

Krzysztof E. SKÓRA

Hel Marine Laboratory
University of Gdańsk
Morska 9, P.O. Box 37
84-150 Hel, POLAND

Ichthyoplankton near ice edge between King George Island and the South Orkney Islands

ABSTRACT: In the region between King George Island and the South Orkney Islands 7 fish species from 6 families were found. The concentration of larvae at the edge of drifting ice was higher ($2.55 \text{ ind.} \times 1000 \text{ m}^{-3}$) than in the stations situated at a distance from the ice edge ($0.93 \text{ ind.} \times 1000 \text{ m}^{-3}$).

Key words: Antarctic, ice edge, ichthyoplankton.

Introduction

There are few works on ichthyoplankton of this area and even less observations concern its occurrence in the drifting ice zone. Some data for comparison can be found in the results of FIBEX and SIBEX research programs (Kock 1982, Kellermann and Kock 1984, Kellermann and Ślósarczyk 1984, Kellermann 1986, White and North 1987); they were based mainly on the fishing with RMT-8 net. Catches with a Bongo net in the eastern part of the area discussed had been carried out only by Brazilian expedition PROANTAR II and III (Sinque, Koblitz and Costa 1986a,b).

Material and method

Catches took place during the r/v „Profesor Siedlecki” cruise from December 29, 1988 to January 15, 1989 using a Bongo net, at the depths ranging from 0 to 200 m. The investigated area was situated between King George Island, Elephant Island and South Orkney Islands (Fig. 1). The material consisted of 13 samples (Tab. 1).

Fish larvae were identified according to the key by Kellermann (1989), their developmental stage was determined and the standard body length was measured

in not damaged specimens. The concentration of individuals per 1000 m³ was calculated.

Results of this ichthyological study were related to the data from the same cruise (Tokarczyk *et al.*, 1991).

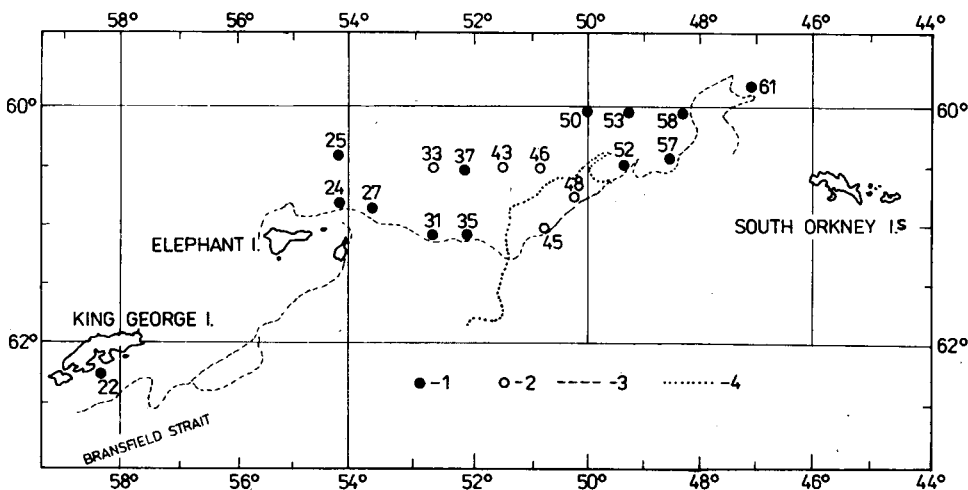


Fig. 1. The location of the sampling stations where material was caught with a Bongo net 22–61 — numbers of the stations, 1 — ichthyoplankton appearance, 2 — absence of ichthyoplankton, 3 — the edge of ice during eastward cruise, 4 — the edge of ice during westward cruise.

Table 1

The list of samples

Station number	Date	Time of haul LT	Depth of haul (m)	Sounding (from – to)	V ^{*)} (m ³)
22	27.12.88	00.30	0–200	530	1343.0
24	29.12.88	08.45	0–200	860–1160	1854.5
25	29.12.88	18.30	0–200	3000	1859.0
27	30.12.88	06.15	0–200	1650–650	1527.9
31	31.12.88	11.00	0–200	1120–1150	1720.1
35	01.01.89	14.00	0–200	568–2000	1433.6
37	02.01.89	01.20	0–200	670–1000	1557.3
50	05.01.89	18.00	0–200	3150	1546.8
52	06.01.89	07.00	0–200	1520	1866.4
53	06.01.89	14.00	0–200	3080–3240	1721.4
57	07.01.89	10.20	0–200	2150–1900	1690.2
58	07.01.89	16.55	0–200	3850	1741.2
61	08.01.89	09.30	0–200	4700	1866.1

*) Volume of the water filtered through the Bongo net with a mouth diameter of 61 cm, according to the flowmeter indications

Results

Seven species from 6 families were identified (Tab. 2). Distribution analysis of the material examined allowed to distinguish three regions. In the first region, near King George Island (station 22) only *C. antarcticus* and *P. charcotii* were present. *N. larseni* occurred in the second region, situated near the Elephant Island shelf (stations 24, 25, 27, 31, 35, 37). The third region was situated to the west of the South Orkney Islands with the highest species diversity (Figs. 2 and 3), and significant dominance of mezopelagic fish (mainly Myctophidae). Regions II and III (between 50° and 52° W) were separated by waters in which no ichthyoplankton was recorded.

Table 2
The list of identified species

Species	Developmental stage	Number of fish	Length	
			average	min – max
Channichthyidae				
<i>Cryodraco antarcticus</i> Dollo	1–j ^{*)}	1	48.0	
Nototheniidae				
<i>Notothenia kemp</i> Norman	larva	1	9.7	
<i>Nototheniops larseni</i> (Loennberg)	larvae	31	10.9	8.8 – 13.3
Bathypoda				
<i>Parachaenichthys charcotii</i> (Vaillant)	1–j	1	35.0	
Paralepididae				
<i>Notolepis coatsi</i> Dollo	larvae	4	20.5	11.8 – 28.8
Myctophidae				
<i>Electrona antarctica</i> (Günther)	larvae	14	6.5	5.0 – 9.8
Batylagidae				
<i>Batylagus</i> sp.	larva	1	11.5	

^{*)} Transitory stage from larva to juvenile fish

The concentration of ichthyoplankton per water volume unit varied from 0.54 (stations 52 and 61) to 8.28 (station 57) ind. × 1000 m⁻³ (Fig. 2). In the single station of the first region (No 22) it amounted to 1.49 ind. × 1000 m⁻³, in the second region mean value was 2.65 ind. × 1000 m⁻³ and in the third region — 2.3 ind. × 1000 m⁻³. The concentration of fish larvae at the stations neighbouring the ice edge was nearly three times higher than at the stations situated farther, respective means were 2.55 and 0.93 ind. × 1000 m⁻³.

The species composition of ichthyoplankton was not related to the distance from the drifting ice edge.

Most of fish species collected were represented by larval forms. Only two of them occurred in the larva-juvenile transitory stage: *C. antarcticus* and *P. charcotii*. The smallest larvae examined were those of *E. antarctica*, *N. larseni* larvae were bigger: from 8.8 to 13.3 mm (mean value 10.9 mm; Fig. 4). Fish of this

species caught at the stations 24, 25 and 26 were bigger than those caught at stations 31, 35 and 37.

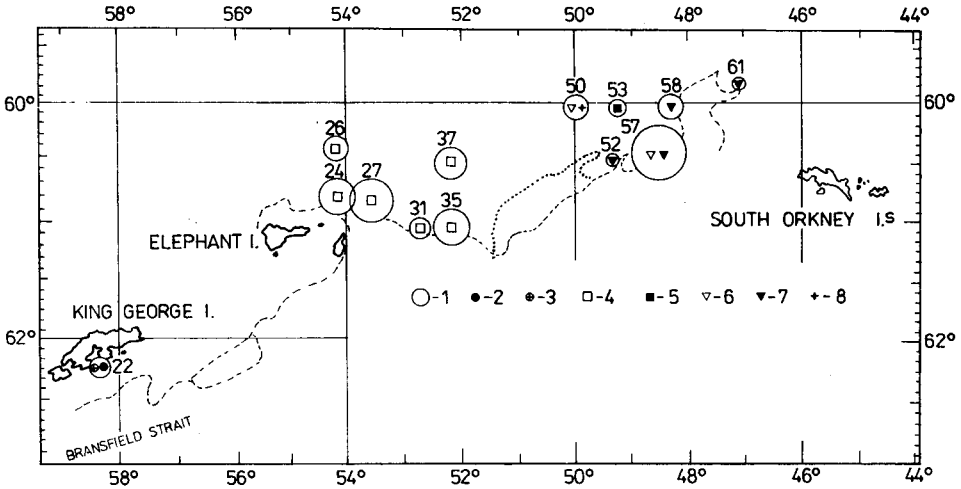


Fig. 2. The density and distribution of ichthyoplankton in the investigated area 22–61 – numbers of the stations, 1 – density – 1 ind. $\times 1000 \text{ m}^{-3}$, 2 – *Parachaenichthys charcotii*, 3 – *Cryodraco antarcticus*, 4 – *Nototheniops larseni*, 5 – *Notothenia kempii*, 6 – *Notolepis coatsi*, 7 – *Electrona antarctica*, 8 – *Bathylagus antarcticus*

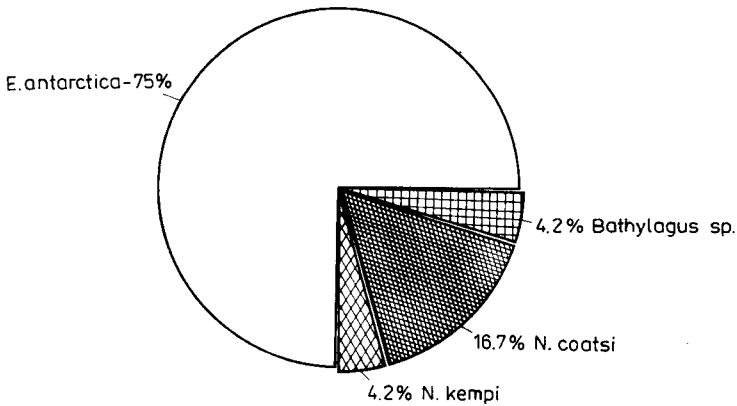


Fig. 3. The quantitative shares of fish species in the South Orkney Islands region (stations: 50, 52, 53, 57, 58, 61)

Discussion

All species found in the samples are typical representatives of ichthyofauna of this region (Kock 1982, Kellermann and Kock 1984, Kellermann and Ślósarczyk 1984, Kellermann 1986, Sinque, Koblitz and Costa 1986a,b, White and North 1987).

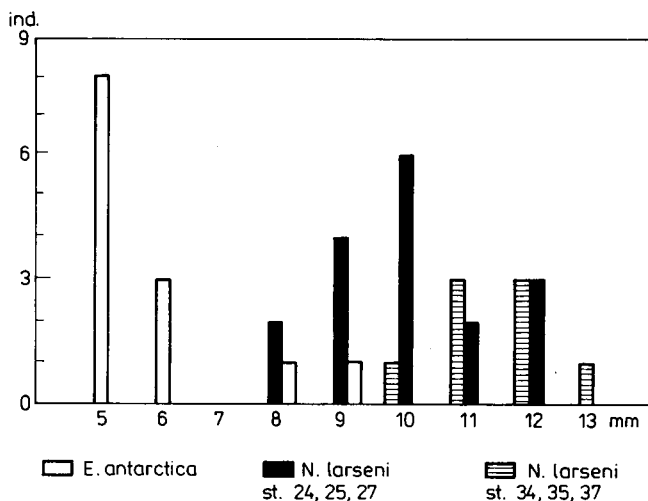


Fig. 4. The frequency in the length classes for *E. antarctica* and *N. larseni* larvae

Hydrobiological conditions in the single station from the Bransfield Strait (No 22) situated outside the main area of study were typical of the post-winter period (water temperature at the station 22 was from $+0.04^{\circ}\text{C}$ at the surface to -0.59°C at the depth of 250 m, salinity — from 34.08 to 34.49%). These parameters were similar to those found for water masses in the north-east shelf of Elephant Island region (Tokarczyk *et al.*, 1991). Despite this hydrological similarity the composition of ichthyoplankton in both regions was different. Stations 24, 25 and 27 were situated in hydrological front of comparatively warm Bellingshausen Sea waters flowing through the Bransfield Strait and the Drake Passage contacting there with waters residing over the Scotia Sea Ridge. It was the region of *N. larseni* occurrence. These larvae were also found at the neighbouring stations 31, 35 and 37, but larvae from this region were smaller than those from the previous ones. This might be due to the different thermic characteristics of waters which were here cooler than those occupying the eastern part of the investigated area. Stations 35 and 37, from the hydrological point of view, were situated within the confluence zone (Tokarczyk *et al.*, 1991). Earlier observations (Kellermann and Ślósarczyk 1984) indicated to the lack of notothenioids within the epipelagial of this zone. However, the present data and the data of Kellermann and Kock (1984) concerning *N. gibberifrons* indicate that it is possible.

To the north-west of the South Orkney Islands stations from 50 to 61 were situated in the water column with very diversified vertical thermal stratification (*e.g.* station 61 from 0.6°C at the surface to -1.4°C at 100 m and again 0.4°C at 400 m). The similar temperature gradient concerned all stations in this region. This phenomenon can be correlated with the highest species diversity and the

dominance of mezopelagic fish larvae; especially the larvae of *E. antarctica*. Occurrence of these larvae near the surface is regarded to be typical (Hureau *et al.* 1990). Frequency distribution of larvae of this species caught during present study in January was similar to that found for larvae caught at the end of February 1985 over the southern shelf of the Elephant Island (Sinque, Koblitz and Costa 1986a); they were, however, less abundant ($2.5 \text{ ind.} \times 1000 \text{ m}^{-3}$).

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Streszczenie

Oznaczono skład ichtioplanktonu z zaciągów przeprowadzonych siatką Bongo na 13 stacjach badawczych, w większości rozmieszczonych w bezpośredniej bliskości północnego krańca dryfującego lodu (Tab. 1–2; Rys. 1–2), w rejonie strefy konfluencji Morza Scotia. Podano długości występujących osobników oraz ich zagęszczenie (Rys. 3–4).

Stwierdzono występowanie 7 gatunków ryb z 6 rodzin. Odnotowano: *Nototheniidae* z dwoma gatunkami — *Notothenia kemp*i i *Nototheniops larseni* oraz gatunki — *Cryodraco antarcticus* z *Channichthyidae*, *Parachaenichthys charcotii* z *Bathyaconiiidae*, *Electrona antarctica* z *Myctophidae*, *Notolepis coatsi* z *Paralepididae* i *Batylagys* sp. z *Bathylagidae*.

Zagęszczenie larw na skraju dryfującego lodu było wyższe (2.55 osob./1000 m³) niż w oddaleniu od niego (0.93 osob./1000 m³).

Zaobserwowano nie notowane wcześniej występowanie *N. larseni* w strefie konfluencji Mórz Weddella i Scotia.