and Walters Shoal (summit depths at ~60, ~240 and ~18  
86 m below the sea surface, respectively). La Pérouse and Walters Shoal are well-located and  
87 named seamounts, but MAD-Ridge refers to an unnamed seamount located south of  
88 Madagascar (details in Roberts et al., 2020). Mesopelagic fish caught during three cruises  
89 were compared with data collected during the MICROTON cruise (Fig. 1) that was conducted  
90 in the open ocean of the western tropical Indian Ocean (Anassawmy et al., 2018). The present  
91 work is companion to those devoted to La Pérouse and MAD-Ridge seamounts, which present  
92 information on (i) micronekton distribution and assemblages based on acoustic and trawl data  
93 (Anassawmy et al., 2019), (ii) micronekton distribution in relation to physical oceanography  
94 (Anassawmy et al., 2020b), and (iii) the trophic structure of mesopelagic communities using

95 the stable isotope method (Anassawmy et al., 2020a). Here, we focus on the taxonomic  
96 composition and biology of lanternfish (family Myctophidae), because they constitute the  
97 most diverse and abundant group of mesopelagic fish worldwide (Gjøsaeter and Kawaguchi,  
98 1980).

99

## 100 **2. Material and methods**

101

### 102 *2.1. Scientific cruises and pelagic trawling*

103 The oceanographic cruises La Pérouse (19°43'S, 54°10'E, 15–30 September 2016,  
104 from/to La Réunion Island) and MAD-Ridge (27°28'S, 46°16'E, leg 2, Fort Dauphin,  
105 Madagascar to Durban, South Africa, 26 November–14 December 2016) were carried out in  
106 the western tropical Indian Ocean on board the RV *Antea* (more details can be found at DOI:  
107 10.17600/16004500 and 10.17600/16004900, respectively). Totals of 10 and 17 trawls were  
108 performed during La Pérouse and MAD-Ridge, respectively. Micronekton was sampled with  
109 an open 40-m long International Young Gadoid Pelagic Trawl (IYGPT) constructed of 8 cm  
110 knotless nylon delta mesh netting at the front tapering to 0.5 cm at the codend. The trawl had  
111 a theoretical maximal mouth area of ~96 m<sup>2</sup> that is reduced to a smaller ellipse when  
112 deployed. The IYGPT is a non-closing (i.e. permanently open) trawl with the principal  
113 disadvantage that it fishes from when it is shot away until it is recovered, not simply across  
114 the selected depth. However, its main advantages are its size larger than closing nets and its  
115 faster towing speed, allowing it to sample a large volume of water.

116 The study of the Walters Shoal seamount (33°12'S, 43°50'E, 26 Apr/18 May 2017,  
117 MD 208, DOI: 10.17600/17002700) was conducted from the RV *Marion Dufresne II*. In all,  
118 14 night-time hauls were performed using an Isaacs–Kidd Midwater Trawl (IKMT), because  
119 it is not possible to use trawls with doors (e.g. IYGPT) on that ship. The non-closing trawl

120 had a mesh size reducing from 3.5 cm at its mouth to 0.5 cm at the codend and a mouth area  
121 of ~26 m<sup>2</sup>.

122 The net was towed at a ship's speed of ~2–3 knots at the targeted depth for 60 min  
123 during the La Pérouse and 30 min during the MAD-Ridge and Walters Shoal cruises. Sound  
124 scattering layers (SSLs) were sampled, and trawl depth was monitored using a Scanmar depth  
125 sensor. Trawling was at night during the Walters Shoal cruise, and by night and day during  
126 the La Pérouse and MAD-Ridge cruises (n = 9 and 1, and 12 and 5, respectively). Hauls were  
127 categorized according to sampling depths as shallow ( $\leq 100$  m, no less than 30 m),  
128 intermediate (from 100 to 400 m), and deep ( $> 400$  m, no more than 550 m).

129 An earlier cruise, MICROTON, (21°00'–24°30'S, 55°00'–64°50'E, 19 March – 05  
130 April 2010, from/to La Réunion Island) was also conducted in the western tropical Indian  
131 Ocean on board the RV *Antea* (Fig. 1), but in the open ocean (Annasawmy et al., 2018).  
132 Micronekton on that cruise was sampled using an IYGPT within the same depth range (30–  
133 600 m), thus allowing comparison of the mesopelagic fish caught then with those collected  
134 during the La Pérouse and MAD-Ridge cruises. The main goal of the study was to compare  
135 the micronektonic fish caught either near or at seamounts with those found in oceanic waters.

136

## 137 2.2. Fish identification and data analyses

138 Micronekton was divided on board into four broad categories: gelatinous organisms,  
139 crustaceans, cephalopods (represented mostly by squid species) and fish. Fish collected  
140 during the La Pérouse and MAD-Ridge cruises were sorted to species or lowest identifiable  
141 taxon and measured before being frozen, but during the Walters Shoal cruise, fish were sorted  
142 by broad taxa and immediately frozen. Fish were kept at –20°C until further analysis at the  
143 University of Cape Town in June 2017. There, identifications from the La Pérouse and MAD-  
144 Ridge cruises were double-checked, and fish from the Walters Shoal cruise were identified

145 and measured. Identification was based on morphological features according to the available  
146 literature (mainly [Smith and Heemstra, 1986](#)). Special emphasis was laid on myctophid  
147 identification down to species level by combining morphological features and otolith shapes.  
148 Identification of several of the myctophids was double-checked by P.A. Hulley from the  
149 Iziko–South African Museum (Cape Town). Owing to taxonomic complexity and the lack of  
150 good identification keys, many other mesopelagic fish were determined only to genus level.  
151 Pelagic juvenile stages of non-mesopelagic fish are not detailed here and were pooled ([Tables](#)  
152 [1 and 2](#)). Fish standard length (SL) was measured to the nearest 0.1 mm with a digital vernier  
153 caliper.

154 Statistical analyses were carried out using SYSTAT 13. Despite different sampling  
155 protocols depending on cruises, equality of proportion tests (large-sample tests) were  
156 performed to compare the relative numbers of each fish taxon between the La Pérouse and the  
157 MAD-Ridge cruises, with the significance level being set at  $p < 0.001$ . Values are reported as  
158 mean  $\pm$  SD.

159

### 160 **3. Results**

161

162 Overall, 5714 micronektonic fish were identified and measured during the three  
163 cruises. Larvae/postlarvae/small juvenile stages of adult non-mesopelagic species represented  
164 8.3% (472 individuals) of the fish communities, with leptocephali of the order Anguilliformes  
165 (n=261, 4.6%) being the most important. A few larger fish were also caught accidentally,  
166 including one *Ectreposebastes niger* (163 mm SL, Setarchidae; [Fourmanoir, 1970](#); [Paulin,](#)  
167 [1982](#)) during the La Pérouse cruise, and six *Cookeolus japonicus* (209–322 mm SL; [Starnes,](#)  
168 [1988](#)), six *Neobathyclupea malayana* (219–278 mm SL, Bathyclupeidae; [Prokofiev, 2014a](#);



169 [Prokofiev et al., 2016](#)) and two *Promethichthys prometheus* (294–437 mm SL, Gempylidae;  
170 [Nakamura and Parin, 1993](#)) during the MAD-Ridge cruise.

171

### 172 3.1. Mesopelagic fish taxonomy

173 Overall, 121 fish taxa were identified during the three cruises, with fewer taxa caught  
174 during the Walters Shoal (n=40) than during the La Pérouse (77) and MAD-Ridge (83)  
175 cruises. In all, 20 similar taxa were collected during all three cruises ([Tables 1 and 2](#)). When  
176 compared, fish size of those taxa depended on cruise. Smaller specimens were consistently  
177 caught during the Walters Shoal than during the La Pérouse and MAD-Ridge cruises,  
178 apparently because the smaller IKMT pelagic trawl was deployed during that cruise. The  
179 different nets precludes comprehensive comparison of the fish assemblages collected during  
180 the Walters Shoal cruise with those from the two other cruises.

181 Three families of mesopelagic fish accounted for 79.7% by number of the total catch,  
182 myctophids (n=3387, 59.3%), gonostomatids (661, 11.6%) and sternoptychids (507, 8.9%)  
183 ([Tables 1 and 2](#)). Myctophids were also the most diverse group (51 taxa), and they dominated  
184 by number during the La Pérouse (49.1%), MAD-Ridge (65.4%) and Walters Shoal (68.1%)  
185 cruises. Myctophid species accounting for >5% of the catch during a given cruise were  
186 *Ceratoscopelus warmingii* (three cruises), *Diaphus suborbitalis* (La Pérouse and MAD-  
187 Ridge), *Lobianchia dofleini* (Walters Shoal), and *Hygophum hygomii* and *D. perspicillatus*  
188 (MAD-Ridge). Length-frequency distribution showed one mode of large *H. hygomii* and two  
189 size modes in *D. perspicillatus* with a predominance of large fish during the MAD-Ridge  
190 cruise ([Fig. 2](#)). Bimodality was also found in the *C. warmingii* caught, but the larger size-  
191 class dominated the La Pérouse cruise and the smaller one the MAD-Ridge cruise ([Fig. 3,](#)  
192 [upper panel](#)). Inter-cruise difference is also found for *D. suborbitalis*, with only one large  
193 size-class caught during the MAD-Ridge cruise and two size-classes during the La Pérouse

194 cruise (Fig. 3, lower panel). Interestingly, the two modes were found in two different night  
195 hauls that contained larger and smaller fish, with no overlap in size (n=50 and 29 measured  
196 fish, 58.1–81.9 mm and 33.6–52.1 mm SL, respectively).

197 Gonostomatids ranked second by number. They were more abundant during the La  
198 Pérouse cruise (21.1%) than during the MAD-Ridge cruise (6.8%), and no fish of that family  
199 were caught during the Walters Shoal cruise. By far the most abundant gonostomatid was  
200 *Sigmops elongatus*, which accounted for 20.3% by number of the catch during the La Pérouse  
201 cruise. The size of *S. elongatus* ranged widely, from 23.0 to 236 mm SL. Smaller individuals  
202 dominated during the MAD-Ridge cruise and larger ones during the La Pérouse cruise (Fig. 4,  
203 upper panel).

204 Sternoptychids ranked third and constituted 7.2, 10.3 and 8.8% by number during the  
205 La Pérouse, MAD-Ridge and Walters Shoal cruises, respectively. Most sternoptychids  
206 belonged to two species of hatchetfish, *Argyropelecus aculeatus* (5.9 and 6.7% during the La  
207 Pérouse and MAD-Ridge cruises, respectively) and *A. hemigymnus* (3.4 and 6.3% during the  
208 MAD-Ridge and Walters Shoal cruises, respectively). Length-frequency distribution of *A.*  
209 *aculeatus* showed a bimodal pattern and no inter-cruise differences between the La Pérouse  
210 and MAD-ridge cruises (Fig. 4, lower panel). By contrast, specimens of the viperfish  
211 *Chauliodus sloani* were smaller during the MAD-Ridge than during the La Pérouse cruise  
212 (Table 1).

213

### 214 3.2. Daytime and night-time trawls

215 During the La Pérouse cruise, the single daylight trawl performed in shallow water  
216 over the summit of the seamount only caught four fish, including three leptocephali. The same  
217 pattern was found during the MAD-Ridge cruise, with few fish (n=8, six leptocephali)  
218 collected during a shallow daylight trawl compared with the five shallow night-time trawls

219 (n=177±94). The scarcity of fish in the daylight hauls led to shallower trawls only being  
220 conducted at night. During deep trawls (437–550 m) on the MAD-Ridge cruise, the same  
221 number of fish taxa was collected by night and day (53 vs. 54). The catches contained more  
222 gonostomatids (15.5 vs. 10.8% by number) and sternoptychids (28.1 vs. 19.9%) and fewer  
223 myctophids (19.8 vs. 50.7%) by day than by night. Some species were more abundant by day  
224 (e.g. *Cyclothone* sp., *Gonostoma atlanticum*), whereas others (*C. warmingii*, *Diaphus*  
225 *richardsoni*) were caught almost exclusively at night.

226

### 227 3.3 Night-time trawls at shallow, intermediate and deep depths

228 Fish diversity was greater in deeper hauls than in shallow ones during both La Pérouse  
229 and MAD-Ridge cruises (55 vs. 29, and 53 vs. 29 taxa, respectively). This large difference  
230 cannot be explained solely by the fact that the IYGPT is an open net that fishes also in  
231 shallow water during deep deployment. Myctophids constituted the main micronektonic fish  
232 component at each depth on all three cruises, their proportion varying from 45.6 to 83.9% of  
233 the total number of fish. Myctophid assemblages were more diverse in deeper layers, and the  
234 two commonest species (*C. warmingii* and *D. suborbitalis*) showed different depth-related  
235 patterns. *C. warmingii* was found at every sampled depth, but it was more abundant in  
236 shallow trawls. On the other hand, *D. suborbitalis* were mostly caught in two intermediate  
237 trawls during the La Pérouse (n=316) and MAD-Ridge (n=570) cruises. No *D. suborbitalis*  
238 were collected during the Walters Shoal cruise. For other myctophids, several *D.*  
239 *perspicillatus* and *H. hygomii* were caught during the MAD-Ridge cruise, with most  
240 individuals being taken in shallow trawls.

241 A consistent feature during the three cruises is the greater abundance of sternoptychids  
242 in deeper layers, with almost none caught in shallow trawls. *A. aculeatus* was collected in  
243 both deep and intermediate hauls, and *A. hemigymnus* almost exclusively in deep trawls. The

244 few specimens of melamphaid and chiasmodontids were also found in deep and intermediate  
245 trawls, but were absent from shallow trawls. For gonostomatids, most of the abundant *S.*  
246 *elongatus* were caught in deep and intermediate hauls during the La Pérouse cruise, and fish  
247 size was related to depth. Small individuals were found in all three depth strata, but no fish  
248 >100 mm SL were caught in shallow trawls during the La Pérouse cruise (n=12, 28.6±4.3 mm  
249 SL) or in intermediate and shallow trawls during the MAD-Ridge cruise (n=57, 48.0±16.6  
250 mm SL).

#### 251 **4. Discussion**

252

253 The three seamounts studied here are located in different biogeochemical provinces of  
254 the western Indian Ocean (Fig. 1), with MAD-Ridge lying within the productive East African  
255 Coastal Province (EAFR), and La Pérouse and Walters Shoal in, respectively, oligotrophic  
256 waters and at the southern boundary of the Indian South Subtropical Gyre (ISSG) (Longhurst,  
257 2007). MICROTON was also conducted within the oligotrophic waters of the ISSG (Fig. 1),  
258 but in oceanic waters (Annasawmy et al., 2018). According to a recent global biogeographic  
259 classification of the mesopelagic zone, MICROTON, MAD-Ridge and Walters Shoal are  
260 located within the Southern Indian Ocean ecoregion and La Pérouse at the boundary between  
261 that region and the northern Mid-Indian Ocean ecoregion (Sutton et al., 2017). The Southern  
262 Indian Ocean ecoregion is oligotrophic with a mesopelagic fish diversity and biomass low  
263 relative to the rest of the Indian Ocean (Sutton et al., 2017).

264

##### 265 *4.1. Mesopelagic fish taxa*

266 Three families of mesopelagic fish accounted for the vast majority (77–83% by  
267 number) of the fish catches during the three seamount cruises, and this statement is also true  
268 for the oceanic cruise (MICROTON; 84%). Overall, myctophids ranked first (49–82%),

269 gonostomatids second and sternoptychids third, a common pattern for micronektonic fish  
270 communities in upper oceanic waters worldwide (Bernal et al., 2015). In contrast to the three  
271 other cruises, gonostomatids were exceptionally abundant during the La Pérouse cruise, with  
272 a single species, *Sigmops elongatus*, the most numerous fish. *S. elongatus* is found throughout  
273 the world in tropical and subtropical waters (Craddock and Haedrich, 1973; Harold, 2016). It  
274 has been placed among the top three most abundant stomiiforms, *Cyclothone* excluded, and  
275 its abundance may rival the dominant species of myctophid (Lancraft et al., 1988; Moore et  
276 al., 2004). The size of *S. elongatus* ranged widely from small juveniles to adults, and different  
277 size-classes dominated during the La Pérouse and MAD-Ridge cruises. Moreover, fish size  
278 was related to depth, which is the same situation as the larger adults living and migrating in  
279 deeper layers than the smaller juveniles in the Gulf of Mexico (Lancraft et al., 1988).

280 All but one species (*Diaphus bertelseni*) of myctophid caught during the four cruises  
281 had been previously recorded in the Indian Ocean (Vipin et al., 2012). According to their  
282 distribution patterns (Hulley, 1981), the 49 myctophid species were partitioned either as high-  
283 oceanic or pseudo-oceanic. The high-oceanic group was by far the most diverse (46 species). It  
284 included the numerically dominant *Benthoosema suborbitale*, *Ceratoscopelus warmingii*,  
285 *Diaphus perspicillatus*, *Hygophum hygomii* and *Lobianchia dofleini*. The first four species in  
286 this list were collected during all cruises, but the last was caught only during the Walters  
287 Shoal cruise. The latitudinal distribution of *L. dofleini*, together with the concomitant catch of  
288 *Diaphus meadi*, *Diogenichthys atlanticus*, *Lampanyctus australis*, *Myctophum phengodes* and  
289 *Notoscopelus resplendens* (Hulley, 1986) was indicative of the more southern location of the  
290 Walters Shoal seamount than the MAD-Ridge and La Pérouse seamounts and the area  
291 covered by the earlier MICROTON cruise. Overall, *C. warmingii* was either the most  
292 abundant myctophid or numerically one of the dominant ones during each cruise, ranking first  
293 on the MICROTON cruise (56% by number), second during the La Pérouse cruise, third

294 during the MAD-Ridge cruise and fifth during the Walters Shoal cruise. *C. warmingii* has a  
295 broadly tropical pattern (Hulley, 1981), being widely distributed in tropical and subtropical  
296 waters (Bekker, 1983; Kinzer and Schulz, 1985; Takagi et al., 2009), including in the vicinity  
297 of and over seamounts (Moore et al., 2004). The present work emphasizes its numerical  
298 importance in tropical waters of the western Indian Ocean. *C. warmingii* was caught  
299 exclusively at night, in every sampled layer, and with a bigger catch in shallow trawls, a  
300 pattern that supports the reported daylight depth range below 600 m and a night-time  
301 concentration in the upper 100 m (Robison, 1984; Kinzer and Schulz, 1985).

302         The three remaining myctophids (*Diaphus garmani*, *D. knappi* and *D. suborbitalis*)  
303 belonged to the pseudo-oceanic group (Hulley, 1981, 1986, pers. comm.), meaning that they  
304 interact with land environments (Kawaguchi and Shimizu, 1978; Reid et al., 1991). As  
305 expected, they were not collected during the oceanic cruise MICROTON, but they were  
306 caught together and/or in association with other known slope- and seamount-associated fish  
307 such as *Argyripnus hulleyi*, *Benthoosema fibulatum*, *Cookeolus japonicus*, *Neobathyclupea*  
308 *malayana*, *Neoscopelus macrolepidotus*, *N. microchir* and *Promethichthys prometheus*  
309 (Starnes, 1988; Bekker and Shcherbachev, 1990; Nakamura and Parin, 1993; De Forest and  
310 Drazen, 2009; Quéro et al., 2009; Prokofiev, 2014b; Roberts, 2015). The case of *D.*  
311 *suborbitalis* exemplifies this pattern. It was caught either (i) in moderate numbers together  
312 with the single catch of *D. garmani* (La Pérouse) or the single catch of *N. macrolepidotus*, *N.*  
313 *microchir* and *N. malayana* (MAD-Ridge), or (ii) in large numbers together with the single  
314 catch of *A. hulleyi* (La Pérouse) or together with *B. fibulatum* and *D. knappi* (MAD-Ridge).  
315 Elsewhere, *D. suborbitalis* is considered to be an abundant Indo-Pacific species associated  
316 with continental and oceanic island slopes, seamounts and mid-oceanic ridges (Kawaguchi  
317 and Shimizu, 1978; Bekker and Shcherbachev, 1990), where it plays a key trophic link  
318 between copepods, small *Cyclothone* fish and large predatory fish (Gorelova and Prutko,

319 1985; Parin and Prutko, 1985). Within that context, it is notable that the main catch of *D.*  
320 *suborbitalis* during the MAD-Ridge cruise was associated with two *P. prometheus*, a  
321 benthopelagic fish that is known to prey on *D. suborbitalis* over seamounts (Parin and Prutko,  
322 1985).

323 Two species of the genus *Argyropelecus* accounted for most of the sternoptychid fish  
324 collected during the four cruises. Both *A. aculeatus* and *A. hemigymnus* have a worldwide  
325 distribution in tropical and temperate waters, with *A. hemigymnus* being found farther south  
326 than *A. aculeatus* (Baird, 1971). Accordingly, *A. aculeatus* was the most abundant  
327 sternoptychid during the MICROTON, La Pérouse and MAD-Ridge cruises, and *A.*  
328 *hemigymnus* dominated the sternoptychid catch during the Walters Shoal cruise. The two  
329 species were collected in intermediate and deep layers, supporting the belief that  
330 *Argyropelecus* species are rarely caught in the upper 100 m (Baird, 1971).

331

#### 332 4.2. Notable records

333 No remarkable micronektonic fish taxa were caught during the Walters Shoal cruise,  
334 but some of the fish collected during the La Pérouse and MAD-Ridge cruises added new  
335 information to the biogeography of the species. First, four individuals of the sternoptychid  
336 *Argyripnus hulleyi* were collected during a single night trawl at intermediate depth during the  
337 La Pérouse cruise. The species was first described from nine specimens found dead at the sea  
338 surface following a volcanic eruption at La Réunion Island (Quéro et al., 2009). The La  
339 Pérouse specimens therefore constitute the second record of the species in the scientific  
340 literature, extending its occurrence to a seamount located nearby (90 nautical miles from) the  
341 holotype locality. They also raise the maximum known size of the species from 73 mm  
342 (Quéro et al., 2009) to 82 mm SL. Second, to the best of our knowledge, the single *Diaphus*  
343 *bertelseni* caught in a deep trawl close to the La Pérouse seamount is the first record of the

344 species in the Indian Ocean (Vipin et al., 2012). *D. bertelseni* was previously recorded in  
345 tropical to temperate seas in the Atlantic and Pacific oceans (Paxton and Hulley, 1999;  
346 Craddock and Hartel, 2002; Robertson and Clements, 2015; Hulley and Paxton, 2016). Its  
347 presence in the western Indian Ocean extends considerably its biogeographical range and  
348 suggests that *D. bertelseni* may well have a worldwide distribution. Finally, *D. suborbitalis*  
349 has been previously caught between 7°N and 8°S in the tropical eastern and western Indian  
350 Ocean, with a few collected at 17–26°S off the eastern African and western Madagascar  
351 coasts (Nafpaktitis, 1978; Gjøsaeter and Beck, 1981; Bekker, 1983; Bekker and  
352 Shcherbachev, 1990). When compared with the records of Bekker (1983), our large catches of  
353 *D. suborbitalis* at 46°14'E 27°29'S (MAD-Ridge) and 54°06'E 19°47'S (La Pérouse)  
354 represent the southernmost and easternmost localities in the western Indian Ocean,  
355 respectively, where this species has been found. They also increased the maximum known  
356 size of *D. suborbitalis* from ~70 mm (Nafpaktitis, 1978) to 84 mm SL for the Indian Ocean.

357

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359

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376

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516 **Fig. 1. (a)** Map of the western Indian Ocean showing the locations of cruises and pelagic  
517 trawls (red crosses) over three seamounts: **(b)** La Pérouse, **(c)** MAD-Ridge and **(d)** Walters  
518 Shoal, and of the single open ocean investigation (MICROTON). EAFR (East African Coastal  
519 Province) and ISSG (Indian South Subtropical Gyre) refer to [Longhurst \(2007\)](#)

520

521 **Fig. 2.** Length-frequency distribution of the myctophids *Hygophum hygomii* (upper panel)  
522 and *Diaphus perspicillatus* (lower panel) caught during the MAD-Ridge cruise.

523

524 **Fig. 3.** Length-frequency distribution of the myctophids *Ceratoscopelus warmingii* (upper  
525 panel) and *Diaphus suborbitalis* (lower panel) caught during the La Pérouse (grey) and MAD-  
526 Ridge (black) cruises. Note that only a subset of *D. suborbitalis* was measured in two trawls  
527 containing large numbers of fish (50 and 120 of a total of 316 and 570 specimens during the  
528 La Pérouse and MAD-Ridge cruises, respectively).

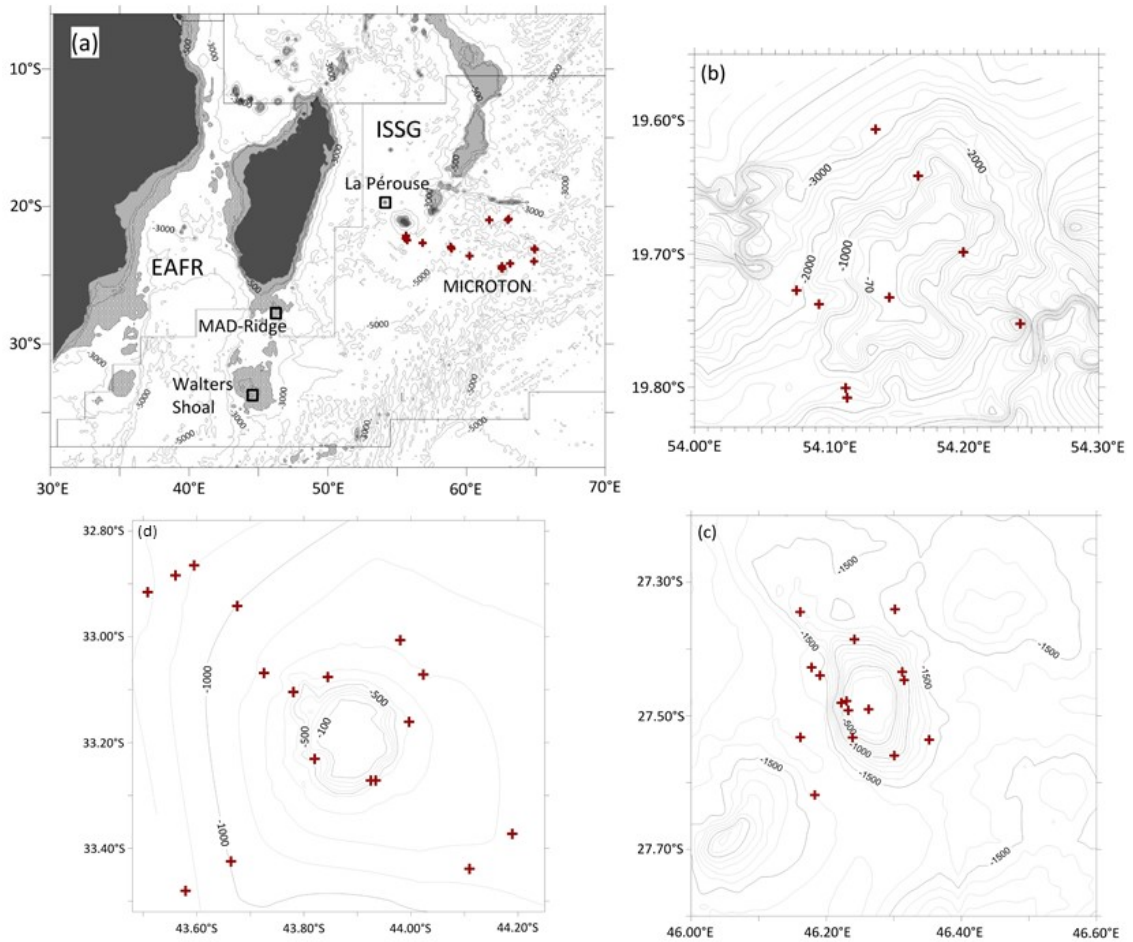
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530 **Fig. 4.** Length-frequency distribution of *Sigmops elongatus* (upper panel) and *Argyropelecus*  
531 *aculeatus* (lower panel) caught during the La Pérouse (grey) and MAD-Ridge (black) cruises.

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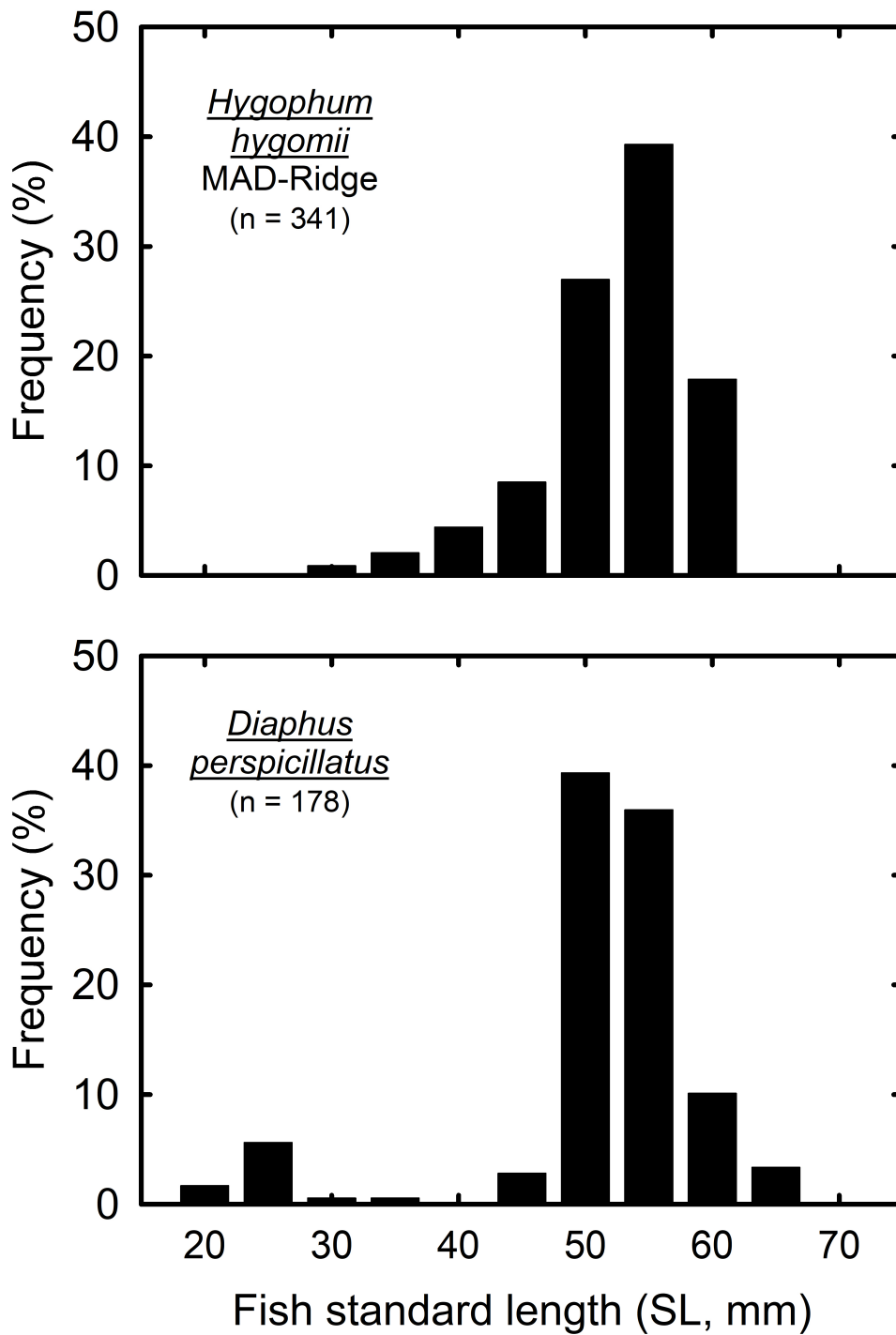


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Figure 1

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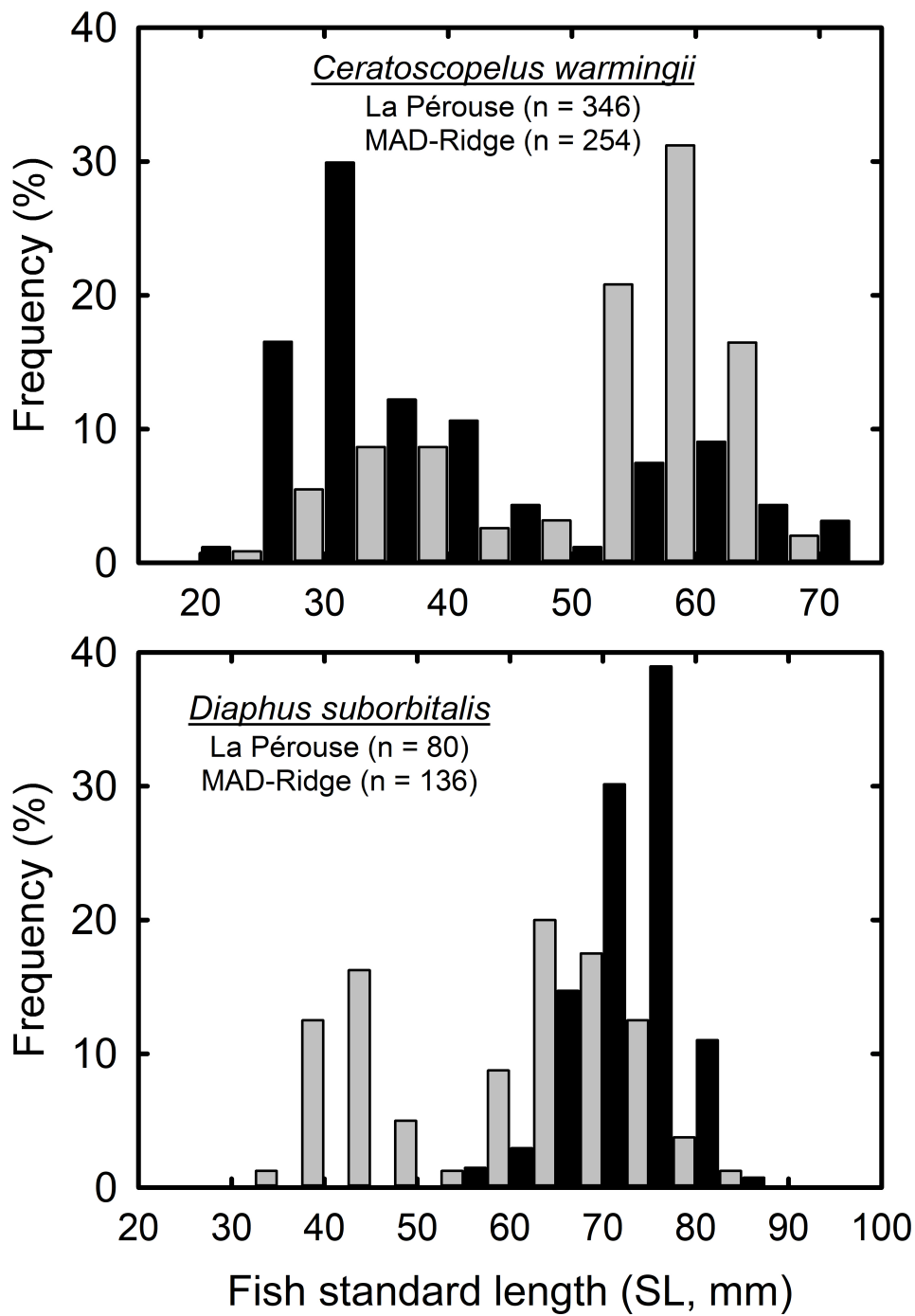
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Figure 2

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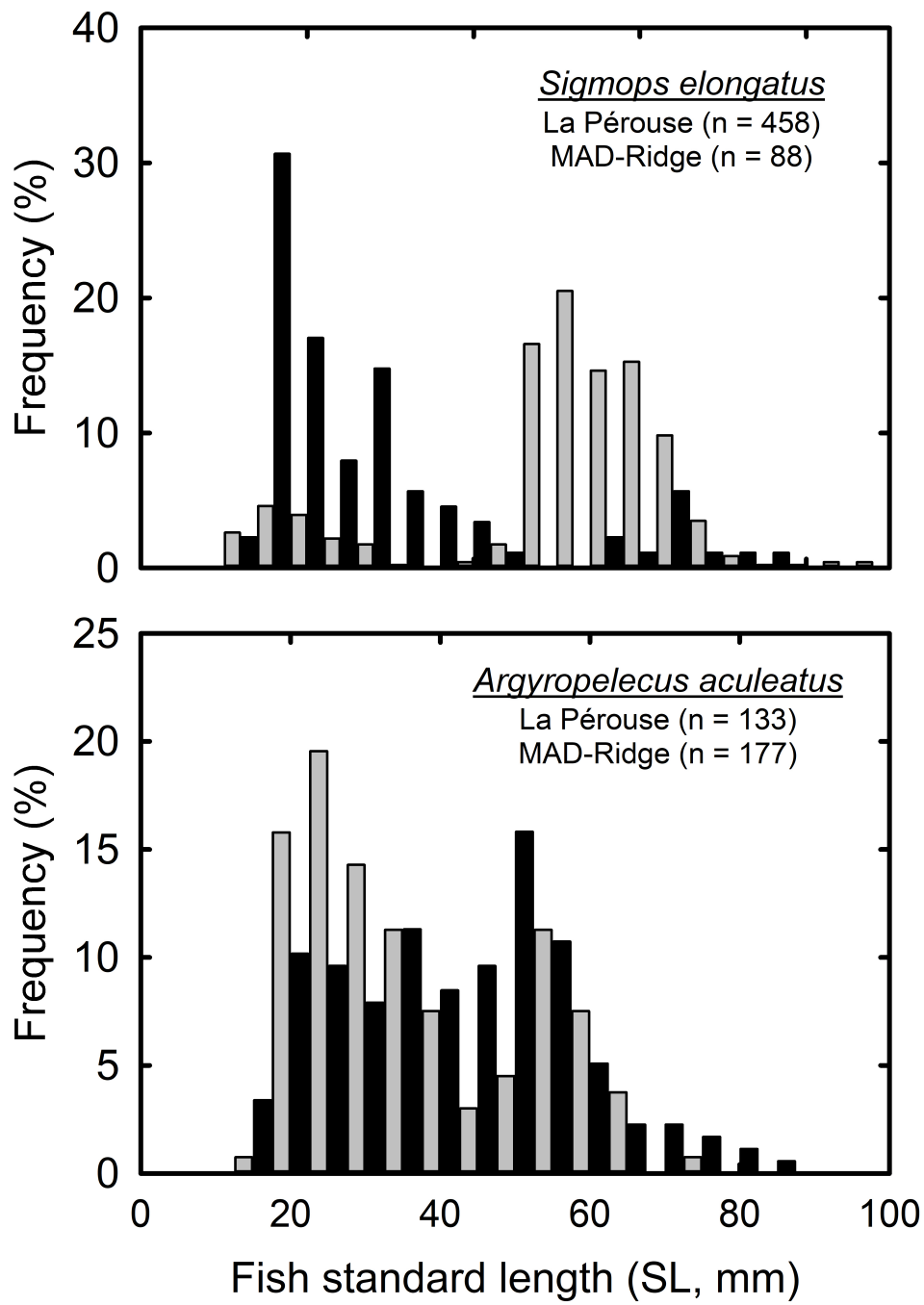
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Figure 3



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Figure 4

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75**Table 1**

Micronektonic fish taxa identified from pelagic trawls during the La Pérouse and MAD-Ridge cruises on board the RV *Antea* together with their standard length. Equality of proportion tests (large-sample tests) were performed to compare relative numbers between the two cruises. Significant differences ( $p < 0.001$ ) are highlighted in **bold**; na, not applicable.

Family	Species	Numbers				Standard length (mm)							
		La Pérouse		MAD-Ridge		Statistics		La Pérouse			MAD-Ridge		
		(n)	(%)	(n)	(%)	Z	p	(n)	mean ± SD (range)	(n)	mean ± SD (range)	(n)	mean ± SD (range)
SERRIVOMERIDAE	<i>Serrivomer beanii</i>			3	0.11	na	na			2	136-177		
NEMICHTHYIDAE	Unidentified	14	0.62	12	0.45	0.82	0.413	13	362 ± 101 (238-614)		11	301 ± 87 (143-446)	
ARGENTINIDAE	<i>Glossanodon</i> sp. (larvae/juv.)	1	0.04			na	na						
	Unidentified (larvae/juv.)	2	0.09			na	na						
STOMIIDAE	<i>Stomias boa</i>	1	0.04			na	na	1	148				
	<i>Stomias longibarbus</i>	1	0.04	2	0.07	0.44	0.663	1	257		2	127-299	
	Unidentified (larvae/juv.)			2	0.07	na	na						
CHAULIODONTIDAE	<i>Chauliodus sloani</i>	40	1.76	77	2.87	2.57	0.01	40	120 ± 37 (60.4-200)		75	63.3 ± 41.3 (24.5-213)	
ASTRONESTHIDAE	<i>Astronesthes</i> sp.	9	0.40	18	0.67	1.31	0.19	9	69.5 ± 29.4 (26.9-117)		18	43.9 ± 22.2 (25.3-128)	
IDIACANTHIDAE	<i>Idiacanthus atlanticus</i>			3	0.11	na	na				3	93.7 ± 22.0 (73.2-117)	
	<i>Idiacanthus fasciola</i>	9	0.40	34	1.27	3.3	0.001	9	166 ± 87 (67.5-276)		31	123 ± 56 (66.4-264)	
MALACOSTEIDAE	<i>Aristostomias</i> sp.			1	0.04	na	na				1	103	
	<i>Malacosteus australis</i>			1	0.04	na	na				1	61.3	
	<i>Photostomias</i> sp.	11	0.48	2	0.07	2.81	0.005	11	72.0 ± 18.5 (49.1-106)		2	56.9-60.2	
MELANOSTOMIIDAE	<i>Bathophilus</i> sp.	4	0.18	12	0.45	1.68	0.093	3	88.7 ± 41.0 (59.4-136)		10	51.2 ± 24.1 (30.9-108)	
	<i>Echiostoma barbatum</i>	11	0.48	11	0.41	0.39	0.697	11	45.0 ± 6.1 (34.8-54.0)		11	74.0 ± 8.6 (61.2-92.7)	
MELANOSTOMIIDAE	<i>Eustomias</i> sp.	15	0.66	13	0.48	0.82	0.412	14	86.0 ± 22.8 (63.0-126)		13	88.0 ± 14.6 (65.8-117)	
	<i>Leptostomias</i> sp.	1	0.04			na	na	1	131				
	<i>Melanostomias niger</i>			1	0.04	na	na				1	239	
	<i>Melanostomias</i> sp.	18	0.79	6	0.22	2.87	0.004	17	73.0 ± 30.8 (44.9-178)		6	87.9 ± 8.5 (75.5-98.7)	
	<i>Photonectes</i> sp.	2	0.09	4	0.15	0.62	0.537	2	123-124		4	56.0 ± 16.7 (40.6-77.5)	
	Unidentified	14	0.62	8	0.30	1.68	0.094						
	PHOTICHTHYIDAE	<i>Ichthyococcus ovatus</i>			1	0.04	na	na				1	31.3
PHOTICHTHYIDAE	<i>Photichthys argenteus</i>	2	0.09	4	0.15	0.62	0.537	2	31.5-42.2		4	91.8 ± 28.3 (67.7-129)	
	<i>Vinciguerria nimbaria</i>	17	0.75	10	0.37	1.79	0.074	16	35.8 ± 9.7 (23.7-56.5)		10	26.9 ± 3.8 (21.1-32.4)	
	Unidentified												
GONOSTOMATIDAE	<i>Cyclothone</i> sp.			52	1.94	na	na				33	28.4 ± 10.1 (13.6-60.7)	
	<i>Diplophos rebaini</i>			4	0.15	na	na				4	86.3 ± 17.7 (60.1-98.3)	
	<i>Diplophos taenia</i>	13	0.57	6	0.22	1.98	0.048	13	75.0 ± 23.5 (32.8-130)		6	93.5 ± 51.3 (51.1-176)	
	<i>Gonostoma atlanticum</i>	4	0.18	23	0.86	3.25	0.001	4	49.6 ± 6.9 (42.6-59.1)		23	44.7 ± 8.7 (26.4-61.2)	
	<i>Sigmops elongatus</i>	461	20.29	89	3.32	<b>18.94</b>	<b>&lt;0.0001</b>	458	121 ± 37 (23.0-236)		88	64.7 ± 39.2 (29.6-186)	

	<i>Margrethia obtusirostra</i>			7	0.26	na	na			7	34.9 ± 6.4 (22.3-42.4)
	Unidentified	1	0.04	1	0.04	0.12	0.907				
STERNOPTYCHIDAE	<i>Argyropelecus aculeatus</i>	133	5.85	179	6.68	1.19	0.235	133	34.2 ± 14.5 (13.4-71.4)	177	39.0 ± 15.3 (13.7-80.9)
	<i>Argyropelecus affinis</i>			1	0.04	na	na			1	34.8
	<i>Argyropelecus hemigymnus</i>	15	0.66	92	3.43	<b>6.69</b>	<b>&lt;0.0001</b>	15	20.6 ± 3.8 (14.3-28.0)	90	20.7 ± 3.5 (12.9-32.4)
	<i>Argyropelecus sladeni</i>	4	0.18			na	na	4	36.9 ± 6.3 (29.7-44.6)		
	<i>Argyripnus hullei</i>	4	0.18			na	na	4	74.7 ± 5.0 (70.6-82.0)		
	<i>Sternoptyx diaphana</i>	2	0.09			na	na	2	14.9-22.5		
	<i>Sternoptyx</i> sp.	1	0.04	1	0.04	0.12	0.907				
	<i>Valenciennellus tripunctulatus</i>	2	0.09	4	0.15	0.62	0.537	2	26.1-28.5	4	24.6 ± 6.4 (17.8-31.2)
	Unidentified	2	0.09			na	na				
SCOPELARCHIDAE	<i>Scopelarchus</i> sp.	6	0.26			na	na	6	55.3 ± 9.8 (42.6-70.3)		
NOTOSUDIDAE	<i>Scopelosaurus</i> sp.			1	0.04	na	na			1	92.4
PARALEPIDIDAE	<i>Lestidiops</i> sp.	1	0.04			na	na	1	195		
	<i>Lestidium atlanticum</i>			1	0.04	na	na			1	119
	<i>Lestrolepis japonica</i>	1	0.04			na	na	1	174		
	Unidentified (larvae/juv.)	39	1.72	15	0.56	<b>3.91</b>	<b>&lt;0.0001</b>	36	61.3 ± 13.0 (40.8-95.3)	15	55.7 ± 29.5 (35.3-140)
EVERMANELLIDAE	<i>Coccorella atrata</i>	1	0.04			na	na	1	93.3		
	<i>Evermanella balbo</i>			2	0.07	na	na			2	47.4-64.6
	<i>Evermanella indica</i>	4	0.18			na	na	4	112 ± 8 (101-121)		
	<i>Odontostomops normalops</i>	1	0.04			na	na	1	90.3		
	Unidentified (larvae/juv.)	1	0.04			na	na				
MYCTOPHIDAE	<i>Benthoosema fibulatum</i>			56	2.09	na	na			56	74.6 ± 7.9 (60.7-88.0)
	<i>Benthoosema suborbitale</i>	7	0.31	26	0.97	2.85	0.004	7	29.3 ± 1.9 (26.6-31.5)	25	24.8 ± 3.3 (17.2-29.6)
	<i>Bolinichthys photothorax</i>	14	0.62	8	0.30	1.68	0.094	14	56.7 ± 9.5 (39.6-73.7)	8	43.9 ± 9.4 (30.2-56.7)
	<i>Bolinichthys supralateralis</i>			2	0.07	na	na			2	36.6-36.7
	<i>Ceratoscopelus warmingii</i>	346	15.23	258	9.62	<b>6.01</b>	<b>&lt;0.0001</b>	346	50.9 ± 11.2 (23.6-68.2)	254	36.5 ± 13.6 (19.6-68.4)
	<i>Diaphus bertelseni</i>	1	0.04			na	na	1	65.9		
	<i>Diaphus brachycephalus</i>	20	0.88	10	0.37	2.29	0.022	20	33.2 ± 3.5 (26.2-38.8)	10	27.8 ± 7.0 (18.2-40.4)
	<i>Diaphus diadematus</i>	14	0.62	22	0.82	0.84	0.399	14	31.5 ± 3.6 (28.4-39.6)	21	31.3 ± 2.9 (23.5-35.9)
	<i>Diaphus effulgens</i>	1	0.04	4	0.15	1.16	0.245	1	34.5	4	79.0 ± 36.8 (28.6-107)
	<i>Diaphus fragilis</i>	1	0.04			na	na	1	35.3		
	<i>Diaphus garmani</i>	10	0.44			na	na	10	48.1 ± 3.8 (42.8-54.5)		
	<i>Diaphus knappi</i>			17	0.63	na	na			17	60.4 ± 18.9 (45.3-130)
	<i>Diaphus lucidus</i>	15	0.66			na	na	15	76.6 ± 4.7 (66.3-82.1)		
	<i>Diaphus metopoclampus</i>			2	0.07	na	na			2	50.1-51.4
	<i>Diaphus mollis</i>	16	0.70	27	1.01	1.15	0.252	16	47.6 ± 11.4 (35.8-79.4)	26	50.1 ± 10.5 (17.1-65.4)
	<i>Diaphus parri</i>			3	0.11	na	na			3	38.4 ± 2.2 (35.9-39.8)
	<i>Diaphus perspicillatus</i>	24	1.06	179	6.68	<b>9.94</b>	<b>&lt;0.0001</b>	24	49.8 ± 10.5 (35.8-69.1)	178	48.7 ± 8.6 (17.0-63.3)
	<i>Diaphus richardsoni</i>	11	0.48	24	0.90	1.72	0.085	11	40.8 ± 4.2 (32.9-47.6)	24	34.3 ± 9.7 (20.1-53.5)
	<i>Diaphus splendidus</i>	35	1.54	1	0.04	<b>6.21</b>	<b>&lt;0.0001</b>	35	53.1 ± 10.4 (36.4-80.9)	1	62.6
	<i>Diaphus suborbitalis</i>	346	15.23	586	21.86	<b>5.95</b>	<b>&lt;0.0001</b>	80	57.3 ± 13.4 (33.6-81.9)	136	69.5 ± 5.4 (50.3-83.9)
	<i>Diaphus</i> sp.	10	0.44	12	0.45	0.04	0.969				

	<i>Hygophum hygomii</i>	5	0.22	345	12.87	<b>17.31</b>	<b>&lt;0.0001</b>	5	42.5 ± 10.8 (29.6-55.9)	341	50.0 ± 5.9 (26.9-59.5)
	<i>Hygophum proximum</i>	2	0.09	1	0.04	0.72	0.470	2	39.8-43.4	1	39.7
	<i>Lampadena luminosa</i>	2	0.09			na	na	2	25.9-45.7		
	<i>Lampanyctus alatus</i>	26	1.14	53	1.98	2.33	0.020	26	43.5 ± 3.2 (38.3-50.0)	53	36.3 ± 5.4 (21.4-44.4)
	<i>Lampanyctus lepidolychnus</i>			5	0.19	na	na			5	82.5 ± 31.7 (33.4-113)
	<i>Lampanyctus nobilis</i>	30	1.32	2	0.07	<b>5.45</b>	<b>&lt;0.0001</b>	30	71.5 ± 19.9 (47.5-118)	2	68.3-70.5
	<i>Lampanyctus turneri</i>	1	0.04	1	0.04	0.12	0.907	1	54.5	1	48.6
	<i>Lampanyctus</i> sp.	96	4.23	11	0.41	<b>9.20</b>	<b>&lt;0.0001</b>				
	<i>Lampichthys procerus</i>	1	0.04			na	na	1	33.7		
	<i>Lobianchia gemellarii</i>	36	1.58	22	0.82	2.49	0.013	35	41.1 ± 3.2 (35.2-50.7)	22	38.2 ± 8.7 (22.6-58.7)
	<i>Myctophum fissunovi</i>	12	0.53	11	0.41	0.61	0.543	12	55.0 ± 8.1 (43.5-67.5)	11	62.6 ± 2.7 (59.7-69.1)
	<i>Myctophum nitidulum</i>	4	0.18	7	0.26	0.63	0.526	4	54.8 ± 9.4 (44.4-63.4)	7	63.7 ± 5.4 (55.1-70.8)
	<i>Myctophum phengodes</i>	1	0.04	2	0.07	0.44	0.663	1	62.8	2	72.1-74.0
	<i>Myctophum selenops</i>			2	0.07	na	na			2	53.5-59.8
	<i>Nannobrachium atrum</i>			1	0.04	na	na				
	<i>Nannobrachium</i> sp.	12	0.53			na	na	12	105 ± 17 (70.0-125)		
	<i>Notolychnus valdiviae</i>			3	0.11	na	na			3	19.8 ± 0.4 (19.4-20.1)
	<i>Notoscopelus caudispinosus</i>			1	0.04	na	na			1	108
	<i>Notoscopelus resplendens</i>			10	0.37	na	na			10	33.6 ± 3.4 (28.0-40.5)
	<i>Scopelopsis multipunctatus</i>			7	0.26	na	na			7	36.8 ± 5.4 (31.6-47.1)
	<i>Symbolophorus evermanni</i>			1	0.04	na	na			1	54.5
	<i>Symbolophorus rufinus</i>	1	0.04			na	na	1	74.1		
	Unidentified	16	0.70	31	1.16	1.64	0.102				
NEOSCOPELIDAE	<i>Neoscopelus macrolepidotus</i>			27	1.01	na	na			27	62.3 ± 17.9 (41.1-116)
	<i>Neoscopelus microchir</i>			25	0.93	na	na			25	44.6 ± 8.0 (32.1-73.4)
BREGMACEROTIDAE	<i>Bregmaceros macclellandii</i>	4	0.18	2	0.07	1.02	0.306	4	69.4 ± 4.2 (64.8-74.9)	2	39.4-40.7
	<i>Bregmaceros</i> sp.			4	0.15	na	na			4	32.2 ± 4.1 (27.0-37.1)
CARAPIDAE	Unidentified			1	0.04	na	na				
DIRETMIDAE	<i>Diretmichthys parini</i> (larvae/juv.)	12	0.53			na	na	12	18.5 ± 4.2 (13.9-24.6)		
	<i>Diretmus argenteus</i> (larvae/juv.)			2	0.07	na	na			2	30.1-30.3
MELAMPHAIDAE	<i>Melamphaes longivelis</i>	1	0.04			na	na	1	58.6		
	<i>Melamphaes</i> sp.			1	0.04	na	na			1	25.1
	<i>Scopelogadus mizolepis</i>	33	1.45			na	na	33	58.7 ± 11.1 (33.1-79.5)		
CHIASMODONTIDAE	<i>Chiasmodon</i> sp.	7	0.31			na	na	7	45.2 ± 11.6 (33.4-64.8)		
	<i>Pseudoscopelus</i> sp.	2	0.09	1	0.04	na	na	2	82.2-87.3	1	45.0
OTHER FISH	Indeterminate fish	1	0.04	1	0.04	0.12	0.907				
	Larvae/juv. of non-mesopelagic fish	228	10.04	161	6.01	<b>5.25</b>	<b>&lt;0.0001</b>				
	Total	2272	100.00	2681	100.00						

577 **Table 2**

578 Micronektonic fish taxa identified from pelagic trawls during the Walters Shoal cruise on  
 579 board the RV *Marion Dufresne II* together with their standard length.

Family	Species	Walters Shoal		SL (mm)	
		(n)	(%)	(n)	mean $\pm$ SD (range)
STOMIIDAE	<i>Stomias longibarbatus</i>	1	0.13	0	na
CHAULIODONTIDAE	<i>Chauliodus sloani</i>	13	1.71	12	75.7 $\pm$ 46.2 (42.3-184.8)
MELANOSTOMIIDAE	<i>Bathophilus</i> sp.	1	0.13	1	69.1
	<i>Melanostomias niger</i>	1	0.13	1	52.0
PHOTICHTHYIDAE	<i>Photichthys argenteus</i>	2	0.26	2	57.0-63.6
	<i>Vinciguerria</i> spp.	64	8.41	36	28.1 $\pm$ 4.3 (20.0-35.9)
STERNOPTYCHIDAE	<i>Argyrolepecus aculeatus</i>	4	0.53	4	39.0 $\pm$ 12.8 (22.8-50.6)
	<i>Argyrolepecus hemigymnus</i>	48	6.31	44	18.1 $\pm$ 4.7 (11.0-26.4)
	<i>Valenciennellus tripunctulatus</i>	11	1.45	5	25.9 $\pm$ 1.7 (24.8-29.0)
	Unidentified	4	0.53	0	na
NOTOSUDIDAE	Unidentified	1	0.13	1	83.1
PARALEPIDIDAE	Unidentified (larvae/juv.)	1	0.13	1	48.4
EVERMANELLIDAE	<i>Evermanella</i> sp. (larvae/juv.)	4	0.53	4	33.7 $\pm$ 5.0 (26.2-36.7)
MYCTOPHIDAE	<i>Benthoosema suborbitale</i>	30	3.94	24	24.2 $\pm$ 2.6 (16.9-29.1)
	<i>Bolinichthys indicus</i>	21	2.76	21	21.9 $\pm$ 5.6 (17.6-39.9)
	<i>Ceratoscopelus warmingii</i>	39	5.12	38	26.7 $\pm$ 8.2 (19.3-60.5)
	<i>Diaphus diadematus</i>	4	0.53	3	27.8 $\pm$ 0.6 (27.1-28.3)
	<i>Diaphus effulgens</i>	7	0.92	7	45.2 $\pm$ 5.5 (38.0-53.8)
	<i>Diaphus meadi</i>	11	1.45	11	25.6 $\pm$ 8.3 (19.2-41.9)
	<i>Diaphus mollis</i>	17	2.23	17	44.0 $\pm$ 12.0 (18.9-60.1)
	<i>Diaphus perspicillatus</i>	6	0.79	6	47.9 $\pm$ 5.6 (41.5-56.4)
	<i>Diaphus</i> sp.	6	0.79	1	22.8
	<i>Diogenichthys atlanticus</i>	22	2.89	22	19.1 $\pm$ 1.8 (15.3-22.5)
	<i>Gonichthys barnesi</i>	4	0.53	4	41.4 $\pm$ 4.1 (35.7-45.2)
	<i>Hygophum hanseni</i>	1	0.13	1	29.9
	<i>Hygophum hygomii</i>	36	4.73	35	49.4 $\pm$ 5.1 (28.6-55.2)
	<i>Lampanyctus alatus</i>	34	4.47	33	36.8 $\pm$ 11.5 (20.0-54.2)
	<i>Lampanyctus australis</i>	1	0.13	1	87.2
	<i>Lampanyctus</i> sp.	101	13.27	93	29.9 $\pm$ 6.2 (16.2-51.4)
	<i>Lobianchia dofleini</i>	99	13.01	94	29.5 $\pm$ 3.1 (24.2-38.7)
	<i>Lobianchia gemellarii</i>	13	1.71	13	38.1 $\pm$ 8.5 (29.1-60.4)
	<i>Myctophum phengodes</i>	30	3.94	28	35.8 $\pm$ 10.0 (18.0-54.6)
	<i>Myctophum selenops</i>	1	0.13	1	43.3
	<i>Notoscopelus caudispinosus</i>	1	0.13	1	84.7
	<i>Notoscopelus resplendens</i>	9	1.18	9	58.9 $\pm$ 7.6 (40.3-64.4)
	<i>Scopelopsis multipunctatus</i>	2	0.26	2	51.5-52.7
	<i>Symbolophorus evermanni</i>	1	0.13	1	30.7
	Unidentified	22	2.89	11	18.7 $\pm$ 4.1 (11.9-27.7)
MELAMPHAIDAE	<i>Scopeloberyx</i> sp.	5	0.66	5	15.5 $\pm$ 0.6 (14.6-16.1)
OTHER FISH	Larvae/juv. of non-mesopelagic fish	83	10.91		na
	Total	761	100.00		