A Report to the U.S. Army Corps of Engineers

and the

United Illuminating Company

on

The Environmental Consequences of Dredge Spoil Disposal in

Central Long Island Sound:

SR-16

VIII. Changes in spatial and temporal abundance patterns of benthic molluscs sampled from New Haven Harbor, Dump Site, S. Control N.W. Control Sites; 1972 - 1973 (pre-dump baseline)

Submitted by

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Department of Geology and Geophysics

Yale University

New Haven, Connecticut

March 1974

Introduction

Numerical abundance data can best be interpreted when it is presented graphically. This report is a summary of seasonal abundance data for New Haven Harbor, The New Haven dump site, S. Control site, and N. W. Control and spatial density patterns on the latter three sampling areas. This data is completed for molluscs only. This baseline data will be compared with comparable data to be taken after dredging and dumping terminates (March 1974).

Methods

Two computer programs were employed to generate the graphs and maps in this report:

Plot z

The primary purpose of the plotting routine is to make a visual time-series display of the mean number of individuals-per square meter at a given site and for a given species. The program was written in Fortran IV using basic Calcomp pen plotter routines (PLOT, SYMBOL, NUMBER) and was batch run on the Yale Computer Center's IBM 370/158.

Mapac III

Given a data set as follows

```
1....2....3....4
................
................
5....6....7....8
................
................
9....10...11...12
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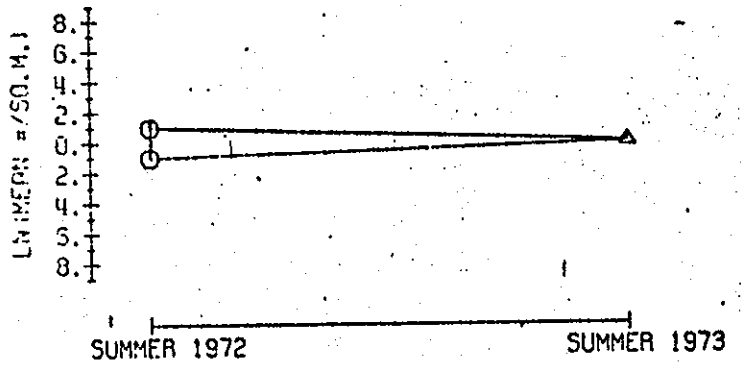
The program will make a linear interpolation between the values read in, and fill in the entire array of points represented by dots. The printing ranges are variable and interpolation proceeds first across the array and

then down. Since the present data set provides more stations taken in the E-W direction (7 across) than in the N-S direction (3 down), the interpolation tends to produce maps that show somewhat elongated N-S trends. This is an artifact which should be considered in interpretation. Data stations are represented on the maps at x-marks.

The program is written in Fortran IV and batch run on the Yale Computer Center's IBM 370/158. The program was originally written by Dr. T. G. Siccama, Yale Forestry School, rewritten by D. S. Wethey and J. B. Fisher, Yale College 1973, and later modified by Robert Cerrato, Dept. Geology-Geophysics, Yale University.

HARBOR CHANNEL-MOLLUSCA: BIVALVIA DEPOSIT FEEDERS

NUCULA ANNULATA



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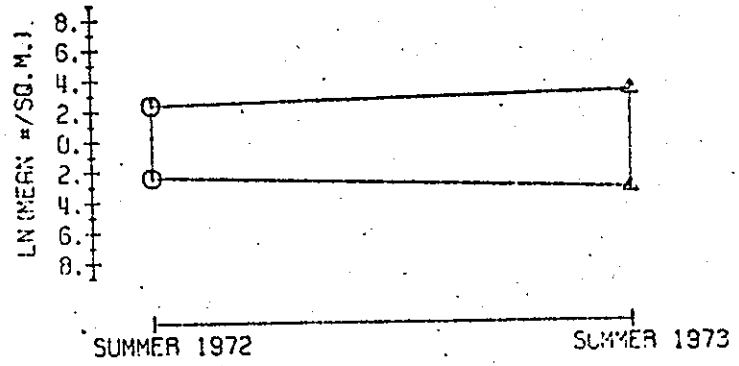
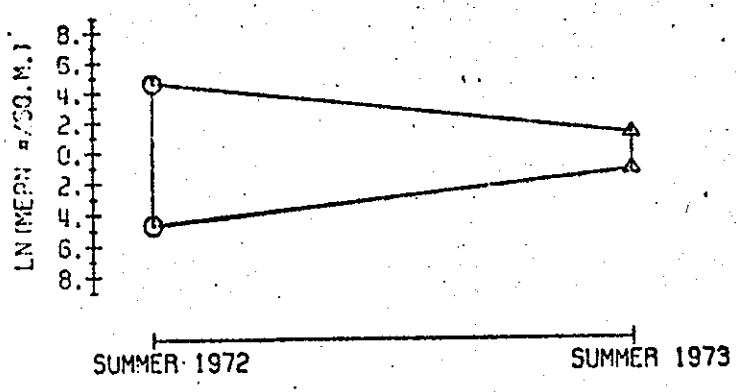


YOLDIA LIMATULA



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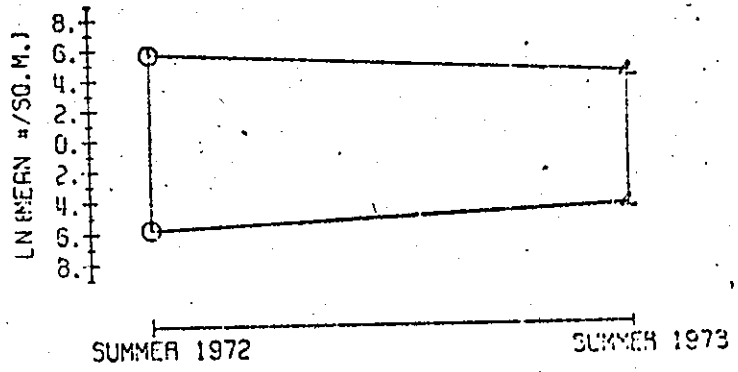
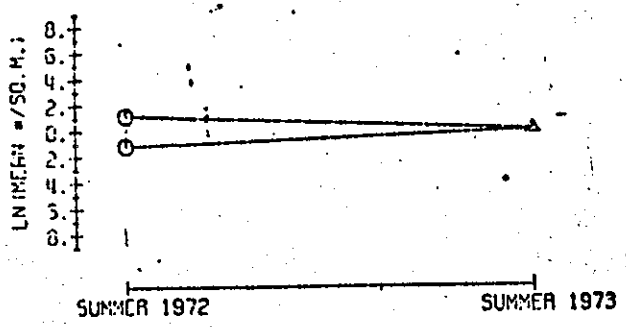


HARBOR CHANNEL-MOLLUSCA: BIVALVIA SUSPENSION FEEDERS

PITAR MORRHUANA



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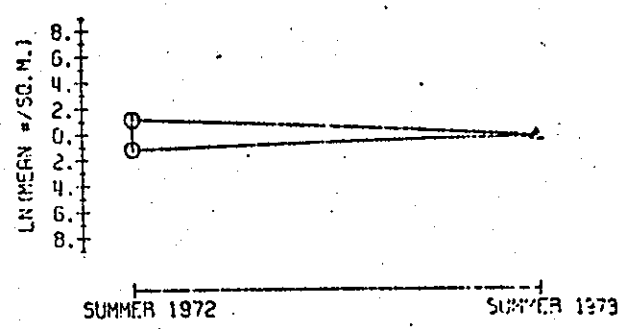

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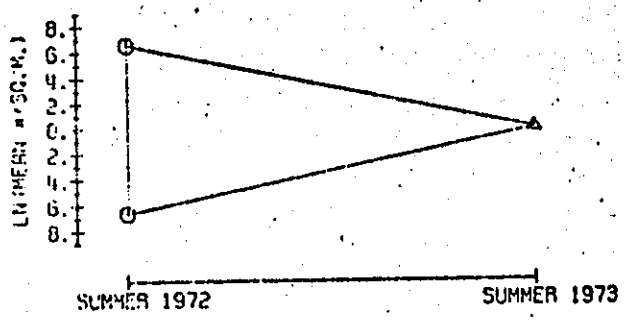

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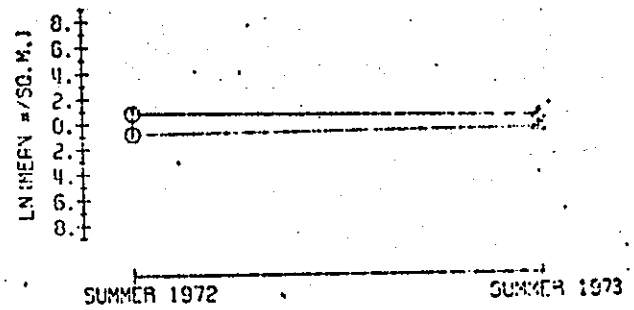

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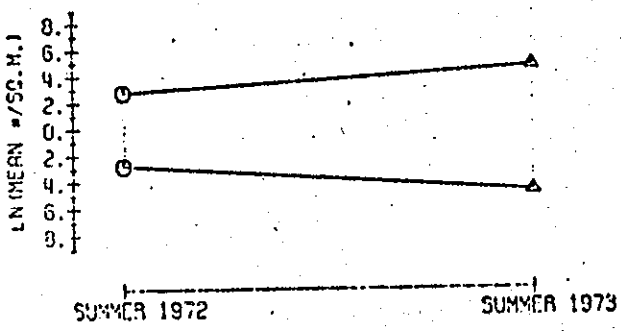

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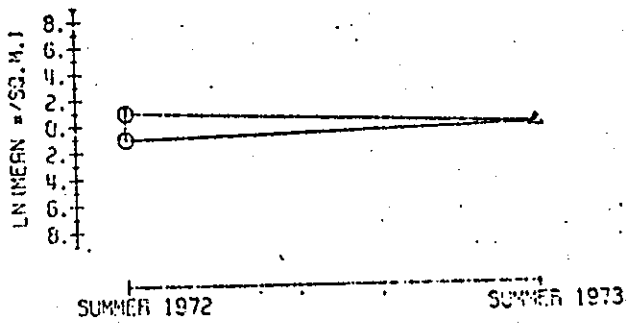

RBOR CHANNEL-MOLLUSCA: GASTROPODA DEPOSIT FEEDERS

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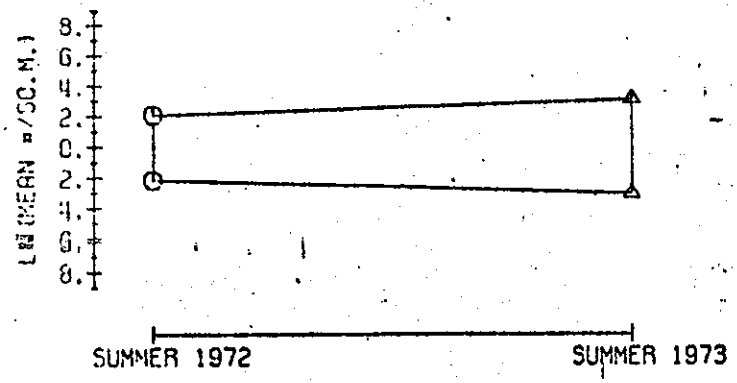

HARBOR CHANNEL-MOLLUSCA: GASTROPODA SUSPENSION FEEDE

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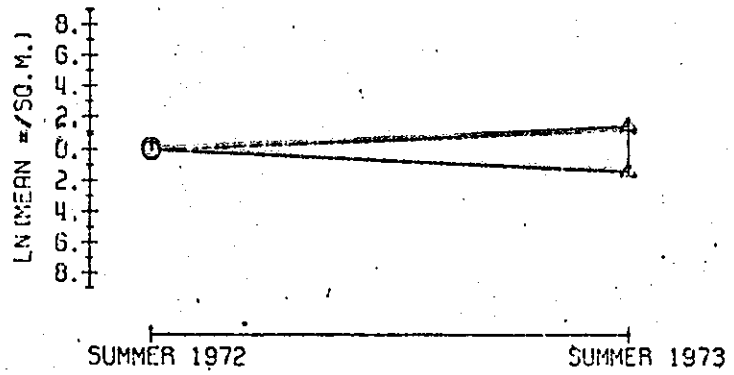

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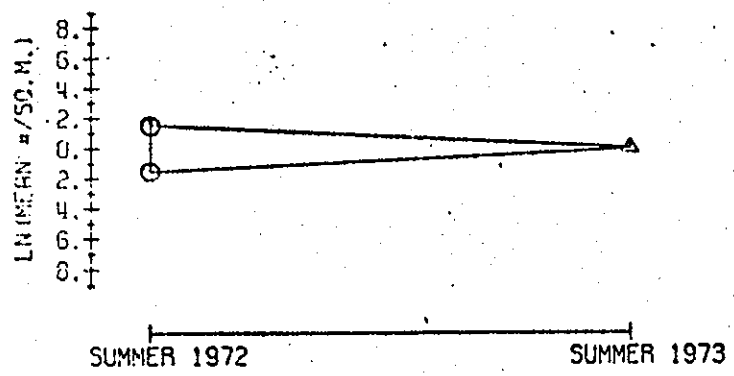
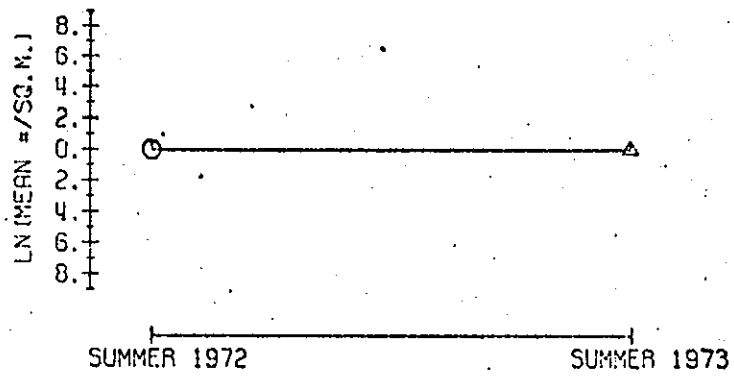


HARBOR CHANNEL-MOLLUSCA: GASTROPODA CARNIVORES

POLINICES DUPLICATUS



DUMP SITE MOLLUSCA: BIVALVIA DEPOSIT FEEDERS

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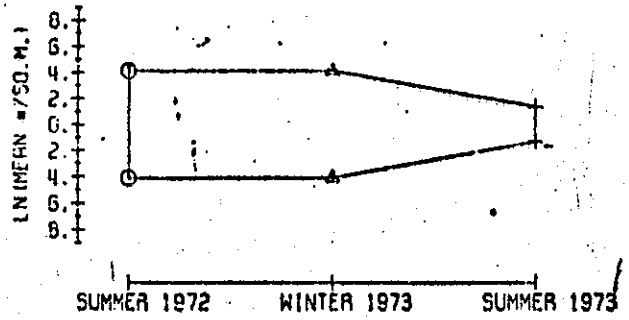

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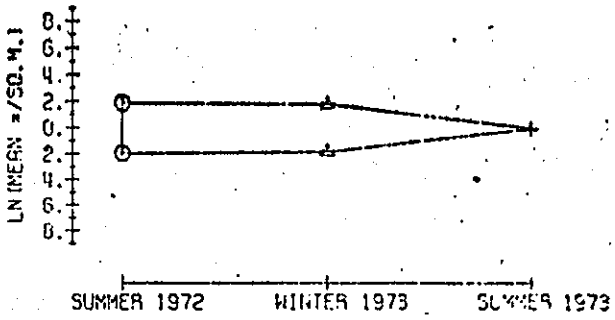

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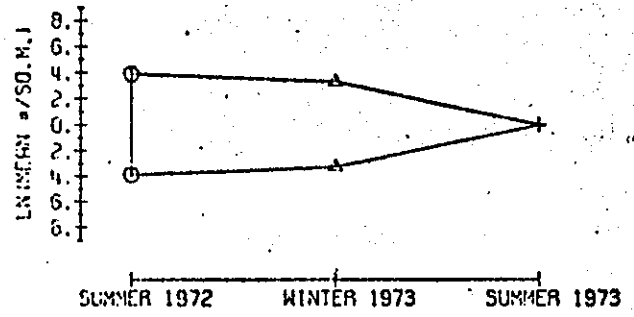

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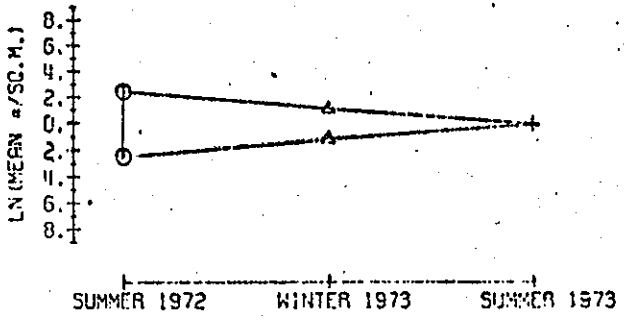

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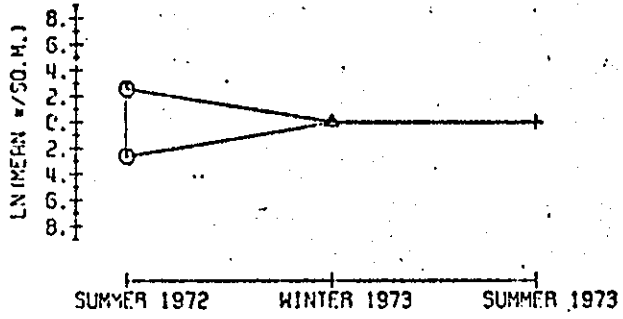
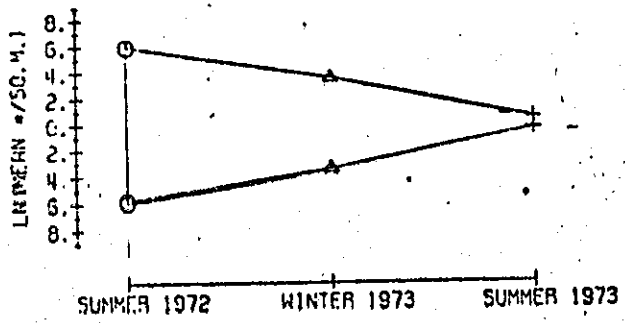


DUMP SITE MOLLUSCA: BIVALVIA SUSPENSION FEEDERS

PITAR MORRHUANA



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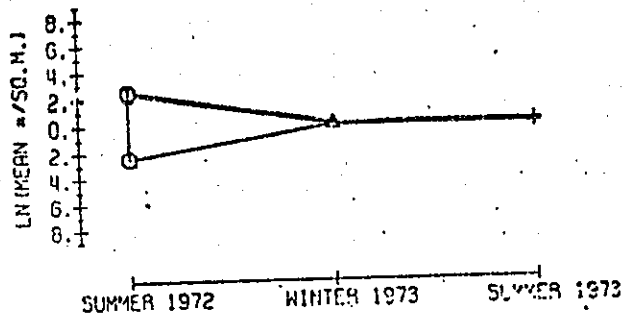

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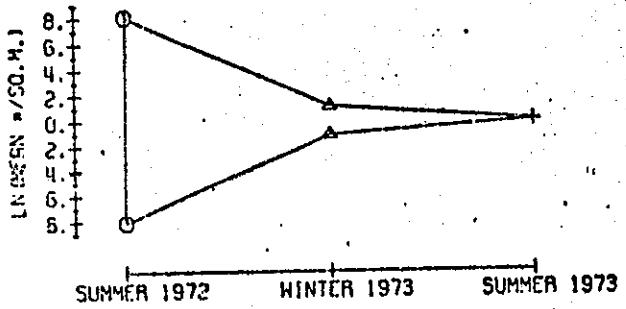

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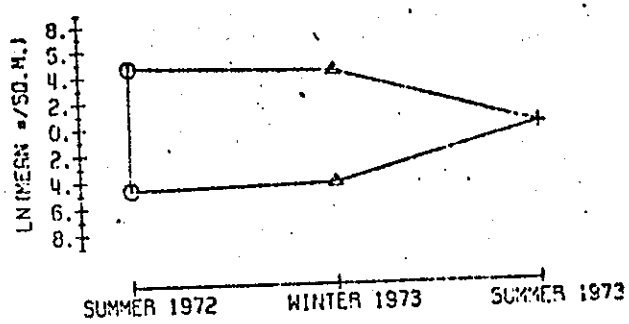

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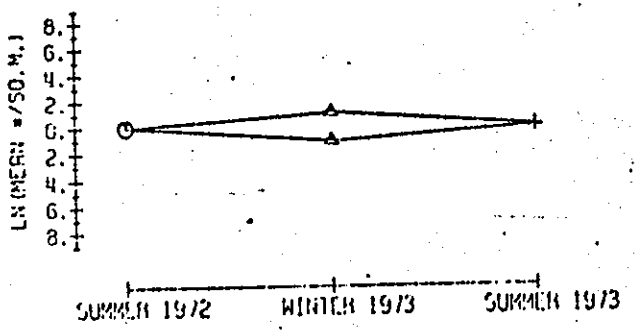
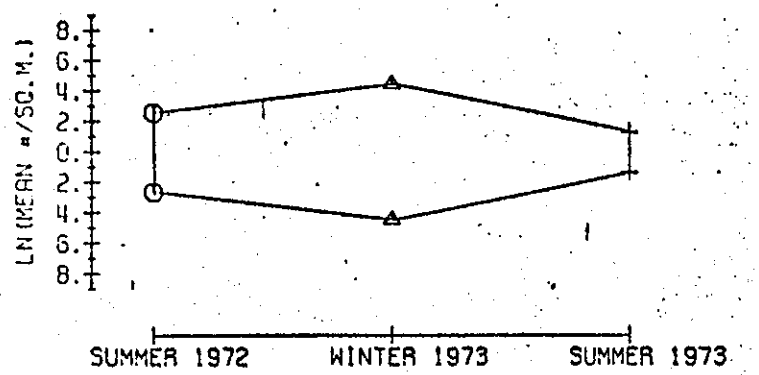


DUMP SITE MOLLUSCA: GASTROPODA DEPOSIT FEEDERS

NASSARIUS TRIVITTATUS



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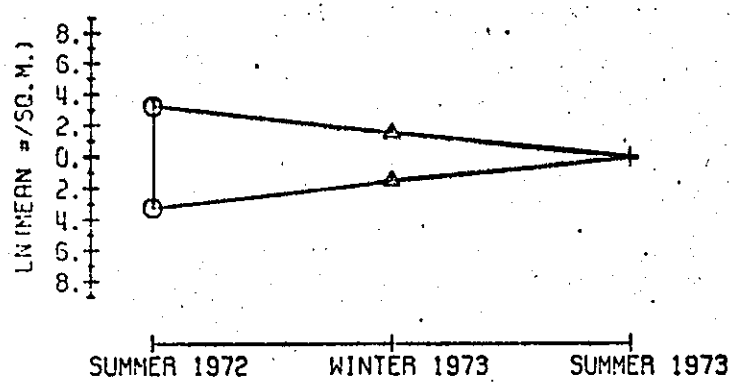

DUMP SITE MOLLUSCA: GASTROPODA CARNIVORE

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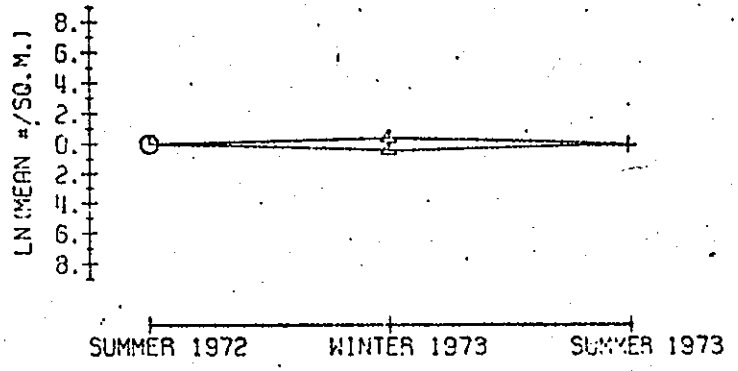

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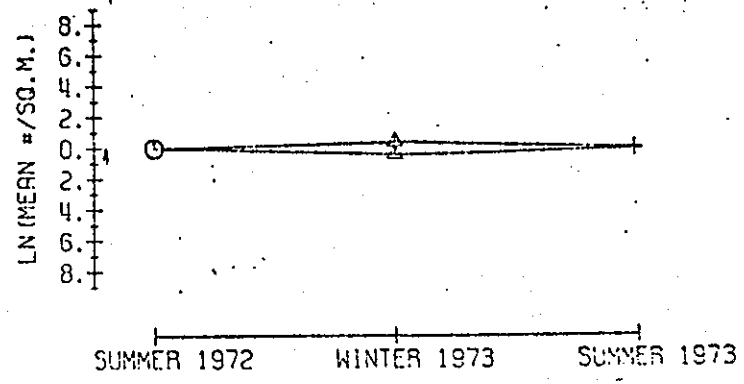
TURBONILLA INTERRUPTA



SOUTH CONTROL MOLLUSCA: BIVALVIA DEPOSIT FEEDERS

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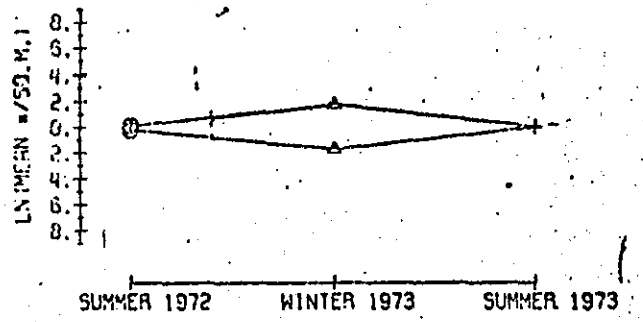

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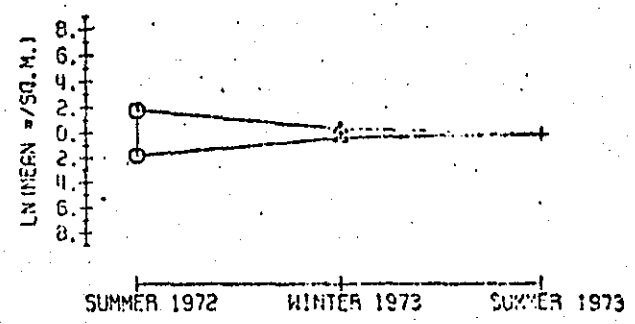

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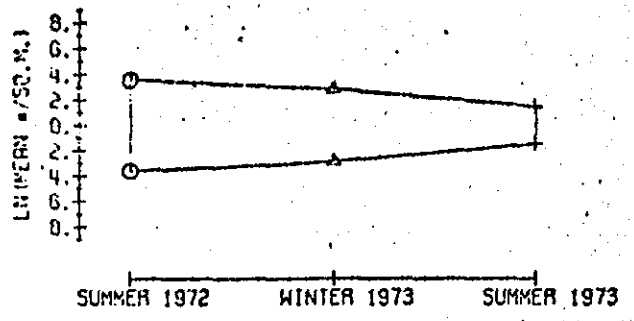

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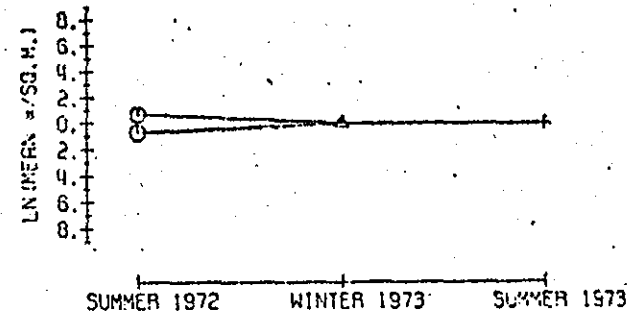

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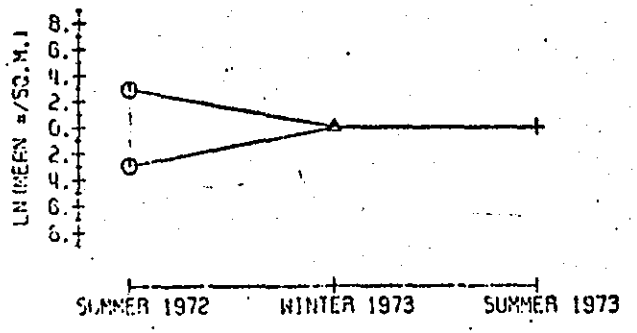

SOUTH CONTROL MOLLUSCA: BIVALVIA SUSPENSION FEEDERS

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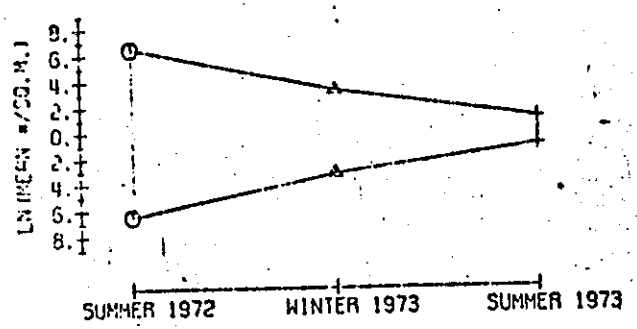

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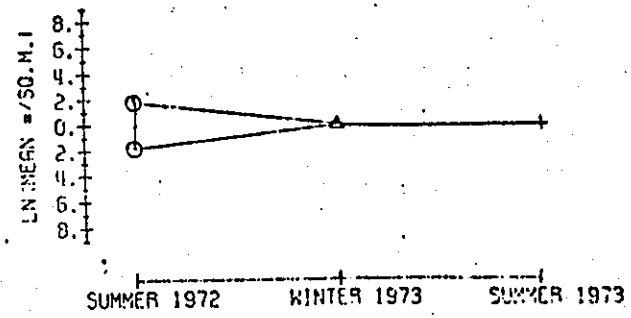

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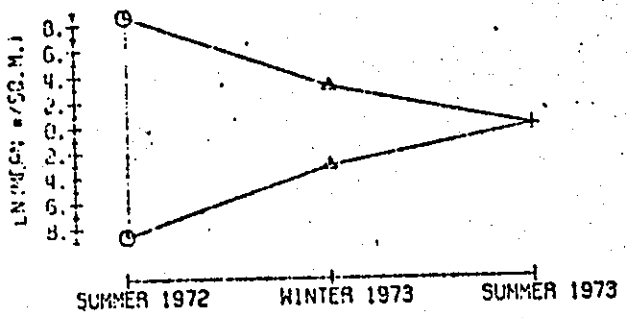

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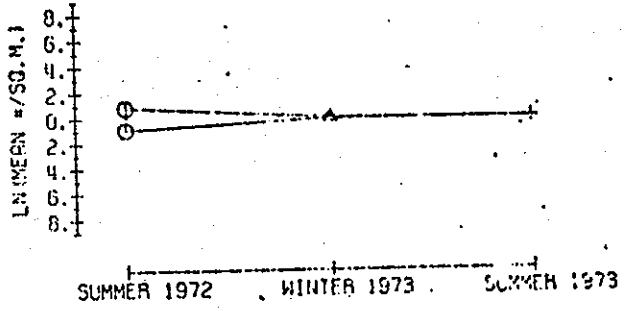

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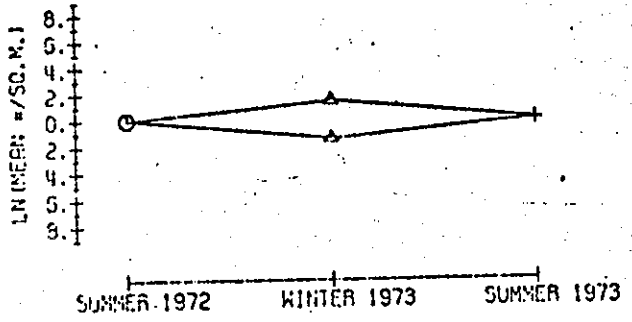

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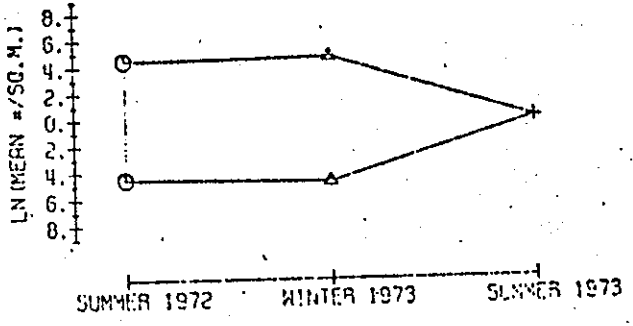
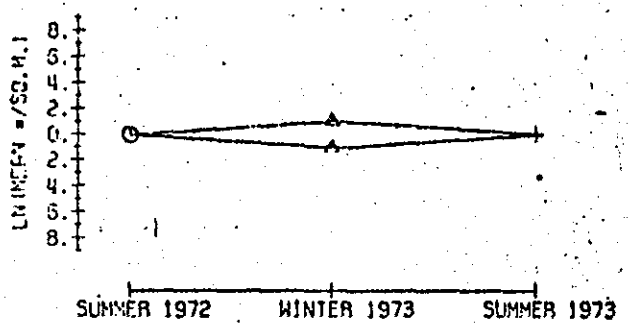


SOUTH CONTROL MOLLUSCA: GASTROPODA CARNIVORES

POLINICES DUPLICATUS



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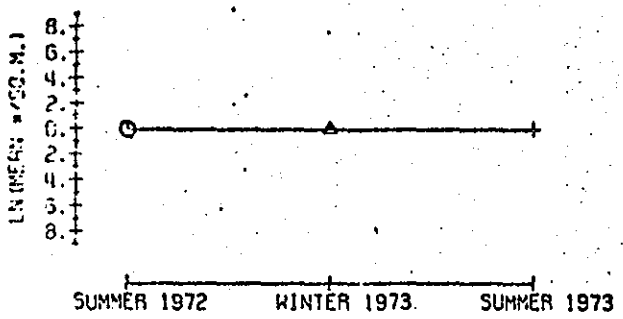

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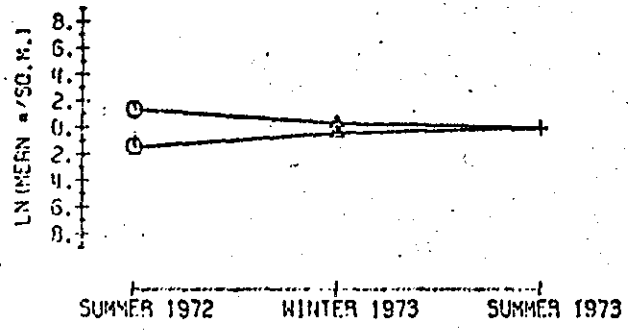

SOUTH CONTROL MOLLUSCA: GASTROPODA DEPOSIT FEEDERS

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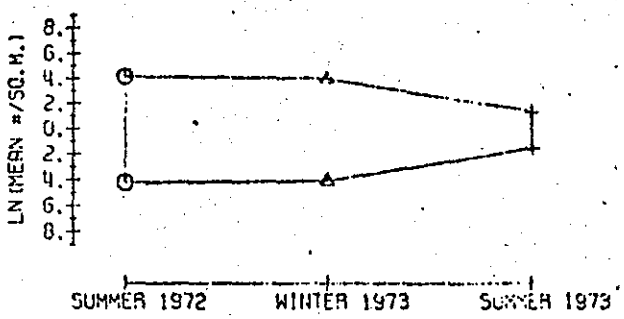

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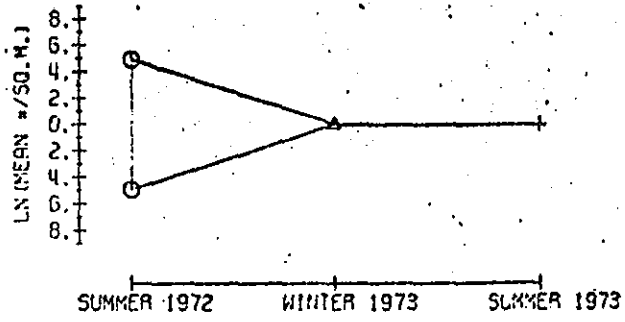
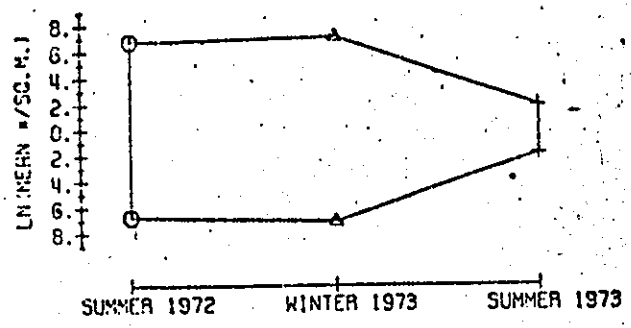


NW CONTROL MOLLUSCA: BIVALVIA DEPOSIT FEEDERS

NUCULA ANNULATA



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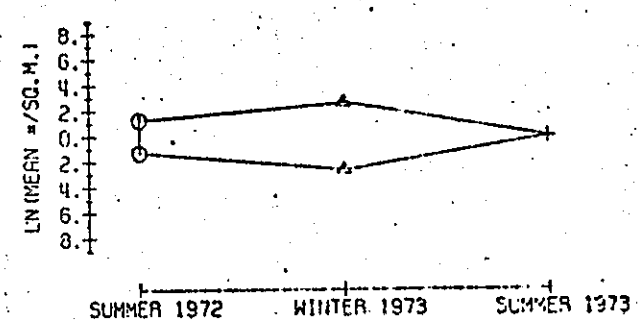
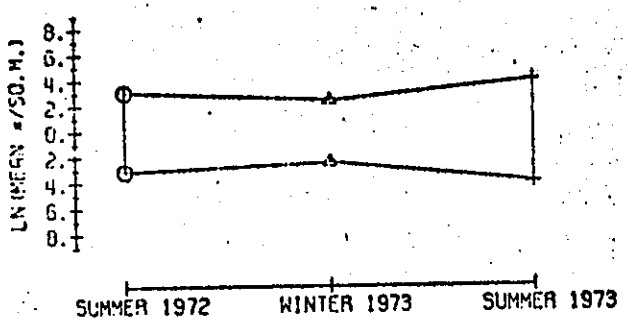


YOLDIA LIMATULA



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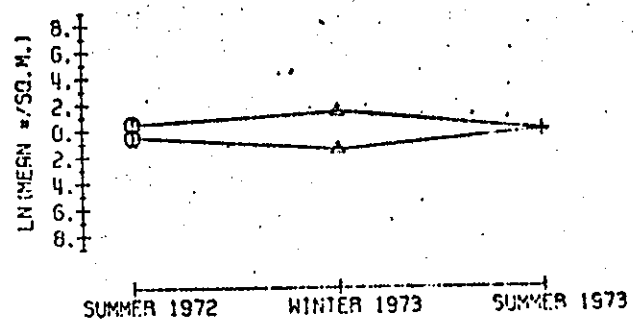
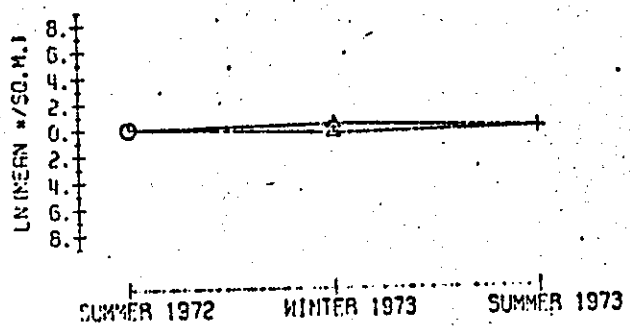
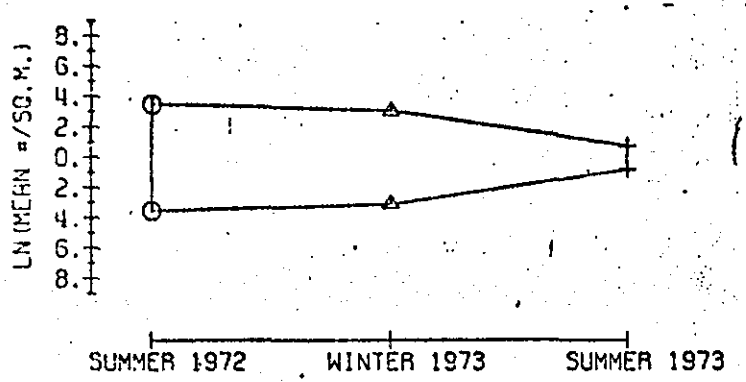


PETRICOLA PHOLADIFORMIS

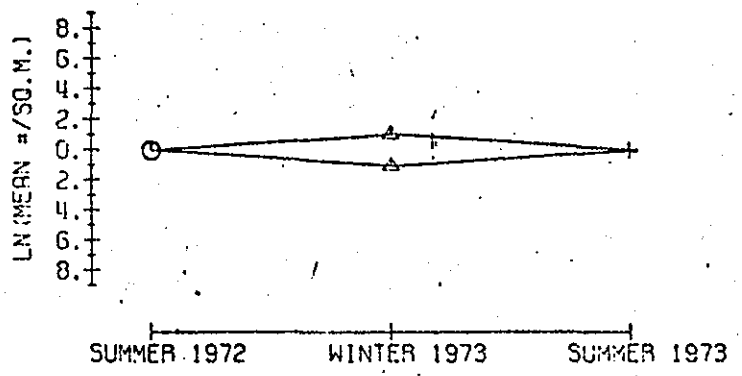


NW CONTROL MOLLUSCA:BIVALVIA SUSPENSION FEEDERS

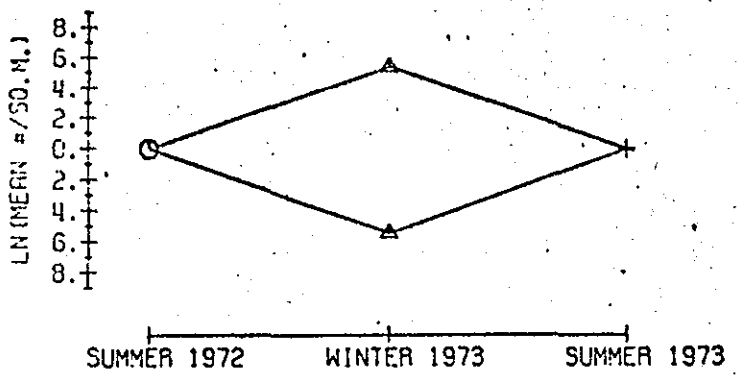
PITAR MORRHUANA



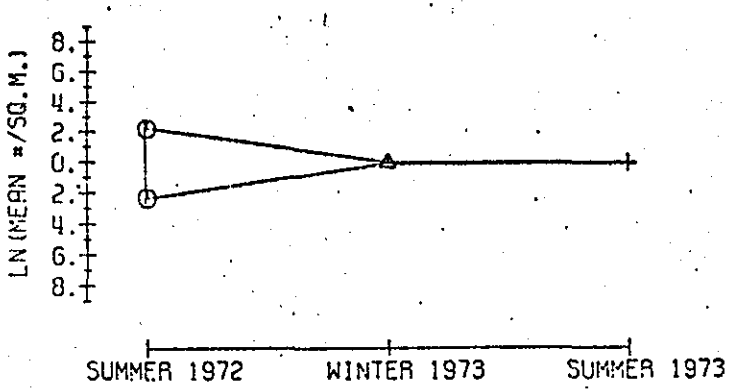
PERIPLOMA PAPYRATIUM



MULINIA LATERALIS

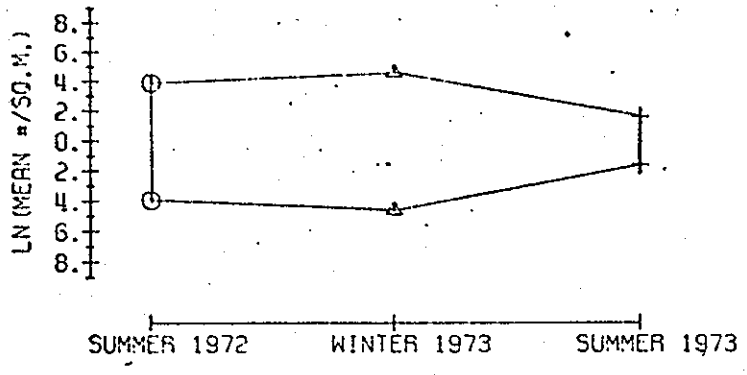


PANDORA GOULDIANA

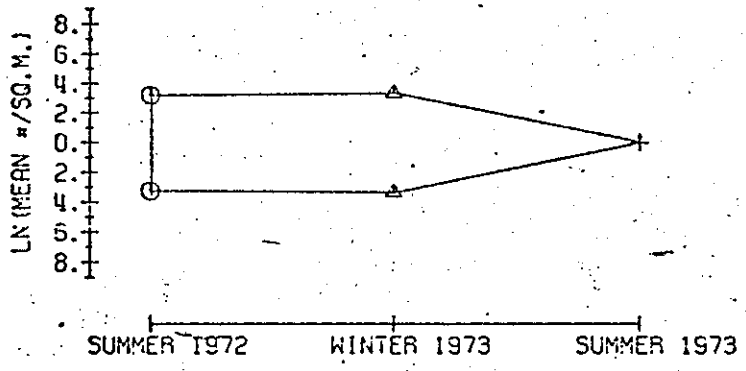


NW CONTROL MOLLUSCA: GASTROPODA DEPOSIT FEEDERS

NASSARIUS TRIVITTATUS

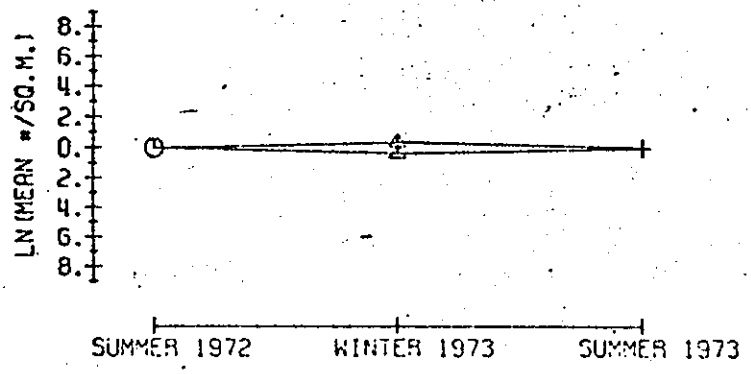


RETUSA SP.



NW CONTROL MOLLUSCA: GASTROPODA CARNIVORES

POLINICES DUPLICATUS



NUCULA ANNULATA

DUMP SITE

JULY 1972

0 = 1.0 - 2.7

1 = 2.7 - 7.4

2 = 7.4 - 20.1

3 = 20.1 - 54.6

4 = 54.6 - 148.4

5 = 148.4 - 403.4

6 = 403.4 - 1096.6

NUCULA ANNULATA

DUMP SITE

JANUARY 1973

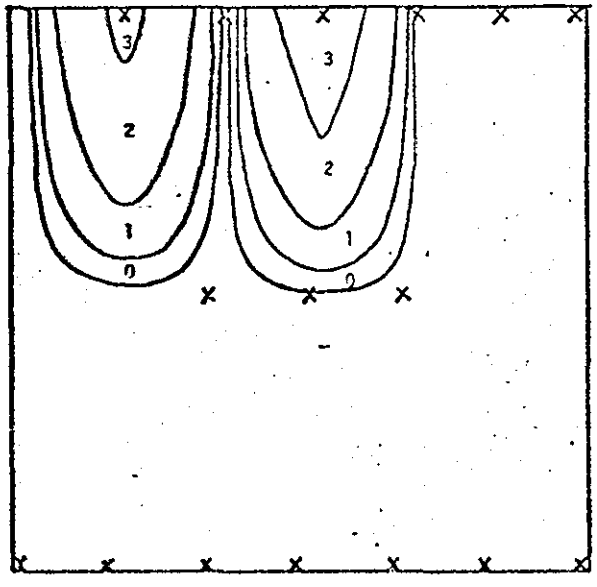
0 = 1.0 - 2.7

1 = 2.7 - 7.4

2 = 7.4 - 20.1

3 = 20.1 - 54.6

4 = 54.6 - 148.4



NUCULA ANNULATA

DUMP SITE

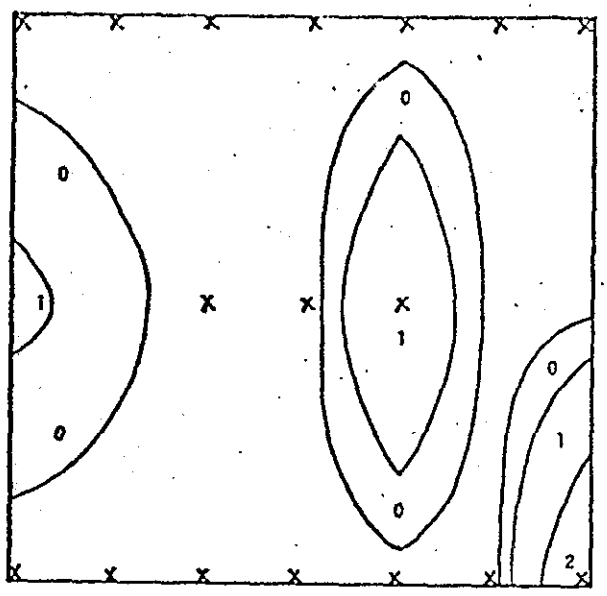
JULY 1973

0 = 1.0 - 2.7

1 = 2.7 - 7.4

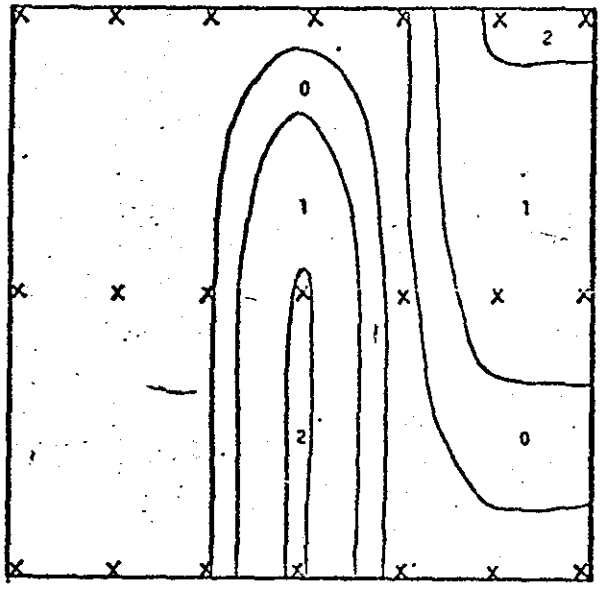
2 = 7.4 - 20.1

3 = 20.1 - 54.6



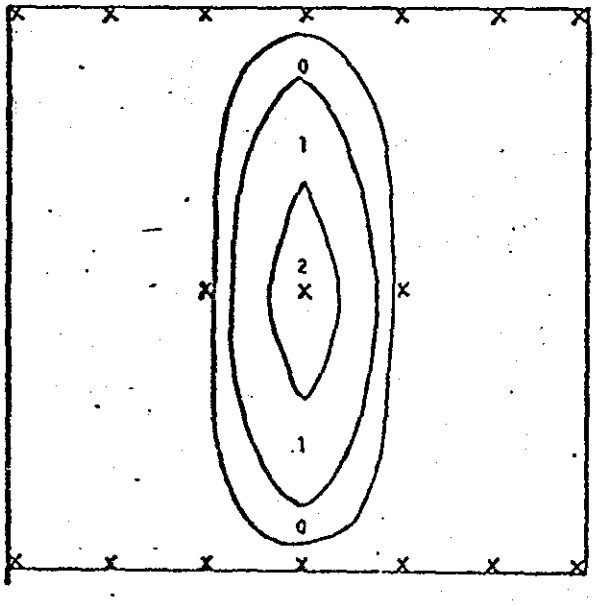
NUCULA ANNULATA
SOUTH CONTROL SITE
JULY 1972

0 = 1.0 - 2.7
1 = 2.7 - 7.4
2 = 7.4 - 20.1



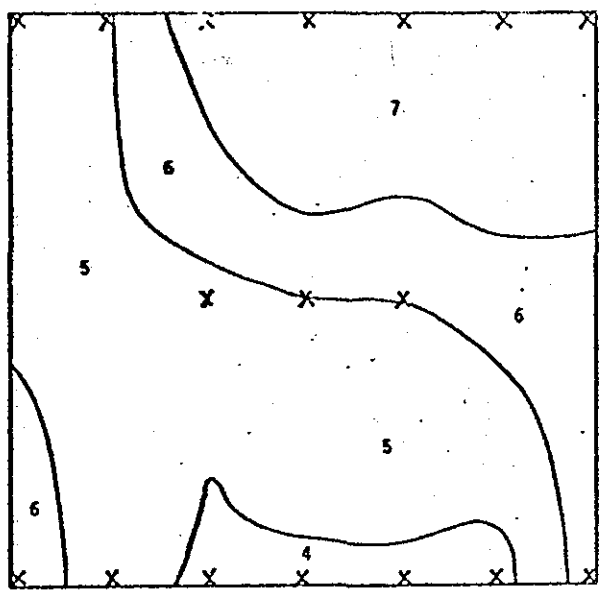
NUCULA ANNULATA
SOUTH CONTROL SITE
JANUARY 1973

0 = 12.1 - 36.3
1 = 36.3 - 60.5
2 = 60.5 - 84.7



NUCULA ANNULATA
SOUTH CONTROL SITE
JULY 1973

0 = 1.0 - 2.7
1 = 2.7 - 7.4
2 = 7.4 - 20.1



NUCULA ANNULATA

NORTHWEST CONTROL SITE

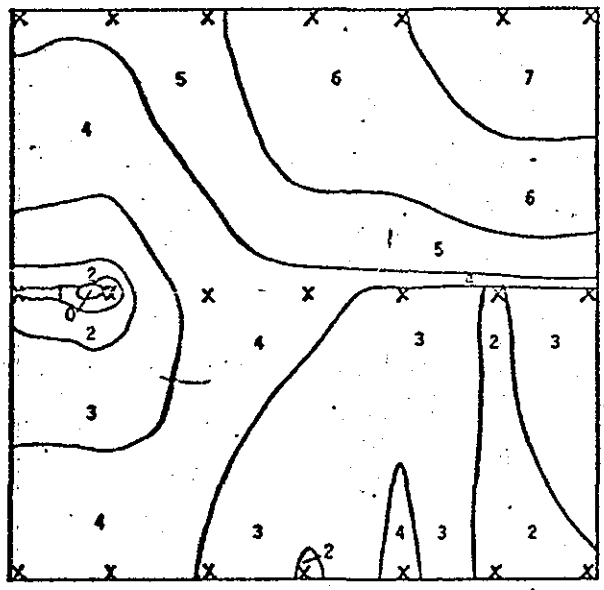
SEPT. 1972

4 = 54.6 - 148.4

5 = 148.4 - 403.4

6 = 403.4 - 1096.6

7 = 1096.6 - 2981.0



NUCULA ANNULATA

NORTHWEST CONTROL SITE

JANUARY 1973

0 = 1.0 - 2.7

1 = 2.7 - 7.4

2 = 7.4 - 20.1

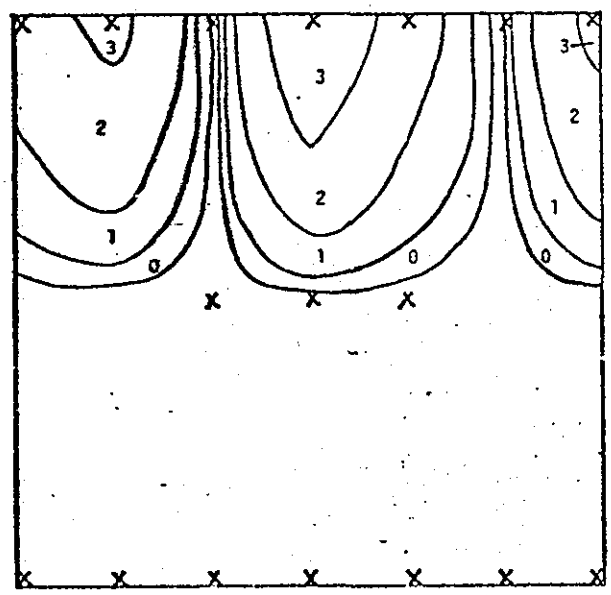
3 = 20.1 - 54.6

4 = 54.6 - 148.4

5 = 148.4 - 403.4

6 = 403.4 - 1096.6

7 = 1096.6 - 2981.0



NUCULA ANNULATA

NORTHWEST CONTROL SITE

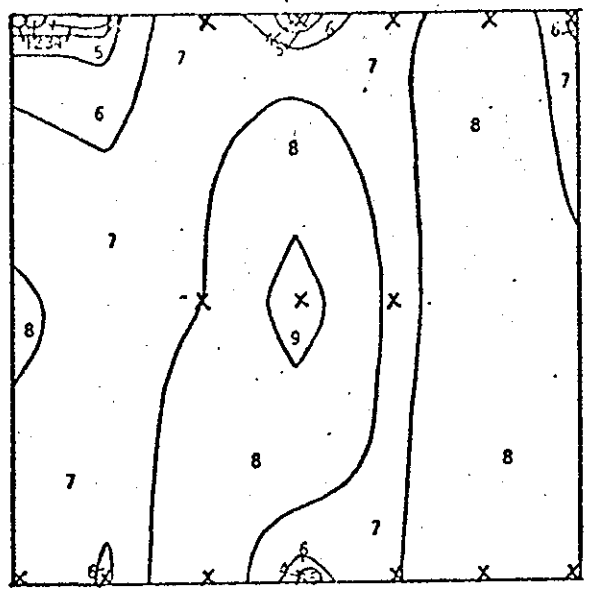
JULY 1973

0 = 1.0 - 2.7

1 = 2.7 - 7.4

2 = 7.4 - 20.1

3 = 20.1 - 54.6



MULINIA LATERALIS

DUMP-SITE

JULY 1972

1 = 2.7 - 7.4

2 = 7.4 - 20.1

3 = 20.1 - 54.6

4 = 54.6 - 148.4

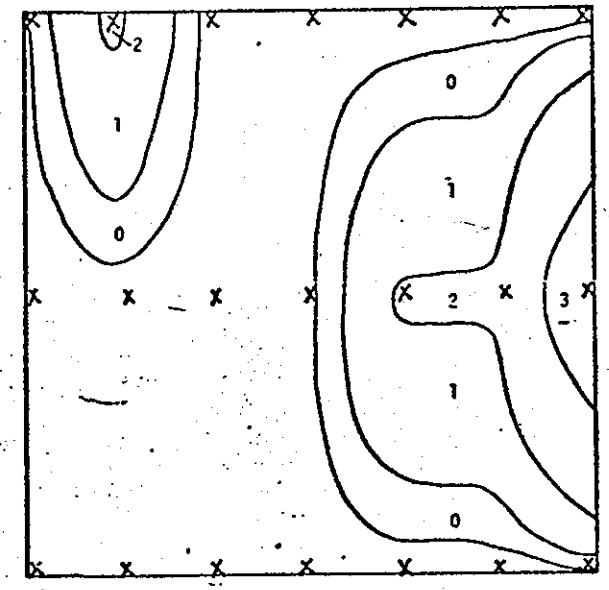
5 = 148.4 - 403.4

6 = 403.4 - 1096.6

7 = 1096.6 - 2981.0

8 = 2981.0 - 8103.1

9 = 8103.1 - 22,026.0



MULINIA LATERALIS

DUMP SITE

JANUARY 1973

0 = 1.0 - 2.7

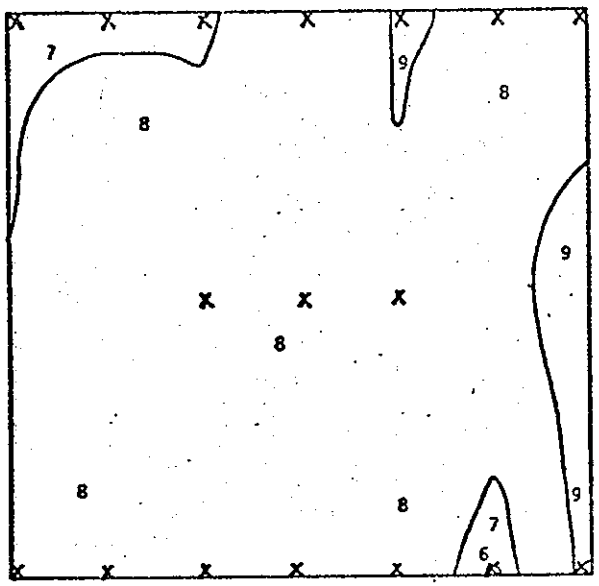
1 = 2.7 - 7.4

2 = 7.4 - 20.1

3 = 20.1 - 54.6

none present

7



MULINIA LATERALIS

SOUTH CONTROL SITE

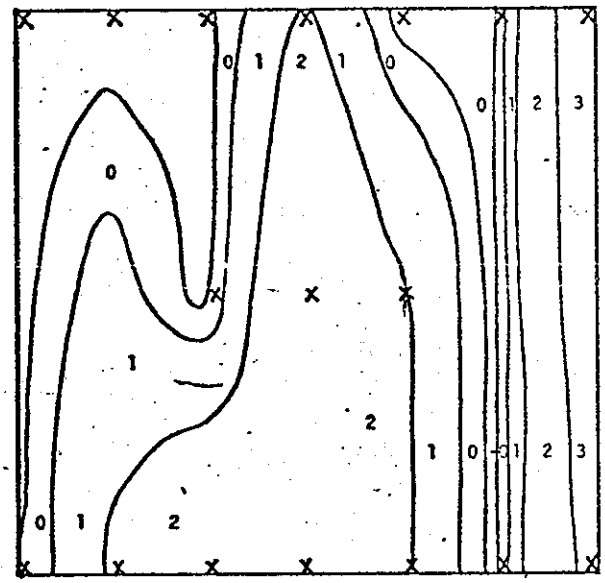
JULY 1972

6 = 403.4 - 1096.6

7 = 1096.6 - 2981.0

8 = 2981.0 - 8103.1

9 = 8103.1 - 22,026.0



MULINIA LATERALIS

SOUTH CONTROL SITE

JANUARY 1973

0 = 1.0 - 2.7

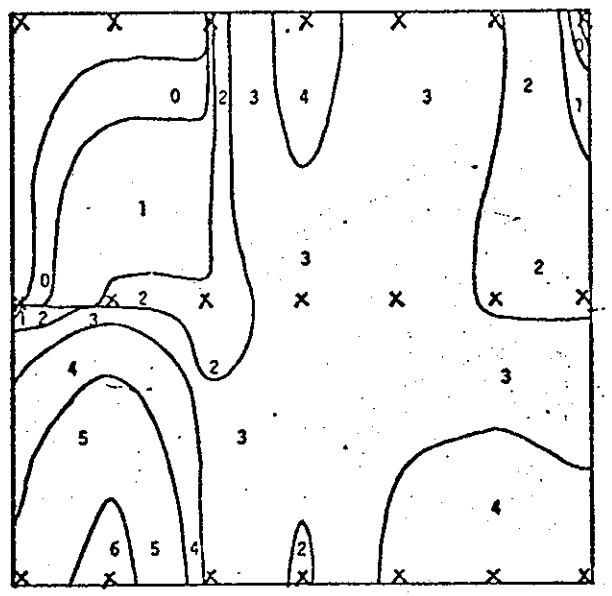
1 = 2.7 - 7.4

2 = 7.4 - 20.1

3 = 20.1 - 54.6

none present

none present



MULINIA LATERALIS

NORTHWEST CONTROL SITE

JANUARY 1973

0 = 1.0 - 2.7

1 = 2.7 - 7.4

2 = 7.4 - 20.1

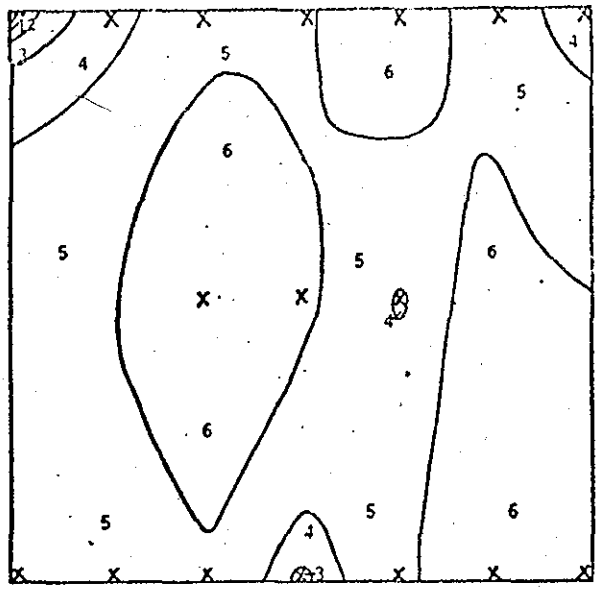
3 = 20.1 - 54.6

4 = 54.6 - 148.4

5 = 148.4 - 403.4

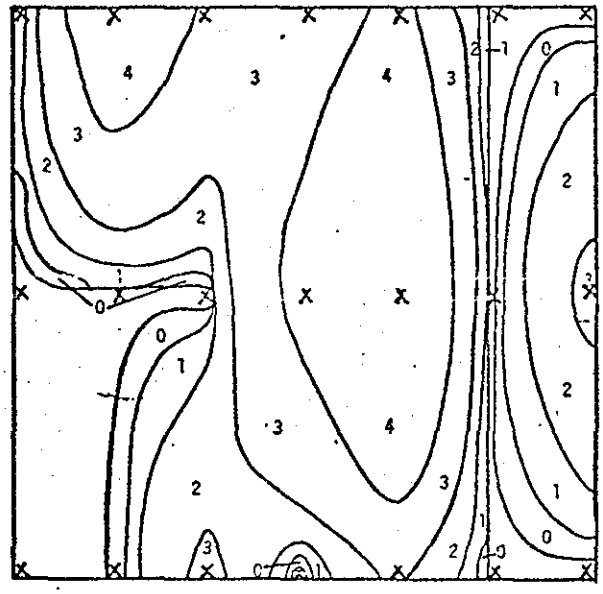
6 = 403.4 - 1096.6

none present



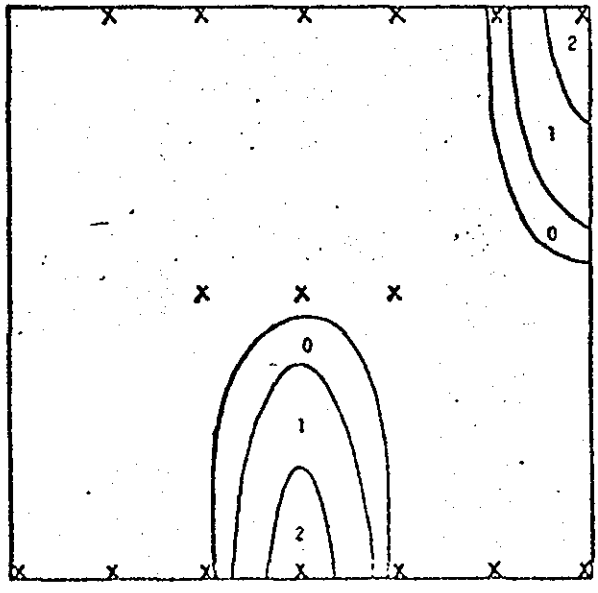
PITAR MORRHUANA
DUMP SITE
JULY 1972

1 = 2.7 - 7.4
2 = 7.4 - 20.1
3 = 20.1 - 54.6
4 = 54.6 - 148.4
5 = 148.4 - 403.4
6 = 403.4 - 1096.6



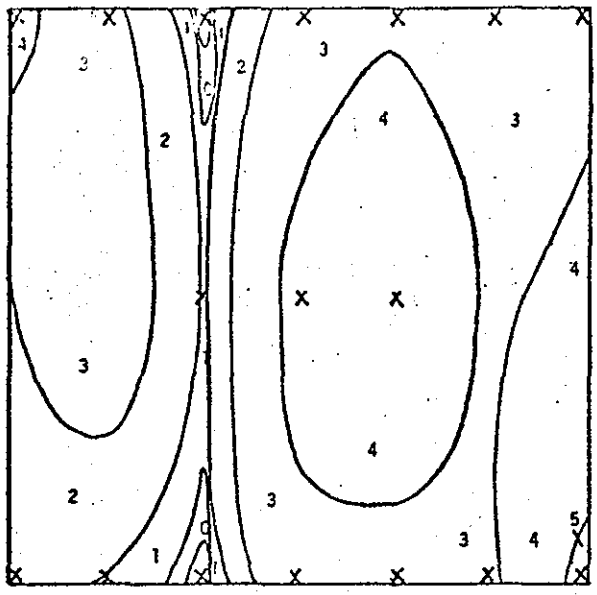
PITAR MORRHUANA
DUMP SITE
JANUARY 1973

0 = 1.0 - 2.7
1 = 2.7 - 7.4
2 = 7.4 - 20.1
3 = 20.1 - 54.6
4 = 54.6 - 148.4



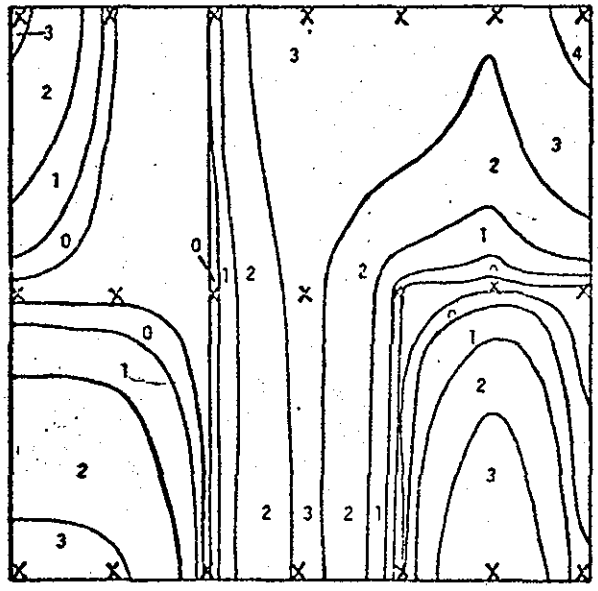
PITAR MORRHUANA
DUMP SITE
JULY 1973

0 = 1.0 - 2.7
1 = 2.7 - 7.4
2 = 7.4 - 20.1



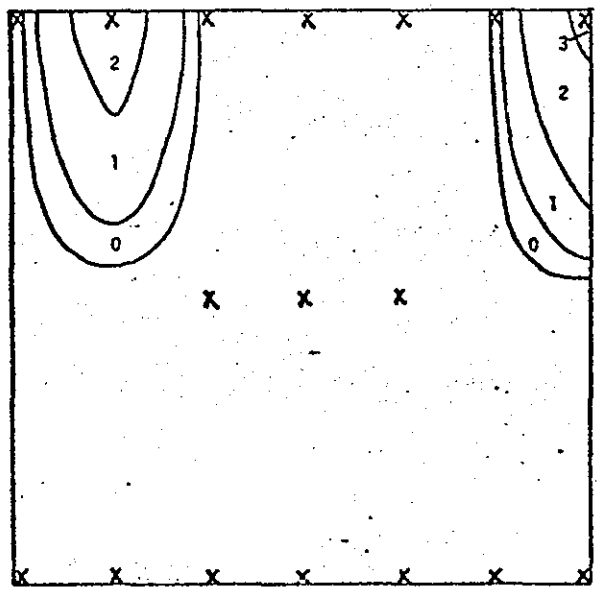
PITAR MORRHUANA
NORTHWEST CONTROL SITE
SEPT. 1972

0 = 1.0 - 2.7
1 = 2.7 - 7.4
2 = 7.4 - 20.1
3 = 20.1 - 54.6
4 = 54.6 - 148.4



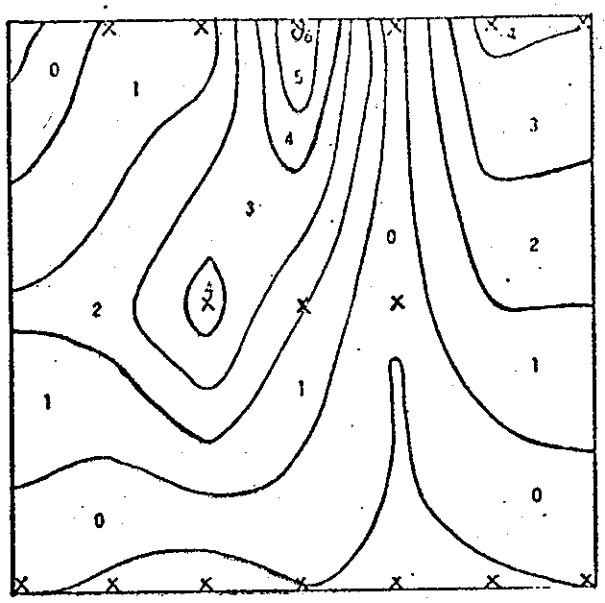
PITAR MORRHUANA
NORTHWEST CONTROL SITE
JANUARY 1973

0 = 1.0 - 2.7
1 = 2.7 - 7.4
2 = 7.4 - 20.1
3 = 20.1 - 54.6
4 = 54.6 - 148.4



PITAR MORRHUANA
NORTHWEST CONTROL SITE
JULY 1973

0 = 1.0 - 2.7
1 = 2.7 - 7.4
2 = 7.4 - 20.1
3 = 20.1 - 54.6



YOLDIA LIMATULA

DUMP SITE

JULY 1972

0 = 12.1 - 36.3

1 = 36.3 - 60.5

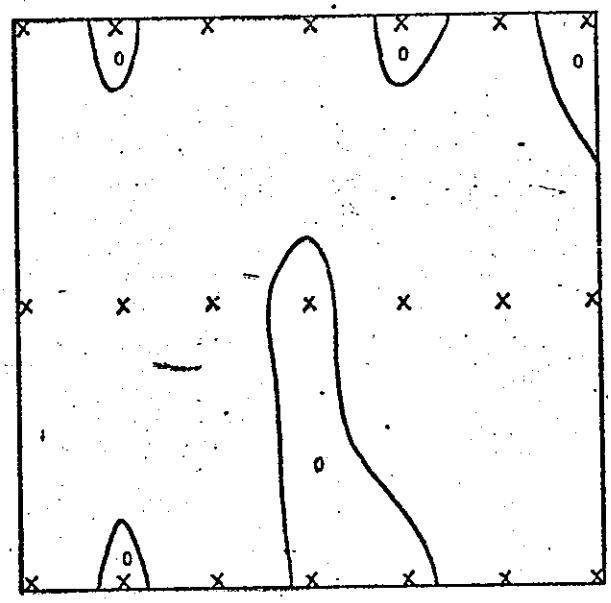
2 = 60.5 - 84.7

3 = 84.7 - 108.9

4 = 108.9 - 133.1

5 = 133.1 - 157.3

6 = 157.3 - 181.5



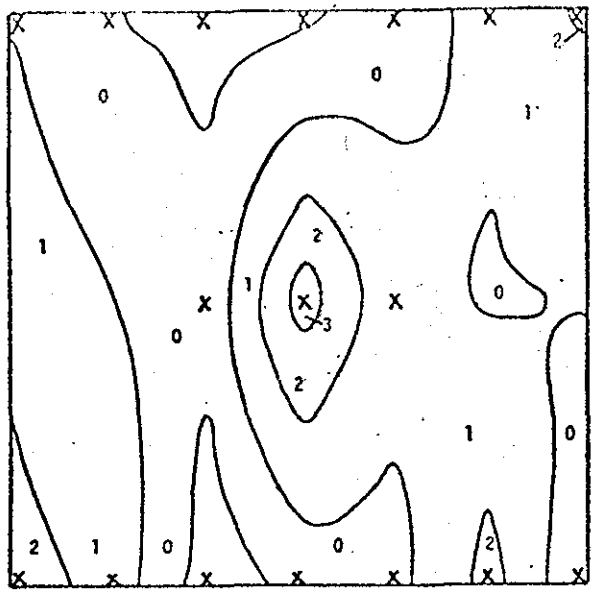
YOLDIA LIMATULA

DUMP SITE

JANUARY 1973

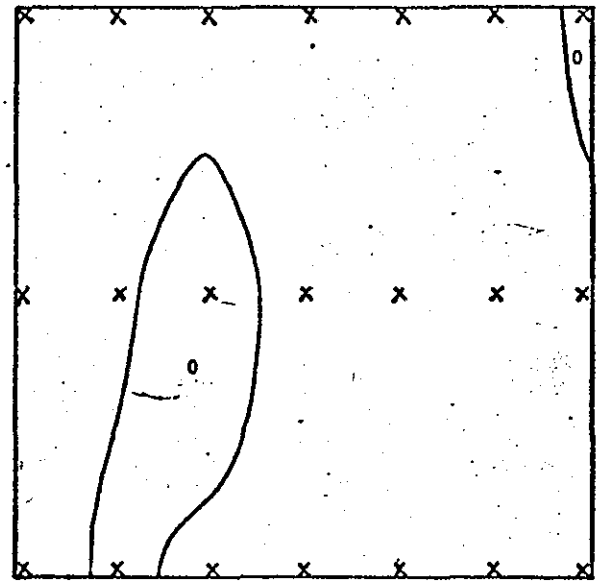
0 = 12.1 - 36.3

Number fewer than
Class 0 abundance



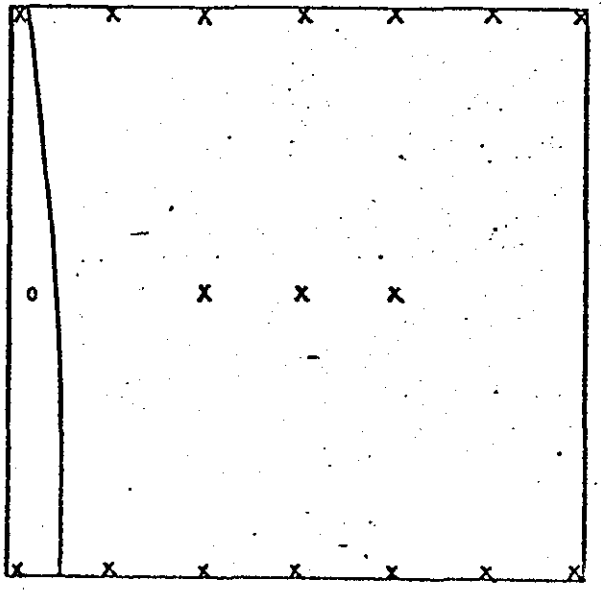
YOLDIA LIMATULA
SOUTH CONTROL SITE
JULY 1972

0 = 12.1 - 36.3
1 = 36.3 - 60.5
2 = 60.5 - 84.7
3 = 84.7 - 108.9



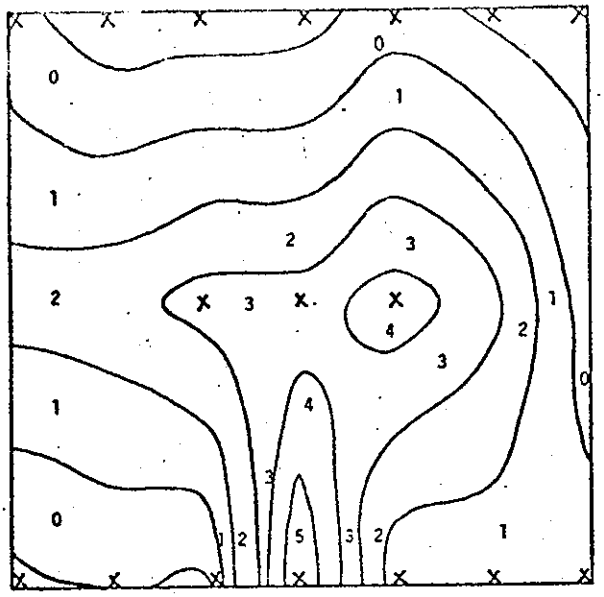
YOLDIA LIMATULA
SOUTH CONTROL SITE
JANUARY 1973

0 = 12.1 - 36.3



YOLDIA LIMATULA
SOUTH CONTROL SITE
JULY 1973

0 = 12.1 - 36.3



YOLDIA LIMATULA

NORTHWEST CONTROL SITE

SEPT. 1972

0 = 12.1 - 36.3

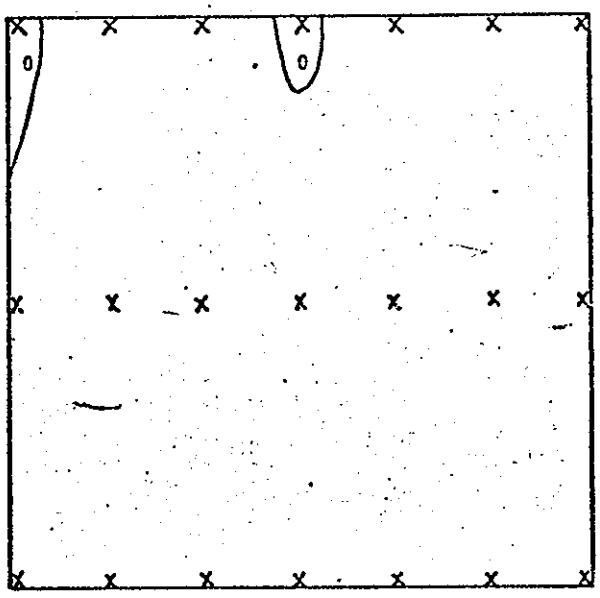
1 = 36.3 - 60.5

2 = 60.5 - 84.7

3 = 84.7 - 108.9

4 = 108.9 - 133.1

5 = 133.1 - 157.3

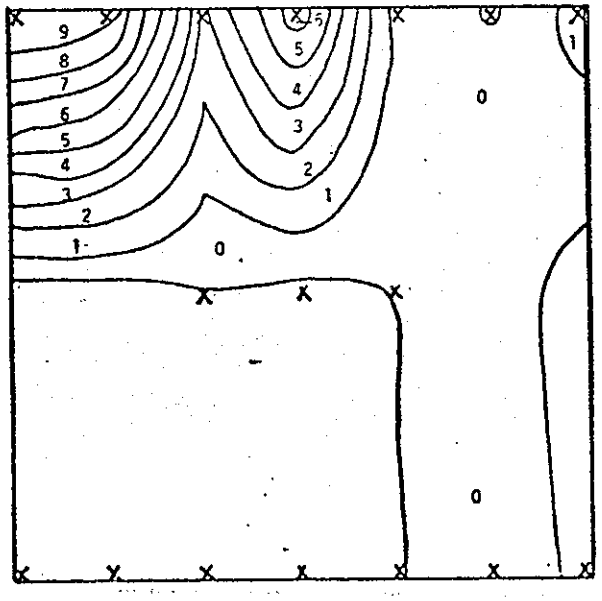


YOLDIA LIMATULA

NORTHWEST CONTROL SITE

JANUARY 1973

0 = 12.1 - 36.3



YOLDIA LIMATULA

NORTHWEST CONTROL SITE

JULY 1973

0 = 12.1 - 36.3

1 = 36.3 - 60.5

2 = 60.5 - 84.7

3 = 84.7 - 108.9

4 = 108.9 - 133.1

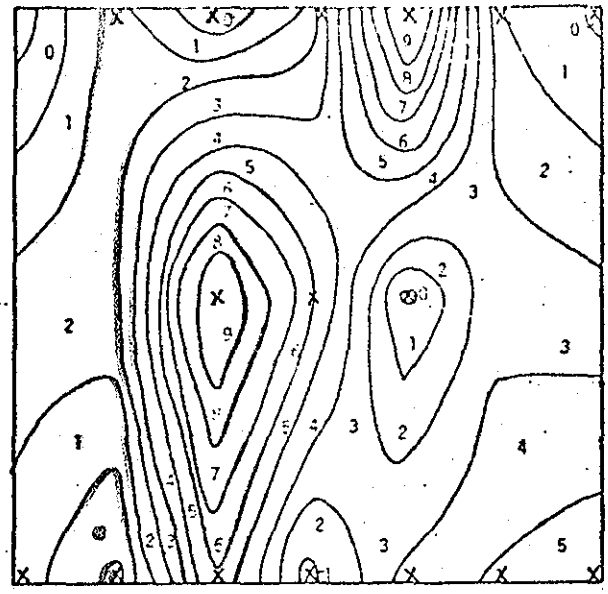
5 = 133.1 - 157.3

6 = 157.3 - 181.5

7 = 181.5 - 205.7

8 = 205.7 - 229.9

9 = 229.9 - 254.1

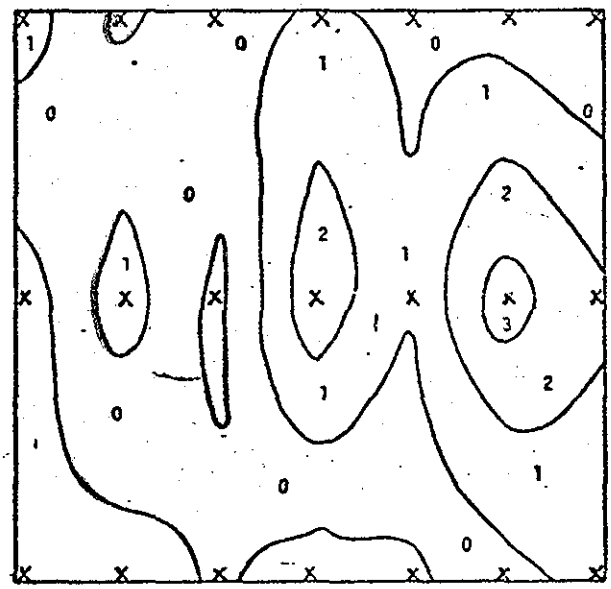


PANDORA GOULDIANA

DUMP SITE

JULY 1972

0 = 12.1 - 36.3
1 = 36.3 - 60.5
2 = 60.5 - 84.7
3 = 84.7 - 108.9
4 = 108.9 - 133.1
5 = 133.1 - 157.3
6 = 157.3 - 181.5
7 = 181.5 - 205.7
8 = 205.8 - 229.9
9 = 229.9 - 254.1



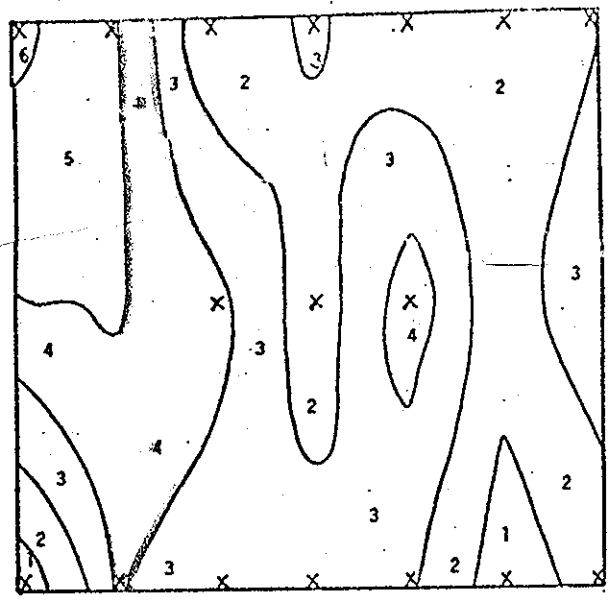
PANDORA GOULDIANA

DUMP SITE

JANUARY 1973

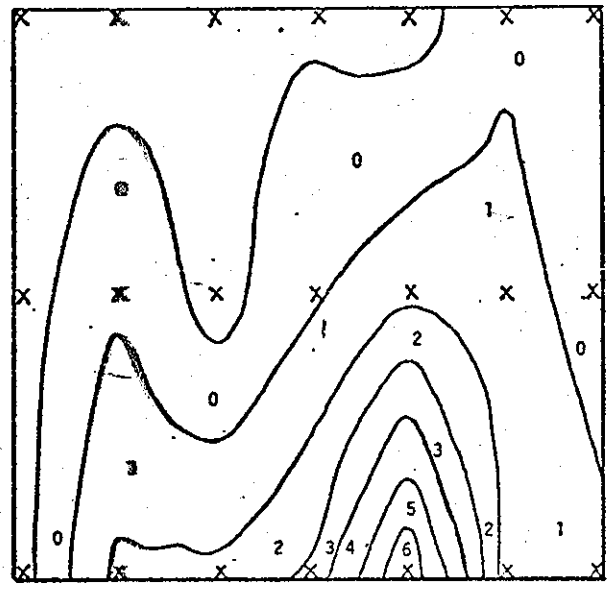
0 = 12.1 - 36.3
1 = 36.3 - 60.5
2 = 60.5 - 84.7
3 = 84.7 - 108.9

none present



PANDORA GOULDIANA
SOUTH CONTROL SITE
JULY 1972

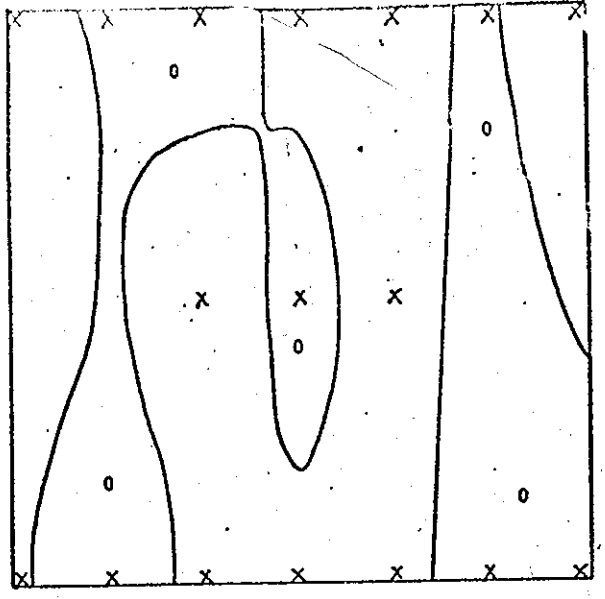
1 = 36.6 - 60.5
2 = 60.5 - 84.7
3 = 84.7 - 108.9
4 = 108.9 - 133.1
5 = 133.1 - 157.3
6 = 157.3 - 181.5



PANDORA GOULDIANA
SOUTH CONTROL SITE
JANUARY 1973

0 = 12.1 - 36.3
1 = 36.3 - 60.5
2 = 60.5 - 84.7
3 = 84.7 - 108.9
4 = 108.9 - 133.1
5 = 133.1 - 157.3
6 = 157.3 - 181.5

none present



PANDORA GOULDIANA

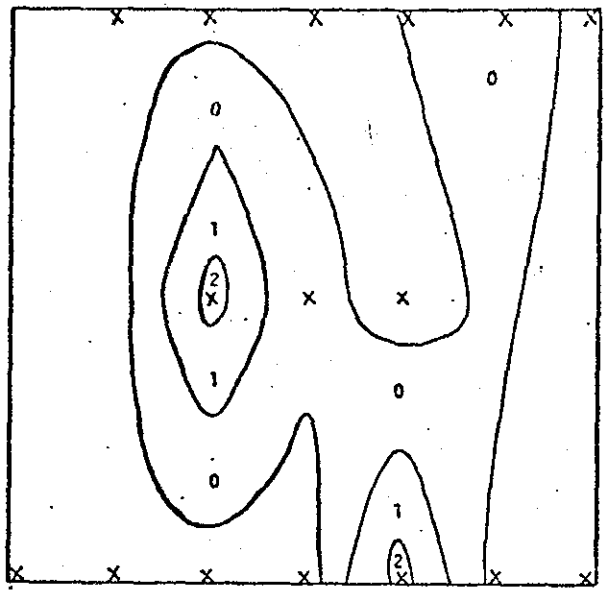
NORTHWEST CONTROL SITE

SEPT. 1972

0 = 12.1 - 36.3

none present

Number fewer than
Class 0 abundance



MASSARIUS TRIVITTATUS

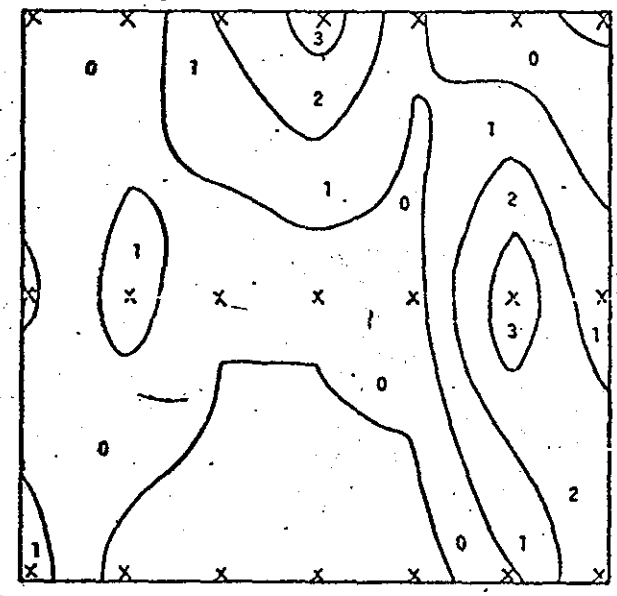
DUMP SITE

JULY 1972

0 = 12.1 - 36.3

1 = 36.3 - 60.5

2 = 60.5 - 84.7



MASSARIUS TRIVITTATUS

DUMP SITE

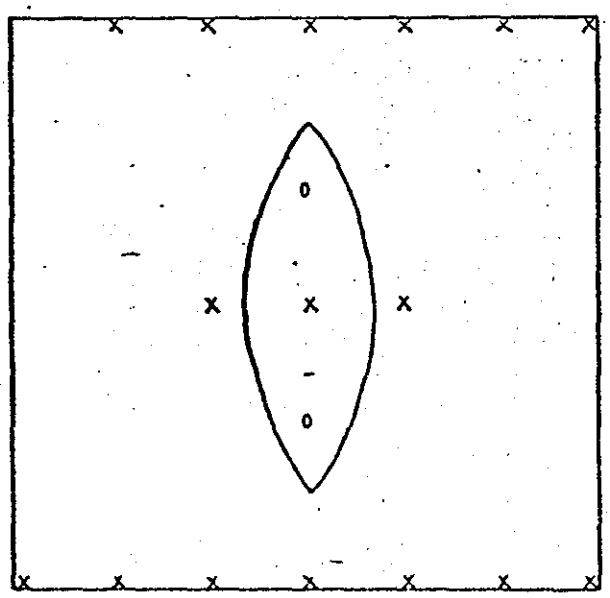
JANUARY 1973

0 = 12.1 - 36.3

1 = 36.3 - 60.5

2 = 60.5 - 84.7

3 = 84.7 - 108.9

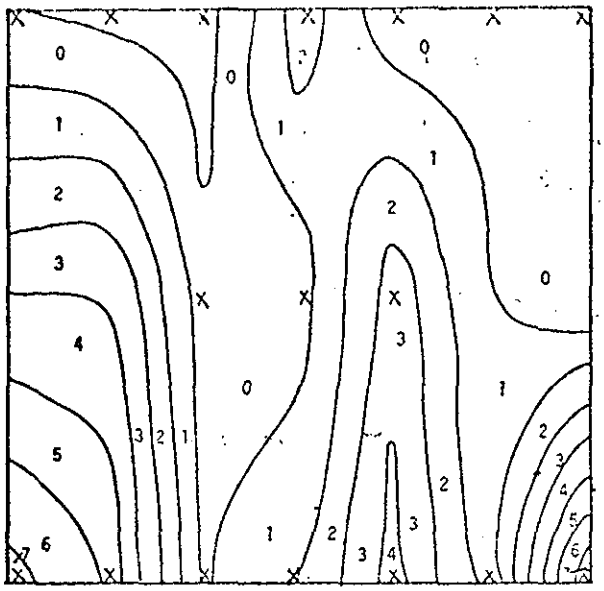


MASSARIUS TRIVITTATUS

DUMP SITE

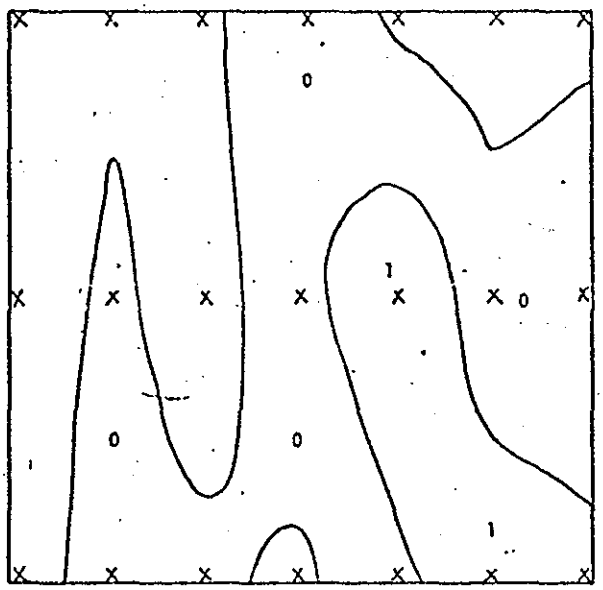
JULY 1973

0 = 12.1 - 36.3



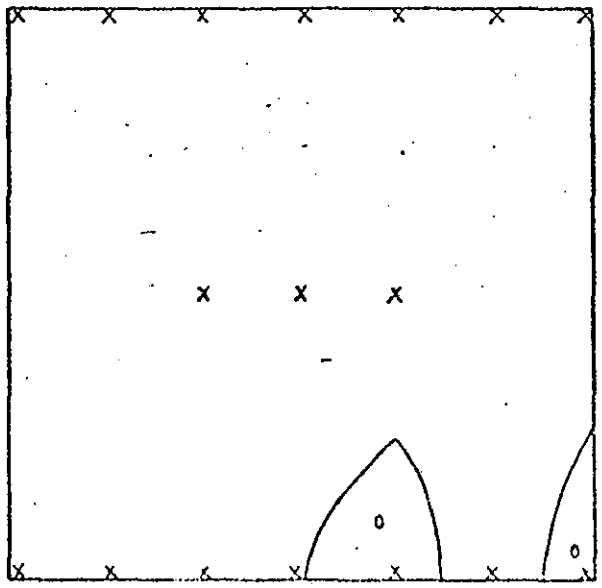
NASSARIUS TRIVITTATUS
SOUTH CONTROL SITE
JULY 1972

0 = 12.1 - 36.3
1 = 36.3 - 60.5
2 = 60.5 - 84.7
3 = 84.7 - 108.9
4 = 108.9 - 133.1
5 = 133.1 - 157.3
6 = 157.3 - 181.5
7 = 181.5 - 205.7



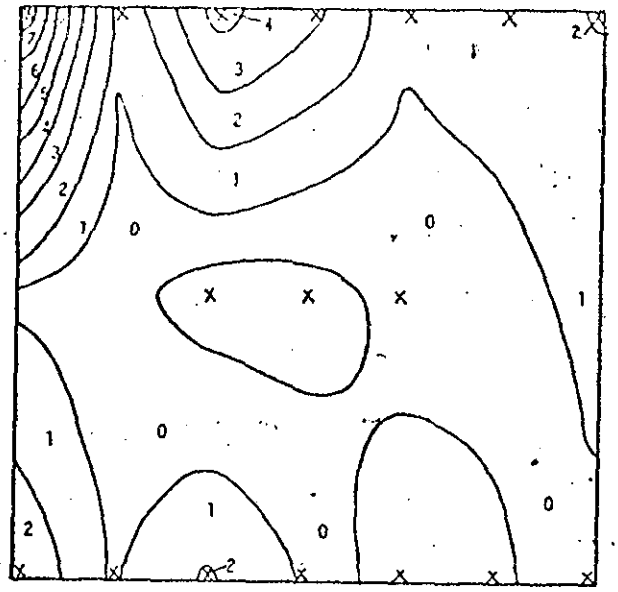
NASSARIUS TRIVITTATUS
SOUTH CONTROL SITE
JANUARY 1973

0 = 12.1 - 36.3
1 = 36.3 - 60.5



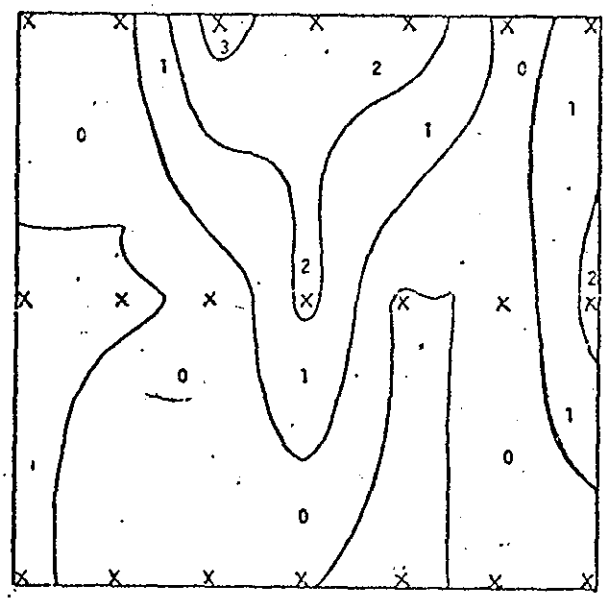
NASSARIUS TRIVITTATUS
SOUTH CONTROL SITE
JULY 1973

0 = 12.1 - 36.3



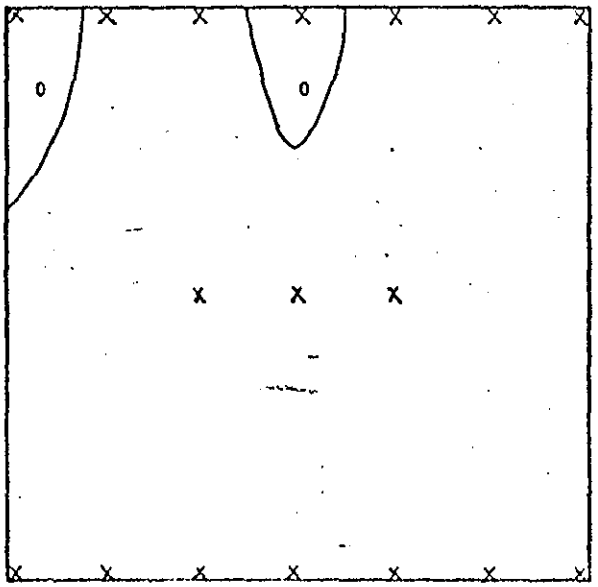
NASSARIUS TRIVITTATUS
NORTHWEST CONTROL SITE
SEPT. 1972

0 = 12.1 - 36.3
1 = 36.3 - 60.5
2 = 60.5 - 84.7
3 = 84.7 - 108.9
4 = 108.9 - 133.1
5 = 133.1 - 157.3
6 = 157.3 - 181.5
7 = 181.5 - 205.7
8 = 205.7 - 229.9



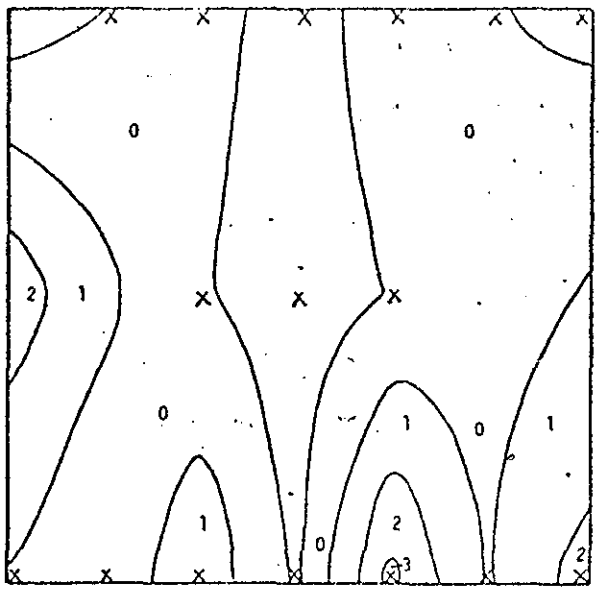
NASSARIUS TRIVITTATUS
NORTHWEST CONTROL SITE
JANUARY 1973

0 = 12.1 - 36.3
1 = 36.3 - 60.5
2 = 60.5 - 84.7
3 = 84.7 - 108.9



NASSARIUS TRIVITTATUS
NORTHWEST CONTROL SITE
JULY 1973

0 = 12.1 - 36.3



RETUSA SP.

DUMP SITE

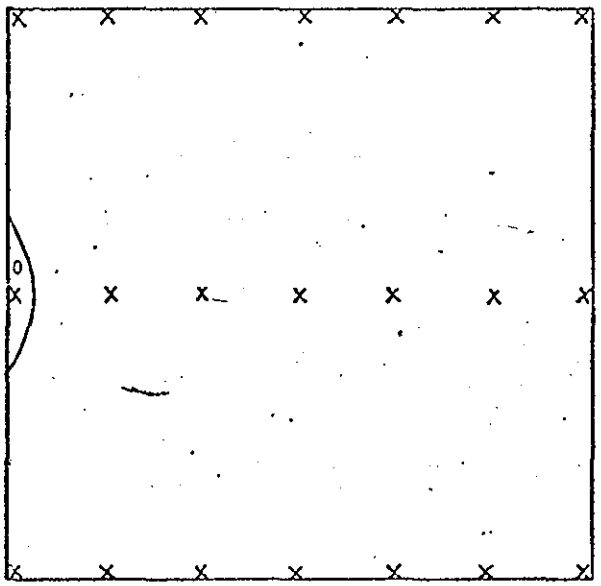
JULY 1972

0 = 12.1 - 36.3

1 = 36.3 - 60.5

2 = 60.5 - 84.7

3 = 84.7 - 108.9



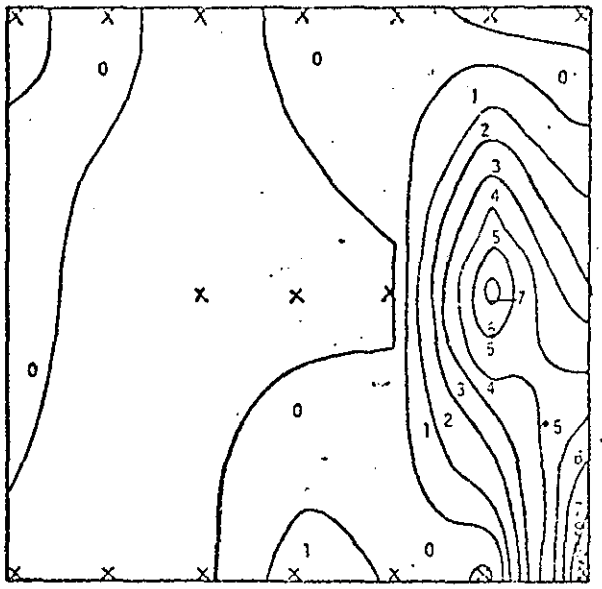
RETUSA SP.

DUMP SITE

JANUARY 1973

0 = 12.1 - 36.3

none present



RETUSA SP.

NORTHWEST CONTROL SITE

SEPT. 1972

0 = 12.1 - 36.3

1 = 36.3 - 60.5

2 = 60.5 - 84.7

3 = 84.7 - 108.9

4 = 108.9 - 133.1

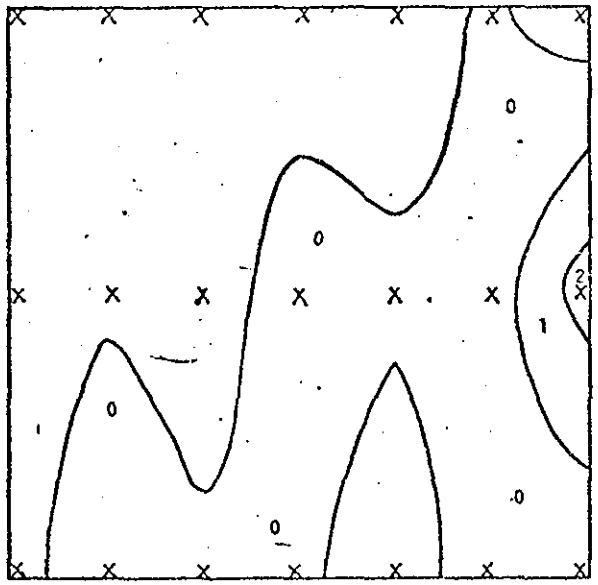
5 = 133.1 - 157.3

6 = 157.3 - 181.5

7 = 181.5 - 205.7

8 = 205.7 - 229.9

9 = 229.9 - 254.1



RETUSA SP.

NORTHWEST CONTROL SITE

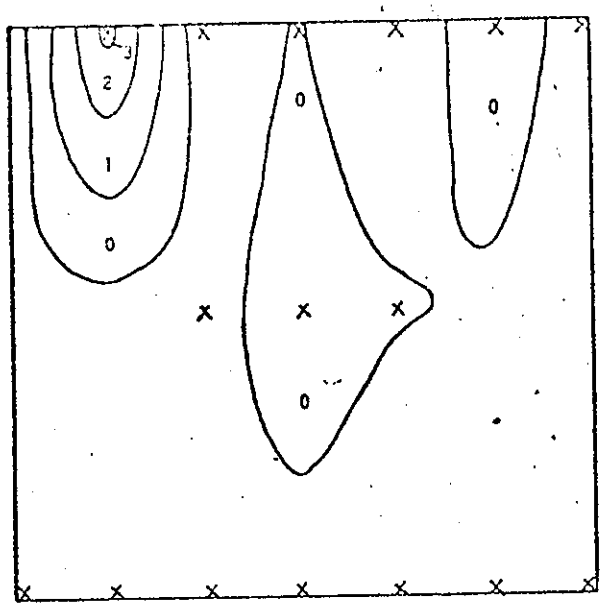
JANUARY 1973

0 = 12.1 - 36.3

1 = 36.3 - 60.5

2 = 60.5 - 84.7

none present



MACOMA TENTA

DUMP SITE

JULY 1972

0 = 12.1 - 36.3

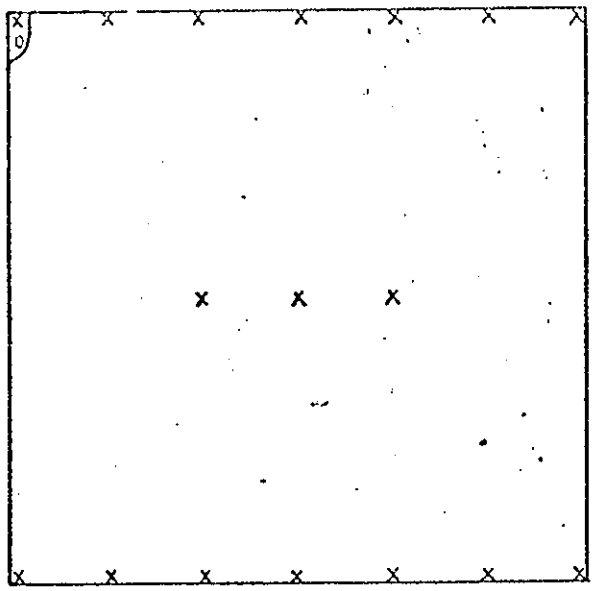
1 = 36.3 - 60.5

2 = 60.5 - 84.7

3 = 84.7 - 108.9

Number fewer than
Class 0 abundance

none present



MACOMA TENTA

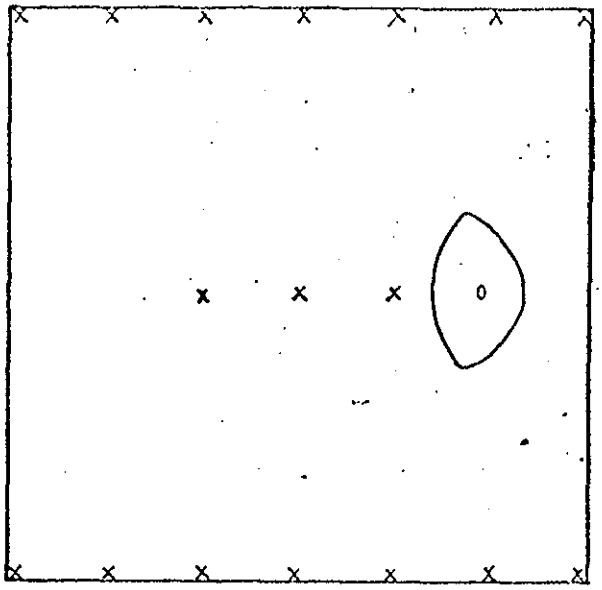
SOUTH CONTROL SITE

JULY 1972

0 = 12.1 - 36.3

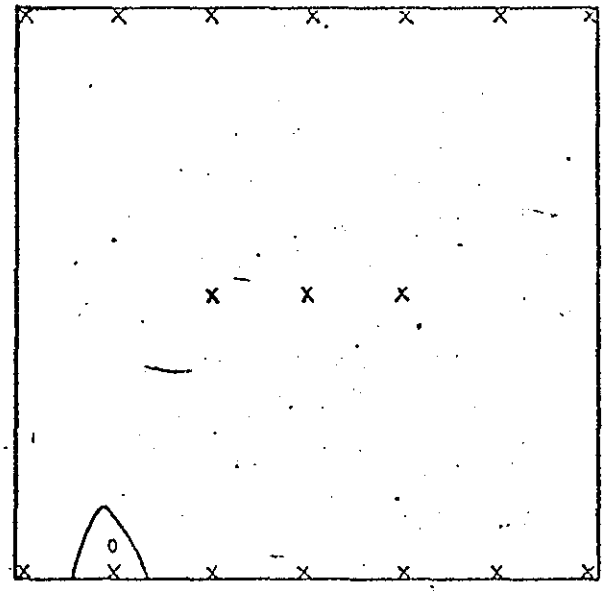
none present

none present



MACOMA TENTA
NORTHWEST CONTROL SITE
SEPT. 1972

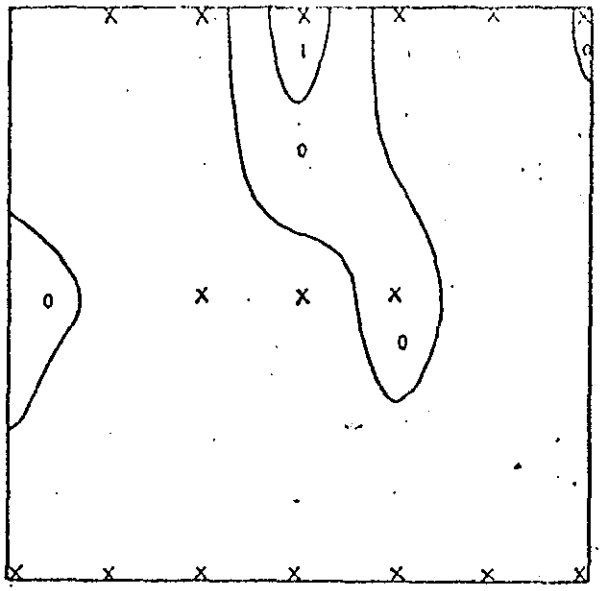
0 = 12.1 - 36.3



MACOMA TENTA
NORTHWEST CONTROL SITE
JANUARY 1973

0 = 12.1 - 36.3

none present



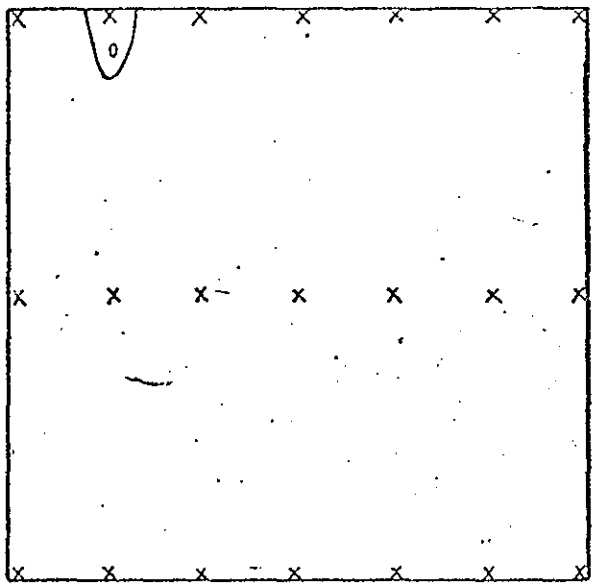
TELLINA AGILIS

DUMP SITE

JULY 1972

0 = 12.1 - 36.3

1 = 36.3 - 60.5



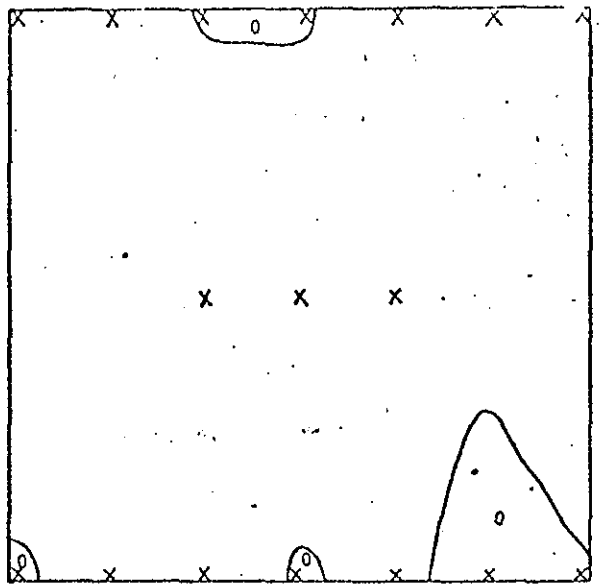
TELLINA AGILIS

DUMP SITE

JANUARY 1973

0 = 12.1 - 36.3

none present



TELLINA AGILIS

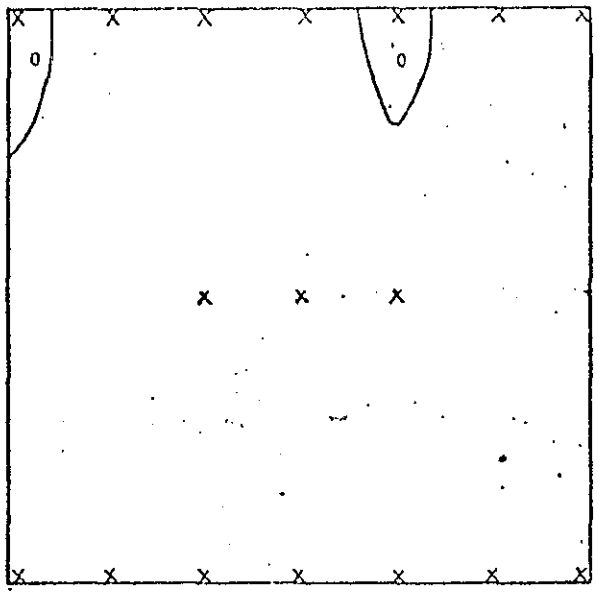
SOUTH CONTROL SITE

JULY 1972

0 = 12.1 - 36.3

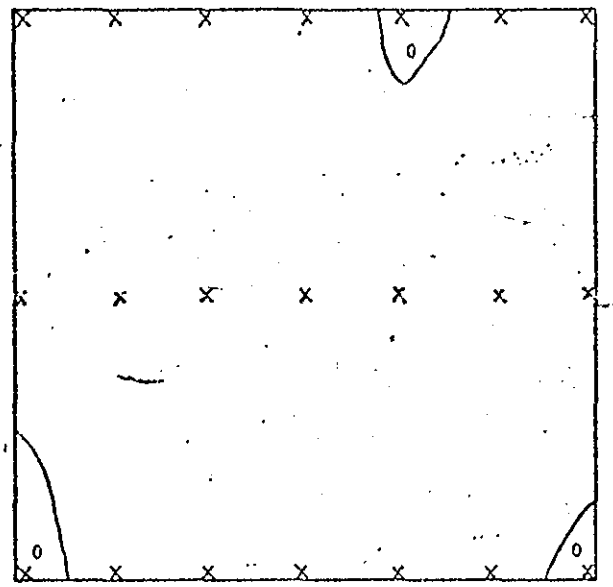
Number fewer than
Class 0 abundance

none present



TELLINA AGILIS
NORTHWEST CONTROL SITE
SEPT. 1972

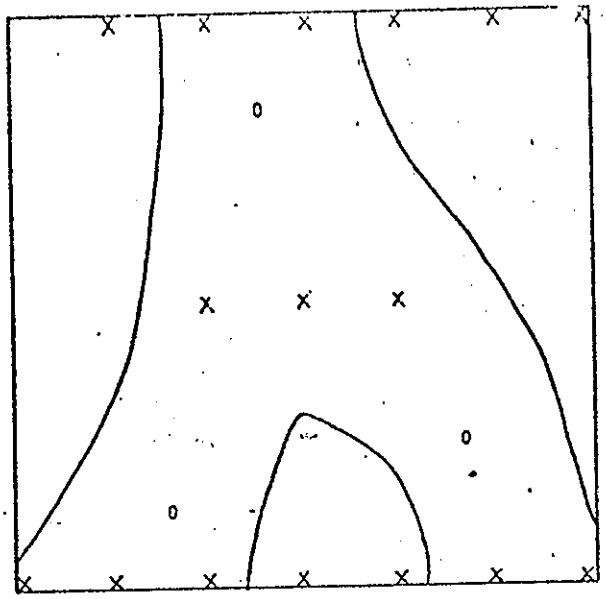
0 = 12.1 - 36.3



TELLINA AGILIS
NORTHWEST CONTROL SITE
JANUARY 1973

0 = 12.1 - 36.3

none present



PETRICOLA PHOLADIFORMIS

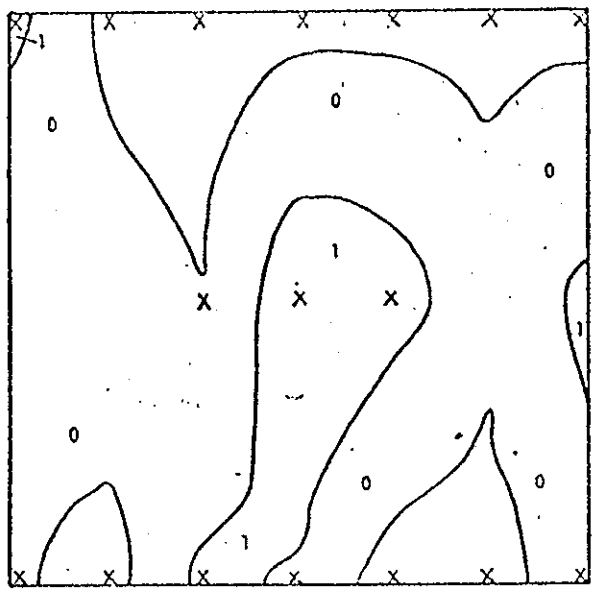
DUMP SITE

JULY 1972

0 = 12.1 - 36.3

none present

none present



PETRICOLA PHOLADIFORMIS

SOUTH CONTROL SITE

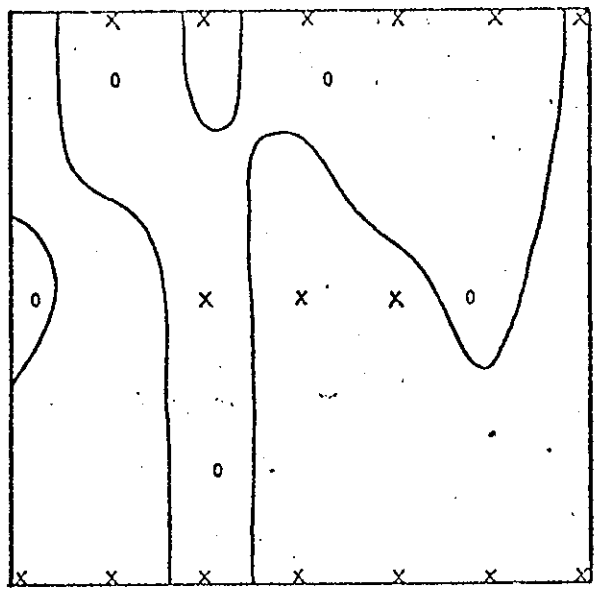
JULY 1972

0 = 12.1 - 36.3

1 = 36.3 - 60.5

Number fewer than
Class 0 abundance

none present



LYONSIA HYALINA

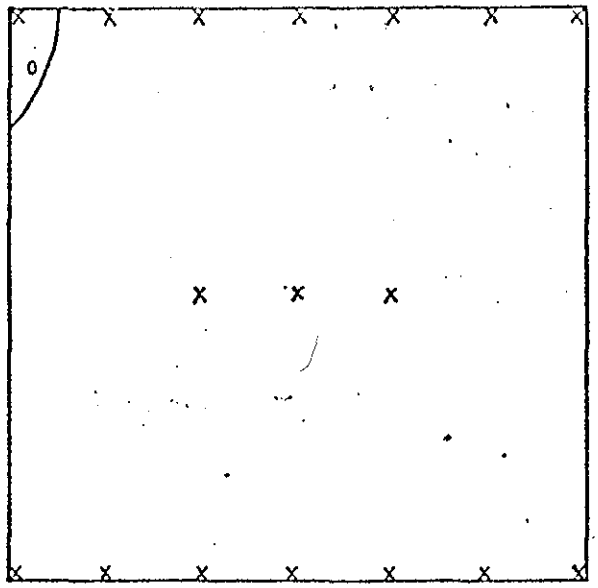
DUMP SITE

JULY 1972

0 = 12.1 - 36.3

none present

none present



LYONSIA HYALINA

SOUTH CONTROL SITE

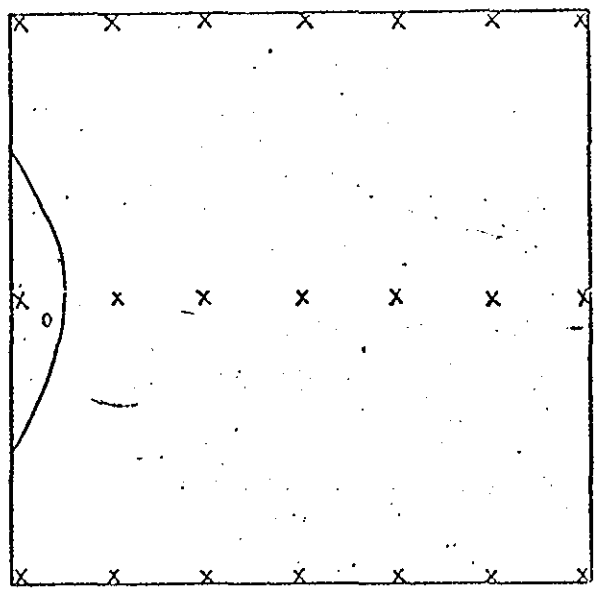
JULY 1972

0 = 12.1 - 36.3

none present

none present

Number fewer than
Class 0 abundance



PERIPLOMA PAPYRATIUM

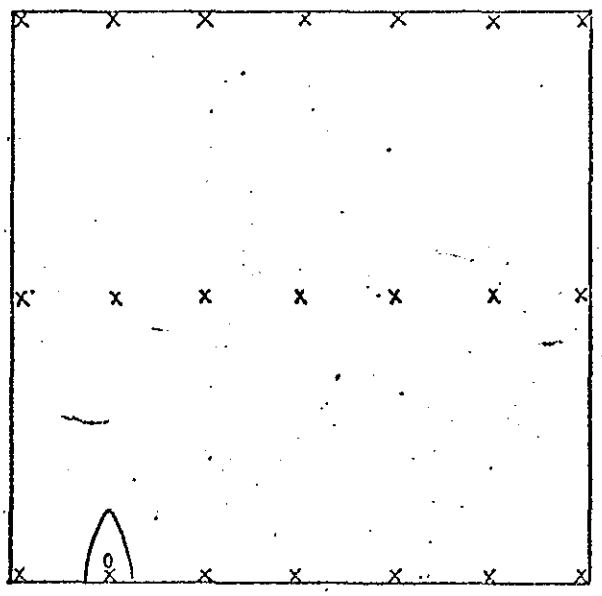
DUMP SITE

JANUARY 1973

0 = 12.1 - 36.3

none present

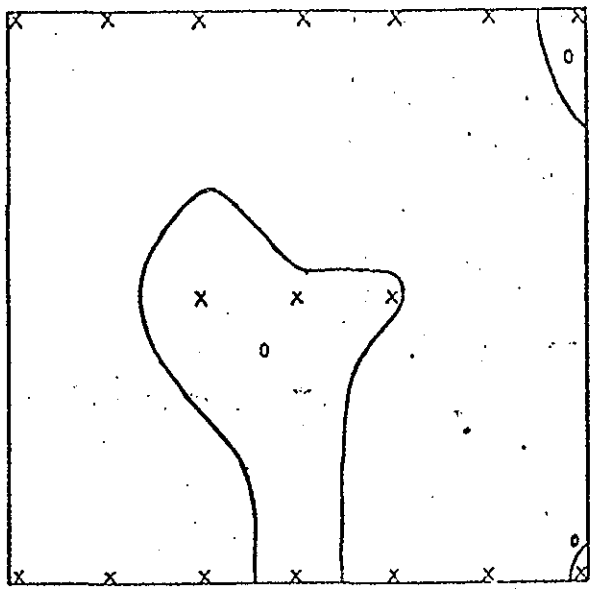
Number fewer than
Class 0 abundance



PERIPLOMA PAPYRATIUM
SOUTH CONTROL SITE
JANUARY 1973

0 = 12.1 - 36.3

none present



ENSIS DIRECTUS

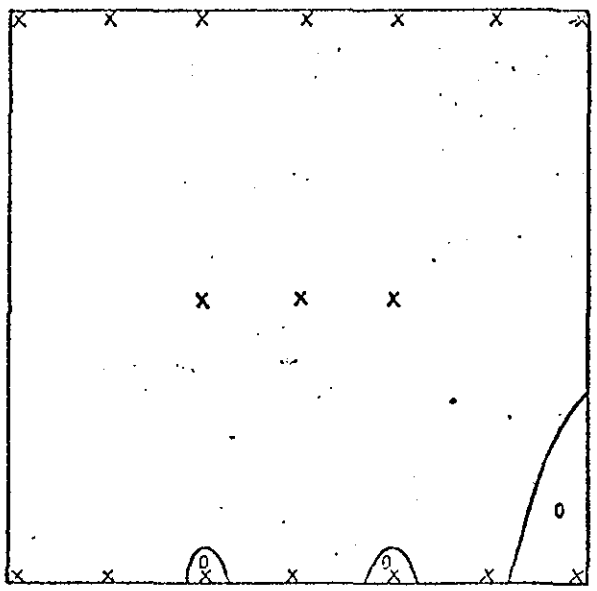
SOUTH CONTROL SITE

JULY 1972

0 = 12.1 - 36.3

-none present

none present



LORA SCALARIS

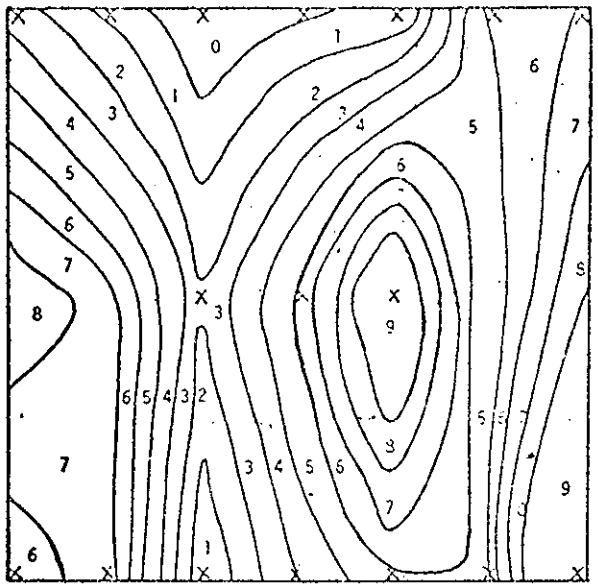
SOUTH CONTROL SITE

JULY 1972

0 = 12.1 - 36.3

none present

none present



RETUSA SP.

SOUTH CONTROL SITE

JULY 1972

0 = 12.1 - 36.3
1 = 36.3 - 60.5
2 = 60.5 - 84.7
3 = 84.7 - 108.9
4 = 108.9 - 133.1
5 = 133.1 - 157.3
6 = 157.3 - 181.5
7 = 181.5 - 205.7
8 = 205.7 - 229.9
9 = 229.9 - 254.1

none present

none present