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**Postlarval and juvenile fish (*Pisces*,
Perciformes and *Myctophiformes*) in
the Antarctic Peninsula region
during BIOMASS-SIBEX,
1983/1984***

ABSTRACT: During the SIBEX¹⁾ programme in December 1983/January 1984, 27 hauls were made from the "Profesor Siedlecki" with a 368 — mesh midwater sampling trawl. A total of 13 fish species at postlarval or juvenile stages was found in the catches. The greatest abundance and species diversity of juvenile ichthyofauna was observed within shelf waters of the Peninsula. Postlarval and juvenile *Pleuragramma antarcticum* was the most common and most abundant species there.

Key words: Antarctic, BIOMASS-SIBEX juvenile fish

1. Introduction

The knowledge about juvenile Antarctic ichthyofauna in the pelagic phase of its life is still insufficient to understand the mechanisms governing its distribution and migrations, determine the factors influencing its individual development and survival rate, as well as establish the interrelations between juvenile fish and the pelagic ecosystem of the Antarctic. More extensive and thorough observations and investigations of the problem were commenced at the end of the 1970's (Rembiszewski, Krzeptowski and Linkowski 1978, Kompowski 1980 a,b, Ślósarczyk 1983a). The FIBEX programme was the first attempt at a presentation of information concerning the distribution and abundance of postlarval and juvenile fish against the background of hydrological conditions prevailing in the areas of study (Kellermann and Kock 1984, Kellermann and Ślósarczyk

¹⁾ Second International BIOMASS Experiment

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1984). In the first phase of SIBEX, a programme of ichthyological investigations of the FIBEX expedition was repeated on the r/v "Profesor Siedlecki"; at the same time, a new small midwater trawl, designed especially for these investigations, was used to catch juvenile fish (BIOMASS Working Party on Fish Ecology 1982).

2. Material and method

In December 1983/January 1984, 27 hauls were made from the r/v "Profesor Siedlecki" (Fig. 1). For sampling a small, 368 — mesh midwater

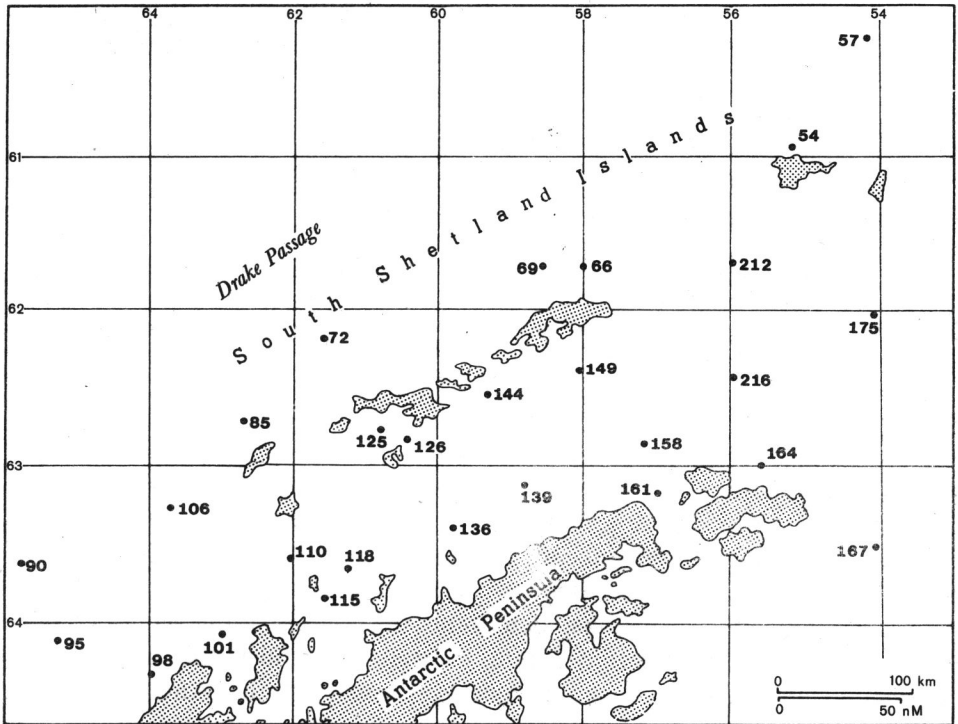


Fig. 1. Sampling trawl stations of r/v, "Profesor Siedlecki" during SIBEX (21 December — 8 January 1983/1984)

trawl was used. The fine — meshed inset with a bar length of 15 and 12 mm was attached to the belly and 10 mm inset to the cod — end of the trawl. Approximate vertical and horizontal opening of the trawl was 9 and 14 m, respectively, at a mean speed of trawling of 3 knots.

Fourteen hauls were made at preselected stations; haul duration was usually 30 minutes and 3—5 depth levels were sampled: 10—15 m, 25—30 m,

50—55, 70—75 m, 95—110 m. Because of the expected short duration of investigations (December 21–January 8) these stations were mostly established on the shelf and continental slope of the investigated area since it was assumed that outside this zone, juvenile fish occur rarely (Ślósarczyk and Rembiszewski 1982, Kellermann and Ślósarczyk 1984). The remaining hauls were made in order to determine the presence of fish in the vicinity of krill or salp patches recorded on the echosounder.

The whole catch or a random sample taken from it (when the numbers of krill were large) was sorted out, than weighed or counted. When determining c.p.u.e. for fish, two measures were used (1) number of specimens caught in 1 hour fished, and additionally (2) number of specimens in

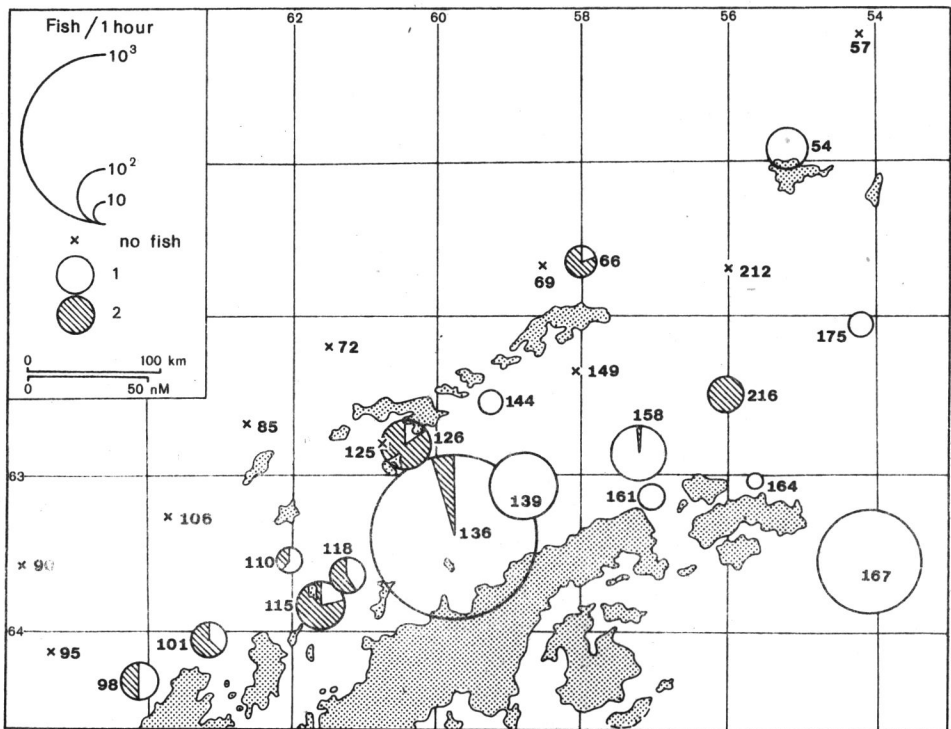


Fig. 2. Distribution and abundance (No. per 1 hour of trawling) of juvenile *Nototheniidae* (1) and *Chaenichthyidae* (2) in the Antarctic Peninsula region during SIBEX (21 December — 8 January 1983/1984)

100 kg of krill, when fish were caught together with krill. For further investigations, postlarval and juvenile fish were preserved in 4% formaldehyde buffered with borax, in alcohol, or Dorogostaisky's solution (Ślósarczyk and Rembiszewski 1982).

3. Results

Species composition of total trawl catches is presented in Table I. The data contained in the table should not be treated in the same way as the results of quantitative macrozooplankton catches by means of Bongo or RMT nets because of relatively large mesh size in the belly and cod — end of the trawl. However, they could supply some information about pelagic fauna, among which postlarval and juvenile stages of fish live and develop.

In the 27 hauls made, 21 contained postlarval or juvenile fish. The presence of these fish in the catches was observed almost exclusively in shelf waters, particularly north of Antarctic Peninsula (Table I, Fig. 2). A total of 13 fish species at early developmental stages was found in the catches (Table II). The most abundant and most often encountered was *Pleuragramma antarcticum* (*Nototheniidae* — Fig. 2, Table II) at a postlarval and juvenile stage. Postlarval *Cryodraco antarcticus*, *Chaenodraco wilsoni* and *Chionodraco rastropinosus* were also often encountered.

Fishes were associated with krill aggregations occurring in relatively shallow waters, north of Palmer Archipelago and in single hauls near the Livingstone I., King George I. and Elephant I. (Table III). Fishes were not found on were very rare within krill concentrations observed far from coasts of the islands.

4. Discussion

When compared with the results of FIBEX (Kock 1982, Ślósarczyk and Rembiszewski 1982, Kellermann and Kock 1984, Kellerman and Ślósarczyk 1984), fewer fish species were observed in the pelagic zone of the study area; prevailing species also differed in 1981 and 1983/1984. Two factors were responsible for this, according to the authors: a different season of the year and a different hydrological situation. Polish investigations within the SIBEX programme were carried out two months earlier than FIBEX and that is why certain species — if the growth and development of fish were similar — were still too small to get stuck in the relatively large meshes of the trawl inset while other species did not yet go beyond the coastal zone of the adjoining islands, where their spawning grounds were located. Such an opinion is confirmed by the results of catches of fish larvae by means of plankton nets, made in the vicinity of trawling stations as well as observations from 4-day long krill catches in coastal waters of Elephant Island directly after SIBEX programme (Ślósarczyk, in print). The different hydrological situation helps to explain the

Sampling data and composition of catches (W, ‰) with 368-mesh midwater trawl by r/v "Profesor Siedlecki" (SIBEX 21 December — 8 January 1983 (1984))

Region	Depth range (m)	Haul No. ¹⁾	Sampling depths (m)	Day (night-time ²⁾)	Catch (kg per 1 hour)	Sample weight (kg)	<i>Euphausia superba</i>	<i>Thysanoëssa macrura</i>	<i>Gammaridae</i>	<i>Hyperitidae</i>	<i>Salpa</i> sp.	<i>Scyphozoa</i>	<i>Hydrozoa</i>	<i>Diphyes antarctica</i>	<i>Cephalopoda</i>	<i>Nototheniidae</i> (juv.)	<i>Nototheniidae</i> (ad.)	<i>Channichthyidae</i> (juv.)	<i>Channichthyidae</i> (ad.)	<i>Bathypoda</i> (ad.)	<i>Paralepidae</i> (juv.)	<i>Myctophidae</i> (ad.)	
South Shetland Is. (shelf)	191—690(875)	54	5—78	L	3000.	48.6	999.9				.05												
		66	60—103	L	110.8	22.7	970.5		+ ³⁾		.15						.32	23.7	.23	5.1			
		69	15—38	D	3272.7	42.6	998.4					1.6											
		85	5—58	L	4000.	46.2	995.5				+	4.5											
		106	30—58	L	6000.	47.8	1000.										+						
		125	10—38	L	300.	25.5	993.3					6.7					+			+			
		126b	20—98	L	540.	45.5	996.4					3.5					.02		.06				
		144b	10—108	L	10.2	5.1	8.9					976.8	+		+		1.		.1				13.3
212b	5—78	L	16000.	46.	999.1					.9								+					
South Shetland Is. (cont. slope)	1875—3100	57b	4—24	N	200.	100.	.5				999.5												
		72b	15—64	L	50.	25.	800.				200.												
		90b	55—63	L	60.	30.	999.9					999.9											.13
		149	80—128	L	327.3	42.4	937.5					62.3					+						.24
		95	55—83	L	900.	44.2	999.1		+			.04											.89
		98	20—88	L	1200.	48.7	999.6					.06						.01		.01	.3		
		101b	8—108	L	300.	26.6	985.1		+	+	+	14.8					.02			.08			
		110b	10—120	L	1.	.5	991.1					991.1					4.			4.9			
Antarctic Peninsula (shelf)	91—602	115	35—48	L	267.	25.3	989.1				10.7		.13		+	.02			.06				
		118b	9—58	L	60.	24.5	946.4		+		53.2					.08			.18			+	
		136b	10—103	L	2.3	1.1					+						498.8				.2		
		139b	10—108	L	9.9	5.					711.	201.1			10.5		19.1		58.3				
		158b	10—78	D	22.9	13.	612.9					384.6					2.5		.02	5.6			
		161	90—118	L	825.	42.6	555.					442.8					.02		+	.14			
		164b	10—113	L	.5	.5							992.	6.	+		2.						
		167b	6—71	D	3.	3.	135.5					1.2		2.	.3	852.7				8.3			
		175	30—115	L	428.6	43.5	934.					66.					.04			+			
		216b	12—106	L	40.	20.			6.			993.3								.66			

¹⁾ Haul type (b) — blind haul; remaining are identification hauls

²⁾ (L) — daylight, (D) — dawn and dusk, (N) — night

³⁾ + — out of sample (abundance not estimated)

Abundance of juvenile fish (No. per 1 h of trawling) in the Antarctic Peninsula region (21 December — 8 January 1983/1984)

Region	Haul No.	<i>Pleuragramma antarcticum</i>	<i>Trematomus bernacchii</i>	<i>Trematomus</i> sp.	<i>Trematomus hansonii</i>	<i>Dissostichus mawsonii</i>	<i>Chionodraco rastrospinosus</i>	<i>Chaenodraco wilsonii</i>	<i>Cryodraco antarcticus</i>	<i>Chaenocephalus aceratus</i>	<i>Neopagetopsis ionah</i>	<i>Pseudochaenichthys georgianus</i>	<i>Pagetopsis macropterus</i>	<i>Notolepis coatsi</i>
South Shetland Is. (shelf)	54			61.7										
	66	4.9						+	4.9		14.7			
	69													
	85													
	106		+			+								
	125													
	126				11.9			11.9	47.4	+				
	144	6.	2.	2.									2.	
	212								+					
South Shetland Is. (cont. slope)	57													
	72													
	90													
	149		+											
Antarctic Peninsula (shelf)	95													
	98		24.6				24.6	+				+		
	101		11.3					22.5						
	110		6.	2.				4.	2.					
	115		10.6						10.6	21.1			10.6	
	118	4.9		12.2			12.2	2.5	7.4	2.5			+	
	136	898.3					13.9		1.9	3.7			8.4	1.9
	139	152.												
	158	81.1			1.8				1.8					
	161	19.4				+							+	
	164	2.												
167	450.6					15.4								
175	19.7							+						
216							8.	12.						

*) Out of sample (abundance not estimated)

Abundance of juvenile fish in krill catch (No. per 100 kg of krill) in the Antarctic Peninsula region (21 December — 8 January 1983/1984)

Region	Haul No.	Yield of krill (kg per 1 h)	<i>Pleuragramma antarcticum</i>	<i>Trematomus bernacchii</i>	<i>Trematomus</i> sp. <i>Trematomus hansoni</i>	<i>Dissostichus mawsoni</i>	<i>Chionodraco rastrospinosus</i>	<i>Chaenodraco wilsoni</i>	<i>Cryodraco antarcticus</i>	<i>Chaenocephalus aceratus</i>	<i>Neopagetopsis ionah</i>	<i>Pseudochaenichthys georginaus</i>	<i>Pagetopsis mactopterus</i>
South Shetland Is. (shelf)	54	2999.7			2.1								
	66	107.5	4.6						4.6		13.7		
	69	3267.5						+ ¹⁾					
	85	3982.				+							
	106	6000.		+									
	125	298.	+						+				
	126	538.1			2.2		2.2	8.8					
	144 ²⁾	.05											
212	15985.6						+						
South Shetland Is. (cont. slope)	57	.0											
	72	40.											
	90	.0											
	149	306.8		+									
	95	899.2											
Antarctic Peninsula (shelf)	98	1199.5	+	2.1			2.1	+				+	
	101	295.5		3.8				7.6					
	110	.0											
	115	264.1		4.			+		4.	8.			4.
	118	56.8	8.6	+	21.5		21.5	4.4	13.	4.4			+
	136	.0											
	139	.0											
	158	14.											
	161	457.9	4.2										+
	164	.0											
167	.4												
175	400.3	4.9						+					
216													

¹⁾ out of sample (abundance not estimated)

²⁾ hauls: 57, 90, 110, 136, 139, 144, 158, 164, 167, 216 are not considered as krill catches

abundant appearance of *Pleuragramma* in the catches. Eight out of ten hauls in which this species was observed were made over the shelf of the Antarctic Peninsula. During the period of investigations, the whole southern part of the Bransfield Strait was under the influence of waters from the Weddell Sea, flowing eastwards (Grelowski — pers. comm.). It may be expected that before our investigations began, a strong inflow of Weddell Sea waters to the Strait had taken place and in this way *Pleuragramma* was carried there from the areas of its greatest concentrations in the south-eastern part of the Weddell Sea (Keller 1983).

The abundance of postlarval and juvenile fish in krill catches was similar to that observed during FIBEX (Ślósarczyk and Rembiszewski 1982, Kellermann and Kock 1984). A more detailed comparison of the results of FIBEX and SIBEX is not possible because the distribution of krill was quite different in the two seasons and krill concentrations in the Bransfield Strait were not present. However, a preliminary conclusion may be drawn from the results of the two programmes that juvenile fish off the Antarctic Peninsula do not occur in December-March in such great numbers within krill concentrations as off South Georgia (Kompowski 1980a, Ślósarczyk, 1983b, off the Balleny Is. (Ślósarczyk 1983) or in the Prydz Bay (Ślósarczyk, unpublished). Thus, in that period, off the Antarctic Peninsula, the krill fishery does not constitute such a large threat to the survival rate of juvenile fish as is the case in the above-mentioned areas which, incidentally, belong to the traditional, heavily exploited krill fishing grounds. This opinion does not refer to certain species, observed during FIBEX exclusively in the shelf zone of the Antarctic Peninsula (Ślósarczyk and Rembiszewski 1982, Kellermann and Ślósarczyk 1984), for which the danger still exists. Among these are species from families *Bathypagrusidae* and *Harpagiferidae*, as well as some *Channichthyidae*, considered rare species or species with low fecundity (Permitin 1973) and therefore thought worthy of protection.

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5. РЕЗЮМЕ

Согласно программе экспедиции СИБЭКС, в период с 21 декабря 1983 года по 8 января 1984 года проведено попытку оценки присутствия и численности в пелагиали молоди антарктических рыб с помощью специально сконструированного для этих исследований малогабаритного трала.

В 27 тралениях, проведенных в акватории севернее Южных Шотландских островов и Пальмерских островов, а также в Брансфильдском проливе (рис. 1., таблица 1)

обнаружено присутствие 13 видов рыб в постларвальной или ювенальной стадиях развития (таблица II). Наибольшую разновидность и численность ювенальной ихтиофауны наблюдали в шельфовых водах Антарктического полуострова (рис. 2). Чаще всего и в наибольшей численности в этом районе встречались постларвальная и ювенальная стадии *Pleuragramma antarcticum* (таблицы II и III). Кроме этого вида часто встречалась молодь видов *Cryodraco antarcticus*, *Chaenodraco wilsoni* и *Chionodraco rastrospinosus*.

Сравнивая результаты исследований с результатами программы ФИБЭКС, в пелагиали исследуемого района наблюдали более убогий видовой состав, а также различие их численного соотношения. Обусловлено это было различием гидрологических условий и времени года, в период которых проводились наблюдения.

По результатам обеих программ можно предполагать, что в районе Антарктического полуострова и Южных Шотландских островов в период с декабря по март, в соседстве промысловых скоплений криля молодь рыб не встречается в такой численности, как в других районах Антарктики (Южная Георгия, острова Баллены, залив Придз). Не смотря на это в исследуемом районе промысел криля становится угрозой уменьшения выживаемости молоди, обитающих в этом районе видов рыб с низкой степенью воспроизводительности, а также редко встречающихся видов рыб.

6. Streszczenie

W programie SIBEX, w okresie od 21 grudnia 1983 do 8 stycznia 1984, dokonano próby oceny rozmieszczenia i liczebności w pelagialu młodocianych ryb antarktycznych przy użyciu małego włoka, zaprojektowanego specjalnie do tego programu badań. W 27 zaciągach przeprowadzonych w akwenie na północ od Szetlandów Południowych i Archipelagu Palmera oraz w Cieśninie Bransfielda (rys. 1, tabela I) stwierdzono występowanie 13 gatunków ryb w postlarwalnym lub młodocianym stadium rozwoju (tabela II). Największą różnorodność i liczebność młodocianej ichtiofauny obserwowano w wodach szelfowych Półwyspu Antarktycznego (rys. 2). Postlarwalna i młodociana *Pleuragramma antarcticum* była najliczniej i najczęściej występującym w tym rejonie gatunkiem (tabela II i III). Obok niej do często notowanych należały *Cryodraco antarcticus*, *Chaenodraco wilsoni* i *Chionodraco rastrospinosus*.

W porównaniu z wynikami FIBEX w pelagialu badanego obszaru obserwowano dwukrotnie mniej gatunków ryb, inne również gatunki były dominantami połowów. Wpłynęła na to odmienna sytuacja hydrologiczna i inna pora roku, w której przeprowadzono badania. Z wyników obu programów można ostrożnie wnioskować, że w rejonie Półwyspu Antarktycznego i Szetlandów Południowych, w okresie od grudnia do marca, ryby młodociane nie występują w sąsiedztwie koncentracji kryla tak licznie jak w innych regionach Antarktyki (Georgia Południowa, Wyspy Balleny, Zatoka Prydz). Pomimo tego w rejonie badań istnieje jednak ze strony rybołówstwa kryłowego zagrożenie dla przeżywalności młodzieży licznie notowanych tam gatunków ryb o niskiej płodności bądź gatunków uznawanych za rzadko występujące w przyrodzie.

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