

Andrzej KOMPOWSKI

Fish Biology

ON FEEDING OF *CHAMPSOCEPHALUS GUNNARI* LÖNNBERG, 1905
(*PISCES, CHAENICHTHYIDAE*) OFF SOUTH GEORGIA
AND KERGUELEN ISLANDS

O ODŻYWIANIU SIĘ KERGULENY – *CHAMPSOCEPHALUS GUNNARI*
LÖNNBERG, 1905 (*PISCES, CHAENICHTHYIDAE*)
W REJONIE POŁUDNIOWEJ GEORGII I WYSP KERGUELENA

Institute of Ichthyology, Szczecin

The food of *Champsocephalus gunnari* caught off South Georgia and Kerguelen Islands consisted almost exclusively of krill (*Euphausia superba* Dana) with a certain amount of the amphipod *Parathemisto gaudichaudi* (Guerin). A mean length of prey picked out from stomachs of *Ch. gunnari* off Kerguelen was much lower than that found for the prey in stomachs of the species off South Georgia.

INTRODUCTION

Champsocephalus gunnari Lönnberg, 1905 is undoubtedly one of the most widely spread members of the family *Chaenichthyidae*. Kochkin (1979), drawing from the literature data, delineated its range as extending from off South Georgia, the South Shetlands, South Orkneys to Bouvet, Kerguelen, and Heard Islands, as well as off the Antarctic Peninsula. Kanaeva et al. (1969) regarded the species as a typical inhabitant of pelagic waters. The species is of a considerable economic importance. The most abundant catches are made off South Georgia (Sosiński and Skóra, 1977). Feeding habits of

Ch. gunnari are still poorly known. Some remarks on this subject can be found in Olsen (after Andryashev, 1965); Kanaeva et al. (1969); Krzeptowski et al. (1976), Chłapowski and Krzeptowski (1978), and Rembiszewski et al. (1978). Extensive studies by Permitin and Tarverdeva (1972) on food of 10 fish species, *Ch. gunnari* included, from South Georgia, as well as observations of Linkowski and Rembiszewski (1978) cover only the incidence of individual food items and extent of stomach filling assessed visually.

The present studies, based on direct weighings and back-calculated weights, attempt to describe feeding of *Ch. gunnari* and length distribution of the prey present in the fish stomachs examined.

MATERIAL AND METHODS

The fishes to be studied were collected during the 1977 cruise of MT "Rekin" to the South Georgia waters. The fishes were picked out at random from bottom trawl catches made at 260–290 m depth. A single sample consisted of those fishes was collected by a krill trawl towed at approximately 30 m (Fig. 1). After measuring (l.t.) the specimens to be

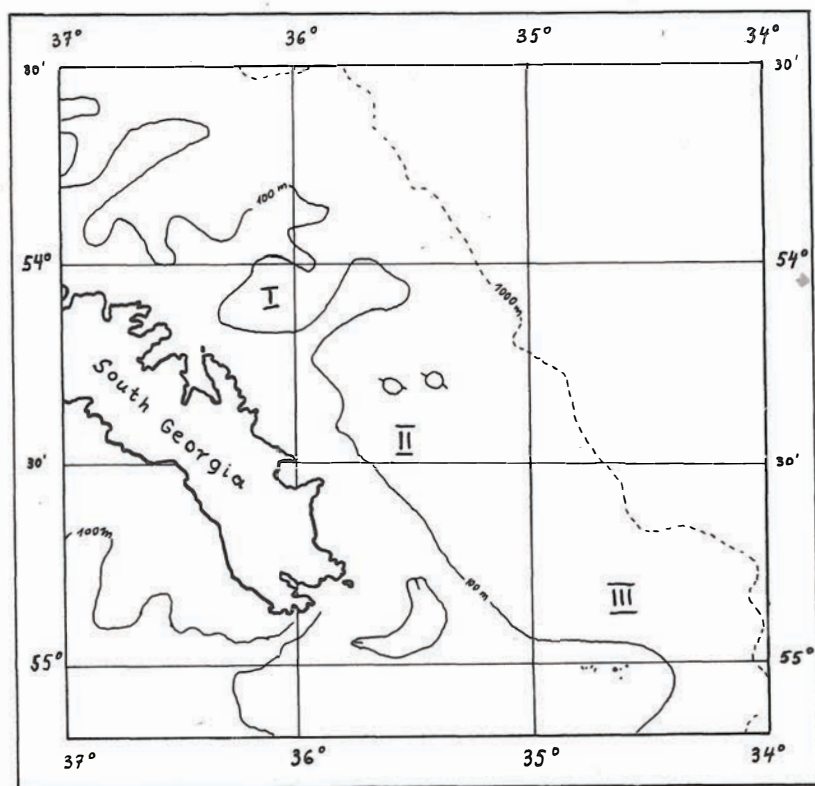


Fig. 1. Sampling sites off South Georgia. Fishing grounds:
I – "NE of Cumberland Bay"; II – „Paluch“; III – "NE of Clerke Rocks"

studied, their stomachs were taken out and fixed in 4% formalin. Apart from the materials collected off South Georgia the author examined stomachs of 23 individuals collected by Mr. Zbigniew Neja* off Kerguelen Islands (Fig. 2). The organisms present in stomachs were grouped to major taxa, each group being subsequently weighed and the organisms forming it counted. The extent of digestion permitting, those organisms were measured; about 20 randomly selected individuals were measured in case of an abundantly filled stomach. The *Euphausia* sp. length was measured from the tip of telson to the anterior margin of the eye, while the length of *Parathemisto gaudichaudi* was measured from the anterior margin of the eye to the tips of uropods.

Table 1 gives the numbers of stomachs examined.

The food composition was studied using – wherever possible – several methods: 1. a "frequency" method; 2. a "weight" method; 3. a "retraced weights" method, i.e., using standard weights (Fortunatova, 1964); 4. a numerical method.

Based on the known lengths of *Euphausia superba*, their weights were reconstructed with the use of the equation given by Rakusa-Suszczewski (1977):

$$M = 0.0018 \cdot L^{3.3831}$$

where M denotes wet weight (mg) and L length (mm).

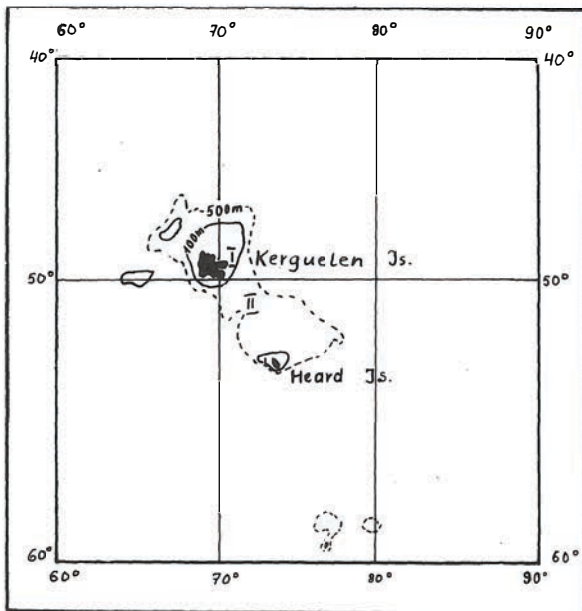


Fig. 2. Sampling sites off Kerguelen Islands. I – December 1977; II – February 1978

* Mr. Zbigniew Neja is thanked for placing these materials at the author's disposal.

Table 1

Specification of *Champscephalus gunnari* stomachs examined

Region and fishing ground	Date	Fishing gear and trawling depth	Fish length range (cm)	No. of stomachs examined	No. of stomachs			
					„full“		„empty“	
					n	%	n	%
SOUTH GEORGIA								
"NE of Cumberland Bay"	22 and 23 March 1977	bottom trawl 260–280 m	33.0–68.0	50	24	48.0	26	52.0
"NE of Clerke Rocks"	April 1977	pelagic krill trawl 30 m	17.9–23.0	42	32	76.2	10	23.8
„Paluch“	6 and 9 May 1977	bottom trawl 280–290 m	19.0–54.5	102	36	35.3	66	64.7
"NE of Cumberland Bay"	11 May 1977	bottom trawl ca. 280 m	20.0–39.0	58	13	22.4	45	77.6
Total for South Georgia	–	–	–	252	110	43.5	147	56.5
KERGULEN ISLANDS								
48°45' S; 70°55' E	28 and 29 Dec. 1977	bottom trawl 150–350	28.0–39.0	18	18	–	–	–
51°20' S; 72°02' E	7 Feb. 1978	bottom trawl 175–180	27.0–38.0	5	5	–	–	–
Total for Kergulen Islands	–	–	–	23	23	–	–	–
GRAND TOTAL	–	–	–	275	128	–	147	–

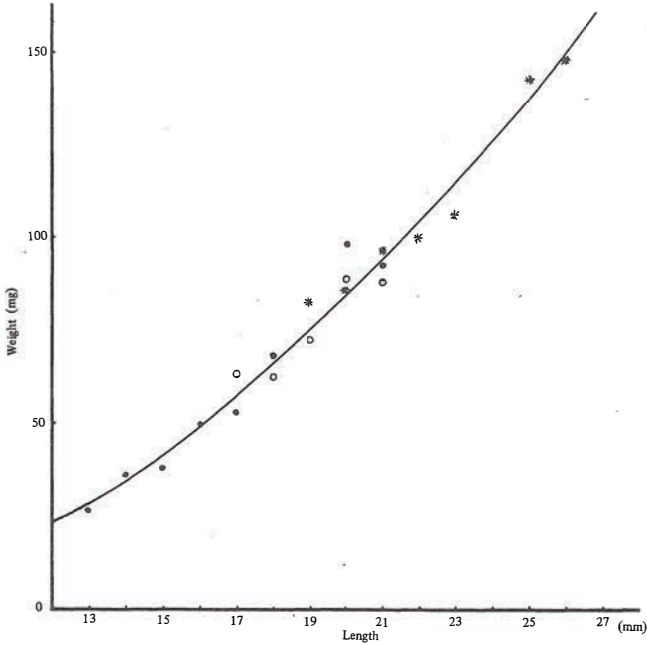


Fig. 3. Length/weight relationship for *Parathemisto gaudichaudi* (Guerin)

- * off South Georgia, krill trawl, alcohol-preserved specimens; n = 32;
- off South Georgia, specimens picked out from stomachs off *Champocephalus gunnari*, preserved in 4% formalin; n = 21;
- off Kerguelen Islands, specimens picked out from stomachs, preserved in 4% formalin; n = 37.

As the literature available to the author gives no such relationship for *Parathemisto gaudichaudi*, it was calculated from materials picked out by the author from the South Georgia krill trawl catches, supplemented by the best preserved individuals from stomach contents (Fig. 3). In spite of both a diverse origin of these crustaceans and different fixation techniques applied to them, the points representing mean weights for each length class are arranged fairly accurately along the empirical curve. It should be, however, borne in mind that the reconstructed weights read from the graph may differ from weights of freshly-caught *Parathemisto gaudichaudi*.

Mean indices of filling were calculated using the formula

$$\text{mean index of filling} = \frac{\sum \text{weights of stomach contents}}{\sum \text{weights of fishes examined}} \cdot 10^4$$

while mean indices of consumption were derived from the formula

$$\text{mean index of consumption} = \frac{\sum \text{retraced weights of prey}}{\sum \text{weights of fishes examined}} \cdot 10^4$$

Partial indices of consumption were calculated in a similar manner, substituting to the equation sums of prey's reconstructed weights. The fish weight was calculated from

$$W = 0.00111 L^{3.5260}$$

where W is the fish weight (g), and L is the total length of a fish. The parameters of this formula were obtained using the least squares method from the author's own data and those reported by Sosiński and Skóra (1978) Fig. 4).

Hours of fishing are given according to the local time.

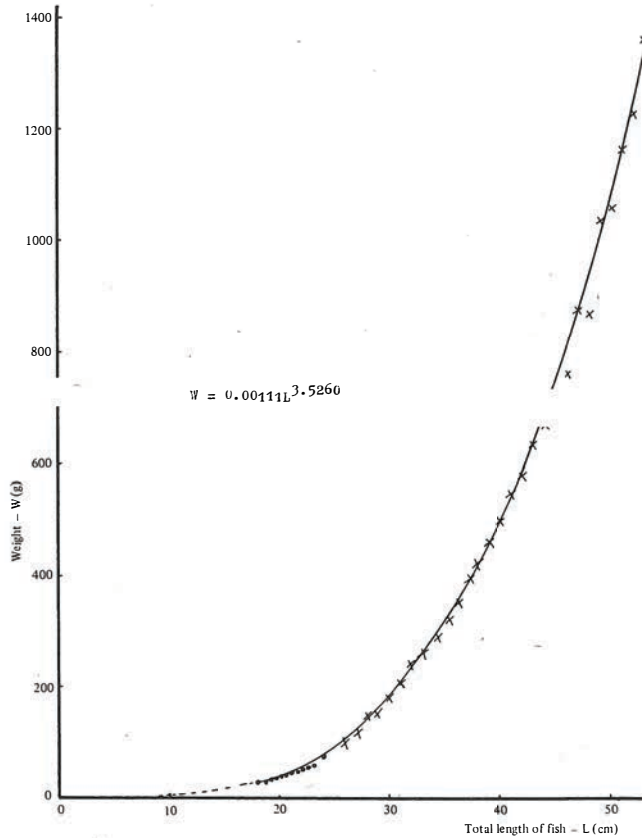


Fig. 4. Length/weight relationship for *Champsocephalus gunnari* off South Georgia

- present authors data; n = 188;
- * after Sosiński and Skóra (1978)

FEEDING OF *CHAMPSOCEPHALUS GUNNARI*

A. Off South Georgia

1. *Ch. gunnari* in demersal catches

The catches were made at 260–290 m depth; apart from *Ch. gunnari* making up 5–40% of a catch, *Pseudochaenichthys georgianus*, *Notothenia rossi*, *N. gibberifrons*, *Chaenocephalus aceratus*, and other species were recorded.

Three clearly-marked modal lengths were observed in the catches: 22, 31–32, and 38 cm (Fig. 5). Gonads of sexually mature individuals (more than 35 cm in size) were in stages II–IV Maier's scale. Intestines of the individuals examined were amply provided with fat, the stomachs being poorly filled with food; also Permitin and Tarverdeva (1972) observed poorly filled stomachs in *Ch. gunnari* caught in the same seasons of the year. According to these authors, this may be accounted for by throwing up of food after the fish had been caught by the net; on the other hand, Sosiński and Skóra (1977) suppose that poor feeding is a regular feature observed in most fishes during spawning.

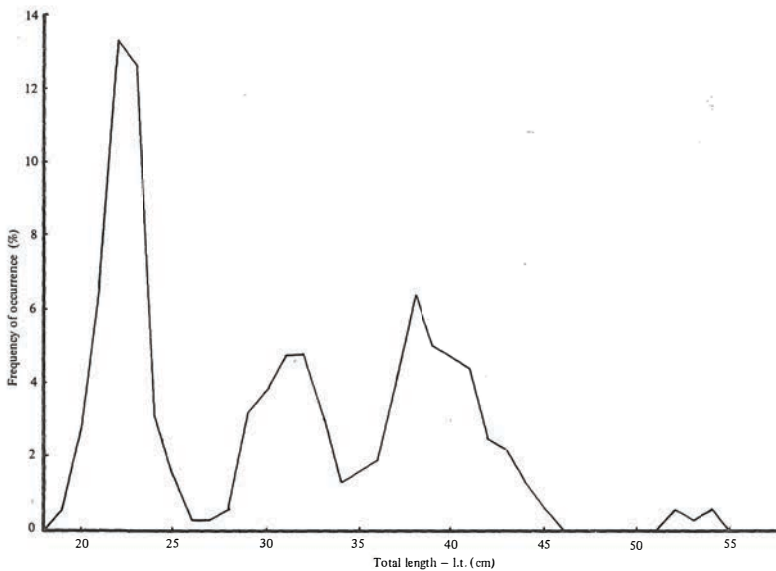


Fig. 5. Length distribution of *Ch. gunnari* in bottom trawl catches off South Georgia for 22 March – 19 May 1977; n = 315 (after Kompowski, 1977)

Table 2 summarises the results of studies on *Ch. gunnari* food off South Georgia. About a half of the 50 examined individuals measuring 33–68 cm caught in March at the fishing ground denoted "NE of Cumberland Bay" at 7.35–12.23 h showed empty stomachs. In the remaining ones a total of 652 food organisms was found, 81% of which being made up by the amphipod *Parathemisto gaudichaudi* (Guerin), while 18.7% by krill,

Table 2

Feeding of *Champscephalus gunnari* off South Georgia, March-May 1977

Indicator	Fishing ground, date, hour, gear		"NE of Cumberland Bay" ³ 22 and 23 March 1977 7 ³⁵ –12 ²³ , bottom trawl		"Paluch" 6 and 9 May 1977 8 ⁰³ –14 ⁴⁴ bottom trawl		"NE of Cumberland Bay" ⁴ 11 May 1977 4 ⁵⁹ –9 ¹⁴ bottom trawl		"NE of Clerke Rocks" 11 April 1977 2 ³² –7 ⁴⁷ krill trawl	
	1.	No. of stomachs examined, of which	50	100.0%	102	100.0%	58	100.0%	42	100.0%
	"full"	24	48.0%	36	35.3%	13	22.4%	32	76.2%	
	"empty"	26	52.0%	66	64.7%	45	77.6%	10	23.8%	
2.	Total no. of prey organisms found in stomachs, of which	652	100.0%	101	100.0%	—	—	98	100.0%	
	<i>Euphasia superba</i>	122	18.7%	91	90.1%	—	—	92	93.9%	
	<i>Parathemisto gaudichaudi</i>	528	81.0%	9	8.9%	—	—	5	5.1%	
	Other	2	0.3%	1	1.0%	—	—	1	1.0%	
3.	Mean no. of prey per 1 "full" stomach	50.15		2.81		—		3.06		
4.	Total weight (g) of stomach contents, of which	99.95	100.0%	75.01	100.0%	9.57	100.0%	52.43	100.0%	
	<i>Euphasia superba</i>	56.44	56.5%	43.32	57.8%	6.94	72.5%	51.26	97.8%	
	<i>Parathemisto gaudichaudi</i>	43.22	43.2%	0.64	0.9%	2.23	23.3%	0.31	0.6%	
	Other	0.29	0.3%	31.05	41.3%	0.40	4.2%	0.86	1.6%	
5.	Mean index of filling	35.448		38.623		6.548		239.702		
6.	Total weight of swallowed prey, as retraced using standard weights	146.33		103.31		—		58.66		
7.	Mean index of consumption, of which partial indices for	51.90	100.0%	53.20	100.0%	—	—	268.19	100.0%	
	<i>Euphasia superba</i>	33.84	65.2%	36.88	69.3%	—	—	262.84	98.0%	
	<i>Parathemisto gaudichaudi</i>	17.95	34.6%	0.33	0.6%	—	—	3.93	1.5%	
	Other	0.11	0.2%	15.99	30.1%	—	—	1.42	0.5%	
8.	Frequency (% of "full" stomachs)									
	<i>Euphasia superba</i>	79.2		92.7		84.6		100.0		
	<i>Parathemisto gaudichaudi</i>	50.0		12.2		7.7		6.3		
	Inne	8.3		2.4		15.4		3.2		

* Stomach contents strongly digested. Abundance and size of prey impossible or difficult to ascertain

Euphasia superba Dana. Additionally, a single representative of the *Mysidacea* and in one occasion unidentified crustacean remains were found. The mean number of food organisms per one full stomach was 50.15; the mean index of filling was low amounting to 35.448, while the mean index of consumption was 51.90. *E. superba* and *P. gaudichaudi* amounted to 56.5 and 43.2% of the total stomach content weight, respectively. Using the partial indices of consumption, krill and *P. gaudichaudi* were found to amount to 65.2 and 34.6%, respectively, of the mean index of consumption. Krill were found also in most "full" stomachs (79.2%), while *P. gaudichaudi* in 50% only.

About 2/3 of the 102 examined individuals measuring 19.0–54.5 cm caught in May at the fishing ground "Paluch" at a similar time of the day as mentioned before (8.03–14.44 h) showed empty stomachs. In the remaining 36 "full" ones 101 prey organisms were present, that is about six times less than previously, while the mean indices of filling and consumption (38.623 and 53.20, respectively) did not differ much from the March values. This resulted from krill individuals, far bigger than *P. gaudichaudi*, prevailing numerically. Krill constituted 90.1% of the number of food organisms and occurred in 92.7% of "full" stomachs. In the stomach of one of larger fishes (54.5 cm) a *Notothenia gibberifrons* specimen was found. A relatively large weight of this organism, 31.05 g, resulted in krill, predominating in the food in terms of numbers and frequency, amounting to only 57.8% of the food weight, while the partial index of consumption of this food item was 69.3% of the mean index of consumption. The percentage of individuals of *P. gaudichaudi* found was low (0.9%), and the partial index of consumption of this item was very low (0.33) and amounted to 0.6% of the mean index of consumption.

Owing to an extensive length range of fishes at the fishing ground discussed, it was possible to follow changes in feeding intensity and in food composition, accompanying changes in fish size. To achieve this, the sample studied was divided into three length classes: 25 cm and less; 25.1–35 cm; and above 35 cm, so that the midpoint of each class was approximately equal to one of the modal lengths occurring in the catches. A differential feeding intensity was observed in each length class. Only 30% of the small fishes (25 cm and less) had their stomachs filled with food; similarly only 33% of the fishes in the next class (25.1–35.0 cm) had been feeding; on the other hand, 63% of the large individuals (above 35 cm) showed the presence of food in their stomachs. The mean indices of filling for the three above-mentioned length classes: 10.499; 18.186; and 89.527, respectively, provide a still more clear-cut example of the phenomenon described. Similarly, the values of the mean index of consumption were seen to increase with fish length: 20.328; 32.191; and 107.330 for the respective fish length classes. Thus the large fishes fed more intensively than the small ones. The composition of food was also related to fish size (Fig. 6): in the smallest fishes' food, apart from the predominating *E. superba*, there was a large proportion of *P. gaudichaudi*, the amphipods making up almost a half (47.4%) of the number of organisms present in stomachs of these fishes. Owing to their small size, the amphipods amounted to 22.7% of the food weight only, while their partial index of consumption (2.383) was 11.7% of the mean index of consumption. The

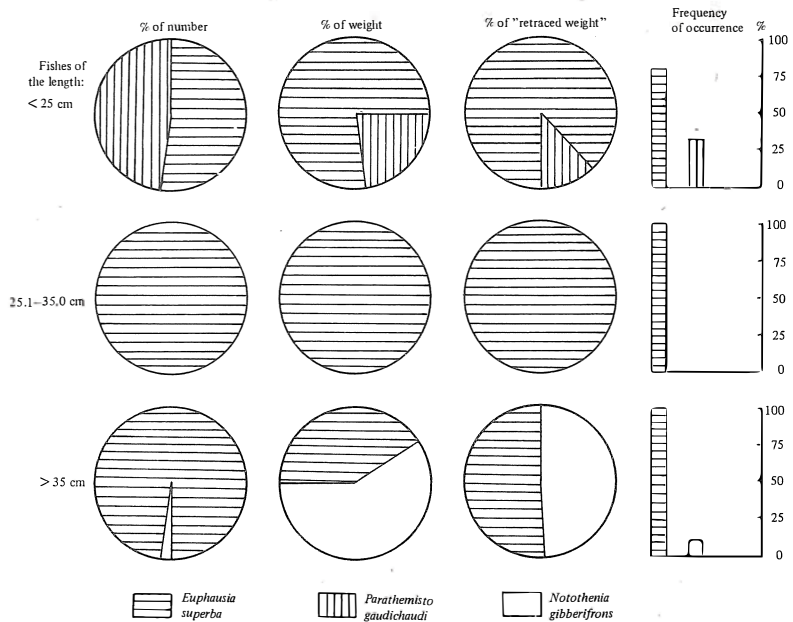


Fig. 6. Food composition of *Ch. gunnari* of various length on the „Paluch“ fishing ground in May 1977

medium length class' food consisted exclusively of *E. superba*, while among the food of the largest fishes – apart from the fact that all those feeding contained *E. superba* in their stomachs – a single specimen of *Notothenia gibberifrons* was found.

Out of the 58 individuals measuring 20–39 cm, caught in May at the neighbouring fishing ground "NE of Cumberland Bay" at 4.59–9.14 h, only 13 (22.4%) had stomachs poorly filled with a strongly digested food. Most of the remains found were, on the basis of their highly characteristic coloration and the appearance of some intact organs (eyes), identified as 2 species: *E. superba*) and *P. gaudichaudi*. On the other hand, it was impossible – or very difficult – to count those prey organisms, not to mention finding their length distribution. Therefore the appropriate entry in Table 2 gives only tentative data on the frequency (84.6; 7.7; and 15.4% for *E. superba*, *P. gaudichaudi*, and unidentified, respectively and percentage composition of the food weight (72.5; 23.3; and 4.2% respectively). The mean index of filling was very low (6.548).

Thus *Ch. gunnari* caught with bottom trawls off South Georgia in March and May 1977 were found to feed with a low intensity. It is suggested that there is a diel feeding rhythm as those fishes caught during the daytime (7.35–14.44) showed their stomachs much more abundantly filled with well-preserved organisms than those individuals caught at dawn (4.59–9.14). This conclusion, however, needs to be supplied with observations

made throughout a 24-h cycle. Large fishes were found to feed more intensively than smaller ones. The food spectrum of the fishes examined was very narrow, consisting mainly of the Antarctic krill (*E. superba*) and – to a lower extent – of the amphipod *P. gaudichaudi*, the latter occurring chiefly in the smaller fishes stomachs. Larger *Ch. gunnari* can also be ichthyophages.

2. *Ch. gunnari* in pelagic catches made with krill trawl

Juvenile *Ch. gunnari* occurred en masse in several hauls made on 11 April at the krill ground "NE of Clerke Rocks" (Fig. 1), making up about 20% of the total catch and amounting to 2 t per haul. Other, numerous in the region, vessels fishing for krill recorded considerable amounts of *Ch. gunnari* on that day too. Other authors did not observe such a mass occurrence of the species in krill catches (Chłapowski and Krzeptowski, 1978; Rembiszewski et al., 1978). The fishes caught measured 18–23 cm with a modal length of 21 cm (Fig. 7), i.e., similar to those fishes making up the first peak in the demersal catches discussed previously (Fig. 5).

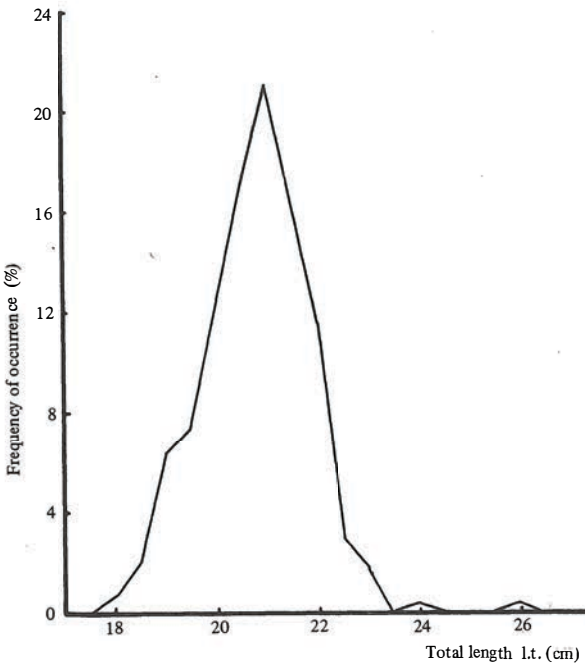


Fig. 7. Length distribution of *Ch. gunnari* in krill trawl catches off South Georgia on 11 April 1977; n = 269 (after Kompowski, 1977)

The last column in Table 2 presents the results of examining the fishes caught at night (2.32–7.47 h) at approximately 30 m. The fishes examined fed with a high intensity as evidenced by a high proportion (76.2%) of full stomachs as well as by high values of the

mean indices of filling (239.702) and consumption (268.19). In the stomachs examined, a total number of 98 prey organisms were found, 93.9% of which being assigned to *E. superba*, and 5.1% to *P. gaudichaudi*. A strongly digested, about 5 cm long fish was also found; its state of deterioration made even a tentative identification impossible. Krill occurred in all those stomachs filled with food, while *P. gaudichaudi* in two (6.25). Moreover, krill made up almost the entire food weight (97.8%), while its partial index of consumption was 262.84, i.e., 98% of the mean index of consumption. One full stomach yielded, on the average, 3.06 well-preserved prey organisms.

As the above data indicate, the juvenile *Ch. gunnari* had, over the period studied, a very narrow food spectrum as well, covering mainly krill. Their feeding intensity was much stronger than that of large fishes. It is interesting to note that the sample examined was obtained from a night catch, while – as discussed in the previous section – the large *Ch. gunnari* caught with bottom trawls at more or less the same time of the day had their stomachs mostly empty or poorly filled with heavily digested remnants, which would suggest a different feeding rhythm to exist in the adults as compared with the juvenile *Ch. gunnari*. Noteworthy is also the fact of a sparse occurrence of *P. gaudichaudi* in stomachs of the juveniles, whereas the highest percentage of the amphipod in the demersal trawl catches was recorded in the small fishes. This is presumably a result of a poor availability of the amphipod at the krill ground "NE of Clerke Rocks", since the author (Kompowski, 1977) observed that krill aggregations there were almost pure, *P. gaudichaudi* occurring very rarely.

3. Size of prey in *Ch. gunnari* stomachs

Owing to an extremely narrow food spectrum of *Ch. gunnari* and difficulties in our perceiving a possibly selective behaviour of the fish in relation to various prey species, an attempt was made to find out whether *Ch. gunnari* showed any fish size-dependent selectivity for prey size. To study this, length measurements of krill, the main food component found in stomachs, were compared with the data on krill length obtained from commercial catches made at about the same time from approximately the same grounds (Fig. 8). As seen from the comparison, the krill eaten by *Ch. gunnari* were somewhat smaller than those found in the catches. A mean length of krill individuals occurring in stomachs of the juvenile *Ch. gunnari* caught with a krill trawl at "NE of Clerke Rocks" was 42.27 mm, while a mean length of krill in the catches made with the same gear was 45.95 mm; the modal values were 40 and 45 mm, respectively. A mean length of krill found in stomachs of the adult (28.5–68.0 cm) *Ch. gunnari* caught with bottom trawl NE of South Georgia was 45.67 mm, while a mean length of krill caught at the same time from the same region with a krill trawl was 49.57 mm; the modes were 45 and 50 mm, respectively. Furthermore, the krill individuals eaten by the juveniles were smaller than those found in stomachs of the adults.

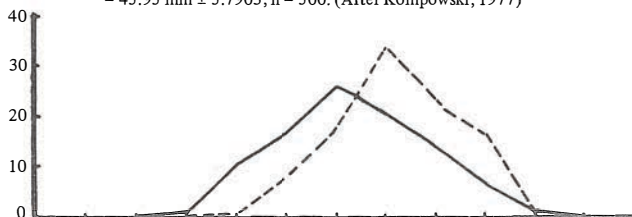
The differences between the lengths of krill caught with a trawl and found in fish stomachs may have resulted from a krill trawl selectivity, the trawl failing to retain smaller individuals and therefore giving rise to an increase in mean length of those

A. Off South Georgia

"NE" of Clerke Rocks (III)

Krill found in stomachs of the juvenile (17.9–23.0 cm) *Ch. gunnari* caught with a krill trawl 11 April 1977. Mean length of the krill = 42.27 mm ± 7.4139; n = 73 (original)

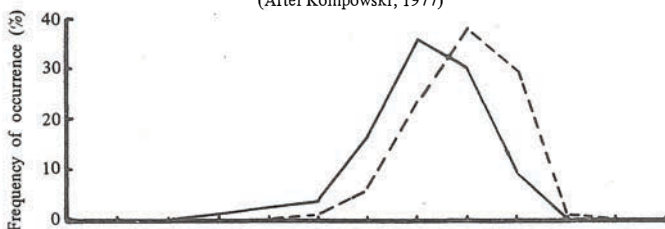
Krill caught with a krill trawl 5–14 April 1977; Mean length of the krill = 45.95 mm ± 5.7903; n = 500. (After Kompowski, 1977)



"NE" of South Georgia (I and II)

Krill found in stomachs of adult *Ch. gunnari* (28.5–68.0 cm). March and May 1977, bottom trawl. Mean length of the krill = 45.67 mm ± 5.8311; n = 73. (original).

Krill caught with a krill trawl 18 April – 8 May 1977; Mean length of the krill = 49.57 mm ± 4.4992; n = 700. (After Kompowski, 1977)



B. Off Kergulen Islands

Krill found in stomachs of the adult *Ch. gunnari* (27–39 cm). December 1977. Mean length of krill = 23.40 mm ± 2.0535; n = 80. (original)

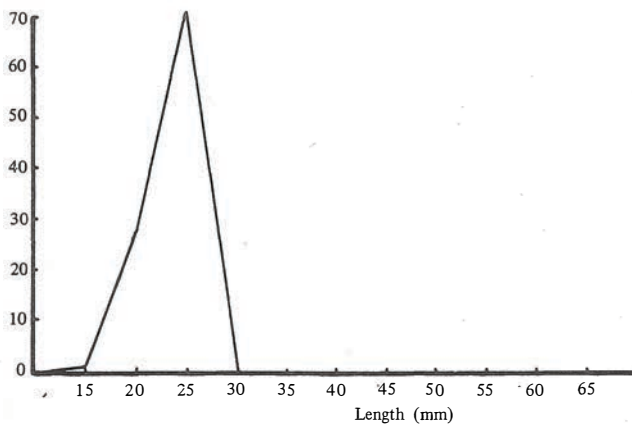


Fig. 8. Length distribution of krill (*Euphausia superba*) found in *Ch. gunnari* stomachs and caught with krill trawls

crustaceans retained in the codend. On the other hand, the larger size of the krill found in stomachs of large fishes may have resulted both from the fish preference toward larger prey and, as mentioned above, from the larger size of krill occurring in the larger fishes feeding grounds. In *Ch. gunnari*, a preference toward a definite prey size seems to be rather low and only slightly changing with fish length

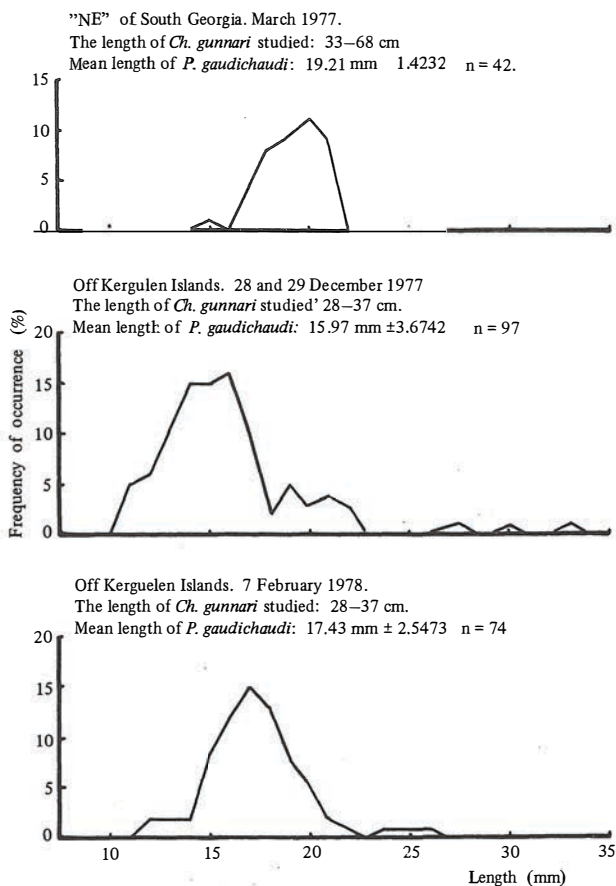


Fig. 9. Length distribution of *Parathemisto gaudichaudi* found in *Ch. gunnari* stomachs

Fig. 9 presents the length distribution of *P. gaudichaudi* found in stomachs of *Ch. gunnari* (a mean length of 19.21 mm). Unfortunately, the lack of studies on the amphipode population length distribution within the region studied makes it impossible to consider the aspects discussed with relation to krill.

B. Off Kerguelen Islands

Detailed morphological studies by Kochkin (1979) confirmed the previous suggestion of Nybelin that the two *Ch. gunnari* populations, those found off Kerguelen Islands and off South Georgia, are so different that they should be treated as subspecies. Thus it would be of interest to find out if the food of *Ch. gunnari* off Kerguelen Islands were any different from that off South Georgia discussed above.

The catches were made at 150–310 m, *Ch. gunnari* being the main component. Other items caught were *Notothenia rossi*, *Chaenichthys rhinoceratus*, and *N. squamifrons*. The *Ch. gunnari* population was very uniform in size: only one modal length (33 cm) was found to occur in the December catches (east of Kerguelen Islands) and one mode (32 cm) in February when the fishing operations were performed at about middle distance between the Kerguelen Archipelago and Heard Island (Fig. 10).

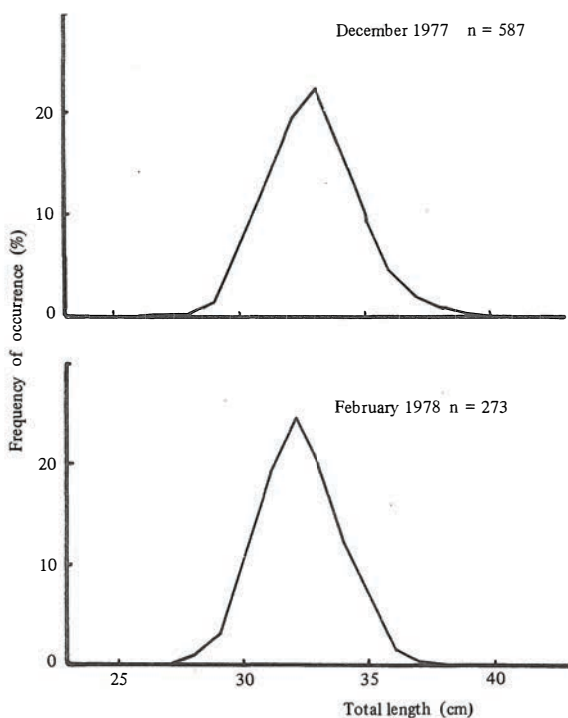


Fig. 10. Length distribution of *Ch. gunnari* in trawls catches off Kerguelen Islands

The caught *Ch. gunnari* yielded a total of 23 stomachs which were not, however, taken at random, but only those filled with food were considered. Therefore, the studies concerned only the food composition, feeding intensity being disregarded. The results are summarised in Table 3.

Feeding of *Champsocephalus gunnari* off Kergulen Islands;
December 1977 – February 1978

	Fishing ground, date, hour, gear	48°45'S; 70°55'E 28 and 29 Dec. 1977 11 ⁴⁵ –17 ⁵⁵ bottom trawl		51°20'S; 72°02'E 7 Feb. 1978 5 ⁵⁵ –7 ⁵⁵ bottom trawl	
	Indicator				
1.	No. of stomachs examined	18		5	
2.	Total no. of prey in stomachs studies, of which:	2623	100.0%	604	100.0%
	<i>Euphausia</i> sp.	1969	75.1%	113	18.7%
	<i>Parathemisto gaudichaudi</i>	653	24.9%	491	81.3%
	Pisces unidentified	1	0.0%	–	–
3.	Total weight of stomach contents of which (g)	249.79	100.0%	45.36	100.0%
	<i>Euphausia</i> sp.	216.88	86.8%	6.19	13.7%
	<i>Parathemisto gaudichaudi</i>	28.88	11.6%	39.17	86.3%
	Pisces unidentified	4.03	1.6%	–	–
4.	Frequency (in % of "full" stomachs)				
	<i>Euphausia</i> sp.	100.0		20.0	
	<i>Parathemisto gaudichaudi</i>	94.4		100.0	
	Pisces unidentified	5.6		–	
5.	Mean no. of prey per one "full" stomach	145.72		120.8	

In stomachs of the fishes caught in December at 48°45 S; 70°55 E at 11.45–17.55 h a total number of 2623 prey organisms were found, 75.1% of which being *E. superba*. Krill made up 86.8% of the total food weight and occurred in every stomach examined. In one stomach, remains of a fish individual weighing about 4 g and belonging presumably to the family *Chaenichthyidae* were found.

The main item in the food of 5 individuals caught in February from the other ground surveyed (51°20 S; 72°02 E) at 5.55–7.55 h was *P. gaudichaudi* contributing 81.3% of the prey number and 86.3% of their weight; the amphipods occurred in every stomach examined. Members of the genus *Euphausia* (*E. superba* together with some amount of *E. vallentini* Stebbing) made up as little as 18.7% and 13.7% of the prey number and weight, respectively, occurring in one stomach only.

A mean size of prey organisms found in the stomachs examined was much lower than that off South Georgia: the modal lengths of krill and *P. gaudichaudi* were 25 and 17 mm, respectively (Figs. 8 and 9).

The picture of feeding of the Kerguelen *Ch. gunnari* presented is obviously incomplete owing to a scarcity of the material on hand. Nonetheless, the food spectrum recorded in this area is clearly seen to be very narrow, consisting of the same two items, krill and *P. gaudichaudi*.

Concluding remarks

The fundamental component of food of *Ch. Gunnari* in the two regions studied was krill, *E. superba*, *P. gaudichaudi* being a supplementary item. Studies by Permitin and Tarverdeva (1972) showed the *Mysidacea* to be the third, important food component off South Georgia. The authors even ranked the mysids second in importance, after *E. superba* and before *P. gaudichaudi*. According to Rembiszewski et al. (1978), small *Ch. gunnari* (51–71 mm l. corp.) off South Georgia feed mainly on Copepods. Apart from various fish species, the other food items, found very rarely and being undoubtedly taken up accidentally, were *Euphausiacea* (other than *E. superba*), *Amphipoda*, *Ctenophora*, and *Polychaeta* (Permitin and Tarverdeva, 1972; Rembiszewski et al., 1978).

Krill is encountered in diets of very numerous Antarctic animals. In case of fishes, even the typically benthic species tend to migrate up to the midwater, at least in certain periods of their life cycle, and feed on those crustaceans (Kanaeva et al., 1969; Tarverdeva, 1972; Kompowski, 1979). However, *Ch. gunnari* feed on krill throughout their life span; it is therefore appropriate to classify the species, together with *Notothenia larseni*, to the typical planktivores, as did Permitin and Tarverdeva (1972).

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Translated: mgr Teresa Radziejewska

O ODŻYWIANIU SIĘ KERGULENY – *CHAMPSOCEPHALUS GUNNARI* LÖNNBERG, 1905
(*PISCES, CHAENICHTHYIDAE*) W REJONIE POŁUDNIOWEJ GEORGII
I WYSP KERGUELENA

Streszczenie

Zbadano zawartość 252 żołądków ryb złowionych na szelfie Południowej Georgii w marcu do maja 1977 r. oraz 23 ryb z szelfu Wysp Kerguelena, złowionych w grudniu 1977 i lutym 1978 r. (Tabl. 1, rys. 1 i 2).

W połowach włokiem dennym w rejonie Pd. Georgii były trzy długości modalne *Ch. gunnari*: 22,31–32 i 38 cm (rys. 5). Żołądki tych kergulen były słabo wypełnione pokarmem składającym się prawie wyłącznie z *Euphausia superba* Dana i *Parathemisto gaudichaudi*. Młodociane ryby o długości modalnej 21 cm (rys. 7) występujące jako domieszka do kryła poławianego włokiem pelagicznym, żerowały intensywnie, a ich spektrum pokarmowe było bardzo podobne do spektrum ryb złowionych włokiem dennym, lecz przewaga *E. superba* była w tym przypadku silniejsza (Tab. 2). Wśród ryb złowionych włokiem dennym ryby mniejsze żerowały mniej intensywnie niż duże, a odsetek *P. gaudichaudi* w ich pokarmie był większy (rys. 6).

Przeciętna długość kryła zjadanego przez młodą kergulene była nieco mniejsza niż długość kryła zaobserwowana w żołądkach ryb dużych (rys. 8). Może to jednak wynikać nie z preferencji tej ryby do określonej wielkości ofiar, ale z różnic w długości kryła w miejscach żerowania ryb młodocianych i dorosłych.

W rejonie Wysp Kerguelena w połowach występowały ryby o jednej tylko długości modalnej 32–33 cm (rys. 10). Pokarm *Ch. gunnari* w rejonie Wysp Kerguelena również składał się prawie wyłącznie z dwóch komponentów: *E. superba* i *P. gaudichaudi* (Tab. 3). Przeciętna długość ofiar znajdowana w żołądkach *Ch. gunnari* w tym rejonie była znacznie niższa niż w rejonie Pd. Georgii (rys. 8 i 9).

Анджей Комповски

О ПИТАНИИ БЕЛОКРОВОЙ ЩУКИ - *CHAMPSOCEPHALUS GUNNARI*
LÖNNBERG, 1905 (PISCES, SNAENICHTHYIDAE)
В РАЙОНЕ ЮЖНОЙ ГЕОРГИИ И ОСТРОВОВ КЕРГЕЛЕН

Резюме

Исследовано содержание 252 желудков рыб с улова в районе Южной Георгии от марта до мая 1977 года и 23 рыб с шельфа у островов Кергелен добытых в декабре 1977 и в феврале 1978 г. (табл. 1, рис. 1 и 2).

С уловов донным тралом в районе Южной Георгии получено три модальные длины *Ch. gunnari*, 22, 31-32 и 38 см (рис. 5). Желудки этих белокровных щук были только частично выполнены пищей слагающейся в основном с *Euphausia superba* Dana и *Parathemisto gaudichaudi*. Рыбы помелче о модальной длине 21 см (рис. 7). Выступающие как примесь криля добываемого педагогическим тралом, питались интенсивно, а их пищевой спектр был очень похож к спектру рыб полученных донным тралом, однако в этом случае был перевес *E. superba* (табл. 2). Среди рыб вылавливаемых донным тралом, рыбы помелче кормились менее интенсивно, а процент *P. gaudichaudi* в их пище был выше (рис. 6).

Средняя длина криля съедаемого молодой белокровной щукой немного меньше от длины криля наблюдаемого в желудках больших рыб (рис. 8). Однако это не конечно должно быть результатом предрасположения этих рыб к величине жертвы, а может быть разная длина криля в местах питания рыб молодых и взрослых.

В районе островов Кергелен вылавливали рыбы о одной модальной длине 32-33 см (рис. 10). Пища *Ch. gunnari* в районе островов Кергелен тоже складывалась в основном с двух компонентов: *E. superba* и *P. gaudichaudi* (табл. 3). Средняя длина жертв найденых в желудках *Ch. gunnari* в этом районе была значительно ниже чем в районе Южной Георгии (рис. 8 и 9).

Перевод: мгр Владыслав Черешко

Adress:

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Dr Andrzej Kompowski
Instytut Ichtiologii AR
71-550 Szczecin,
ul. Kazimierza Królewicza 4
Polska - Poland