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TAXONOMIC SURVEY OF BENTHIC FAUNA IN ESTUARINE SALTMARSH POOLS, MINAS BASIN, BAY OF FUNDY

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Ten pools situated in 5 estuarine salt marshes of western Minas Basin were surveyed for benthic fauna from 1975 to 1977. Eleven phyla, comprising 56 taxa, were identified. Twenty-five new records for the pools, of which 20 are unpublished records for Minas Basin and 18 new for Bay of Fundy, included representatives from Homalorhagae, Dinophilidae, Cuthonidae, Phyllodocidae, and Spionidae. In abundance, nematodes outranked other taxa. The other dominant taxa were copepods, oligochaetes, *Hydrobia totteni*, and *Nematostella vectensis*. There was faunal variation between areas flooded frequently and those flooded only by high spring tides, and between one estuary and another. Generally, both diversity and density showed a decline during winter and early spring.

Introduction

Minas Basin is recognized as an exceptional area geologically (Goldthwait 1924; Johnson 1925) and hydrologically (Garrett 1977) but has only recently gained recognition as an equally exceptional area bionomically (Bousfield & Leim 1960; Petersen & Petersen 1977; Thomas 1977). The peculiar combination of physical characteristics within the basin provides an environment for biota which is both unique and diverse.

Petersen and Petersen (1977) and Thomas (1977) provide comprehensive accounts of published work to date on the biota of the benthic and intertidal zones of the Minas Basin and other areas of the Bay of Fundy and recommend that this work be greatly expanded, especially since the Petersens' survey revealed hydroids and polychaetes new to science. Trevors and Fuller (1977) also conducted an intensive survey of intertidal macrobenthos in Minas Basin. However, apart from species-specific studies (Bailey & Bleakney 1967; Bleakney & Bailey 1967; Frank 1974; Frank & Bleakney 1976; 1978; Norenburg 1976; Graves et al. 1979) little has been done on the general fauna of the Minas Basin salt marshes, especially the marsh pools. Until 1975, only 2 pools, among the several hundred present in the southern bight of the Minas Basin, had been investigated (K.H. Bailey unpubl).

Preliminary evidence indicated that local marsh pools are peculiarly stressed systems whose benthic communities exhibit not only low diversity and high density, but also both local and regional variation. Primarily this study set out to define the basic fauna of the benthos, to estimate their relative abundance, and to indicate something of their seasonal and regional distribution. Field sampling began in July, 1975, and ended in August, 1977 (Table I).

Description of the study area

Figure 1 is a map of the study areas in Minas Basin, which include estuarine marshes of 2 creeks, Pereau and Habitant, and 3 rivers, Canard, Cornwallis, and Gaspereau. Ganong (1903), Chapman (1960), and MacInnis (1976) have described the local marsh flora.

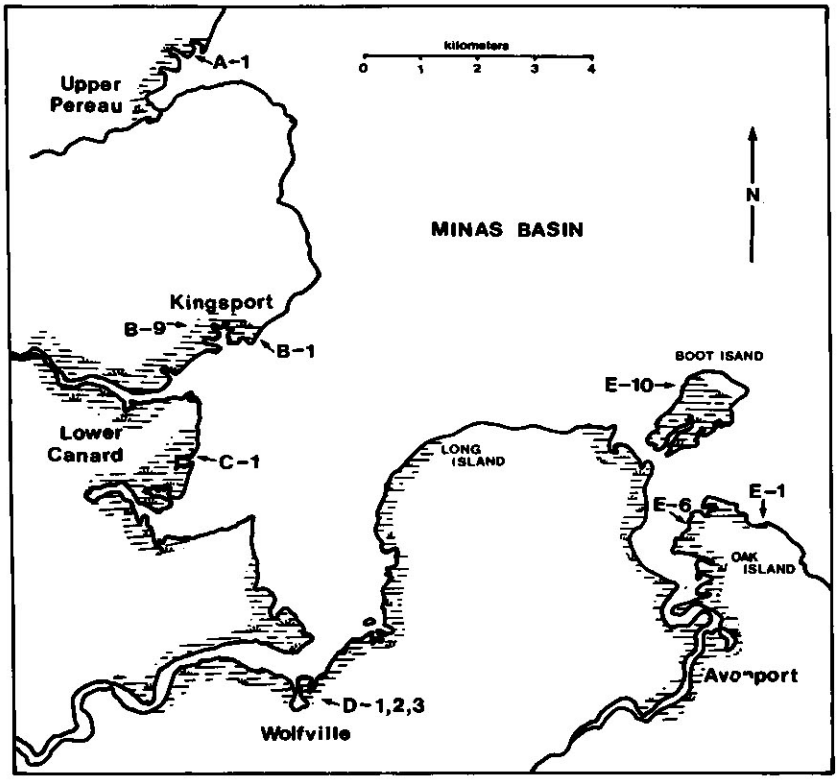

Fig 1 Study pool locations in southwestern Minas Basin, Kings Co., N.S.

Color aerial photographs (Maritime Resource Management Services, Amherst) were used to estimate the number of pools in each estuary and to choose arbitrarily pools for investigation. The majority of pools were uniformly oval; some were oblong or even rectangular. Most were small, 6 m^2 to 12 m^2, and most had perpendicular sides, sometimes undercut and overhung with sod; the bottoms of fine sand or silt were overlain with fine detritus. Water depth did not often exceed 35 cm. With one exception, E-6, the pools sampled were on high marsh and were inundated only by spring tides or high neap tides. E-6 was much deeper than the rest with a narrow drainage ditch permitting water to enter at each tide (Table II). Evaporation and rain caused fluctuations in pool salinities; extremes of 20.5°/oo to 39.3°/oo and 22.6°/oo to 39°/oo have been reported (Table X). During the 3 summers of observation the water in no pool evaporated entirely.

The denser vegetation surrounding the pools is dominated by *Spartina patens* at higher marsh levels and by *S. alterniflora* at lower levels subject to more frequent flooding. Intermingling both are *Distichlis spicata* and *Limonium nashii*. Areas of sparse vegetation are colonized by *Salicornia europea* and *Sueda maritima*. Within the pools *S. alterniflora* is an emergent, and during the observation period, colonizing D-1 almost entirely, trapping the sediment load of the incoming tide, and gradually reducing the pool's area. Observations have not been made over a long

Table I. Sampling periods for saltmarsh pools, 1975-1977 in Minas Basin. River estuaries are: A - Pereau, B - Habitant, C - Canard, D - Cornwallis, and E - Gaspereau. The aggregate of individual specimens removed from benthic grab samples at each pool is indicated.

Estuary	Pool	Sampling period	Total organisms counted
A	A-1	1976, Feb., May, 1977, April	6,349
B	B-1	1976, Feb; 1977, July	2,505
	B-9	1976, Nov.	7,056
C	C-1	1976, May; 1977, Aug.	2,184
D	D-1	1975, July; 1976, Jan., July; 1977, Mar.	14,474
	D-2	1976, Jan.	965
	D-3	1975, Sept. (algal sample)	203
E	E-1	1976, Feb., Aug.	3,748
	E-2	1976, May; 1977, June	6,715
	E-10	1976, June; 1977, June	12,036

Table II. Physical aspects of marsh pools sampled in Minas Basin. (agri, close to agricultural run-off; hneap, high neap; remote, at least 1 km from habitations; swg, close to urban sewage outlet).

Pool	Location	Bottom	Depth (cm)	Tidal flooding	Area (m^2)
A-1	agri	sand	20	hneap	195
B-1	agri	mud	20	spring	71
B-9	agri.	mud	20	spring	105
C-1	agri	mud	20	spring	103
D-1	swg	mud	20	spring	12
D-2	swg	mud	15	spring	3
D-3	swg	mud	15	spring	14
E-1	agri	mud	35	spring	15
E-6	agri	mud	100	daily	229
E-10	remote	mud	25	spring	403

enough period to determine whether or not this process results in the obliteration of the pool, but according to Dr. Kenneth Mann (in litt.), *S. alterniflora* cannot survive as an emergent longer than about 3 years. Other pool flora include *Ruppia maritima,* and algae such as species of *Enteromorpha, Cladophora, Chaetomorpha,* and *Rhizoclonium* which vary in abundance from pool to pool.

Pereau Creek Salt Marshes (W. 64°24′, N. 45°12′)

Pereau Creek salt marshes comprise 16 ha (Hilchey & Cann 1953), most of which lie on the north bank of the estuary. Across this bank flow 4 widely-spaced brooks draining the south slope of North Mountain. About 17 pools are scattered on the marsh bordering the second most westerly of the 4 brooks and the largest pond, A-1, was selected for sampling (Fig 1, Table II).

Habitant Creek Salt Marshes (W. 64°23′, N. 45°09′)

Through deterioration of the dykes, the area east of the causeway reverted to salt marsh, most of which is located on the north bank. Six brooks, draining agricultural land, transverse the north bank, and effluent from 2 community settling ponds drains into the creek above the causeway. At least 135 pools occur from Kingsport to this causeway at the head of the estuary. About 6 pools are located on the less extensive marsh occupying the south bank, 2 of which were studied by Bailey in 1965-67 (Bailey 1967; Bleakney & Meyer 1979). On the north bank, near Kingsport, 2 widely spaced pools were chosen for sampling: B-1, the site of a more specific study of *Nematostella vectensis* by Frank (1974) and B-9, located beside a large gully which drains the farmlands north of the highway (Fig 1, Table II).

Canard River Salt Marshes (W. 64°23′, N. 45°08′)

East of the dyke and causeway crossing the Canard River there are 177 ha of saltmarsh (Hilchey & Cann 1953) almost equally divided between the north and south banks of the estuary. The marsh is dissected by erosion channels and there are an estimated 400 pools, about 20 lying on the south bank. C-1 was selected from a small group of pools, located in an area of agricultural run-off at the north-east extremity of the estuary (Fig 1, Table II).

Cornwallis River Salt Marshes (W. 64°22′, N. 45°07′)

The Cornwallis River salt marshes are the most extensive in the Minas Basin and include: (1) the salt marsh portion of the Grand Pré marsh body (Hilchey & Cann 1953) comprising 90 ha (Fuller & Woodman, in verb.). It lies to the east of the Cornwallis River and to the west of the Wickwire dykeland which was reclaimed by Maritime Marshlands Reclamation Committee in 1962 and includes Long Island marsh and the east shore of Wolfville Harbour; and (2) 468 ha of salt marsh described by Hilchey and Cann (1953) as lying at the mouth of the Cornwallis River, west of Wolfville and south of Starrs Point, an area known as Sutton's marsh. About 57 pools lie in the Cornwallis salt marsh: 33 on Long Island, 21 on the marshes bordering Wolfville Harbour and 3 on the Sutton marsh south of Starrs Point. Study pools D-1, D-2, and D-3 were selected on the east side of Wolfville Harbour immediately north of the Dominion Atlantic Railway. D-1 and D-2 lay within 100 m southeast of the raw effluent of the town's main trunk sewer (Fig 1, Table II). This outflow was terminated by the installation of a sewage treatment plant in 1978.

Gaspereau River Salt Marshes (W. 64°16′, N. 45°06′, + 08′)

Gaspereau River salt marshes comprise about 350 ha (Hilchey & Cann 1953) in-

cluding Boot Island marsh and extending from Oak Island, west of Avonport Beach, along the east and west banks at the mouth of the Gaspereau River as far as the eastern end of Long Island. About 20 pools are scattered along the east bank of the river from Oak Island to the railway bridge. On the west bank, from the 101 Highway bridge to Long Island, there are about 27 pools, with another estimated 70 pools on Boot Island marsh. Study pools E-1 and E-6 are located on Oak Island and E-10 on Boot Island (Fig 1, Table II). The elevation of E-1 protects it from direct run-off originating in the surrounding agricultural lands and nearby habitation. In contrast, E-6 is readily contaminated by agricultural run-off from the ditch to which it is connected. The island location of E-10 isolates it from direct influence of agricultural lands, but its proximity to an extensive gull nesting colony could be equally significant in terms of both nutrients and pollutants.

Materials and Methods

The initial strategy had been to sample randomly selected pools, 1 from each of the 5 estuarine marshes, monthly for 2 years. However, the scrutiny to which each sample was subjected sometimes occupied as much as 6 weeks. This resulted in an irregular sampling schedule for, at most, only 1 pool per marsh per month could be processed (Table I). Severe winter conditions also required altering the sampling schedules.

Random samples were taken, by means of a plexiglass grab (Frank 1974) which was pressed into the substrate to a depth of 1 cm; the inside dimensions were 15 cm x 15 cm with a total volume collected of about 225 ml. Since the pools were small, a single sample was collected from a given pool at any one time to avoid disruption.

In summer, washing and screening of the samples were done at nearby pools. In winter, usually screening was done in the laboratory using water from the pools. Five grades (mesh sizes 3.360 mm, 1.558 mm, 0.602 mm, 0.351 mm, 0.223 mm, and 0.093 mm) of rigid nylon screen (NITEX) were used successively. Those organisms passing the 0.233 screening constituted such large numbers of nematodes and copepods that, for reasons of expediency, they were not included in the survey.

Analysis of each 225 ml field sample was done by transferring sub-samples of about 0.3 ml to the bottom of a 60 mm x 15 mm plastic petri dish, the top of which was modified as a counting grid. Each 12 mm square grid unit was exactly circumscribed by the 12x field of a Wild M5 binocular microscope, and the subsamples were of such small density that every particle was discernible. A series of sub-samples was prepared, allowed to settle, placed upon the counting grid, and tabulated as absolute numbers for each taxon for each pool (Appendix I).

Once assigned taxonomic rank, individuals were stored at 5°C. Before further processing, representative specimens were photographed (Bleakney 1970). Photomicrographs were taken using a Pentax KX fitted to a Wild M5 binocular microscope.

Most organisms were readily identified with the aid of available literature; obscure taxa were sent to appropriate specialists. The following persons were most helpful: Dr. Louise Bush, platyhelminths; Dr. M.J. Dadswell, oligochaetes; Dr. R.P. Higgins, kinorhynchs; Mr. Jon Norenburg, nemertines; Dr. Marion H. Pettibone, polychaetes; and Dr. Gustavs Vilks, foraminiferans.

Results

A total of 63 benthic taxa, distributed among 11 phyla, were recorded from the 10 marsh pools (Table III). Sixty-four percent of the fauna were given specific rank,

Table III. Distribution of 63 taxa collected from Minas Basin salt marsh pools, 1975 to 1977.

	A-1	B-1	B-9	C-1	D-1	D-2	D-3	E-1	E-6	E-10	Totals	v%
Phylum Protista												
Ammotium salsum	*	*	*	*	*	*	*	*	*	*		
Miliammina fusca	*	*	*	*	*	*	*	*	*	*		
Ammonia beccarii	*	*	*	*	*	*	*	*	*	*		
Trochammina inflata	*	*	*	*	*	*	*	*	*	*		
Jadammina polystoma	*	*	*	*	*	*	*	*	*	*		
Haplophragmoides bonplandi	*	*	*	*	*	*	*	*	*	*		
Cribroelthidium excavatum	*	*	*	*	*	*	*	*	*	*		
Elphidum sp	*	*	*	*	*	*	*	*	*	*		
Phylum Cnidaria												
Protohydra leuckarti	+		+		+				+	+	129	50
Nematostella vectensis	+	+	+		+	+	+	+		+	2810	80
Phylum Platyhelminthes												
Neochildia fusca	+								+	+	44	30
Macrostomum sp		+	+								2	20
D-6.11.76			+		+						3	20
Ty-28.3.77					+						1	10
E-28.3.77					+						1	10
S-28.3.77					+						1	10
Otomesostoma sp				+							175	10
Monocelis durhami	+	+	+	+					+	+	64	60
Phylum Nemertea												
Prostomatella obscura	+	+		+	+	+					31	50
Lineus viridis	+	+									18	20

	A-1	B-1	B-9	C-1	D-1	D-2	D-3	E-1	E-6	E-10	Totals	v%
Phylum Rotifera												
Unidentified	*	*	*	*	*	*	*	*	*	*		100
Phylum Kinorhyncha												
Pycnophyes 1016.4									+		36	10
Pycnophyes 1016.6	+										7	10
Phylum Nematoda												
Unidentified	*	*	*	*	*	*	*	*	*	*		100
Phylum Bryozoa												
Bowerbankia gracilis	+		+		+				+		18	40
Phylum Mollusca												
Littorina littorea	+	+					+		+		8	40
Littorina saxatilis	+	+					+	+	+	+	6	60
Hydrobia totteni	+	+	+	+	+	+	+	+	+	+	5778	100
Ilyanassa obsoleta	*	*	*	*	*	*	*	*	*	*		100
Stiliger fuscatus		+									2	10
Alderia modesta					+						40	10
Elysia chlorotica	+				+						6	20
Physa sp							+				1	10
Mytilus edulis	+								+		2	20
Geukensia demissa									+		2	10
Hiatella striata										+	1	10
Gemma gemma	+								+		38	20
Mya arenaria									+		1	10
Phylum Annelida												
Dinophilus sp				+	+		+				8	30
Eteone heteropoda	+	+	+		+	+			+	+	19	70
Eteone longa	+								+	+	15	30
Nereis diversicolor		+		+	+				+	+	85	50
Heteromastis filiformis					+				+	+	93	30
Streblospio benedicti	+				+				+	+	51	40

	A-1	B-1	B-9	C-1	D-1	D-2	D-3ϕ	E-1	E-6	E-10	Totals	v%
Pygospio elegans	+							+	+	+	10	40
Polydora ligni	+		+		+	+				+	235	50
Scoloplos fragilis					+				+		33	20
Fabricia sabella	+	+	+								101	30
Manayunkia aestuarina	+		+						+	+	49	40
Oligochaeta	+		+	+	+		*	+	+	+	3006	90
Peloscolex benedeni	*				*		*		*	*		40
Isochaeta hamata	*		*									20
Tubifex pseudogaster					*					*		30
Phylum Arthropoda												
Acarina	+	+	+	+	+	+	*	+	+	+	426	100
Ostracoda	+	+		+	+			+	+	+	880	70
Copepoda	+	+	+	+	+	*	+	+	+	+	6264	100
Jaera marina	+										4	10
Corophium volutator	+	+		+	+				+	+	953	60
Gammarus mucronatus	+	+	+	+	+	+				+	142	70
						+					24	20
Orchestia grillus					+						1	10
†*Carcinus maenus*					+		+				2	10
Corixidae						+		+	+		452	80
Chironomidae	+	+	+	+	+		+				1	10
Hydrophilidae												
Total taxa	35	22	21	17	33	14	16	13	31	27		
Percent total collected taxa	56	35	32	25	51	22	25	21	49	43		

+ = present and quantified; * = present but not quantified; † = observed but not collected; ϕ = pool from which was collected only an algal sample; v% = percent abundance among all pools sampled.

with an additional 14% given generic rank. Of the remaining 22%, 16% were assigned ranks above suborder and 6% assigned to families. Because of the difficulties, of isolation and identification, turbellarians (*Monocelis* excepted), rotifers, nematodes, acarinids, ostracods, and copepods, were not further classified.

Table IV lists all species known to occur in these pools based on material from this survey and from other collections at Acadia University dating back to 1965. The sources of these additional records are indicated in the table and bring the total fauna to 73 taxa.

Table IV. Checklist of fauna collected 1965-77 from saltmarsh pools of Minas Basin. These include benthic, epibenthic, and epiphytic species. Taxa recorded previous to the 1975-77 survey are indicated by author and are included here for completeness as most of those records were unpublished. Asterisks indicate organisms which are illustrated by line-drawings in Bromley (1978).

Fauna - 76 taxa	Storage jar Id. number	Records previous to 1975
Phylum PROTISTA		
Order Foraminiferida		
Ammotium salsum (Cushman and Brönniman 1948)	1007.9	
Miliammina fusca (Brady 1870)	1007.1	
Ammonia beccarii (Linnaeus 1758)	1007.8	
Trochammina inflata (Montagu 1808)	1007.7	
Jadammina polystoma (Bartenstein and Brand 1938)	1007.16	
Haplophragmoides bonplandi (Todd and Brönniman 1957)	1007.11	
Cribroelthidium excavatum (Terquem 1876)	1007.10	
Elphidum sp	?	
Class Ciliatea		
Lachrymaria sp		
Zoothamnium sp		
Semifolliculina gigantea Dons 1913		Bailey 1967
Phylum CNIDARIA		
Class Hydrozoa		
Family Hydridae		
Protohydra (leuckarti Greeff 1870) sp	1008.1	Petersen 1970
Class Anthozoa		
Family Edwardsiidae		
Nematostella vectensis Stephenson 1935	1008.3	Bailey & Bleakney 1966
Phylum PLATYHELMINTHES		
Class Turbellaria		
Order Acoela		
Family Proporidae		
Neochildia fusca Bush 1975	1003.11	

Fauna - 76 taxa	Storage jar Id. number	Records previous to 1975
Order Rhabdocoela		
Family Microstomidae		
**Macrostomum* sp		
Suborder Lecithophora Division Dalyellioida		
*D-6.11.76	1003.10	
Division Typhloplanoida		
*Ty-28.3.77	1003.13	
Division Kalyptorhynchia Subdivision Eukalyptorhynchia		
*E-28.3.77		
Subdivision Schizorhynchia		
*S-28.3.77		
Order Alloeocoela		
Family Otomesostomidae		
Otomesostoma sp	1003.18	
Family Monocelis		
Monocelis durhami Hyman 1964	1003.8	
Phylum NEMERTEA		
Class Enopla		
Family Tetrascemmatidae		
Prostomatella obscura (Schultz 1851)		Norenburg 1976
Amphiporus angulatus (Fabricius 1774)		Norenburg 1976
Class Anopla		
Family Lineidae		
Lineus viridis Johnston 1865		Norenburg 1976
Phylum ROTIFERA		
Phylum KINORHYNCHA		
Family Homalorhagae		
Pycnophyes 1016.4	1016.4	
Pycnophyes 1016.6	1016.6	
Phylum NEMATODA	1016.1 to 2	
Phylum BRYOZOA		
Class Gymnolaemata		

Fauna - 76 taxa	Storage jar Id. number	Records previous to 1975
Family Vesicularidae		
Bowerbankia gracilis Leidy 1855		Bailey 1967
Phylum MOLLUSCA		
Class Gastropoda		
Littorina littorea (Linnaeus 1758)	1004.6	Bailey 1967
Littorina saxatilis (Olivi 1792)	1004.5	Bailey 1967
Hydrobia totteni (Morrison 1954)	1004.8	Bousfield 1960
Ilyanassa obsoleta Say 1822	1004.10	Bailey 1967
Subclass Opisthobranchia		
Order Sacoglossa		
Stiliger fuscatus Gould 1870		Bleakney (unpubl.)
Alderia modesta Loven 1944		Bleakney & Bailey 1967
Elysia chlorotica Gould 1870	1004.4	Bailey & Bleakney 1967
Order Nudibranchia		
Tenellia sp		Bleakney (unpubl.)
Class Bivalvia		
Mytilus edulis Linnaeus 1758		
Geukensia demissa (Dillwyn 1817)	1010.2	
Gemma gemma Totten 1834	1010.1	Bailey 1967
Hiatella striata Fleuriau 1802		
Mya arenaria Linnaeus 1758		
Phylum ANNELIDA		
Class Polychaeta		
Order Archiannelida		
Family Dinophilidae		
Dinophilus sp	1013.9	
Family Phyllodocidae		
Eteone heteropoda Hartman 1957	1013.32	
Eteone longa (Fabricius 1780)	1013.21a	
Family Nereidae		
Nereis diversicolor Müller 1776	1013.23	
Family Capitellidae		
Heteromastis filiformis Claparède 1864	1013.10	
Family Spionidae		
Streblospio benedicti Webster 1879	1013.17	
Pygospio elegans Claparède 1863	1013.2	
Polydora ligni Webster 1879	1013.20	

Fauna - 76 taxa	Storage jar Id. number	Records previous to 1975
Order Ariciida		
Family Orbiniidae		
Scoloplos fragilis (Verrill 1873)	1013.7	
Order Sabellida		
Family Sabellidae		
Fabricia sabella (Ehrenberg 1837)	1013.6	
Manayunkia aestuarina (Bourne 1883)	1013.11	Petersen & Petersen 1977
Class Oligochaeta		
Family Tubificidae		
Peloscolex benedeni (Udekem 1835)	1001.11	
Isochaeta hamata (Moore 1905)	1001.27	
Tubifex pseudogaster (Dahl 1960)	1001.26	
Phylum ARTHROPODA		
Order Acarina	1002.1 to 14	Bailey 1967
Subclass Ostracoda	1006.1 to 8	
Order Ispoda		
Jaera marina (Fabricius 1780)	1012.1	
Order Amphipoda		
Corophium volutator (Pallas 1766)	1014.5	
Gammarus mucronatus Say 1818	1014.1	Bousfield 1960
Orchestia grillus Bosc 1802	1014.3	Bousfield 1960
Order Decapoda		
Carcinus maenus (Linnaeus 1758)	1017.1	
Class Insecta		
Order Hemiptera		
Family Corixidae	1018.2	Bousfield 1960
Order Diptera		
Family Chironomidae	1000.14	
Family Ephydridae		
Ephydra riparia		Bailey 1967
Family Tabanidae		
Tabanus nigrovittatus (Macquart)		Bailey 1967

Fauna - 76 taxa	Storage jar Id. number	Records previous to 1975
Order Coleoptera		
Family Hydrophilidae		
Enochrus hamiltoni Hatch and Kincaid		Bailey 1967
Phylum CHORDATA		
Class Osteichthyes		
Anguilla rostrata (Le Sueur 1817)		Bailey 1967
Fundulus heteroclitus (Linnaeus 1766)		Bailey 1967
Gasterosteus aculeatus Linnaeus 1758		Bailey 1967
Apeltes quadracus (Mitchill 1815)		Bailey 1967
Pungitius pungitius (Linnaeus 1758)		Bailey 1967

Several specimens were unavoidably lost and the only records are figures. These are identified by the initial of the lowest taxonomic level plus the date collected, e.g. E-28.3.77 refers to a member of the subdivision Eukalyptorhynchia collected 28 March 1977.

Appearing in the second column opposite most specimens in Table IV is a bipartite number. The first part signifies the storage jar number and the second part the number of the vial within the jar, e.g., 1003.18 refers to a member of the Dalyelioida stored in vial 18, Jar No. 1003. All specimens from this 1975 to 1977 study have been labelled in this manner for later reexamination by specialists and are stored in Acadia University's Museum.

Certain species and groups merit further comment relative to new observations on habits, density, feeding, or taxonomic difficulties, and are treated here prior to analysis of the numerical data.

Phylum Protista

Although it was decided to exclude protists from this study, foraminiferans were so abundant and so easily isolated that some species were recorded but not quantified. Several species of calcareous Rotaliidae were destroyed in improperly buffered preservatives. Seven other species were confirmed by Vilks (in litt.) and all have been reported to occur commonly in marshes (Murray 1971; Scott 1978).

Phylum Cnidaria

Class Hydrozoa

This appears to be the first record of *Protohydra leuckarti* Greef 1870 from the Bay of Fundy region and both pink and colorless specimens were observed feeding on nematodes and dividing by transfission.

Class Anthozoa

Nematostella vectensis Stephenson 1935 was intensively investigated in Minas Basin pools (Frank & Bleakney 1976) and was one of the most widely distributed and abundant taxa.

Phylum Platyhelminthes

Five species could not be identified even to genus, but detailed notes on behavior and drawings were made (Bromley 1978).

Phylum Nemertea
Class Enopla

Prostomatella obscura (Schultz 1851) is a hoplonemertean first reported from the Baltic region. The Minas Basin populations were the first to be noted in North America and this species is the only nemertean known to complete its life cycle in salt marshes (Norenburg 1976).

Class Anopla

Lineus viridis (Fabricius) Johnston 1865 was said by Verrill (1888) to be "abundant at all locations about the Bay of Fundy." No records for this area have since appeared in the literature, but in 1976 Norenburg reported its rediscovery and common occurrence in several Minas Basin saltmarsh pools.

Phylum Rotifera

Representatives of this phylum were present in all the pools but in small numbers.

Phylum Kinorhyncha
Family Homalorhagae

Species of *Pycnophyes* have been dredged from the surface of sandy muds from depths of 1 to 40 m (Southern 1914; Blake 1930; Wieser 1960; McIntyre 1964; Higgins 1964; 1966), but none except *Echinoderes coulli* (Higgins 1977) appears to have been gathered from an estuarine salt marsh. Higgins (in litt.) confirmed the generic position of Minas Basin Pychnophyidae, and inferred that the single specimen (*Pycnophyes* 1016.4) which he examined from E-6 was a new species. Those from A-1 (*Pycnophyes* 1016.6) differ, appearing to be another species of *Pycnophyes,* possibly *frequens.*

Phylum Nematoda

No attempt was made to identify members of this difficult taxon, nor to estimate the myriads which escaped the finest screens. Numerically nematodes dominate the meiofauna of the pools and the quantities recorded herein are probably low by several orders of magnitude.

Phylum Bryozoa
Family Vesicularidae

Although *Bowerbankia gracilis* Leidy 1855 (+ *caudata* Osburn 1919) is distributed from Greenland to Brasil on both American coasts (Maturo 1956) and is common on a number of seaweeds in shallow water (Rogick & Croasdale 1949), it was not included in the extensive collection of Bryozoa reported by Powell and Crowell (1967) from Minas Basin. Bailey (1967) first reported *B. gracilis* in saltmarsh pools, and it was found in 1976 associated with species of *Vaucheria, Ruppia,* and *Spartina* detritus. Of those collected in 1976, the zooecia varied in their possession of a caudate process.

Phylum Mollusca
Family Hydrobiidae

Hydrobia totteni Morrison 1954 was reported by Bousfield and Leim (1960) for the Minas Basin, but Smith (1964), apparently avoiding assigning specific rank, asserted that "several species of this difficult but widespread genus may occur." From Minas Basin collections on 15 February 1976, morphological variants, designated A and B (Table V) were evident in samples from pool E-1.

Table V. Polymorphism in *Hydrobia* from Minas Basin saltmarsh pool E-1, February 15, 1976.

Structure	Morph A	Morph B
Shell	truncated spire (usually)	pointed spire
Shell color	grey-green	golden
Body color	black	grey-brown
Growth lines	pearl-grey, distinct	indistinct
Texture	rough	smooth
Aperture	proportionally smaller than B	proportionally larger than A
Operculum	irridescent black; distinct spiralling	opaque golden; indistinct spiralling
Head	long; velvety-black pigmentation	shorter; lighter pigment than A
Tentacles	tipped with black	not so

In a holding jar, containing 53 A-morphs and 64 B-morphs, all the A's had crawled to the water surface. The B's had a pink cast to their shells, imparted by an apparent film of epibionts. Further differences are summarized in Table V. The fact that 3 species of *Hydrobia* in Britain can be readily separated on the basis of tentacular pigmentation (Bishop 1976) supports our hypothesis that there is more than 1 species of *Hydrobia* in Minas Basin.

Order Sacoglossa

On 21 October, 1970, Bleakney discovered *Stiliger fuscatus* Gould 1870 in a pool on Habitant Marsh, following which a number of collections have been made from other Minas Basin pools. Specimens from B-1 agree with the description of Marcus (1958), and possess an unnotched anterior margin, which disagrees with the illustration of *S. fuscatus* (after Gould 1870) presented in Abbott (1974). Gascoigne (1976); 1978) used specimens from Minas Basin as material for his anatomical studies.

The saltmarsh sacoglossan, *Alderia modesta* Loven 1844 occurs in Europe, and along the east and west coasts of North America (Abbott 1974). Forty specimens were extracted from the 28 January sample at Pool D-1. They are winter residents in some pools, often beneath thick ice, and move onto the marsh in summer, feeding on *Vaucheria* mats.

Elysis chlorotica Gould 1870 was reported for the first time in Canada by Bailey and Bleakney (1967). Their specimens, from Minas Basin pools, were usually found on Cladophorales or on the marsh surface on *Vaucheria* mats, from which they ex-

tract and incorporate functional chloroplasts into their gut cells (Graves et al. 1979). Specimens collected from D-1, January 1976, were 30 mm long, and clung to the undersurface of ice, 15 cm thick. Those collected from A-1 in May 1976 were less than 1 mm long, and were crawling over filaments of *Cladophora*.

Order Nudibranchia

Four specimens of *Tenellia* sp, previously recognized as *Embletonia* (Roginskaya 1970), were collected by Bleakney 18 July 1973, from Canard Estuary, in pools situated southwest of C-1 on the low marsh. A cold-water genus of the northwest Atlantic (Abbott 1974), this hydroid predator has also been found in the *Sabellaria vulgaris* zone at low water off Kingsport wharf in Minas Basin.

Class Bivalvia

The soft sand of pool A-1 (Table II) is an unexpected habitat for *Mytilus edulis* Linnaeus 1778, and the presence of a 60 mm specimen in A-1 in February suggests winter-storm transport.

The ribbed mussel, *Geukensia demissa* (Dillwyn 1817), an important inhabitant of many tidal marshes (Gould 1870; Teal & Teal 1969; Morris 1973; Abbott 1974) is rare in Minas Basin. Although Bousfield and Leim (1960) do not include *G. demissa*, Bousfield (1964) later does so. They were found only at E-6 and in several neighboring pools, where they formed dense colonies. The colony in E-6 lay half-buried in a bed of *Spartina alterniflora* and was exposed between tides. Colonies in neighboring pools were in the bottom mud and were always submerged.

The gem clam *Gemma gemma* Totten 1834 had been reported from Canard marsh pools (Bailey 1967), but during this survey it was found only in A-1, the only pool with a sand substrate.

A single juvenile specimen of *Hiatella striata* Fleurian 1803, 5 mm long, was collected from E-10. Present in the lower Bay of Fundy (Linkletter et al. 1977), it has not been reported from Minas Basin. Although *H. striata* and *H. arctica* are almost indistinguishable as adults (Abbott 1974; Linkletter et al. 1977), the absence of radial spinose ribs in the young is diagnostic of *H. striata* (Abbott 1974). The presence of this pelycopod borer in a pool must be attributed to storm transport.

Mya arenaria Linnaeus 1758 is common in the mud flats of Minas Basin (Bousfield & Leim 1960) and the single 5 mm specimen in E-6 was probably the result of transport. There is no indication that this species is established in the pools.

Phylum Annelida

Class Polychaeta

Eteone heteropord Hartman 1951 reportedly ranges from Maine to Texas and frequents low-salinity salt ponds (Pettibone 1963). Linkletter et al. (1977) reported it in the lower Bay of Fundy, and Gratto (1977) established the first record for Minas Basin.

Pettibone (in litt.) confirmed the identify of the *Eteone longa* (Fabricius 1780), collected from A-1, E-6 and E-10. Pettibone (1963) has examined specimens from the Bay of Fundy, but this appears to be the first record for Minas Basin. *Eteone longa* has not preveiously been reported from brackish water. Further study might indicate whether or not it completes a life cycle within the pools, as may be the case with *E. heteropoda*. It should be noted as well that *Manayunkia aestuarina* reported first by Peterson and Peterson (1977) was collected only from A-1 and E-6, indicating a marine affinity. *Nereis diversicolor* Müller 1776 was taken from B-1, C-1, D-1, E-6, and E-10. Only 1, from D-1, 28 January 1976, was a mature adult, about 105 mm, sex unknown.

The first published Canadian record of *Pygospio elegans* Claparede 1863 was from Wedgeport, Yarmouth and Sandy Cove, N.S. (Berkeley & Berkeley 1956). *Pygospio elegans* next appeared in the checklist of Linkletter et al. (1977). This study affords the first reports for Minas Basin with specimens from A-1, E-1, E-6, and E-10. Miner (1950) describes the color patterns as yellow and white, whereas local specimens were pink and green; but Pettibone (in litt.) verified the diagnosis.

Polydora ligni Webster 1879 is an estuarine species (Hartman 1951; Blake 1969; 1971) and was collected from A-1, B-9, D-1, D-2, and E-10 in higher numbers than any other polychaete gathered during the study.

Scoloplos fragilis (Verrill 1873) ranges from the Gulf of St. Lawrence to the Gulf of Mexico, and has been dredged in shallow water muds and in estuaries (Pettibone 1963). The first record for Minas Basin was from intertidal mud flats (Gratto 1977). Marsh specimens were collected from only two pools, D-1 and E-6.

Manayunkia aestuarina found at pools A-1, B-9, E-6, and E-10, is not included in extant keys. External morphological features closely parellel those of *Fabricia sabella,* but an important diagnostic difference is the presence of simple branchial lobes. Specimens were verified by Pettibone (in litt.) and detailed notes and drawings are in Bromley (1978).

Class Oligochaeta

The oligochaeta annelids, present in all pools, comprised an immense assemblage of what appeared to be relatively few species.

Three genera could be readily separated from the rest by their distinctive external characteristics and behavioral patterns. These were identified by Dadswell (in litt.)

Table VI. Checklist of invertebrate taxa reported from United States east coast saltmarsh pools. The right hand column indicates those occurring in Minas Basin saltmarsh pools.

Fauna	Teal & Teal 1969	Nixon & Oviatt 1973	Minas Basin
Nematostella		+	+
Euplana		+	
Nematodes		+	+
Modiolus		+	+
Mercenaria		+	
Mya		+	+
Scolocolepides		+	
Streblospio		+	+
Polydora		+	+
Amphitrite	+		
Harpactacoida		+	+
Ostracoda		+	+
Corophium		+	+
Palaeometes	+		
Cragnon	+		
Carcinides maenas		+	+
Callinectes sapiens		+	
Mosquito larvae	+		

as *Peloscolex, Isochaeta,* and *Tubifex*. The remaining individuals were a homogeneous group whose identity could not be determined by external morphology alone. There was a marked morphological variation in setiger number, setae structure, and certain visible internal organs, but positive identification is only possible through sectioning techniques. It is surprising that there is no report of oligochaetes from the United States east coast saltmarsh pools (Table IV, VI), considering the existence of at least several brackish water species (Brinkhurst & Jamieson 1971). The significance of distribution and abundance patterns in Minas Basin deserves further study.

Peloscolex benedeni is a brackish water and marine species of the Atlantic coast (Brinkhurst & Jamieson 1971), but Minas Basin specimens were unusually long, 35 to 55 mm.

Isochaeta hamata (Moore 1905) is a brackish water worm reported only from Massachusetts (Brinkhurst & Jamieson 1971).

Tubifex pseydogaster (Dahl 1960), another brackish water species (Brinkhurst & Jamieson 1971), was distinctive in being relatively short, 12 to 13 mm, and in moving about with whip-like movements, reminiscent of nematodes.

Phylum Arthropoda
Class Arachnida
Order Acarina

Mites were ubiquitous within the pools and appeared in unexpected numbers in A-1, February 1976. No attempt was made to assign specific rank to this difficult taxon which includes 41 recorded species from eastern North America (Newell 1947).

Class Crustacea
Subclass Ostracoda

Ostracods were not separated below the class level, and were collected from all but 2 pools, D-2 and D-3.

Subclass Copepoda

Among copepods, cyclopoids far outnumbered harpacticoids, with calanoids comprising the minority. These arthropods are present in all pools, and are numerically second only to the nematodes. No attempt was made to classify them below sublcass level.

Jaera marina (Fabricius 1780) is a common intertidal species, occasionally found in brackish water (Schultz 1975). It was collected from only 1 pool, A-1, and no additional species of isopod were recorded from any of the other pools.

Order Amphipoda

Corophium volutator (Pallas 1766) is an estuarine and intertidal amphipod, common in Europe (Hart 1930; Crawford 1937) but is confined to the Gulf of Maine and Bay of Fundy in the northwest Atlantic (Bousfield 1973). Specimens were collected from A-1, B-1, C-1, E-6, and E-10, and 554 were present in the sample from E-6, 31 May 1976. Of the 36 adults, the female to male ratio in this sample was 11:1, very high, even so early in the year (Hart 1930). The remaining 518 individuals were juveniles.

Gammarus mucronatus Say 1818 was collected from the pools year round but was not a dominant species, as reported elsewhere (Bousfield 1973). Specimens were collected from A-1, B-1, B-9, C-1, D-1, D-2, and E-10. Only in D-1 were they common.

Orchestia grillus Bosc 1802 normally inhabits the marsh surface, nesting among marsh grass roots (Bousfield 1973), but during this survey was found in winter in D-1 and D-2. During winter thaws, they swim about in the rivulets that issue from the ice margins of the pools.

Order Decapoda

Carcinus maenus (Linnaeus 1758) is one of the commonest marine and brackish water brachyurans on the North American east coast (Smith 1964). It was not recorded in Minas Basin before 1953 (Bousfield & Leim 1960), but since that time appears to have become widespread in the area. The record of a specimen from D-1 is in deference to its presence, having been observed in pools and drainage ditches in all 5 marshes.

Class Insecta

Water boatmen have been reported from brackish water (Chu 1949), and they were often abundant in Minas Basin marsh pools i spite of the high salinities (Bailey 1967; Frank 1974). Because of their rapid swimming, they were seldom caught in the benthic sampler.

Family Chironomidae

Larval concentrations of this family were higher in winter than in summer.

Family Hydrophilidae

Only 1 individual of this aquatic beetle family (Chu 1949) was collected from D-3.

Discussion

Faunal Composition

The results indicate that Minas Basin saltmarsh pools contain a benthos which not only exhibits low diversity and high density, but also local and regional variation.

The prime objective of this study was to determine what taxonomic groups comprise the benthos of the saltmarsh pools in Minas Basin. As a result of rigorous searching, and assuming the benthos to have a degree of homogeneity, it is probable that a high percentage of the groups present were isolated. Excepting the occasional giant ciliate and obscure platyhelminthes, no additional taxa were noted during the last few months of study. The distribution of taxa relative to each of the 10 marsh pools is summarized in Table III.

The variation in species composition of these pool communities is evident, because only 3 pools, A-1, D-1, and E-6, ever exceeded 50% of the total taxa. On a local distributional basis, there are only 20 taxa that occurred in at least one-half of the marsh pools, and of these only 12 were found in each of the 5 estuarine marshes (Table VII). Therefore, the apparent uniformity of habitat of these marsh pools is deceptive, for the fauna is diverse and the community composition can vary greatly from pool to pool and from marsh to marsh.

It is difficult to demonstrate seasonal differences in faunal community composition with much confidence because of irregular sampling. Nevertheless, pools A-1, B-1, C-1, and D-1 were sampled in different months and those species having 100% frequency in each sample from their respective pools were selected for comparison with the total number of taxa from that pool (Table VIII). C-1 had the highest percentage (40%) of taxa occurring in every sample, and A-1 was second with 35%. Although sampled 4 times, pool D-1 had only 15% of the 32 taxa repeatedly occurr-

Table VII. The 20 taxa occurring in at least one-half of the pools sampled in Minas Basin. Their percentage occurrence in the 10 pools is indicated. The asterisk denotes the 12 taxa occurring in each of the 5 estuaries.

Taxa	Percentage
*Foraminiferida	100
*Rotifera	100
*Nematoda	100
**Hydrobia totteni*	100
**Ilyanassa obsoleta*	100
*Acarina	100
*Copepoda	100
*Oligochaeta	90
Nematostella vectensis	80
*Insect larvae	80
Etone heteropoda	70
*Ostracoda	70
**Gammarus mucronatus*	70
Monocelis durhami	60
Littorina saxatilis	60
**Corophium volutator*	60
Protohydra leuckarti	50
Protostomatella obscura	50
Nereis diversicolor	50
Polydora ligni	50

ing in samples. Only 1 species, *Hydrobia totteni,* was present in every sample from every pool regardless of season.

A further seasonal analysis was attempted by plotting the percent of total taxa (63) in samples collected in different months from the same pool sampled twice or more (Fig 2). These data indicate the variation that can exist, but should not be construed as representative of extremes.

Despite the absence of data from other marsh systems (Chapman 1960), the absolute numbers of organisms per sample (Appendix I) appear high. On 5 occasions over 4,500 animals were extracted from 225 ml of substrate, and at B-9 and E-10 the figures exceeded 7,000 individuals.

Fauna of Foreign Pools

In Britain, there are marshes comparable to those in Minas Basin. The most intensive work on British saltmarsh pools was done by Nicol (1935) and Brough et al. (1960-61), their data indicating similarity in community structure between their study pools and ours. Fifty-four taxa were reported, 9 fewer than in Minas Basin pools. However, 9 of the 54 were copepod species which were not sorted beyond the ordinal level in our study. Disregarding copepod species, 50% of Minas Basin genera and 19% of Basin species were represented in British pools.

There is no evidence in the literature of intensive work having been done on

Table VIII. Distribution of taxa having 100% frequency in at least 1 of the Minas Basin pools sampled in different months, compared with the total taxa recorded from that pool (Table III).

Taxa	Pool	A-1	B-1	C-1	D-1
	Sampling Date	2.76 5.76 4.77	2.76 7.77	5.76 8.77	7.75 1.76 7.76 3.77
Protohydra leuckarti		+			
Nematostella vectensis			+		+
Prostomatella obscura			+		
Nematoda		+	+	+	
Hydrobia toteni		+	+	+	+
Gemma gemma		+			
Nereis diversicolor					+
Fabricia sabella		+			
Oligochaeta		+		+	
Acarina		+		+	
Ostracoda		+		+	
Copepoda		+		+	
Corophium volutator		+			
Gammarus mucronatus				+	
Insecta larvae		+			
% total taxa from each pool		35%	19%	40%	15%

+ = 100% distribution

Table IX. Checklist of 54 invertebrate benthic taxa recorded from British saltmarsh pools. The right hand column includes those occurring in Minas Basin pools.

Taxa Recorded in British Pools	Hickson 1929	Lebour 1931	Nicol 1933	Nicol 1935	Brough et al. 1960–61	Minas Basin
Phylum Protista						
Elphidium crispum					+	+
Phylum Cnidaria						
Protohydra leuckarti	+			+		++
Syncoryne sarsi				+		
Phylum Nemertea						
Lineus gasserensis			+	+		+
Phylum Rotifera						
Unidentified sp					+	+

Taxa Recorded in British Pools	Hickson 1929	Lebour 1931	Nicol 1933	Nicol 1935	Brough et al. 1960–61	Minas Basin
Phylum Nemetoda						
Unidentified sp					+	+
Phylum Bryozoa						
Bowerbankia gracillema	+				+	+
Phylum Mollusca						
Littorina littorea			+	+		++
Littorina saxatilis			+	+		++
Hydrobia ulva			+	+	+	+
Hydrobia stagnalis	+					+
Mya arenaria				+		++
Mytilus edulis				+		++
Limpontia capitata				+		
Limpontia depressa			+		+	
Alderia modesta				+		++
Macoma balthica			+	+		
Nudibranch (unident.)	+					
Embletonia pallida				+		+
Phylum Annelida						
Manayunkia aestuarina				+		++
Nereis diversicolor			+	+	+	++
Arenicola marina			+	+		
Pygospio elegans				+		++
Polydora larvae					+	+
Eulalia viridis				+		
Dinophilus taeniatus				+		+
Paranais litoralis	+					
Oligochaeta					+	+
Phylum Arthropoda						
Acarina					+	+
Copepoda	+	+				+
Acartia longiremis					+	
Amphiascus giesbrechti					+	
Canuella perplexa					+	
Ectinosoma curticorne					+	
Eyrytemora affinis					+	
Laophonte nana					+	
Mesochra lilljeborgi					+	
Nitocra spinipes					+	
Tachidius disipes					+	
Sphaeroma rugicauda	+		+	+	+	
Palaemonetes varians	+		+		+	
Carcinus maenas	+		+	+	+	++
Jaera marina				+		++
Melita palmata				+		
Corophium volutator			+	+	+	++
Crangon vulgaris			+	+		
Gammarus duebeni				+	+	+
Eurydice pulchra					+	
Gnathia oxyuraea					+	
Chironomus aprilinus					+	
Limnophilus affinis					+	
Corixa					+	+
Notonecta					+	+
Anurida maritima					+	
Insecta larvae			+	+		+
Total	9	1	14	26	31	29

In the right hand column, + = occurrence at the generic or higher level;
++ = occurrence at the specific level.

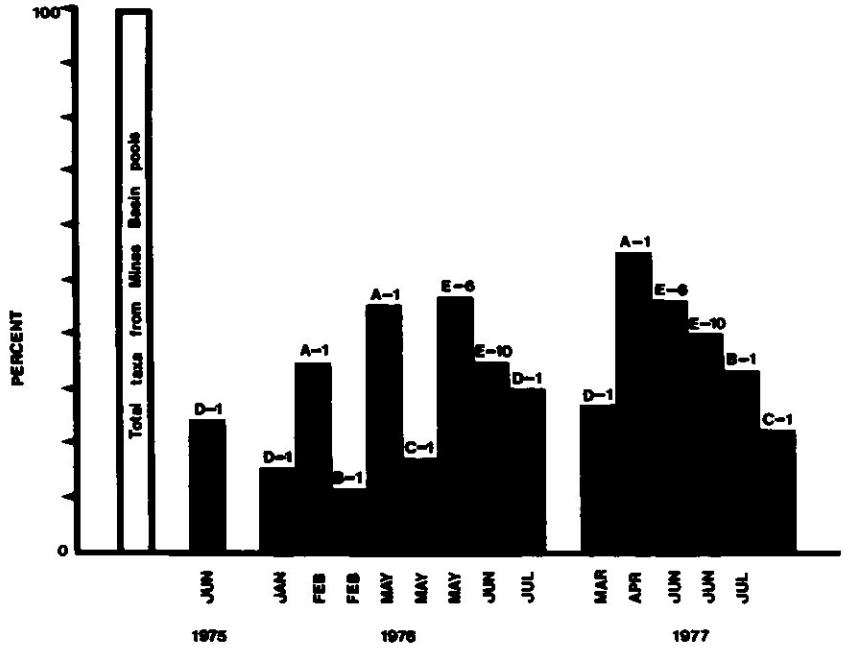

Fig 2 Percent of total taxa comparisons of benthic samples collected in different months and different years from pools sampled twice during 1975-1977.

Table X. Miscellaneous temperature, ice, and salinity measurements at salt marsh pools, Kings County, Minas Basin, 1966-1977. Norenburg's work included small shallow pools not considered by the other authors.

Data Source	Data dates	Temperature range °C	Thickness of ice (cm)	Salinity (°/oo)	
				Bottom	Surface
Bailey 1967	Jan. to Nov. 1966 June to Nov. 1966	-1.5 to 28.5	50	28.5 - 38.9	20.5 - 39.3
Bleakney (unpubl.)	25 Jan., 1970 27 Jan., 1971		30 46 - 50		
Frank 1974	9 Jan. to 15 Nov. 1973	-1.0 to 26.0	19	22.6 - 39.3	11.9 (10 days rain)
Norenburg 1976	Sept. 1974 to Feb., 1976	-1.5 to 28.0	30	19.7 - 31.9	11.1 - 23.0
Bleakney (unpubl.)	8 March, 1977		68.5		

United States east coast saltmarsh pools which differ in origin and structure from those in Minas Basin (Teal & Teal 1969; Cooper 1974) and therefore could be expected to differ in community structure as well. Teal and Teal (1969) record the fauna collected from pools on Georgia salt marshes, and Nixon and Oviatt (1973) listed those from Bissel Cove embayment, a small body of water in Maine whose description approximates that of E-6 in Minas Basin. The majority of fauna reported in these 3 studies were assigned ranks above the species level, thus permitting only perfunctory comparison with fauna from Minas Basin (Table IX). Only 18 taxa were reported from United States saltmarsh pools. Surprisingly, of the Minas Basin species of molluscs, annelids, and arthropods only 8%, 17%, and 27% respectively were represented in United States pools.

Despite intensive studies of salt marshes of the world (Chapman 1960), there is a paucity of literature and no quantitative studies on saltmarsh pools. Therefore, having only informal written and verbal reports of other geographic regions as bases for comparison, our tentative conclusion is that permanent marsh pools are a unique and rich community component of Minas Basin marshes.

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Appendix I

Numbers of animals per 225 ml.

Pool A-1	23 Feb 1976	13 May 1976	29 Apr 1977	Total
Phylum Cnidaria				
Protohydra leuckarti	2	5	5	12
Nematostella vectensis	11			11
Phylum Platyhelminthes				
Neochildia fusca			7	7
Otomesostoma sp		7		7
Monocelis durhami	20	25		45
Phylum Nemertea				
Prostomatella obscura			2	2
Lineus viridis	6	10	1	17
Phylum Kinorhyncha				
Pycnophyes sp			7	7
Phylum Nematoda				
Unidentified	601	223	1298	2122
Phylum Bryozoa				
Bowerbankia gracilis	4	2		6
Phylum Mollusca				
Littorina littorea	3	1		4
Littorina saxatilis		4		4
Hydrobia totteni	70	31	15	116
Elysia chlorotica		4		4
Mytilus edulis	1			1
Gemma gemma	22	9	6	37
Phylum Annelida				
Eteone heteropoda		1		1
Eteone longa	7			7
Streblospio benedicti			29	29
Pygospio elegans		1	3	4
Polydora ligni		1		1
Fabricia sabella	3	10	78	91
Manayunkia aestuarina			6	6
Oligochaeta	254	146	258	658
Phylum Arthropoda				
Acarina	300	16	5	321
Ostracoda	79	206	61	346
Copepoda	737	752	528	2017
Jaera marina		4		4
Corophium volutator	40	27	22	89
Gammarus mucronatus	1	22		23
Carcinus maenus				
Chironomidae larvae	160	35	153	348
Grand total	2321	1544	2484	6347
Total taxa	19	24	18	31

Pool B-1.	3 Feb 1976	29 July 1977	Total
Phylum Cnidaria			
Nematostella vectensis	33	38	71
Phylum Platyhelminthes			
Otomesostoma sp		4	4
M-6.11.76		1	1
Monocelis durhami		5	5
Phylum Nemertea			
Prostomatella obscura	2	3	5
Lineus viridis		1	1
Phylum Nematoda			
Unidentified	135	1028	2063
Phylum Mollusca			
Littorina littorea		2	2
Littorina saxatilis		1	1
Hydrobia totteni	6	50	56
Stiliger fuscatus		2	2
Phylum Annelida			
Eteone heteropoda		4	4
Nereis diversicolor		8	8
Fabricia sabella		7	7
Oligochaeta		67	67
Phylum Arthropoda			
Acarina		11	11
Ostracoda		37	37
Copepoda		117	117
Corophium volutator		37	37
Gammarus mucronatus		2	2
Chironomidae larvae	4		4
Grand total	180	2325	2505
Total taxa	5	20	21

Pool B-9	6 Nov 1976
Phylum Cnidaria	
Protohydra leuckarti	2
Nematostella vectensis	80
Phylum Platyhelminthes	
Otomesostoma sp.	58
M-6.11.76	1
Monocelis durhami	7
Phylum Nematoda	
Unidentified	5406
Phylum Bryozoa	
Bowerbankia gracilis	8
Phylum Mollusca	
Hydrobia totteni	469
Phylum Annelida	
Eteone heteropoda	2
Polydora ligni	7
Fabricia sabella	3
Manayunkia aestuarina	5
Oligochaeta	52
Phylum Arthropoda	
Acarina	10
Copepoda	862
Gammarus mucronatus	3
Chironomidae larvae	75
Grand Total	7056
Total taxa	17

Pool C-1	3 May 1976	29 Aug 1977	Total
Phylum Platyhelminthes			
Otomesostoma sp.		9	9
Monocelis durhami	2	3	5
Phylum Nemertea			
Prostomatella obscura	1		1
Phylum Nematoda			
Unidentified	855	868	1723
Phylum Mollusca			
Hydrobia totteni	86	25	111
Phylum Annelida			
Dinophilus sp.	5		5
Nereis diversicolor		1	1
Oligochaeta	15	50	65
Phylum Arthropoda			
Acarina	2	10	12
Ostracoda	18	6	24
Copepoda	111	87	198
Corophium volutator		13	13
Gammarus mucronatus		16	16
Chironomidae larvae	1		1
Grand total	1096	1088	2184
Total taxa	10	11	14

Pool D-1	9 Jul 1975	28 Jan 1976	31 Jul 1976	28 Mar 1977	Total
Phylum Cnidaria					
Protohydra leuckarti	1		2		3
Nematostella vectensis	1816	176	520	62	2574
Phylum Platyhelminthes					
D-6.11.76	3				3
Ty-28.3.77				1	1
E-28.3.77				1	1
S-28.3.77				1	1
Phylum Nemertea					
Prostomatella obscura		18			18
Phylum Nematoda					
Unidentified	876		610	5480	6966
Phylum Bryozoa					
Bowerbankia gracilis				3	3
Phylum Mollusca					
Hydrobia totteni	2193	10	65	94	2362
Alderia modesta		40			40
Elysia chlorotica		2			2
Phylum Annelida					
Dinophilus sp.			1	1	2
Eteone heteropoda	1		1	2	4
Nereis diversicolor	15	1	4	1	21
Heteromastis filiformis			67		67
Streblospio benedicti			10		10
Polydora ligni			8		8
Scoloplos fragilis			2		2
Oligochaeta	743		359	498	1600
Phylum Arthropoda					
Acarina	5			2	7
Ostracoda				36	36
Copepoda	14		49	465	528
Corophium volutator	53		42		95
Gammarus mucronatus	80	4	4	2	90
Orchestia grillus		22			22
Carcinus maenus	1				1
Chironomidae larvae	4			3	7
Grand total	5802	273	1747	6652	14474
Total taxa	14	8	15	16	28

Pool D-2	28 Jan 1976
Phylum Cnidaria	
Nematostella vectensis	65
Phylum Nemertea	
Prostomatella obscura	5
Phylum Nematoda	
Unidentified	768
Phylum Mollusca	
Hydrobia totteni	114
Phylum Annelida	
Eteone heteropoda	2
Polydora ligni	1
Phylum Arthropoda	
Acarina	1
Gammarus mucronatus	3
Orchestia grillus	2
Chironomidae larvae	4
Grand total	965
Total taxa	10

Pool D-3*	21 Sept 1975
Phylum Cnidaria	
Nematostella vectensis	4
Phylum Mollusca	
Littorina littorea	1
Littorina saxatilis	46
Hydrobia totteni	122
Physa sp	1
Phylum Annelida	
Dinophilus sp	1
Peloscolex benedeni	3
Tubifex pseudogaster	1
Phylum Arthropoda	
Copepoda	23
Corixidae	2
Hydrophilidae	1
Grand total	205
Total taxa	11

*Animals collected from sieveful of floating *Vaucheria* sp

Pool E-1	15 Feb 1976	31 Aug 1976
Phylum Cnidaria		
Nematostella vectensis		+
Phylum Platyhelminthes		
Otomesostoma sp	6	
Phylum Nematoda		
Unidentified	1903	+
Phylum Mollusca		
Littorina saxatilis	112	+
Hydrobia totteni	1604	+
Phylum Annelida		
Pygospio elegans		+
Oligochaeta	2	
Phylum Arthropoda		
Acarina	9	
Ostracoda	53	
Copepoda	53	+
Chironomidae larvae	6	
Grand total	3748	
Total taxa	9	6

Pool E-6	31 May 1976	1 Jun 1977	Total
Phylum Cnidaria			
Protohydra leuckarti	59	19	78
Phylum Platyhelminthes			
T-1003.11	2	8	10
Otomesostoma sp		11	11
Monocelis durhami	1		1
Phylum Kinorhyncha			
Pycnophyes sp	24	12	36
Phylum Nematoda			
Unidentified	1206	2399	3605
Phylum Bryozoa			
Bowerbankia gracilis	1		1
Phylum Mollusca			
Littorina littorea		1	1
Littorina saxatilis	1		1
Hydrobia totteni	15	8	23
Ilyanassa obsoleta	3	5	8
Mytilus edulis		1	1
Geukensia demissa	1	1	2
Gemma gemma	1		1
Mya arenaria		1	1
Phylum Annelida			
Eteone heteropoda	2	1	3
Eteone longa	3	1	4
Nereis diversicolor	4	6	10
Heteromastis filiformis	6	18	24
Streblospio benedicti	4	2	6
Pygospio elegans	4		4
Scoloplos fragilis	28	3	31
Manayunkia aestuarina	1	2	3
Oligochaeta	51	40	91
Phylum Arthropoda			
Acarina	27	8	35
Ostracoda	220	121	341
Copepoda	894	909	1803
Corophium volutator	554	146	700
Chironomidae larvae	3	4	7
Grand total	3115	3600	6715
Total taxa	25	24	29

Pool E-10	19 Jun 1976	24 Jun 1977	Total
Phylum Cnidaria			
Protohydra leuckarti	19	15	34
Nematostella vectensis	2	3	5
Phylum Platyhelminthes			
T-1003.11	18	9	27
Otomesostoma sp	2	78	80
Monocelis durhami		1	1
Phylum Nematoda			
Unidentified	3643	5780	9423
Phylum Mollusca			
Littorina saxatilis	2	5	7
Hydrobia totteni	444	460	904
Hiatella striata		1	1
Phylum Annelida			
Eteone heteropoda	2	1	3
Eteone longa	1	3	4
Eteone sp. juvenile	18		18
Nereis diversicolor	18	27	45
Nereis sp. juvenile	1		1
Heteromastis filiformis		2	2
Streblospio benedicti		6	6
Pygospio elegans	1	1	2
Polydora ligni	187	31	218
Manayunkia aestuarina	7	34	41
Oligochaeta	109	357	466
Phylum Arthropoda			
Acarina	10	10	20
Ostracoda	12	31	43
Copepoda	309	354	663
Corophium volutator (Juvenile)	19		19
Gammarus mucronatus		3	3
Grand total	4829	7212	12036
Total taxa	20	22	23