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Preliminary Estimates of Copepod Extrusion from 0.333 mm and 0.165 mm Mesh Plankton Nets

by

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ICNAF larval herring survey stations were selected from Albatross IV 75-02 (February 1975) in order to estimate extrusion of copepods from .333 and .165 mm meshed plankton nets (see Figure 15). The objective was to find the lower size limit of copepods that can be adequately sampled by .165 and .333 meshed nets.

The standard ICNAF tow profile was used in collecting these samples and the four net meshes used were: .505, .333, .165, and .053 mm. Use of the .053 mm meshed net allows for estimating extrusion from the .165 mm net. Since .053 nets clog easily a February cruise was selected since there is less clogging due to phytoplankton during this time of year. Furthermore, only those .053 and .165 samples which showed no clogging on a plot of flowmeter revolutions vs tow duration were used in the analysis.

For estimating 0.333 extrusion, the measure of copepod size used was metasomal length of Pseudocalanus sp. copepodites. It is assumed here that other dominant copepod species will be extruded in a fashion similar to Pseudocalanus since there are similarities in general body form (length/weight ratios) among these groups. Abundance (no. per $10m^3$) of copepodid stages from the 0.165 mm samples are plotted in Fig. 1-5. The length scale of these Figures corresponds to the actual mean metasomal length of copepodites recorded in another study (Davis, 1977)[1/]. Both relative and absolute abundances (no. per $10\ m^3$) of copepodids change with station. To determine the size of copepod extruded from the 0.333 net, the cumulative distributions of copepodid stages from the 0.165 mm samples were plotted (Fig. 6-10) from largest to smallest copepodids using the same length as in Fig. 1-5. Abundances (no. per $10m^3$) of total Pseudocalanus sp. (the only measure available since the .333 samples were not sorted to stage for this cruise) as estimated from .333 mesh tows are shown in these figures as a solid horizontal line. Although the relative and absolute abundances of copepodids change with station, total Pseudocalanus sp. captured by the .333 meshed net predominantly falls in between the fifth stage and adult, corresponding to a metasomal length between .9 and 1.0 mm. This is the lower size limit of copepod which can be retained adequately by the .333 meshed net.

Extrusion from .165 meshed nets was estimated in two steps. First, the abundance (no. per $10m^3$) of Pseudocalanus sp. copepodid I was found for the seven .053 stations sorted. These were compared by a paired "t" test to C-I abundance estimates from the .165 net. There was no significant difference between nets ($t = 0.1939$). Therefore, the lower size limit for complete retention is smaller than C-I Pseudocalanus sp., i.e. less than 0.4 mm. A closer approximation to this lower limit was made by measuring the size distribtuion of nauplii in three .053 samples (shown in Figures 11 and 12) and comparing their cumulative abundance with the total abundance (per $10m^3$) of nauplii from the .165 samples in the same way as for the .333 samples. This is shown in Figures 13 and 14. Approxi-

1/ Davis, Cabell. 1977. Length/weight relations in the copepod Pseudocalanus minutus on Georges Bank. Unpublished data report, 20 pp. Northeast Fisheries Center, Woods Hole.

mate measures of extruded body size were found using linear interpolation between adjacent size classes. The mean and standard deviation of these independent measures of extruded size are:

$$\bar{X} \pm 2S.D. = .26 \text{ mm} \pm .08 \text{ mm}$$

These measures are only rough approximations and should only be used in a general way. More extensive measuring and sorting will be required to pinpoint the extruded sizes more precisely.

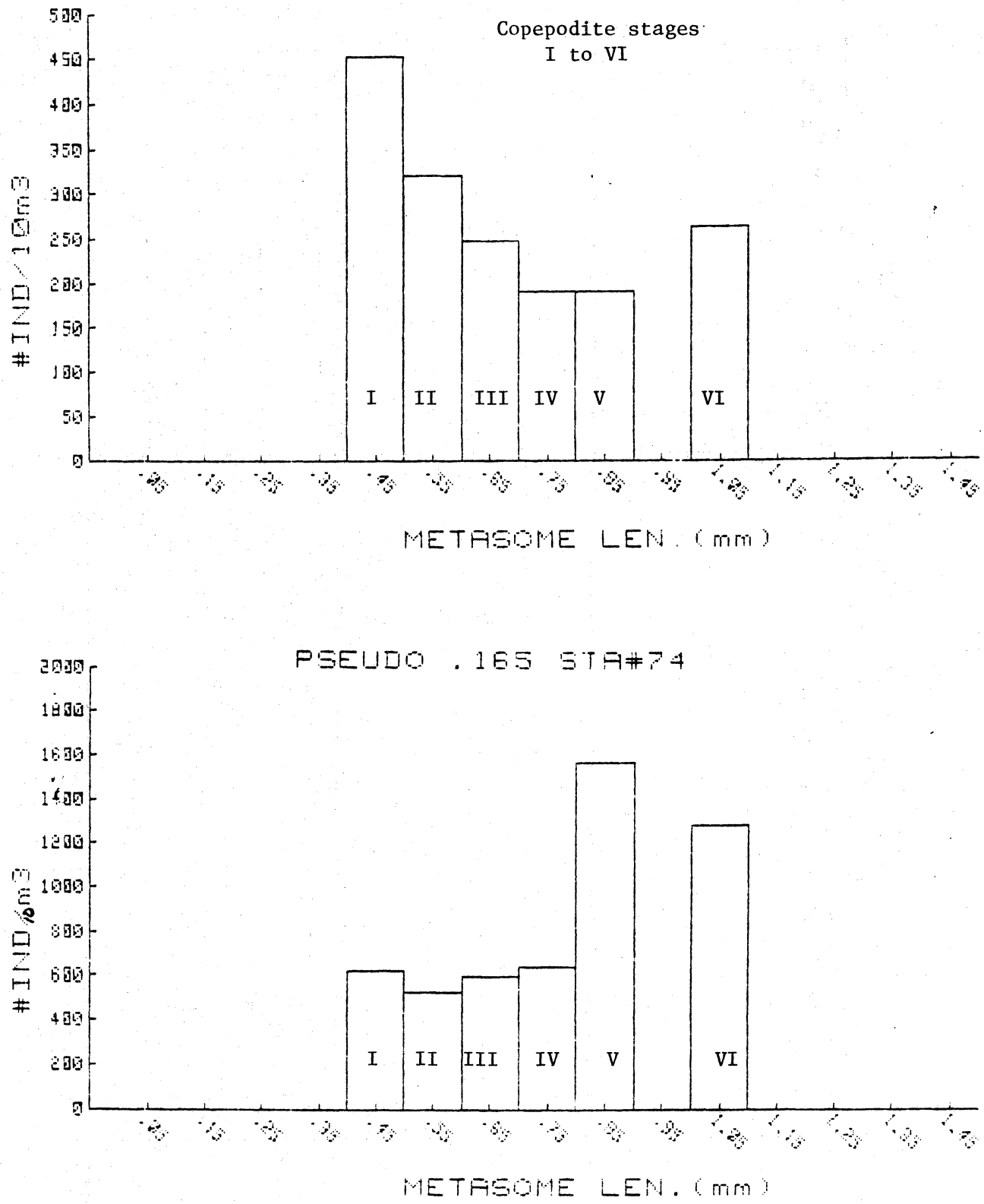
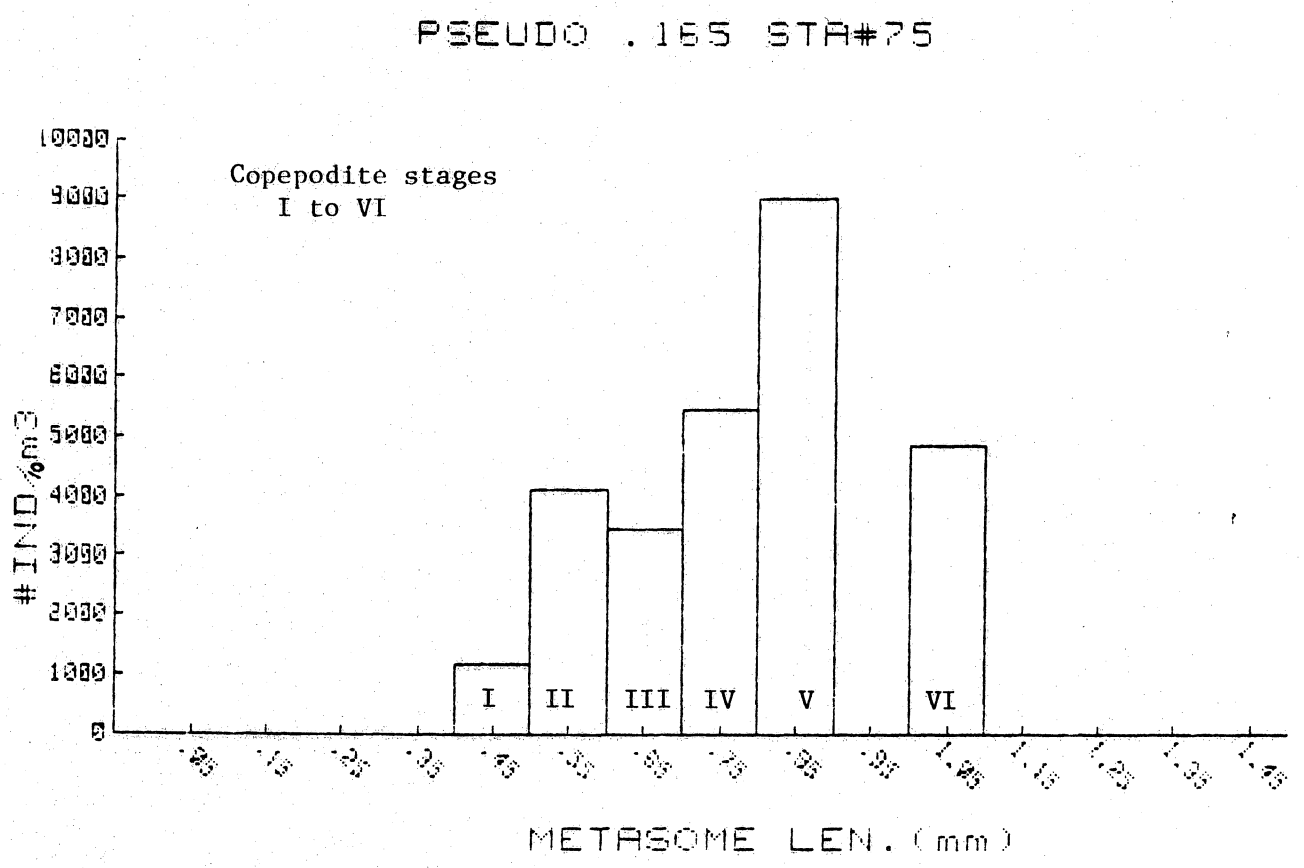

PSEUDO .165 STA#21
Copepodite stages
I to VI
#IND/10m3
500
450
400
350
300
250
200
150
100
50
0
I
II
III
IV
V
VI
METASOME LEN. (mm)
PSEUDO .165 STA#74
#IND/m3
2000
1800
1600
1400
1200
1000
800
600
400
200
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

Fig. 1


PSEUDO .165 STA#75
Copepodite stages
I to VI
#IND/m3
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

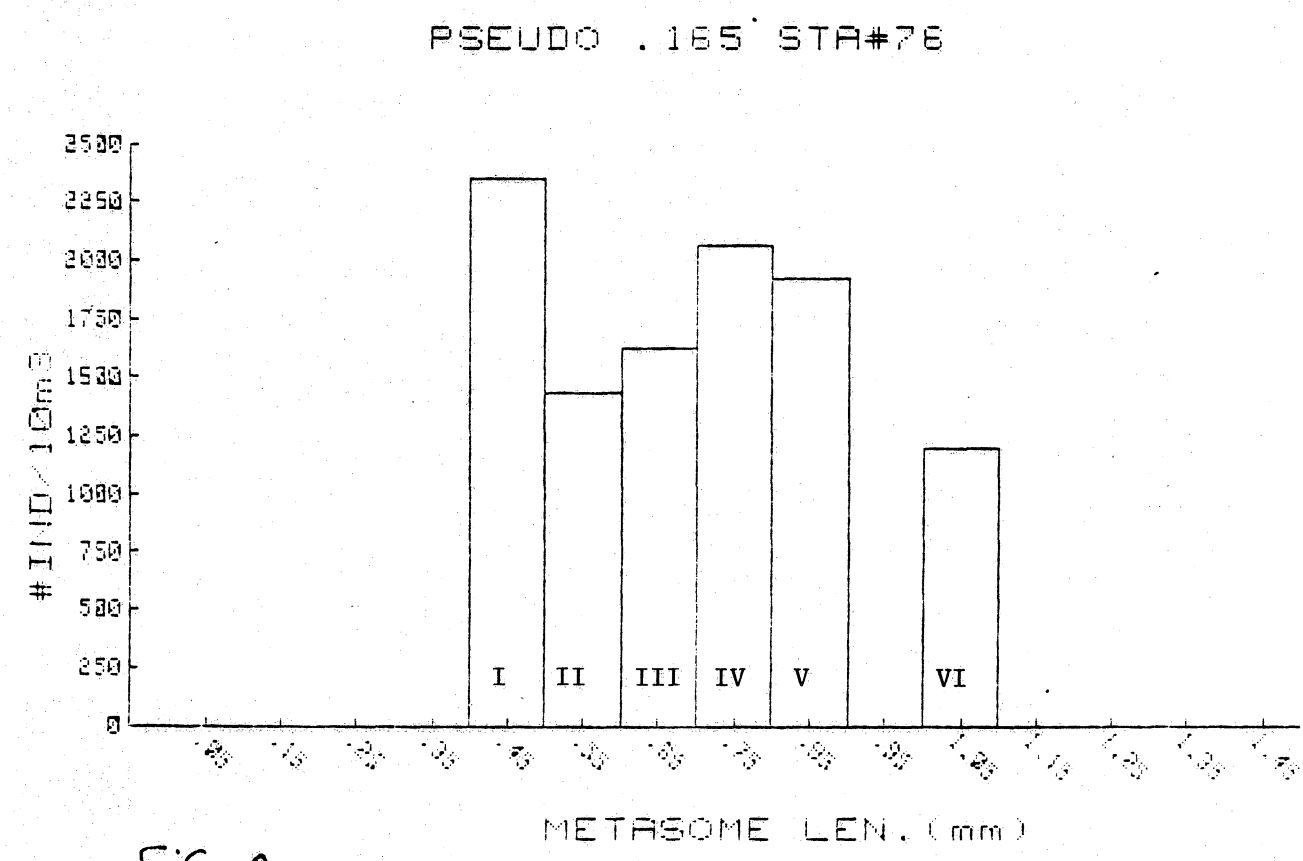

PSEUDO .165 STA#76
#IND/10m3
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

FiG. 2

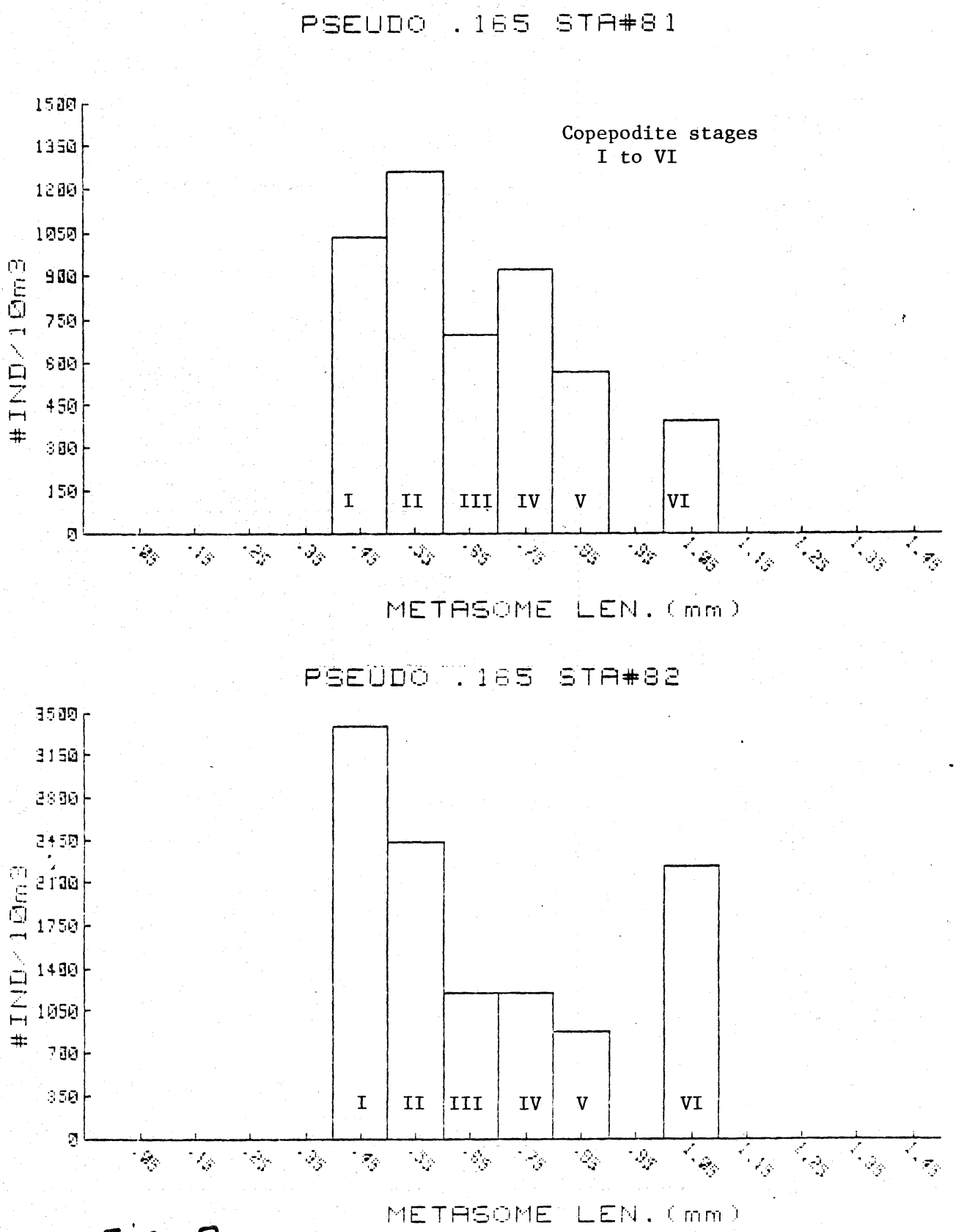
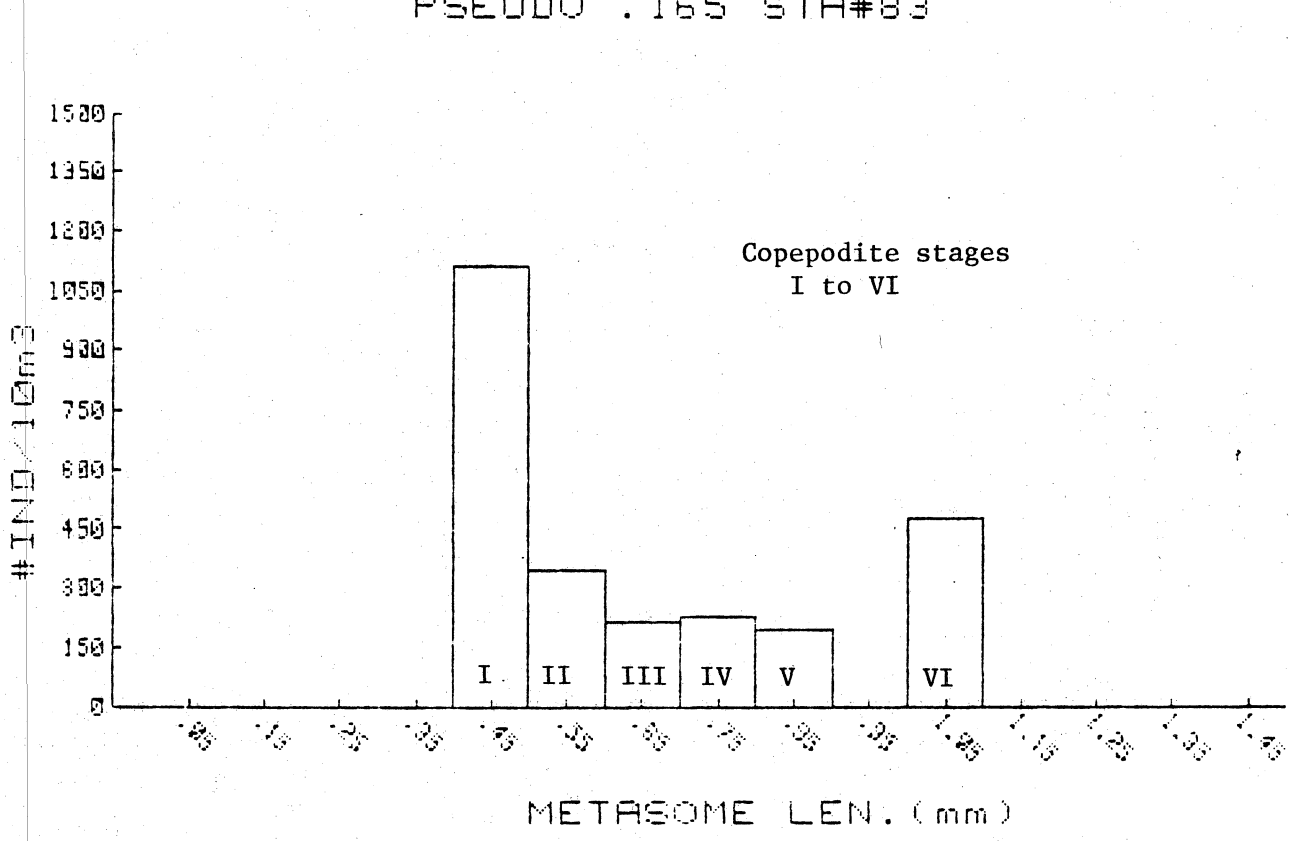

PSEUDO .165 STA#81
Copepodite stages
I to VI
#IND/10m3
1500
1350
1200
1050
900
750
600
450
300
150
0
I
II
III
IV
V
VI
METASOME LEN. (mm)
PSEUDO .185 STA#82
#IND/10m3
3500
3150
2800
2450
2100
1750
1400
1050
700
350
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

FIG. 3


PSEUDO .165 STA#83
Copepodite stages
I to VI
#IND/10m3
1500
1350
1200
1050
900
750
600
450
300
150
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

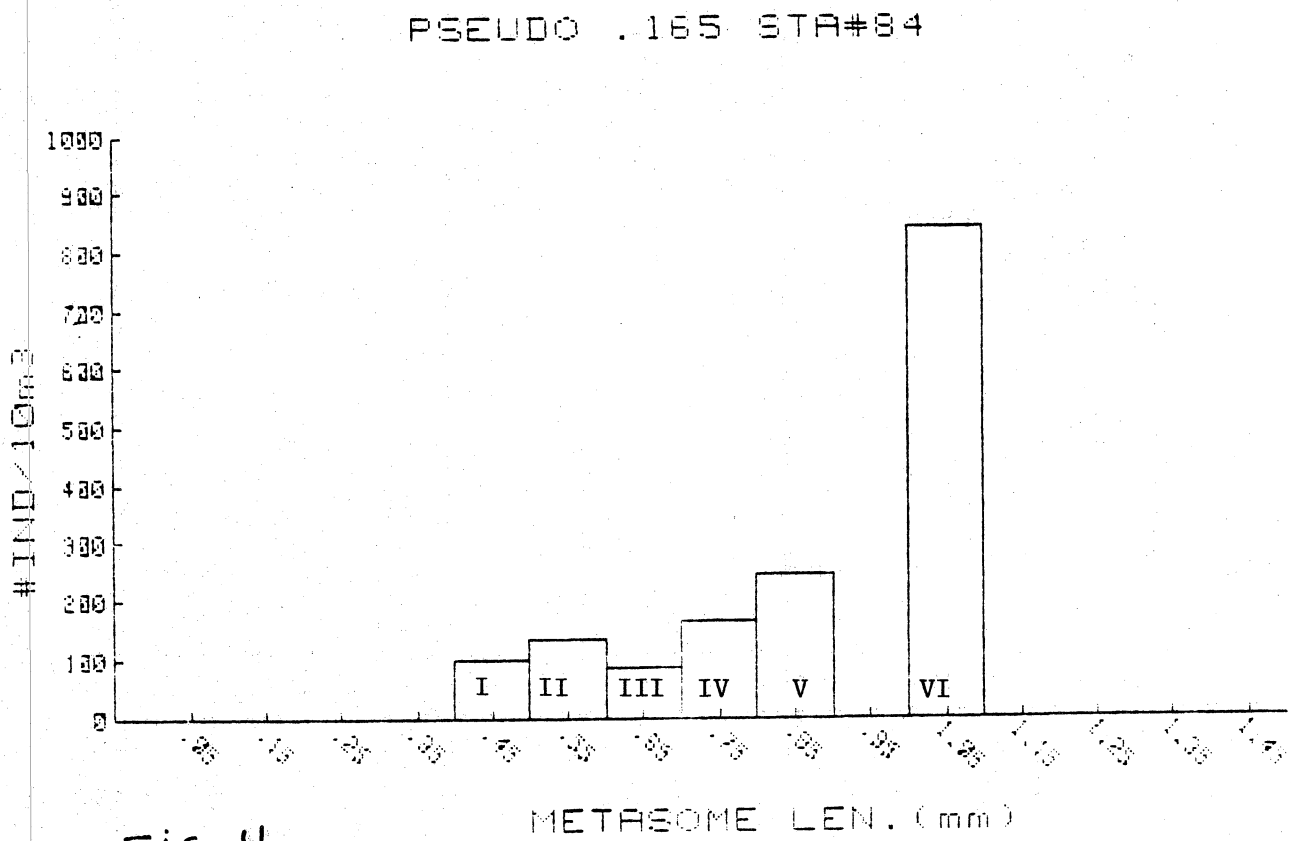
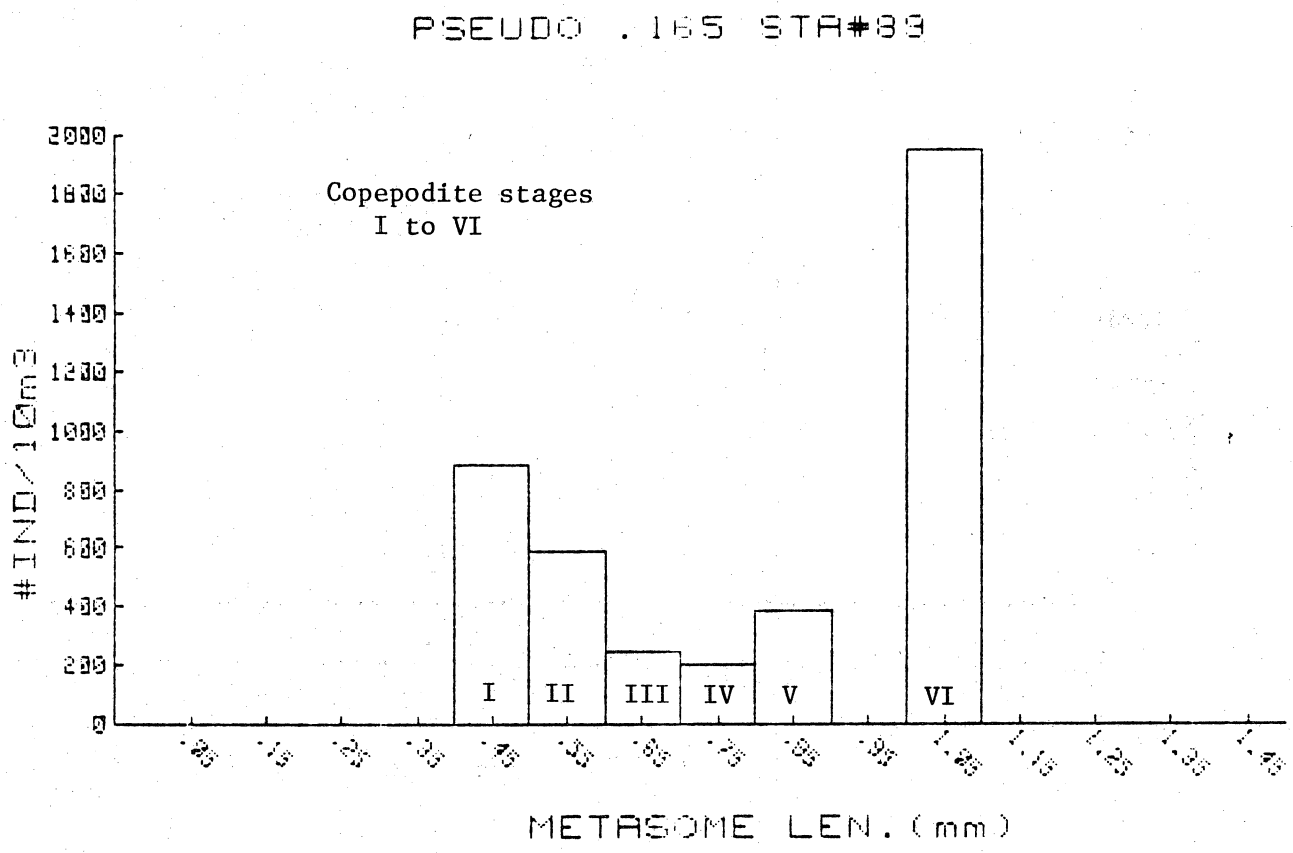

PSEUDO .165 STA#84
#IND/10m3
1000
900
800
700
600
500
400
300
200
100
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

FIG. 4


PSEUDO .165 STA#89
Copepodite stages
I to VI
#IND/10m3
2000
1800
1600
1400
1200
1000
800
600
400
200
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

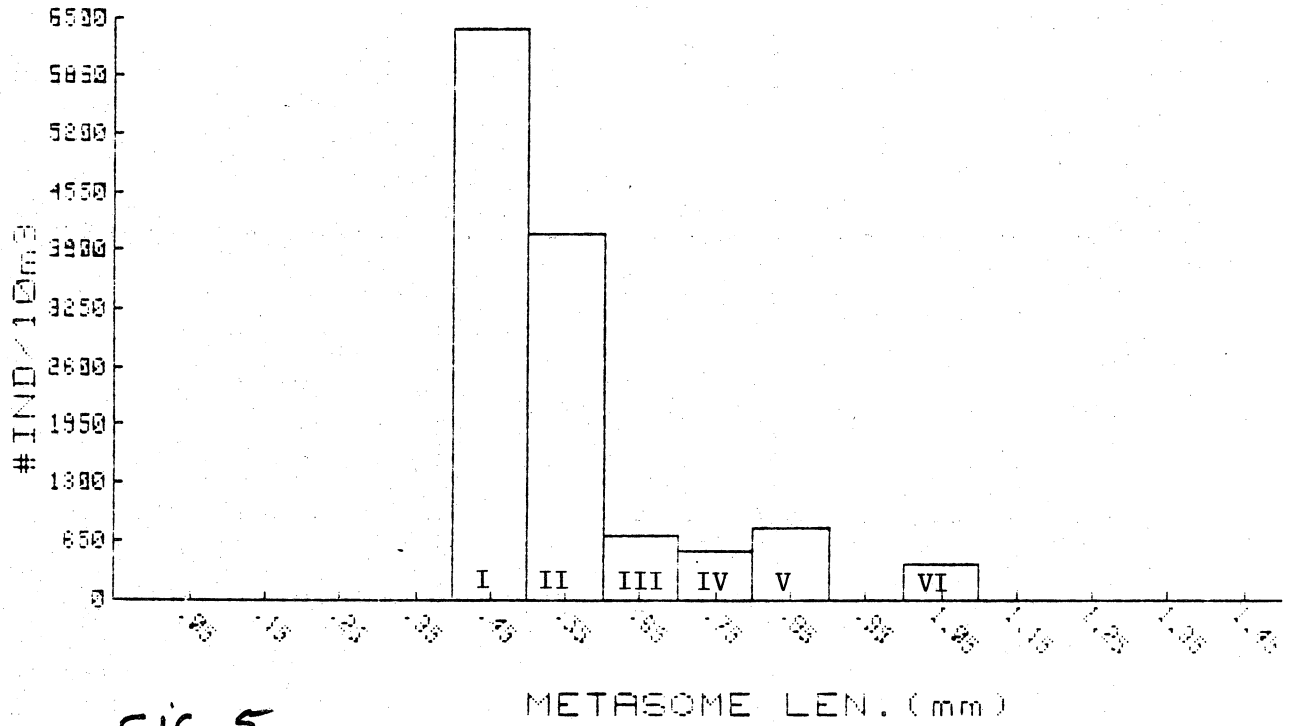
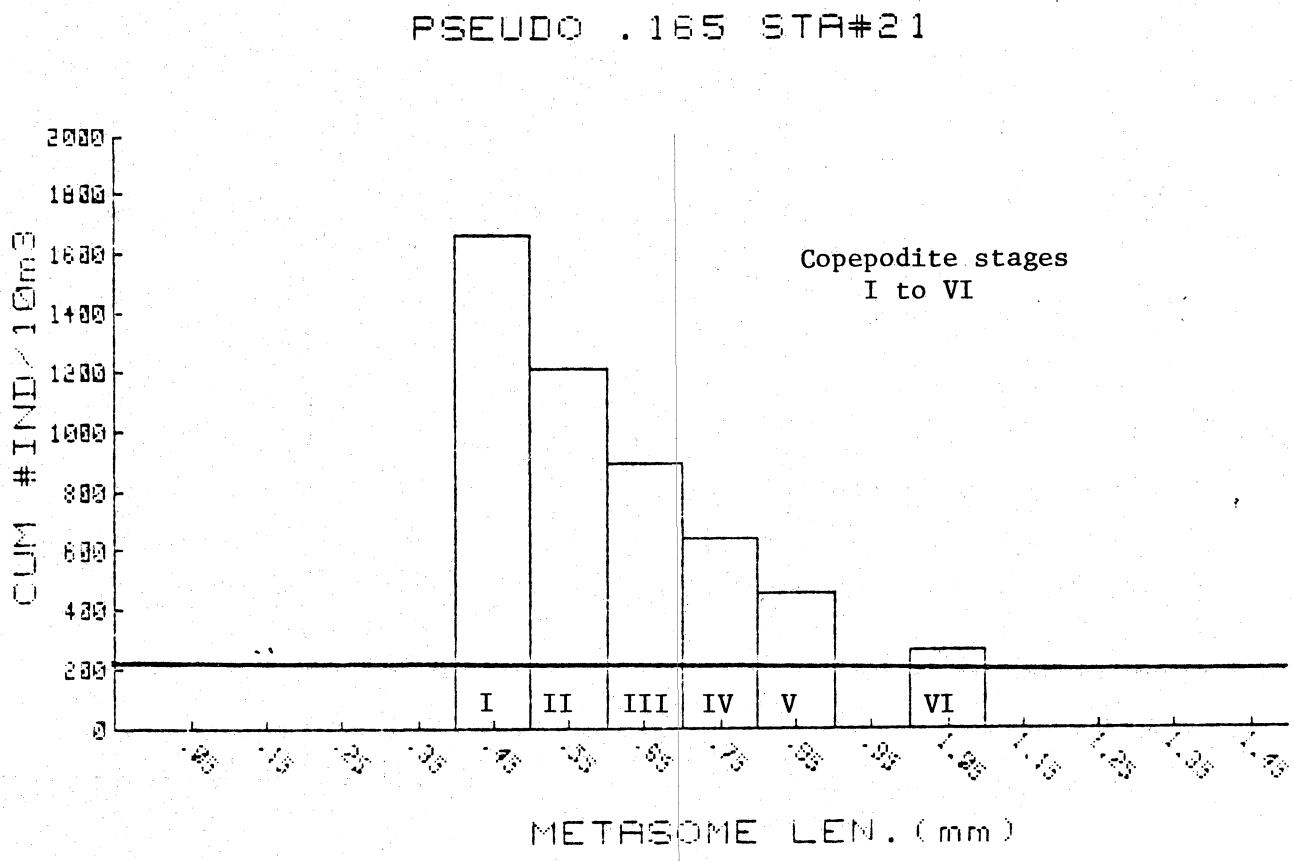

PSEUDO .165 STA#91
#IND/10m3
6500
5850
5200
4550
3900
3250
2600
1950
1300
650
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

FIG. 5


PSEUDO .165 STA#21
2000
1800
1600
1400
1200
1000
800
600
400
200
0
CUM #IND/10m3
Copepodite stages
I to VI
I
II
III
IV
V
VI
METASOME LEN. (mm)

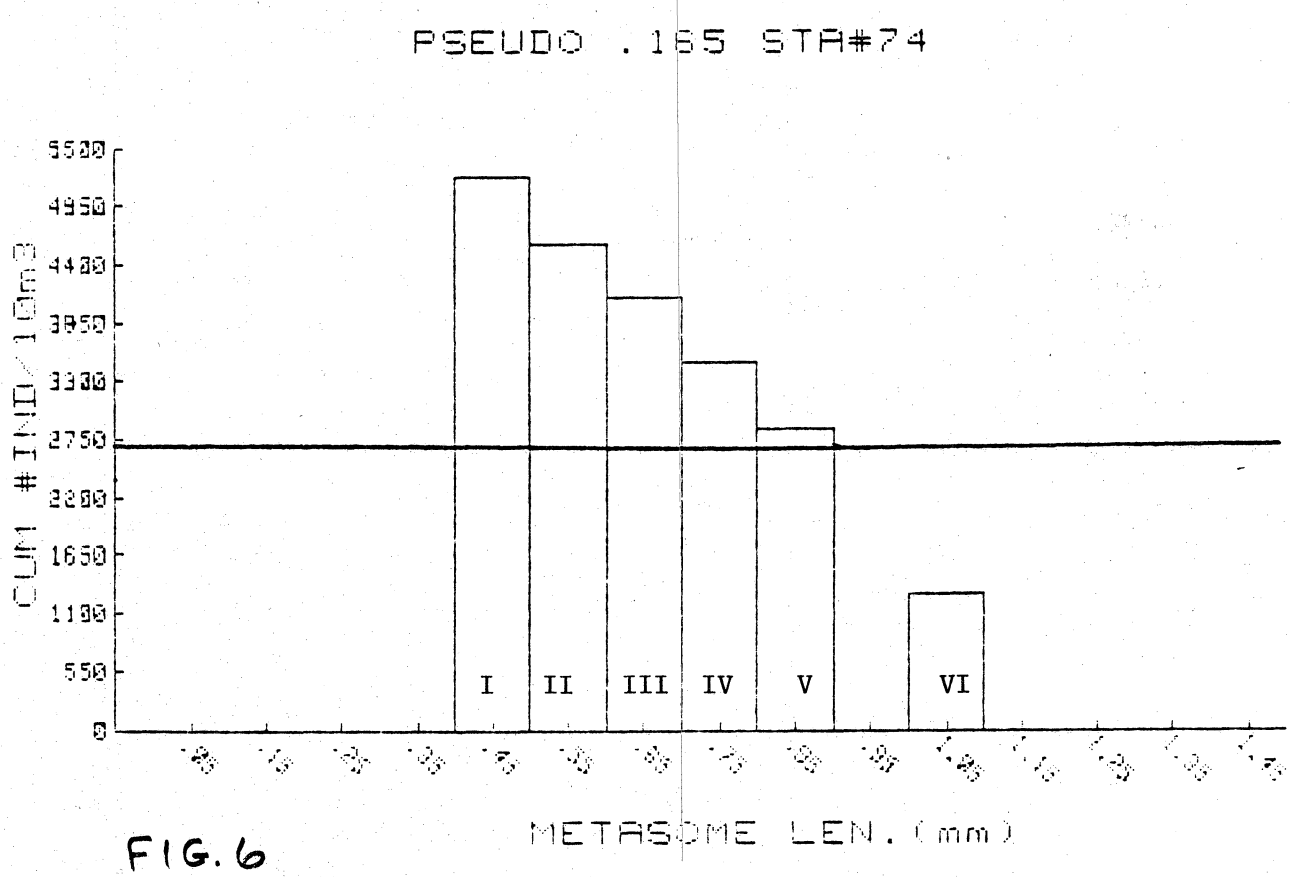
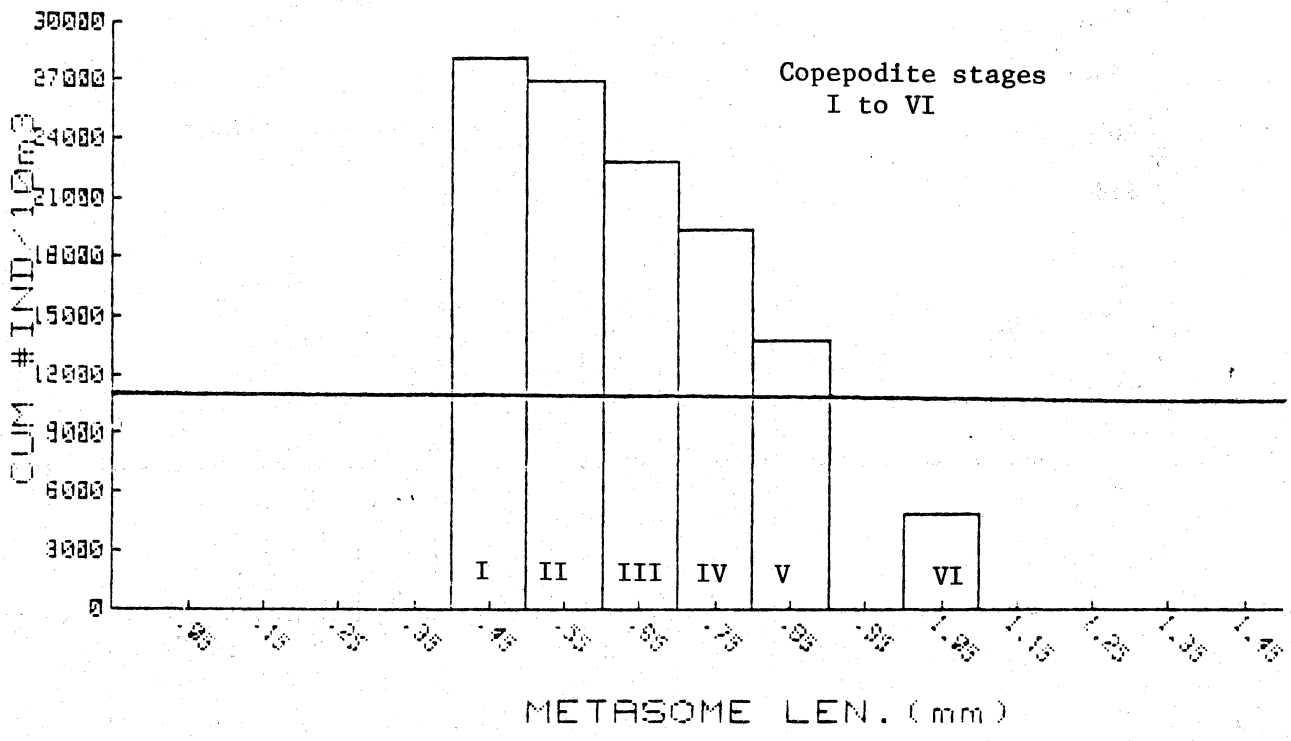

PSEUDO .165 STA#74
5500
4950
4400
3850
3300
2750
2200
1650
1100
550
0
CUM #IND/10m3
I
II
III
IV
V
VI
METASOME LEN. (mm)

FIG. 6


PSEUDO .165 STA#75
Copepodite stages
I to VI
CUM #IND/10m3
30000
27000
24000
21000
18000
15000
12000
9000
6000
3000
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

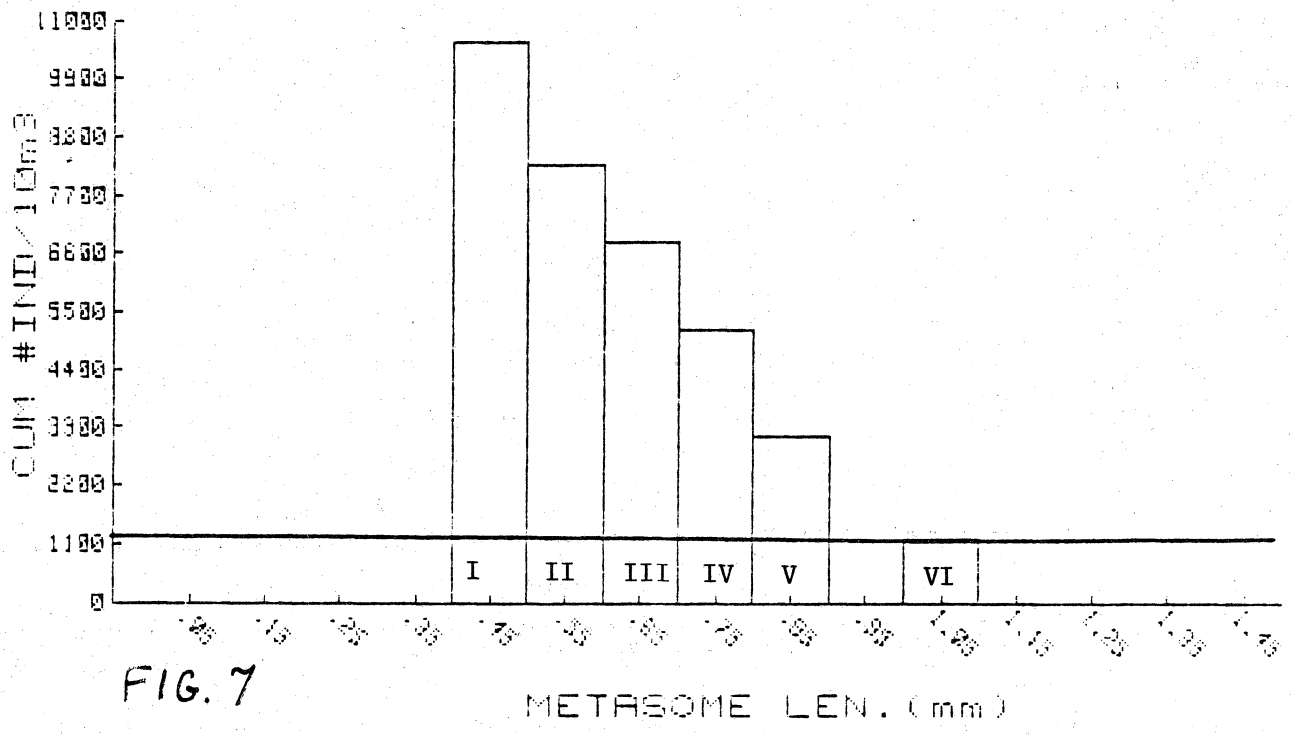
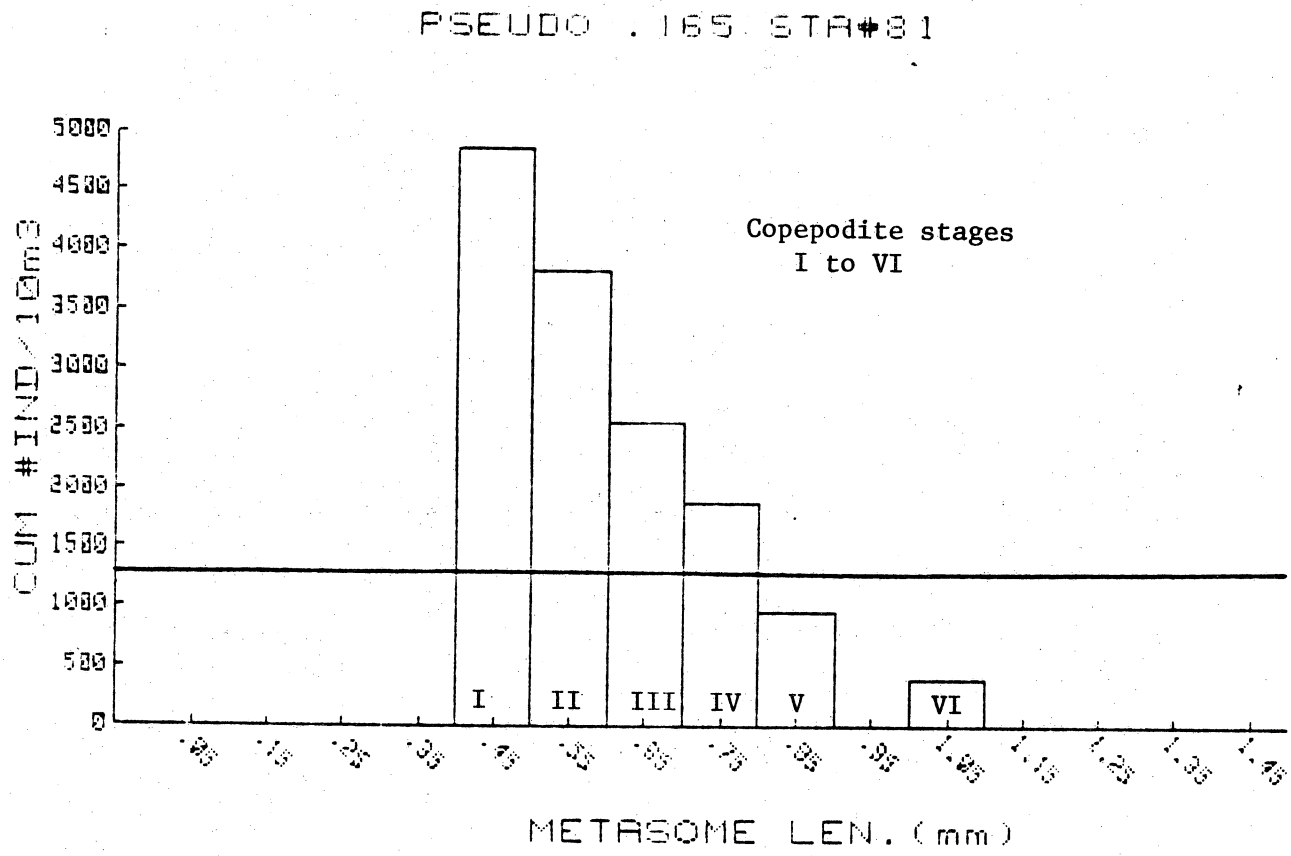

PSEUDO .165 STA#76
CUM #IND/10m3
11000
9900
8800
7700
6600
5500
4400
3300
2200
1100
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

FIG. 7


PSEUDO .165 STA#81
CUM #IND/10m3
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Copepodite stages
I to VI
I
II
III
IV
V
VI
METASOME LEN. (mm)

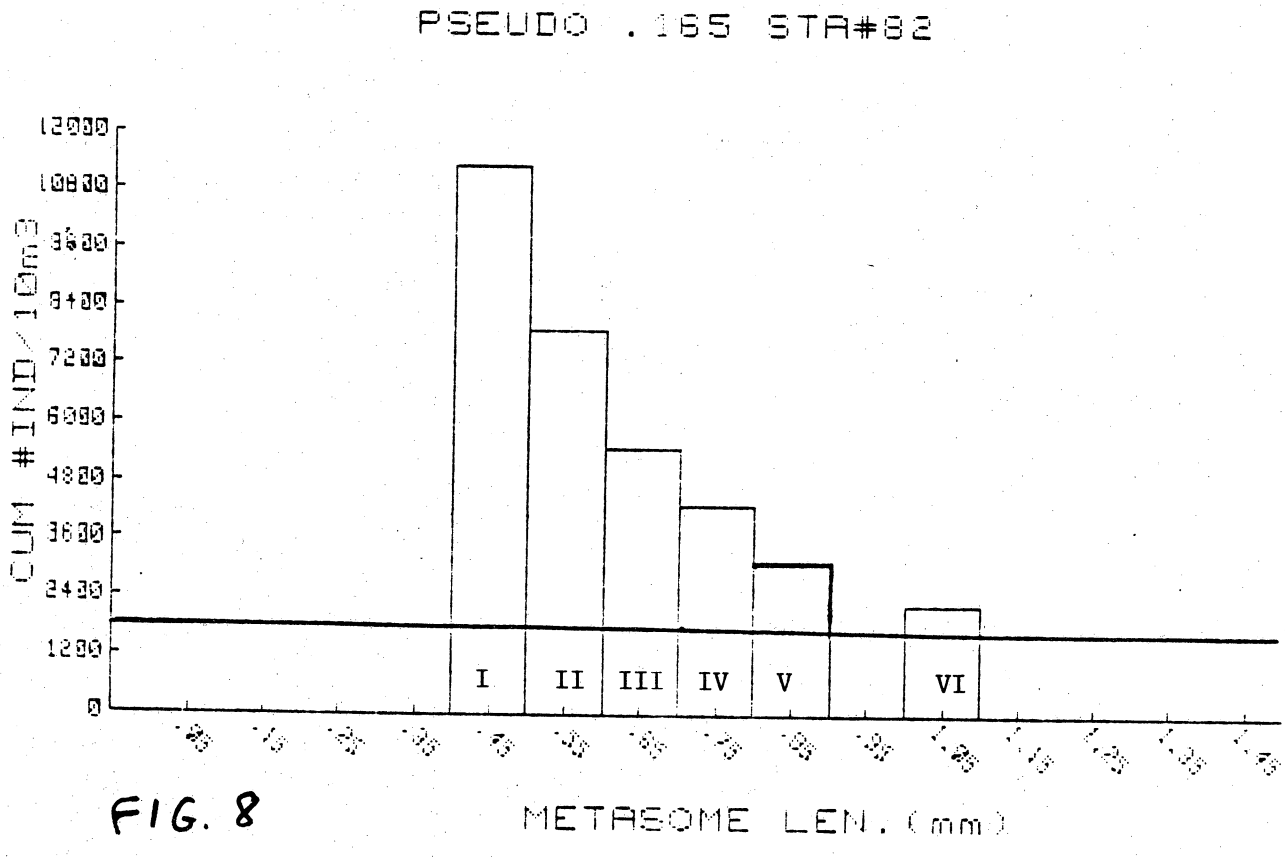
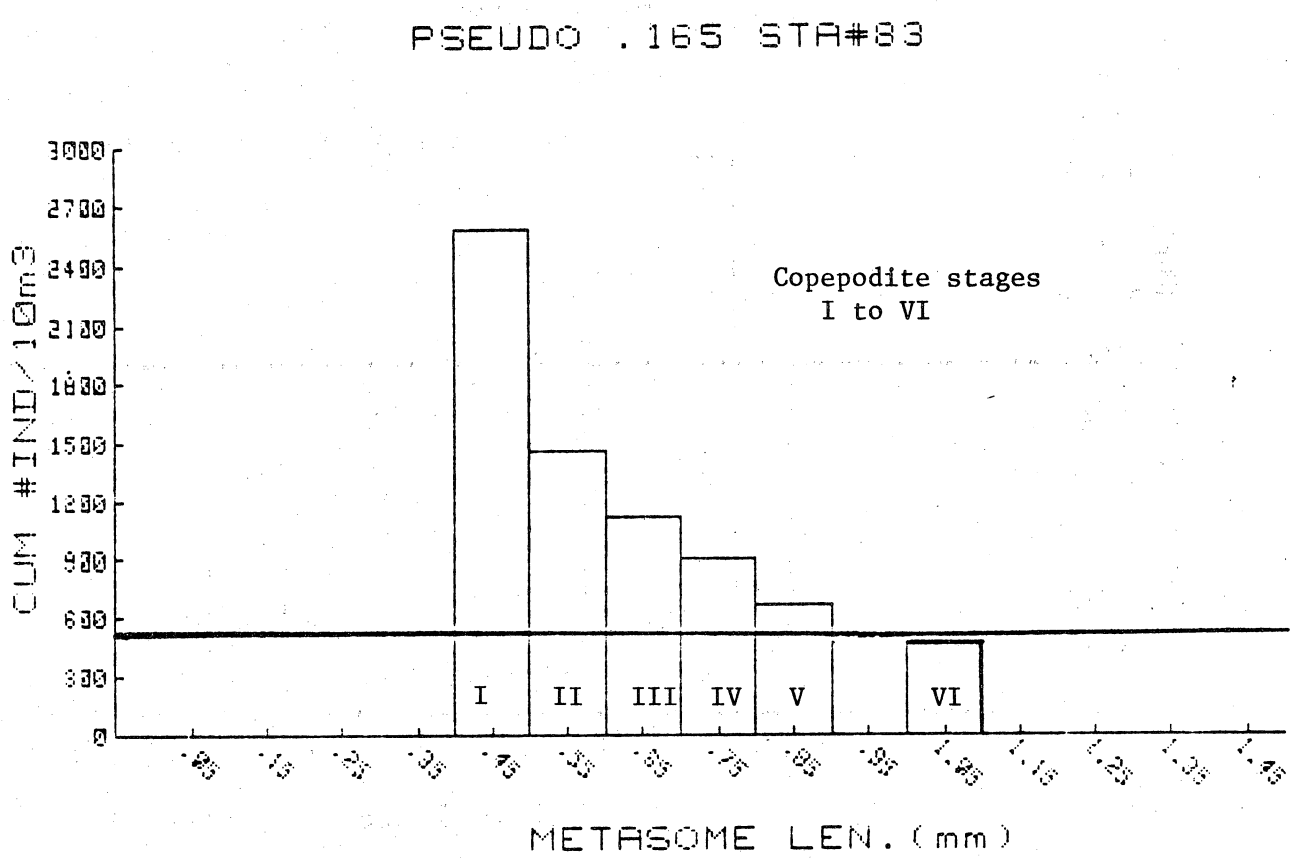

PSEUDO .165 STA#82
CUM #IND/10m3
12000
10800
9600
8400
7200
6000
4800
3600
2400
1200
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

FIG. 8


PSEUDO .165 STA#83
CUM #IND/10m3
3000
2700
2400
2100
1800
1500
1200
900
600
300
0
Copepodite stages
I to VI
I
II
III
IV
V
VI
METASOME LEN. (mm)

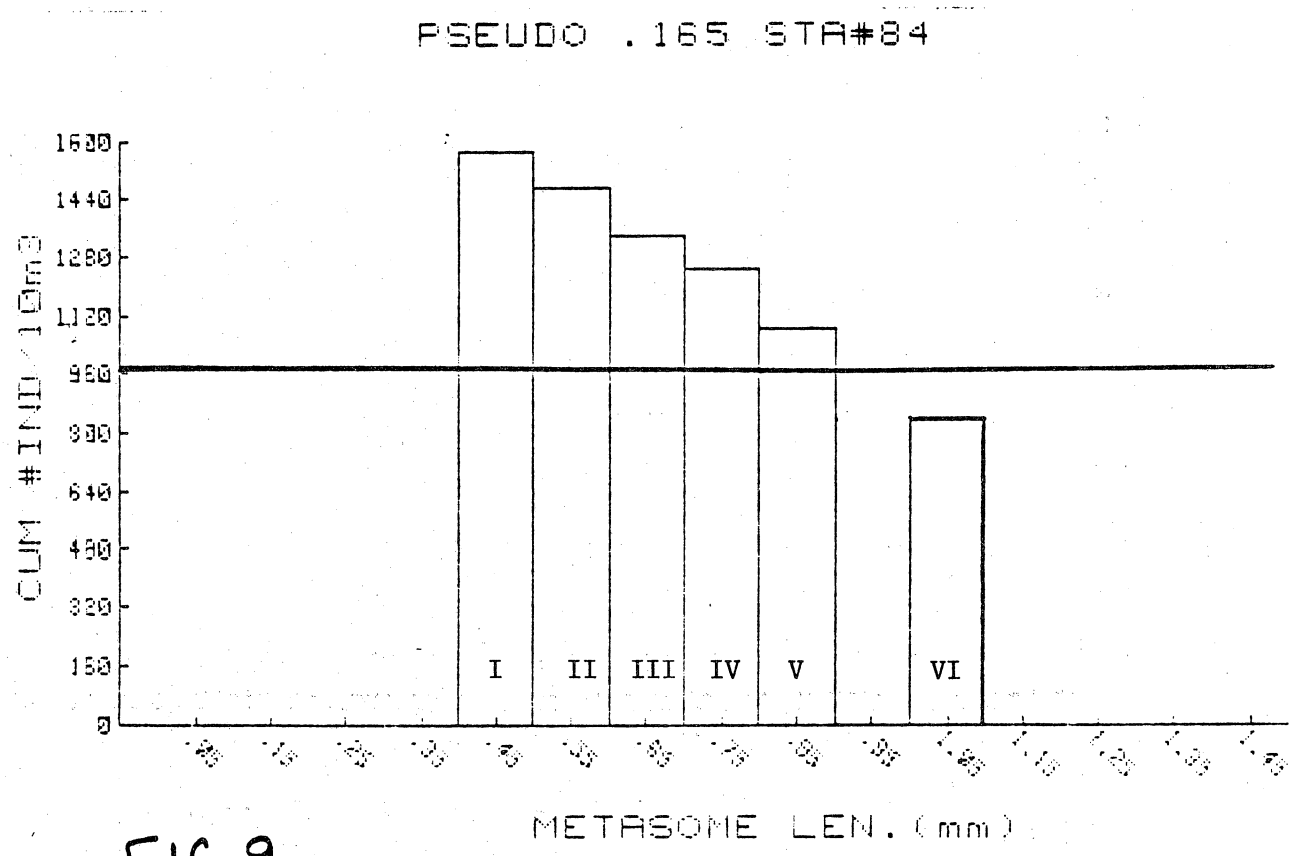
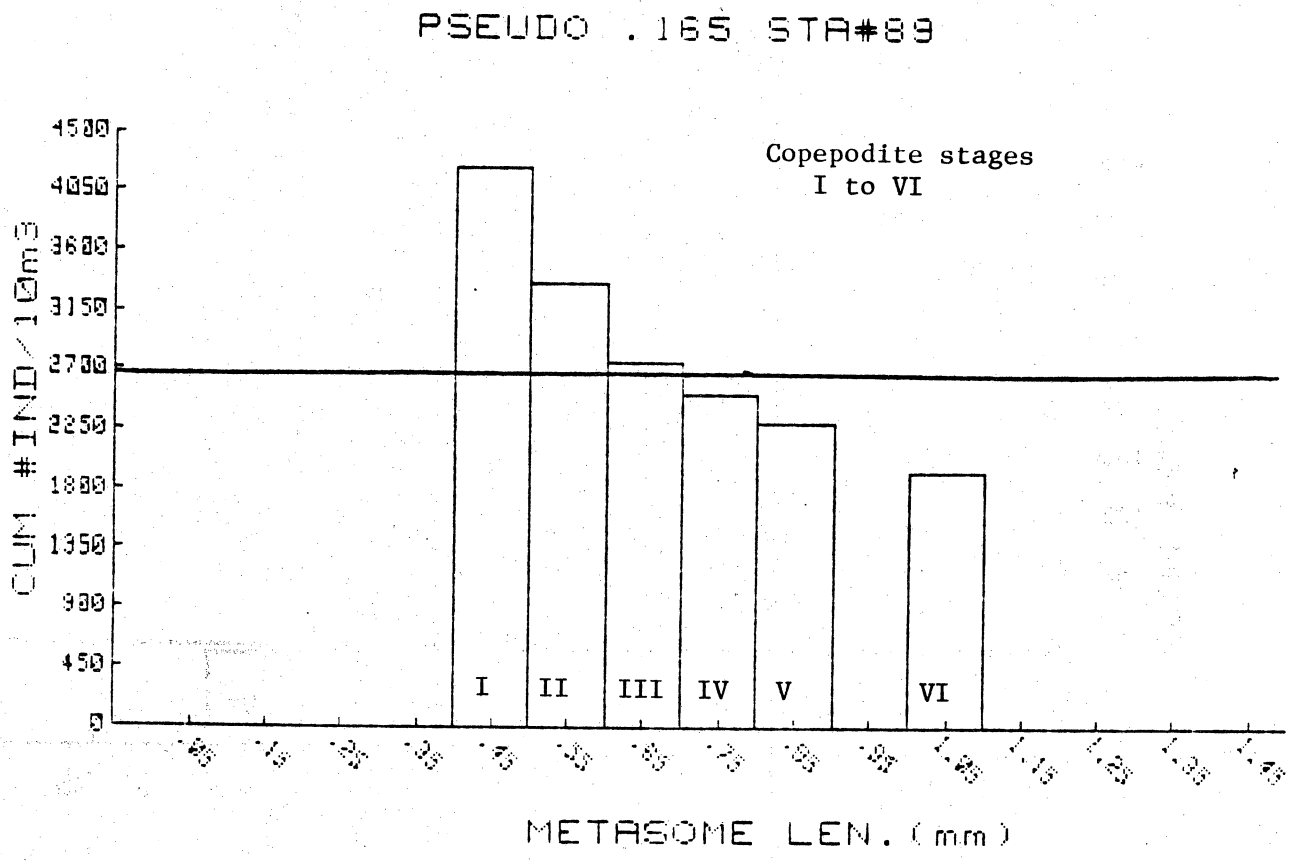

PSEUDO .165 STA#84
CUM #IND/10m3
1600
1440
1280
1120
960
800
640
480
320
160
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

FIG. 9


PSEUDO .165 STA#89
Copepodite stages
I to VI
CUM #IND/10m3
4500
4050
3600
3150
2700
2250
1800
1350
900
450
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

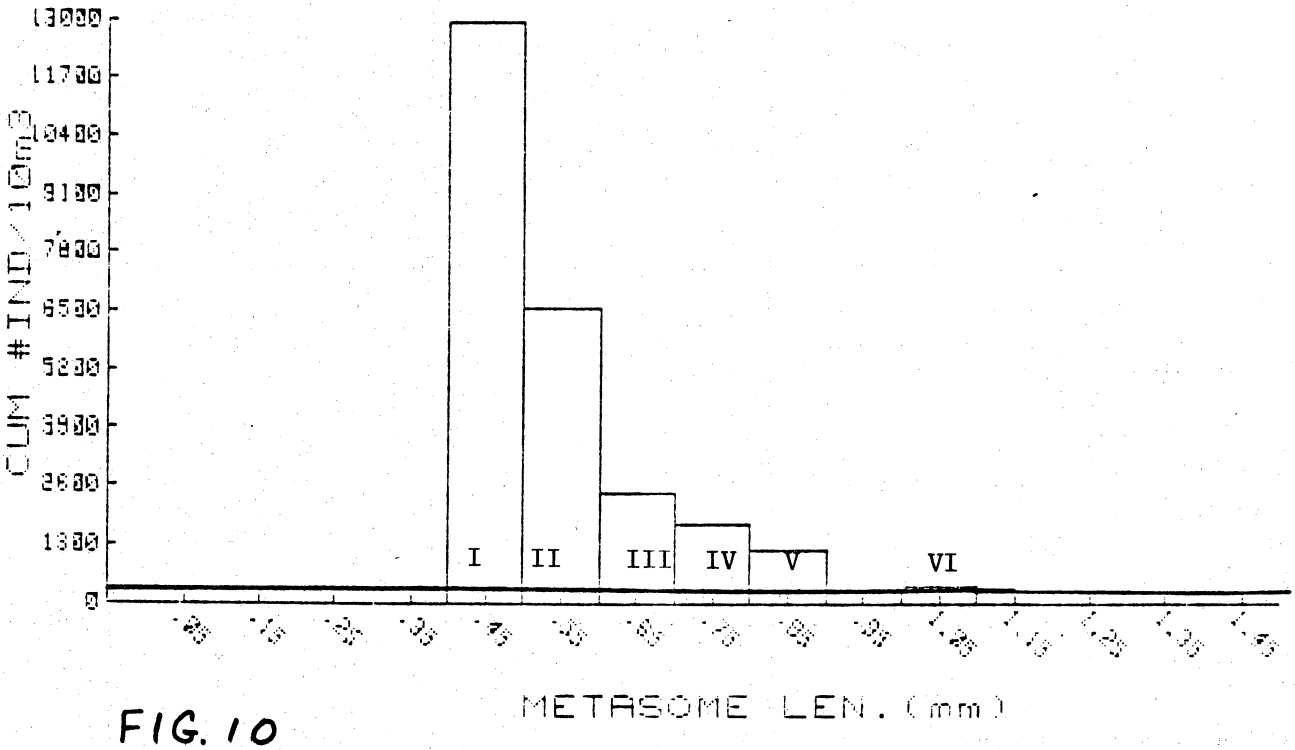
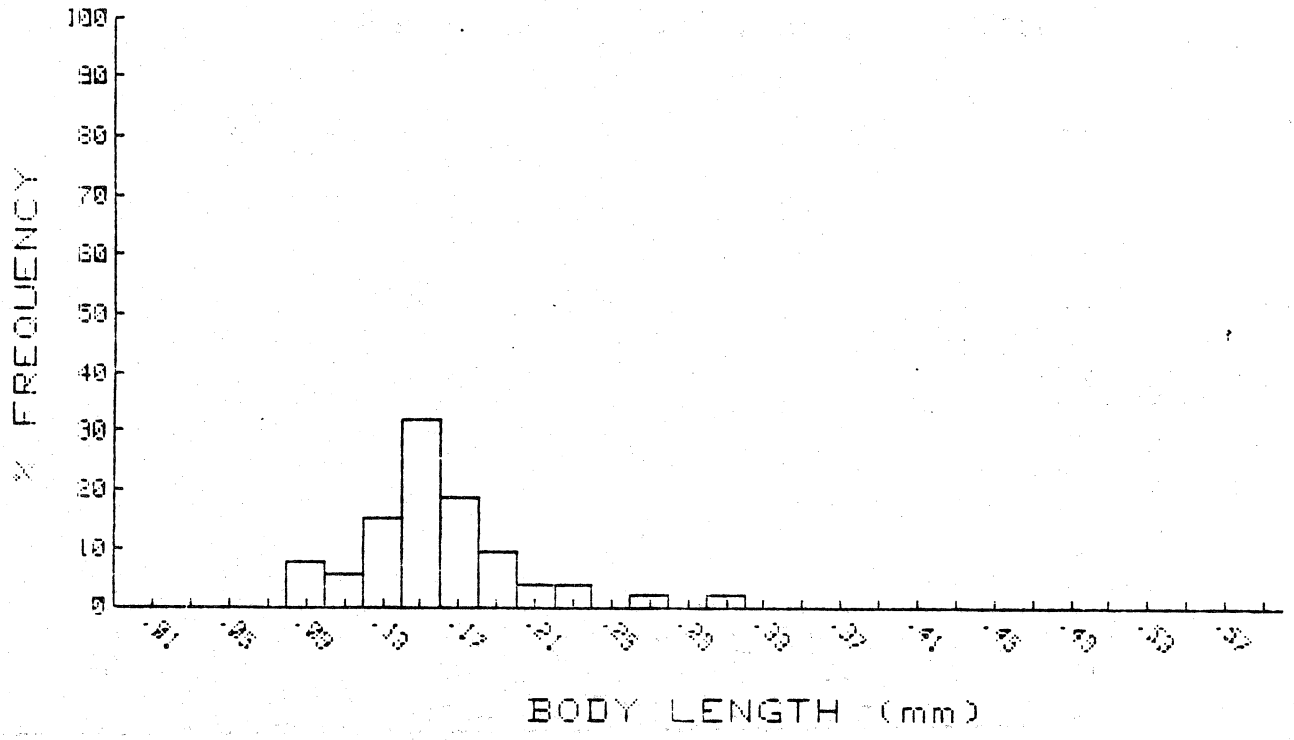

PSEUDO .165 STA#91
CUM #IND/10m3
13000
11700
10400
9100
7800
6500
5200
3900
2600
1300
0
I
II
III
IV
V
VI
METASOME LEN. (mm)

FIG. 10


NAUP .053 STA#52 N= 53
% FREQUENCY
100
90
80
70
60
50
40
30
20
10
0
BODY LENGTH (mm)

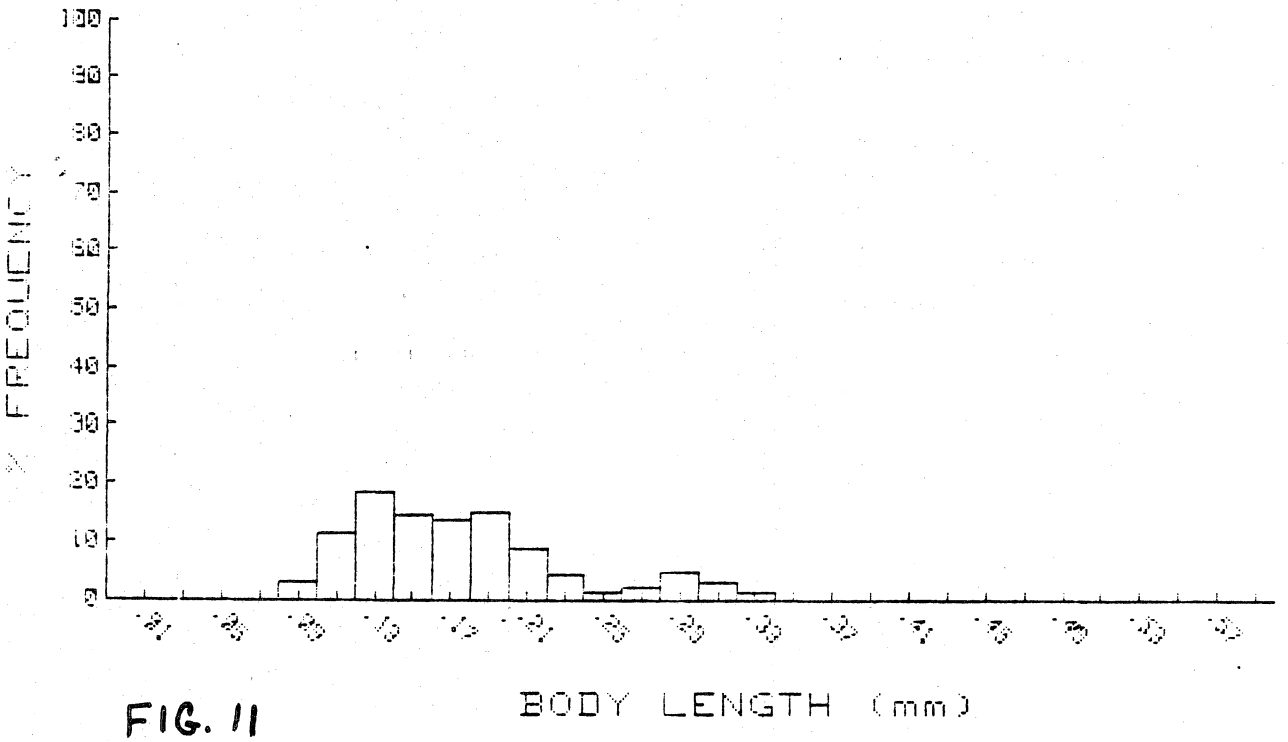

NAUP .053 STA#80 N= 148
% FREQUENCY
100
90
80
70
60
50
40
30
20
10
0
BODY LENGTH (mm)

FIG. 11

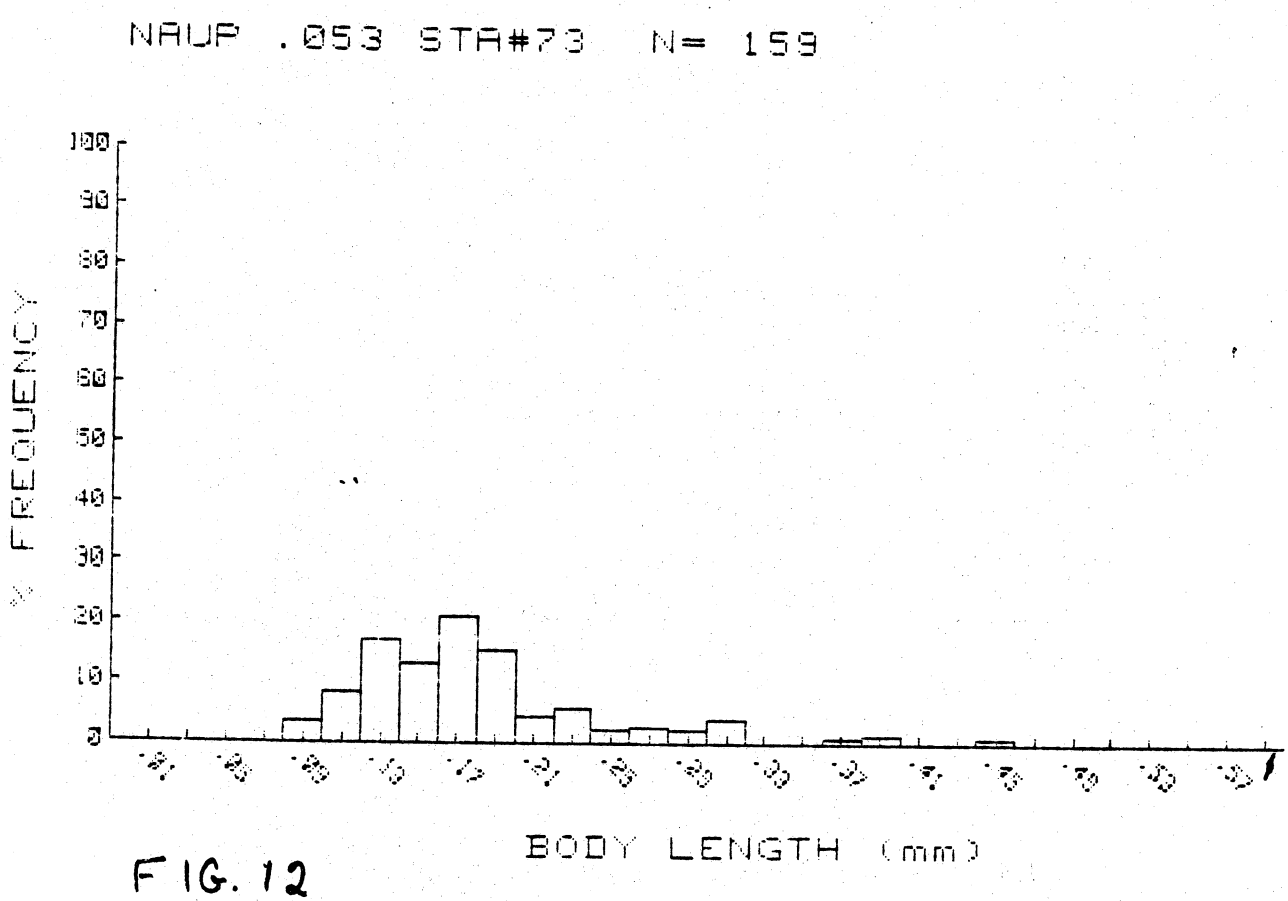
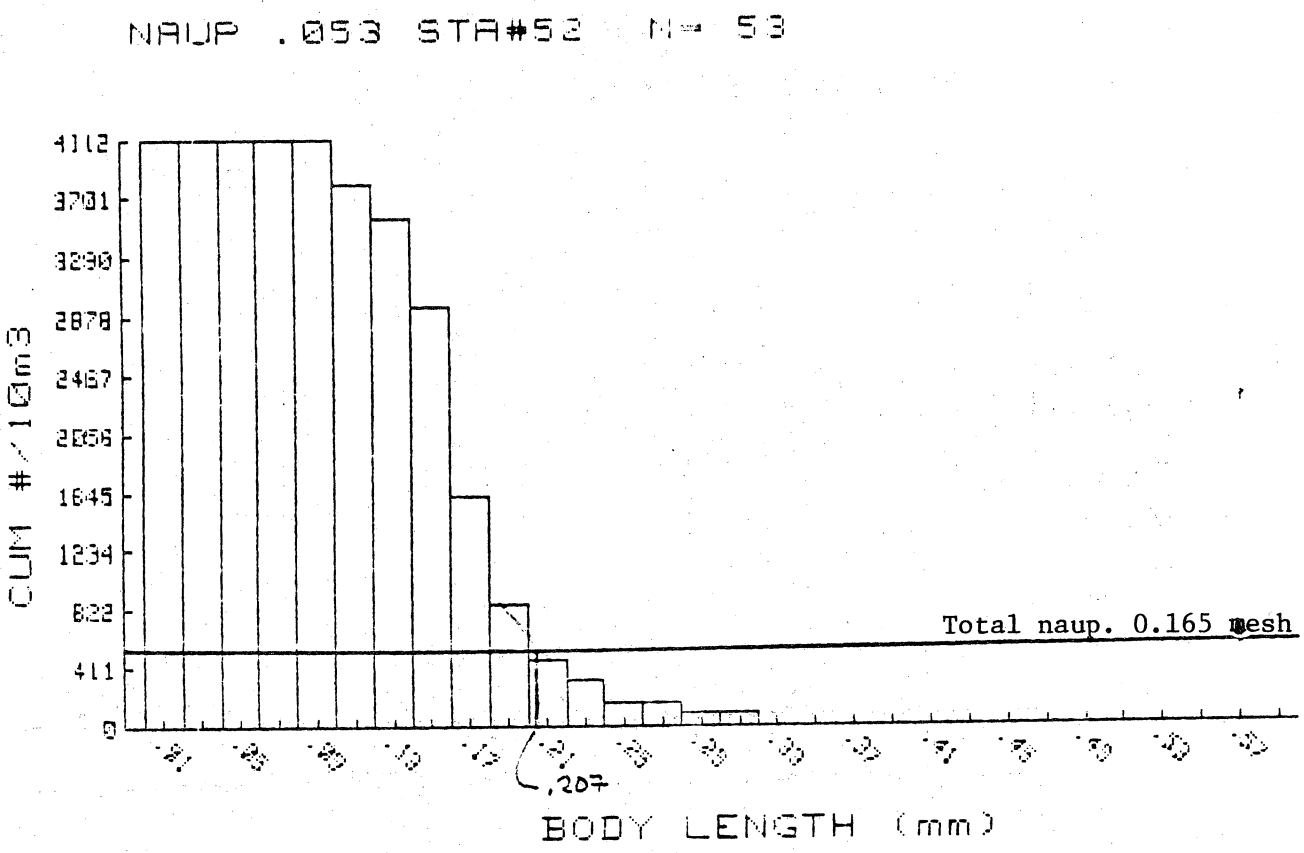

NAUP .053 STA#73 N= 159
% FREQUENCY
100
90
80
70
60
50
40
30
20
10
0
BODY LENGTH (mm)

FIG. 12


NAUP .053 STA#52 N= 53
4112
3701
3290
2878
2467
2056
1645
1234
822
411
0
CUM #/10m3
Total naup. 0.165 mesh
.207
BODY LENGTH (mm)

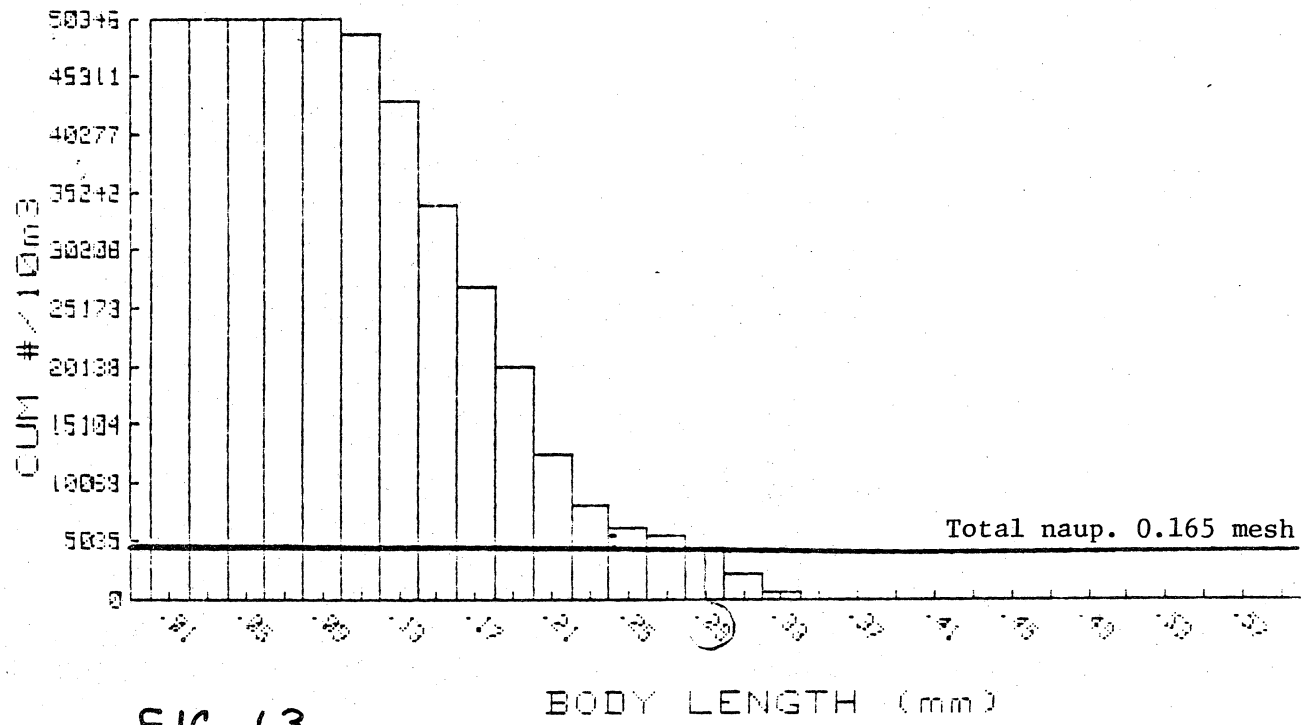

NAUP .053 STA#80 N= 148
50346
45311
40277
35242
30208
25173
20138
15104
10069
5035
0
CUM #/10m3
Total naup. 0.165 mesh
BODY LENGTH (mm)

FIG. 13

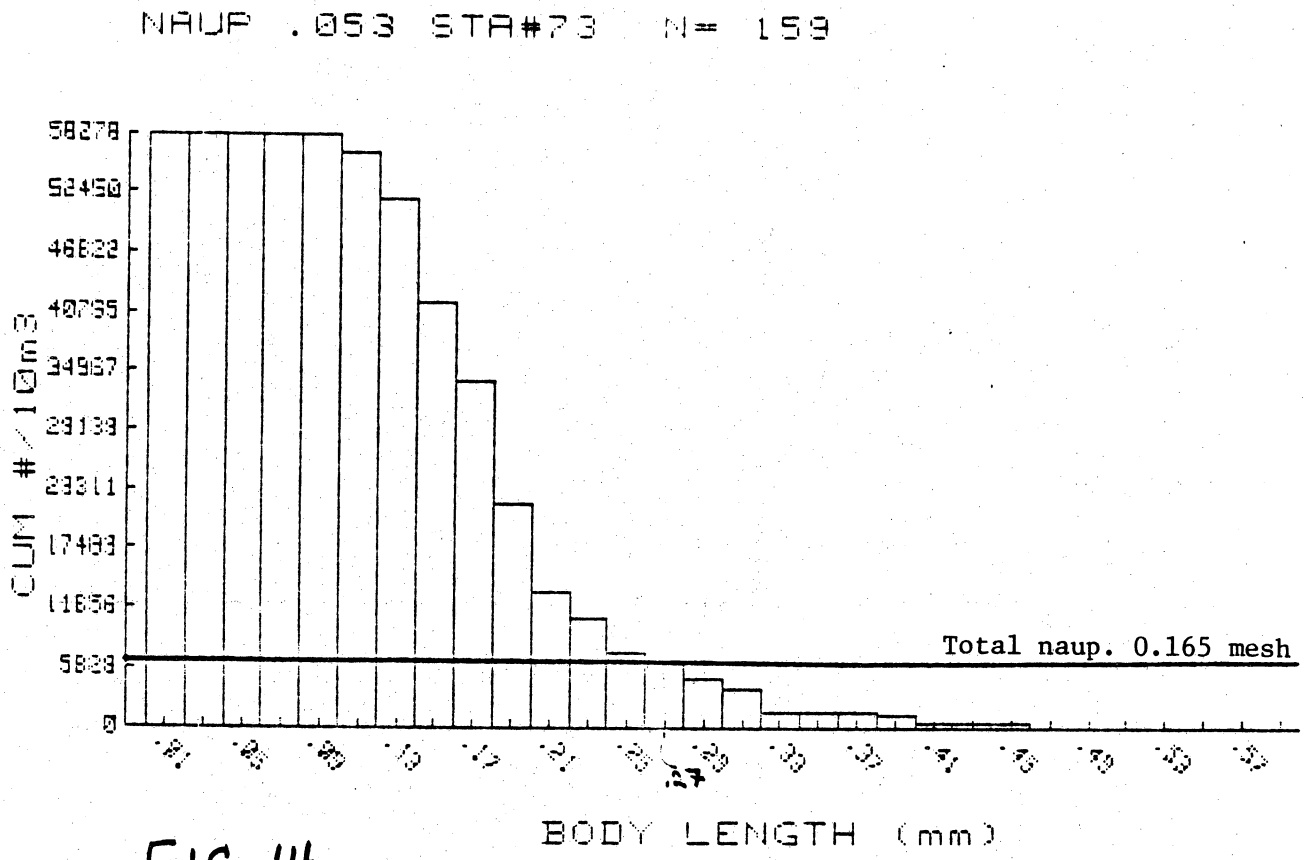
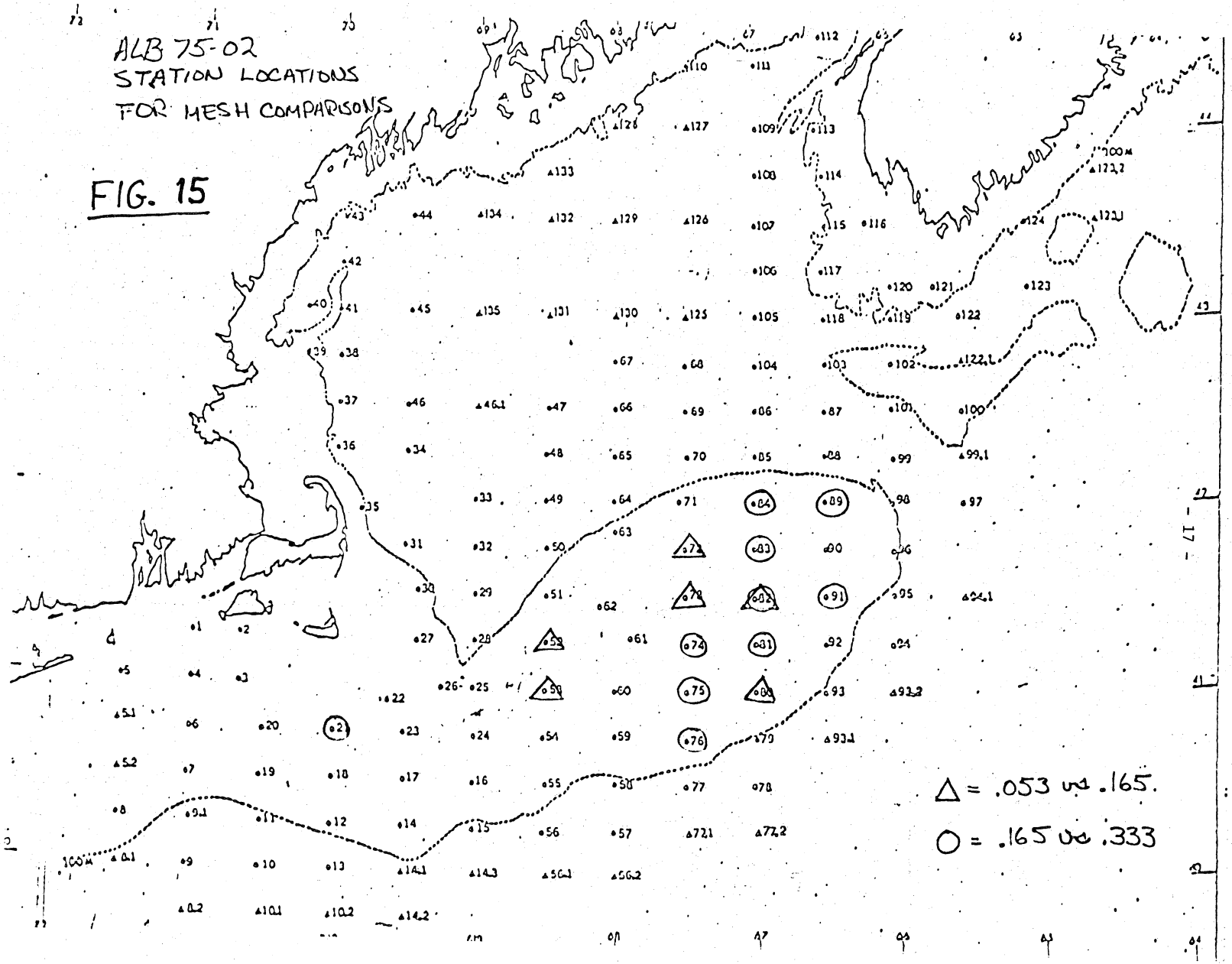

NAUP .053 STA#73 N= 159
58278
52450
46622
40795
34967
29139
23311
17483
11656
5828
0
CUM #/10m3
Total naup. 0.165 mesh
BODY LENGTH (mm)

FIG. 14


ALB 75-02
STATION LOCATIONS
FOR MESH COMPARISONS
FIG. 15
Δ = .053 vs .165.
○ = .165 vs .333