

International Commission for



the Northwest Atlantic Fisheries

Serial No. 5062  
(D.c. 5)

ICNAF Res. Doc. 77/VI/37

ANNUAL MEETING - JUNE 1977

Plankton Distribution in the Flemish Cap Area in the Spring of 1976

by

N. V. Plekhanova and V. M. Ryzhov  
PINRO, Murmansk, USSR

Abstract

The results of the plankton surveys in March and May 1976 are used to characterize the plankton population of the 200 m deep water mass over Flemish Cap bank. The relation between the development of some groups of phyto- and zooplankton and the waters of various temperature is shown. The vertical distribution of the main plankters by months is given and the dependence of the spawning of the most abundant copepod - *Calanus Finmarchicus* - on the degree of phytoplankton development is discussed. The date at which the plankton started to develop in 1976 is compared with that of the previous years. The charts showing the distribution of the biomass of food zooplankton in the Flemish Cap area from 0 to down 200 m in March and May 1976 are given.

Introduction

The aim of the present paper is to determine the areas of the highest plankton concentration and to analyse its vertical distribution in the 0 - 200 m layer; to determine the age composition of the most abundant plankter *Calanus Finmarchicus* and qualitative composition of phytoplankton.

### Material and methods

The present paper is based on the plankton samples collected in the course of the 15 - th cruise of R/V " PERSEI III " in the Flemish Cap area from 17 March to 19 May 1976. The plankton was sampled with a Juday net ( diameter 37 cm, gauze No. 38 ) according to technique of Yashnov, V.A. ( 1934 ) on a standard hydrological section 6A at depths 0 - 50, 50 - 100, 100 - 200 m. The plankton was collected twice: in March and May ( Fig. 1a, b ). The total of 40 samples was collected.

### Results

The analysis of the March plankton collections in the Flemish Cap area showed a poor development of phytoplankton ( tens of cells per cubic meter ). The diatoms found on the western stations ( stations 3146, 3147, 3148 ) were *Chaetoceros atlanticus*, *Coscinodiscus oculus - iridis*, *Thalassiotrix longissima*. In the eastern part of the section ( stations 3136, 3145 ) there occurred single specimens of large peridium ( *Ceratium longipes* ) which can be an indication of the inflow of waters of Atlantic origin.

In the investigated period the zooplankton on Flemish Cap bank was made up mainly of copepods, *Calanus finmarchicus* being the most abundant copepod. It occurred at depths from 0 down to 200 m but its greatest concentrations were found in the 0 - 100 m layer where it accounted for the bulk of food zooplankton biomass. Zooplankton on the eastern stations of the section where the surface water temperature was +2°, +3°C was more abundant. The abundance of zooplankton amounted to 400 - 638 specimens per cubic meter and was the highest in this period. Here together with *Calanus* occurred small copepods ( *Oithona similis*, *Oithona atlantica*, *Microcalanus* sp., *Ophiura* juv. ) and their larvae. The small copepods and echinoderms were distributed mainly at

depths from 50 to 200 m. The occurrence of these organisms in the given area also confirms the presence of waters of Atlantic origin.

In western Flemish Cap, near the frontal zone, ( stations. 3146, 3147, 3148 ) with surface temperatures  $-1^{\circ}, 0^{\circ}\text{C}$  zooplankton consisted mainly of large copepods: *Calanus finmarchicus*, *C. hyperboreus*, *C. glacialis*, *Metridia longa*. While their abundance was not high they gave a large biomass from 300 to  $400 \text{ mg/m}^3$  ( Fig. 2a ).

As regards the zooplankton abundance and biomass the 0 - 50m layer was the most productive.

*Calanus finmarchicus* in this period was found at V and VI copepodite stages; its larvae and nauplii occurred singly. The reproduction of *Calanus* had not yet started.

In May phytoplankton was developing in the whole area but in spite of high abundance ( 5 - 6 million cells per cubic meter ) mainly diatoms dominated: *Rhizosolenia hebetata* f. *semispina*, *Fragillaria cylindrus*, *Chaetoceros decipiens*, *Ch. atlanticus*, *Thalassiosira gravis*, *Th. nordenskiöldii*, *Fragillaria oceanica*.

An intensive development of plankton algae was observed both in the cold waters and in the zone of interaction of water masses of different origin whereas in the warm waters ( stations 3416, 3417, 3418 ) the phytoplankton vegetation was noticeably poorer. A limiting factor here was probably a minimum stability of waters in the upper 100 m layer ( Vladimirskaia et al., 1976 ).

In May the zooplankton abundance in the upper layers increased as a result of the vertical migration of zooplankters in the upper layers for spawning. The main concentrations of zooplankton in this period were observed in the 0 - 50 m layer.

In great numbers were found *Calanus finmarchicus*, *C. hyperboreus*, *C. glacialis*, *Oithona similis*, *Euphausiacea* ( nauplii, calyptopises and adult *Thysanoessa longicaudata* ). Echinoderms were almost entirely absent. The occurrence in great numbers of cold water organisms *Calanus hyperboreus*,

*C. glacialis*, *Metridia longa* in the surface 0 - 50 m layer indicates a great influence of the cold waters of the Labrador Current in spring 1976.

The highest zooplankton abundance in May 1976 in the 0 - 50 m layer was 6168 specimens per cubic meter ( station 3411 ), the lowest - 426 specimens per cubic meter ( station 3417 ).

In this period the zooplankton biomass somewhat decreased and was 200 - 300 mg/m<sup>3</sup> ( Fig.2b ), the highest biomass being observed in the areas of mass development of phytoplankton. Almost over the whole area the copepodite stages 1, II and VI ( ♀ ) dominated in the age composition of *Calanus finmarchicus* and eggs and nauplii were observed in great numbers, i.e. a mass spawning of *Calanus* was observed. The beginning of the reproduction period was registered only in the area of the poor phytoplankton development ( where V - VI copepodite stages were observed and eggs and larvae occurred in small numbers ). According to our data the same state of *Calanus* was observed at the end of April and beginning of May of extremely " hydrologically cold " 1972 ( Burmakin, 1975 ).

#### Conclusions

1. In 1976 a biological " spring " ( outbreak ) in the Flemish Cap area was a late one. A mass development of phytoplankton and the spawning of *Calanus* started in the middle of May.

2. The greatest productivity of the plankton communities in spring 1976 in the investigated area was observed in the eastern and western parts of the area.

3. The main zooplankton concentrations in spring 1976 were observed in the 0 - 100 m layer. The most productive was the 0 - 50m layer. The zooplankton biomass in this layer in March was 300 - 400 mg/m<sup>3</sup>, in May - 200 - 300 mg/m<sup>3</sup>.

4. Zooplankton on Flemish Cap in March 1976 was more abundant in the 0 - 100 m layer, the average abundance being 810 specimens per cubic meter, while in May - in the 0 - 50 m layer, the average abundance being 2077 specimens per cubic meter.

5. The cold water organisms *Calanus hyperboreus*, *C. glacialis*, *Metridia longa* occurred more often in the cold waters of Labrador origin whereas oceanic *Oithona similis*, *Oithona atlantica*, *Thysanoessa longicaudata* and a warm water *Metridia lucens* kept in the waters of Atlantic origin.

6. The areas of mass spawning of *Calanus* coincided with the areas of the mass development of phytoplankton.

#### References

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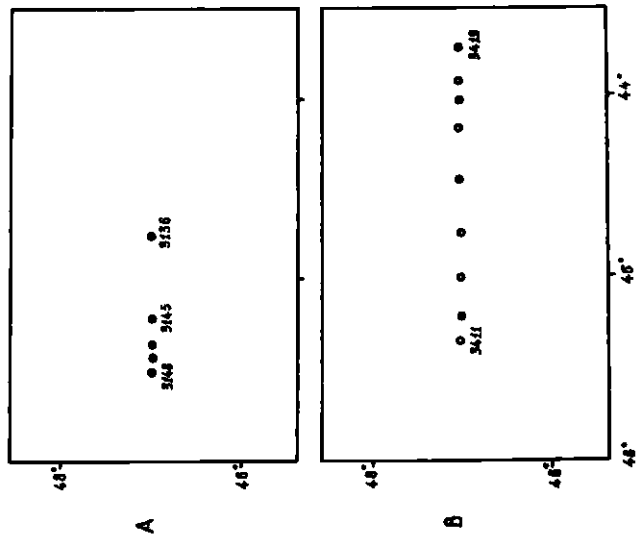


Fig. 1a, b. The location of stations worked in the 15th cruise of R/V *Perseé* III from 17-23 March (a) and from 18-19 May (b) 1976 in the Flemish Cap area.

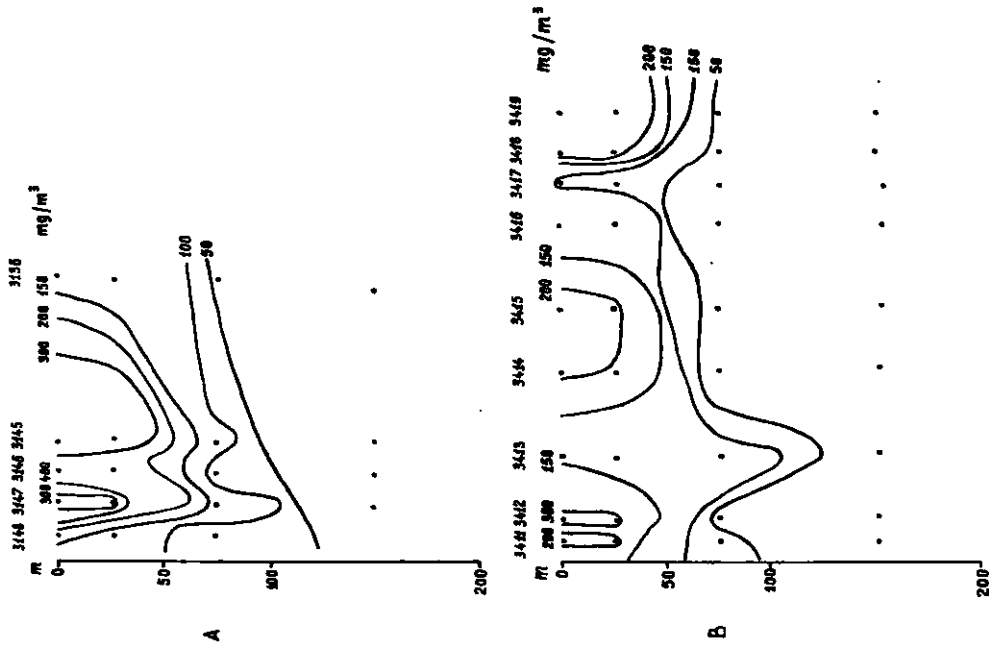


Fig. 2a, b. Distribution of the biomass of zooplankton ( $\text{mg}/\text{m}^3$ ) in the 0-200 m layer in March (a) and in May (b) 1976 in the Flemish Cap area.