9m

DEVON AREA INTERNAL REPORT

THE KINGSBRIDGE ESTUARY

SURVEY OF THE BENTHIC MACROINVERTEBRATE INFAUNA (OCTOBER 1990) FOR THE PROPOSED CLASSIFICATION OF ESTUARIES IN THE SOUTH WESTERN REGION

October 1994
DBT/94/07
Author: Trevor Baker
Biologist

G R Bateman
Area Manager (Devon)

NRA
National Rivers Authority
South Western Region

CONTENTS

SUMMARY

A review of available literature of the estuary is summarised in Table 1.

Twelve intertidal sites, with 4x0.01 m^2 cores at each, were taken to provide data on the communities present and population structure. In addition, a protocol of 4x0.05 m^2 Van Veen grab at each of six subtidal sites, assisted in characterising the species composition of the soft sediments of the Kingsbridge estuary.

Sediment particle size analyses at the selected sample sites, and salinity measurements of the water column, were used to assess their roles in determining community structure. Both salinity and grain size were seen to have some influence on species distribution and population size. The sheltered aspect of the middle and upper reaches, where salinities remained high, allowed for speciose communities.

Community structure and species composition appears to be typical of this type of environment and there are no species in sufficient numbers to indicate excessive organic enrichment.

This survey provides baseline data from which subsequent work can be developed, though it should be recognised that a time series dataset would also be required as part of a baseline.

INTRODUCTION

Current estuarine classification, introduced in 1980 by the National Water Council, is subjective and considered insensitive to changes in water quality. As a response to the continued need for a nationally applicable and objective scheme, the Water Quality Survey Group Working Party made recommendations, in 1989, to the NRA. The, then, South West region subsequently took steps to embrace, as far as possible, the objectives of the proposed National Classification Scheme.

The proposed scheme recognises the need to develop appropriate biological assessment criteria which can be applied objectively. However, given that a developmental period is required for the so-called Ecological Quality Index (EQI) then the continued use of the NWC estuarine classification is accepted for the interim.

The present NWC scheme divides each estuary into zones of reasonably uniform characteristics. Each zone would then be classified individually, with regard to the biological, aesthetic and water quality components. A scoring system would apply to each of these categories to provide a summary total and a quality status (good, fair, poor, bad). For the biological component, it was suggested that four categories were taken into account: Migratory fish passage, resident fish population, bioaccumulation of toxic and tainting substances and benthic fauna. The biological classification would be used to augment chemical data, providing a fundamentally different means of assessing water quality.

In line with classification proposals, the estuary was divided into five zones of, largely assumed, uniform features. Within each zone sample sites were located in an attempt to characterise them and, in turn, the estuary.

The Kingsbridge (or Salcombe) estuary is situated on the south coast of Devon, and largely sheltered from prevailing westerlies, particularly behind the restricted entrance. Much of the shore of the upper and middle reaches of the estuary consisted of mudflat. The lower stretches and the mouth were

fringed by hard substrate. Occasional bays provide sandy shores.

An initial literature review is summarised in Table 1. A combination of quantitative and qualitative surveys have been undertaken, most notably Hiscock (1985).

METHODS

Intertidal Sampling

Each of twelve sites, positioned throughout the estuary, consisted of four replicate core samples (Figure 1). The cylindrical steel core gave a sample area of 0.01 m^2 and penetrated to a depth of 15 cm. Samples were taken on 16th-17th October 1990.

The sample was sieved through a 0.5 mm mesh on site by "puddling" in available standing water to remove excess sediment. Samples were potted and mixed in 10% buffered formalin (from a stock solution of 40% formalin with 200 gl^{-1} hexamine) and including the vital stain eosin, to aid sorting.

Sediment samples of at least 50 g for granulometric and organic carbon and nitrogen analysis were taken from the top 2 cm. These were stored in a freezer on the same day that they were taken.

Particle size analysis used a dry sieving technique.

Site information records (Table 2) consisted of notes on the topography, vegetation, conspicuous macrofauna and human influences. Photographic records and site location bearings were taken where appropriate.

Subtidal Sampling

Four replicate grab samples were taken at six sites (Table 2.1) using a 0.05 m^{-2} Van Veen Grab with a bite depth of 8cm. Superficial bites were discarded as not being a representative or consistent sample. Sampling took place around high water neap to avoid strong tidal currents associated with larger tidal ranges, which would have reduced grab operation efficiency. Samples were taken on the 11th October 1990.

Site information records and sediment samples were taken, and illustrated, in a manner similar to that described for intertidal survey work.

Salinity

Salinity data from the Tidal Waters routine monitoring programme for 1990 has been summarised (Table 6). Measurements were taken from various positions in the water column (surface, mid-depth, bottom) at different times of the year and the range given.

Laboratory processing

Samples were allowed to fix in formalin for at least 10 days prior to thorough rinsing in a fume cupboard, to remove all traces of formalin and remaining fine sediment. Rinsing took place over a stack of brass sieves with mesh sizes of 0.5 mm, 1.0 mm and greater than 2 mm where required. Sorting of samples was achieved under water, on a white tray with specimens separated into major groups. After identification to species level with low power binocular and high power microscopes, all specimens were counted (heads only) and preserved in vials containing 70% ethanol and 5% glycerol. The latter to reduce the volatility of the preservative.

Taxonomy

Where possible all taxa have been identified to species. In the event of being unable to achieve this, identification has been restricted to the level where a high degree of certainty remains. A variety of reasons for this are described below.

1) Damaged specimens

Identification problems can arise where fragmentation of specimens has occurred during sample processing. This only proved to be an occasional problem with a few annelid, amphipod and bivalve specimens, which were consequently recorded to an appropriate level (genus, family or superfamily).

2) Availability of suitable keys

In the case of the Capitellid polychaetes, there is ongoing research and discussion as to the validity of various genera and species. With this in mind we have taken the conservative view and refrained from going beyond the generic level.

3) Juvenile specimens

There is very little work available to assist in the identification of larval and juvenile forms. It is a particular problem with bivalves and annelids, resulting in a conservative approach to their identification (e.g. Ampharetidae juv. indet.).

Data Analysis

The data set was subject to univariate analyses in the form of the Shannon-Weiner Diversity Index, Pielou Evenness Index and Species Richness Index. The results from these are presented graphically (Figures 2, 2.1), from values given in Table 7, showing changes in their values along the length of the estuary.

A coefficient of diversity is a convenient way of demonstrating the variety of species present in a sample. The value of this index is affected by the number of species found and also their relative dominances. With an even population distribution among the species, the diversity index value is greater than when only a few taxa make up the majority of individuals present. Consequently a measure of this evenness was simultaneously calculated. The Pielou Evenness Index compares the diversity of the data with its theoretical maximum, where all species would be equally abundant.

Species richness can be regarded as an indication of the number of species per unit area. As individual species occur,or are absent, species richness will fluctuate. At the same time diversity may vary differently as this is also a measure of relative abundance. Hence the effect of the loss of some

species may be masked by the increase in numbers of others.

Multivariate analysis, based on Bray-Curtis Similarity, in the form Multidimensional Scaling (MDS). MDS produces a two-dimensional plot of a multidimensional ordination for all of the replicates. The closer the similarity of replicates, the more proximate they are positioned in the plot. In this manner a graphical representation of community similarity (or dissimilarity) can be presented. Sites or replicates that appear aberrant can then be noted, by their isolation, for possible further examination. In addition to this plot, physical and chemical parameters can be superimposed on similarity ordination (Figures 6 - 9) to illustrate any trends (i.e. to show whether a particular parameter is responsible for the community pattern or not). Significance tests can be used to confirm or reject hypotheses that arise from such representations if required.

RESULTS

The Classification system split the estuary into six zones. These zones were followed in the design of this survey. In conjunction with published data (see Table 1) this survey was undertaken to provide a characterisation of the macroinvertebrate infauna of the whole of the estuary.

Particular emphasis was placed on intertidal regions and to this end twelve samples sites were located throughout the designated zones. Site details are given in Tables 2 and 2.1 and mapped in Figure 1. The intertidal communities found are detailed in Appendix Ci and summarised in Table 4. Subtidal sites and data are treated similarly in Appendix Cii, and Table 3.

Univariate statistical indices (diversity, richness and evenness) are given in Table 7 and illustrated in Figures 2 and 2.1. Multivariate statistical analyses, in the form of MDS were used to illustrate similarities and differences between replicates and sites (Figures 4 and 5).

Particle size analysis for each intertidal and subtidal site are given in Tables 5 and 5.1 and shown in Figures 3 and 3.1. The proportion of sediment passing through a 0.063mm mesh sieve (percent particle fines) and median grain size were superimposed on to the intertidal MDS plot of species similarities (Figure 5) to highlight trends between these abiotic parameters and community structure (Figure 6 and 7 respectively).

A similar procedure was undertaken for mid-depth and surface salinity (Figures 8 and 9, from Table 6).

Intertidal survey sites

The uppermost reaches of the estuary (sites 1-5) were inhabited by few species. Many of these characteristic taxa were found in densities greater here than elsewhere in the estuary (Tubifex costatus, Nereis diversicolor, Manayunkia aesturina and Polydora cornuta). These euryhaline and oligohaline

taxa were also present at other peripheral sites (8 and 10), along with several other estuarine species (Alkmaria romijni and Melinna palmata).

In the middle reaches of the estuary, sites 6 and 7 showed increased diversity and species richness. A rise in the number of ampharetid, spionid and cirratulid polychaete species were the principal distinguishing components.

The heterogenous sediment at site 9 (Figure 3, Table 5) and persistently high salinities (Table 6) supported the most speciose and diverse intertidal fauna sampled in the survey. Species present, intertidally, only at this site included: Notomastus latericeus, Ophryotrocha gracilis, Euclymene oerstedii, Spio decorata, Microdeutopus anomalus and various bivalve molluscs.

Sites 11 and 12 sampled sandy bays where the fauna was, apart from cumaceans, poor both numerically and in terms of diversity. Species adapted to inhabiting clean, mobile sand substrates dominated (Scolelepis sp.,Nephtys cirrosa, Bodotria pulchella and Vauthompsonia cristata).

Subtidal survey sites

The upper two sites (A and B) were very rich in species (Figure 2.1, Table 5.1) though numerically dominated by a few taxa (Exogone naidina, Sphaerosyllis taylori, Corophium sextonae, Janira maculosa and Amphipholis squamata).

In the mouth of the estuary, where the substrate was coarser (Figure 2.1, Table 5.1) richness and diversity were lower, particularly in the constricted entrance to the estuary (site D) where particulate sizes were in excess of 1.0 mm.

Site C showed intermediate features between the energetic environment of the mouth and the sheltered, but stenohaline (see Table 6), upper sites.

DISCUSSION

An initial literature review (Table 1) determined that a minimal amount of relevant data had been published (in 1985). This current survey provided further quantitative data for a wider area of the sedimentary substrates of the estuary.

The information acquired from these twelve intertidal and six subtidal sites of this survey should act as a baseline from which further work, including investigative and mid to long term monitoring, should develop. Enhancement of the value of this data would be achieved by repeating the survey in order to develop an appreciation of natural population variation. A baseline dataset is more robust when incorporating data from more than a just one point in time.

The proposed zonation system proved to hold no biological significance and consequently this discussion does not follow this format.

Intertidal survey sites

The upper reaches (Sites 1-5)

A predictable fauna was encountered at the peripheral sites of the estuary where salinity is expected to be much reduced and vary widely. The occurrence of various oligochaetes, N.diversicolor, and other euryhaline taxa conforms to expectations and was comparable with similar sites on other estuaries of the region (NRA biological data). The presence of T.costatus at site 5 is indicative of periodically oligohaline conditions as this species is known to tolerate low salinities (Birtwell and Arthur,1980, McLusky, Teare and Phizachlea, 1981).

Such salinity reductions have been largely assumed, from topography and community composition, as available salinity data was sparse. Simultaneous salinity measurement during biological sampling is advocated for, at least, the adjacent channel. The most useful measurements, however, would be of the

interstitial levels in conjunction with the water column immediately above the substrate and for all states of the tide and all seasons.

The diversity at these sites is low and with poor species richness (Figure 2), due to a restricted faunal assemblage of those taxa adapted to withstand widely fluctuating salinities, periodic emersion and an organically rich fine particulate anoxic sediment (mud).

Mid estuary sites (6-8 and 10)

There are minor differences in the univariate indices of these and the above sites, but sufficient distinguishing features in population sizes and species present to result in a multivariate analysis that isolates these sites from the previous five (Figure 5).

These sites are transitory in that the resident communities include many of the taxa from the upper sites, alongside additional species that consequently raise diversity. The additional taxa include the diminutive ampharetid polychaete, Alkmaria romijni, which is listed in the protected species list (revised) of the Wildlife and Countryside Act (1981). The increasing number of species likely reflects the absence of the more extreme environmental variables encountered at the previous sites which inhibits their more widespread occurrence.

Sedimentary characteristics also provide further explanation for these changes in population structure, though more detailed examination of the relative importance of the various environmental parameters (particle size, salinity etc) is beyond the requirements of this initial survey.

The lower sites (9,11,12)

The major differences between these sites and those immediately upstream is the sediment composition. All three sites were described as sandy (Table 2), though site 9 contained a noticeable mud component (Table 2, Figure 3). The sheltered aspect at site 9 facilitated the occurrence of taxa that occupy

marine sediments with a component of fine organic material (species such as the maldanid polychaetes Euclymene oerstedii and Praxillella affinis).

The remaining two sites (11 and 12) consisted of clean sands which are evidently subject to greater wave exposure and are consequently distinct from the other communities (Figure 5), particularly site 12.

The dominant fauna were cumaceans (B.pulchella and V.cristata), Scolelepis sp. and N.cirrosa. All are taxa characteristic of mobile clean sand substrates.

Subtidal survey sites

Sheltered upper sites (A and B)

In the sheltered reaches where the marine water remains, more or less undiluted (Table 6), the species richness (and diversity) are the highest for the survey. Indeed, these sites represent the most species rich estuarine habitats sampled to date (NRA biological data). The diversity too ranks very high and exceeds the faunistically important Helford and Fal estuaries (NRA biological data). Such richness is largely attributable to a number of polychaetes (Nereids, Syllids and Cirratulids), amphipods (Corophids, Melitids and Caprellids), isopods and tanaids.

The sediment at these two sites is well mixed and supports probably in excess of the one hundred species, or so, identified here. It is not without justification, then that the estuary has been designated a local nature reserve (see Goff, 1992).

These sites represent a community quite distinct from the remainder of the areas sampled and represent a potentially valuable monitoring tool. Changes in such a community, at the species level, could provide early signals to detrimental impact. From the limited data gathered so far, indications are that the community may be both stable (as indicated by their close similarities, Table 3, and proximate positions on the ordination plot,

Figure 3) and cover a large area (assuming the community is continuous from one site to the next). Consequently the continued accumulation of data from these sites could prove to be most desirable, particularly if changes in inputs into the system were to occur.

The middle site (C)

This site showed many similarities with the above sites, except that the species richness was reduced and also the abundance of many. Taxa that were more numerous were the polychaete Capitella capitata and the amphipod Maera grossimana. The increased proportion of particles greater than 0.25 mm reduced the heterogeneity of the sediment considerably and therefore niche heterogeneity also. Though C.capitata has been noted as a pollution indicator in the past, its occurrence here likely reflects the level of disturbance, from tidal currents, rather than any anthropogenic impact.

The estuary mouth (sites D-F)

In the vicinity of the estuary mouth, which is constricted by a bedrock coastline, the sediment is subject to tidal currents and wave action and hence consists of larger particle sizes to the point of being well sorted and coarse (Site D). The communities were dominated by crustacea, bivalves and other taxa adapted to inhabiting mobile and energetic sediments.

Though these three sites are quite varied (as indicated by the distribution of replicates on the ordination, Figure 4), in light of logistic constraints the continued use of each of these sites for monitoring purposes should be reconsidered. The saving in resources by discontinuing sampling at one or two of these sites probably outweighs the loss of data.

CONCLUSIONS

1) The faunal assemblages of the intertidal and also subtidal sites of this survey were considered to be consistent with prevailing hydrographic conditions.

2) The subtidal communities in the sheltered reaches of the estuary were very rich and consequently of considerable importance.

3) The proposed zonation scheme did not accurately reflect the distribution of the invertebrate communities sampled.

4) This survey provided data which contributes to a baseline of information. Subsequent monitoring should be undertaken to support the initial dataset as part of the baseline process. This would be an essential part of the process of monitoring anthropogenically induced change.

RECOMMENDATIONS

1) A requirement for a time series dataset was identified, to add value to the data and development of its interpretation. Repeat surveys would be appropriate in this context.

Action: Catchment Planning (Regional and Area)
Water Quality Section (Regional)

2) A reduction in the number of survey sites is not recommended other than subtidally, in the mouth of the estuary.

Action: Marine Biologists

3) A more accurate assessment of salinity, and other environmental parameters should be obtained, simultaneously with future biological surveys.

Action: Marine Biologists

4) The proposed classification scheme should be modified to accommodate the prevailing hydrographic conditions and community distribution patterns.

Action: Classification Scheme managers

GLOSSARY

Benthic	Dwelling at the substrate/water interface at the bottom of the aquatic environment.
Biota	The living organisms of a given region.
Euryhaline	Tolerant to a relatively wide range of environmental salinities, with particular reference to salinities lower than that of the open sea.
Granulometric	The measurement of sediment particle size (diameter).
Heterogenous	Of variable components. For sediments, mixed particle sizes.
Hydrographical	Physical aspects of the aquatic environment.
Infauna	Dwellers within the sediment.
Littoral	The region of land subject to tidal inundation.
Macroinvertebrate	Invertebrate animals retained on a 0.5mm, or larger, mesh sieve
Oligohaline	Tolerance to low environmental salinities.
Stenohaline	Tolerance to stable environmental salinities not deviating significantly from marine conditions.
Topography	The delineation of the natural and artificial features of an area.
Univariate	Determination of the statistical variation of a distribution having one variable only.

REFERENCES

Birtwell,J. and Arthur,D.R. 1980

The ecology of the tubificids in the Thames estuary, with particular reference to Tubifex costatus.
In. Aquatic Oligochaete Biology. Brinkhurst and Cook.
Plenum Press.

Goff,L. 1992

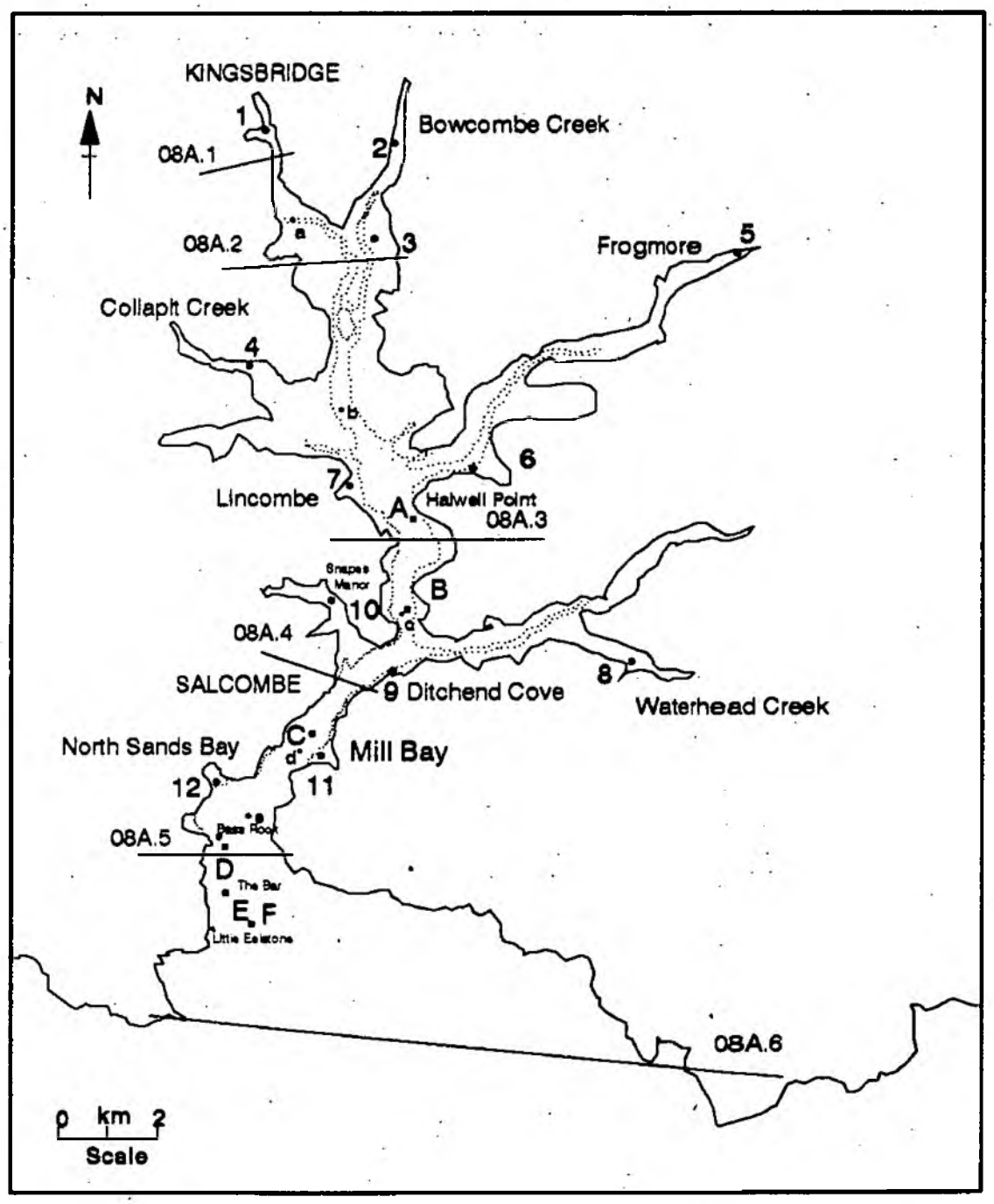
Identified uses of tidal waters. Volume 1
NRA SW Environmental Protection Report TWU/92/14.

McLusky,D.S., Teare,M. and Phizachlea, P. 1981

Effects of domestic and industrial pollution on the distribution of aquatic oligochaetes in the Forth Estuary.
Est.Cstl.Mar.Sci. 6:197-208.

APPENDIX A

Figure 1: Kingsbridge Estuary 8A



Key: Zone Code - 08A.3 Site Code - 1/A Low Water - dashes
Intertidal site - 1 Subtidal site - A Physico-chemical sample stations - *a

Figure 2: Intertidal sites: Univariate indices mean values - Species Richness, Diversity and Richness.

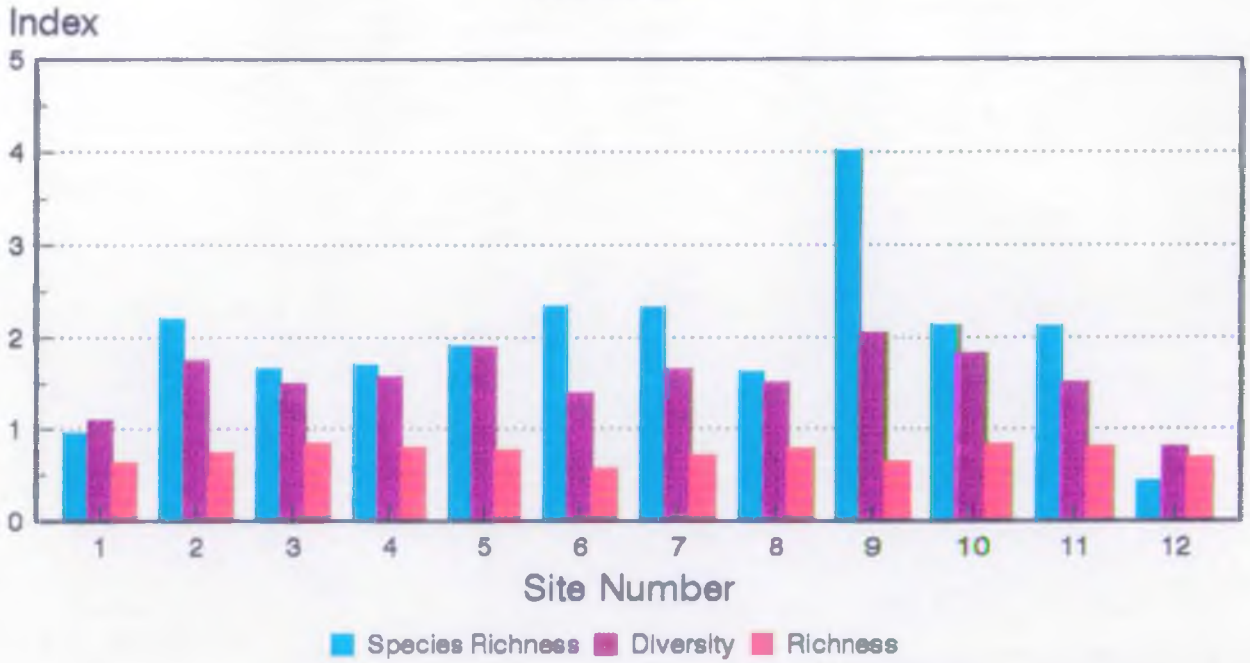


Figure 2.1: Subtidal sites: Univariate indices mean values - Species Richness, Diversity and Richness.

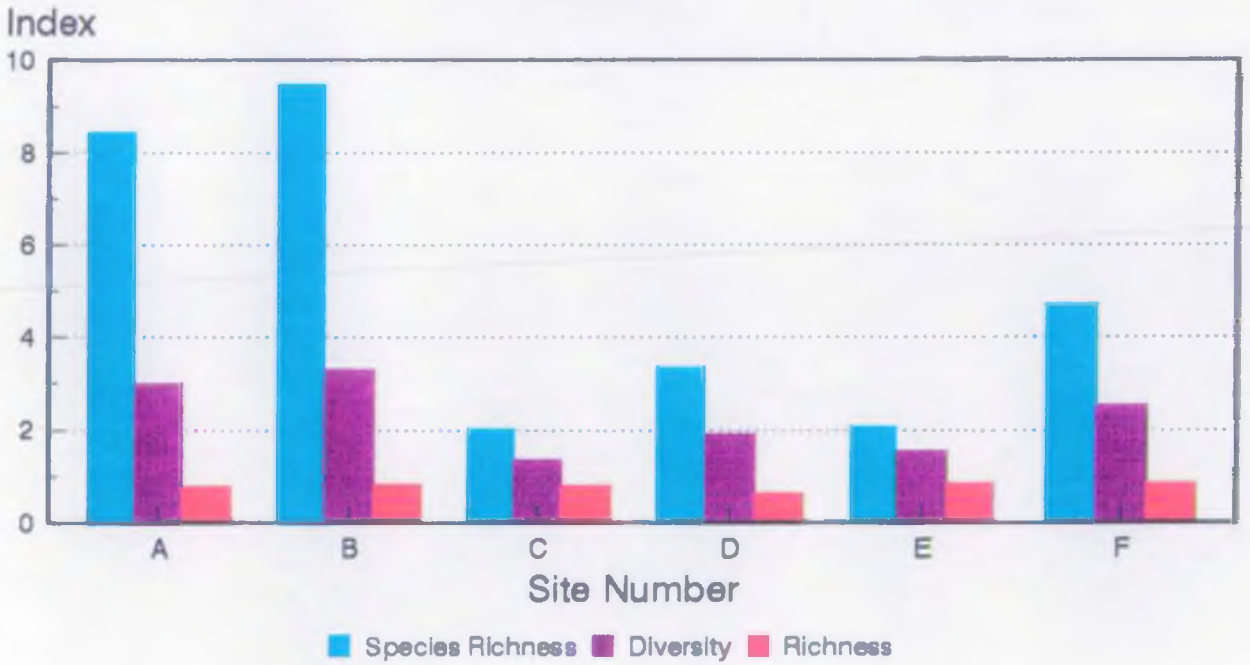


Figure 3: Intertidal sites: Granulometry

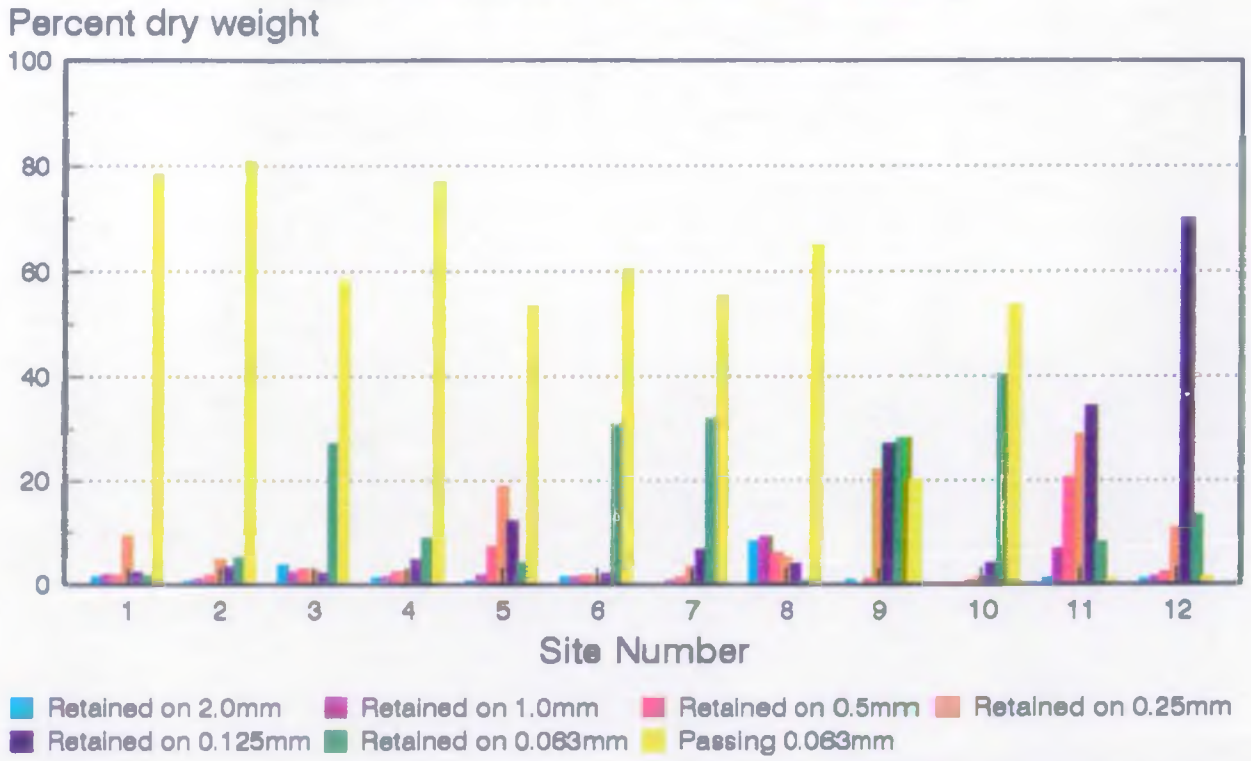


Figure 3.1: Subtidal sites: Granulometry

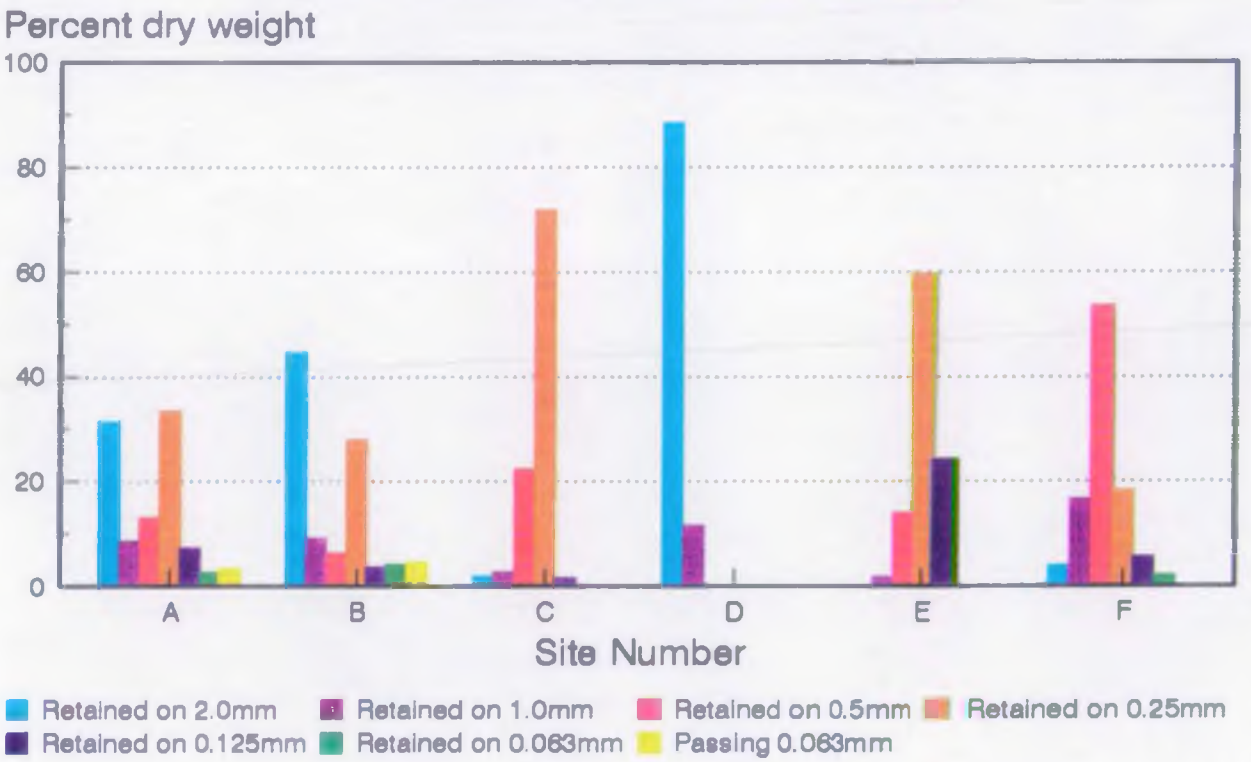


FIGURE 4:MDS PLOT OF SUBTIDAL SITES

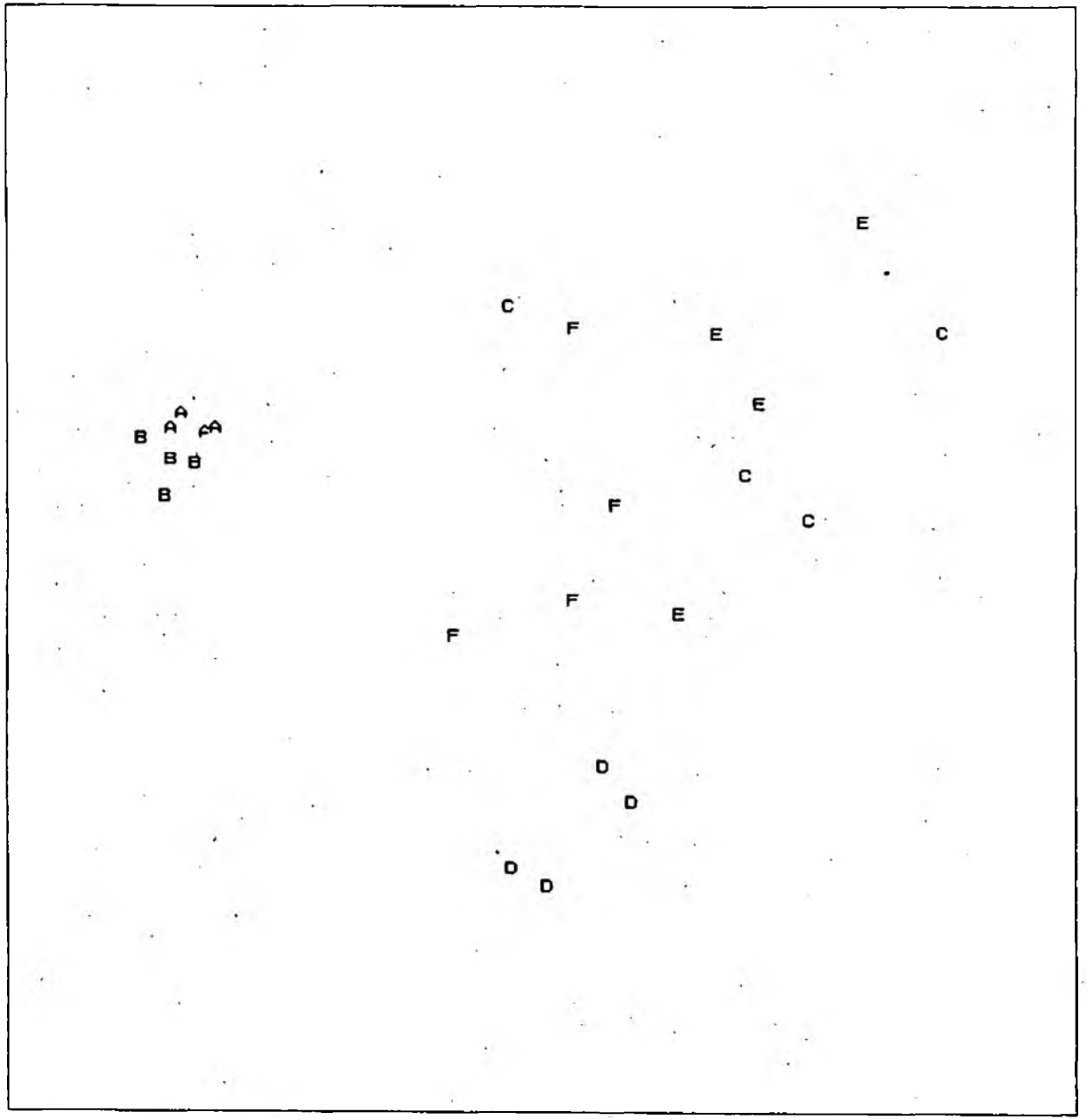


FIGURE 5: MDS PLOT OF INTERTIDAL SITES

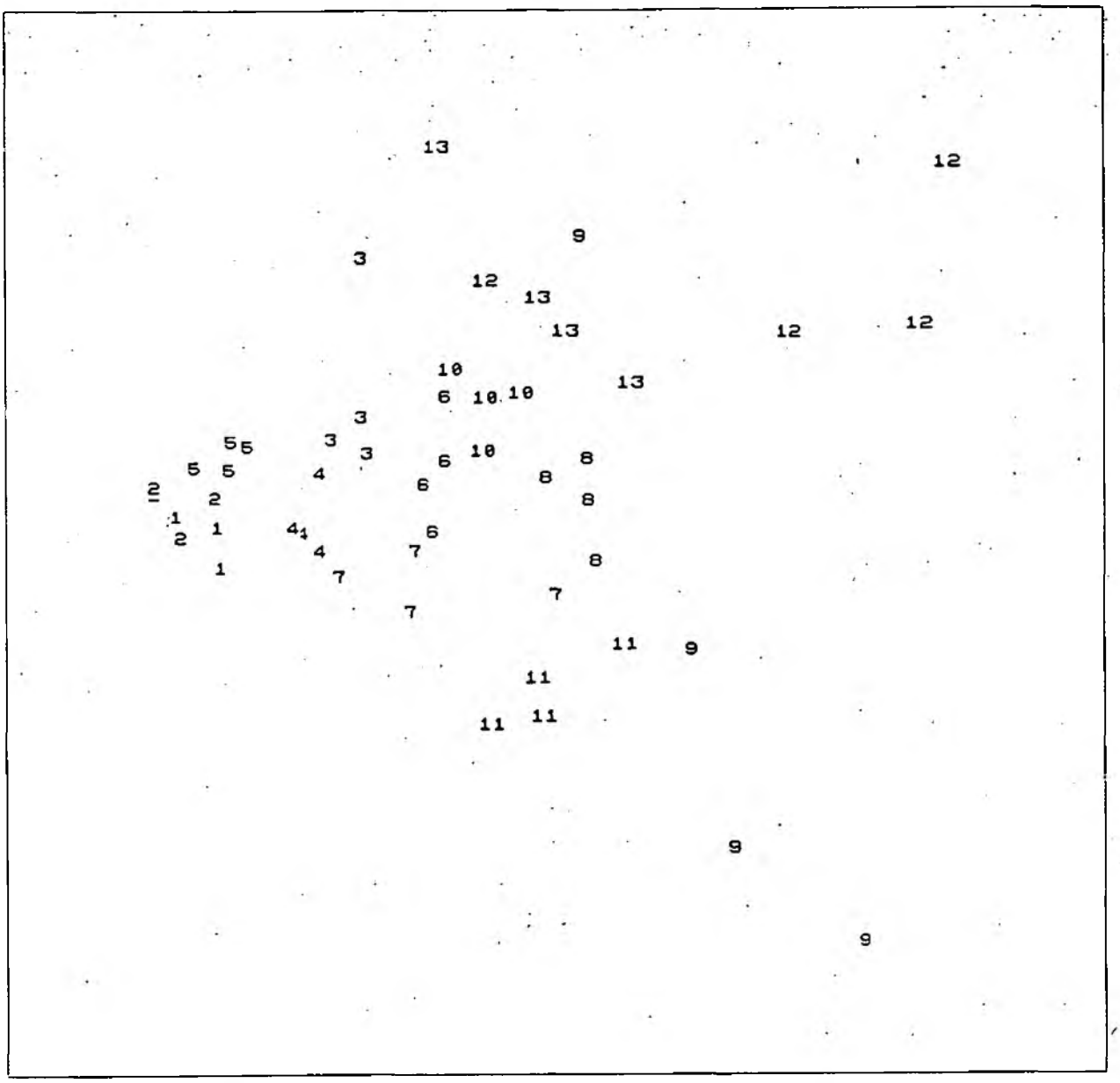


FIGURE 6: PERCENT OF SEDIMENT FINES ON MDS

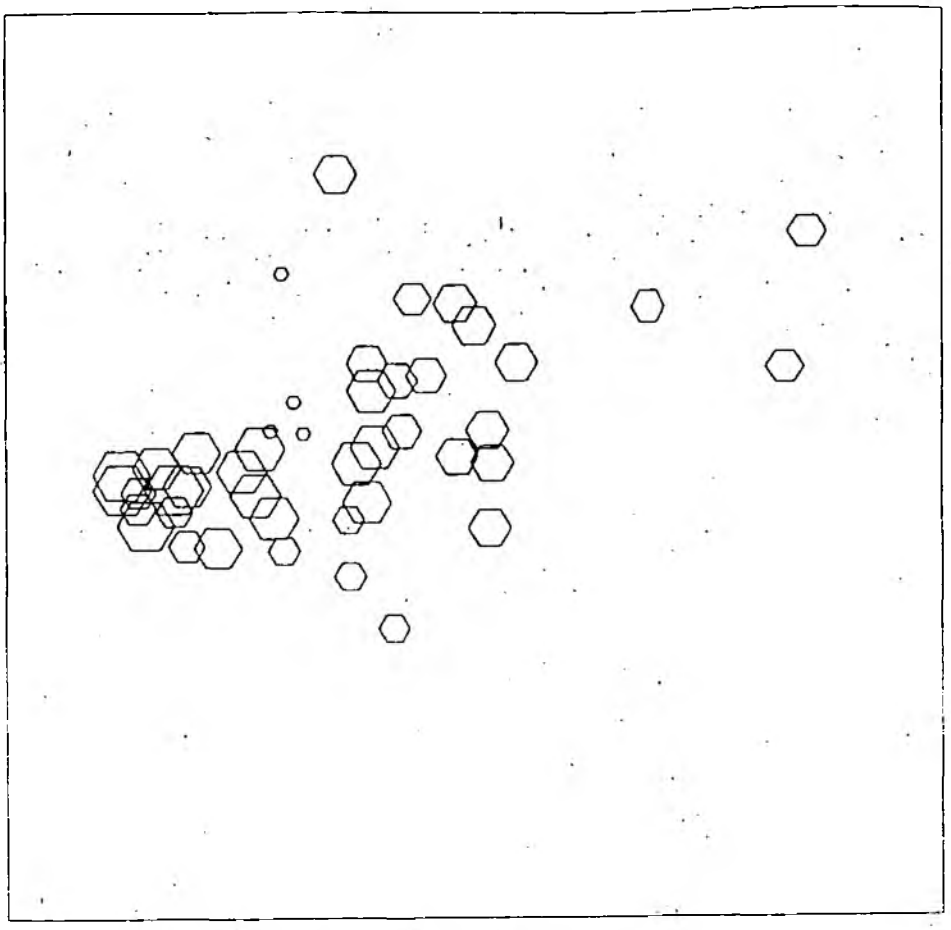


FIGURE 7: MEDIAN GRAIN SIZE FOR INTERTIDAL SITES ON MDS

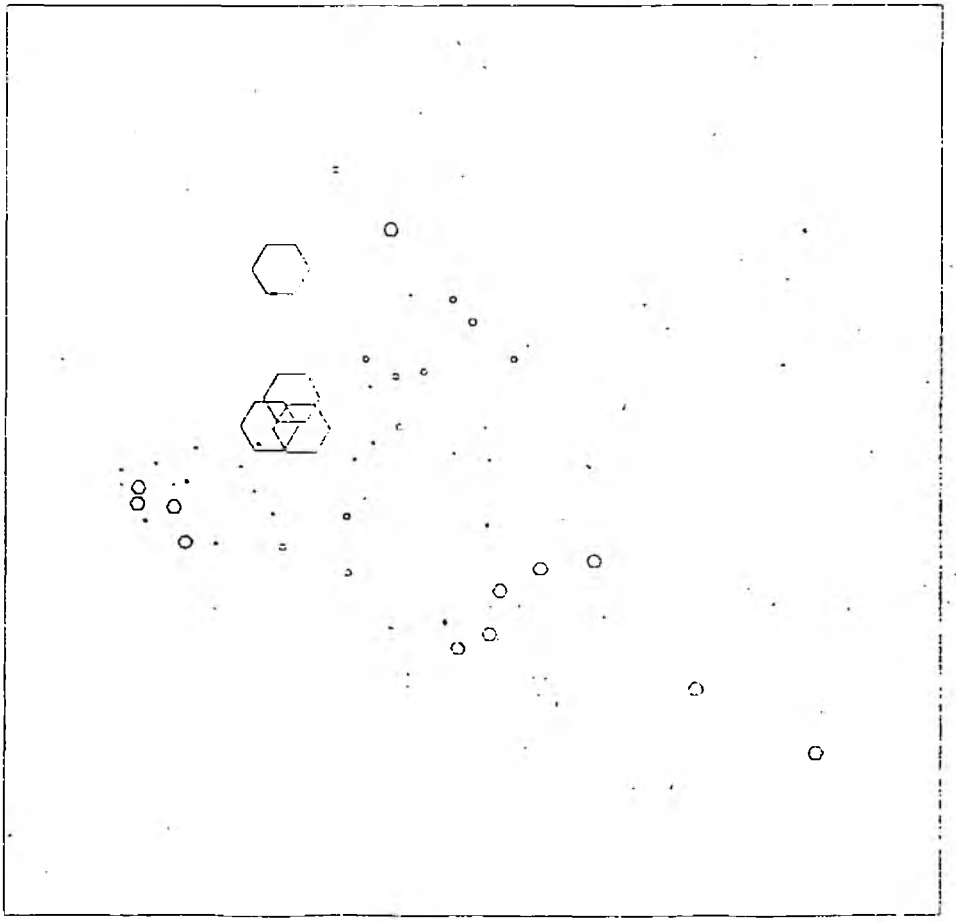


FIGURE 8: MINIMUM MID-DEPTH SALINITY (10.07.90) ON MDS

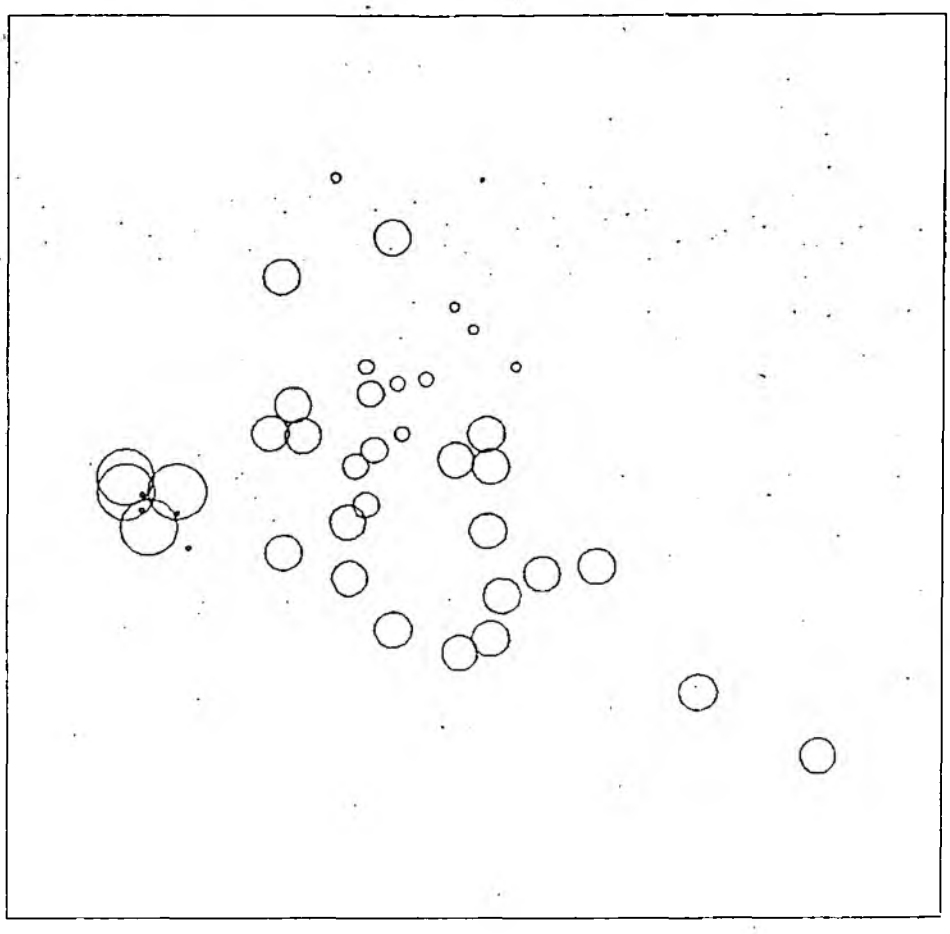
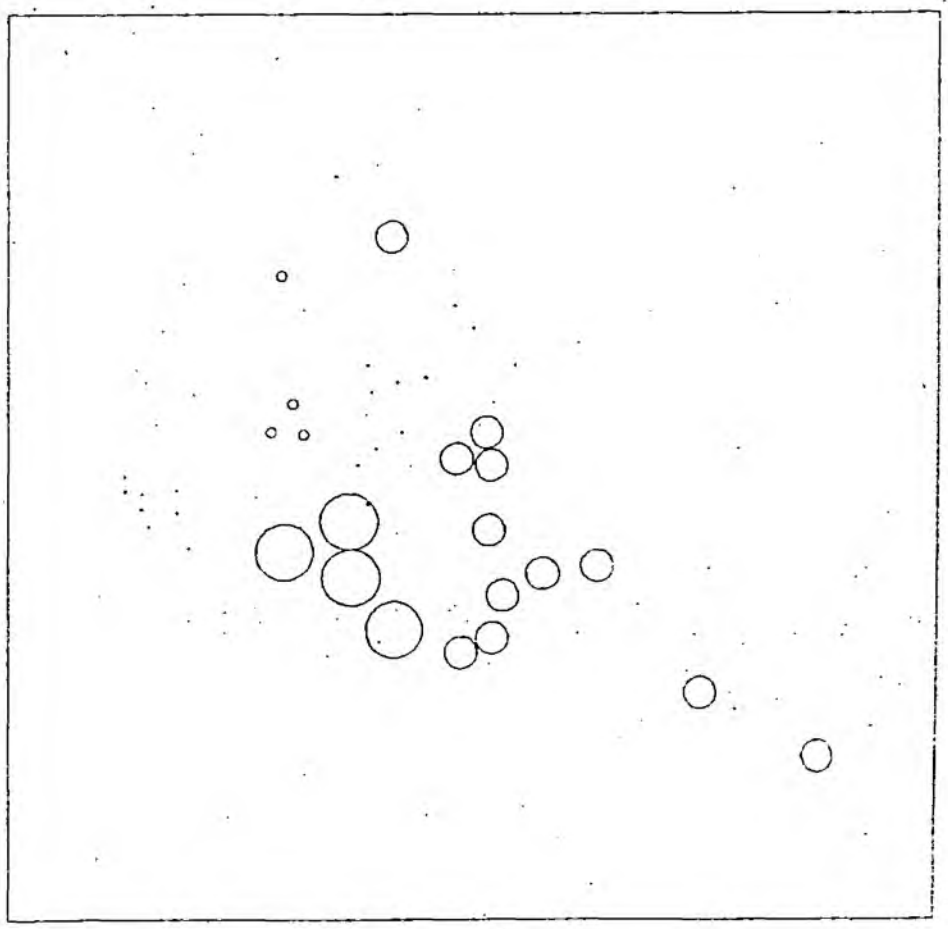


FIGURE 9: MINIMUM SURFACE SALINITY (06.06.91) ON MDS



APPENDIX B

Table 1: Literature review.

KINGSBRIDGE ESTUARY, DEVON main towns: KINGSBRIDGE, SALCOMBE o.s.map: 202 proposed sample date:

GENERAL: This ria consists of a steep sided, 8 km, main channel with branches. There is very little freshwater input (captured by the Avon) and thus pure marine conditions predominate. The Salcombe Harbour region is sandy but this gives way to mud further upstream in most places. The maximum tidal range is 6m and the main channel depth up to 6-8m (12m at Snapes Point).
POLLUTION: Sewage is a major problem around Salcombe Harbour where much of it is crude. There is no industry or a history of mining within the catchment so heavy metal pollution is not significant. As the estuary is subject to a great number of pleasure boats and leisure activities, tributyltin pollution may be of importance.

INTERTIDAL AND SUBTIDAL SAMPLING

ZONE	REFERENCE	SAMPLE PERIOD	SAMPLE TECHNIQUE	VALUE OF DATA	NO.SITES	SEDIMENT	MAIN COMMUNITIES
08A.1/K (1.25km)							
08A.2/K (1.75km)	HISCOCK,K., 1986 FSC/OPRU/40/85	1985	3x(4x0.01 sq.m.) cores 0.5mm mesh sieve.	quantitative	1	mud/some gravel	Melinna palmata, Neanthes diversicolor, Golfingia indet., Abra tenuis, Scrobicularia plana
08A.3/K (2.5km)	HISCOCK,K., 1986 FSC/OPRU/40/85	1985	4x0.01 sq.m. cores. 0.5mm mesh sieve.	quantitative	2	mud	Heteromastus filiformis, Tharyx spp., Ampharete baltica, Golfingia sp., Corophium volutator
			diving survey	qualitative	5	mud/sand-gravel	Myxicola infundibulum, Lanice conchilega, Sabella pavonina, Cereus pedunculatus
			subtidal pipe dredge 25cm.diam.x1m. 1.0mm mesh sieve.	qualitative	4	shallow mud	dominated: Cirratulidae, Chaetozone setosa, also: Capitella capitata, M.palmata, Amphipoda spp., Abra alba
	ALLEN,E. and TODD,R. 1900 JMBA 6(2):150-217	summer 1900	?	qualitative	?	mud/gravel	Nephtys hombergi, M.infundibulum, Perinereis cultifera, Tapes(Venerupis) pullastra
08A.4/K (1.0km)	HISCOCK,K., 1986 FSC/OPRU/40/85	1985	3x(4x0.01 sq.m.) cores 0.5mm mesh sieve	quantitative	2	mud/sandy mud	Tharyx spp., M.palmata, N.diversicolor, Golfingia sp., C.volutator
			diving survey	qualitative	5	mud/sand-gravel	M.infundibulum, S.pavonina, C.pedunculatus, Cerianthus lloydi, Sagartiogeton undatus.
			subtidal pipe dredge 25cm.diam.x1m. 1.0mm mesh sieve.	qualitative	4	mud/gravel	M.palmata, Platynereis dumerilli, N.hombergi C.setosa, Amphipoda spp,, A.alba
	ALLEN,E. and TODD,R. 1900 JMBA 6(2)150:217	summer 1900	?	qualitative	?	sticky mud	M.infundibulum, Melinna adriatica(palmata?), N.diversicolor, N.hombergi, T.(V.)pullastra
					?	mud/sand-Zostera	Arenicola marina, M.infundibulum
08A.5/K (1.0km)	HISCOCK,K., 1986 FSC/OPRU/40/85	1985	3/4x0.01 sq.m. cores 0.5mm mesh sieve	quantitative	2	coarse sand	abundant: Scoloplos armiger sparse: H.filiformis, A.tenuis.
			diving survey	qualitative	2	sand/Zostera beds	L.conchilega, P.dumerelli, Erichthonius punctatus Jassa falcata, Aora gracilis
					3	gravel/sand	M.infundibulum, C.lloydi, C.pedunculatus

INTERTIDAL AND SUBTIDAL SAMPLING

ZONE	REFERENCE	SAMPLE PERIOD	SAMPLE TECHNIQUE	VALUE OF DATA	NO.SITES	SEDIMENT	MAIN COMMUNITIES
			subtidal suction sampler 2x0.1 sq.m.x20cm.depth 1.0mm mesh sieve	qualitative	1	fine sand	C.setosa, C.capitata, Notomastus latericeus A.gracilis, E.punctatus
			subtidal pipe dredge 25cm.diam.x1m 1.0mm mesh sieve.	qualitative	2	mud/sand-gravel	C.setosa, N.latericeus, Apseudes latreillei Corophium sextonae
	POWELL,H.et al. 1978 SMBA/MBA for NCC	?	?	qualitative	4	sand/Zostera beds	A.marina, L.conchilega, Ensis sp.
	ALLEN,E and TODD,R. 1900 JMBA 6(2):150-217	summer 1900	?	qualitative	?	sand/mud-Zostera	A.marina, L.conchilega, P.cultifera, N.hombergi N.caeca, Solen marginatus
08A.6/K (1.5km)	HISCOCK,K., 1986 FSC/OPRU/40/85	1985	subtidal suction sampler 2x0.1 sq.m.x20cm.depth 1.0mm mesh sieve.	qualitative	2	coarse sand	Magelona mirabilis, C.setosa, Nephtys caeca Montacuta ferruginosa, Tellina fabula
	ALLEN,E and TODD,R. 1900 JMBA 6(2):150-217	summer 1900	?	qualitative	?	sand	A.marina, L.conchilega, M.adriatica (palmata?)

Table 2: Kingsbridge intertidal sites 16-17 October 1990

Zone	Site No.	Site Location	Grid Ref.	Approx Position	Date	Site description	R.P.D.
08A.1/K	1	Kingsbridge	437736	MTL	17.10.90	At end of slip. Deep mud 6 feet from slip. Many boats, epilithic diatoms.	<1cm
08A.2/K	2	Bowcombe Creek	434747	MTL	16.10.90	Lower shore mud to gravel/shell at 8cm. Deeper mud on lower shore. A few boats near bridge.	<1cm
	3	High House Pt.	427743	LWN	17.10.90	Mudflat below bedrock/gravel. Fucoids, Ascophyllum. Arenicola 1-2 per sq.m.	<1cm
08A.3/K	4	Collapit Creek House	418733	LWN	16.10.90	Access through private grounds (permission). Lower shore mud deep, 5m downstream from jetty. Hydrobia abundant, Arenicola 1 per sq.m.	0cm
	5	Frogmore	426772	MTL	16.10.90	200m walk along creek. A few boats. Enteromorpha and Ulva.	<1cm
	6	Halwell wood	407753	ELWS	17.10.90	Via Lower Barn Farm. Clay/mud. Ascophyllum/Fucus.	<1cm
	7	Lincombe boatyard	404744	MTL	16.10.90	100m from boatyard. Arenicola 5 per sq.m.	<1cm
08A.4/K	8	Waterhead Creek	389765	MTL	17.10.90	Arenicola 5 per sq.m. Access via ford and walk down channel.	<1cm
	9	Ditchend Cove	389747	ELWS	17.10.90	Sandy beach, muddy sand at LW. Lanice 30 per sq.m. in places. Residential houses on cliffs behind.	2.5cm
	10	Snapes Manor	397741	ELWS	16.10.90	Clay/mud. Arenicola 1 per sq.m. Ascophyllum and Fucus vesiculosus on upper shore shale.	1cm
08A.5/K	11	Mill Bay	383740	ELWS	17.10.90	Sandy beach, undrained on lower shore. Arenicola 1 per sq.m. above the Lanice, where drainage is better.	5-8cm
	12	North Sands Bay	381732	LWS-ELWS	16.10.90	Exposed, sand/shell. Lugworms 20 per sq.m. midshore, 1-2 sq.m. on lower shore. Laminaria debris and freshwater runoff down centre of bay.	12/15cm

Table 2.1: Kingsbridge estuary subtidal sites

Zone	Site Letter	Site Location	Grid Ref.	Approx Depth	Date	Site description
	A	Halwell Point	748403	6m BCD	11.10.90	Coarse gravel/shell. Pleasure boats.
	B	Ox Point	747396	5m BCD	11.10.90	Coarse sand/gravel, shell, stones and some dredge spoil. Boats.
	C	Mill Bay	737384	6m BCD	11.10.90	Clean coarse sand.
	D	Bass Rock	733376	2m BCD	11.10.90	Shingle
	E	The Bar	732371	3m BCD	11.10.90	Sand.
	F	Little Eelstone	734367	6m BCD	11.10.90	Sand.

Table 3: Kingsbridge Estuary subtidal sites: Species densities (per sq.m.)

Taxa	A	B	C	D	E	F
ANNELIDA:POLYCHAETA						
Macrochaeta indet.	0	0	0	150	700	0
Melinna palmata	0	25	0	0	0	0
Arenicola marina	0	25	0	0	0	0
Capitella capitata	50	50	2550	0	0	0
Mediomastus fragilis	500	0	0	0	0	0
Notomastus latericeus	100	0	0	0	0	0
Caulleriella bioculata	225	400	100	0	0	0
Caulleriella zetlandica	175	350	0	0	0	0
?Chaetozone setosa	0	0	0	0	0	0
Aphelochaeta marioni	200	850	100	0	0	0
Cossura longocirrata	0	0	25	0	0	0
Dorvillidae juv indet.	0	0	25	0	0	0
Ophryotrocha ?dubia	0	0	0	50	250	0
Ophryotrocha gracilis	0	125	75	0	0	0
Protodorvillae kefersteini	25	0	0	0	0	0
Glycera juv indet.	0	0	25	125	0	50
Glycera lapidum	25	0	0	625	0	0
Microphthalmus similis	0	0	25	0	0	0
Nereimyra punctata	0	0	0	0	25	0
Syllidia armata	1250	1850	775	0	0	0
Lumbrinereis indet.	50	125	0	0	0	0
Lumbrinereis gracilis	0	0	0	0	0	0
Magelona filiformis	0	0	0	0	0	0
Magelona mirabilis	0	0	0	0	25	25
Maldanidae juv. indet.	0	325	0	0	0	0
Euclymeninae indet.	50	50	25	0	0	0
Praxillella affinis	75	200	0	0	0	0
Nephtys assimilis	0	0	0	0	0	0
Nephtys cirrosa	0	0	150	50	125	200
Nereis longissima	50	0	0	0	0	0
Perinereis cultifera	0	0	50	0	0	0
Platynereis dumerilii	2375	1875	2025	0	0	0
Websternereis glauca	1050	675	800	0	0	0
Eumida indet.	1275	400	25	0	0	0
Hesionura elongata	0	0	0	0	0	0
Phyllodoce mucosa	0	25	0	0	0	0
Pseudomystides limbata	150	50	0	0	25	0
Pisione remota	0	0	125	250	25	0
Polygordius indet.	0	0	0	0	0	0
Harmathoe indet.	75	100	0	0	25	0
Harmathoe impar	0	25	0	0	0	0
Protodrilus indet.	0	0	0	50	50	0
Sabellidae indet.	150	25	25	0	0	0
Saccocirrus papillocercus	0	0	0	0	75	0
Pomatoceros lamarcki	900	900	125	25	0	0
Serpula vermicularis	0	25	0	0	0	0
Pholoe synophthalmica	0	150	25	0	0	0
Sthenelais boa	0	50	50	0	0	0
Sphaerodorum gracilis	0	25	25	0	0	0

Table 3: Kingsbridge Estuary subtidal sites: Species densities (per sq.m.)

Taxa	A	B	C	D	E	F
Sphaerodoropsis minuta	25	25	25	0	0	0
Spirorbidae indet.	3375	375	75	0	0	0
Aonides paucibranchiata	0	0	0	0	125	0
Laonice bahusiensis	0	0	0	0	0	0
Polydora caeca	0	50	0	0	0	0
Polydora flava	275	250	25	0	0	0
Prionospio fallax	0	50	0	0	0	0
Pseudopolydora pulchra	0	0	25	0	0	0
Scolelepis squamata	0	0	0	0	25	25
Spio martinensis	275	100	25	0	0	0
Spiophanes bombyx	0	0	0	0	25	25
Amblyosyllis formosa	0	50	125	0	0	0
Autolytus prolifer	50	25	50	0	0	0
Brania sp A	75	0	50	0	0	0
Brania swedmarki	0	0	0	0	225	0
Eurysyllis brevipes	0	0	0	0	25	0
Exogone hebes	150	25	0	0	0	0
Exogone naidina	6175	1725	1175	0	0	0
Odontosyllis ctenostoma	0	25	0	0	0	0
Odontosyllis gibba	50	50	0	0	0	0
Opistodonta pterochaeta	0	0	0	25	0	0
Parapionosyllis minuta	75	0	0	25	0	0
Pionosyllis indet.	0	0	0	25	0	0
Proceraea cornuta	0	0	50	0	0	0
Sphaerosyllis indet.	150	0	0	0	0	0
Sphaerosyllis bulbosa	0	0	0	4825	3225	0
Sphaerosyllis erinaceus	25	100	0	0	0	0
Sphaerosyllis taylori	7925	7175	2575	0	0	0
Streptosyllis bidentata	0	0	0	0	0	0
Syllides indet.	0	0	0	0	75	0
Trypanosyllis coeliaca	0	0	0	150	25	0
Typosyllis indet.	125	75	175	0	0	0
Typosyllis cornuta	0	0	0	0	0	0
Typosyllis hyalina	0	0	0	25	50	0
Terribellidae juv. indet.	0	0	75	0	0	0
Lanice conchilega	25	0	25	0	0	0
Eupolymnia nebulosa	0	0	50	0	0	0
Pista cristata	0	0	0	0	0	0
Polycirrus norvegicus	50	0	100	0	0	0
ANNELIDA:OLIGOCHAETA						
Grania indet.	0	0	0	0	125	0
Tubificoides benedii	225	0	0	0	0	0
Tubificoides pseudogaster	0	175	0	0	0	0
Tubificoides swirencoides	300	25	25	0	0	0
CRUSTACEA:AMPHIPODA:GAMMARIDEA						
Amphipoda indet.	1450	300	925	0	0	0
Iphimedia (Panoploea) minu	25	25	0	0	0	0

Table 3: Kingsbridge Estuary subtidal sites: Species densities (per sq.m.)

Taxa	A	B	C	D	E	F
Ampelisca indet	0	25	0	0	0	0
Ampelisca brevicornis	0	0	0	0	0	0
Ampelisca diadema	0	25	0	0	0	0
Amphilochus neopolitanus	575	375	0	0	0	0
Aoridae indet.	1900	650	0	0	0	0
Aora gracilis	975	225	475	0	0	0
Leptocheirus hirsutimanus	0	0	0	700	0	0
Leptocheirus pectinatus	0	0	0	1475	0	0
Leptocheirus tricristatus	0	0	0	50	0	0
Microdeutopus anomalus	0	25	0	0	0	0
Atylus falcatus	0	0	0	100	25	0
Corophium sextonae	1850	1075	2250	0	0	0
Siphonocoetes kroyeranus	0	0	0	0	0	0
Dexamine spinosa	25	0	0	0	0	0
Guernea coalita	0	0	0	1725	75	0
Microprotopus maculatus	125	25	150	0	0	0
Microjassa cumbrensis	400	50	100	0	0	0
Leucothoe spinicarpa	0	25	150	0	0	0
Perrierella audouiniana	0	0	0	0	0	0
Orchomene humilis	0	125	0	6575	25	0
Socarnes erythrophthalmus	0	0	0	4475	0	0
Abludomelita gladiosa	475	0	0	0	0	0
Abludomelita obtusata	2350	0	0	75	0	0
Cheirocratus intermedius	100	350	0	0	0	0
Maera grossimana	450	250	1550	0	0	0
Perioculodes longimanus	0	0	25	0	0	0
Pontocrates altamarinus	0	0	0	0	0	25
Pontocrates arenarius	0	0	0	25	25	25
Synchelidium maculatum	0	0	0	0	25	0
Harpinia crenulata	0	25	0	0	0	0
Bathyporeia pelagica	0	0	0	0	25	25
Bathyporeia sarsi	0	0	0	0	0	0
Bathyporeia tenuipes	0	0	0	0	0	0
Metopa bruzelii	475	125	0	0	0	0
Stenothoe tergestina	0	0	0	25	0	0
Urothoe brevicornis	0	0	50	0	25	25
CRUSTACEA:AMPHIPODA:CAPRELLIDEA						
Caprella acanthifera	50	0	0	0	0	0
Pariambus typicus	100	650	25	0	0	0
Phtisica marina	1400	1925	200	0	0	0
Pseudoprotella phasma	50	0	0	0	0	0
CRUSTACEA:CUMACEA						
Bodotria scorpoides	0	25	0	0	0	0
Cumopsis fagei	0	0	0	0	25	25
Cumopsis goodsiri	25	0	0	0	0	0
Cumella pygmaea	0	50	0	0	0	0
Diastylis bradyi	0	0	0	0	0	0

Table 3: Kingsbridge Estuary subtidal sites: Species densities (per sq.m.)

Taxa	A	B	C	D	E	F
Eudorella truncatula	0	25	25	0	0	0
Pseudocuma longicornis	0	0	0	0	0	0
CRUSTACEA:DECAPODA						
Anapagurus hyndmanni	50	0	75	0	0	0
Anapagurus laevis	0	0	0	0	25	25
Galathea intermedia	0	25	25	0	0	0
Liocarcinus arcuatus	25	0	0	0	0	0
Liocarcinus depurator	25	0	0	0	0	0
Pisidia longicornis	0	0	75	0	0	0
CRUSTACEA:ISOPODA						
Arcturella damnoniensis	50	0	0	0	0	0
Astacilla longicornis	275	25	0	0	0	0
Eurydice pulchra	0	0	75	0	0	0
Gnathia indet.	25	150	0	0	0	0
Gnathia dentata	0	0	175	0	0	0
Munna minuta	450	1075	300	0	0	0
Janira maculosa	1450	2150	525	0	0	0
CRUSTACEA:TANAIDACEA						
Apseudes latreilli	11850	675	550	0	0	0
Leptochelia savigny	75	3250	275	0	0	0
Leptognathia gracilis	0	0	0	0	300	300
Tanaopsis graciloides	0	3000	425	0	0	0
CHELICERATA						
Achelia echinata	200	575	400	0	0	0
Anoplodactylus petiolatus	50	100	0	0	0	0
MOLLUSCA:BIVALVIA						
Bivalvia indet.	975	2750	1475	25	75	25
Anomiidae indet.	50	0	0	0	0	0
Goodalia triangularis	0	0	0	25	0	0
Parvicardium exiguum	275	150	125	25	0	0
Parvicardium ovale	0	0	0	0	25	25
Parvicardium scabrum	0	0	0	225	0	0
Mysella bidentata	225	75	75	0	0	0
Spisula solida	0	0	0	625	175	75
Spisula subtruncata	0	0	0	25	0	0
Hiatella arctica	0	0	25	0	0	0
Myacea juv.indet	50	25	0	0	0	0
Corbula gibba	0	275	100	25	0	0
Modiolarca tumida	0	0	100	0	0	0
Modiolus modiolus	0	0	50	0	0	0
Mytilus edulis	0	0	125	5850	1450	125

Table 3: Kingsbridge Estuary subtidal sites: Species densities (per sq.m.)

Taxa	A	B	C	D	E	F
Nucula nucleus	0	75	0	0	0	0
Chlamys opercularis	0	0	50	0	0	0
Tellinid juv indet.	0	0	0	0	0	0
Abra nitida	0	575	825	0	0	0
Moerella pygmaea	0	0	0	0	0	0
Veneridae indet.	75	0	0	50	25	0
Venerupis juv indet.	400	375	250	0	0	0
Venerupis senegalensis	0	0	0	50	0	0
Venus juv. indet.	0	0	0	250	0	0
Venus casina	0	0	0	0	0	0
MOLLUSCA:GASTROPODA						
Gastropoda indet.	0	0	0	100	125	0
Calyptraea chinensis	1625	725	125	0	0	0
Crepidula fornicata	0	25	0	0	0	0
Hinia incrassata	0	0	175	0	0	0
Lunatia sp.	0	0	0	25	0	0
Lunatia poliana	0	50	0	0	0	0
Brachystomia albella	0	0	0	25	0	0
Odostomia plicata	50	100	0	0	0	0
Turbonilla juv indet.	0	0	25	0	0	0
Caecum glabrum	0	0	0	100	0	0
Caecum imperforatum	0	0	0	0	0	0
Manzonia crassa	0	25	0	0	0	0
Onoba semicostata	50	0	500	0	0	0
Rissoa parva	75	0	25	0	0	0
Dikoleps culteriana	0	0	0	950	0	0
Calliostoma zizyphinum	0	0	25	0	0	0
Gibbula juv indet.	25	0	0	0	0	0
Gibbula cineraria	125	25	0	0	0	0
Gibbula tumida	0	50	0	0	0	0
Gibbula umbilicalis	50	0	0	0	0	0
Tricolia pullus	0	25	0	0	0	0
MOLLUSCA:OPISTOBRANCHA						
Nudibranchia indet.	0	0	25	25	0	0
Doridoidea indet.	0	0	25	0	0	0
Philine juv indet.	0	0	0	0	0	0
ECHINODERMATA						
Echinocyamus pusillus	0	0	0	0	100	100
Psammechinus miliaris	0	25	0	0	0	0
Leptosynapta inhaerans	0	0	0	0	0	0
Leptosynapta minuta	0	0	0	5375	575	0
Amphipholis squamata	750	1425	2150	0	0	0
Ophiothrix fragilis	0	25	25	0	0	0
Ophiura juv. indet.	0	0	25	0	0	0

Table 3: Kingsbridge Estuary subtidal sites: Species densities (per sq.m.)

Taxa	A	B	C	D	E	F
NEMERTEA						
Nemertea indet.	650	850	525	0	150	175
Tetrastemma longissimum	50	25	0	0	0	0
Tubulanus polymorphus	0	0	0	0	0	0
OTHERS						
Anemone indet.	50	0	0	0	0	0
Cerianthus lloydii	0	0	0	0	0	0
Phoronis muelleri	0	0	0	350	0	0
Golfingia juv indet.	25	25	25	0	0	0
Phascolion strombi	0	25	0	0	0	0
Thalassema thalassemum	0	25	0	0	0	0
Turbellaria indet.	50	150	125	0	0	0

Table 4: Kingsbridge Estuary intertidal: Species densities (per sq.m.)

SPECIES	1	2	3	4	5	6	7	8	9	10	11	12
Alkmaria romijni	-	-	-	-	-	-	-	300	-	-	-	-
Ampharete acutifrons	-	-	-	-	-	25	-	25	-	25	-	-
Melinna palmata	-	33	275	-	-	1 550	250	175	1 925	525	-	-
Arenicola marina	-	-	-	-	-	-	50	-	-	-	-	-
Capitella spp. complex	-	-	-	-	25	-	-	-	300	-	25	-
Heteromastus filiformis	-	-	25	-	-	375	25	-	200	25	25	-
Mediomastus fragilis	-	-	-	-	-	-	-	-	25	50	-	-
Notomastus latericeus	-	-	-	-	-	-	-	-	675	-	-	-
Aphelochaeta marioni	-	-	-	-	-	8 875	-	-	11 925	-	-	-
Caulleriella zetlandica	-	-	-	-	-	225	-	-	350	-	-	-
Tharyx vivipara	250	1 122	100	266	-	50	775	500	-	1 300	-	-
Cossura longocirrata	-	-	-	-	-	50	-	-	-	-	-	-
Ophryotrocha gracilis	-	-	-	-	-	-	-	-	25	-	-	-
Lumbrinereis juv. indet.	-	-	-	-	-	-	-	-	25	-	-	-
Glycera juv. indet.	-	-	-	-	-	-	-	-	25	-	25	-
Gyptis sp.	-	-	-	-	-	-	-	-	-	-	75	-
Magelona filiformis	-	-	-	-	-	-	-	-	25	-	25	-
Magelona mirabilis	-	-	-	-	-	50	-	-	-	-	-	-
Euclymene oerstedii	-	-	-	-	-	-	-	-	575	-	-	-
Praxillella affinis	-	-	-	-	-	-	-	-	50	-	-	-
Nephtys cirrosa	-	-	-	-	-	-	-	-	-	-	125	-
Nephtys hombergii	-	-	475	100	-	275	50	100	50	50	-	-
Nereis diversicolor	5 250	2 409	75	433	3 950	125	675	550	75	975	-	-
Platynereis dumerilii	-	-	-	-	-	-	-	-	25	-	-	-
Scoloplos armiger	-	-	-	-	-	-	-	-	25	-	-	-
Myriochele oculata	-	-	-	-	-	75	-	-	150	-	-	-
Aricidea minuta	-	-	-	-	-	-	-	-	-	-	25	-
Eumida indet.	-	-	-	-	-	-	-	-	25	-	25	-
Phyllodoce mucosa	-	-	-	-	-	-	-	-	100	25	-	-
Manayunkia aesturina	20	231	-	-	1 725	-	-	-	-	25	-	-
Pholoe inornata	-	-	-	-	-	-	-	-	25	-	-	-
Aonides oxycephala	-	-	-	-	-	-	-	-	50	-	-	-
Microspio mecznikowianus	-	-	-	-	-	275	-	-	625	-	-	-
Polydora ciliata	-	67	-	-	-	-	200	-	-	-	-	-
Polydora cornuta (ligni)	20	33	-	-	850	-	-	2 475	-	150	-	-
Pygospio elegans	-	-	-	-	-	50	750	-	1 425	300	25	-
Scolelepis sp.	-	-	-	-	-	-	-	-	-	-	-	900
Spio decorata	-	-	-	-	-	-	-	-	250	-	-	-
Spio martinensis	-	-	-	-	-	-	-	-	-	-	125	-
Streblospio shrubsolii	5 950	2 211	650	759	7 275	2 050	2 050	-	-	1 100	-	-
Exogone hebes	-	-	-	-	-	-	-	-	175	-	25	-
Sphaerosyllis indet.	-	-	-	-	-	-	-	-	75	-	-	-
Streptosyllis websteri	-	-	-	-	-	-	-	-	-	-	275	-
Lanice conchilega	-	-	-	-	-	-	-	-	-	-	150	-
Oligochaeta indet.	-	-	-	100	-	-	-	-	-	-	-	-
Enchytraeidae indet.	-	-	-	-	-	-	-	-	-	-	-	-
Tubificoides benedii	-	33	-	1 365	1 225	125	375	125	4 150	100	-	-
Tubificoides pseudogaster	1 625	3 600	350	1 132	125	-	25	2 250	475	200	-	1
Tubificoides swirencoides	-	-	-	-	-	-	-	-	75	-	-	-
Tubifex costatus	-	-	-	-	1 525	-	-	-	-	-	-	-

Table 4: Kingsbridge Estuary intertidal: Species densities (per sq.m.)

SPECIES	1	2	3	4	5	6	7	8	9	10	11	12
Amphipoda indet.	-	33	-	-	-	100	-	-	150	-	-	-
Ampelisca brevicornis	-	-	-	-	-	-	-	-	25	-	-	-
Aoridae indet.	-	-	-	-	-	-	-	-	-	-	25	-
Microdeutopus indet.	-	-	-	-	-	225	-	-	-	-	-	-
Microdeutopus anomalus	-	-	-	-	-	-	-	-	675	-	-	-
Corophium volutator	-	-	-	-	675	-	-	-	68	-	-	-
Isaeidae indet.	-	-	-	-	-	-	25	-	-	-	-	-
Leucothoe spinicarpa	-	-	-	-	-	-	-	-	50	-	-	-
Bathyporeia pilosa	-	-	-	-	-	-	-	-	-	-	25	-
Bodotria pulchella	-	-	-	-	-	-	-	-	-	-	1 825	12 050
Cumopsis goodsiri	-	165	-	-	-	-	50	-	-	-	-	-
Vauthompsonia cristata	-	-	-	-	-	-	-	-	-	-	500	7 725
Carcinus maenas	-	-	-	-	-	-	25	-	-	-	-	-
Cyathura carinata	-	167	-	-	675	-	-	-	-	75	-	-
Idotea juv. indet.	-	33	-	-	-	-	-	-	-	-	-	-
Leptognathia gracilis	-	-	-	-	-	-	-	-	-	-	50	-
Tanaopsis graciloides	-	-	-	-	-	-	-	-	525	-	-	-
Bivalve indet.	100	333	175	67	7 875	125	175	50	1 125	-	-	-
Cardiidae indet.	-	-	-	-	-	175	25	-	-	50	-	-
Cerastoderma edule	25	33	-	33	-	-	25	-	50	-	25	-
Parvicardium exiguum	-	-	-	-	-	-	-	-	25	-	-	-
Mysella bidentata	-	-	-	-	-	-	-	-	300	-	-	-
Corbula gibba	-	-	-	-	-	-	-	-	25	-	-	-
Abra juv. indet.	-	-	-	-	-	-	-	-	100	-	-	-
Abra tenuis	-	33	-	-	150	-	-	-	-	-	-	-
Macoma balthica	-	-	-	-	25	-	-	-	-	-	-	-
Scrobicularia plana	-	133	75	67	-	-	-	50	-	25	-	-
Hydrobia ulvae	50	366	-	1 532	1 500	125	1 025	75	50	-	-	-
Tetrastemma longissimum	-	-	-	-	-	-	-	-	-	225	25	-
Insect larva	-	-	-	-	-	-	50	-	-	-	150	-

Table 5: Kingsbridge Estuary intertidal sites: Particle size analysis (% dry weight w/w).

Fraction size	Site 1	2	3	4	5	6	7	8	9	10	11	12
Retained on 2.0 mm	1.4	0.7	3.7	1.2	0.6	1.5	0.3	8.2	0.9	0.0	1.3	1.1
Retained on 1.0 mm	1.9	1.0	2.3	1.4	1.7	1.5	0.7	9.1	0.2	0.1	6.7	1.5
Retained on 0.5 mm	1.6	1.6	2.9	2.3	7.2	1.6	1.2	6.0	1.1	0.7	20.4	2.3
Retained on 0.25 mm	9.3	4.7	2.6	2.5	18.8	1.5	3.3	5.2	22.2	1.2	28.9	10.7
Retained on 0.125 mm	2.3	3.3	2.0	4.7	12.2	2.0	6.5	3.9	27.1	3.9	34.1	69.8
Retained on 0.063 mm	1.6	5.2	27.1	8.8	4.1	30.5	31.8	0.6	28.0	40.1	8.0	13.3
Passing 0.063 mm	78.3	80.9	58.2	77.2	53.5	60.3	55.3	65.0	20.0	53.5	0.6	1.3

Table 5.1: Kingsbridge Estuary subtidal sites: Particle size analysis (% dry weight w/w).

Fraction size	Site A	B	C	D	E	F
Retained on 2.0 mm	31.4	44.4	1.9	88.3	0.2	4.0
Retained on 1.0 mm	8.7	9.0	2.7	11.4	1.7	16.6
Retained on 0.5 mm	12.8	6.1	22.3	0.2	14.0	53.4
Retained on 0.25 mm	33.3	27.8	71.6	0.0	59.6	18.3
Retained on 0.125 mm	7.2	3.5	1.4	0.0	24.1	5.5
Retained on 0.063 mm	2.7	4.1	0.1	0.0	0.2	2.0
Passing 0.063 mm	3.2	4.5	0.1	0.0	0.1	0.2

Table 6: Kingsbridge Estuary: Salinity data.

Sample station	Site name	Grid reference	Date	Depth	Salinity range
a	Park Farm	7385 4295	30.04.90	mid	26.8 - 33.8
			05.06.90	mid	25.5 - 31.9
				bottom	31.7 - 32.8
			06.09.90	mid	33.6 - 34
			14.11.90	mid	11.7 - 31.6
				bottom	33
b	Gerston Pt.	7425 4130	30.04.90	mid	30.5
				bottom	32.6 - 33.3
			05.06.90	mid	30.9 - 32.6
				bottom	33.8 - 34.5
			14.11.90	mid	30.7 - 32.8
				bottom	32.4
c	Mid estuary	7470 3950	30.04.90	all	33 - 33.6
			26.06.90	all	33 - 33.6
			08.10.90	all	33.9 - 34.2
			20.11.90	all	33.6 - 34.2
d	Mill Bay	7400 3855	all dates	all	> 33
e	South Sands	7360 3785	all dates	all	> 33

APPENDIX C

Appendix Ci: Kingsbridge estuary intertidal replicate taxa lists

SPECIES	SITE NUMBER																			
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2	5.3	5.4
Alkmaria romijni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ampharete acutifrons	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Melinna palmata	-	-	-	-	-	1	1	-	1	4	5	1	-	-	-	-	-	-	-	-
Arenicola marina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capitella spp. complex	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Heteromastus filiformis	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Mediomastus fragilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notomastus latericeus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aphelochaeta marioni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caulleriella zetlandica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tharyx vivipara	1	6	2	1	-	12	6	16	2	2	-	-	5	1	-	2	-	-	-	-
Cossura longocirrata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ophryotrocha gracilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lumbrinereis juv. indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glycera juv. indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gyptis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magelona filiformis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magelona mirabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Euclymene oerstedii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Praxillella affinis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nephtys cirrosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nephtys hombergii	-	-	-	-	-	-	-	1	4	5	3	7	2	1	-	-	-	-	-	-
Nereis diversicolor	53	65	45	58	-	12	52	9	-	1	2	-	2	4	-	7	20	37	34	67
Platynereis dumerilii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scoloplos armiger	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Myriochele oculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aricidea minuta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eumida indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phyllodoce mucosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manayunkia aesturina	-	1	-	1	-	-	7	-	-	-	-	-	-	-	-	-	7	19	4	39
Pholoe inornata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aonides oxycephala	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Microspio mecznikowianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polydora ciliata	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Polydora cornuta (ligni)	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	12	3	9	10
Pygospio elegans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scolelepis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spio decorata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spio martinensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Streblospio shrubsolii	41	76	65	56	-	19	35	13	7	5	9	1	9	4	-	10	72	65	59	95
Exogone hebes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sphaerosyllis indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Streptosyllis websteri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lanice conchilega	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oligochaeta indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Enchytraeidae indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubificoides benedii	-	-	-	-	-	1	-	-	-	-	-	-	30	11	-	-	24	9	8	8
Tubificoides pseudogaster	20	23	2	20	-	29	99	16	-	5	9	-	26	8	-	-	2	1	2	-
Tubificoides swirencoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubifex costatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	14	11	24
Amphipoda indet.	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix Ci: Kingsbridge estuary intertidal replicate taxa lists

SPECIES	SITE NUMBER																			
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2	5.3	5.4
Ampelisca brevicornis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aoridae indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Microdeutopus indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Microdeutopus anomalus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corophium volutator	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5	7	13
Isaeidae indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leucothoe spinicarpa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bathyporeia pilosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bodotria pulchella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cumopsis goodsiri	-	-	-	-	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Vauthompsonia cristata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carcinus maenas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyathura carinata	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	14	16	8	3
Idotea juv. indet.	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Leptognathia gracilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tanaopsis graciloides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bivalve indet.	-	4	-	-	-	2	1	7	1	2	4	-	1	-	-	1	97	103	87	28
Cardiidae indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cerastoderma edule	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-
Parvicardium exiguum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mysella bidentata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corbula gibba	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Abra juv. indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Abra tenuis	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	4	2
Macoma balthica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Scrobicularia plana	-	-	-	-	-	1	2	1	-	2	1	-	-	1	-	1	-	-	-	-
Hydrobia ulvae	2	-	-	-	-	2	-	9	-	-	-	-	46	-	-	-	14	12	23	11
Tetrastemma longissimum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Insect larva	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total number species	6	7	4	6	0	11	13	10	5	8	7	4	8	7	0	7	12	12	12	11
Total number individuals	118	176	114	137	0	81	215	75	15	26	33	10	121	30	0	25	277	285	256	300

Appendix C1: Kingsbridge estuary intertidal continued.

SPECIES	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	8.4	9.1	9.2	9.3	9.4	10.1	10.2	10.3	10.4	11.1	11.2	11.3	11.4	12.1	12.2	12.3	12.4
Alkmaria romijni	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aupharete acutifrons	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Malirna palmata	16	8	17	21	6	2	2	-	5	1	1	-	21	25	15	16	6	3	11	1	-	-	-	-	-	-	-	-
Arenicola marina	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capitella spp. complex	-	-	-	-	-	-	-	-	-	-	-	-	3	1	5	3	-	-	-	-	1	-	-	-	-	-	-	-
Heteromastus filiformis	7	-	3	5	-	1	-	-	-	-	-	-	2	-	5	1	1	-	-	-	1	-	-	-	-	-	-	-
Mediomastus fragilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	1	-	-	-	-	-	-	-	-
Notomastus latericeus	-	-	-	-	-	-	-	-	-	-	-	-	6	10	7	4	-	-	-	-	-	-	-	-	-	-	-	-
Aphelochaeta marioni	94	130	83	48	-	-	-	-	-	-	-	-	87	134	168	88	-	-	-	-	-	-	-	-	-	-	-	-
Cauller iella zetlandica	4	2	1	2	-	-	-	-	-	-	-	-	1	5	2	6	-	-	-	-	-	-	-	-	-	-	-	-
Tharyx vivipara	-	-	-	2	22	9	-	-	4	2	12	2	-	-	-	-	14	23	10	5	-	-	-	-	-	-	-	-
Cossura longocirrata	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ophryotrocha gracilis	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lumbrineris juv. indet.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glycera juv. indet.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Gyptis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-
Magelona filiformis	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Magelona mirabilis	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Euclymene oerstedii	-	-	-	-	-	-	-	-	-	-	-	-	3	9	4	7	-	-	-	-	-	-	-	-	-	-	-	-
Praxillella affinis	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Naphtys cirrosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	2	-	-	-	-
Naphtys hombergii	1	3	1	6	1	1	-	-	-	1	1	2	1	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-
Nereis diversicolor	4	-	-	1	1	1	19	6	7	1	9	5	-	1	2	-	15	8	9	7	-	-	-	-	-	-	-	-
Platynereis dumerilii	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scoloplos armiger	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Myriochele oculata	-	3	-	-	-	-	-	-	-	-	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Aricidea minuta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Ampharete indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-
Phyllodoce mucosa	-	-	-	-	-	-	-	-	-	-	-	-	3	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Eteone flava	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Pholoe inornata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Aonides oxycephala	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Microspio mecznikowianus	2	3	1	5	-	-	-	-	-	-	-	-	9	5	4	7	-	-	-	-	-	-	-	-	-	-	-	-
Polydora ciliata	-	-	-	-	2	4	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polydora cornuta (ligni)	-	-	-	-	-	-	-	-	17	6	62	14	-	-	-	-	-	-	3	3	-	-	-	-	-	-	-	-
Pygospio elegans	-	1	1	-	6	7	5	12	-	-	-	-	11	2	15	29	8	2	2	-	-	-	-	1	-	-	-	-
Scolelepis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	12	14	3
Spio decorata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-
Spio martinensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	4	-	-	-	-
Streblospio shrubsolii	36	38	4	4	43	38	-	1	-	-	-	-	-	-	-	-	15	11	9	9	-	-	-	-	-	-	-	-
Exogone hebes	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	3	-	-	-	-	-	1	-	-	-	-	-	-
Sphaerosyllis indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Streptosyllis websteri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	8	-	-	-	-
Lanice conchilega	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-	-
Oligochaeta indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Enchytraeidae indet.	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubificoides benedii	1	4	-	-	1	14	-	-	-	5	-	-	34	5	20	107	1	2	1	-	-	-	-	-	-	-	-	-
Tubificoides pseudogaster	-	-	-	-	-	1	-	-	-	-	80	10	-	2	1	16	7	-	-	1	-	-	-	-	1	-	-	-
Tubificoides swirencoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-
Tubifex costatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix C1: Kingsbridge
estuary intertidal continued.

SPECIES	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	8.4	9.1	9.2	9.3	9.4	10.1	10.2	10.3	10.4	11.1	11.2	11.3	11.4	12.1	12.2	12.3	12.4
Amphipoda indet.	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–	–	–	–	–	–	–	–	–	–	–
Ampelisca brevicornis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–
Aoridae indet.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–
Microdeutopus indet.	6	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Microdeutopus anomalus	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–	21	–	–	–	–	–	–	–	–	–	–	–	–
Corophium volutator	–	–	–	–	–	–	–	–	–	–	–	–	27	19	4	18	–	–	–	–	–	–	–	–	–	–	–	–
Isaeidae indet.	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Leucothoe spinicarpa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–
Bathyporeia pilosa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
Bodotria pulchella	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	26	8	17	22	68	166	160	88
Cumopsis goodsiri	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Vauthompsonia cristata	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	2	8	3	36	145	48	80
Carcinus maenas	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cyathura carinata	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–
Idotea juv. indet.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Leptognathia gracilis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–
Tanaopsis graciloides	–	–	–	–	–	–	–	–	–	–	–	–	2	16	3	–	–	–	–	–	–	–	–	–	–	–	–	–
Bivalve indet.	1	1	3	–	2	4	–	1	1	–	1	–	15	7	8	15	–	–	–	–	–	–	–	–	–	–	–	–
Cardiidae indet.	2	3	2	–	–	1	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–
Cerastoderma edule	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	1	–	–	–	–	1	–	–	–	–	–	–	–
Parvicardium exiguum	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mysella bidentata	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	3	–	–	–	–	–	–	–	–	–	–	–	–
Corbula gibba	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Abra juv. indet.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–
Abra tenuis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Macoma balthica	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Scrobicularia plana	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–
Hydrobia ulvae	3	2	–	–	24	4	1	12	2	1	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–
Tetrastemma longissimum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–
Insect larva	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–
Total number species	17	15	10	9	12	13	8	9	8	8	7	5	25	18	22	30	12	7	7	11	10	8	5	11	4	3	3	3
Total number individuals	182	205	116	94	110	87	32	37	50	18	166	33	242	245	279	381	73	50	45	33	41	21	29	51	112	323	222	171

Appendix Cii: Kingsbridge estuary subtidal replicates taxa lists.

Taxa	Site Number																							
	A.1	A.2	A.3	A.4	B.1	B.2	B.3	B.4	C.1	C.2	C.3	C.4	D.1	D.2	D.3	D.4	E.1	E.2	E.3	E.4	F.1	F.2	F.3	F.4
ANNELIDA																								
Macrochaeta indet.	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	28	-	-	-	-	-	-	3	-
Melinna palmata	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arenicola marina	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capitella capitata	1	-	1	-	2	-	-	1	-	-	101	-	-	-	-	-	-	-	-	-	-	-	-	-
Mediomastus fragilis	5	-	4	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notomastus latericeus	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aphelochaeta marioni	4	-	4	-	11	-	23	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caulleriella bioculata	2	5	2	-	2	4	10	4	-	-	-	-	-	-	-	-	-	-	-	-	3	2	3	-
Caulleriella zetlandica	3	-	1	3	4	3	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
?Chaetozone setosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-
Cossura longocirrata	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dorvillidae juv indet.	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Ophryotrocha ?dubia	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	10	-	-	-	-	-	-	10	-
Ophryotrocha gracilis	-	-	-	-	2	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Protodorvillae kefersteini	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glycera juv indet.	-	-	-	-	-	-	-	-	1	-	-	-	-	-	5	-	-	-	-	2	-	-	-	-
Glycera lapidum	1	-	-	-	-	-	-	-	-	-	-	-	6	1	18	-	-	-	-	-	6	-	7	2
Microphthalmus similis	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Nereimyra punctata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Syllidia armata	8	16	11	15	26	38	10	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lumbrinereis indet.	1	-	-	1	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lumbrinereis gracilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magelona filiformis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
Magelona mirabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Maldanidae juv. indet.	-	-	-	-	3	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Euclymeninae indet.	2	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Praxillella affinis	-	-	-	3	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nephtys assimilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Nephtys cirrosa	-	-	-	-	-	-	-	-	2	3	1	2	-	-	-	1	3	-	1	4	2	5	-	4
Nereis longissima	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Perinereis cultifera	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Platynereis dumerilii	10	13	34	38	27	33	15	81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Websternereis glauca	9	6	20	7	12	9	6	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Eumida indet.	17	5	7	22	7	7	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hesionura elongata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	2
Phyllodoce mucosa	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pseudomystides limbata	1	2	2	1	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Pisione remota	-	-	-	-	-	-	-	-	2	-	3	-	7	-	3	1	-	-	-	-	19	-	10	5
Polygordius indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harmathoe indet.	-	-	1	2	2	-	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Harmathoe impar	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Protodrilus indet.	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-	-	-	-	-
Sabellidae indet.	-	3	1	2	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Saccocirrus papillocercus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	1	-
Pomatoceros lamarcki	5	6	11	14	7	18	11	5	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Serpula vermicularis	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pholoe inornata/synophthalmica	-	-	-	-	1	5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sthenelais boa	-	-	-	-	1	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sphaerodorum gracilis	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix Cii: Kingsbridge estuary subtidal replicates taxa lists.

Taxa	Site Number A.1	A.2	A.3	A.4	B.1	B.2	B.3	B.4	C.1	C.2	C.3	C.4	D.1	D.2	D.3	D.4	E.1	E.2	E.3	E.4	F.1	F.2	F.3	F.4
Sphaerodoropsis minuta	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spirorbidae indet.	19	66	5	45	3	8	4	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Aonides paucibranchiata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	6	-	5	-
Laonice bahusiensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Polydora caeca	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polydora flava	5	2	1	3	3	4	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prionospio fallax	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pseudopolydora pulchra	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scolelepis squamata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-
Spio martinensis	2	2	4	3	-	-	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Spiophanes bombyx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Amblyosyllis formosa	-	-	-	-	2	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Autolytus prolifer	1	1	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brania sp A	1	-	1	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brania swedmarki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	1	-	-	-
Eurysyllis brevipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-
Exogone hebes	3	1	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exogone naidina	33	45	126	43	20	20	29	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Odontosyllis ctenostoma	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Odontosyllis gibba	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Opistodonta pterochaeta	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Parapionosyllis minuta	-	-	-	3	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Pionosyllis indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Proceraea cornuta	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sphaerosyllis indet.	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Sphaerosyllis bulbosa	-	-	-	-	-	-	-	-	-	-	-	-	142	28	23	129	-	-	-	-	26	-	79	-
Sphaerosyllis erinaceus	-	1	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sphaerosyllis taylori	63	85	126	43	110	105	72	103	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Streptosyllis bidentata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1
Syllides indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Trypanosyllis coeliaca	-	-	-	-	-	-	-	-	-	-	-	-	1	5	-	1	-	-	-	-	-	-	-	-
Typosyllis indet.	-	1	2	2	1	1	1	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Typosyllis cornuta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Typosyllis hyalina	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	-	3	-
Terribellidae juv. indet.	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lanice conchilega	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eupolymnia nebulosa	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pista cristata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Polycirrus norvegicus	1	1	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grania indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	6	-
Tubificoides benedii	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubificoides pseudogaster	-	-	-	-	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubificoides swirencoides	1	2	1	8	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA:AMPHIPODA																								
Amphipoda indet.	4	16	35	3	7	3	2	36	-	-	1	-	-	-	-	-	-	-	-	-	-	1	2	-
Iphimedia (Panoploea) minuta	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ampelisca indet	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ampelisca brevicornis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ampelisca diadema	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix Cii: Kingsbridge estuary subtidal replicates taxa lists.

Taxa	Site Number A.1	A.2	A.3	A.4	B.1	B.2	B.3	B.4	C.1	C.2	C.3	C.4	D.1	D.2	D.3	D.4	E.1	E.2	E.3	E.4	F.1	F.2	F.3	F.4
Amphilochus neopolitanus	3	6	14	-	11	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aoridae indet.	22	19	35	-	7	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aora gracilis	-	-	16	23	-	9	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leptocheirus hirsutimanus	-	-	-	-	-	-	-	-	-	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-
Leptocheirus pectinatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	59	-	-	-	-	-	-	-	-	-
Leptocheirus tricristatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Microdeutopus anomalus	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Atylus falcatus	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	1	-	-	-	-	-	-	-	-
Corophium sextonae	8	7	45	14	10	26	7	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Siphonocoetes kroyeranus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Dexamine spinosa	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Guernea coalita	-	-	-	-	-	-	-	-	-	-	-	-	-	16	53	3	-	-	-	-	-	-	-	-
Microprotopus maculatus	-	-	1	4	-	1	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Microjassa cumbrensis	2	2	9	3	-	-	2	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Leucothoe spinicarpa	-	-	-	-	-	1	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Perrierella audouiniana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orchomene humilis	-	-	-	-	-	-	5	-	-	-	-	-	-	37	226	1	-	-	-	-	-	-	-	-
Socarnes erythrophthalmus	-	-	-	-	-	-	-	-	-	-	-	-	-	37	142	-	-	-	-	-	-	-	-	-
Abludomelita gladiosa	-	-	12	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Abludomelita obtusata	9	13	45	27	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
Cheirocratus intermedius	2	-	1	1	-	3	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maera grossimana	1	-	9	8	1	7	2	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Perioculodes longimanus	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pontocrates altamarinus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Pontocrates arenarius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-
Synchelidium maculatum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Harpinia crenulata	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bathyporeia pelagica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	14	-	2
Bathyporeia sarsi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-
Bathyporeia tenuipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
Metopa bruzelii	9	2	4	4	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stenothoe tergestina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Urothoe brevicornis	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Caprella acanthifera	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pariambus typicus	2	-	2	-	14	5	7	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phtisica marina	16	2	35	3	41	20	16	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pseudoprotella phasma	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA:CUMACEA																								
Bodotria scorpoides	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cumopsis fagei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
Cumopsis goodsiri	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cumella pygmaea	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diastylis bradyi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Eudorella truncatula	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pseudocuma longicornis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-
CRUSTACEA:DECAPODA																								
Anapagurus hyndmanni	-	-	-	2	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix Cii: Kingsbridge estuary subtidal replicates taxa lists.

Taxa	Site Number A.1	A.2	A.3	A.4	B.1	B.2	B.3	B.4	C.1	C.2	C.3	C.4	D.1	D.2	D.3	D.4	E.1	E.2	E.3	E.4	F.1	F.2	F.3	F.4
Anapagurus laevis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Galathea intermedia	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liocarcinus arcuatus	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liocarcinus depurator	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pisidia longicornis	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA:ISOPODA																								
Arcturella damnoniensis	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Astacilla longicornis	-	-	11	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eurydice pulchra	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Gnathia indet.	-	-	1	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gnathia dentata	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Munna minuta	3	1	5	9	20	20	3	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Janira maculosa	5	2	23	28	38	24	24	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA:TANAICEA																								
Apseudes latreilli	118	38	123	195	2	7	18	21	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Leptochelia savigny	1	1	1	-	47	35	48	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leptognathia gracilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	4	-	-	6	-	-
Tanaopsis graciloides	-	-	-	-	40	34	46	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHELICERATA																								
Achelia echinata	4	1	3	-	13	9	1	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anoplodactylus petiolatus	1	-	1	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA																								
Bivalvia indet.	2	16	8	13	34	-	76	59	-	-	-	1	-	-	-	2	-	1	-	-	3	1	3	4
Anomiidae indet.	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Goodalia triangularis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	9	-	7	3
Parvicardium exiguum	1	3	4	3	3	3	-	5	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Parvicardium ovale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Parvicardium scabrum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-
Mysella bidentata	4	3	1	1	-	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spisula solida	-	-	-	-	-	-	-	-	-	-	-	-	3	2	20	5	-	1	1	1	1	-	-	2
Spisula subtruncata	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Hiatella arctica	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Myacea juv:indet	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corbula gibba	-	-	-	-	5	3	3	4	-	-	-	-	-	-	1	-	-	-	-	-	2	-	1	-
Modiolarca tumida	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modiolus modiolus	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mytilus edulis	-	-	-	-	-	-	-	2	3	-	-	2	20	24	188	53	-	5	-	-	4	-	1	-
Nucula nucleus	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlamys opercularis	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tellinid juv indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Abra nitida	-	-	-	-	-	23	-	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moerella pygmaea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-
Veneridae indet.	-	2	1	-	-	-	-	-	-	-	-	-	2	-	-	1	-	-	-	-	1	-	-	-

Appendix Cii: Kingsbridge estuary subtidal replicates taxa lists.

Taxa	Site Number A.1	A.2	A.3	A.4	B.1	B.2	B.3	B.4	C.1	C.2	C.3	C.4	D.1	D.2	D.3	D.4	E.1	E.2	E.3	E.4	F.1	F.2	F.3	F.4
Venerupis juv indet.	3	1	9	3	9	-	6	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Venerupis senegalensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Venus juv. indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-
Venus casina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	9
Gastropoda indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	5	-	-	-	-	-	-	-	-
Calyptraea chinensis	6	12	17	30	12	14	3	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crepidula fornicata	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hinia incrassata	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lunatia sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Lunatia poliana	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2
Brachystomia albella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Odostomia plicata	-	-	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbonilla juv indet.	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caecum glabrum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-
Caecum imperforatum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Manzonia crassa	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Onoba semicostata	-	-	-	2	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rissoa parva	3	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dikoleps culteriana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38	-	-	-	-	-	-	-	-	-
Calliostoma zizyphinum	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gibbula juv indet.	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gibbula cineraria	-	-	-	5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gibbula tumida	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gibbula umbilicalis	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tricolia pullus	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nudibranchia indet.	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Doridoidea indet.	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Philine juv indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
ECHINODERMATA																								
Echinocyamus pusillus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	12	12	6	6
Psammechinus miliaris	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leptosynapta inhaerans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Leptosynapta minuta	-	-	-	-	-	-	-	-	-	-	-	-	-	28	187	23	-	-	-	-	-	-	-	-
Amphipholis squamata	2	12	9	7	17	32	8	86	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Ophiothrix fragilis	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ophiura juv. indet.	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
NEMERTEA																								
Nemertea indet.	5	5	2	14	12	16	6	16	2	-	3	-	-	-	-	-	-	1	5	1	3	2	8	2
Tetrastemma longissimum	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubulanus polymorphus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
OTHERS																								
Anemone indet.	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cerianthus lloydii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Phoronis muelleri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-	-
Golfingia juv indet.	-	-	-	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix Cii: Kingsbridge estuary subtidal replicates taxa lists.

Taxa	Site Number																							
	A.1	A.2	A.3	A.4	B.1	B.2	B.3	B.4	C.1	C.2	C.3	C.4	D.1	D.2	D.3	D.4	E.1	E.2	E.3	E.4	F.1	F.2	F.3	F.4
Phascolion strombi	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thalassema thalassemum	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbellaria indet.	-	-	1	1	5	-	1	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Number of Taxa	53	43	67	57	59	58	59	75	9	3	10	5	13	15	28	27	6	6	8	5	24	20	30	17
Number of specimens	441	431	870	700	622	598	552	965	16	5	119	7	195	213	1015	298	15	13	15	9	108	77	178	60