

# Diet of two Antarctic dragonfish (Pisces: Bathydraconidae) from the Indian sector of the Southern Ocean

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**Abstract:** The diet of *Cygnodraco mawsoni* Waite 1916 and *Gymnodraco acuticeps* Boulenger 1902 (Pisces: Bathydraconidae) was studied in the Cooperation and Cosmonaut seas in the depth range 200–400 m during the summer 1988. Stomach content analysis showed that both species are piscivorous predators but with different feeding habits. *Cygnodraco mawsoni* fed mostly on young notothenioid fish, regularly complementing these with pelagic, *Euphausia superba*, and benthic crustaceans, such as amphipod gammarids and mysids. In contrast, *G. acuticeps* relied mostly on mesopelagic fish of the family Myctophidae. Although *C. mawsoni* and *G. acuticeps* occupy similar depths in the Cosmonaut Sea, different feeding habits appear to limit the probability of interspecific competition for food.

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## Introduction

The family Bathydraconidae, or dragonfish, is endemic to Antarctica (Eastman 1993). The dragonfish are generally most numerous in the coldest, deepest shelf waters at the highest latitudes (Schwarzbach 1988, Eastman 1993). For example, the bottom trawling survey conducted in the Filcher Depression of the Weddell Sea showed that dragonfish accounted for *c.* 24% by numbers and *c.* 18% by biomass of the fish community (Schwarzbach 1988). This was subsequently confirmed by the underwater photography and video techniques which revealed that they comprise *c.* 14.5% of total fish counted within the depth range 100–600 m (Gutt *et al.* 1994). *Cygnodraco mawsoni* Waite, 1916 and *Gymnodraco acuticeps* Boulenger, 1902 are the two common dragonfish over the Antarctic continental shelf occurring in the 112–475 m and 0–550 m depth range, respectively (Gerasimchuk *et al.* 1990, Gon & Heemstra 1990). While *C. mawsoni* generally occurs between 200 and 400 m depth, *G. acuticeps* is more often found in relatively shallow waters (< 50 m) and even under the shelf ice in McMurdo Sound in the Ross Sea (Dayton *et al.* 1970, Bruchhausen *et al.* 1979). In the Ross and Weddell seas, as well as within the Indian sector of the high Antarctic, *C. mawsoni* (not yet found in the Ross Sea, Gon & Heemstra 1990) and *G. acuticeps* accounted for < 3% of total abundance and *c.* 0.3–0.4% of total demersal fish community stock (DeWitt 1970, Schwarzbach 1988, Ekau & Gutt 1991, Pakhomov *et al.* 1991, Gutt *et al.* 1994). In the Cooperation and Cosmonaut seas their average density in the 100–500 m depth range has been estimated to be *c.* 15 kg km<sup>-2</sup> (Pakhomov *et al.* 1991).

To date, little is known about the ecology of *C. mawsoni* and *G. acuticeps*. Their early pelagic stages have been observed to be associated with krill swarms, while adults are

almost entirely benthic (Gon 1987, Kozlov & Naumov 1988, Ekau & Gutt 1991, Eastman 1993, Pakhomov *et al.* 1994). The trophic ecology of *C. mawsoni* and *G. acuticeps* is also poorly studied. From a few studies conducted in the Weddell and Ross seas, and in the Antarctic Peninsula region, these species are regarded mainly as piscivorous predators (Takahashi 1983, Kock *et al.* 1984, Eastman 1985, Schwarzbach 1988, Gröhler 1992). With two exceptions (Pakhomov & Tseitlin 1992, Pakhomov 1997), no studies on the feeding ecology of *C. mawsoni* and *G. acuticeps* in the Indian sector of the Southern Ocean have been undertaken to date. The generalized description of the food composition and its ontogenetic changes in *C. mawsoni* and *G. acuticeps* from East Antarctic region are published elsewhere (Pakhomov 1997). The present study provides additional information on the spatial and temporal variation in the feeding habits of these two dragonfish from this poorly studied region.

## Materials and methods

Specimens of *Cygnodraco mawsoni* and *Gymnodraco acuticeps* were collected during the demersal fish surveys on the shelf area of the Cooperation Sea (= Prydz Bay region, 70–80°E, only *C. mawsoni*) between 8–20 February 1988 and the Cosmonaut Sea (40–45°E) between 24 February and 2 April 1988 (Fig. 1). Fish were taken from commercial bottom trawls conducted within the depth range 200–400 m, but usually 200–300 m. Bottom trawls were deployed throughout a 24 h cycle and were towed for *c.* 30 min on the bottom at a speed of 2–3 knots. Generally, no less than 25 specimens (if less, then all) of each species were randomly selected and analysed from each trawl. Adult fish were

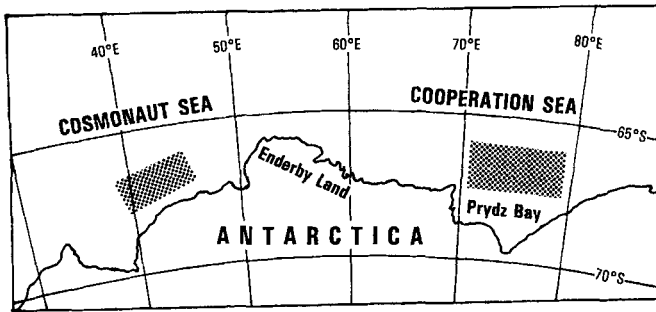


Fig. 1. Locations of the sampling areas (shaded areas) in the Indian sector of the Southern Ocean.

measured for standard length (to nearest mm) and weight (to nearest gram). The stomachs were removed, preserved in 4–6% buffered formaldehyde and analysed in the laboratory. For each stomach prey items were counted, measured, weighed and identified to the lowest taxon possible. Among the prey, crustaceans were measured to the nearest mm from the tip of the rostrum to the end of the telson, and the standard length of fish was obtained. The wet weight of prey was estimated after blotting the sample on filter paper. Dry weight of the fish and different food items was obtained by oven-drying specimens at 60°C for 48–72 h. Stomach fullness indices were calculated for individuals from total prey dry weight as a percentage of body dry weight. To compare the diets of *C. mawsoni* and *G. acuticeps*, a food similarity index was calculated using the formula

$$FSI = \sum \min r(i,j),$$

where  $\min r(i,j)$  is the minimal contribution (%) by mass of food item  $r$  in the two samples  $i$  and  $j$  (Shorygin 1952).

## Results

### *Cygnodraco mawsoni*

Overall, 356 stomachs of *C. mawsoni* were analysed of which 25 were collected in the Cooperation Sea and 331 in the Cosmonaut Sea. Fish collected in the Cooperation Sea were slightly longer with standard lengths ranging from 27–53 cm, modal class 43–45 cm. In the Cosmonaut Sea, standard lengths varied between 16–50 cm with a modal class of 35–41 cm (Fig. 2).

The diet composition of *C. mawsoni* varied substantially between different regions and seasons (Table I). In the Cooperation Sea, Antarctic krill, *Euphausia superba*, with a length of 28–52 mm (mode 47–49 mm) formed the most important food item by both frequency of occurrence and weight. This was followed by the fish of the genus *Trematomus*, mostly *T. eulepidotus* and *T. scotti*, and the benthic mysid *Antarctomysis maxima*, mainly 43–62 mm long (mode 53–57 mm) (Table I). In the Cosmonaut Sea, *E. superba* was quite frequently found in the guts of *C. mawsoni*, but never accounted for > 15% of the stomach content by mass (Table I).

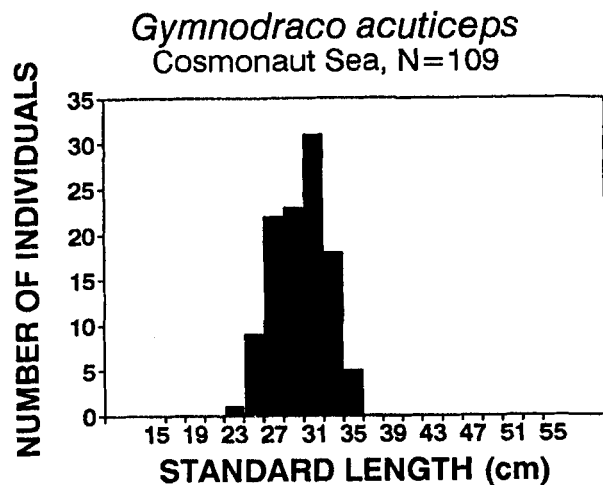
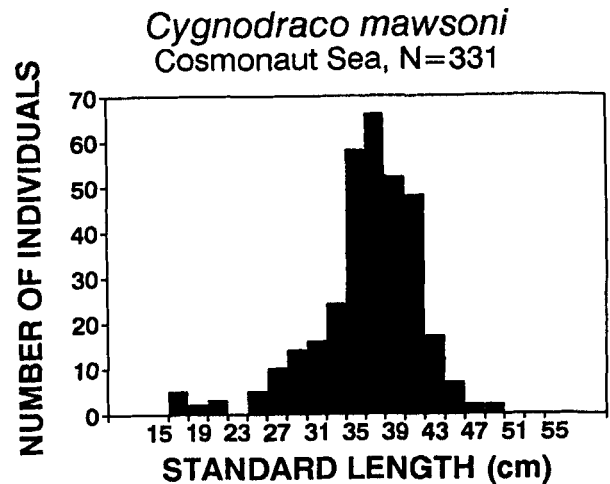
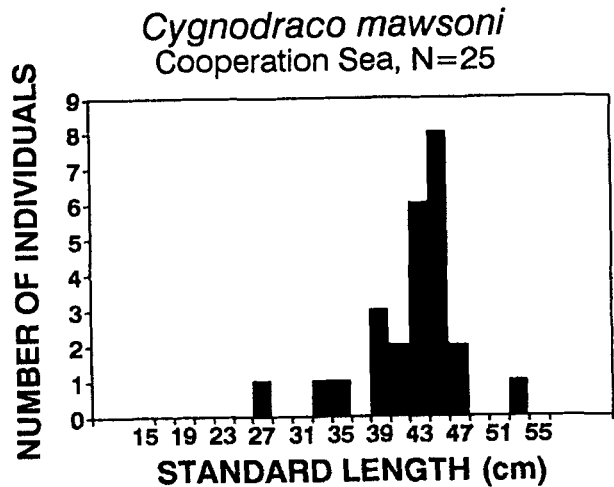


Fig. 2. Size-frequency distribution of *Cygnodraco mawsoni* and *Gymnodraco acuticeps* in the Cooperation and Cosmonaut seas.

**Table I.** Diet of *Cygnodraco mawsoni* in the central part of the Indian sector of the Southern Ocean during summer 1988.

Taxa	Coop. Sea		Cosmonaut Sea							
	Feb 1988		41°20'E March 1988		43°00'E March 1988		44°35'E 24.02.88		44°35'E 02.04.88	
	FO	P	FO	P	FO	P	FO	P	FO	P
<i>Euphausia superba</i> Dana	63.6	34.1	16.9	1.2	46.0	10.8	76.7	14.2	44.0	4.3
<i>E. crystallorophias</i> Holt & Tattersall	–	–	2.7	0.5	34.9	5.1	–	–	–	–
<i>Antarctomysis maxima</i> Holt & Tattersall	50.0	10.1	20.3	1.9	33.3	6.7	66.7	38.1	28.0	0.8
Gammaridea	4.5	0.1	53.4	4.6	27.0	1.8	56.7	12.3	32.0	0.4
Decapoda, Isopoda	4.5	0.8	4.9	0.6	1.6	0.1	12.1	1.2	–	–
Polychaeta	–	–	11.5	1.3	–	–	3.3	1.0	4.0	0.4
<i>Salpa thompsoni</i> Foxton	–	–	–	–	–	–	3.3	0.4	–	–
<i>Pleuragramma antarcticum</i> Boulenger	9.1	0.6	11.5	4.5	73.0	30.2	3.3	0.9	56.0	5.9
<i>Lepidonotothen kempfi</i> Norman	–	–	–	–	3.2	0.1	10.0	0.7	–	–
<i>Aethotaxis mitopteryx</i> DeWitt	–	–	6.7	24.6	3.2	4.4	–	–	–	–
<i>Dissostichus mawsoni</i> Norman	–	–	0.7	1.2	–	–	–	–	–	–
<i>Trematomus scotti</i> Boulenger	31.8	14.4	1.4	3.8	–	–	–	–	–	–
<i>T. eulepidotus</i> Regan	9.1	16.9	2.0	11.2	1.6	7.2	3.3	27.4	48.0	67.4
<i>T. centronotus</i> Regan	–	–	0.7	3.7	3.2	2.6	–	–	4.0	6.0
<i>T. hansonii</i> Boulenger	–	–	–	–	1.6	2.3	–	–	–	–
<i>Trematomus</i> sp.	13.6	16.7	2.7	14.0	1.6	1.8	–	–	16.0	10.3
Nototheniidae undet.	4.5	3.5	–	–	3.2	5.8	–	–	–	–
<i>Chionodraco hamatus</i> Loennberg	–	–	8.1	5.4	4.8	2.9	–	–	–	–
<i>Chaenodraco wilsoni</i> Regan	–	–	2.7	5.1	1.6	4.5	–	–	–	–
Channichthyidae undet.	–	–	4.7	4.4	–	–	–	–	–	–
<i>Prionodraco evansii</i> Regan	–	–	–	–	4.8	3.2	–	–	–	–
<i>Gymnodraco acuticeps</i> Boulenger	–	–	1.4	2.3	1.6	2.2	–	–	–	–
<i>Cygnodraco mawsoni</i> Waite	–	–	–	–	1.6	3.4	–	–	–	–
Artedidraconidae	–	–	0.7	1.4	–	–	–	–	–	–
<i>Electrona antarctica</i> Guenther	–	–	2.0	1.7	–	–	–	–	4.0	0.4
Myctophidae undet.	–	–	0.7	0.2	3.2	1.8	–	–	4.0	0.5
Fish undet.	18.2	2.8	16.9	6.9	3.2	3.1	10.0	3.8	12.0	3.6
Sand, stones	13.6	–	12.8	–	6.3	–	46.7	–	8.0	–
No. of stomachs analysed	25		206		65		35		25	
% of empty stomachs	12.0		28.1		3.1		14.3		0	
Mean fullness index (%)	1.2		1.9		6.4		2.0		12.1	

FO: frequency of occurrence, %; P: proportion of total food dry weight, %; Coop. Sea = Cooperation Sea (Prydz Bay region).

During March 1988, the neritic euphausiid *Euphausia crystallorophias* (11–33 mm, mode 17–21 mm) was also present in the stomachs of adult *C. mawsoni*, but its contribution was ≤ 5% by mass. In the Cosmonaut Sea, juvenile and subadult fish formed the staple food (usually > 75% by mass) of *C. mawsoni*. Cannibalism was recorded during March 1988. However, in February 1988, *E. superba*, *A. maxima* and benthic gammarids contributed 14, 38 and 12% respectively to the stomach content by mass, leaving only c. 32% of the total gut content for fish (Table I). At least 13 species of notothenioids with standard lengths equivalent to 10–51% of predator length were identified from *C. mawsoni* stomachs (Table II). Among them, *T. eulepidotus* (up to 67% of gut content by mass), *Pleuragramma antarcticum* (up to 30%) and *Aethotaxis mitopteryx* (up to 25%) were the three most important species in different areas of the Cosmonaut Sea (Table I). Sand particles and small stones, apparently collected from the bottom, were found in 6–47% of all stomachs analysed with the highest contribution observed during February 1988. Then, benthic crustaceans formed the bulk of the fish diet (Table I). A cumulative curve of the

relative frequency of stomach fullness indices shows that c. 50% (including empty guts c. 70%) of all fish had a fullness index below 1% (Fig. 3), indicating that most fish consumed small portions of food, or had not fed for some time.

**Table II.** Standard length (SL) of fish from stomachs of *Cygnodraco mawsoni* in the Cooperation and the Cosmonaut seas during summer 1988.

Species	SL (cm) of prey		% of predator body		SL (cm) of <i>C. mawsoni</i>
	mean	range	mean	range	
<i>Pleuragramma antarcticum</i>	5.5	4.3–7.3	16	12–20	26–38
<i>Trematomus scotti</i>	7.4	4.4–13.5	18	10–33	35–44
<i>T. eulepidotus</i>	16.0	14.3–21.0	37	31–51	38–48
<i>T. hansonii</i>	10.6	–	30	–	34.8
<i>T. centronotus</i>	8.6	8.2–9.0	24	23–25	35–36
<i>Lepidonotothen kempfi</i>	4.4	4.3–4.5	16	12–21	21–37
<i>Dissostichus mawsoni</i>	10.8	–	29	–	37.0
<i>Aethotaxis mitopteryx</i>	15.7	14.0–17.1	43	38–48	33–45
<i>Chaenodraco wilsoni</i>	13.8	12.3–16.5	35	32–40	37–41
<i>Chionodraco hamatus</i>	8.7	6.6–10.6	26	18–34	31–36
<i>Gymnodraco acuticeps</i>	14.0	13.3–15.0	36	32–40	37–42
<i>Cygnodraco mawsoni</i>	16.0	–	49	–	32.9
<i>Prionodraco evansii</i>	10.6	8.5–12.2	27	24–31	35–41

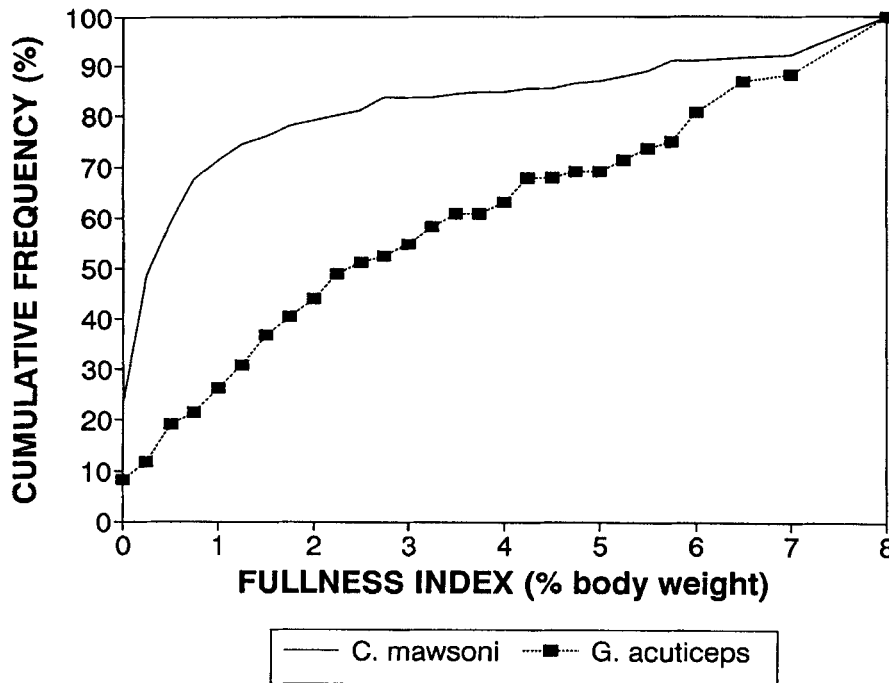


Fig. 3. Cumulative curves of the relative frequency of the stomach fullness index of *Cygnodraco mawsoni* and *Gymnodraco acuticeps* in the Cosmonaut Sea.

Within the Cosmonaut Sea, food similarity indices (FSI) between *C. mawsoni*, as calculated from the data presented in Table I, ranged from 24 to 39% (average 32%). This was generally, but not significantly ( $P > 0.05$ ), lower than FSI (average 38%, range 36–45%) among *C. mawsoni* collected in the Cooperation and Cosmonaut seas.

#### *Gymnodraco acuticeps*

In total, 109 stomachs of *G. acuticeps* with standard lengths of 23–35 cm (mode 27–33 cm) were analysed from the Cosmonaut Sea (Fig. 2). Fish (at least 10 species) formed the bulk of the diet of this species comprising > 97% of food dry mass (Table III). Among them myctophids, mainly *Electrona antarctica* (24%) and *Gymnoscopelus nicholsi* (32%), were the most important food items. *Pleuragramma antarcticum* juveniles were found in one third of the stomachs analysed but on average accounted only for c.6% of gut content by mass (Table III). Fish of the genus *Trematomus*, mostly *T. eulepidotus* and *T. hansonii*, together contributed c.19% to the stomach content by mass while the contribution of the three channichthyid species, e.g. *Chaenodraco wilsoni*, *Chionodraco hamatus* and *Cryodraco antarcticus*, did not exceed 4% (Table III). *Gymnodraco acuticeps* juveniles were found in three stomachs of adult specimens. Length of eight prey fish species ranged from 5–12.5 cm, which was equal to 15–52% of predator length (Table IV). The size of prey (Table IV) was broadly similar to that obtained from the stomachs of *C. mawsoni* (Table II). The stomach contents of *G. acuticeps* were composed of either a single or several big prey items. Consequently, c.82% of all fish examined had stomach fullness indices of >1% (Fig. 3).

#### Discussion

The results of this study show that in the shelf region of the Cooperation and Cosmonaut seas the food spectrum of both species investigated comprised mainly fish. In the diet of *Cygnodraco mawsoni* pelagic and benthic crustaceans were

Table III. Diet of *Gymnodraco acuticeps* in the Cosmonaut Sea during February–April 1988.

Taxa	FO	P
<i>Euphausia superba</i>	26.6	2.3
<i>E. crystallorophias</i>	6.0	<0.1
Gammaridea, Decapoda, Mysidacea	6.0	0.1
Polychaeta	1.0	<0.1
Teuthida	1.0	0.3
<i>Pleuragramma antarcticum</i>	32.0	5.5
<i>Trematomus eulepidotus</i>	3.0	7.3
<i>T. hansonii</i>	1.0	2.2
<i>Trematomus</i> sp.	6.0	9.2
Nototheniidae undet.	7.0	1.1
<i>Chaenodraco wilsoni</i>	3.0	2.4
<i>Chionodraco hamatus</i>	1.0	0.3
<i>Cryodraco antarcticus</i> Dollo	1.0	0.8
Channichthyidae undet.	2.0	0.2
<i>Gymnodraco acuticeps</i>	3.0	3.2
<i>Notolepis coatsi</i> Dollo	2.0	0.3
<i>Electrona antarctica</i>	34.0	23.9
<i>Gymnoscopelus nicholsi</i>	16.0	31.7
Myctophyidae undet.	9.0	4.6
Fish undet.	14.0	4.5
Fish eggs	3.0	<0.1
Stones	2.0	–
No. of stomachs analysed	109	
% of empty stomachs	8.2	
Mean fullness index (%)	4.17	

FO: frequency of occurrence, %; P: proportion in total food dry weight, %

**Table IV.** Standard length (SL) of fish from stomachs of *Gymnodraco acuticeps* in the Cosmonaut Sea during summer 1988.

Species	SL (cm) of prey		% of predator body		SL (cm) of <i>G. acuticeps</i>
	mean	range	mean	range	
<i>Pleuragramma antarcticum</i>	5.8	5.0–7.0	20	15–25	27–33
<i>Trematomus eulepidotus</i>	15.9	–	51.6	–	30.8
<i>Chaenodraco wilsoni</i>	12.1	–	40.1	–	30.9
<i>Chionodraco hamatus</i>	8.8	–	32	–	27.5
<i>Cryodraco antarcticus</i>	13.0	–	41.4	–	31.4
<i>Gymnodraco acuticeps</i>	12.4	12.4–12.5	39	37–40	31–33
<i>Electrona antarctica</i>	7.0	5.8–8.5	22	17–26	28–36
<i>Gymnoscopelus nicholsi</i> Gilbert	10.8	9.5–12.0	36	31–41	30–31

the most frequent food items in the stomachs, but juvenile and subadult notothenioids dominated by mass. The diet composition of *C. mawsoni* adults in the continental seas of the South Indian Ocean reveals substantial meso- and macroscale geographic and seasonal variability. This suggests an opportunistic feeding mode for this species and probably reflects the availability of 'major' prey. The higher dissimilarity in the gut contents between specimens collected in the Cooperation and Cosmonaut seas may also reflect the differences in length composition of *C. mawsoni* in these regions (Fig. 1). However, there is no conclusive evidence as yet to support this suggestion.

To date, the food composition of *C. mawsoni* has only been documented from the Weddell and Cosmonaut seas. In the shelf region of the Weddell Sea, nektobenthic and benthic animals dominated in the guts of fish with standard length 13–36 cm. In order of significance there were fish of the genus *Trematomus*, gammarid amphipods, mysids, the decapod *Notocrangon antarcticus* Pfeffer and polychaetes, comprising > 90% of the stomach content (Kock *et al.* 1984, Schwarzbach 1988). During the 24 h station in the Cosmonaut Sea, notothenioid fish alone accounted for c.90% of stomach content by mass, while benthic organisms, e.g. gammarids, polychaetes, mysids, decapods and isopods together contributed only c.8% (Pakhomov & Tseitlin 1992).

In the case of ambush piscivores one expects high stomach fullness indices (SFI) (Shorygin 1952), but *C. mawsoni* frequently has low values of the SFI associated with small portions of benthic prey. This indicates that, while the bulk of diet is composed of fish, a supplement of smaller benthos is frequent and probably energetically important. Benthic animals were often found together with fish. The presence of small stones and sand particles along with the substantial proportion of benthic organisms in the guts of *C. mawsoni* clearly indicates that this species feeds on the sea floor. Underwater photography has shown that in the Weddell Sea *C. mawsoni* "seems to prefer open bottom habitats, or at least areas without high-growing sponges or other benthic animals" (Ekau & Gutt 1991). Therefore, from the results of gut content analyses, the feeding mode of *C. mawsoni* adults may be characterized as an ambush, nondiscriminatory predator, largely because this species probably behaves like a predator-collector between the consumption of large prey items. In

addition, the results of this study show the ability of *C. mawsoni* adults to use pelagic resources, particularly *E. superba*, at least during summer. To date, there is no information as to whether *C. mawsoni* is able to undertake vertical migration to consume Antarctic krill near the surface or whether krill become available in the near-bottom layers.

The dragonfish of the genus *Parachaenichthys* are the ecological equivalents of *C. mawsoni* in the lower latitudes Antarctic demersal fish communities, e.g. South Georgia, South Shetland and South Orkney islands (Kock 1992). The comparison of their feeding ecology with *C. mawsoni* revealed the high degree of similarity in the taxonomic groups consumed. For example, *P. georgianus* Fischer feeds on fish, pelagic (*E. superba* and *Themisto gaudichaudi* Guerin) and benthic (decapods, mysids) crustaceans (Permitin & Tarverdieva 1972, 1978, Targett 1981, Kozlov *et al.* 1988, Gröhsler 1994). The diet of this species showed a high degree of spatio-temporal variability (Kozlov *et al.* 1988). The prey species in the stomachs and their importance were found to reflect the food availability (Kozlov *et al.* 1988) and trophic relationships within fish communities (Targett 1981)

Unlike *C. mawsoni*, in the Cosmonaut Sea *Gymnodraco acuticeps* adults fed mainly on fish of the family Myctophidae (Pakhomov & Tseitlin 1992, this study), although young notothenioids, particularly *Pleuragramma antarcticum*, *Trematomus eulepidotus*, *Chaenodraco wilsoni* and *G. acuticeps*, also contributed substantially to the diet of this species. Pelagic crustaceans were of only minor importance. The limited number of previous studies indicate that the feeding habits of *G. acuticeps* are quite diverse. In early analyses from the South Shetland Islands region, the few specimens of this species examined had only *E. superba* in their stomachs (Takahashi 1983). More recently around Elephant Island, *G. acuticeps* with total length 22–25 cm fed mostly on *E. superba* (c. 66% of the gut content by mass) while fish were the second most important component accounting for 34% of the stomach content (Gröhsler 1992). In the Scotia Sea, *E. superba* was also found in 83% of 161 specimens of *G. acuticeps* examined (Permitin 1970). Despite the possibility that Antarctic krill might be available in the near-bottom layer, the above facts suggest that *G. acuticeps* may undertake vertical migrations to the surface waters to feed on Antarctic krill (Permitin 1970). This is partially

supported by pelagic catches of *G. acuticeps* adults in the Davis Sea (Gerasimchuk *et al.* 1990). According to Eastman (1993, fig. 6.10), *G. acuticeps* has jaws which are specifically designed for grasping prey. This species is, therefore, regarded mainly as a benthic predator and its buoyancy is the lowest among other benthic Antarctic notothenioids (Eastman 1993, fig. 10.1). This is, however, about twice as high as for benthic fish from New Zealand and may be attributed to the ecological plasticity of Antarctic demersal fishes which are able to feed, at reasonable energetic cost, on seasonally abundant food resources in the water column (Eastman 1993).

Although recorded over a wide depth range in the Ross Sea, *G. acuticeps* are regularly found at depths < 50 m where they behave as active ambush predators feeding on small *Trematomus*, e.g. *T. bernacchii* Boulenger and *T. nicolai* Boulenger (Dayton *et al.* 1970). In addition to the above mentioned *Trematomus newnesi* Boulenger, *T. scotti*, *Pagothenia borchgrevinki* Boulenger and *P. antarcticum* as well as small numbers of amphipods, fish eggs and polychaetes were recorded from fish stomachs caught over the Ross Sea shelf (Gosse 1961, Eastman 1985, Voskoboynikova 1991). It has been suggested that *G. acuticeps* may even become a scavenger during the winter (Arnaud 1970). On the basis of these facts and the results of this study, *G. acuticeps* can, therefore, be characterized as an opportunistic, active predator.

The stomach content analysis indicated that *C. mawsoni* fed on a wider range of prey than *G. acuticeps* (Tables I & III). Generally, the vertical distribution of *C. mawsoni* and *G. acuticeps* is different (Gerasimchuk *et al.* 1990) but during this study in the Cosmonaut Sea, both species of dragonfish were sampled within the same depth range, 200–400 m. Although both species are considered piscivorous, the different feeding modes and habits apparently limit interspecific competition. Indeed, the degree of dietary overlap (e.g. food similarity indices, FSI) between *C. mawsoni* and *G. acuticeps* in the Cosmonaut Sea was low, varying between 13 and 34% (average 26%). This was, however, not significantly ( $P > 0.05$ ) lower than the FSI calculated for *C. mawsoni* for the same region (24–39%, average 32%).

In conclusion, despite the fact that the two dragonfish investigated are able to consume seasonal pelagic prey, *C. mawsoni* was found to rely mainly on benthic and nektobenthic Antarctic shelf food resources. In contrast, *G. acuticeps* in the deep-shelf waters fed mainly on the mesopelagic midwater fish stock. These feeding modes would diminish interspecific competition within the demersal fish community in this area (Pakhomov & Tseitlin 1992).

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