EKOLOGIE EN SYSTEMATIEK

C.I.P.S.

MATHEMATICAL MODEL
OF THE POLLUTION IN NORTH SEA.

TECHNICAL REPORT
1971/O:Biol.I

This paper not to be cited without prior reference to the author.

PRIMARY PRODUCTIVITY.

by

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The results provided by the International Agency for C-14 determination for each sample are expressed in cpm (coup par minute) and in mg $C/m^3/h$ (incubation times, bottle volume, ampoules specific activity and batch standardization being taken into account).

The samples not prefiltered (total phytoplankton) and the samples prefiltered through townet silk (40 μ, nannoplankton) being duplicated, the deviation to the mean has been calculated : it amounts on an average to 6 % of the results.

A. STANDING CROP.

The results as expressed in cpm / sample are directly related to phytoplanktonic stanging crop. It is wished to compare these data with the numeration of total phytoplankton by Prof. LOUIS and the pigments extraction by Prof. BOUILLON. After computation of the means and blanks (dark bottles) subtraction, the results (see annexe I) allow us to formulate a few preliminary constatations :

1. for all the stations, there is no significant variation of the photosynthetic potential with sampling depth. This may indicate that water was well mixed throughout the first cruises.

2. This potential in higher as we come closer to the coast. This is probably related to the promoting effect of chemical modifications bound to the proximity of terrestrial activity (promoting pollution). However station MO2, off the river Scheldt mouth shows a low activity possibly demonstrating a toxic pollution.

3. The relative importance of nannoplankton increases with coastal proximity. Nannoplankton abouhdance means a very quick recycling of nutrients.

B. PRODUCTIVITY.

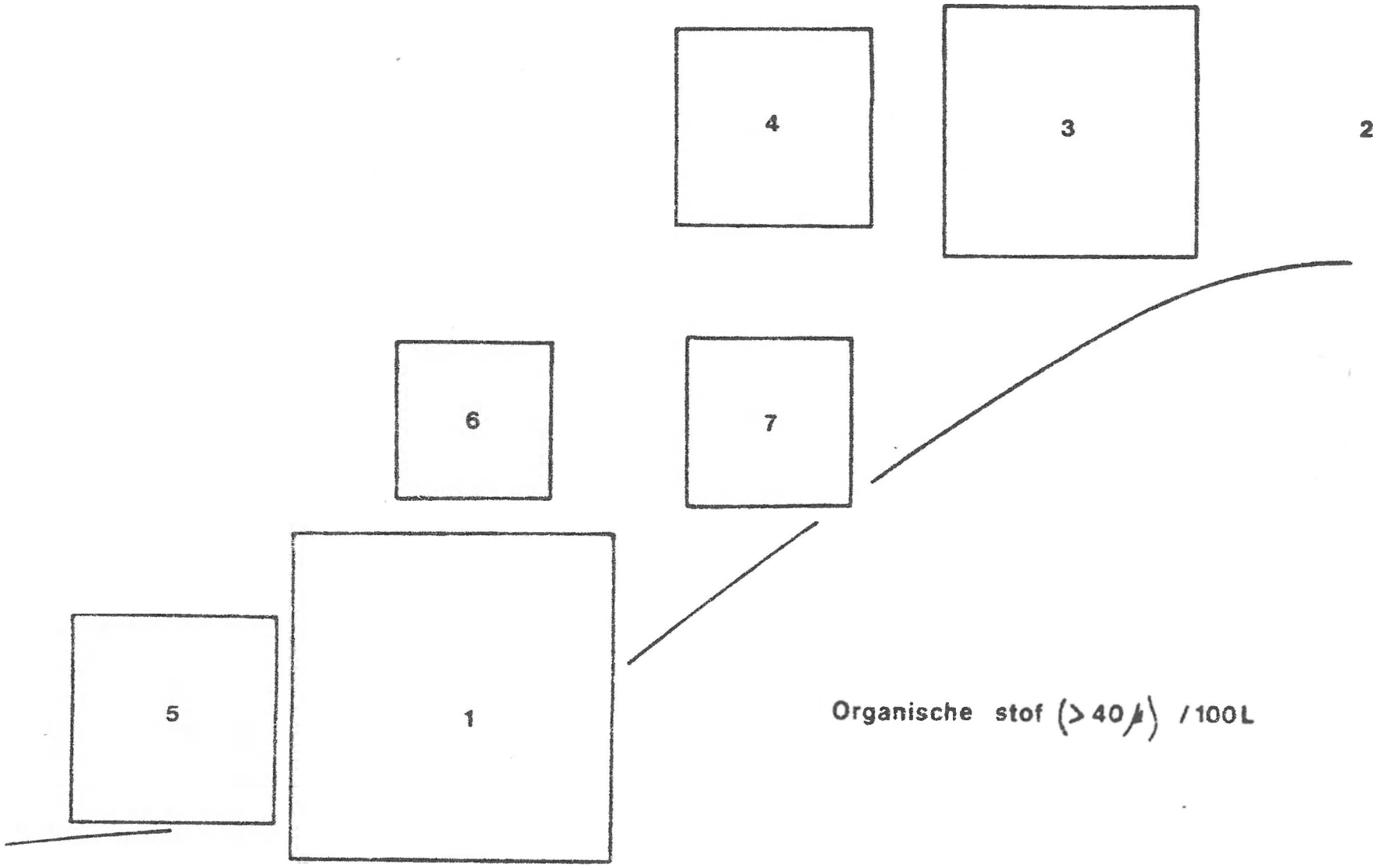
Without comparative measurements of in situ and in vitro productivity the integration of in vitro productivity results for the water column (1 m^2) comprised between 100 % and 1 % of relative irradiance has been calculated according to STEEMAN NIELSEN (1952).

However imperfectly adapted to the experimental circumstances, the STEEMAN-NIELSEN formula provides relative results of the same order of magnitude than those mentioned in the litterature for the North Sea in the winter (STEEL 1956, CUSHING 1957, WIMPENNY 1957).

CONSTATATIONS (See annexe II)

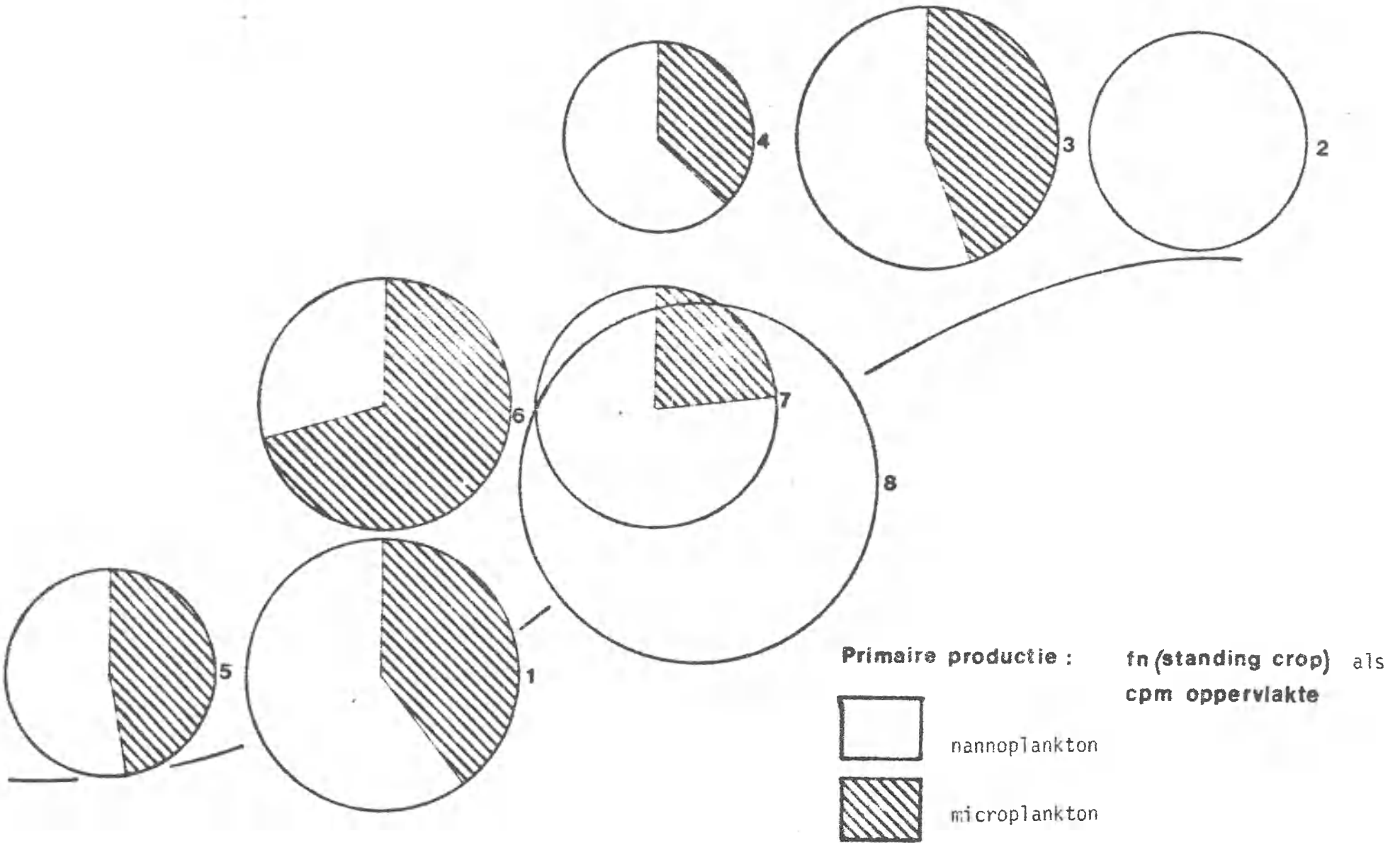
1. Between certain limits, one can see that if the thickness of the trophogenic layer is bigger, total primary productivity under 1 m^2 can be higher even if nutrients are poorer.
Such a situation is demonstrated here, primary productivity beeing higher far off the coast. The fact that near the coast the standing crop is not as productive as it could have been is only related to a local feature (transparency of the water) that may change quicker than standing crop itself.
In the open sea such a factor is of minimal importance and productivity data yield a maximum of information.

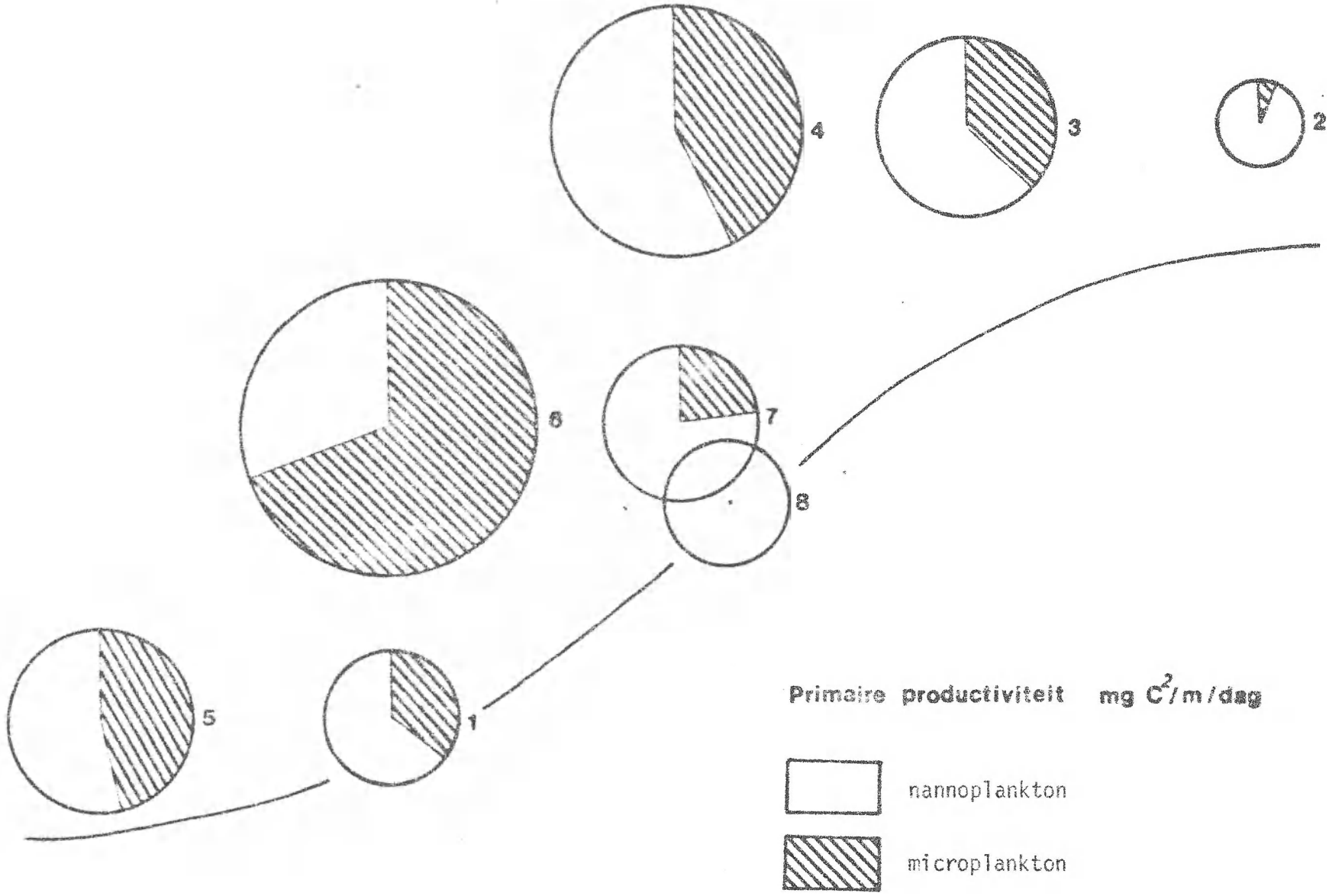
2. The relative importance of nannoplankton remains of course higher near the coast.



Programme zooplancton

Détermination de la matière organique par différence entre poids sec et poids cendres.


4
3
2
6
7
8
5
1
Primaire productie :
fn (standing crop) als
cpm oppervlakte
nannoplankton
microplankton


4
3
2
6
7
8
5
1
Primaire productiviteit mg C²/m/dag
nannoplankton
microplankton

A N N E X E I

CARBON 16:53 TS-BRU 19/03/71

PRIMARY PRODUCTIVITY EKOLOGIE EN SYSTEMATIEK V.U.B.

MECHELEN 1 MO1.230171 .1400

	cpm	%
CPM TOTAL PHYTO 100	405	100
CPM NANNOPLANCT 100	245	60
CPM TOTAL PHYTO 10	330	100
CPM NANNOPLANCT 10	238	72
CPM TOTAL PHYTO 1	382	100
CPM NANNOPLANCT 1	249	65

DIAGRAM CONSTRUCTION: R= 2.51 A= 142

MECHELEN 2 MO2.280171 .1430

CPM TOTAL PHYTO 100	265	0
CPM NANNOPLANCT 100	267	100
CPM TOTAL PHYTO 1	378	100
CPM NANNOPLANCT 1	313	82

DIAGRAM CONSTRUCTION: R= 2.03 A= -3

MECHELEN 3 MO3.300171 .1400

CPM TOTAL PHYTO 100	369	100
CPM NANNOPLANCT 100	206	55
CPM TOTAL PHYTO 25	390	100
CPM NANNOPLANCT 25	235	60
CPM TOTAL PHYTO 10	371	100
CPM NANNOPLANCT 10	254	68
CPM TOTAL PHYTO 1	361	100
CPM NANNOPLANCT 1	236	65

DIAGRAM CONSTRUCTION: R= 2.4 A= 159

MECHELEN 4		M04.310171	.1015
CPM TOTAL PHYTO	100	201	100
CPM NANNOPLANCT	100	126	62
CPM TOTAL PHYTO	50	229	100
CPM NANNOPLANCT	50	152	66
CPM TOTAL PHYTO	25	227	100
CPM NANNOPLANCT	25	117	51
CPM TOTAL PHYTO	10	209	100
CPM NANNOPLANCT	10	111	53
CPM TOTAL PHYTO	1	197	100
CPM NANNOPLANCT	1	102	51

DIAGRAM CONSTRUCTION: R= 1.77 A= 134

MECHELEN 5		M05.020271	.1330
CPM TOTAL PHYTO	100	240	100
CPM NANNOPLANCT	100	127	52
CPM TOTAL PHYTO	50	377	100
CPM TOTAL PHYTO	25	234	100
CPM NANNOPLANCT	25	147	62
CPM TOTAL PHYTO	10	252	100
CPM NANNOPLANCT	10	123	48
CPM TOTAL PHYTO	1	192	100
CPM NANNOPLANCT	1	129	67

DIAGRAM CONSTRUCTION: R= 1.93 A= 169

MECHELEN 6	M06.040271	.1200	
CPM TOTAL PHYTO 100		364	100
CPM NANNOPLANCT 100		107	29
CPM TOTAL PHYTO 50		314	100
CPM NANNOPLANCT 50		124	39
CPM TOTAL PHYTO 25		343	100
CPM NANNOPLANCT 25		147	42
CPM TOTAL PHYTO 10		352	100
CPM NANNOPLANCT 10		110	31
CPM TOTAL PHYTO 1		398	100
CPM NANNOPLANCT 1		128	32
DIAGRAM CONSTRUCTION: R=2.38			A= 254

MECHELEN 7	M07.050271	.0930	
CPM TOTAL PHYTO 100		471	100
CPM NANNOPLANCT 100		362	76
DIAGRAM CONSTRUCTION: R= 2.71			A= 83

MECHELEN 8			
CPM TOTAL PHYTO 100		716	100
CPM NANNOPLANCT 100		732	102
DIAGRAM CONSTRUCTION: R= 3.34			A= -9

Remarques : 1. Mechelen 8. concerne un prélèvement fait le 2.2.71 à 09.30h à 1 km au large d'Ostende

2. "Diagram construction" comporte deux données utiles au dessin d'un cercle dont la surface est proportionnelle à l'activité totale à l'irradiance 100 (surface) (R=rayon) et d'un secteur proportionnel à l'abondance relative du micro-plancton (ce qui n'est pas le nannopl.) (A= angle du secteur)

A N N E X E II

PRODUC 15:35 TS-BRU 22/03/71

PRIMARY PRODUCTIVITY EKOLOGIE EN SYSTEMATIEK V.U.B.

MECHELEN 1 MO1.230171 .1400

TOTAL PROD. MG C/M2/DAY	85	100
NANNO PROD. MG C/M2/DAY	55	64

DIAGRAM CONSTRUCTION : R = 2.3 A= 127

MECHELEN 2 MO2.280171 .1430

TOTAL PROD. MG C/M2/DAY	34	100
NANNO PROD. MG C/M2/DAY	32	94

DIAGRAM CONSTRUCTION: R = 1.45 A= 21

MECHELEN 3 MO3.300171 .1400

TOTAL PROD. MG C/M2/DAY	169	100
NANNO PROD. MG C/M2/DAY	106	62

DIAGRAM CONSTRUCTION: R = 3.24 A= 134

MECHELEN 4 MO4.310171 .1015

TOTAL PROD. MG C/M2/DAY	303	100
NANNO PROD. MG C/M2/DAY	172	56

DIAGRAM CONSTRUCTION: R = 4.35 A= 155

MECHELEN 5 MO5.020271 .1330

TOTAL PROD. MG C/M2/DAY	162	100
NANNO PROD. MG C/M2/DAY	86	53

DIAGRAM CONSTRUCTION: R = 3.18 A= 168

MECHELEN 6 M06.040271 .1200

TOTAL PROD. MG C/M2/DAY	419	100
NANNO PROD. MG C/M2/DAY	128	30

DIAGRAM CONSTRUCTION: R= 5.11 A=250

MECHELEN 7 M07.050271 .0930

TOTAL PROD. MG C/M2/DAY	108	100
NANNO PROD. MG C/M2/DAY	83	76

DIAGRAM CONSTRUCTION: R= 2.59 A= 83

MECHELEN 8

TOTAL PROD. MG C/M2/DAY	82	100
NANNO PROD. MG C/M2/DAY	83	101

DIAGRAM CONSTRUCTION: R= 2.26 A= -5