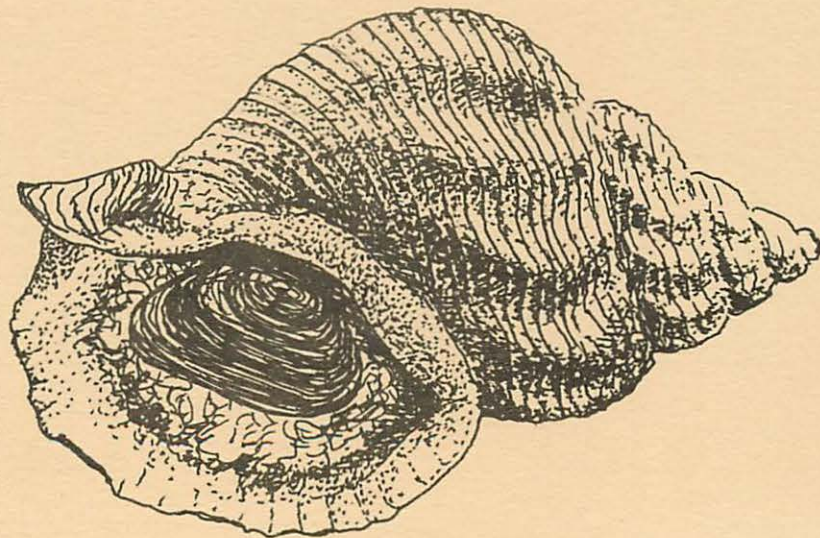


Curatorial Report Number 14

Nova Scotia Museum
1747 Summer Street
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An Analysis of Three Samples of Whelks From Nova Scotia Waters

By Paul McClung
July 1973

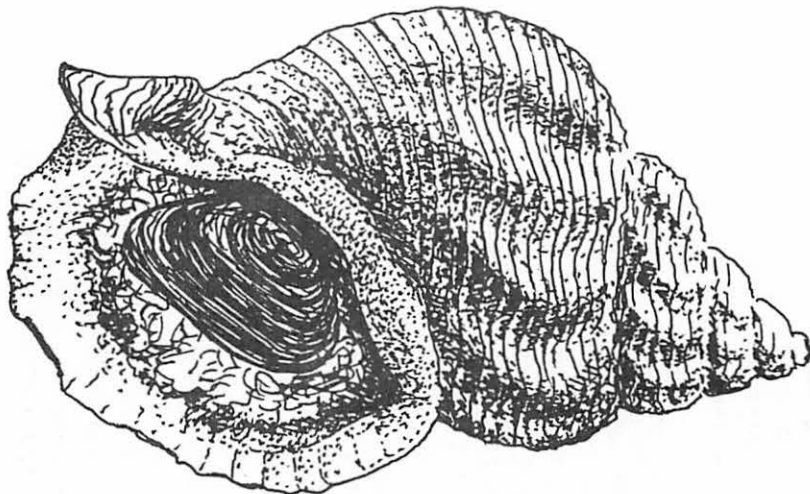


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NOVA SCOTIA MUSEUM

Curatorial Reports

The *Curatorial Reports* of the Nova Scotia Museum contain information on the collections and the preliminary results of research projects carried out under the program of the museum. The reports may be cited in publications but their manuscript status should be clearly indicated.

INTRODUCTION

The common northern whelk, *Buccinum undatum* L., is widespread throughout the European North Atlantic and along the eastern coast of North America from New Jersey to northern Labrador. It is locally abundant and lives in depths of up to 2,000 meters. This whelk generally avoids brackish waters but can survive salinities of less than 14‰ (Fretter and Graham, 1962).

B. undatum is a generalized carnivore and is also cannibalistic. Stomachs of European specimens were found to contain nemertean worms, crustaceans, echinoderms, turbellarians, polychaetes, amphipods and other molluscs including *Buccinum*. (Nielsen, 1963; Blegvad, 1914). This species is parasitized by a number of organisms such as sporozoans, turbellarians and trematodes (Køie, 1969).

The breeding season for *B. undatum* extends from October to May, depending on locality. Egg capsules are laid in clusters. Whelk development does not pass through a free-swimming larva stage; instead the larva is retained within the egg capsule during development. For this reason *B. undatum* tends to form local populations which may possess a wide range of variability. Several varieties have been named (Entrop, 1960?). The specimens sampled in this survey fell largely into var. *typica* and var. *flexuosa* Jeffreys, with some specimens approaching var. *striata* Pennant and var. *vulgaris* (Da Costa).

The published material available on *B. undatum* inhabiting the eastern coast of North America is very limited. In view of the commercial market potential, better understanding of the ecology and population dynamics of *B. undatum* is desirable.

MATERIALS AND METHODS

In 1966-1967 the Nova Scotia Museum conducted a survey of the cancrid crabs found in the coastal waters of Nova Scotia. (Malcomb, 1972). The crab samples were collected by lobster fishermen in various locations around the province. Three of the fishermen, Stan Purdy (Eastern Passage, Halifax Co.), Ervin Scott (Sand Point, Guys. Co.), and George Cadden (New Waterford, Cape Breton Co.), in addition to collecting crabs, collected moderately large samples of whelks (*Buccinum undatum* L.).

The whelks taken in the 1966-67 survey were fixed and preserved in formalin. They then remained uncatalogued in the museum collection until February 1973. At that time they were examined for trematode parasitism, sexed; the length and width of shell measured and the shell and meat weighed. Unfortunately parasites, particularly trematodes, are quite difficult to locate in old preserved specimens. However, it has been shown that penis length has a direct relationship to trematode parasitism in males, infected males possessing a severely reduced penis (Koie, 1969). Determining the sex of *Buccinum undatum* is a relatively simple and exact procedure which depends upon the presence or absence of a penis. The penis is always conspicuous in males even when they are heavily parasitized. The length and width were measured with calipers, length being the greatest distance between the apex and base of the body whorl and width being the greatest distance across the shell on an axis perpendicular to the length axis. Weight measurements were recorded for the whole specimen, the shell including operculum (wet and dry), and the meat (wet and dry). The dry weights were determined after separating the meat from the shell and placing both in an oven (60°C) for 12 hours. All weighing was done on a Sartorius balance (range 0.1 - 1000.0 grams).

Specimens were then catalogued and incorporated into the reference collection. (Cat. Nos. 967-Z.8.6.(85-146); 967-Z.9.3(1-60); 967-Z.2.10.8(61-84).

DISCUSSION AND RESULTS

In the three Nova Scotian samples of *B. undatum* examined, specimens in samples 1 (New Waterford, Cape Breton Co.) and 2 (Sand Point, Guys. Co.) were similar in size, shape and color. Specimens in sample 3 (Eastern Passage, Halifax Co.) were generally smaller, reddish in color and exhibited a more pronounced shell sculpture, having more distinct sutures and spiral cords. This was because of the absence of encrusting *Lithothamnium* spp. and the boring sponge, *Cliona* spp., which were present on specimens in the first two samples. The red coloration was the result of the removal of the brown periostracum during fixation, leaving the natural reddish color of the shell.

The ratio of males to females in samples 1 and 3 was 50:50. In sample 2, however, the frequency of males dropped to 27.4% (table 5). Considering that sample 2 was the largest (62 specimens) it seems that this inconsistency was not a coincidence. There is always the possibility that males were so severely infected by parasites that their penises were not visible and they were mistaken for females. This is not likely since no evidence of parasitism (castration) was observed in the male specimens of this sample as compared to an approximately 20% infection rate among the males in samples 1 and 3. The cause of this deviation in the ratio of the sexes is not known.

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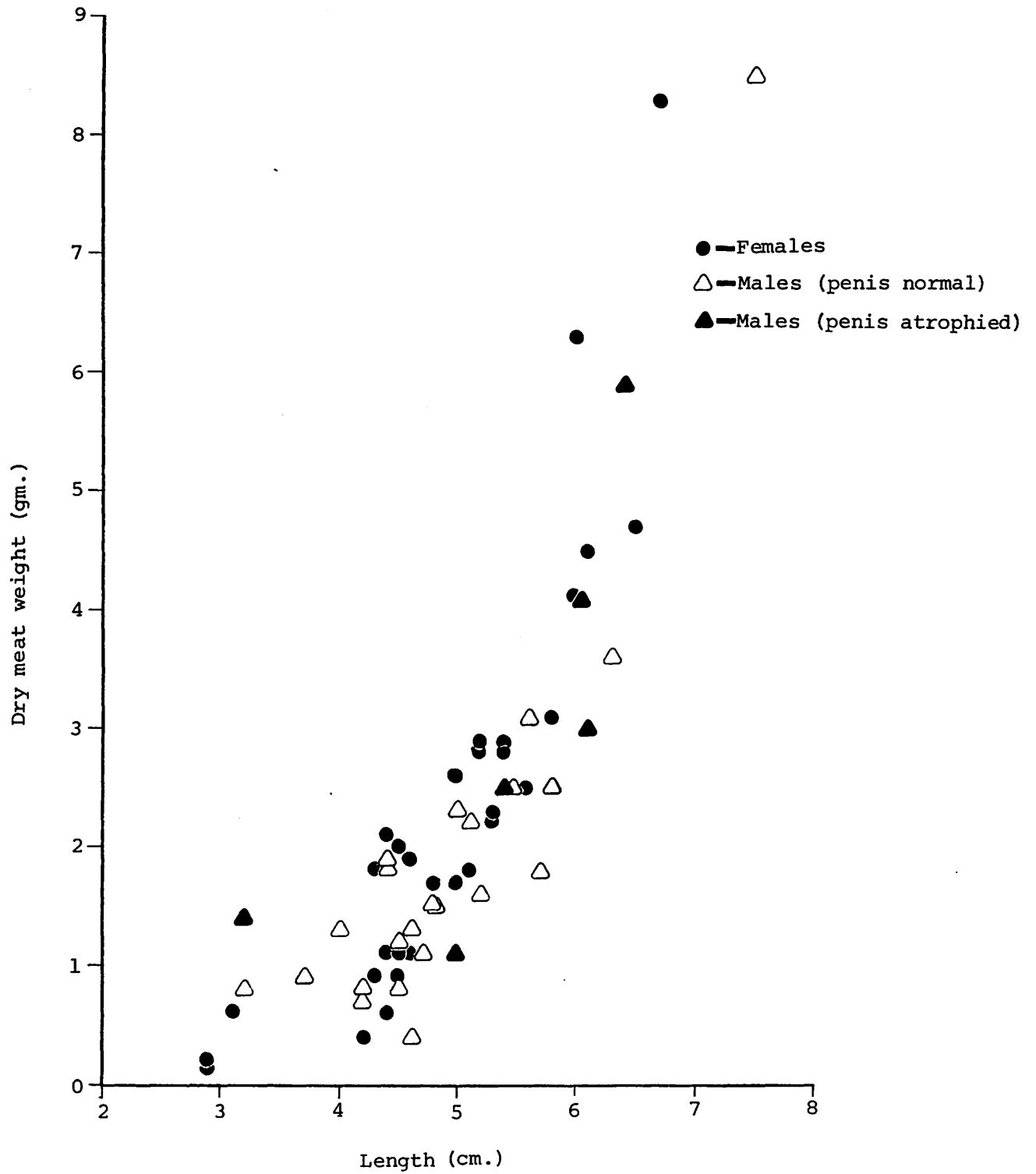


Fig. 1 Distribution of shell length and dry meat weight in male and female *Buccinum undatum* (L.) taken from New Waterford, Cape Breton Island, N. S. (sample #1).

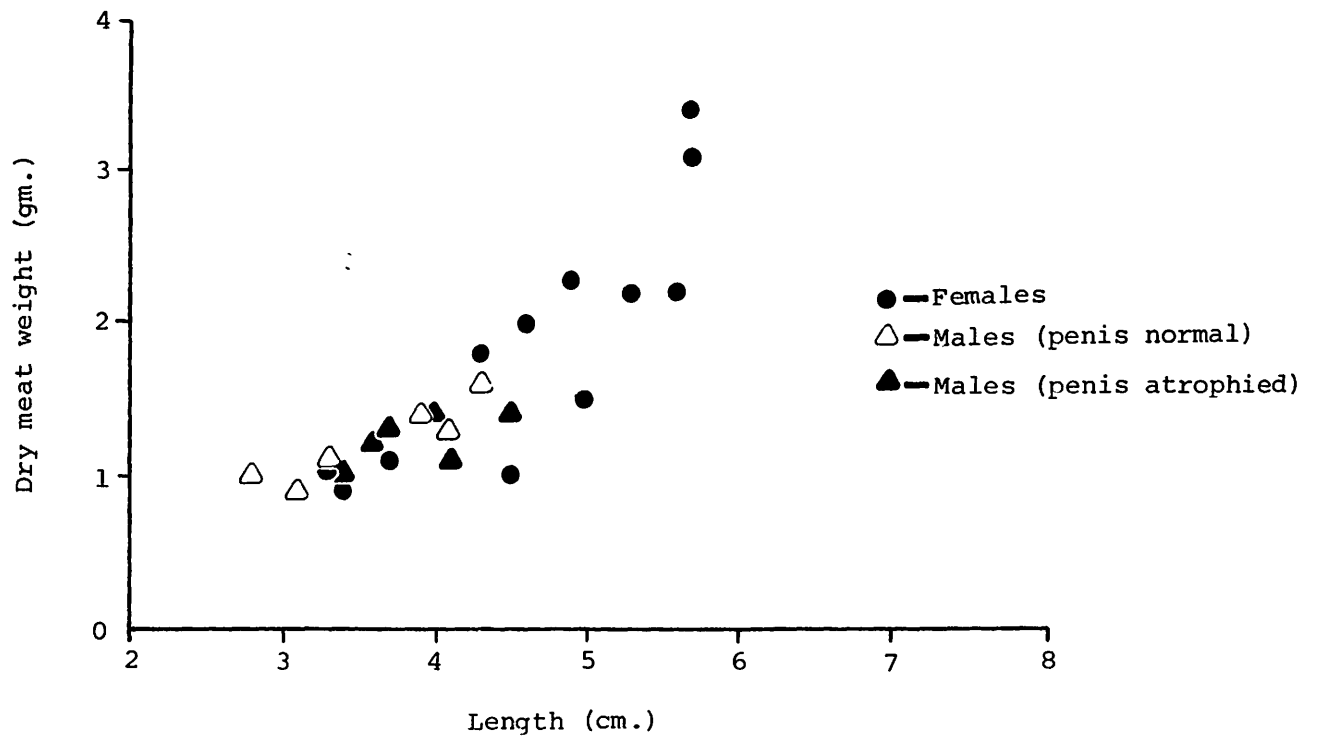


Fig. 3 Distribution of shell length and dry meat weight in male and female *Buccinum undatum* (L.) taken from Eastern Passage, Halifax Co., N. S. (sample #3).

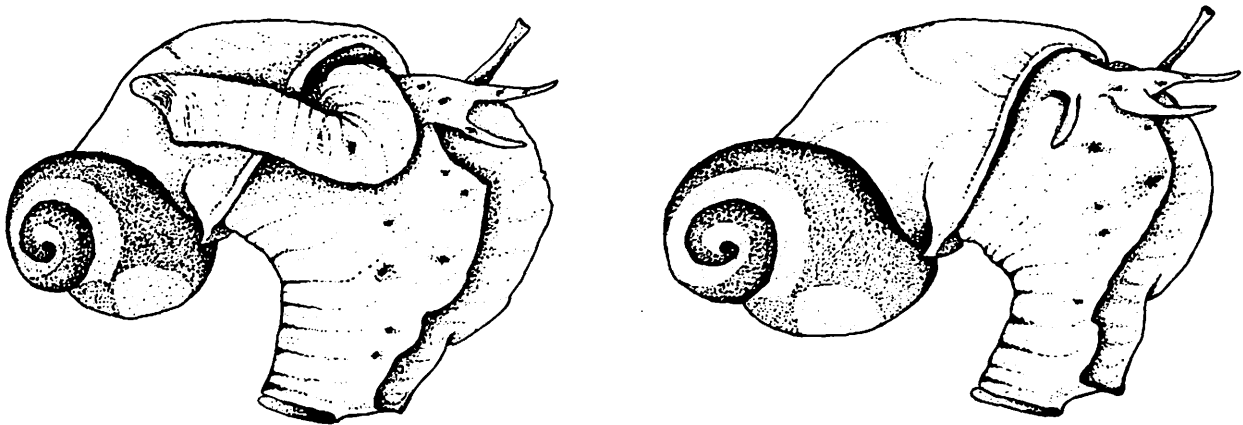


Fig. 4 Parasitism of *Buccinum* by trematodes produces penis atrophy in males. The figure at left represents the soft parts of a male *Buccinum* with penis in the uninfected condition; the right hand figure shows severe penis atrophy. (After Olsen)

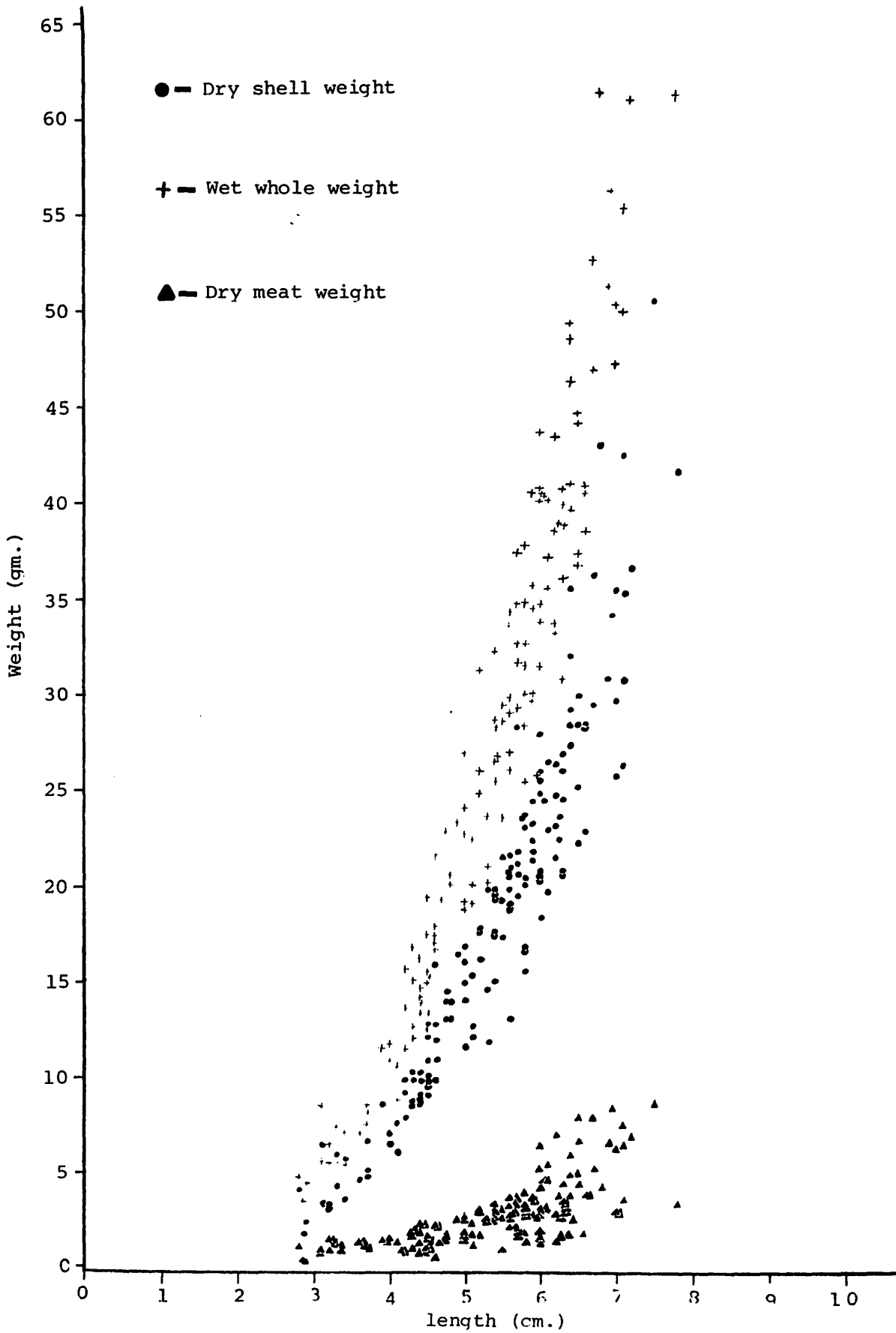


Fig. 5 Distribution of wet whole weight, dry shell weight, dry meat weight in relation to shell length in the three samples of *Buccinum undatum* (L.)

NOVA SCOTIA

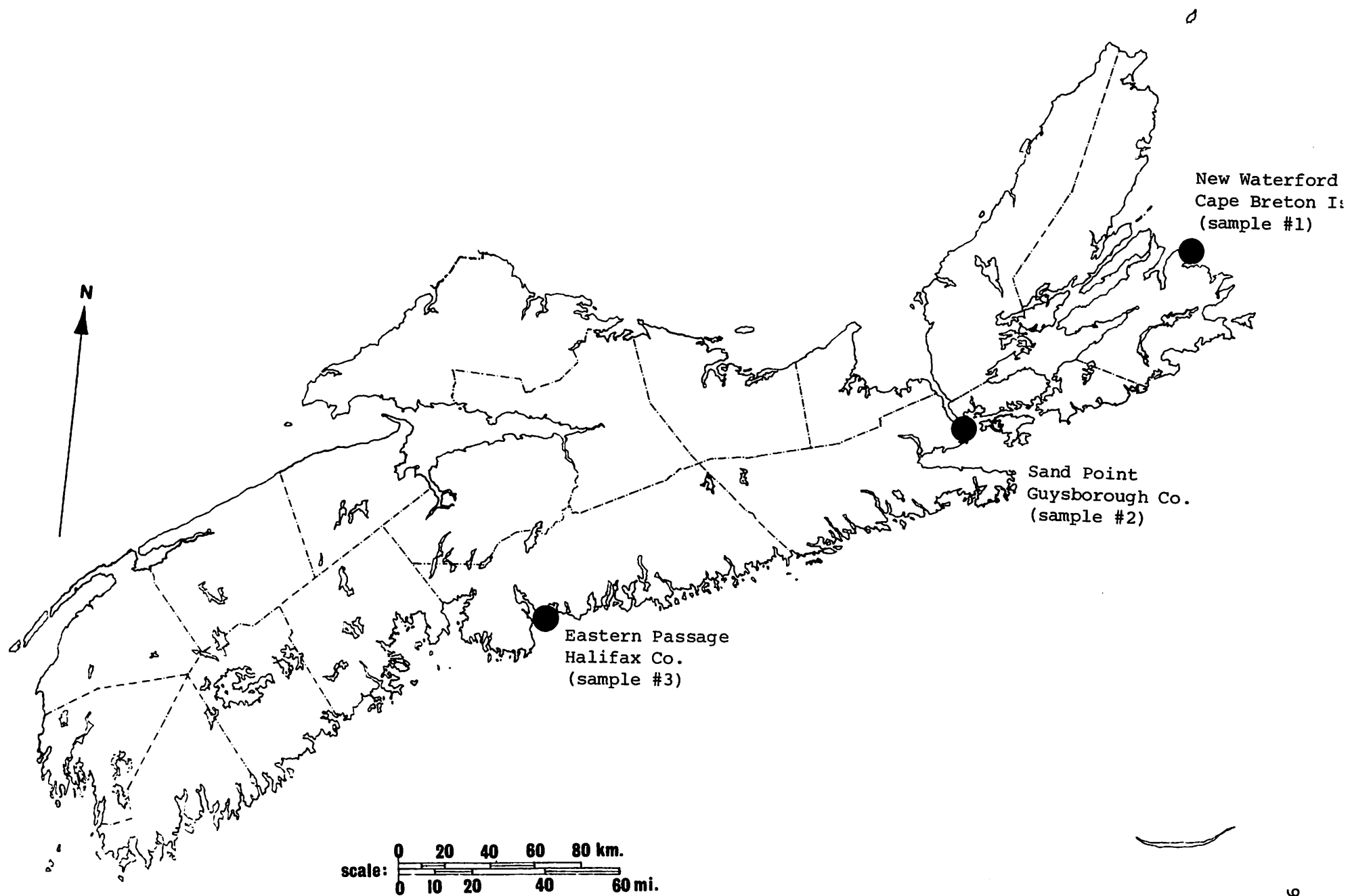


Table 1

Accession Number 67-Z-9-3-(1-60) *Buccinum undatum* L. taken in lobster traps by George Cadden, May-July 1967, New Waterford, Cape Breton Island, Nova Scotia. (sample #1).

Specimen Number	Sex	Length (cm.)	Width (cm)	Wet whole weight (gm)	Wet shell weight (gm.)	Wet meat weight (gm)	Dry shell weight (gm)	Dry meat weight (gm)	Penis size
1	F	6.7	3.9	56.3	37.0	18.9	34.1	8.3	
2	F	5.2	3.7	31.2	19.7	9.5	17.6	2.8	
3	F	5.4	3.5	32.2	20.7	8.9	19.5	2.8	
4	F	5.0	3.1	22.7	15.5	6.0	14.9	1.7	
5	M	5.4	3.3	26.5	16.0	8.3	15.0	2.5	S
6	M	6.4	4.2	49.4	32.9	13.8	29.2	5.9	S
7	M	6.3	3.7	38.9	27.0	8.6	23.6	3.6	L
8	F	6.1	3.75	40.4	25.9	11.0	24.4	4.5	
9	M	3.2	2.1	6.3	3.3	2.9	2.9	0.8	L
10	F	3.1	2.1	5.5	3.6	1.9	3.3	0.6	
11	F	4.8	3.1	20.4	14.1	6.4	13.0	1.7	
12	M	7.5	4.5	78.1	54.5	17.8	50.6	8.5	L
13	M	4.8	2.9	20.2	14.5	4.0	13.9	1.5	L
14	F	6.0	3.9	40.1	27.0	8.1	25.5	4.1	
15	F	4.8	3.2	22.8	15.3	4.8	14.4	1.5	
16	F	5.4	3.6	28.5	19.5	7.6	17.4	2.9	
17	F	4.4	2.7	13.3	9.1	2.2	8.6	0.6	
18	F	4.5	2.85	15.1	11.7	3.1	10.8	0.9	
19	M	4.7	3.15	19.2	13.5	3.8	13.0	1.1	L
20	M	4.2	2.55	15.6	10.6	3.6	9.8	0.7	L
21	M	4.5	2.9	14.8	10.5	2.5	10.0	0.8	L
22	M	5.2	3.25	24.8	19.5	5.8	17.7	1.6	L
23	F	6.0	3.95	43.8	27.0	14.5	25.9	6.3	
24	F	6.5	4.2	44.7	31.3	11.5	29.9	4.7	
25	M	5.8	3.7	34.8	25.9	7.8	23.8	2.5	L
26	M	5.7	3.6	32.6	23.0	6.3	21.1	1.8	L
27	M	5.6	3.35	34.3	22.1	8.6	20.9	3.1	L
28	M	4.2	2.8	13.5	9.8	3.6	9.1	0.8	L
29	F	5.3	3.0	20.1	12.6	6.8	11.8	2.2	
30	F	4.3	2.95	15.0	10.3	3.9	9.8	0.9	
31	F	5.8	4.0	32.6	21.0	7.9	20.0	3.1	
32	F	2.9	1.8	3.3	1.9	0.8	1.7	0.2	
33	M	6.0	3.4	34.7	21.4	9.1	20.2	4.1	S
34	M	4.5	2.8	15.4	9.8	5.7	9.0	1.2	L
35	F	2.9	2.8	4.4	2.3	1.2	2.2	0.1	
36	F	4.2	2.7	11.5	8.4	2.8	7.8	0.4	
37	M	4.6	2.8	16.8	13.4	3.2	11.9	0.4	L
38	M	5.0	3.4	26.9	17.7	7.8	16.8	2.3	L
39	F	4.5	3.2	19.3	14.7	4.9	12.7	1.1	
40	F	4.4	2.9	16.1	9.4	6.7	9.0	2.1	
41	M	5.0	3.1	19.1	15.3	3.4	14.0	1.2	S
42	F	4.4	2.85	13.9	10.7	4.3	10.1	1.2	
43	F	4.6	2.8	16.9	10.7	5.9	9.8	1.2	
44	M	4.0	2.5	11.7	7.7	4.7	6.5	1.3	L
45	M	4.6	2.9	17.4	12.1	6.0	10.9	1.3	L
46	M	3.7	2.2	8.2	5.3	3.0	4.6	0.9	L
47	M	3.2	2.0	5.4	3.7	2.7	3.2	1.4	S
48	F	4.6	2.8	17.9	12.9	4.5	12.6	1.9	
49	F	5.3	3.1	23.6	19.5	5.7	18.0	2.3	
50	M	4.4	2.7	14.6	10.2	4.7	9.7	1.8	L
51	F	4.5	2.9	17.4	12.2	5.5	12.0	2.0	
52	M	4.4	2.65	14.0	9.1	5.1	8.7	1.9	L
53	F	4.3	2.9	16.7	10.9	6.2	10.2	1.8	
54	F	5.0	3.1	24.0	16.9	7.3	16.0	2.6	
55	F	5.2	3.4	26.0	17.0	8.6	16.1	2.9	
56	M	5.1	3.1	22.3	16.8	7.1	15.4	2.2	L
57	F	5.6	3.6	29.9	21.5	8.1	20.6	2.5	
58	M	5.5	3.3	29.4	22.6	7.6	21.5	2.5	L
59	M	6.1	3.8	37.2	24.5	10.0	22.9	3.0	S
60	F	5.1	3.0	20.0	13.8	5.9	12.7	1.8	

Table 2

Accession Number 67-2-8-6-(85-146) *Buccinum undatum* L. taken in lobster traps by Ervin Scott, November-May 1967, Sand Point, Guysborough Co., Nova Scotia. (sample #2)

Specimen Number	Sex	Length (cm)	Width (cm)	Wet whole weight (gm)	Wet shell weight (gm)	Wet meat weight (gm)	Dry shell weight (gm)	Dry meat weight (gm)	Penis size
85	F	6.0	3.8	33.8	21.8	10.2	20.7	2.9	
86	F	6.4	3.9	39.7	30.4	7.0	28.3	1.7	
87	F	7.8	4.45	61.3	46.7	12.9	41.7	3.2	
88	F	6.2	3.7	38.5	28.2	8.6	26.3	2.7	
89	F	7.0	4.1	50.4	30.7	16.2	29.7	6.1	
90	F	7.0	3.8	47.3	37.5	8.2	35.5	2.6	
91	F	5.8	3.75	30.0	24.4	4.4	23.7	1.7	
92	F	6.3	4.1	39.9	28.7	10.5	26.9	3.4	
93	M	6.3	3.5	25.2	23.9	9.9	22.4	3.2	L
94	M	5.6	3.1	26.9	21.1	5.3	18.7	1.8	L
95	F	5.4	3.5	26.7	20.5	6.4	19.2	2.1	
96	M	5.6	3.0	19.8	13.4	6.0	13.0	2.0	L
97	F	6.3	4.0	36.1	21.7	13.8	20.7	4.3	
98	F	6.0	3.8	31.6	21.3	9.0	20.3	2.6	
99	M	5.8	3.6	31.5	21.8	9.6	20.4	3.0	L
100	F	6.2	4.0	43.5	26.6	17.9	24.8	6.9	
101	F	7.0	4.0	35.3	28.8	7.5	25.8	2.6	
102	M	5.5	3.2	23.6	18.9	6.8	17.3	2.8	L
103	F	6.9	4.6	51.4	32.7	17.5	30.7	6.4	
104	M	6.1	3.7	35.5	21.0	15.2	19.7	5.3	L
105	F	7.2	4.2	61.1	39.3	19.9	36.5	6.8	
106	F	7.1	4.5	55.4	38.0	17.8	35.1	7.2	
107	M	5.6	3.7	33.7	21.1	9.2	21.6	3.6	L
108	M	7.1	3.8	42.5	29.5	10.1	26.2	3.4	L
109	F	6.8	4.5	61.5	46.8	11.2	43.0	4.0	
110	F	7.1	4.4	50.0	31.8	13.2	30.8	6.1	
111	F	6.5	4.1	36.7	22.7	13.1	22.1	6.5	
112	F	5.9	3.7	29.7	22.3	6.9	21.8	3.3	
113	F	6.5	4.0	44.1	29.2	14.9	28.3	7.9	
114	F	5.6	3.5	29.0	21.6	6.0	20.5	2.7	
115	F	6.4	4.3	46.3	34.3	10.8	32.0	4.8	
116	F	6.6	4.1	40.5	29.3	11.2	28.2	4.6	
117	F	5.4	3.5	28.3	20.5	8.2	19.8	3.2	
118	F	5.7	3.5	29.3	21.9	6.4	20.6	2.8	
119	F	6.7	4.2	47.0	30.8	16.0	29.5	7.8	
120	F	6.1	3.8	40.4	28.3	10.2	26.6	4.5	
121	F	6.4	3.9	41.0	29.5	8.3	27.4	3.7	
122	M	5.4	3.2	25.4	18.1	7.8	17.5	3.2	L
123	F	5.9	4.0	34.3	23.3	8.9	22.4	3.4	
124	F	5.9	3.6	30.0	22.5	8.0	21.3	3.2	
125	F	6.5	3.9	37.6	26.5	9.7	25.1	4.1	
126	F	6.7	3.9	52.8	39.3	11.8	36.1	5.0	
127	F	5.7	3.6	31.7	21.6	9.0	19.5	1.9	
128	M	6.0	3.5	25.9	19.7	4.8	18.4	1.2	L
129	M	5.8	3.2	23.9	18.2	4.9	16.5	1.1	L
130	M	5.2	3.9	33.3	25.5	7.4	23.1	1.4	L
131	F	6.6	4.2	38.5	24.7	12.9	22.8	3.7	
132	M	5.8	3.1	25.4	16.5	7.3	15.5	1.9	L
133	F	5.8	3.7	37.9	24.6	11.4	23.0	3.8	
134	F	5.9	3.7	40.5	29.9	10.1	24.4	2.4	
135	M	6.3	3.5	30.8	22.6	6.5	20.6	1.5	L
136	M	6.2	3.6	33.7	23.3	9.0	21.5	2.6	L
137	F	6.3	3.8	38.8	27.1	11.3	24.5	2.6	
138	M	6.0	3.7	40.3	29.2	10.2	24.8	2.4	L
139	F	6.4	3.9	48.6	38.2	9.4	35.7	2.3	
140	F	5.9	3.4	28.4	18.9	9.4	16.7	2.5	
141	F	5.1	3.9	19.0	14.3	5.2	12.0	1.6	
142	M	5.9	3.8	35.9	25.3	10.1	23.1	2.3	L
143	F	5.5	3.5	28.6	21.2	5.3	19.3	0.9	
144	F	6.6	3.9	40.7	30.9	7.9	28.3	1.8	
145	F	6.0	3.9	40.2	29.8	7.6	27.9	1.7	
146	F	6.3	4.0	40.5	29.2	11.7	26.0	2.9	

Table 3

Accession Number 67-2-10-8-(61-84) *Buccinum undatum* L. taken in lobster traps by Stan Purdey, April-June 1967, Eastern Passage, Halifax Co., Nova Scotia. (sample #3).

Specimen Number	Sex	Length (cm)	Width (cm)	Wet whole weight (gm)	Wet shell weight (gm)	Wet meat weight (gm)	Dry shell weight (gm)	Dry meat weight (gm)	Penis size
61	F	5.0	3.0	18.9	12.4	5.4	11.6	1.5	
62	F	3.4	2.0	5.4	3.7	2.1	3.5	0.9	
63	M	3.3	2.0	7.3	6.3	1.7	5.9	1.2	L
64	F	4.5	2.7	11.9	10.3	2.4	9.5	1.0	
65	F	4.9	3.2	23.3	17.3	6.9	16.4	2.3	
66	F	5.7	3.9	37.5	29.9	8.2	28.3	3.1	
67	F	3.3	2.0	5.5	4.4	2.2	4.1	1.1	
68	F	5.7	3.7	34.8	23.4	11.5	21.8	3.4	
69	F	4.6	3.1	21.6	16.5	5.8	15.9	2.0	
70	M	3.6	2.1	7.0	4.9	2.8	4.5	1.2	S
71	M	4.1	2.45	10.5	8.2	3.1	7.7	1.3	L
72	M	2.8	1.7	4.6	4.2	1.3	4.0	1.0	L
73	F	5.6	3.4	26.0	19.9	6.6	19.0	2.2	
74	F	5.3	2.9	21.0	15.2	6.1	14.6	2.2	
75	M	3.7	2.3	7.5	5.3	2.4	5.0	1.3	S
76	M	3.1	2.2	8.3	6.8	2.0	6.4	0.9	L
77	F	4.3	2.8	12.0	9.4	4.0	8.7	1.7	
78	M	3.4	1.9	7.0	6.1	1.6	5.7	1.0	S
79	M	4.3	2.5	12.6	9.1	4.0	8.5	1.6	L
80	M	4.1	2.4	8.8	6.3	2.7	6.0	1.1	S
81	M	3.9	2.4	11.6	9.0	3.7	8.5	1.4	L
82	M	4.0	2.4	10.8	7.5	3.9	7.0	1.4	S
83	M	4.5	2.7	12.4	10.0	3.0	9.8	1.4	S
84	F	3.7	2.4	8.2	6.9	2.2	6.6	1.1	

Table 4 Summary of length and weight results.

	SAMPLE NO. 1			SAMPLE NO. 2			SAMPLE NO. 3		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
Shell Length									
Minimum	2.9	3.2	2.9	5.1	5.4	5.1	2.8	2.8	3.3
Maximum	7.5	7.5	6.7	7.8	7.1	7.8	5.7	4.5	5.7
Average	4.9	4.9	4.9	6.2	5.9	6.3	4.2	3.7	4.6
Shell Weight (dry)									
Minimum	1.7	2.9	1.7	12.0	13.0	12.0	3.5	4.0	3.5
Maximum	50.6	50.6	34.1	43.0	26.2	43.0	28.3	9.8	28.3
Average	15.1	15.6	14.8	24.5	20.0	26.3	10.0	6.6	13.3
Meat Weight (dry)									
Minimum	0.1	0.4	0.1	0.9	1.1	0.9	0.9	0.9	0.9
Maximum	8.5	8.5	8.3	7.9	5.3	7.9	3.4	1.6	3.4
Average	2.2	2.1	2.3	3.4	2.5	3.8	1.5	1.2	1.9

Table 5 Summary of sex distribution and percent trematode parasitism in males.

	SAMPLE NO. 1		SAMPLE NO. 2		SAMPLE NO. 3	
	Males	Females	Males	Females	Males	Females
Sex Distribution	46.7%	53.3%	27.4%	72.6%	50.0%	50.0%
Trematode Parasitism in Males	18.2%		0.0%		20.0%	