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The benthic and epibenthic fauna of the Thornton Bank area

by

F. Redant

Fisheries Research Station, Ostend, Belgium
Laboratory for Ecology and Systematics, Brussels (*)

INTRODUCTION

In the framework of a research programme on the influence of dumped industrial waste derived from the titanedioxyde process on the fish and shrimp stock on the Thornton Bank (De Clerck and Van de Velde, 1974), qualitative and quantitative analyses of the benthic and epibenthic fauna in the catches of experimental shrimp fishing were started in April 1973.

The bottom fauna of this area has never been investigated intensively. The lack of historical data with which the recent ones could be compared, makes it very difficult to determine whether these dumpings have any influence on the qualitative or quantitative composition of the benthos.

This contribution describes the actual state of the bottom fauna on the Thornton Bank.

MATERIAL AND METHODS

Four fixed stations were monthly sampled on the Thornton Bank (figures 1 and 2). Except during the half-yearly stock surveys of April 1973 and October 1973, for which a beam trawl was used, sampling always was performed with an otter trawl. The mesh size was 18 mm and each haul lasted 15 minutes. Experimental shrimp fishing was always carried out by day.

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As soon as the catch has been discharged, the commercial and non-commercial fishes were graded. After this the catch was divided into two fractions with a crab sieve. From each fraction a sample was taken for analysis. The samples from the fraction remaining on the sieve (great by-catch species) had a minimal volume of 3 000 cc. From the other fraction (shrimps and small by-catch species) at least 1 000 cc was sampled.

On the Thornton Bank large catches (up to 1200 kg/hour fishing), dominated by Ophiura texturata and Asterias rubens, were recorded very frequently. In this cases it was quasi impossible to devide the catch with a crab sieve. Therefore the catch was split up into fractions of about 15 kg each. The shrimps (Pandalidae, Crangonidae, etc.) and the by-catch of only one of these fractions was separated manually. The shrimp sub-fraction was considered completely as a shrimp sample. From the by-catch sub-fraction at least 3000 cc was taken for analysis.

Analyses of the samples involved counting of the number of individuals per species and measurement of the total wet-weight of these individuals per species. The planktonic Scyphozoa and Ctenophora were not studied.

For each species monthly mean densities (in kg/hour fishing) were calculated for the whole area. From these data yearly procentual weight contributions (YWC) to the average total monthly catch were derived per species. The results of these calculations are summarized in table 1. The months during which the different species were observed are also mentioned in the tabl

RESULTS AND DISCUSSION

The yearly mean weight of the catches was 174.3 kg/hour fishing. The average weight of the catches showed however two distinct peaks, the first one in May 1973 (261.7 kg/hour fishing) and the second one in January 1974 (321.2 kg/hour fishing). During early spring (February and March 1974) catches were minimal (respectively 21.4 and 22.7 kg/hour fishing)(figure 3).

The following phyla, in order of importance (YWC-values), were observed (table 1) : Echinodermata (YWC = 71.90 %), Arthropoda (YWC = 21.70 %), Annelida (YWC = 2.76 %), Coelenterata (YWC = 1.86 %), Mollusca (YWC = 1.71 %), Bryozoa (YWC = .057 %), Porifera (YWC = .005 %) and Echiurida (YWC = .004 %).

The most important species (YWC $\geq$ .1 %) were (table 1) : Ophiura texturata (YWC = 54.36 %), Asterias rubens (YWC = 15.46 %), Crangon crangon (YWC = 10.84 %), Macropipus holsatus (YWC = 8.74 %), Pagurus bernhardus (YWC = 2.06 %), Echinocardium cordatum (YWC = 2.04 %), Actinia equina (YWC = 1.61 %), Aphrodite aculeata (YWC = 1.30 %), Sepia officinalis (YWC = .785 %), Lanice conchilega (YWC = .740 %), Pectinaria koreni (YWC = .680 %), Angulus tenuis (YWC = .470 %), Hydrozoa (considered as a whole : YWC = .190 %), Abra alba (YWC = .135 %), Buccinum undatum (YWC = .120 %) and Mya truncata (YWC = .115 %).

The carnivores Actinia equina, Tealia felina, Natica catena, Natica alderi, Sepia officinalis, Sepiola atlantica, Allotheutis subulata, Asterias rubens and Psammechinus miliaris (Barnes, 1968 ; Hardy, 1970 ; Jones, 1973 and Newell, 1970) constituted 17.9 % of the catches.

The omnivores, like Aphrodite aculeata, Buccinum undatum, Crangon crangon, Crangon allmanni and Macropipus holsatus (Barnes, 1968 ; Newell, 1970 ; Plagmann, 1939 and Tait, 1968) and the more distinct detritophages Pagurus bernhardus, Ophiura texturata and Echinocardium cordatum (Barnes, 1968 ; Jones, 1973 ; Newell, 1970 and Tait, 1968) represented 79.5 % of the catches.

The remaining part of the catches (namely 2.6 %) constituted of suspension and deposit feeders. The most important representatives of this trophic level (YWC $\geq$ .1 %) were (table 1) : Lanice conchilega, Pectinaria koreni, Abra alba, Angulus tenuis and Mya truncata. The deficiency of the sampling method probably explains the small weight contributions of Polychaeta and Lamellibranchia (Redant, 1974).

The macrobenthic fauna of the Thornton Bank is characterized mainly by the abundance of Ophiura texturata (YWC = 54.36 %) and Asterias rubens (YWC = 15.46 %). Up to now such a complete and almost continuous domination of the epibenthic fauna by these organisms (figure 3) along the Belgian coast has never been described. This also appeared very clearly from the results of both half-yearly stock surveys (figures 4 and 5). In April 1973 the average densities of Ophiura texturata and Asterias rubens on the Thornton Bank were respectively 3851.0 $\pm$ 3288.0 gram/1000 m^2 and 773.0 $\pm$ 553.0 gram/1000 m^2 against respectively 491.0 $\pm$ 1694.0 gram/1000 m^2 and 151.0 $\pm$ 331.0 gram/1000 m^2 for the whole Belgian coast (Thornton Bank included).

In October 1973 these values were respectively 509.5 ± 471.5 gram/1000 m^2 and 185.0 ± 111.5 gram/1000 m^2 for the Thornton Bank versus respectively 84.8 ± 230.8 gram/1000 m^2 and 52.5 ± 92.9 gram/1000 m^2 for the whole Belgian coast (Thornton Bank included).

This situation however is not a recent phenomenon. For a long time the Thornton Bank area has the reputation to be a difficult fishing ground because of the large numbers of Echinodermata which 'dirty' the catches.

The regular presence and rather high numbers of Abra alba, Ophiura texturata and Echinocardium cordatum might point to the occurence of an Abra-community on the Thornton Bank. This community is outstanding for areas with a depth between 10 and 40 m and a soft bottom composed of sand and clay (Petersen, 1924 ; Sparck, 1935 and Tait, 1968). On the Thornton Bank the depth ranges from 10 to 25 m (figure 2) and the handling of the catches is frequently hindered by large quantities of clayish mud.

In Danish coastal waters the Abra-community is, among other things, characterized by large numbers of Echinodermata (Petersen, 1924). On the Thornton Bank this phylum constituted on average 71.9 % of the catches (table 1).

Based on these observations the hypothesis can be postulated that the bottom fauna of the Thornton Bank forms an Abra-community.

To what extent a causal relation exists between the bathymetric and hydrological properties of the Thornton Bank and the occurence of an Abra-community is not known for the moment. If there is such a relation, it is very probable that on other places with similar physical properties, the same community will be found. Further research on the geographical distribution of the benthic communities along the Belgian coast is needed to prove this hypothesis.

CONCLUSIONS

The epibenthic macrofauna of the Thornton Bank is mainly dominated by the detritophage Ophiura texturata. Asterias rubens, Crangon crangon and Macropipus holsatus also contribute to the composition of the epibenthic fauna but their abundance is not so overwhelming as that of Ophiura texturata. The high densities of Ophiura texturata and Asterias rubens are

clearly characteristic for the investigated area.

Taking into account the restrictions imposed by the sampling method (Redant, 1974) it can be assumed that the benthic fauna of the Thornton Bank constitutes an Abra-community. The relative high numbers of three indicator species, viz. Abra alba, Ophiura texturata and Echinocardium cordatum and the physical aptitude of the environment (depth range and bottom composition) could lead to this conclusion.

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Table 1 - Yearly procentual weight contributions (YWC) to the average total monthly catch of the species observed on the Thornton Bank.

Species	YWC	Distribution in time (*) A M J A O N D J F M
Phylum PORIFERA	.005	. . X X
Phylum COELENTERATA (excl. Scyphozoa)	1.860	X X X X X X X X X X
Classis HYDROZOA	.190	X X X X X X X X X X
Tubularia species	-	. . . X . . . . X .
Laomedea species	-	X X X . X X . . X X
Abietinaria abietina (L.)	-	. X . . . . . . X .
Hydrallmania falcata (L.)	-	X X . . . . . X X X
Sertularia species	-	. X . . X X X X X X
Classis ANTHOZOA	1.670	X X X X X X X X X X
Actinia equina L.	1.610	X X X X X X X X X X
Tealia felina (L.)	.002	. . . . . . X . X X
Metridium senile (L.)	.054	X . X . X . . X X X
Phylum ANNELIDA	2.760	X X X X X X X X X X
Aphrodite aculeata (L.)	1.300	X X X X X . . X X X
Lanice conchilega (Pallas)	.740	. . X X X X X X X .
Pectinaria koreni (Malmgren)	.680	X X X X X X X X X X
Other Annelida	.028	X X X X . X X X X X
Phylum ECHIURIDA	.004	X X . . . X X . . .
Echiurus pallasi Guérin	.004	X X . . . X X . . .
Phylum MOLLUSCA	1.710	X X X X X X X X X X
Classis GASTROPODA (**)	.130	X X . X . X X . X .
Natica catena (Da Costa)	.001	X . . . .
Natica alderi (Forbes)	.003	X X . . . . X . . .
Crepidula fornicata (L.)	.005	. . . . X .
Buccinum undatum L.	.120	. X . . . X . . X .
Dendronotus frondosus (Ascanius)	1d .001	. . . X . . . . . .
Classis LAMELLIBRANCHIA (**)	.750	X X X X X X X X X X
Mytilus edulis L.	.011	. . X X X X . . . .
Venerupis pullastra (Montagu)	.001	. . X . . . .
Spisula subtruncata (Da costa)	.006	X X
Spisula solida (L.)	.002	. . X . . . .
Spisula elliptica (Brown)(?)	.001	. . . X . . . . . .
Mactra corallina cinerea Montagu	.002	. . . . X X
Abra alba (W. Wood)	.135	. . X X X X X X . .
Macoma balthica (L.)	.001	X . . . .
Angulus tenuis (Da Costa)	.470	X X X . . X X X . X
Angulus fabula (Gmelin)	1d .001	. . X . . . .
Ensis arcuatus (Jeffreys)	.001	. X . . . .
Mya truncata L.	.115	. X X . . . .

Table 1 (continued)

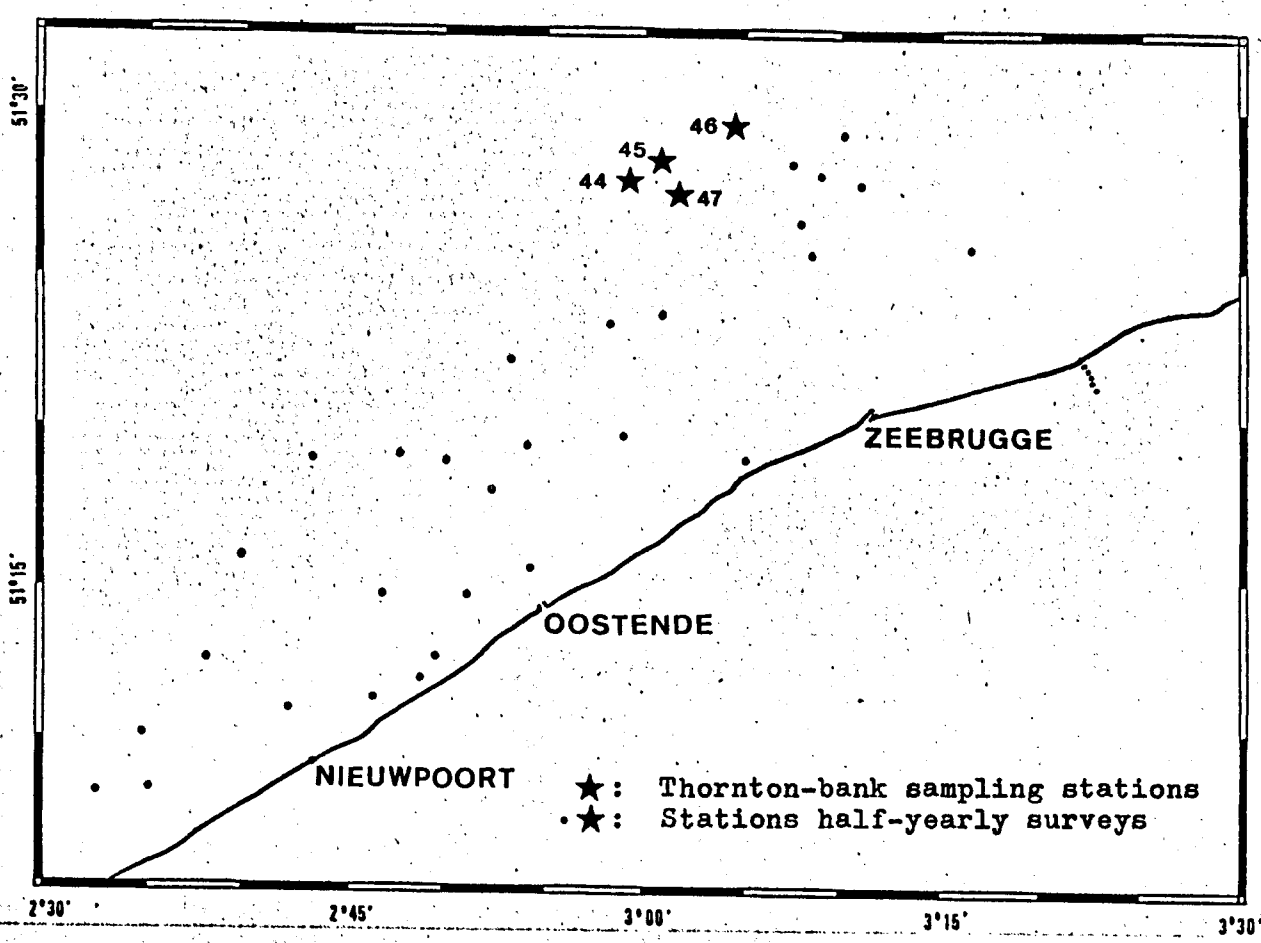
Species	YWC	Distribution in time (*) A M J A O N D J F M
Classis CEPHALOPODA	.835	. X X X X . . . X .
Sepia officinalis L.	.785	. X X . . . .
Sepiola atlantica d'Orbigny	.031	. . X X X . . . X .
Allotheutis subulata (L.)	.021	. . X . . . . . X .
Phylum BRYOZOA	.057	. . . X X . X X X X
Alcyonidium gelatinosum (L.)	.056	. . . . . . X X X X
Flustra foliacea (L.)	1d .001	 X
Other Bryozoa	.001	. . . X X . . . . .
Phylum ARTHROPODA	21.700	X X X X X X X X X X
Classis CRUSTACEA		
Ordo Cumacea	.003	X . . . . X X X . .
Ordo Isopoda	1d .001	. . . . . . X . . .
Idotea linearis (L.)	1d .001	. . . . . . X . . .
Ordo Amphipoda	1d .001	. . . X X . . X . .
Ordo Decapoda	21.700	X X X X X X X X X X
Pandalus montagui Leach	.009	X . . X X . . . X .
Pandalina brevirostris (Rathke)	.001	X . . . X . . . . .
Processa canaliculata Leach	.001	. X . . X . . . . .
Crangon crangon (L.)	10.840	X X X X X X X X X X
Crangon allmanni Kinahan	.046	X X X . X X . X X X
Pontophilus trispinosus (Hailstone)	1d .001	X . . . . X . . . .
Pagurus bernhardus (L.)(**)	2.060	X X X X X X X X X X
Porcellana longicornis (L.)	1d .001	. . . . . X . . . .
Macropipus holsatus (Fabricius)	8.740	X X X X X X X X X X
Macropodia rostrata (L.)	.013	X . X X X X X X X X
Phylum ECHINODERMATA	71.900	X X X X X X X X X X
Classis ASTEROIDEA	15.460	X X X X X X X X X X
Asteria rubens (L.)	15.460	X X X X X X X X X X
Classis OPHIUROIDEA	54.360	X X X X X X X X X X
Ophiura texturata Lamarck	54.360	X X X X X X X X X X
Classis ECHINOIDEA	2.070	X X X X X X X X X X
Psammechinus miliaris (Gmelin)	.028	. . X X X X . . X .
Echinocardium cordatum (Pennant)	2.040	X X X . . X X X . X

The YWC-values larger than .1 were rounded off to the nearest .005 ; the values larger than 1. were rounded off to the nearest .01.

1d .001 = less than .001 %.

(*) : Months during which the different species were observed (X). In July and September 1973 no sampling was performed.

(**) : Weight contributions including shell.



Positions of the sampling stations along the coast.

Figure 1.

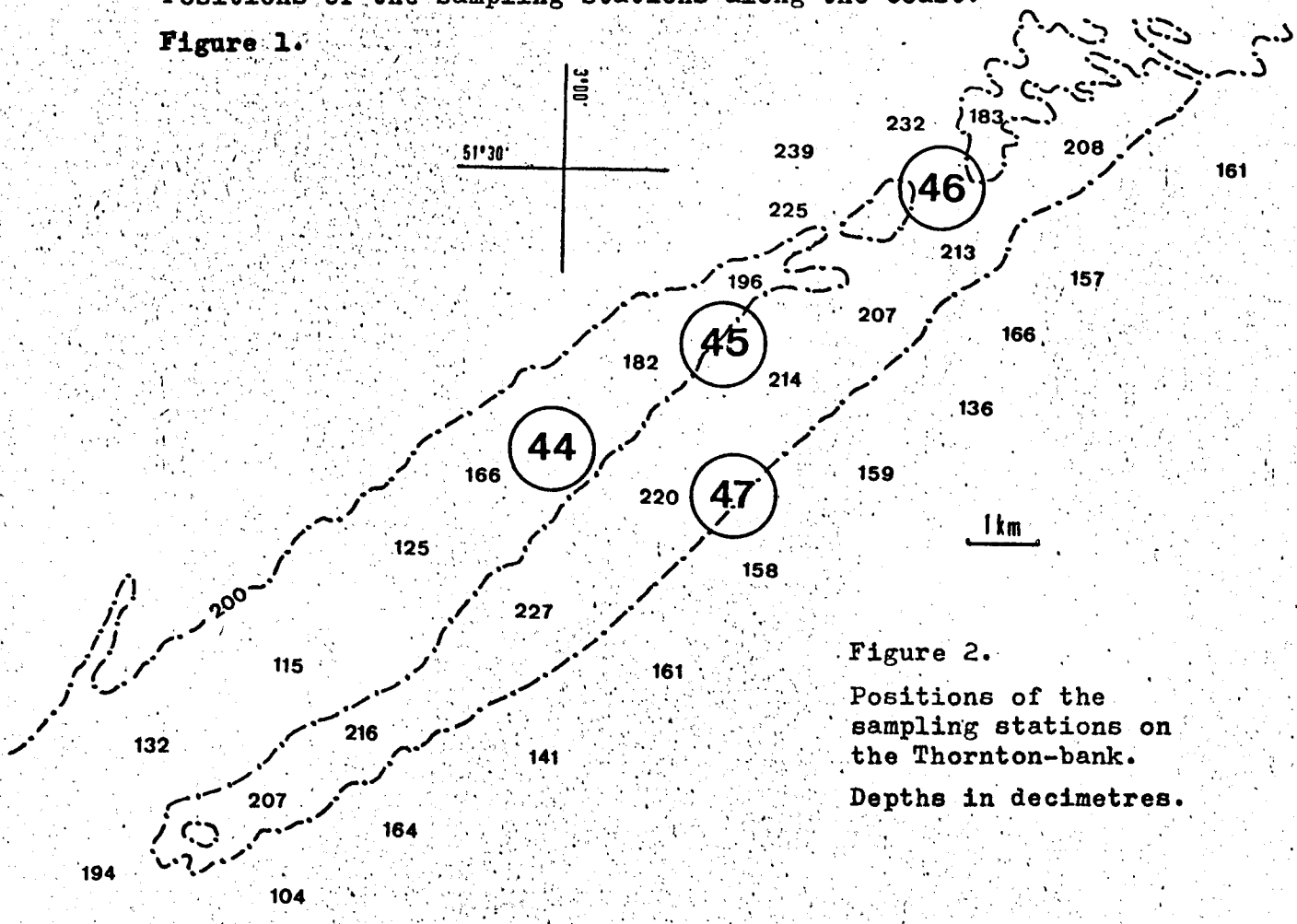


Figure 2.

Positions of the sampling stations on the Thornton-bank.

Depths in decimetres.

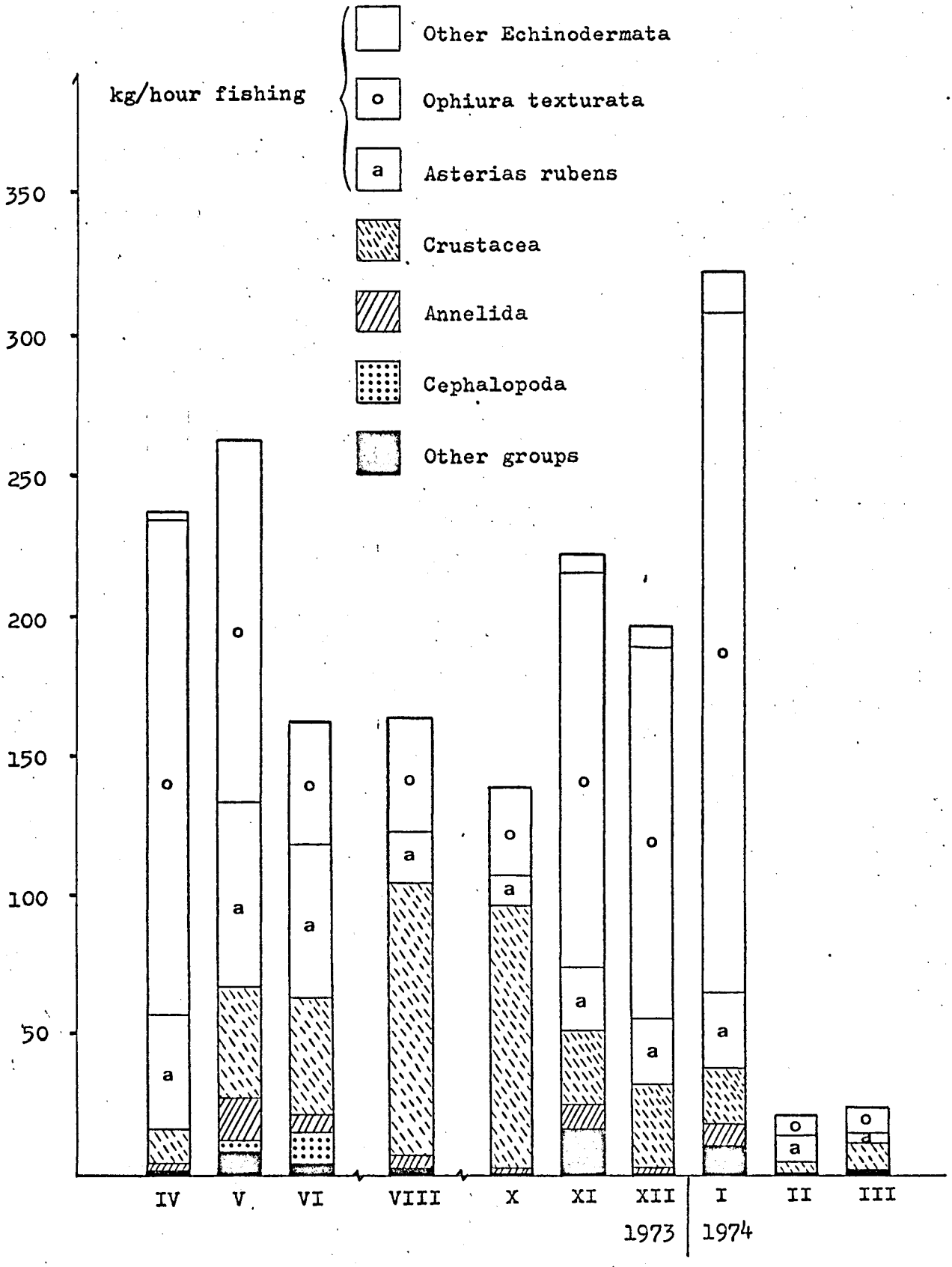
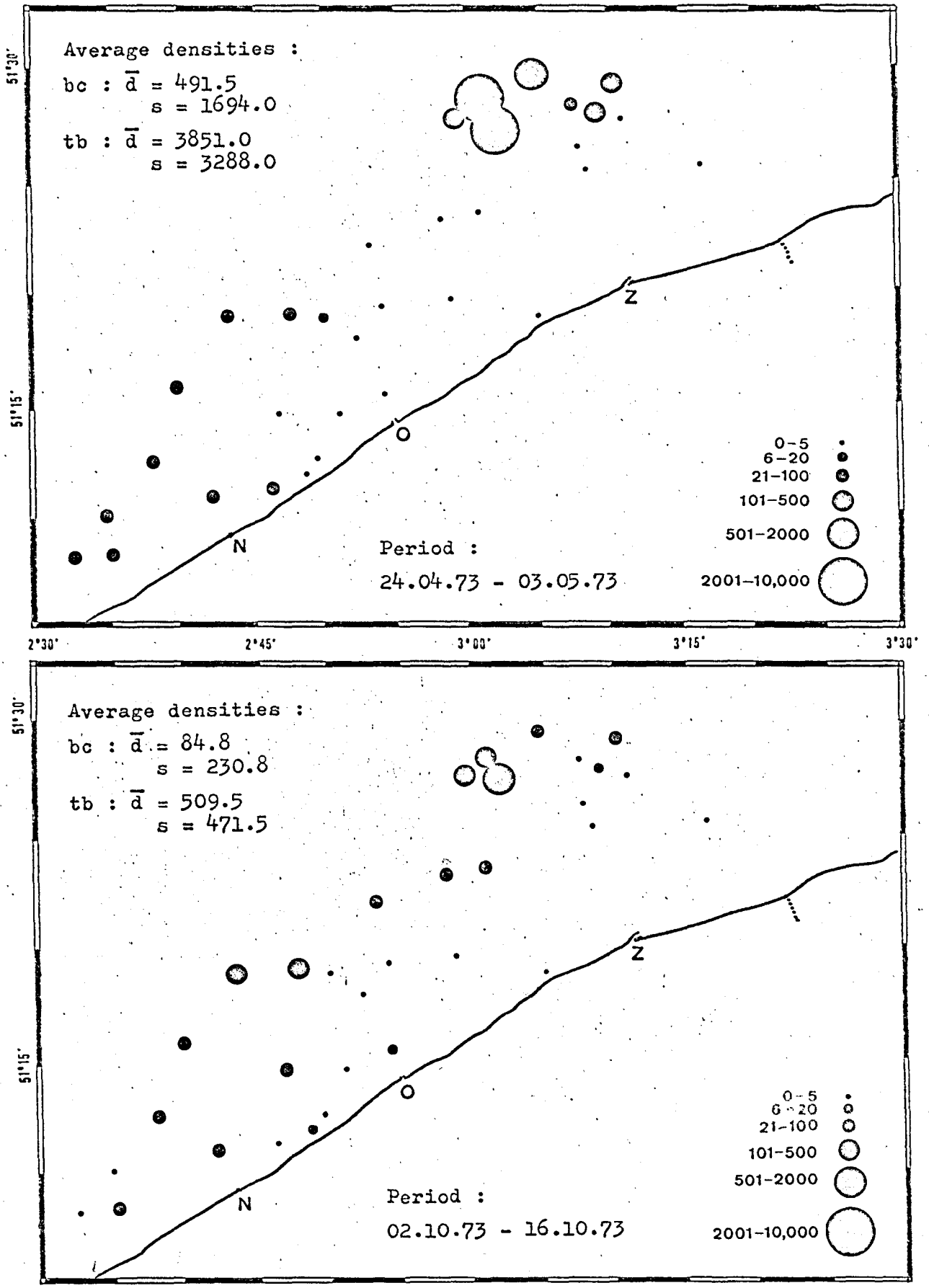
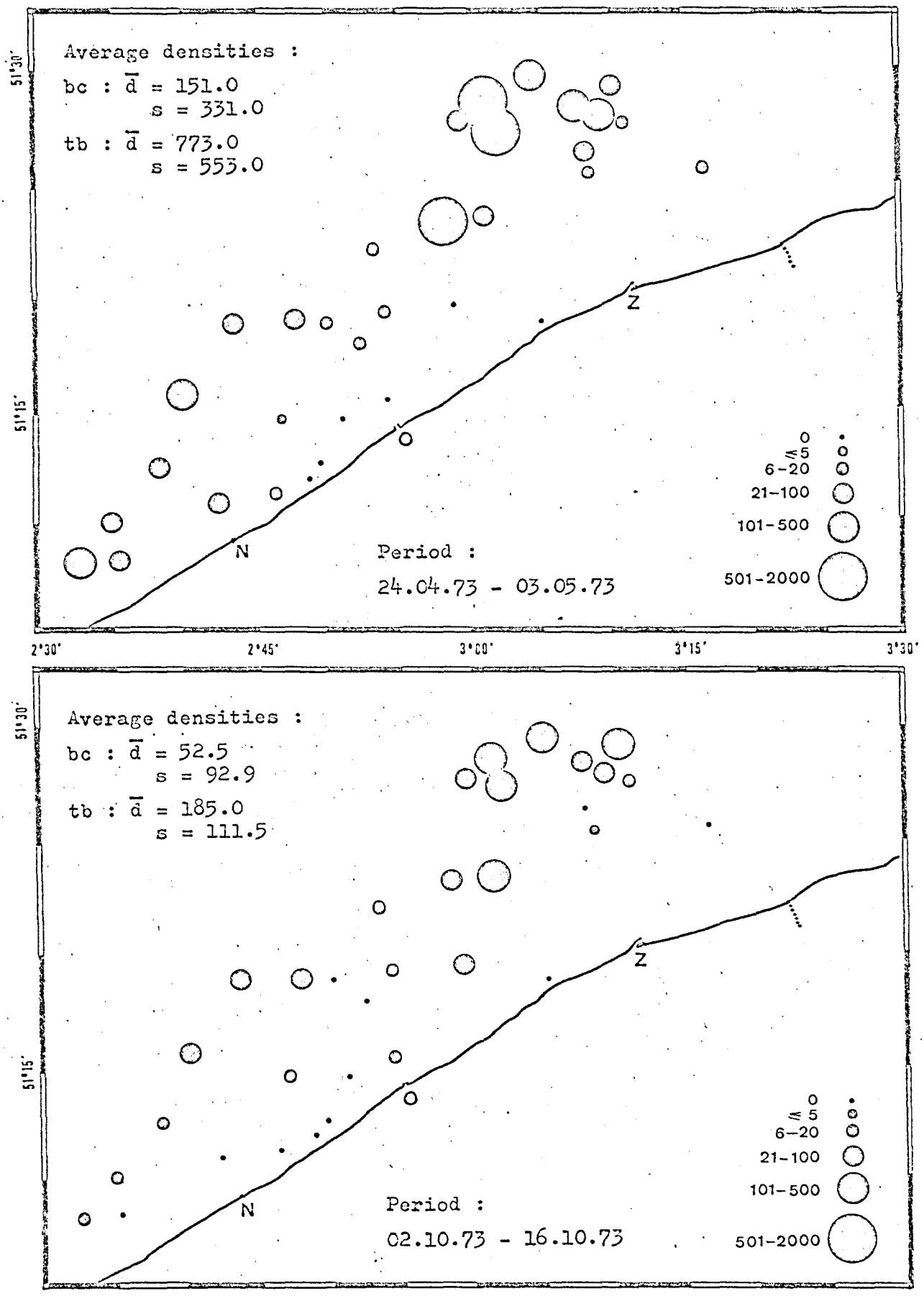


Figure 3. Evolution and composition of the catches on the Thornton-bank.



Distribution and density (gram/1000 m^2) of Ophiura texturata Lamarck.

Figure 4.



Distribution and density (gram/1000 m^2) of Asterias rubens (L.)

Figure 5.