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ZOOPLANKTON STUDIES IN THE SOUTHERN BIGHT OF MINAS BASIN

GRAHAM R. DABORN and CATHY PENNACHETTI*

Biology Department
Acadia University
Wolfville, N.S. BOP 1X0

Quantitative samples of zooplankton were taken at 20 stations in the southern bight of Minas Basin to investigate spatial and temporal composition and abundance. Dominant forms in spring were the copepod *Eurytemora herdmani,* and nauplii and cypris larvae of *Balanus.* In summer *Acartia tonsa* was most abundant at inshore stations whereas *E. herdmani* was restricted to deeper, cooler water. At times the association was dominated by polychaete trochophores, at others by nematodes. All species had extremely patchy distributions. Estimates of total abundance of zooplankton varied from $<5{,}000/m^3$ to $>450{,}000/m^3$. Hourly sampling at 3 anchor stations demonstrated considerable asymmetry of plankton composition during ebb and flood tides.

Introduction

The Minas Basin, with its high tidal range and consequent high turbulence and turbidity, is clearly a physically stressed system. Usually physically stressed systems exhibit characteristic biological features: low community diversity coupled (except in cases of extreme pollution) with moderate to high secondary productivity, limited primary productivity, and a faunal association adapted to utilisation of allochthonous energy. Not all of these features, however, appear to apply to the Minas Basin. Bousfield and Leim (1960) recorded rather large numbers of benthic and nektonic animals in Minas Basin, several of which were considered endemic to the region. The plankton was not specifically included in that study.

Jermolajev (1958), however, examined plankton samples taken by 2 different expeditions up the Bay of Fundy and noted that the inner Bay was "practically devoid of locally produced zooplankton", but that Minas Basin had regions inhabited by endemic estuarine forms. Her results indicated rather large numbers of *Pseudodiaptomus coronatus* and *Acartia tonsa* in Cobequid Bay and a paucity of larger forms typical of the outer Bay of Fundy and Gulf of Maine. Although she did not study production, Jermolajev noted that *Calanus finmarchicus* accidentally carried into Minas Basin rapidly lost their oil reserves and appeared in poor condition and attributed this to the lack of phytoplankton consequent upon high turbidity.

The present study was initiated to examine the composition of the plankton in the southern bight of Minas Basin, a region that exhibits considerable heterogeneity of benthic communities, an extensive fringe of saltmarsh, and a highly variable turbidity. Emphasis has been placed upon the important relationships of zooplankton with suspended particulate matter and with predators, particularly fish larvae. This paper presents a first account of the composition, distribution, and tidal movements of zooplankton in the southern bight of Minas Basin. Our primary objective in this presentation is to demonstrate some of the basic temporal and spatial patterns exhibited by zooplankton populations in inner regions of the Bay of Fundy. The long term objective is to evaluate the role of the zooplankton in the Minas Basin system so that more realistic predictions might be made of the effects of any

*PRESENT ADDRESS: Department of Biology, Memorial University of Newfoundland, St. John's, Nfld.

development that would modify tidal movements and hence the turbulence and turbidity of the water.

Methods

Plankton samples were taken within 1.5 h of high tide at 20 locations between 17 May and 3 August 1978 in association with other physical and chemical studies. Location of sample sites and an account of physical features of the southern bight region are given in Daborn and Pennachetti (1979). At each site 3 vertical tows were taken from 0.5 m above the bottom to the surface using either a Wisconsin net with 15 cm aperture and 80 μm mesh or a conical net with 30 cm aperture and 64 μm mesh. Survey samples were returned to the laboratory and fixed with 5% neutral seawater-formalin.

In conjunction with time-depth studies of physical parameters, vertical plankton tows were also taken at hourly intervals from one high tide to the next at 3 anchor stations. Locations of the anchor stations are given in Daborn and Pennachetti (1979). Three vertical hauls were taken at each hour using the 30 cm-64 μm conical net, combined into a single sample, and immediately fixed. The net was weighted to reduce drag, but during maximum ebb and flood oblique tows were unavoidable. Length of tow rope was recorded, and in making estimates of total abundance it has been assumed that sampling was 100% efficient. Of necessity, we have also assumed that the water was not moving during retrieval of nets, and therefore that volume sampled is a function solely of net aperture and distance towed. This was a reasonable assumption for samples taken at slack water.

Large zooplankters ($>$ 2mm) were enumerated and removed from whole samples. Sample volume was then made up to 400 ml, and smaller zooplankters were examined and counted in 2 to 5 1-ml subsamples removed by syringe and ejected into a Sedwick-Rafter Counting Cell. Following examination subsamples were returned to the original container and the sample re-examined by a separate individual to avoid subsampling bias. Data presented are based on averages of all sub-samples taken.

Results

Composition of the Plankton

The organisms captured in plankton samples varied widely in both time and space. A complete list of those for which at least generic identification was possible (and excluding fish larvae) is given in Table I. Many other taxa that could not be identified satisfactorily were present, and some of these, notably nematodes, polychaete trochophores, and decapod larvae, were very important components of some samples.

It is convenient to recognise 3 major categories of plankton organisms (Table I): i) the *holoplankton* includes species with an entirely planktonic life history; ii) the *tychoplankton* consists of species that alternate between pelagic and benthic modes of behavior with apparent ease, and iii) the *meroplankton,* species of which are temporary members of the plankton only. The last category includes larval stages of benthic animals, reproductive stolons of benthic polychaetes, or poorly swimming larvae of chordates (Perkins 1974). All of the above are species that are resident in a given body of water (i.e. are autochthonous). In estuaries a fourth group is often encountered composed of allochthonous organisms derived from other regions.

The major holoplanktonic members of the plankton were several copepods, par-

Table I. Taxa* identified in plankton hauls from the southern bight of Minas Basin, 1978.

		Status**
PROTOZOA	*Ceratium* sp.	I
	Tintinnopsis sp.	I
CNIDARIA	*Bougainvillia* sp.	II
	Nemopsis bachei Agassiz	II
	Nematostella vectensis Stephanson	II
CTENOPHORA	*Pleurobrachia pileus* (Fabricius)	I
MOLLUSCA	*Nassarius obsoleta* (Say)***	II
ANNELIDA	*Autolytus cornutus* Agassiz	II
	Tharyx acutus Webster & Benedict	II
	Streblospio sp.	II
	Pygospio sp.	II
ARTHROPODA	*Podon leuckarti* Sars	I
	Eurytemora herdmani Thompson & Scott	I
	Centropages hamatus (Lilljeborg	I
	Acartia tonsa Dana	I
	Pseudodiaptomus coronatus Williams	I
	Calanus finmarchicus (Gunner)	I IV
	Caligus rufimaculatus Wilson	
	Parathalestris croni (Krøyer)	I
	Idotea baltica (Pallas)	III
	Amphithoe rubricata Mont.	III
	Corophium volutator (Pallas)	III
	Caprella linearis (L.)	III
	Balanus balanoides L.	II (IV?)
	Neomysis americana (Smith)	III
CHAETOGNATHA	*Sagitta elegans* Verrill	I IV

* excluding fish larvae

**I - Holoplankton II - Meroplankton III - Tychoplankton IV - Allochthonous species

*** egg stage identified

ticularly *Eurytemora herdmani* and *Acartia tonsa*. These 2 species are common dominants in brackish, turbid waters (Wilson 1932) and have been recorded previously from Minas Basin (Jermolajev 1958) and other estuaries in Atlantic Canada (Shih et al. 1971). *Pseudodiaptomus coronatus*, another typically brackish-water species, was infrequently collected during this study. Jermolajev (1958), however, noted that it occurred in very large numbers in Cobequid Bay during July 1951, and was present in the southern bight of Minas Basin in September 1920. Our results indicate that the species is not abundant in the southern bight; individuals collected there might have originated in Cobequid Bay. It is a dominant species in Cumberland Basin (unpubl.). *Centropages hamatus* was occasionally collected in the southern bight, but never in numbers comparable to those of *E. herdmani* or *A. tonsa*. It is very common in the main part of the Bay of Fundy (Jermolajev 1958), in Chignecto Bay, and in Shepody Bay (unpubl.). The harpacticoid copepod, *Parathalestris (Halithalestris) croni*, was an abundant and regular member of the plankton. Unlike many other harpacticoids, this species is habitually pelagic, occurring in surface waters both inshore and offshore (Wilson 1932), and is a common resident of estuaries in the region (Shih et al. 1971). It probably breeds successfully in the southern bight.

The remaining copepods, *Calanus finmarchicus* and *Caligus rufimaculatus*, are probably allochthonous, derived from populations resident in the Bay of Fundy. Indeed, there is considerable evidence that *C. finmarchicus* is unable to maintain breeding populations within the Bay of Fundy itself, and arrives there only as copepodite stages from the Gulf of Maine (Fish & Johnson 1937; Huntsman 1952; Jermolajev 1958). Our recent studies (unpubl.) have confirmed that the *Calanus* encountered in Chignecto Bay are nearly always CIII - CV copepodites. *Caligus* has been collected only twice in Minas Basin.

Meroplanktonic species in these collections are difficult to identify with certainty, except for *Autolytus cornutus*, the reproductive stolons of which were common in May and June. This species is important in Chignecto Bay (unpubl.), and has been recorded elsewhere in the Bay of Fundy (Fish & Johnson 1937). Polychaete and pelecypod trochophores and gastropod veliger larvae were abundant, even dominant components at times throughout the summer. Specific identification was impossible, but the important species undoubtedly are the same as those that dominate the benthos (cf. McCurdy 1979). Often, however, the major components of plankton samples were nauplii and cypris larvae of barnacles—most probably *Balanus balanoides*, the most abundant barnacle species in southern Minas Basin (Bousfield & Leim 1960). In the southern Minas Basin only the Blomidon region has stable rock substrates where *Balanus* might overwinter, thus many of these larvae were probably spawned a considerable distance away.

Benthic animals occasionally appearing in plankton samples included young of the very important amphipod *Corophium volutator* and occasional *Amphithoe*, *Idotea*, and *Caprella*. *Neomysis americana*, which is relatively abundant in night tows in Cumberland Basin (unpubl.), was encountered occasionally in daytime samples from the southern bight, and may have proved more abundant in night tows.

The plankton of the southern bight of Minas Basin is thus considerably more diverse than might be deduced from Jermolajev's (1958) account. Two species are recorded here (Table I) apparently for the first time: the ctenophore *Pleurobrachia pileus* and the cladoceran *Podon leuckarti*. The former species was occasionally fairly numerous. As yet, however, only 1 species in the plankton appears to be endemic (sensu stricto) to the Minas Basin, namely a new species of the anthomedusan *Bougainvillia*. This is in marked contrast to the high degree of endemism found among benthic forms (Bousfield & Leim 1960; Bleakney, in verb.).

Regional and Temporal Variations

Contemporaneous studies of salinity and turbidity indicated that there were marked regional differences within the southern bight itself (Daborn & Pennachetti 1979). Similar regional differences were evident in the relative abundance of zooplankton species, but the pattern was rendered much more complex by temporal changes in relative abundance and distribution (Fig 1).

During May the zooplankton association consisted of $<$ 10 groups of which 3 (copepodites of *E. herdmani* and/or *A. tonsa, Balanus* nauplii and polychaete trochophore larvae) usually constituted $>$ 90% of the organisms captured. Nevertheless, regional differences were clearly evident: juvenile copepods were always the most abundant organism in the shallow, extremely turbid waters near the mouths of the Cornwallis and Canard Rivers and Habitant Creek, whereas in deeper waters at the entrance to the southern bight, samples were sometimes dominated by *Balanus* nauplii and cypris larvae. The latter undoubtedly reflect influx of water recently derived from the Bay of Fundy, and settlement of young barnacles on stakes established in the southern bight was noted during early June. Since development from spawning to settlement takes 15 to 20 days (Bousfield 1955), it is possible that parental populations were very distant.

The copepod larvae present in the southern bight in May were not identified. However, *E. herdmani* adults in breeding condition were numerous at shallow stations on 24 May, and subsequently (9 June) large numbers of nauplii were present. At the end of June, however, *A. tonsa* adults and copepodids were also common at inner stations.

Differences in relative abundance, however, occasionally reflected the occurrence of large numbers of a single organism in relatively dense,discrete clouds (e.g. polychaete trochophore larvae at sta. I, 24 May and *Balanus* cypris larvae at sta. M, Q, 17 May; H, Q, 24 May). Polychaete larvae were particularly numerous at inshore stations on 9 June, perhaps the result of local spawning of polychaetes of the Starr's Point and Kingsport mudflats. By late June these components of the plankton had declined leaving the association dominated again by immature copepods (particularly nauplii) and nematodes.

On and after 7 July *A. tonsa* CV copepodites and adults (CVI) were more numerous than *E. herdmani* at nearly all stations. These mature and maturing copepods may have been derived from the CI - CIV copepodites so abundant 2 weeks before. Although some of the nauplii of that time resulted from the May-June breeding phasse of *E. herdimani, A. tonsa* is known to produce resting eggs which might have provided nauplii even though adults were absent. The ability of *A. tonsa* to develop and colonise areas from small, localised sources has been noted before (Jeffries 1962). During August adult and CV *E. herdmani* were apparently absent from all inshore stations (Fig 2), but remained present in moderate numbers at deeper stations near the mouth of the southern bight.

Numerically, nauplii and copepodite stages of *A. tonsa* and *E. herdmani* were the dominant forms in the plankton during the latter part of the summer. On occasion, dense localised aggregations of nematodes or rotifers were encountered—the former primarily at shallower stations and the latter at offshore locations. These events contributed to the patchiness evident in the zooplankton of the southern bight.

The fine mesh sizes used render the vertical tows moderately quantitative only for the smaller organisms such as the copepods (Fig 2). The sample stations have been grouped according to region within the southern bight: those in shallow water locations nearest the river mouths representing the innermost regions (A, B, C, D, I,

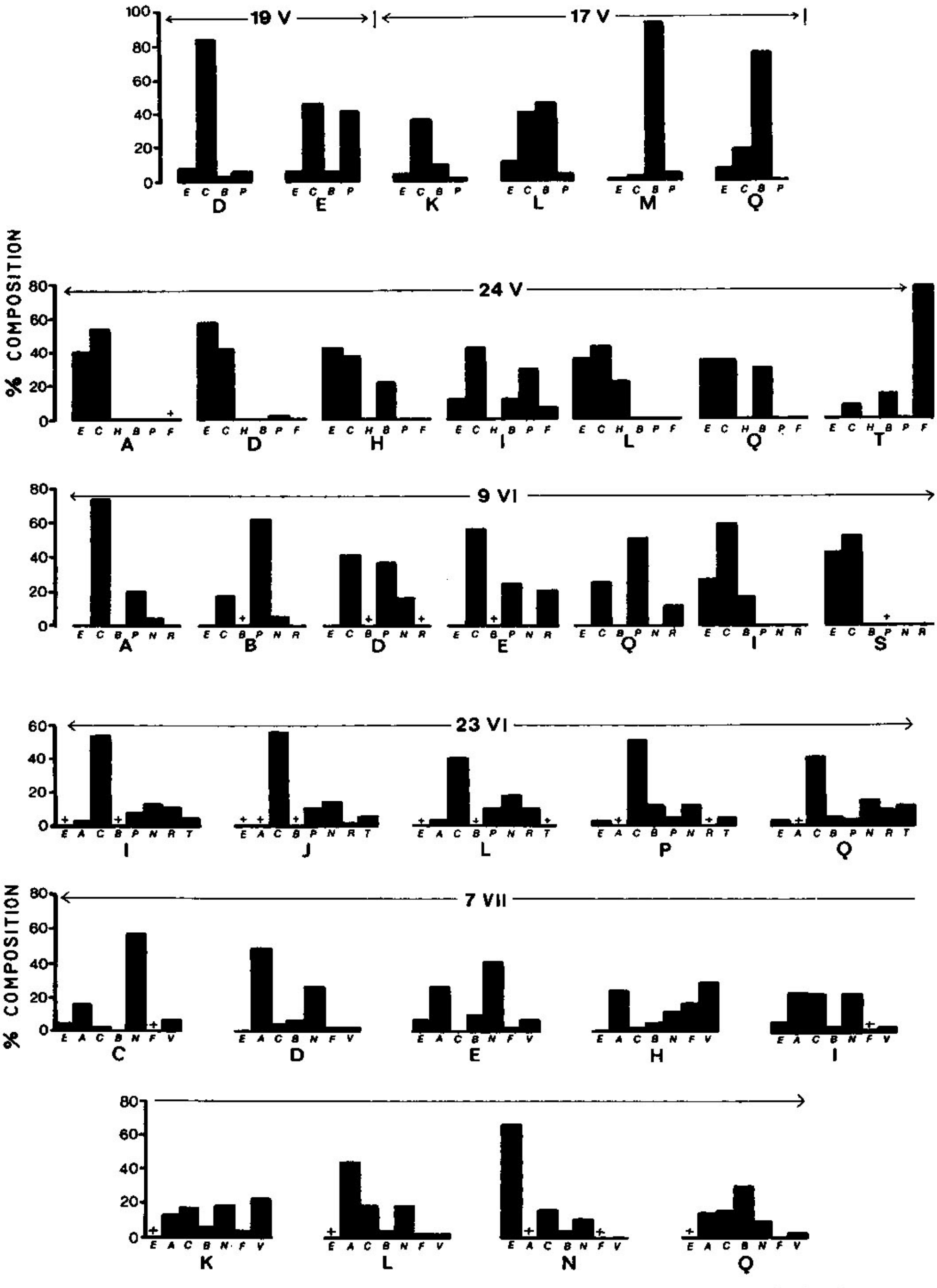

Fig 1. Seasonal and regional variations in percent composition of plankton in the southern bight of Minas Basin, 1978.
A-T Sample stations (cf. Daborn & Pennachetti 1979)
E - *Eurytemora herdmani* CV and CVI; *A* - *Acartia tonsa* CV and CVI; c - copepodites I-IV and nauplii 1-6; *H* - *Parathalestris croni;*

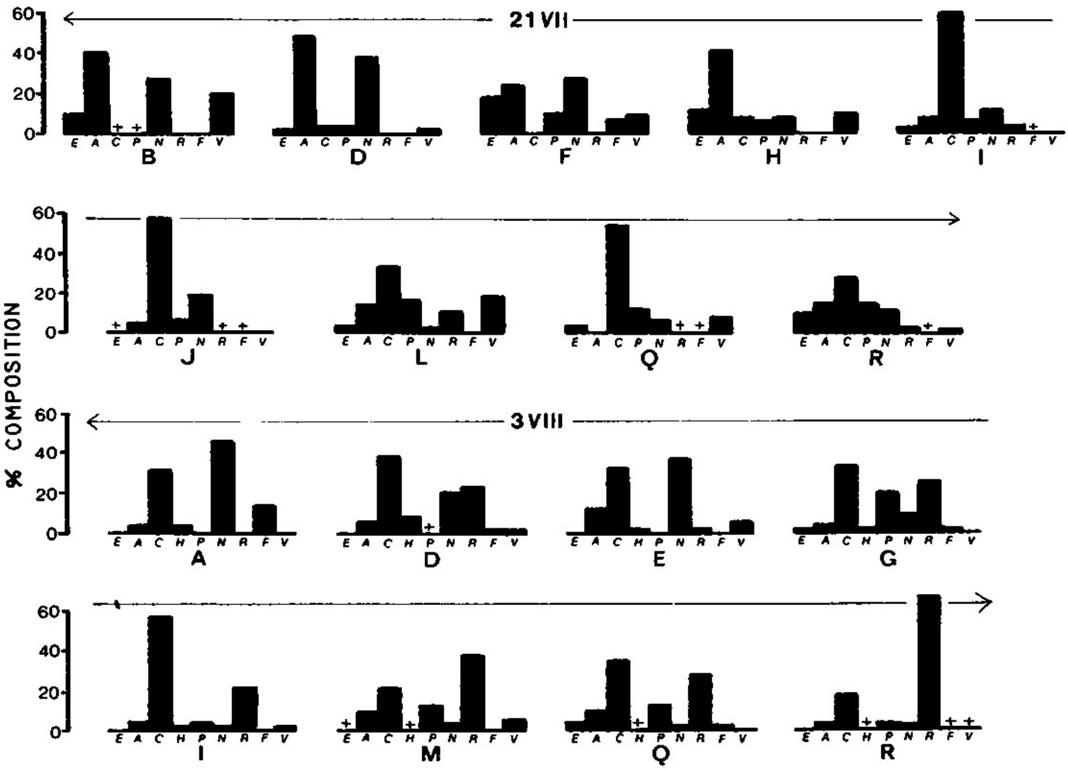

Fig. 1 (cont.)

P - polychaete trochophore and post-trochophore larvae; *N* - nematodes; *R* - rotifers; *F* - Foraminifera; *V* - gastropod veliger larvae; *B* - *Balanus* sp. cypris and nauplius larvae; *T* - Tintinnoidea

L, K); a group of deeper water stations at the entrance to the southern bight (R, N, Q, P); and one intermediate group (E, F, G, H, J, M, S) (cf. Fig 1 Daborn & Pennachetti 1979).

Estimates of copepod abundance varied from < 2000 to > 84,000/m³ during this regional study. During June and July CV and adult *A. tonsa* were more numerous at the shallow inner stations than at those in deeper water, whereas the reverse was true for *E. herdmani*. In early June numbers of polychaete trochophore larvae varied from < 1,000 to > 68,000/m³, but were generally < 8,000/m³ at most sites. Nematodes in July and August ranged from 200/m³ to > 9,000/m³. Unfortunately, quantitative samples were not obtained when the major spawning period of *Balanus* occurred.

Tidal Studies

On 29 May a site on the Starr's Point mudflat near Wolfville (see Daborn & Pennachetti 1979, Fig 1) was sampled from 0800 to 2000 h (Fig 3). As the tide ebbed during the morning, the proportion of adult *E. herdmani* and copepodites declined until, just before the station went dry, the sample was almost all calanoid nauplii and a few harpacticoid copepods (Table II). When the tide returned, it brought with it large numbers of calanoid nauplii (ca. 360,000/m³) and polychaete trochophores, the latter presumably released by polychaetes of the Starr's Point and Kingsport mudflats.

Table II. Abundance of zooplankton during tidal study at Site I (near Wolfville), 29 May 1978.

Time	Depth (m)	*Eurytemora* CV + CVI	Juvenile* Copepods	Polychaeta Trochophores	Total**
		Number per m^3			
0800	6.3	166	13,647	645	15,145
0900	3.0	754	20,371	150	24,899
1000	2.3	539	137,968	5,200	151,441
1100	1.5	0	77,337	860	85,825
1200-1500	DRY — no samples				
1600	1.4	9,431	385,639	3,780	421,270
1700	3.5	1,257	34,581	4,880	44,327
1800	8.0	377	37,726	11,900	50,930
1900	9.0	222	11,872	5,300	19,306
1930	9.3	214	6,752	3,930	13,290

* Including nauplii 1-6 and copepodids I-IV

** Including: Nematoda (<7%), Harpacticoida (<5%), *Balanus* larvae (<5%), Caridea (<1%), Pelecypoda larvae (<1%), Turbellaria (<1%).

Copepods comprised about one-half and polychaete trochophores about one-third of the last samples taken on the evening high tide, with a few nematodes and *Balanus* cypris larvae. The extremely high counts (15,000 to > 420,000/m^3) just as water returned on the flood suggests that early copepod nauplii and polychaete trochophores are concentrated near the advancing tide front. However, control of water volume sampled is more difficult on the flood tide than the ebb in shallow waters because of greater turbulence.

Results of the second tidal study on 16 June at Longspell Point (Daborn & Pennachetti 1979, Fig 1), are shown in Figure 4. Sharp changes in composition occurred also at the deeper (< 15 m) station. Near the morning high tide tintinnids composed about 50% of the zooplankton, but as the tide ebbed, the proportion declined to < 2% at low tide. With the flooding tide, however, the proportion of tintinnids increased steadily once again. Tintinnids were generally much more abundant at the deeper stations.

Total abundance of zooplankton varied much less at this station than during the previous study (Table III). As before, however, these changes largely reflected the patchiness of copepod larvae, polychaete larvae (200-14,000/m^3), and the tintinnids. Although the relative abundance of nematodes changed, absolute numbers varied little (ca. 2,000-11,000/m^3).

As in the 29 May study, considerable changes occurred in the relative abundance of dominant species over the tidal cycle on 13 July at site 3, despite the greater number of species present at this time in the season. Variations in % composition (Fig 5) primarily reflected fluctuations in the number of *A. tonsa* and juvenile copepods (Table IV), and to a lesser extent, of nematodes (200-56,000/m^3). Greatest abundance occurred just before the station went dry, unlike the 29 May study when peak numbers were present after low tide. This difference may be related to tidal asymmetry and variations in the manner in which water flows on the flood and ebb tides. In particular, this station exhibited an anomalous increase in depth during the ebb tide and a corresponding decrease in depth on the flood that we have attributed to sudden changes from sheet to channel flow, and vice versa (Daborn & Pennachetti 1979). Nonetheless, the very considerable changes indicate again that planktonic animals are highly contagiously distributed within the southern bight.

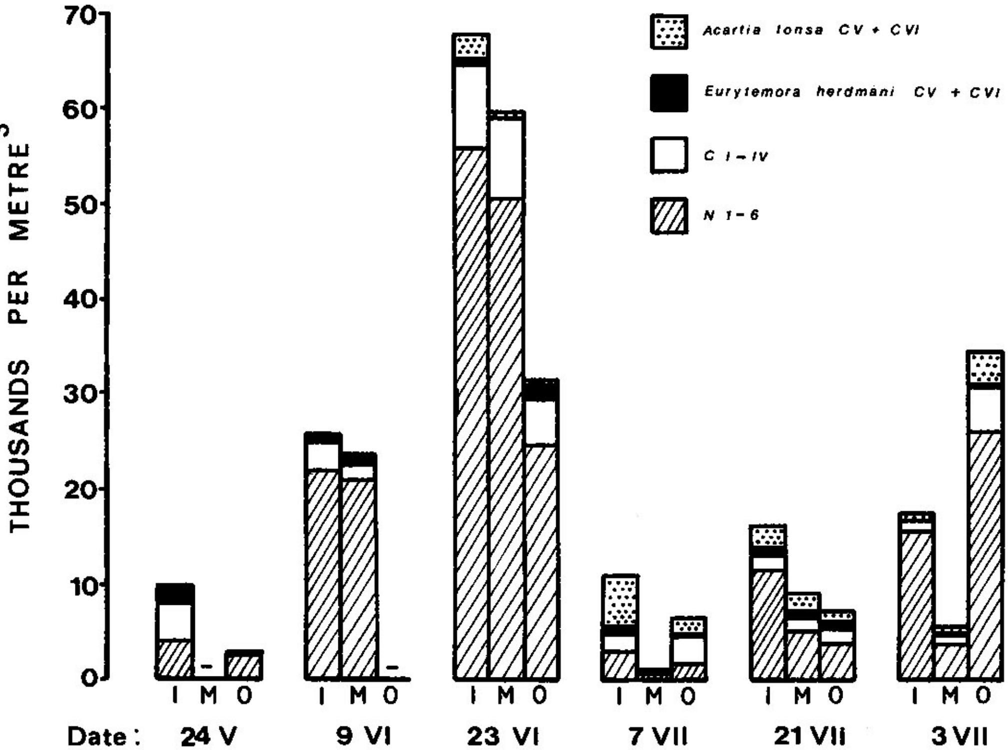

Fig 2. Abundance of copepods in the southern bight of Minas Basin, 1978.
I - inner stations (A,B,C,D,I,L,K) O - outer stations (R,N,Q,P)
M - middle stations (E,F,G,H,J,M,S) — no samples taken

Table III. Abundance of zooplankton during tidal study at Site II (Longspell Point), 16 June 1978.

		Number per m³			
Time	Depth (m)	*Eurytemora* CV + CVI	*Acartia* CV + CVI	Juvenile* Copepods	Total**
0815	14.8	854	0	5,783	12,948
0915	14.2	1,858	0	7,917	23,062
1015	13.6	5,399	72	14,975	34,702
1115	10.3	1,257	96	9,867	29,697
1215	8.5	354	0	6,956	17,684
1315	5.0	419	0	11,318	33,953
1415	4.5	943	0	28,766	44,318
1515	2.9	393	0	50,694	84,883
1615	4.5	0	0	50,645	103,274
1715	7.0	0	0	15,235	30,325
1815	9.0	311	0	11,429	28,849
1915	12.0	574	0	25,588	46,008
2015	14.0	1,631	0	3,120	21,416

* Including nauplii 1-6 and copepodids I-IV

** Including: Tintinnoidea (<50%), Foraminifera (<8%), Nematoda (<42%), Rotifera (<21%), Polychaeta (<25%), Harpacticoida (<10%), *Balanus* larvae (<6%).

Table IV. Abundance of zooplankton during tidal study at site III (Canard River), 13 July 1978.

Time	Depth (m)	Number per m³ *Eurytemora* CV + CVI	*Acartia* CV + CVI	Juvenile* Copepods	Total**
0830	6.4	3,837	11,669	22,699	44,440
0930	2.5	1,886	38,197	17,920	62,247
1030***	3.3	12,462	97,008	36,378	176,165
1130	1.0	1,886	241,444	32,067	360,280
1200-1400	Dry — no samples				
1430	2.0	629	15,090	629	40,869
1530	5.3	0	18,077	8,449	43,031
1630	8.5	472	21,456	11,671	43,974
1730***	8.0	3,395	3,521	11,695	27,288
1830	9.8	2,231	2,332	6,085	15,414
1930	11.0	90	5,928	3,323	14,371
2030	10.0	298	3,673	1,986	6,949

* Including nauplii 1-6 and copepodids I-IV

** Including: Tintinnoidea (<2%), Foraminifera (<3%), Nematoda (<51%), Rotifera (<2%), Gastropoda (<3%), Polychaeta (<4%), Harpacticoida (<9%), *Balanus* larvae (<2%).

*** The sudden transient increase in depth on the ebb tide and a similar decrease on the flood tide is attributed to channel effects (see Daborn & Pennachetti 1979).

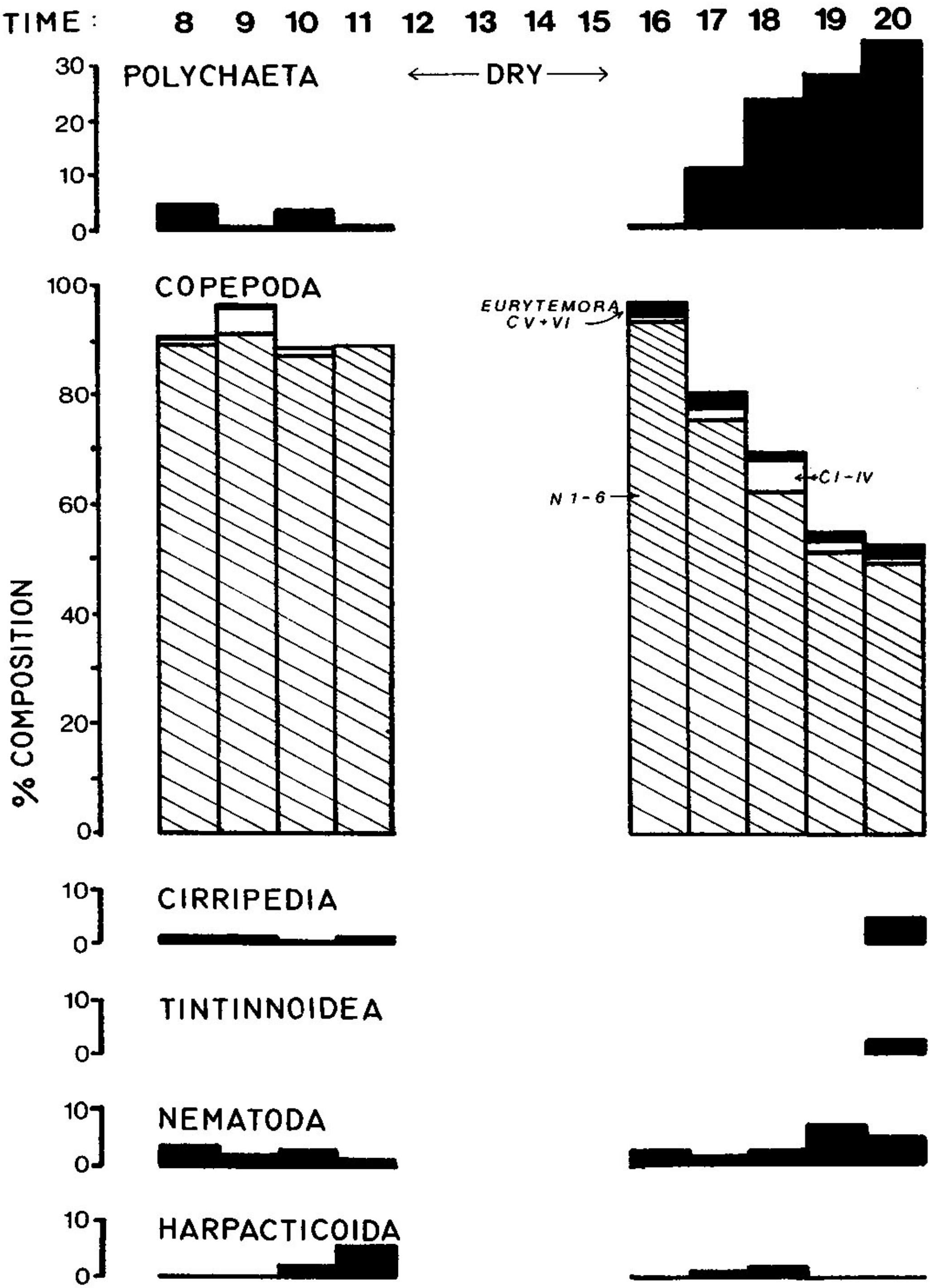

Fig 3. Hourly changes in percent composition of zooplankton at site I (Wolfville), 29 May 1978.

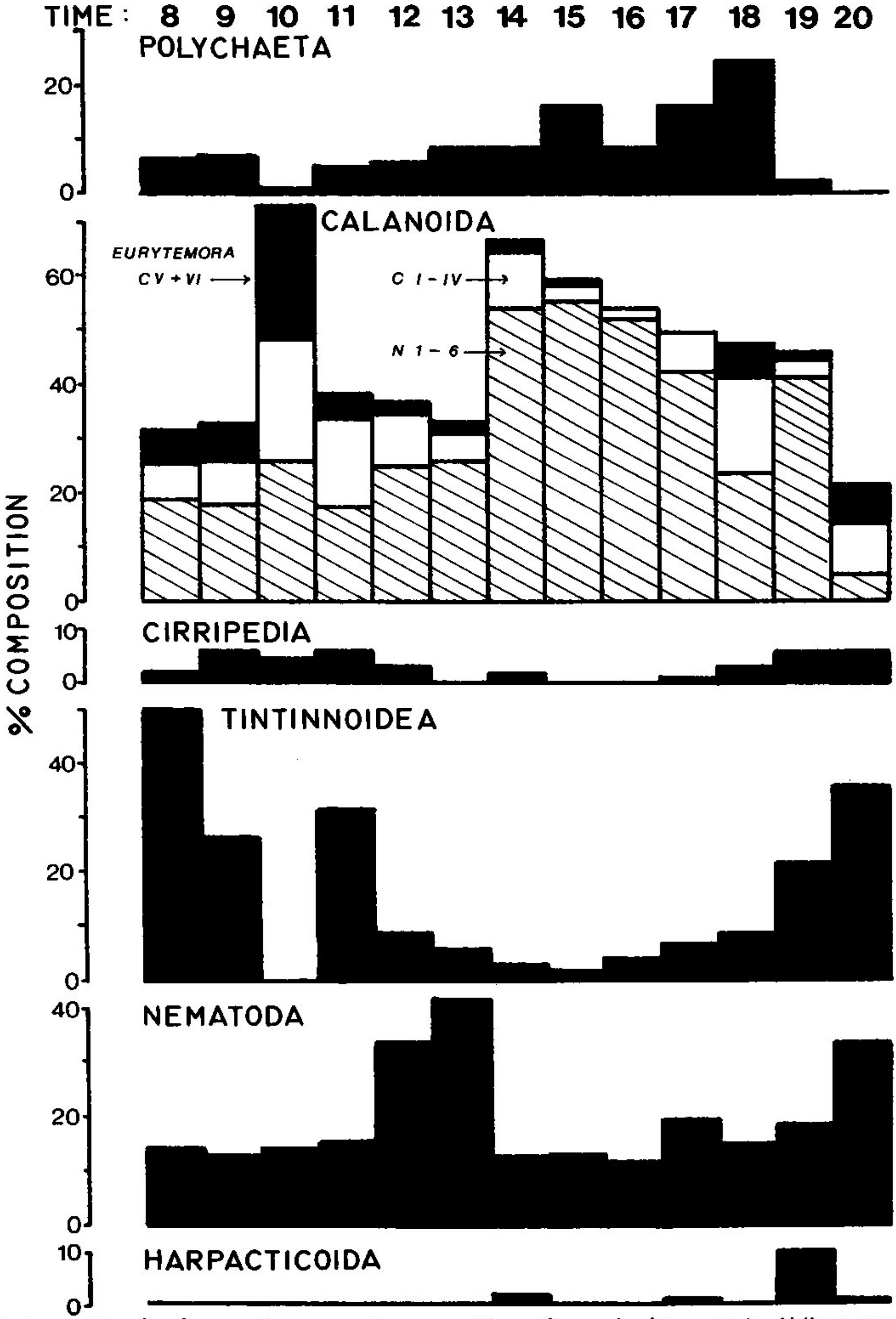

Fig 4. Hourly changes in percent composition of zooplankton at site II (Longspell Point), 16 June 1978.

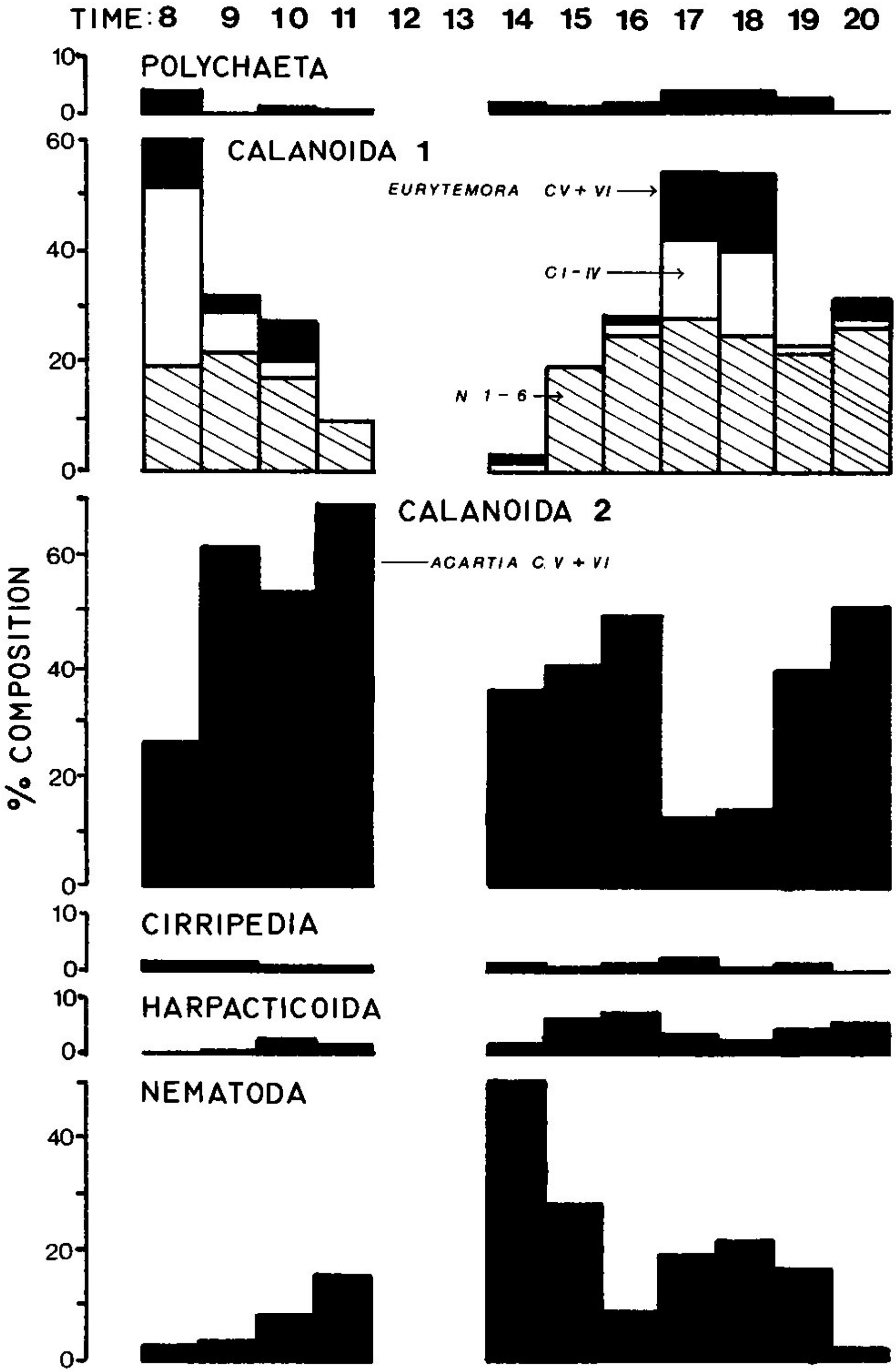

Fig 5. Hourly changes in percent composition of zooplankton at site III (Canard River), 13 July 1978.

Discussion

As indicated above there are considerable difficulties with sampling accurately in rapidly flowing shallow waters, in selecting the optimum mesh and aperture sizes for nets, and restrictions on access to the Basin except at high tide limit the time and extent of sampling. Nonetheless, the major variations appear to be natural ones: marked patchiness in distribution of the major zooplankters and extensive seasonal succession of both holoplanktonic and meroplanktonic components.

Despite the small scale patchiness some generalizations are possible. The spring and early summer plankton of the southern bight is dominated by *E. herdmani,* augmented at times by *Balanus* larvae that are probably allochthonous. In summer, this species is replaced to a large extent in shallower regions by *A. tonsa,* but adult *E. herdmani* are still present in considerable numbers in deeper waters offshore. By October, *A. tonsa* has essentially disappeared from the bight and *E. herdmani* is once again the dominant organism. This pattern of changing dominance is comparable with that described in other estuaries (Jeffries 1955; 1962; Raymont & Carrie 1964; Bousfield et al. 1975).

In species composition also, the zooplankton of the southern bight is similar to that found in the turbid regions of other estuaries, such as Narragansett Bay and Chesapeake Bay. This is in contrast to Jermolajev's (1958) account of the zooplankton of Minas Basin. In 20 to 30 samples collected in Minas Basin in 1920 and 1951 she recorded only 4 species in any number: *A. tonsa, E. herdmani, Pseudodiaptomus coronatus,* and *Centropages hamatus.* Some of the collections were made with a 570 μm mesh net, and in Minas Basin these apparently retained nothing, since even adult *E. herdmani* and *A. tonsa* pass through such mesh. None of the samples she examined was taken from the southern bight: her nearest station (No. 5 on the *M/V Mallotus*) was somewhat north of our station T near Boot Island. This sample, taken with a 280 μm mesh net on 14 July 1951, included 400 *A. tonsa,* 500 *E. herdmani,* 300 *C. hamatus,* 1 *C. finmarchicus* and 1 *Pseudocalanus minutus.* Similar relative numbers and composition were recorded for stations farther out in Minas Basin, and extremely large numbers of *A. tonsa, E. herdmani* and *P. coronatus* were found in samples from Cobequid Bay. Of the species recorded during our studies, only *C. finmarchicus, Sagitta elegans* and possibly *Pseudocalanus minutus* are clearly allochthonous.

Much of Jermolajev's discussion revolves around the noted absence of phytoplankton consequent upon great turbulence and high turbidity. In fact many copepods, particularly but not only estuarine ones, have been shown to feed well on non-living particulate material (e.g. Heinle et al. 1976). Our studies also show that most of the common phytoplanktonic species (*Biddulphia regia, Coscinodiscus* spp, and *Rhizosolenia* sp) are too large for the resident zooplankters to ingest, and we infer that non-living particulate material is the major source of food for most non-predatory zooplankters in Minas Basin.

It is in recognition of this fact that our studies have been done concomitantly with studies of suspended sediments in the southern bight. As we have shown (Daborn & Pennachetti 1979) the water has rather high levels of suspended sediment (100 - 2,000mg/ℓ most of which is fine silt, clay, and sand (5-120 μm),but some of which is saltmarsh detritus. The southern bight has extensive salt marches, and presumably much of the organic production of these is moved around in suspension, to be colonized and decomposed by fungi and bacteria. Studies are presently under way to investigate this link in the food supply of plankton and benthos in southern Minas Basin.

To the extent that abundance may be taken as an indication, production of the zooplankton is moderately high in the Minas Basin. Preliminary studies by Imrie (1979) and Gilmurray (in litt.) have indicated that *E. herdmani* is an important component of the diet of larval American smelt (*Osmerus mordax*), Black-spotted sticklebacks (*Gasterosteus wheatlandi*), and Atlantic silversides (*Menidia menidia*). Thus it appears that the smaller zooplankters play an important role in conversion of non-living particulate matter into fish biomass.

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