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**THE BENTHIC CRUSTACEANS FROM THE
1969 LAKE WINNIPEG BASELINE SURVEY**

by

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ABSTRACT

Flannagan, J.F., and D.G. Cobb. 1994. The benthic crustaceans from the 1969 Lake Winnipeg baseline survey. Can. Data Rep. Fish. Aquat. Sci. 928: iv + 11 p.

The benthos of Lake Winnipeg, Manitoba was sampled at 58 stations from June to October in 1969 as part of a limnological baseline survey. Triplicate Ekman or Ponar grabs at each station resulted in the collection of three species of benthic crustaceans.

This report presents the seasonal abundance and spatial distribution of crustaceans and overall average abundance for each species within each of the three basins of the lake.

Key words: benthos; crustaceans; Caenestheriella setosa; Diporeia brevicornis; Mysis relicta; Ekman; Ponar.

RÉSUMÉ

Flannagan, J.F., and D.G. Cobb. 1994. The benthic crustaceans from the 1969 Lake Winnipeg baseline survey. Can. Data Rep. Fish. Aquat. Sci. 928: iv + 11 p.

Entre juin et octobre 1969, dans le cadre d'une étude limnologique de base, on a prélevé des échantillons de benthos dans 58 stations du lac Winnipeg, au Manitoba. Les trois prises effectuées dans chaque station par les méthodes Ekman et Ponar ont permis d'identifier trois espèces de crustacés benthiques.

Le présent rapport indique l'abondance saisonnière et la répartition spatiale des crustacés ainsi que l'abondance totale moyenne de chaque espèce dans chacun des trois bassins lacustres.

Mots-clés: benthos; crustacés; Crustacé; Caenestheriella setosa; Diporeia brevicornis; Mysis relicta; Ekman; Ponar.

INTRODUCTION

This report presents the seasonal distribution and abundance of benthic Crustacea from a baseline survey of Lake Winnipeg, Manitoba conducted by staff from the Freshwater Institute (FWI) during 1969. The study was a joint investigation of the chemical limnology, phytoplankton, primary production, zooplankton and zoobenthos of the Lake. Data on the Crustacea is being made available for comparison in future studies on the lake, and is one of a series of data reports on the benthos of Lake Winnipeg resulting from the 1969 survey (Mollusca: Flannagan and Cobb 1991; Oligochaetes: Chang et al. 1992; aquatic insects: Chang et al. 1993).

Benthic crustaceans of Lake Winnipeg were included in studies of the abundance and distribution of benthos within the Lake (Bajkov 1930), the benthos of the Narrows region of the Lake at the boundary of the Precambrian and Palaeozoic rocks (Slack 1967), and several studies conducted by Manitoba Provincial Government biologists during the 1960's. Flannagan (1982) studied the ecology and production of the amphipod Diporeia brevicornis (as Pontoporeia hoyi Smith) from the 1969 survey.

Bajkov (1930) recorded the conchostracan Estheria (= Caenestheriella) mexicanus (Claus), however, the taxonomic status of this species and C. setosa (Pearse) are uncertain (Deborne, Acadia University, Wolfville, NS, B0P 1X0, pers. comm.).

The status of the biota and water quality of Lake Winnipeg has been the subject of increasing public concern. The potential for the introduction of exotic biota (e.g. rainbow smelt and zebra mussel) and their effects on the lake ecosystem, along with the declining commercial fishery of the lake, has necessitated a better understanding of the ecology of the fauna of Lake Winnipeg. This report will contribute to that understanding.

MATERIALS AND METHODS

DESCRIPTION OF THE STUDY AREA

Lake Winnipeg (52°N, 97°W) (Fig. 1), a remnant of glacial Lake Agassiz, has a surface

area of 23,750 km², a mean depth (\bar{Z}) of 12.0 m, and a maximum depth of 36 m. Its long fetch, relatively shallow depth, and geology results in a high degree of mixing, an isothermal water column, and high turbidity (Secchi = 0.1-1.0 m south basin, 1.0-3.0 m north basin) (Brunskill 1973).

The Lake has three basins: the South Basin is shallower ($\bar{Z} = 9.7$ m) than the larger North Basin ($\bar{Z} = 13.3$ m), and the two basins are separated by a Narrows Basin ($\bar{Z} = 7.2$ m) which, because of its width, is subject to strong currents associated with the northward drainage of the Lake, and with wind generated seiches.

The north, west, south and southeast shores and watersheds of Lake Winnipeg are in sedimentary (Palaeozoic and Mesozoic) basins, while the eastern shore and its watersheds are on the Precambrian Shield, and are influenced by inflowing water of different chemistry than the rest of the Lake. More detailed descriptions of the Lake and its watershed are found in Brunskill et al. (1980).

BENTHOS SAMPLING

Lake Winnipeg was sampled monthly at up to 58 offshore stations during the open-water season of 1969 (Fig. 1). Each sampling period, referred to as a cruise, had a duration of between five and nine days (Fig. 1, insert). At each station, three 15 x 15 cm Birge-Ekman grabs were taken except when the substrate was too hard for this sampler to penetrate, then samples were taken with a Ponar grab (sampling area 528 cm²). Samples were sieved through a 200 µm mesh (400 µm for coarse substrates), then preserved in 4% formaldehyde. Macrofauna was sorted under a dissecting microscope.

LABORATORY PROCEDURES

Undamaged specimens of Caenestheriella setosa shell lengths and widths (at the apex of the umbone, and the base of the umbone) were measured to the nearest millimeter. Specimens were blotted on filter paper for 5 seconds, and weighed to the nearest mg (wet weight). Details of the methods used in the analysis of the amphipod Diporeia brevicornis are presented in Flannagan

(1982). Insufficient Mysis relicta were available to provide useful length/weight data.

DATA PRESENTATION

Table 1 presents the overall mean number for each crustacean species within each basin of the lake. Tables 2-4 present the abundance of each species as the mean of three grabs converted to number·m² (rounded to nearest whole number) for each cruise. Mean densities for each species (all cruises) were also calculated for each station. Stations not sampled during a cruise are indicated. Shell length and width, and whole body wet weight of C. setosa are presented in Appendix 1.

baseline survey. Can. Data Rep. Fish. Aquat. Sci. 897: v + 77 p.

FLANNAGAN, J.F. 1982. Aspects of the biology of Pontoporeia hoyi Smith in Lake Winnipeg and a comparison of Hexagenia limbata (Serville) and P. hoyi production. Unpublished M.Sc. thesis. University of Manitoba, Winnipeg, MB.

FLANNAGAN, J.F., and D.G. COBB. 1991. The molluscs from the 1969 Lake Winnipeg baseline survey. Can. Manuscr. Rep. Fish. Aquat. Sci. 2127: iv + 35 p.

SLACK, H.D. 1967. A brief survey of the profundal benthic fauna of lakes in Manitoba. J. Fish. Res. Board. Can. 24: 1017-1033.

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REFERENCES

- BAJKOV, A. 1930. Biological conditions in Manitoba Lakes. Contrib. Can. Biol. Fish. NS. 5: 383-422.
- BRUNSKILL, G.J. 1973. Rates of supply of nitrogen and phosphorus to Lake Winnipeg, Manitoba, Canada. Verh. Int. Verh. Theor. Angew. Limnol. 18: 1755-1759.
- BRUNSKILL, G.J., S.E.M. ELLIOT, and P. CAMPBELL. 1980. Morphometry, hydrology, and watershed data pertinent to the limnology of Lake Winnipeg. Can. Manuscr. Rep. Fish. Aquat. Sci. 1556: v + 23 p.
- CHANG, P.S.S., D.G. COBB, J.F. FLANNAGAN, and O.A. SAETHER. 1992. The Oligochaetes from the 1969 Lake Winnipeg baseline survey. Can. Data Rep. Fish. Aquat. Sci. 869: iv + 35 p.
- CHANG, P.S.S., D.G. COBB, J.F. FLANNAGAN, and O.A. SAETHER. 1993. The aquatic insects from the 1969 Lake Winnipeg

Cruise number	Dates of cruise	Number stations sampled
300	4 June - 12 June	26
400	9 July - 17 July	44
500	24 July - 1 August	51
600	2 Sept. - 10 Sept.	44
700	3 Oct. - 12 Oct.	39
800	27 Oct. - 31 Oct.	26

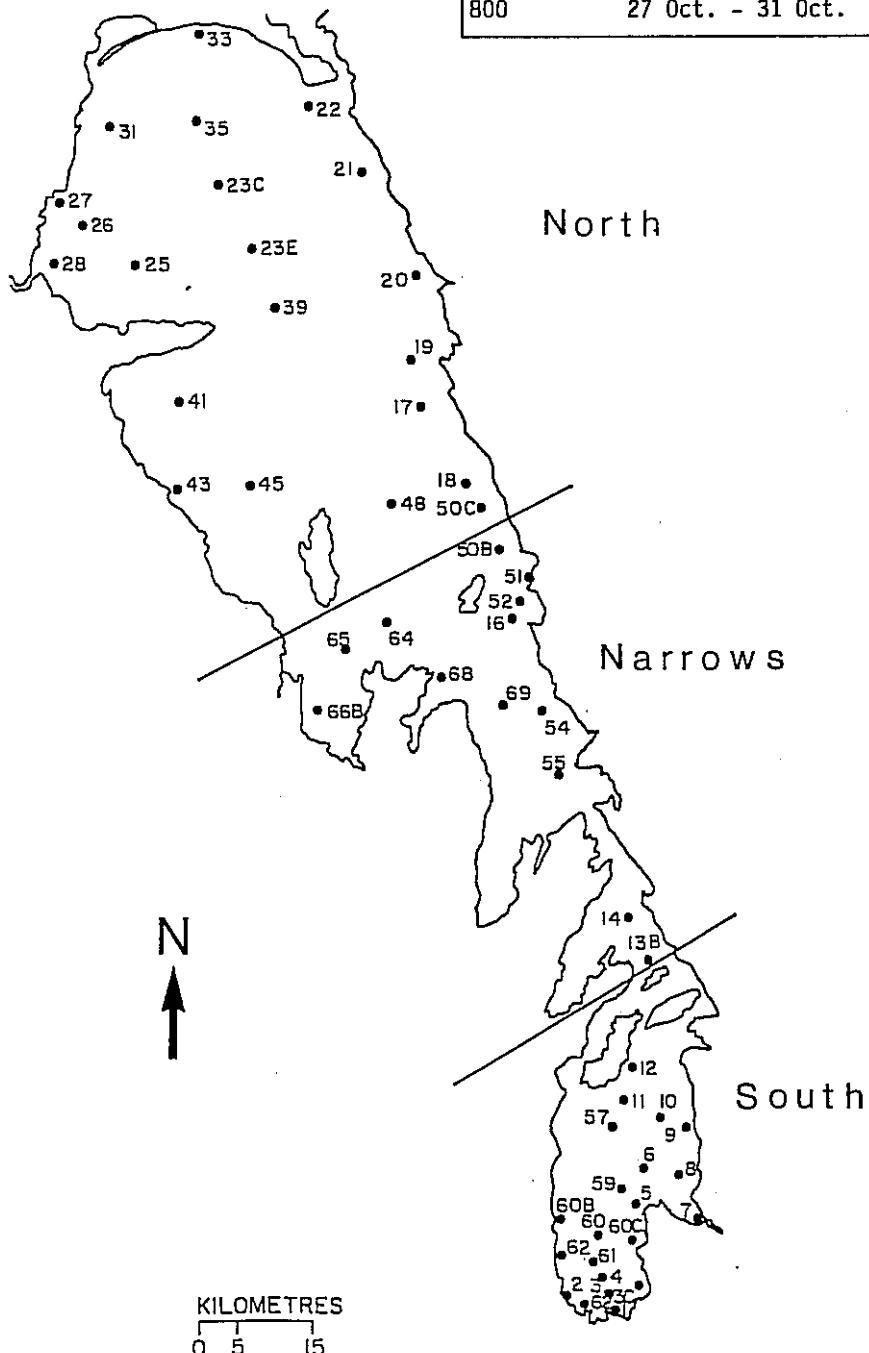


Fig. 1. Map of Lake Winnipeg showing the three regions of the Lake (North and South Basins, and Narrows), location of benthos sampling stations, cruise sample dates and number of stations visited during each cruise.

Table 1. List of benthic Crustacea collected in the 1969 Lake Winnipeg baseline survey and their overall mean abundance (no.· m²) within each basin.

Taxa	South	Narrows	North
Class Crustacea			
Subclass Branchiopoda			
Order Conchostraca			
Family Cyzicidae			
<u>Caenestheriella setosa</u> (Pearse)	1.0	13.0	0.3
Subclass Malacostraca			
Order Amphipoda			
Family Haustoriidae			
<u>Diporeia brevicornis</u> (Serg.)	6.5	2457.0	1397.0
Order Mysidacea			
<u>Mysis relicta</u> Loven	0.2	0.6	0.2

Table 2. Density (no. · m²; mean of 3 grabs) of *Mysis relicta* collected during the 1969 Lake Winnipeg baseline survey (- = not sampled). Where indicated by an asterisk, only empty shells were collected and were not included in cruise means.

Station	Cruise Number							All Cruises
	300	400	500	600	700	800		
1	-	-	-	0	-	-	-	0
2	-	0	0	0	0	0	0	0
3	0	0	0	0	0	-	-	0
3C	-	-	0	0	0	-	-	0
4	0	0	0	0	0	0	0	0
5	-	15*	0	15*	0	-	-	0
6	-	-	15*	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	-	-	-	-	0
10	15*	30	0	15*	0	15	10	10
11	-	-	-	0	-	0	0	0
12	-	-	0	44*	0	0	0	0
13B	-	0	-	-	-	-	-	0
14	15*	681	430	0	0	0	0	185
16	-	0	0	0	0	0	0	0
17	-	0	0	-	0	-	-	0
18	0	0	0	0	0	-	-	0
19	-	0	0	-	-	-	-	0
20	-	-	0	0	-	0	0	0
21	-	-	0	0	0	0	0	0
22	-	0	0	0	-	-	-	0
23c	-	0	0	0	0	0	0	0
23e	0	0	0	0	0	-	-	0
24	0	-	-	-	-	-	-	0
25	0	0	0	0	0	0	0	0
26	0	0	0	30	0	-	-	6
27	0	0	0	-	0	-	-	0
28	-	0	6*	0	-	0	0	0
31	-	0	0	0	0	0	-	0
33	-	0	0	-	-	-	-	0
35	-	0	0	0	0	0	-	0
39	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	-	0
43	0	0	0	-	-	-	-	0
45	0	0	0	0	-	-	-	0
48	0	0	0	0	0	0	0	0
50b	-	0	0	-	-	-	-	0
50c	-	0	0	0	0	0	-	0
51	0	0	0	0	0	0	-	0
52	0	0	0	0	0	0	-	0
54	0	-	0	0	0	0	0	0
55b	-	-	-	0	-	0	0	0
57	0	0	0	44	0	-	-	9
58	-	0	-	-	-	-	-	0
59	15*	0	0	0	0	0	0	0
60	0	0	0	74*	0	0	0	0
60B	-	0	0	30*	0	-	-	0
60C	-	-	0	44*	0	-	-	0
61	0	0	0	59*	0	0	0	0
62	-	-	0	0	0	0	0	0
63	0	0	0	0	0	-	-	0
64	-	0	0	59*	0	0	0	0
65	-	0	0	-	-	-	-	0
66B	-	-	0	-	-	-	-	0
68	-	0	0	-	0	0	0	0
69	-	0	0	0	-	-	-	0
69B	-	-	0	-	-	-	0	0
Cruise mean	0	16.2	8.4	1.7	0.0	0.6	4.5	

Table 3. Density (no.·m⁻²; mean of 3 grabs) of Diporeia brevicornis collected during the 1969 Lake Winnipeg baseline survey (- = not sampled).

Station	Cruise Number						All Cruises
	300	400	500	600	700	800	
1	-	-	-	0	-	-	0
2	-	0	0	0	0	0	0
3	0	0	0	0	0	-	0
3C	-	-	0	0	0	-	0
4	0	0	0	0	0	0	0
5	-	44	0	0	0	-	11
6	-	-	0	0	0	0	0
7	0	30	0	0	0	0	5
8	0	0	0	0	0	0	0
9	0	0	0	-	-	-	0
10	0	0	0	0	0	0	0
11	-	-	-	0	-	0	0
12	-	-	15	489	0	0	126
13B	-	0	-	-	-	-	0
14	1748	1392	1511	815	904	504	1146
16	-	3600	4207	3081	1481	2444	2963
17	-	5588	4681	-	8547	-	6272
18	2948	1748	2326	1644	1570	-	2047
19	-	6	844	-	-	-	425
20	-	-	1355	7644	-	1077	3335
21	-	-	3811	89	3064	2000	2241
22	-	25	4814	785	-	-	1406
23C	-	0	0	74	0	30	21
23E	0	0	0	15	44	-	12
24	0	-	-	-	-	-	0
25	0	15	15	30	0	30	15
26	0	0	30	0	0	-	6
27	3051	4533	5320	-	2889	-	3948
28	-	3148	4482	2857	-	3199	3267
31	-	2381	3689	7096	3066	-	4058
33	-	5066	6484	-	-	-	5775
35	-	0	0	0	0	-	0
39	0	0	0	0	0	0	0
41	0	30	0	0	0	-	6
43	0	9	227	-	-	-	179
45	6	834	749	0	-	-	397
48	0	0	0	0	0	0	0
50B	-	123	0	-	-	-	62
50C	-	25	0	0	0	-	6
51	0	11243	0	3096	0	-	2868
52	4910	7788	10490	6666	3066	-	6584
54	5274	-	9007	7481	6799	6073	5773
55B	-	-	-	0	-	3126	1563
57	0	0	0	0	0	-	0
58	-	0	-	-	-	-	0
59	15	0	0	0	0	0	3
60	0	0	0	0	0	0	0
60B	-	0	0	0	0	-	0
60C	-	-	0	0	0	-	0
61	0	0	0	0	0	0	0
62	-	-	0	0	0	0	0
63	0	0	0	0	0	-	0
64	-	0	15	0	0	0	3
65	-	764	44	-	-	-	404
66B	-	-	15	-	-	-	15
68	-	455	4124	-	1066	164	1452
69	-	1540	3033	1215	-	-	1929
69B	-	-	0	-	-	246	123
Cruise mean	816	1271	1446	1045	866	715	1094

Table 4. Density (no.·m⁻²; mean of 3 grabs) of Mysis relicta collected during the 1969 Lake Winnipeg baseline survey (- = not sampled).

Station	Cruise Number							All Cruises
	300	400	500	600	700	800		
1	-	-	-	0	-	-	-	0
2	-	0	0	0	0	0	0	0
3	0	0	0	0	0	-	-	0
3C	-	-	0	0	0	-	-	0
4	0	0	0	0	0	0	0	0
5	-	0	0	15	0	-	-	4
6	-	-	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	-	-	-	-	0
10	0	0	0	0	0	0	0	0
11	-	-	-	0	-	0	0	0
12	-	-	0	0	0	0	0	0
13B	-	0	-	-	-	-	-	0
14	0	0	0	0	0	0	0	0
16	-	0	0	0	0	0	0	0
17	-	0	0	-	0	-	0	0
18	0	0	0	0	0	-	-	0
19	-	0	0	-	-	-	-	0
20	-	-	0	0	0	0	0	0
21	-	-	0	0	0	0	0	0
22	-	0	0	0	0	-	-	0
23C	-	0	0	0	0	0	0	0
23E	0	0	0	0	0	-	-	0
24	0	-	-	-	-	-	-	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	-	-	0
27	15	0	0	-	0	-	-	4
28	-	0	0	0	-	0	0	0
31	-	0	0	0	0	0	-	0
33	-	0	0	-	-	-	-	0
35	-	0	0	0	0	-	-	0
39	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	-	0
43	0	0	0	-	-	-	-	0
45	0	0	0	0	-	-	-	0
48	0	0	0	0	0	0	0	0
50B	-	0	0	-	-	-	-	0
50C	-	0	0	0	0	0	-	0
51	0	0	0	0	0	0	-	0
52	0	0	0	0	0	0	0	0
54	0	-	0	0	0	0	0	0
55B	-	-	-	0	0	-	0	0
57	0	0	0	0	0	0	-	0
58	-	0	-	-	-	-	-	0
59	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0
60B	-	0	0	0	0	0	-	0
60C	-	-	0	0	0	0	-	0
61	0	0	0	0	0	0	0	0
62	-	-	0	0	0	0	0	0
63	0	0	0	0	0	0	-	0
64	-	0	0	0	0	0	0	0
65	-	0	0	-	-	-	-	0
66B	-	-	0	0	-	-	-	0
68	-	0	0	0	-	0	0	0
69	-	0	0	15	-	-	-	5
69B	-	-	0	-	-	-	15	8
Cruise mean	0.6	0	0	0.7	0	0.6	0.3	

Appendix 1. Length and width of shells and body wet weight of individual
Caenestheriella setosa from Lake Winnipeg benthic samples in 1969.
 Shell width 1 = apex of umbone, shell width 2 = base of umbone.

Cruise and Station	Grab #	Specimen	Shell length (mm)	Shell width 1 (mm)	Shell width 2 (mm)	Body weight (mg)	Comments
310	3	1	7.82	5.10	4.76	---	empty shell
314	2	1	6.97	4.93	4.25	---	empty shell
359	3	1	8.33	5.78	5.61	---	empty shell
405	2	1	8.33	5.78	5.44	—	empty shell
410	2	1	6.63	4.76	4.25	29.65	
410	3	1	5.10	3.57	3.06	13.05	
414	1	1	5.61	4.08	3.74	15.20	
414	1	2	4.25	3.23	3.06	6.10	
414	1	3	4.93	3.57	3.23	12.55	
414	1	4	4.08	3.06	2.72	—	
414	1	5	4.93	3.57	3.40	11.40	
414	1	6	5.10	3.57	3.40	12.10	
414	1	7	4.25	3.23	3.06	8.00	
414	1	8	5.44	3.91	3.74	18.05	
414	1	9	5.44	3.91	3.74	15.20	
414	1	10	4.42	3.40	3.23	8.50	
414	1	11	5.21	3.91	3.57	13.10	
414	1	12	4.59	3.40	3.23	10.05	
414	1	13	3.91	3.06	2.72	5.70	
414	1	14	5.10	3.74	3.40	11.45	
414	1	15	3.23	2.38	1.70	2.00	
414	1	16	4.59	3.40	3.06	10.45	
414	1	17	4.93	3.57	3.23	11.40	
414	2	1	4.76	3.57	3.40	12.05	
414	2	2	5.44	3.91	3.74	14.60	
414	2	3	4.93	3.74	3.40	12.00	
414	2	7	3.57	2.72	2.38	7.0	
414	2	8	4.25	3.23	3.06	8.65	
414	2	9	3.91	3.06	2.72	7.95	
414	2	10	4.59	3.23	3.06	11.20	

Appendix 1. Cont'd.

Cruise and Station	Grab #	Specimen	Shell length (md)	Shell width 1 (md)	Shell width 2 (md)	Body weight (mg)	Comments
414	3	1	4.76	3.40	3.23	—	
414	3	2	4.76	3.57	3.23	—	
414	3	3	4.59	3.40	3.23	—	
414	3	4	4.08	3.06	2.72	—	
414	3	5	4.25	3.23	2.89	—	
414	3	6	4.42	3.40	3.06	—	
414	3	7	4.93	3.74	3.40	—	
414	3	8	4.42	3.23	2.89	—	
414	3	9	4.93	3.57	3.40	—	
414	3	10	4.93	3.74	3.40	—	
414	3	11	4.42	3.23	3.06	—	
414	3	12	5.10	3.74	3.40	—	
414	3	13	5.10	3.74	3.57	—	
414	3	14	4.93	3.40	3.23	—	
414	3	15	4.93	3.57	3.40	—	
414	3	16	4.59	3.23	3.06	—	
414	3	17	4.25	3.23	2.89	—	
414	3	18	4.93	3.74	3.40	—	
414	3	19	4.42	3.23	3.06	—	
506	1	1	8.33	5.78	5.44	—	empty shell
514	1	1	6.46	4.42	4.08	26.05	
514	1	2	5.95	4.25	4.08	20.95	
514	1	3	7.31	5.10	4.76	—	
514	1	4	5.44	3.91	3.57	15.55	
514	1	5	6.12	4.25	3.91	18.55	
514	1	6	7.14	5.27	4.93	37.80	
514	1	7	6.46	4.76	4.59	27.25	
514	1	8	5.27	3.74	3.40	13.35	
514	2	1	6.97	4.93	4.25	—	
514	2	2	5.78	4.25	3.91	21.90	
514	2	3	5.44	3.91	3.74	—	
514	2	4	7.14	5.10	4.59	36.10	
514	2	5	6.46	4.59	4.25	30.85	gravid

Appendix 1. Cont'd.

Cruise and Station	Grab #	Specimen	Shell length (md)	Shell width 1 (md)	Shell width 2 (md)	Body weight (mg)	Comments
514	2	7	5.95	4.25	3.91	18.10	
514	2	8	5.95	4.25	3.91	22.75	
514	2	9	5.95	4.25	4.08	17.45	
514	2	10	6.63	4.76	4.42	24.85	
514	2	11	5.95	4.42	4.08	---	
514	2	12	5.78	4.25	3.91	20.15	
514	2	13	6.46	4.59	4.25	---	
514	2	14	6.12	4.42	4.08	26.25	
514	2	15	5.95	4.25	4.08	---	
514	3	1	6.12	4.59	4.25	21.50	
514	3	2	6.12	4.42	3.91	22.30	
514	3	3	5.61	3.91	3.74	---	
514	3	4	5.44	3.74	3.40	---	
514	3	5	6.29	4.59	4.25	---	
514	3	6	6.12	4.42	4.08	21.50	
528	1	1	9.35	6.63	6.12	---	empty shell
605	3	1	9.18	6.63	6.12	---	empty shell
610	2	1	7.65	5.78	5.27	---	empty shell
612	1	1	7.99	5.95	5.44	---	
612	1	2	8.16	5.78	5.27	---	
612	1	3	8.33	6.12	5.78	---	
626	1	1	7.65	5.44	5.10	---	gravid, 1/2 shell
626	3	1	7.65	5.44	5.10	45.00	
657	2	1	7.65	5.44	5.10	---	
657	2	2	7.31	5.10	4.76	---	
657	3	1	8.16	5.78	5.44	---	
660	1	1	5.61	3.57	3.23	---	empty shell
660	1	2	6.12	4.42	4.25	---	empty shell
660	1	3	5.78	4.08	3.74	---	empty shell
660	1	4	4.93	3.40	3.06	---	empty shell
660	2	1	7.99	5.78	5.27	---	empty shell
660b	2	1	7.14	5.10	4.76	---	empty shell

Appendix 1. Cont'd.

Cruise and Station	Grab #	Specimen	Shell length (md)	Shell width 1 (md)	Shell width 2 (md)	Body weight (mg)	Comments
660c	2	1	7.65	5.27	5.10	---	empty shell
660c	2	2	7.31	5.44	5.10	---	empty shell
660c	2	3	5.95	4.25	4.08	---	empty shell
661	1	1	9.01	6.12	5.78	---	empty shell
661	1	2	—	—	—	—	damaged
661	3	1	7.31	5.61	5.10	---	empty shell
661	3	2	7.14	5.10	4.76	---	empty shell
661	3	3	6.97	5.10	4.93	---	empty shell
664	2	1	9.01	6.46	6.12	---	empty shell
664	3	1	7.31	4.93	4.76	---	empty shell
664	3	2	6.12	4.42	4.25	---	empty shell
664	3	3	7.14	5.10	4.76	---	empty shell
810	2	1	8.67	6.12	5.61	---	