SUBLITTORAL ZOOBENTHIC COMMUNITIES OF HOMEBUSH, ERMINGTON AND BRAYS BAYS, PARRAMATTA RIVER, N.S.W.

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INTRODUCTION

As part of environmental planning for the Homebush Bay area, the Coast and Wetlands Society was requested to survey the biota of local wetlands. Although Robinson *et al.* (1983) had surveyed the zoobenthos of Powells Creek and associated wetlands, no information was available for Homebush Bay proper or for the potential effects of urban runoff from creeks. Consequently, the aims of this study were

1. to describe the benthic community of Homebush Bay and compare it with other N.S.W. estuarine zoobenthic communities and
2. to assess the effects of urban runoff by comparing the Homebush Bay community with those of nearby bays less subject to urban runoff from creeks.

STUDY AREA

The three bays sampled are located between 10 and 15km west of Sydney. Homebush and Brays Bays lie on the southern side of the Parramatta River and Ermington Bay on the northern side. All three bays are fringed to some extent by mangroves but only Homebush Bay receives drainage from creeks (Fig. 1) which also serve as urban stormwater drains. Consequently, Homebush Bay probably experiences both greater salinity depression and pollutant loadings than the other bays, especially after heavy rain.

METHODS

All sampling took place on the 8th October 1985 using a 0.06 m^2 Van Veen grab sampler. At each bay, eight randomly-located replicates were taken along the one-metre depth contour near the mouth of Haslam's Creek in Homebush Bay and in the southern areas of Ermington and Brays Bays (Fig. 1). Consequently, the results of this study only apply to restricted areas of these bays. Most replicates were situated within 20 metres of mangroves. Each was washed through a 1mm mesh sieve and the residue preserved in buffered 10% (V/V) formalin. Fauna were sorted and identified in the laboratory under stereomicroscopes and stored in 70% ethanol.

Community variables (the number of species and number of individuals) were compared among the three bays by one-way analysis of variance (ANOVA) and Student-Newman-Keuls (SNK) *a posteriori* multiple comparisons (Sokal and Rohlf, 1981). Variance heterogeneity was measured by Cochran's test and variance-stabilizing transformations performed where necessary.

RESULTS

A total of 32 species and 4,020 individual animals were sampled. Most species were crustaceans (17 crustaceans, 9 polychaetes and 6 molluscs) whereas most individuals were polychaetes (2,237 polychaetes 1,100 molluscs and 683 crustaceans). The polychaetes *Minuspio cirrifera* and *Ceratonereis aequisetis* and the bivalve mollusc *Notospisula trigonella* were the most abundant species overall although unevenly distributed among replicates and bays (Table 1).

Homebush Bay was distinctive in having:

a . relatively high numbers of *Corophium* cf. *acherusicum, Arthritica helmsi, Ceratonereis aequisetis* and *Capitella* sp.,
b. relatively low numbers of *Notospisula trigonella* and *Tellina deltoidalis* and
c. the presence of *Hydrobia victoriae, Salinator fragilis, Dimorphostylis colefaxi, Alpheus euphrosyne richardsoni* and a nebaliacean (Table 1). Furthermore, far more macroalgae were observed at Homebush Bay than elsewhere.

Homebush Bay was significantly richer in both numbers of species and individuals (in-transformed for analysis) than Brays Bay but showed no significant differences from Ermington Bay (one-way ANOVA's, $F_{species} = 10.5$, $P < 0.001$; $F_{individuals} = 9.1$, $P < 0.001$; SNK tests; Table 1).

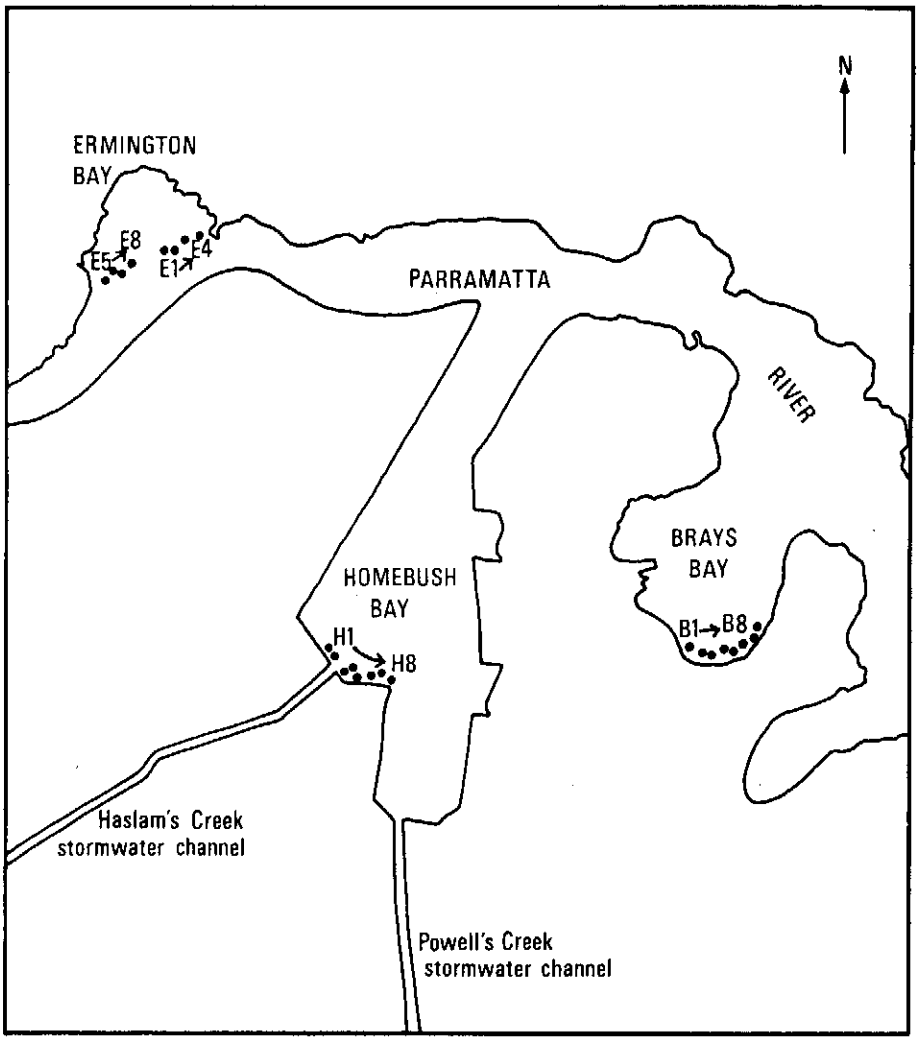

Figure 1. Map of the study area showing sampling locations.

DISCUSSION

The benthic fauna of Homebush Bay showed both similarities to, and differences from the fauna described from other estuaries in south-eastern Australia by Rainer and Fitzhardinge (1981), Poore (1982), Hutchings and Murray (1984) and Jones *et al.* (1986). For example, of the species which are common and widespread elsewhere, *Ceratonereis aequisetis, Minuspio cirrifera, Victoriopisa australiensis, Notospisula trigonella, Carazziella victoriensis* and *Tellina deltoidalis* were present or common at Homebush Bay. However, other widespread species such as *Nephtys australiensis, Australonereis ehlersi, Lumbrineris latreilli, Callianassa arenosa, Syncassidina aestuaria* and *Theora fragilis* were not sampled. Of course, many of these absences may be attributable to the limitations of sampling in space (the present results only refer to the one-metre deep contour) and time (many absences may be temporary). Nevertheless, it is curious that *Nephtys australiensis* was not sampled at Homebush Bay as this species is found in a wide range of sediment grades and salinities and was both abundant and highly persistent in the Hawkesbury Estuary over seven years (Jones *et al.*, ms).

The only previous zoobenthic work at Homebush Bay (Robinson *et al.*, 1983) showed both similarities to, and differences from the present study. For example, both studies found *Ceratonereis aequisetis* to be very common in subtidal muddy habitats (see Hutchings and Glasby (1985) for the synonymy of *C. aequisetis* and *C. pseudoerythraeensis*). As well, Robinson *et al.* (1983) found fewer species in their two subtidal samples than were found in the present study. This finding may arise from the fact that the former samples were taken from creeks with presumably lower salinities than in the bay proper.

Ermington and Brays Bays are less subject to urban runoff than Homebush Bay which should therefore experience more variable salinity conditions and greater pollution. This latter assumption was corroborated by the large amount of macroalgae at Homebush Bay, implying localised nutrient enrichment and eutrophication. Although these factors can depress the number of species and increase the number of individuals (Gray, 1981), Homebush Bay did not differ significantly from Ermington Bay. Consequently, there is no evidence of differences associated with urban runoff with respect to these community variables. However, another aspect of the Homebush Bay community (i.e. the species present and their abundances) did differ from the other bays and this difference may have been caused by urban runoff.

Table 1. Distribution and abundance of each species and community statistics. $\bar{S}$ = mean number of species per grab. $\bar{N}$ = mean number of individuals per grab.

	HOMEBUSH BAY								ERMINGTON BAY								BRAY'S BAY							
SPECIES	H1	H2	H3	H4	H5	H6	H7	H8	E1	E2	E3	E4	E5	E6	E7	E8	B1	B2	B3	B4	B5	B6	B7	B8
POLYCHAETA																								
POLYNOIDAE:																								
Harmothoe sp.														2										
NEREIDIDAE:																								
Australonereis ehlersi (Augener, 1913)													1											
Ceratonereis aequisetis (Augener, 1913)	7	130	143	88	127	23	27	9		1	2	13	65	13	105	64	8	3	24	1	1	3		
NEPHTYIDAE:																								
Nephtys australiensis Fauchald, 1965												2											1	
SPIONIDAE:																								
Carazziella victoriensis Blake & Kudenov, 1978					1																			
Minuspio cirrifera (Wiren, 1883)	4	550	93	1	39	7	16	23	51	90	71	78	27	48	10	10		23	25	2	8	15	24	20
Pseudopolydora paucibranchiata Okuda, 1937						1				1														
CAPITELLIDAE:																								
Barantolla lepte Hutchings, 1974										1	5	7		14	3	7				1				1
Capitella sp.			37	2	12	7	3	3	3	2	1	1		3					2					
CRUSTACEA																								
NEBALIACEA:																								
Nebaliacean						3																		
CUMACEA:																								
Dimorphostylis colefaxi Hale, 1945		5		3																				
ISOPODA:																								
Cyathura hakea Poore & Lew Ton, 1985	1	5	15	1	1		2			2	2		3	2	8	23			1					2
Syncassidina aestuaria Baker, 1929														1										
AMPHIPODA:																								
Caprella scaura Templeton, 1836												1		17	1									
Corophium cf. ascherusicum																								

Gammaropsis sp. 2			1									2		4				1								
Melita cf. matilda Barnard, 1972			1		9		10	2		2			1		7	2	2									
Paracalliope sp.		1	9	1	7		6	1		2					9	2	1									
Victoriopisa australiensis (Chilton, 1923)	7	2	1		2	13	5	5		12	14	4	9	1	1		1		7	20	14	21	10	20	15	22
DECAPODA:																										
Alpheus euphrosyne richardsoni Banner & Banner, 1981	2																									
Caridean shrimp (damaged)																										1
Penaeus plebejus Hess, 1865																									1	
Amarinus paralacustris (Lucas, 1970)															4											
Macrophthalmus sp.																			1	3		1		1		2
Portunid (juv.)															1											
MOLLUSCA																										
PROSOBRANCHIA:																										
Hydrobia victoriae (Tenison-Woods, 1878)				2																						
BIVALVIA:																										
Xenostrobus securis (Lamarck, 1819)		1					2			2		9	3		31		25									
Arthritica helmsi (Hedley, 1915)		68	62	14	39	5	4	4			3					2	2			2	2		1	1		2
Notospisula trigonella (Lamarck, 1818)	2	4	3			1				116	180	200	115	2	3	3	2		8	16	22	8	11	6	4	7
Tellina deltoidalis Lamarck, 1818	6					2				15	9	2	6	1		1			3	14	16	9	1	6	2	1
PULMONATA:																										
Salinator fragilis (Lamarck, 1822)			2		2																					
OLIGOCHAETES								2																		
NEMERTEANS	2				7		3			8	1		4													
TOTAL FAUNA																										
No. Species (S)	9	10	12	9	12	10	11	9		9	11	10	14	7	17	10	10		5	7	9	7	6	7	7	9
$\bar{S}$ ± 1 standard error				10.25 ± 0.45									11.13 ± 1.20									7.13 ± 0.48				
No. Individuals (N)	62	900	394	116	258	66	92	87		211	304	301	245	100	162	137	137		27	81	107	43	32	52	48	58
$\bar{N}$ ± 1 standard error				246.9 ± 101.9									199.6 ± 27.6									56.0 ± 9.4				

In conclusion, this study suggests that Homebush Bay was depauperate compared with some other N.S.W. estuaries and that urban runoff may affect species composition of the community rather than the numbers of species or individuals. However, both suggestions arise from very limited sampling and need to be tested by substantial further work. Moreover, any effects of pollutants in runoff would be difficult to discern because of the confounding effects of freshwater and turbidity and the need for adequate control sites. Nevertheless, urban runoff may well have significant effects on aquatic communities and is sorely in need of study (Pedersen and Perkins, 1986).

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RERERENCES

Gray, J. S. (1981). *The Ecology of Marine Sediments.* Cambridge University Press, Cambridge.

Hutchings, P. A. and Glasby, C. J. (1985). Additional nereidids (Polychaeta) from eastern Australia, together with a redescription of *Namanereis quadraticeps* (Gay) and the synonymising of *Ceratonereis pseudoerythraeensis* Hutchings and Turvey with *C. aequisetis* (Augener). *Records of the Australian Museum*, 37: 101-110.

Hutchings, P. and Murray, A. (1984). Taxonomy of polychaetes from the Hawkesbury River and the southern estuaries of New South Wales, Australia. *Records of the Australian Museum*, 36 (Suppl. 3): 1-118.

Jones, A. R., Watson-Russell, C. J. and Murray, A. (1986). Spatial patterns in the macrobenthic communities of the Hawkesbury Estuary, New South Wales. *Australian Journal of Marine and Freshwater Research*, 37: 521-543.

Pedersen, E. R. and Perkins, M. A. (1986). The use of benthic invertebrate data for evaluating impacts of urban runoff. Hydrobiologia, 139: 13-22.

Poore, G. C. B. (1982). Benthic communities of the Gippsland Lakes, Victoria. *Australian Journal of Marine and Freshwater Research*, 33: 901-915.

Rainer, S. F. and Fitzhardinge, R. C. (1981). Benthic communities in an estuary with periodic deoxygenation. *Australian Journal of Marine and Freshwater Research*, 32: 227-243.

Robinson, K. I. M., van der Velde, J. T. and Gibbs, P. J. (1983). A survey of the benthic fauna of Homebush Bay, Parramatta River, New South Wales. *Wetands, Australia* 3: 81-84.

Sokal, R. R. and Rohlf, F. J. (1981). *Biometry: the Principles and Practice of Statistics in Biological Research.* (2nd Edition). W. H. Freeman and Co., San Francisco.