Institute of Freshwater Ecology

INSTITUTE OF FRESHWATER ECOLOGY
River Laboratory, East Stoke, Wareham, Dorset BH20 6BB

Project leader: P.D. Armitage
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CHANNEL TUNNEL
Stream survey and assessment in the Folkestone area - spring 1989

P.D. Armitage & R.J.M. Gunn

1. INTRODUCTION

1.1 In 1987 the invertebrates of 14 sites on streams in the Ashford and Folkestone areas were sampled to provide a base-line to monitor environmental impacts which may arise from construction activity associated with the Channel Tunnel Project.

1.2 Samples were taken three times in the year in spring, summer and autumn. Faunal and plant lists were compiled. Faunal data were used to calculate biological quality indices and assess the status of the sites by reference to the extensive data-base held at the Institute of Freshwater Ecology's River Laboratory. A report describing the results was presented to the clients, Eurotunnel, in October 1987 (Armitage & Gunn 1987).

1.3 On receipt and assimilation of the report by the clients it was felt that any changes in the stream faunas which could develop as a result of construction activities should be monitored further but at a reduced frequency.

1.4 After consultation with interested parties including Mr D.R. Helliwell, it was decided to repeat the sampling of 1987 subject to the possible construction occupancy of some sites. Sampling was restricted to the spring season and all sites were visited on the 11th and 12th April 1988. The results are presented in a report to Transmanche-Link (Armitage & Gunn 1988). A further survey was commissioned in August 1988 and the results of this study are presented in a report to Transmanche-Link, February 1989 (Armitage & Gunn 1989).

1.5 This current report presents results from a repeat survey carried out on the 3rd and 4th April 1989 of 12 sites.

2. STUDY AREA

2.1 The characteristics of the Ashford and Folkestone areas have been described in a number of reports which also provide data on water quality, hydrology and possible pollutants. These reports were listed in Armitage & Gunn (1987) and are relisted in this report.

2.2 Site details are also presented in Armitage & Gunn (1987) and need not be reported here. The effects of construction activity at the 14 sites sampled in 1987 (Figs 1 and 2) as of 12th April 1988 are summarised in the spring report (Armitage & Gunn 1988). Changes since then at the nine Folkestone sites sampled in August 1988 are indicated in the summer report (Armitage & Gunn 1989). All topsoil stripping had been completed by October 1988. Developments since August 1988 are described below.

2.3 In the Ashford area no changes were noted in the immediate vicinity of the sites but Waterbrook 2 had a thin layer of oil on the surface. Limited soil strip and earthworks for the Ashford southern orbital road began in mid-January 1989. The extent of the works at the time of the survey is shown in Fig. 1.

2.4 Saltwood Stream. Site 1 had a thick deposit of sand between 30 and 37 cm thick overlying the stream bottom. The proportion of sand in the visual assessment of substratum (Table 1) has increased to 94% from 50% in April 1988. In the August 1988 survey, sand was less evenly distributed and the sample site was predominantly gravel. Since that date the sand has spread more evenly over the bottom probably as the result of increased flows in the autumn and winter. The pond water downstream of SW1 was 'cloudy' on the day of sampling (3rd April).

Saltwood 2 and 3 remained unchanged.

2.5 Seabrook Stream. Sites 1 and 3 remained unchanged. Site 4 had more sand on the stream bottom than in the August 1988 visit but this was most noticeable just downstream of the sample area. This site has, throughout the study period, had high sand concentrations ranging from the lowest value of 81% in April 1987 to a peak value of 100% in August 1988.

Seabrook 5 had extensive drainage works above and below the site but this had had no discernible effect on the substratum of the site which was similar to that observed in August 1988 and dominated by boulders and cobbles.

2.6 Pent Stream. Both remaining sites on the Pent, (2) and (3), have experienced extremely high conductivities (mean value of ca. 20,000 µS) as the result of the marine sandfill operation and saline

intrusion into the stream between 1st October 1988 and 24th February 1989. After 24th February conductivities in the Pent were reduced as a result of completely damming Pent B at the terminal site boundary and diverting the water via the marine sand drainage water lagoon directly to the sea. On 7th April 1989 a value as low as 2,500 µS was recorded at Pent 2 and at Pent 3 which receives some non-saline tributaries the conductivity was 1,300 µS. In addition to saline inflows the overall discharge is lower. This is most noticeable at Pent 2 where water velocity is reduced and siltation has increased, but reduced depth, velocity and mean substratum particle size were also noted at Pent 3. Pent 2 has also been heavily contaminated by diesel fuel. The site smelled strongly of diesel which was also present in the sediment.

3. METHODS

3.1 Faunal sampling and data-processing followed the procedures outlined in the previous report, but collections were confined to the 'spring' season. Sample processing of the preserved fauna took place in the laboratory. The fauna of seven sites (Waterbrook 1 and 2, East Stour 1, Saltwood 3, Seabrook 5 and Pent 2 and 3) was identified to family level. However, Hydracarina (water mites) were recorded as such and Chironomidae (midge larvae) were taken to subfamily or tribe level but are referred to as families in the text. Estimates of abundance were made for each 'family' and expressed in five categories according to an approximately logarithmic scale as follows: 1-9 animals = 1, 10-99 = 2, 100-999 = 4, ≥10,000 = 5. The fauna of five sites (Saltwood 1 and 2 and Seabrook 1, 3 and 4) was identified to species level but some juvenile organisms, dipteran larvae and animals for which no taxonomic keys are available were identified to family or genus level.

3.2.1 Data analysis. The IFE River Laboratory system for the classification and prediction of macroinvertebrate communities in running water (Wright et al. 1984, Furse et al. 1987, Moss et al. 1987, Armitage et al. 1987) was used to analyse the results obtained during this survey.

3.2.2 Over the past 10 years about 600 species of macroinvertebrate have been identified from more than 400 substantially unpolluted sites throughout Great Britain. The species lists have been used to construct a national classification of running-water sites and to develop a technique for

predicting the probabilities of occurrence of individual taxa at sites of known environmental characteristics. This large data base provides a standard against which to assess the fauna of new sites and also places the site in a national context.

3.2.3 Since 1987 the FBA data-base and associated computer package have been modified and, whereas before three seasons data were required to predict the faunal composition of a site from environmental features, now such predictions can be made from a single collection. This modified program was used to analyse the data obtained in the 1989 survey. The printout for each site includes the predicted number of taxa and the predicted values for the National Water Council 'BMWP' biotic score (Biological Monitoring Working Party 1978, Chesters 1980, Armitage et al. 1983) and average score per taxon. This is a score system in which score values for individual families reflect their pollution tolerance. Thus high scoring taxa such as some mayflies and stoneflies indicate good biological quality and low scoring worms and dipteran larvae reflect poorer conditions.

A warning message is shown on screen and printout if, on the basis of the physical and chemical data, the site has a probability of less than 5% of belonging to any of the classification groups.

4. RESULTS

4.1 The occurrence and relative abundance (log categories) of families recorded in April 1988 at the 12 sites are presented in Tables 2, 3, 4 and 5 which also present equivalent data for April 1987 and April 1988 for comparison.

4.1.1 At five sites the invertebrate fauna was identified to species level and these data are presented in Table 6 and compared with the April 1987 and April 1988 findings.

4.1.2 Macrophytes were searched for in the April 1989 survey but few stands were well developed. No macrophytes were found at Saltwood 1 or at Pent 2. Saltwood 2 and 3, Seabrook 1 and 3 and Pent 3 supported only moss and/or algae in small proportions (<5% cover). At Waterbrook 2 Apium/Berula, Elodea, Lemna and filamentous algae were recorded for the first time. Sparganium was a new record for Seabrook 4 and

Apium/Berula and moss were found at Seabrook 5 for the first time. In general, macrophytes are poorly developed in the Folkestone streams (not >5% cover). In Waterbrook 1 and 2 the percentage cover of macrophytes was 60 and 85% respectively and 20% in the East Stour site though in the latter, filamentous algae comprised 15% of the total cover.

4.2 The ratios of observed to predicted values of score, average score per taxon and family complement at each of the 12 sites based on April 1989 data are presented in Table 7.

4.2.1 Single seasons predictions of number of taxa, score and average score per taxon were compared with observed April 1989 values to derive the indices, I, S and A. Values of these indices are shown in Fig. 3 which also presents the equivalent values for April 1987 and April 1988.

4.2.2 These indices (Fig. 3) provide information on the biological quality of the sites in relation to a standard developed from the IFE data base and can be matched with a chemically-based standard developed by the National Water Council (1981). The NWC system classifies rivers on a 5-point scale with emphasis on their degree of organic pollution (as indicated by BOD and ammoniacal nitrogen values). The five classes are 1A and 1B (good quality), 2 (fair quality), 3 (poor quality) and 4 (bad quality). The NWC bands equivalent to the I, A and S index values are indicated on Fig 3.

4.3 Comparison with a standard provides a measure of the biological quality of the sites on a national scale but any changes within the streams are best indicated by comparing the April 1988 and April 1989 data at each site. The ratios of observed 1989 values of biotic score, average score and number of taxa over the 1988 values of these parameters are presented in Fig. 4.

4.4 Ashford sites (Table 2)

4.4.1 Waterbrook 1. Twenty-two families were found at this site in April 1989 compared with 27 in April 1988. Haliplidae (Coleoptera) is the only new record for the site. The indices listed in Table 7 and depicted in Figs 3 and 4 indicate a slight reduction in biological quality. The site is, however, still in the 1A/1B category.

4.4.2 Waterbrook 2. Twenty-three families were recorded in April 1989 compared with 29 in April 1988. No new taxa were found and the site remains in the 1A/1B category despite a slight reduction in biological quality.

4.4.3 East Stour. Twenty-nine families were found in April 1989 compared with 30 in 1988. Four families were new records for the site - Physidae, Zonitidae (Mollusca); and Naididae, Lumbricidae (Oligochaeta). Biological quality remains good and the indices for score, ASPT and taxa all show this to be a 1A site.

4.5 Saltwood stream (Tables 3 and 6)

4.5.1 Saltwood 1. Only 21 families (34 species) were recorded from this site in April 1989 compared with 25 families (34 species) in 1988 and 32 families (52 species) in April 1987. Only one taxa was new to the site, Zonitidae (Mollusca); but six taxa present in 1987 and 1988 were missing. There were Ancylidae, Sphaeriidae (Mollusca); Psychomyiidae, Hydropsychidae, Goeridae (Trichoptera); and Chironomini (Diptera). Although there is no deterioration in water quality as indicated by the ASPT index there is a reduction in biological habitat quality and score and faunal indices indicate a drop in class from 1A to 1B.

4.5.2 Saltwood 2. Twenty-four families (31 species) were recorded at this site in April 1989 compared with only 18 (26 species) in April 1988. Eight families are new records for the site and include Mollusca - Zonitidae, Worms - Naididae, Trichoptera - Rhyacophilidae, Hydropsychidae, and Diptera - Tanypodinae, Tanytarsini, Stratiomyidae, Empididae. Details of species gains are presented in Appendix 1. None of the new taxa are particularly rare although the genus Rhypholophus (Tipulidae: Diptera) is infrequently taken in stream samples.

4.5.3 Saltwood 3. Eighteen families were found in April 1989 compared with 15 in 1988. Three families were new records for this site, Zonitidae (Mollusca), Naididae (Oligochaeta) and Chironomini (Diptera). Biological quality was similar to that in April 1988 and the site remains in the Class 2 band as indicated by score (S) and family (I) indices. However, the ASPT index shows a drop from 1B in 1988 to 2 in 1989.

4.5.4 The reduced water and biological quality with distance downstream observed in previous surveys in this stream persisted in April 1989. Year-to-year variations were slight at Saltwood 2 and 3 and most marked at Saltwood 1.

4.6 Seabrook stream (Tables 4 and 6)

4.6.1 Seabrook 1. Twenty-six families (36 species) were recorded in April 1989 compared with 22 families (30 species) in April 1988. Three widely distributed and common families, Lumbricidae, Ceratopogonidae and Tanypodinae, were new records for the site. Twelve species were new to the site in 1989 (see appendix) and included 7 Diptera, 2 oligochaetes, 1 ephemeropteran, 1 caddis and 1 water beetle. The site remains in the 1A band.

4.6.2 Seabrook 3. Twenty families (27 species) were found compared with 17 (19 species) in April 1988. One family, Beraeidae (caddis fly), was new to the site in spring. Additional new 'species' included 2 Diptera and 1 oligochaete. The site has remained in the band 1A and 1B throughout the period 1987-1989. Little change occurred between 1988 and 1989 (Fig. 4).

4.6.3 Seabrook 4. There has been a very slight improvement in biological quality at this site since 1988. Fourteen families were taken in 1989 compared with 11 in April 1988. At species level the improvement is more marked and 19 taxa were recorded in 1989 compared with only 11 in April 1988. Most of the new taxa for the site are Diptera (see appendix) but 2 species of mollusc were recorded for the first time at the site, Potamopyrgus jenkinsi and Pisidium casertanum. Both species are common and widely distributed. The site in 1989 falls in the 2 band for biological or habitat quality (Figs 3, 5 and 1) and in the 1B band for water quality (Fig. 3A). The improvement since 1988 is indicated in Fig. 4.

4.6.4 Seabrook 5. Some improvement in biological quality was observed at this site. Twenty families were recorded in April 1989 compared with 15 in 1988. Five families, Sphaeriidae, Glossiphoniidae, Nemouridae, Polycentropodidae and Psychomyiidae were new to the site. Year-to-year variations were slight between 1987 and 1988. The highest indices (Fig. 3) of biological/habitat quality were found in April 1989. Throughout the study period there was little change in the index A

which indicates water quality. All indices place this site in the 1A/1B band.

4.6.5 The trend towards poor quality downstream is still apparent in the Seabrook stream with site 4 the most affected zone. In general though there has been little change throughout the study period with sites 1, 3 and 5 all falling into the 1A/1B bands.

4.7 Pent stream

4.7.1 Pent 2. The physical changes at this site have been referred to in 2.6 and resulted in a catastrophic drop in both numbers and variety of benthic animals. Only 5 taxa were recorded in very low numbers. At the time of sampling the main polluting agent appeared to be the diesel fuel. This had not originated from construction activity in connection with the Channel Tunnel as no site water had flowed through Pent 2 since February 1988. The source of the oil is not known. The effects of the oil are likely to persist until the stream is flushed out by heavy rain. The surviving invertebrates are all either semi-terrestrial (Enchytraeidae), air breathers and pollution-tolerant Diptera, or molluscs which can seal their shells with an operculum (Hydrobiidae: Potamopyrgus jenkinsi). This latter species can also tolerate brackish water conditions and may have been able to survive the saline conditions prevailing between October 1988 and February 1989.

4.7.2 Pent 3. The total taxa were reduced from 13 in April 1988 to 4 in 1989. Three families of worms and one cranefly larva (Tipulidae) were present at the site. Most aquatic invertebrates were killed by the high salinities recorded following the sandfill operation. With the blocking of the headwall and pumping of all water to 'Return Water Lagoon' some components of the benthic fauna were able to recolonise rapidly. The reduced conductivities, absence of predators and high concentrations of algal food over the substratum and rapid asexual reproduction has enabled a large population of naid worms to develop at Pent 3.

4.7.3 The Pent, at sites 2 and 3, has never been a consistent 1A/1B stream throughout the study period but the combined effects of reduced discharge, saline inflows and, at Pent 2, diesel contamination have now resulted in reducing its quality to 4 (bad). However, if the stream water continues to be relatively free of saline inflows and other

pollutants the fauna will gradually recover but is likely to be impoverished in the absence of nearby sites to provide seed organisms for recolonisation. A solution may be to introduce fauna from sites in the Saltwood and Seabrook streams when the activities in the catchment have stabilised.

4.8 The observed reductions in biological quality in the Pent and at other sites have to be considered in relation to the natural year-to-year variation in the indices. Detailed pre-construction data are not available. However, general experience from a number of unpublished surveys by the IFE in streams in the UK provide some relevant information. Annual variations in numbers of taxa and the BMWP score may vary by about 25% in natural streams but ASPT values in an unperturbed stream do not vary by more than about 6%.

5. OVERALL ASSESSMENT

5.1 To date spring surveys have been carried out in the years 1987, 1988 and 1989. Fig. 3 summarises the temporal and spatial trends. Very striking is the apparent consistency of the indices at most sites. Only in the case of the Pent has there been a major fall in quality from fair (2) to bad (4). Minor fluctuations have occurred in some other sites, most particularly Saltwood 1 and Seabrook 4 where sand deposition and resultant reduction in habitat diversity have led to a fall in biological quality.

5.2 The fall in quality reported in Armitage & Gunn (1989) - the 'summer 1988' report - at Saltwood 1 is continuing as more of the substratum is covered by sand through redistribution of existing deposits. As stated previously the stream will eventually return to its former state provided that a) the discharge quantity and pattern is unmodified and b) that the movement of sand from eroded parts of the catchment is controlled and eventually stopped.

5.3 Seabrook 4 experienced its lowest quality in 1988. Since then there has been a very slight improvement. However, the site continues to have a lower faunal diversity than expected. The cause is not known but sand deposition has certainly reduced habitat diversity. A better developed fringe of macrophytes along the river bank would increase faunal richness. The absence of such a fringe may be due to trampling and grazing of cattle. Another possibility is that in this generally steeply

sloped stream this site occupies a relatively flat area where sand originating from disturbance upstream can deposit. An unstable sandy bottom without emergent macrophytes will not support a great variety of organisms.

5.4 The Pent stream has been discussed in 4.7. It is the most severely impacted of all streams examined in the survey and will require assistance before it recovers.

5.5 A danger sign at Waterbrook 2 was the presence of a thin layer of oil on the water surface. It had not had any major effect on quality at the April 1989 sampling but comparison with 1988 shows a lowering of the faunal indices. The Waterbrook is a good quality watercourse and efforts should be made to prevent contaminants from the construction site entering the stream. It must be said, however, that the source of the oil at Waterbrook 2 is not currently known.

5.6 New records continue to be added to site fauna lists (see tables and appendix) but new finds for the survey are rare. The April 1989 lists included 4 taxa new to the survey - the caddis Hydropsyche angustipennis and Limnephilus lunatus both abundant and widely distributed species, and the Diptera, Ptychoptera paludosa and Rhypholophus sp. Little is known about the distribution of the 2 dipteran taxa; P. paludosa has been recorded along the south coast and up to Derby and westwards to Wales. Rhypholophus is a genus of cranefly and contains 3 species separable only in the adult or pupal stage.

6. CONCLUSIONS

6.1 The major events which have taken place since the April 1988 survey are reduced quality at Waterbrook 2, Saltwood 1 and Pent 2 and 3.

6.2 Ameliorative measures should be undertaken in the Pent if polluting inflows are controlled and the original discharge is reinstated. Advice on implementation could be provided by IFE.

6.3 The suggestions put forward in Armitage & Gunn (1989) with reference to remedial work at Saltwood 1 still stand. The site should return to its

former state without the need to remove the deposited sand. This is likely to take one or two years provided no further perturbations take place.

6.4 A watching brief should be kept on waters draining the Ashford site and settlement lagoons should be used before releasing water into the field ditch/drain system.

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Table 1. Location and summary of the environmental characteristics of the Ashford and Folkestone sites (April 1989).

Site Name	NGR	Water width (m)	Mean depth (cm)	Velocity (category)#	Boulders & cobbles (%)	Pebbles & gravel (%)	Sand (%)	Silt & clay (%)	Altitude (m)	Longitude (°')	Latitude (°')	Distance from source (km)	Slope (m km^{-1})	Discharge (category)*	Air temperature range (°C)	Mean air temperature (°C)	Total oxidised N_2 (mg l^{-1} N)	Alkalinity (mg l^{-1} $CaCO_3$)	Chloride (mg l^{-1} Cl)
Waterbrook 1	TR 0276 4020	0.9	9.0	1	-	-	-	100	38	0.54	51.08	1.0	0.8	1	13.06	10.25	6.14	218	50
Waterbrook 2	TR 0217 4070	2.5	28.3	1	-	-	-	100	37	0.53	51.08	2.0	0.8	1	13.05	10.20	6.14	218	50
East Stour 1	TR 0201 4050	5.0	38.7	3	5	25	55	15	37	0.53	51.08	15.5	0.9	2	13.05	10.21	6.14	218	50
Saltwood 1	TR 1662 3660	1.6	6.7	3	3	2	94	1	45	1.06	51.05	1.7	23.8	1	12.94	10.55	-	250	30
Saltwood 2	TR 1673 3640	1.2	7.0	4	10	70	15	5	40	1.06	51.05	2.0	8.3	1	12.94	10.55	-	250	30
Saltwood 3	TR 1665 3515	1.5	16.7	4	55	39	5	1	15	1.06	51.04	3.3	23.8	1	12.94	10.55	-	250	30
Seabrook 1	TR 1750 3770	1.5	25.7	3	-	5	20	75	57	1.07	51.06	2.0	6.3	1	12.93	10.53	3.50	241	29
Seabrook 3	TR 1810 3671	3.5	11.0	4	35	55	5	5	38	1.07	51.05	3.4	13.9	1	12.93	10.55	2.63	216	59
Seabrook 4	TR 1865 3620	2.0	17.7	3	-	1	89	10	27	1.07	51.05	4.3	10.9	1	12.93	10.54	2.63	216	59
Seabrook 5	TR 1862 3534	3.0	17.0	4	78	10	5	7	10	1.07	51.04	5.5	11.1	1	12.92	10.54	4.52	330	41
Pent 2	TR 2090 3730	0.8	6.0	1	-	-	-	100	38	1.09	51.06	0.9	16.1	1	12.88	10.54	-	250	30
Pent 3	TR 2230 3675	2.0	9.7	3	45	35	5	15	20	1.11	51.05	2.4	9.8	1	12.93	10.55	-	250	30

#1 = ≤10, 2 = >10-25, 3 = >25-50, 4 >50-100 cm s^{-1} *1 = <0.31 m^{3}s^{-1}, 2 = >0.31-0.62 m^{3}s^{-1}

Table 2. Ashford sites. 'Families' recorded in 'Spring' samples in April 1987 (87), April 1988 (88) and April 1989 (89) together with their relative abundance (log categories).

Family	Waterbrook 1			Waterbrook 2			East Stour 1		
	87	88	89	87	88	89	87	88	89
Planariidae	2	3	2	2	2	2	-	2	3
Dendrocoelidae	1	1	-	1	1	-	-	1	-
Valvatidae	-	2	2	-	3	3	-	-	-
Hydrobiidae	4	5	5	2	3	3	1	1	2
Lymnaeidae	2	1	2	-	2	2	1	-	1
Physidae	-	-	-	2	2	2	-	-	1
Planorbidae	-	2	2	2	3	2	-	1	-
Succineidae	-	1	1	-	1	-	-	-	-
Zonitidae	-	-	-	-	-	-	-	-	1
Sphaeriidae	3	4	3	3	3	2	3	2	3
Naididae	1	3	3	-	2	2	-	-	1
Tubificidae	3	3	2	4	3	3	3	3	3
Lumbriculidae	1	2	2	3	2	2	-	3	3
Lumbricidae	-	-	-	-	-	-	-	-	1
Haplotaxidae	-	1	-	-	-	-	-	-	-
Glossiphoniidae	1	2	3	2	2	1	2	2	2
Erpobdellidae	-	-	-	2	2	2	2	2	2
Hydracarina	-	2	-	-	1	-	-	2	1
Asellidae	1	2	1	2	3	2	2	4	4
Gammaridae	2	2	2	1	1	1	2	4	4
Baetidae	2	-	2	1	2	1	1	2	2
Leptophlebiidae	-	-	-	-	-	-	-	1	1
Caenidae	-	-	-	-	-	-	3	3	4
Nemouridae	-	-	-	-	1	-	-	-	-
Coenagriidae	-	-	-	1	2	1	1	1	1
Agriidae	-	-	-	-	-	-	-	2	-
Corixidae	-	-	-	1	1	1	1	1	1
Nepidae	-	1	-	-	-	-	-	-	-
Haliplidae	-	-	1	-	1	-	1	1	1
Dytiscidae	1	1	2	1	1	-	2	2	2
Gyrinidae	-	-	-	-	-	-	-	1	-
Hydrophilidae	1	1	1	-	1	1	-	-	-
Elmidae	-	-	-	-	-	-	-	2	3
Sialidae	1	1	-	-	-	-	1	-	1
Hydropsychidae	-	-	-	-	-	-	1	1	-
Limnephilidae	2	1	2	2	2	2	-	1	2
Leptoceridae	-	-	-	-	-	-	3	3	2
Tipulidae	-	1	-	-	-	-	-	-	-
Ceratopogonidae	2	2	2	-	-	-	3	2	1
Tanypodinae	3	3	2	2	3	2	1	-	-
Diamesinae	-	-	-	-	-	-	1	-	-
Prodiamesinae	3	-	-	1	2	2	1	-	-
Orthocladiinae	4	2	3	3	3	-	3	1	3
Chironomini	-	2	1	2	-	2	4	-	-
Tanytarsini	3	-	-	-	3	1	4	2	3
Simuliidae	1	-	-	-	-	-	1	-	-
Empididae	-	-	-	-	-	-	-	2	-
Stratiomyidae	1	-	-	-	-	-	-	-	-
Muscidae	-	1	-	-	-	-	-	1	-

Table 3. Saltwood stream. 'Families' recorded in 'Spring' samples in April 1987 (87), April 1988 (88) and April 1988 (89) together with their relative abundance log categories).

Family	Saltwood 1			Saltwood 2			Saltwood 3		
	87	88	89	87	88	89	87	88	89
Planariidae	1	-	-	2	-	-	-	-	-
Hydrobiidae	4	3	4	3	4	4	2	-	-
Ancylidae	2	2	-	-	-	-	-	-	-
Zonitidae	-	-	1	-	-	1	-	-	1
Sphaeriidae	1	2	-	2	3	3	1	2	3
Naididae	1	-	1	-	-	1	-	-	2
Tubificidae	2	2	3	1	2	3	2	2	2
Lumbriculidae	1	2	1	3	3	3	3	3	3
Lumbricidae	1	-	1	1	1	1	1	2	1
Glossiphoniidae	1	1	1	2	1	1	2	2	1
Erpobdellidae	-	-	-	1	2	2	2	2	2
Hydracarina	-	2	-	-	-	-	-	-	-
Gammaridae	2	3	3	3	4	4	3	3	4
Baetidae	2	3	2	2	3	3	3	4	3
Nemouridae	2	2	1	-	1	-	-	-	-
Veliidae	-	-	-	1	-	-	-	-	-
Corixidae	1	-	-	-	-	-	-	-	-
Haliplidae	-	-	-	-	-	-	-	1	-
Hydrophilidae	1	-	-	-	-	-	-	-	-
Helodidae	1	1	1	1	1	2	2	-	-
Elmidae	2	3	3	2	3	4	3	3	4
Rhyacophilidae	1	1	1	-	-	1	2	1	2
Polycentropodidae	1	1	1	-	-	-	-	-	-
Psychomyiidae	1	1	-	-	-	-	-	-	-
Hydropsychidae	1	2	-	-	-	1	2	3	3
Limnephilidae	1	1	2	1	1	1	-	-	-
Goeridae	1	2	-	-	-	-	-	-	-
Beraeidae	-	-	-	-	1	-	-	-	-
Lepidostomatidae	1	-	-	-	-	-	-	-	-
Tipulidae	2	1	1	1	1	2	1	-	1
Psychodidae	1	-	-	-	1	-	-	-	-
Ptychopteridae	-	-	-	1	-	-	-	-	-
Ceratopogonidae	2	-	1	-	-	-	-	-	-
Tanypodinae	1	1	2	-	-	1	-	-	-
Prodiamesinae	2	1	2	-	-	-	-	-	-
Orthocladiinae	2	2	2	2	1	3	2	2	3
Chironomini	1	2	-	-	-	-	-	-	1
Tanytarsini	-	1	-	-	-	3	-	1	3
Simuliidae	2	-	-	2	2	1	1	2	-
Stratiomyidae	-	-	-	-	-	1	-	-	-
Empididae	1	1	2	-	-	2	2	-	2
Muscidae	-	-	-	1	-	1	-	-	-

Table 4. Seabrook stream. 'Families' recorded in 'Spring' samples in April 1987 (87), April 1988 (88) and April 1989 (89) together with their relative abundance (log categories).

Family	Seabrook 1			Seabrook 3			Seabrook 4			Seabrook 5		
	87	88	89	87	88	89	87	88	89	87	88	89
Planariidae	-	-	-	1	-	1	-	-	-	1	-	1
Hydrobiidae	-	2	1	1	2	2	-	-	1	1	2	2
Succineidae	-	-	-	-	-	-	-	1	-	-	-	-
Ancylidae	-	-	-	1	-	1	-	-	-	1	-	-
Sphaeriidae	2	2	1	1	-	1	3	1	1	-	-	2
Naididae	-	-	-	2	-	3	1	-	-	1	-	2
Tubificidae	2	2	3	2	2	3	3	1	1	1	2	2
Enchytraeidae	-	-	-	2	-	1	1	-	1	-	-	-
Lumbriculidae	-	1	-	1	-	-	-	-	-	3	3	3
Lumbricidae	-	-	1	1	-	1	-	1	-	1	1	1
Glossiphoniidae	-	-	-	1	-	1	-	-	-	-	-	1
Erpobdellidae	-	-	-	-	1	1	-	1	-	1	1	1
Asellidae	-	-	-	-	-	-	-	1	-	-	-	-
Gammaridae	3	3	4	3	4	3	2	3	3	3	3	3
Baetidae	3	4	3	3	3	3	2	3	1	3	3	3
Leptophlebiidae	1	1	2	-	-	-	-	-	-	-	-	-
Ephemeridae	1	1	2	-	-	-	-	-	-	-	-	-
Nemouridae	-	-	-	2	-	-	1	-	-	-	-	1
Leuctridae	-	-	-	-	1	-	-	-	-	-	-	-
Helodidae	1	2	1	-	-	-	-	-	-	-	-	-
Elmidae	1	2	1	2	2	3	-	1	-	3	3	4
Sialidae	1	1	1	1	-	-	-	-	-	1	-	-
Rhyacophilidae	1	1	2	1	1	1	1	-	-	2	1	1
Polycentropodidae	1	1	2	1	-	1	-	-	-	-	-	1
Psychomyiidae	1	1	2	-	1	-	-	-	-	-	-	1
Hydropsychidae	1	1	1	2	2	-	-	-	-	-	1	3
Hydroptilidae	-	-	-	-	-	-	-	-	-	-	1	-
Limnephilidae	1	2	1	1	2	1	1	-	1	-	1	1
Beraeidae	-	-	-	-	-	1	-	-	-	-	-	-
Lepidostomatidae	-	-	-	1	-	-	-	-	-	-	-	-
Sericostomatidae	-	1	2	-	-	-	-	-	-	-	-	-
Tipulidae	1	1	2	1	1	1	1	1	1	1	1	-
Ptychopteridae	1	-	1	-	-	-	-	-	-	-	-	-
Psychodidae	-	-	-	1	-	-	2	-	-	-	-	-
Dixidae	-	-	-	-	-	-	-	-	1	-	-	-
Ceratopogonidae	-	-	2	-	-	-	1	-	1	1	-	-
Tanypodinae	-	-	3	-	-	-	-	-	1	1	-	-
Prodiamesinae	1	-	3	-	-	-	2	-	2	-	-	-
Orthocladiinae	2	2	3	2	2	3	-	1	2	2	1	3
Chironomini	1	-	-	-	-	-	-	-	-	1	-	-
Tanytarsini	1	-	4	-	1	-	-	-	-	-	-	-
Simuliidae	3	2	1	1	1	-	1	-	1	1	1	-
Empididae	1	2	1	2	1	2	-	-	-	1	-	2
Stratiomyidae	-	1	-	-	1	-	-	-	-	-	-	-

Table 5. Pent stream. 'Families' recorded in 'Spring' samples in April 1987, April 1988 and April 1989 together with their relative abundance (log categories).

Family	Pent 2			Pent 3		
	87	88	89	87	88	89
Planariidae	1	1	-	-	1	-
Hydrobiidae	-	1	1	-	1	-
Lymnaeidae	-	-	-	-	1	-
Sphaeriidae	2	1	-	2	1	-
Naididae	-	-	-	-	1	3
Tubificidae	3	4	-	2	2	1
Enchytraeidae	-	-	1	-	-	2
Lumbriculidae	-	2	-	3	2	-
Lumbricidae	1	-	-	1	-	-
Glossiphonidae	-	1	-	3	1	-
Erpobdellidae	-	-	-	1	1	-
Hydracarina	-	1	-	-	-	-
Gammaridae	3	1	-	3	3	-
Baetidae	2	-	-	1	1	-
Hydropsychidae	-	-	-	1	-	-
Limnephilidae	1	-	-	1	1	-
Tipulidae	1	-	-	1	-	1
Psychodidae	-	-	1	-	-	-
Ceratopogonidae	-	1	-	-	-	-
Tanypodinae	1	-	-	-	-	-
Prodiamesinae	1	-	-	-	-	-
Orthocladiinae	-	2	-	2	2	-
Chironomini	-	-	-	1	1	-
Stratiomyidae	-	-	-	1	-	-
Empididae	-	-	-	1	-	-
Dolichopodidae	1	-	1	-	-	-
Muscidae	-	-	1	-	-	-

Table 6. Taxa recorded at sites on the Saltwood and Seabrook streams in April 1987, April 1988 and April 1989.

	SW1			SW2			SB1			SB3			SB4		
	87	88	89	87	88	89	87	88	89	87	88	89	87	88	89
TRICLADIDA (flatworms)															
Polycelis felina	+	-	-	+	-	-	-	-	-	+	-	+	-	-	-
MOLLUSCA (freshwater snails)															
Hydrobiidae															
Potamopyrgus jenkinsi	+	+	+	+	+	+	-	+	+	+	+	+	-	-	+
Ancylidae															
Ancylus fluviatilis	+	+	+	-	-	-	-	-	-	+	-	+	-	-	-
Succineidae															
Succinea sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
Zonitidae															
Zonitoides nitidus	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-
Sphaeriidae															
Pisidium sp.	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Pisidium casertanum	-	-	-	+	+	+	-	-	-	+	-	-	-	-	+
Pidisium nitidum	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Pisidium personatum	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Pisidium subtruncatum	+	+	-	+	+	+	+	+	+	-	-	-	+	-	-
OLIGOCHAETA (worms)															
Naididae															
Nais elinguis	+	-	+	-	-	+	-	-	-	+	-	+	+	-	-
Nais communis gp.	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-
Tubificidae															
Aulodrilus pluriseta	+	-	+	-	-	-	-	-	+	-	-	-	+	-	-
Limnodrilus hoffmeisteri	+	-	+	-	-	-	-	-	-	-	-	-	+	+	-
Psammoryctides barbatus	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-
Rhyacodrilus coccineus	-	+	+	-	+	+	+	+	+	+	+	+	+	-	+
Spirosperma velutinus	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Tubifex tubifex	+	+	+	-	+	+	-	-	+	-	-	-	-	-	+
indet Tubificidae	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Enchytraeidae	-	-	-	-	-	-	-	-	-	+	-	+	+	-	+
Lumbriculidae															
Stylodrilus heringianus	+	+	-	+	+	+	-	-	-	+	-	-	-	-	-
Stylodrilus sp.	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-
Lumbricidae	+	-	+	+	+	+	-	-	+	+	-	+	-	+	-
HIRUDINEA (leeches)															
Glossiphoniidae															
Glossiphonia complanata	+	+	+	+	+	+	-	-	-	+	-	+	-	-	-
Helobdella stagnalis	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-
Erpobdellidae															
Erpobdella octoculata	-	-	-	+	+	+	-	-	-	-	+	+	-	+	-
HYDRACARINA (freshwater mites)	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA (water slaters and shrimps)															
Asellidae															
Asellus meridianus	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
Gammaridae															
Gammarus pulex	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
EPHEMEROPTERA (mayflies)															
Baetis rhodani	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Baetis vernus	+	+	+	-	+	-	-	+	-	-	-	-	+	-	-
Centroptilum luteolum	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Leptophlebiidae															
Paraleptophlebia submarginata	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-

	SW1			SW2			SB1			SB3			SB4		
	87	88	89	87	88	89	87	88	89	87	88	89	87	88	89
Ephemeridae															
Ephemera danica	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-
PLECOPTERA (stoneflies)															
Nemouridae															
Amphinemura standfussi	+	+	+	-	+	-	-	-	-	-	-	-	-	-	-
Nemoura erratica	+	+	+	-	+	-	-	-	-	+	-	-	-	-	-
Nemurella picteti	+	-	-	-	-	-	-	-	-	+	-	-	+	-	-
Leuctridae															
Leuctra sp.	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
HEMIPTERA (water bugs)															
Veliidae															
Velia caprai	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Corixidae															
Sigara distincta	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COLEOPTERA (water beetles)															
Hydrophilidae indet.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scirtidae (≡ Helodidae)															
Elodes sp. (≡ Helodes)	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-
Elmidae															
Elmis aenea	+	+	+	+	+	+	-	-	+	+	+	+	-	-	-
Limnius volckmari	+	+	+	+	+	+	-	+	-	+	-	+	-	+	-
Riolus subviolaceous	-	+	-	-	-	-	+	+	-	-	+	-	-	-	-
MEGALOPTERA (alderflies)															
Sialidae															
Sialis fuliginosa	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-
TRICHOPTERA (caddisflies)															
Hydropsychidae															
Hydropsyche angustipennis	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Hydropsyche siltalai	+	+	-	-	-	+	+	+	+	+	+	-	-	-	-
Polycentropodidae															
Plectrocnemia conspersa	+	+	+	-	-	-	+	+	+	+	-	+	-	-	-
Psychomyiidae															
Lype reducta	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-
Tinodes unicolor	-	-	-	-	-	-	+	+	-	-	+	-	-	-	-
Tinodes sp.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacophilidae															
Agapetus sp.	+	+	-	-	-	-	+	+	+	-	-	-	-	-	-
Rhyacophila dorsalis	+	+	+	-	-	+	+	+	-	+	+	+	+	-	-
Goeridae															
Silo pallipes	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Lepidostomatidae															
Crunoecia irrorata	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Beraeidae															
Beraea maurus	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-
Limnephilidae															
Halesus digitatus/radiatus	-	-	+	-	+	+	-	+	+	-	+	+	+	-	+
Limnephilus lunatus	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Micropterna sequax	+	-	+	+	+	-	+	+	+	-	+	+	-	-	-
Potamophylax cingulatus/ latipennis	+	+	-	+	-	-	-	-	-	+	-	-	+	-	-
Sericostomatidae															
Sericostoma personatum	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-
DIPTERA (true flies)															
Ceratopogonidae	+	-	+	-	-	-	-	-	+	-	-	-	-	-	+
Chironomidae/Tanypodinae															
Apsectrotanypus trifascipennis	+	+	+	-	-	-	-	-	+	-	-	-	-	-	+
Thienemannimyia group	+	-	+	-	-	+	-	-	-	-	-	-	-	-	-
Zavrelimyia group	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-

	SW1			SW2			SB1			SB3			SB4		
	87	88	89	87	88	89	87	88	89	87	88	89	87	88	89
Chironomidae/Prodiamesinae															
Odontomesa fulva	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+
Prodiamesa oliveacea	+	+	+	-	-	-	+	-	+	-	-	-	+	-	+
Chirionomidae/Orthocladiinae															
Brillia modesta	+	-	+	-	+	-	+	+	+	+	-	+	+	-	-
Chaetocladius sp.	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+
Epoicolcladius flavens	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Eukiefferiella sp.	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Heleniella ornaticollis	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Orthocladius/Cricotopus sp.	+	-	+	+	-	-	+	+	-	+	-	+	+	-	+
Parametriocnemus stylatus	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Paratrissocladius sp.	+	-	-	-	-	-	-	-	+	-	-	-	-	-	+
Rheocricotopus sp.	+	+	+	+	-	-	-	-	-	+	+	+	+	+	+
Symposiocladius 'acutilabis'	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tvetenia sp.	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-
Chironomidae/Chironomini															
Polypedilum sp.	+	+	-	-	-	-	+	-	-	-	-	-	-	-	-
Chironomidae/Tanytarsini															
Rheotanytarsus sp.	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-
Stempellinella sp.	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Tanytarsus/Micropsectra sp.	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Dixidae															
Dixa nubilipennis group	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Empididae															
Chelifera 'type'	+	-	+	-	-	-	-	-	+	-	-	+	-	-	-
Hemerodromia 'type'	+	+	+	-	-	+	+	+	-	+	+	+	-	-	-
Muscidae															
Limnophora sp.	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-
Psychodidae															
Pericoma diversa	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Pericoma trivialis	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Pericoma sp.	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Ptychopteridae															
Ptychoptera lacustris	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-
Ptychoptera paludosa	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Simuliidae															
Simulium angustitarse group	+	-	-	-	-	-	-	+	+	-	-	-	-	-	+
Simulium ornatum group	+	-	-	+	+	+	+	+	+	+	+	-	+	+	-
Stratiomyiidae															
Oxycera sp.	-	-	-	-	-	+	-	+	-	-	+	-	-	-	-
Tipulidae															
Dicranota sp.	+	+	-	-	+	-	+	+	+	-	+	+	+	+	-
Eloeophila sp.	+	-	+	+	-	+	+	+	+	-	-	+	-	-	+
Limoniini indet.	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Nephrotoma sp.	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Pilaria sp.	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-
Rhypholophus sp.	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Tipula maxima	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 7. Observed (O) and Predicted (P) values of score, average score per taxon (ASPT) and numbers of taxa/families based on predictions of BMWP families for 'Spring' samples, April 1989.

Indices	Score			ASPT			Families		
Sites	O	P	O/P=S	O	P	O/P=A	O	P	O/P=I
Waterbrook 1#	61	101	0.60	3.81	4.22	0.90	16	20	0.81
Waterbrook 2	68	93	0.73	3.78	4.32	0.87	18	20	0.88
East Stour 1	103	100	1.03	4.68	4.77	0.98	22	21	1.07
Saltwood 1	68	97	0.71	4.86	5.09	0.96	14	20	0.72
Saltwood 2	64	95	0.68	4.27	5.11	0.84	15	19	0.79
Saltwood 3#	44	127	0.35	4.00	5.45	0.73	11	23	0.47
Seabrook 1	102	93	1.10	5.67	4.68	1.21	18	20	0.90
Seabrook 3	77	115	0.67	4.81	5.36	0.90	16	22	0.73
Seabrook 4	36	96	0.37	4.00	4.94	0.81	9	20	0.45
Seabrook 5 #	76	97	0.78	4.75	5.38	0.87	16	22	0.71
Pent 2	4	101	0.04	2.00	4.63	0.43	2	20	0.10
Pent 3#	6	99	0.06	3.00	5.23	0.57	2	20	0.10

# Indicates the presence of a warning notice on the prediction. (A warning message is shown on screen and printout if, on the basis of the physical and chemical data, the site has a probability of less than 5% of belonging to any of the classification groups.)

Table 8. The total number of 'families' and species (where applicable) in samples obtained in April 1987, 1988 and 1989 from sites on the Waterbrook (WB), East Stour (ES), Saltwood (SW), Seabrook (SB) and the Pent (P). Score and average score per taxon (ASPT) are also presented for 1987, 1988 and 1989.

	Total no. of 'families'			Score			ASPT		
Sites	87	88	89	87	88	89	87	88	89
WB1	23	27	22	64	71	61	4.0	3.9	3.8
WB2	21	29	23	67	90	68	3.9	4.1	3.8
ES1	25	30	29	79	119	103	4.2	5.0	4.7
SW1	32	25	21	124	94	68	5.4	5.2	4.9
SW2	19	18	24	57	69	64	4.1	4.6	4.3
SW3	17	15	18	58	49	44	4.1	4.1	4.0
SB1	22	22	26	94	107	102	5.5	5.6	5.7
SB2	23	21	-	93	71	-	4.9	4.7	-
SB3	25	17	20	92	71	77	4.8	5.1	4.8
SB4	14	11	14	47	32	36	4.7	3.6	4.0
SB5	20	15	20	56	59	76	4.3	4.5	4.8
P1	25	22	-	91	89	-	5.1	5.2	-
P2	11	10	5	33	23	4	4.1	3.3	2.0
P3	15	14	4	39	40	6	3.9	3.6	3.0

	Total no. of 'species'		
	87	88	89
SW1	52	34	34
SW2	25	26	31
SB1	29	30	36
SB3	28	19	27
SB4	21	11	19

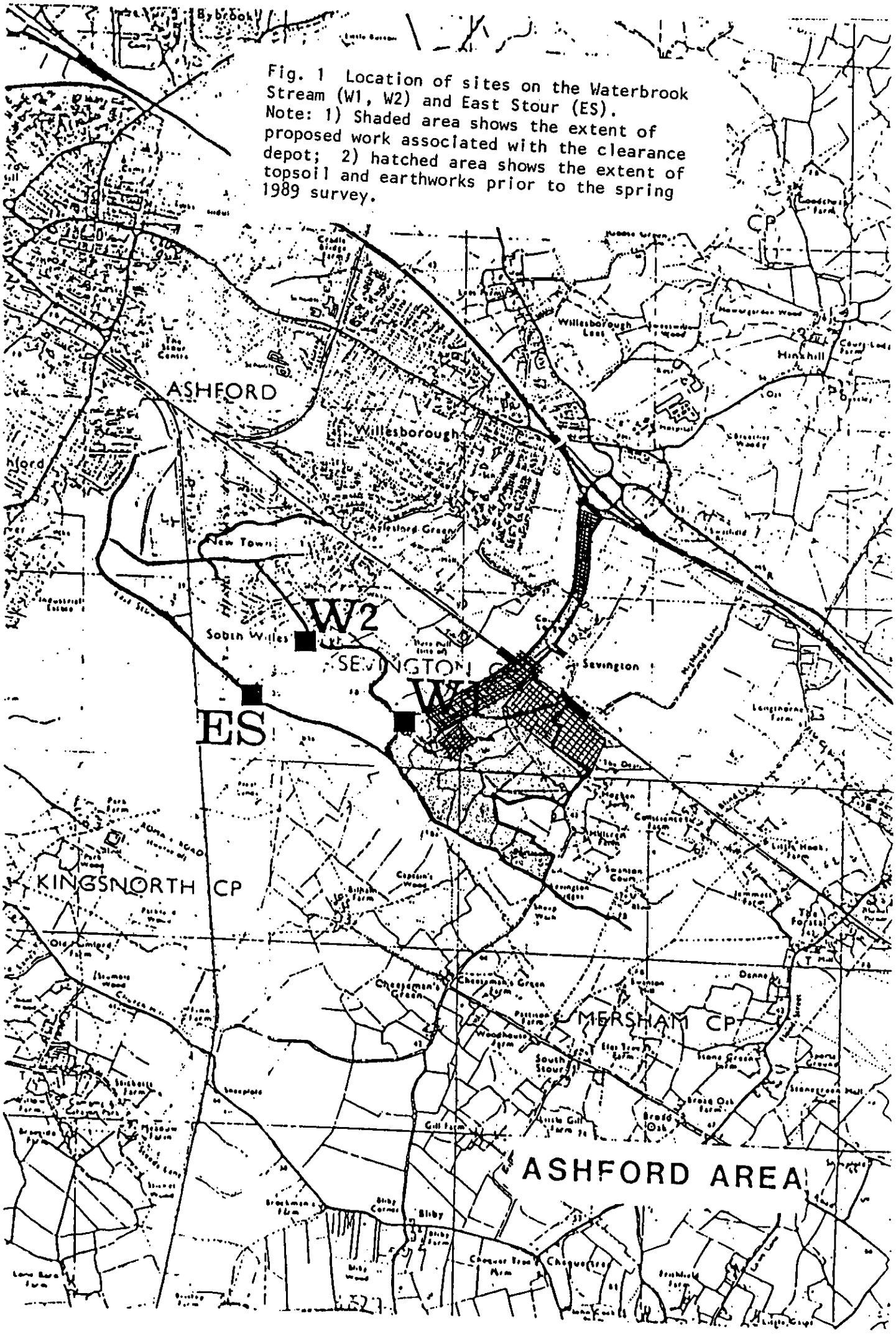

Fig. 1 Location of sites on the Waterbrook Stream (W1, W2) and East Stour (ES).
Note: 1) Shaded area shows the extent of proposed work associated with the clearance depot; 2) hatched area shows the extent of topsoil and earthworks prior to the spring 1989 survey.

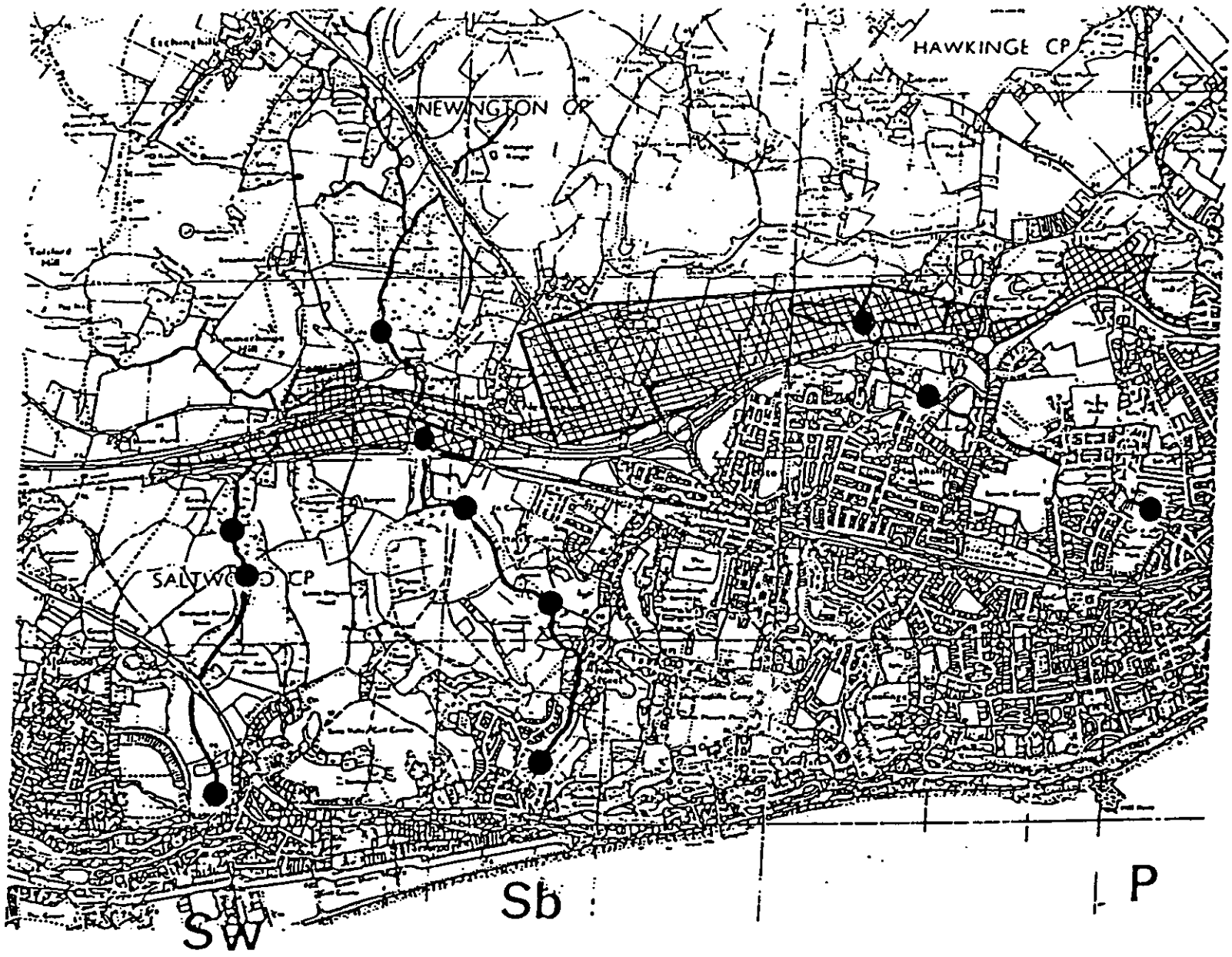

Fig. 2 Location of sites in the Folkestone area (Sw = Saltwood, Sb = Seabrook, P = Pent)
(Hatched areas = topsoil strip prior to spring 1989 survey)

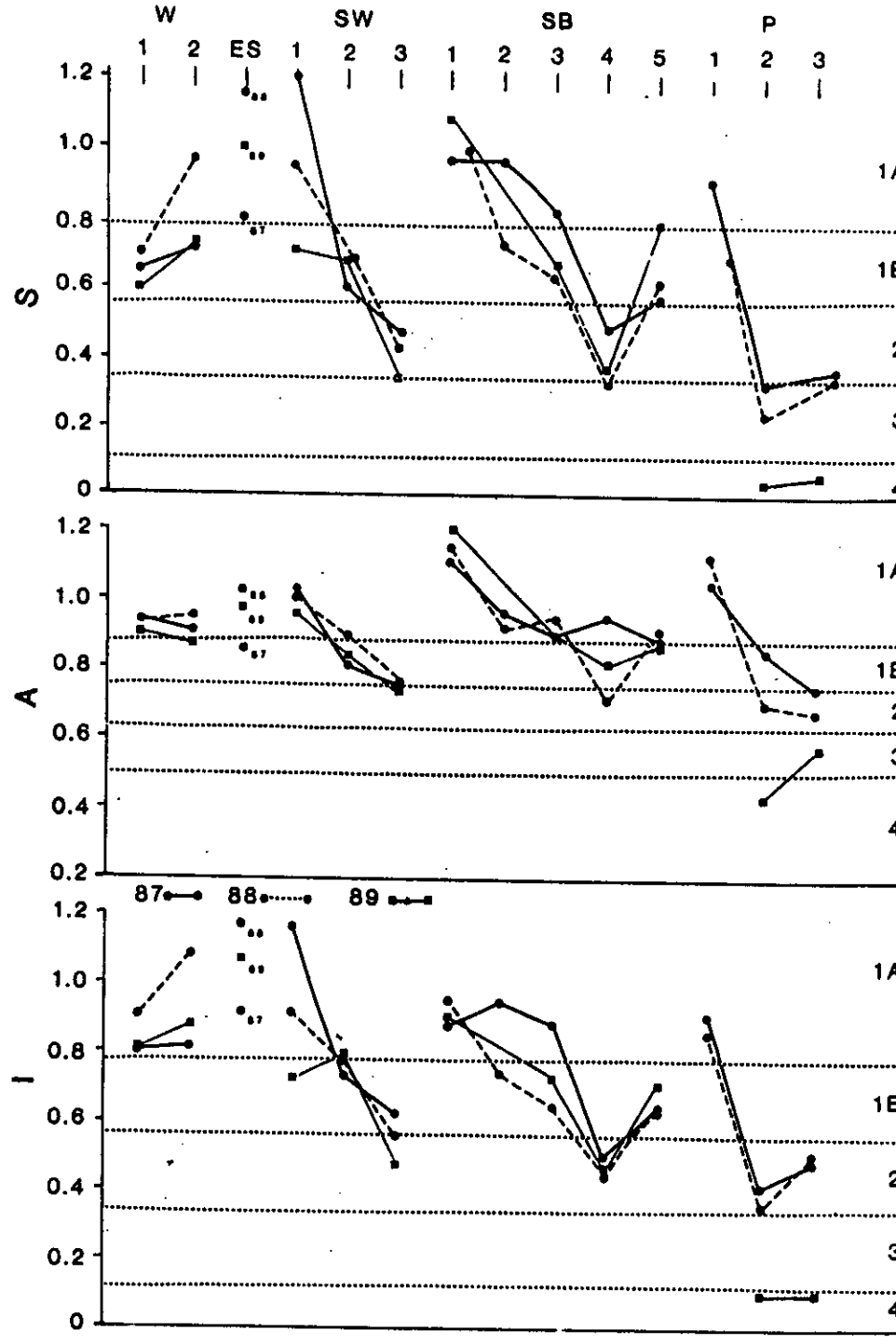

Fig. 3 Variation in index values based on predictions of BMWP families for 'spring' samples. Indices represent Observed value/Predicted values and are presented for Biotic Score (S), ASPT (A) and number of scoring families (I), for 14 sites for spring 1987 and 1988 and for 12 sites in 1989. (SW = Saltwood, SB = Seabrook, P = Pent)

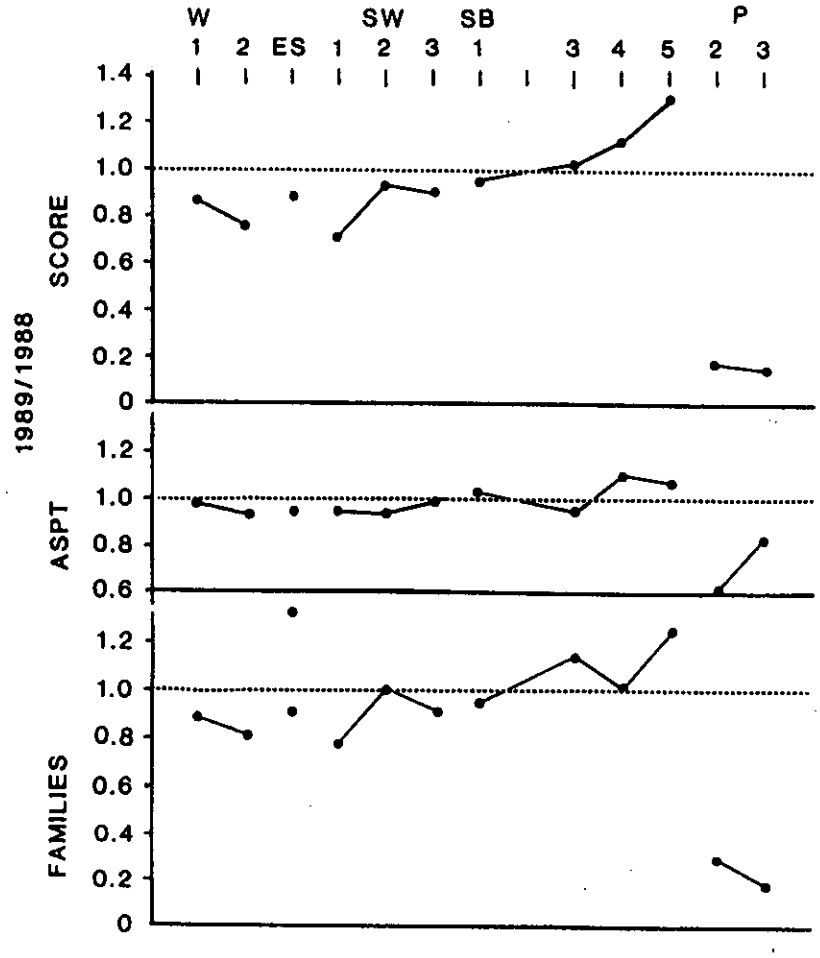

Fig. 4 The ratios of observed spring 1989 values of score, ASPT and numbers of scoring families over the 1988 spring values of these parameters.

Appendix. The following tables list faunal changes at the Ashford sites and in the three Folkestone streams in spring samples. 'New in 1989' = taxa new at this site in the spring survey. 'Missing in 1989' = taxa absent in 1989 but present in both 1987 and 1988. Data are presented at family level (tables A-D) and at species level for the Saltwood and Seabrook sites (tables E-F).

	New in 1989	Missing in 1989 (but present in 1987 and 1988)
Table A. Ashford sites		
WATERBROOK 1		
Dendrocoelidae	-	+
Haliplidae	+	-
Sialidae	-	+
WATERBROOK 2		
Dendrocoelidae	-	+
Dytiscidae	-	+
Orthocladiinae	-	+
EAST STOUR 1		
Physidae	+	-
Zonitidae	+	-
Naididae	+	-
Lumbricidae	+	-
Hydropsychidae	-	+
Table B. Saltwood stream		
SALTWOOD 1		
Ancylidae	-	+
Zonitidae	+	-
Sphaeriidae	-	+
Psychomyiidae	-	+
Hydropsychidae	-	+
Goeridae	-	+
Chironomini	-	+
SALTWOOD 2		
Zonitidae	+	-
Naididae	+	-
Rhyacophilidae	+	-
Hydropsychidae	+	-
Tanypodinae	+	-
Tanytarsini	+	-
Stratiomyidae	+	-
Empididae	+	-
SALTWOOD 3		
Zonitidae	+	-
Naididae	+	-
Chironomini	+	-
Simuliidae	-	+

	New in 1989	Missing in 1989 (but present in 1987 and 1988)
Table C. Seabrook stream		
SEABROOK 1		
Lumbricidae	+	-
Ceratopogonidae	+	-
Tanypodinae	+	-
SEABROOK 3		
Hydropsychidae	-	+
Beraeidae	+	-
Simuliidae	-	+
SEABROOK 4		
Hydrobiidae	+	-
Dixidae	+	-
Tanypodinae	+	-
SEABROOK 5		
Sphaeriidae	+	-
Glossiphoniidae	+	-
Nemouridae	+	-
Polycentropodidae	+	-
Psychomyiidae	+	-
Tipulidae	-	+
Simuliidae	-	+
Table D. Pent stream		
PENT 2		
Planariidae	-	+
Sphaeriidae	-	+
Tubificidae	-	+
Enchytraeidae	+	-
Gammaridae	-	+
Psychodidae	+	-
Muscidae	+	-
PENT 3		
Sphaeriidae	-	+
Enchytraeidae	+	-
Lumbriculidae	-	+
Glossiphoniidae	-	+
Erpobdellidae	-	+
Gammaridae	-	+
Baetidae	-	+
Limnephilidae	-	+
Orthocladiini	-	+
Chironomini	-	+

Table E. Saltwood stream

	New in 1989	Missing in 1989 (but present in 1987 and 1988)
SALTWOOD 1		
Zonitoides nitidus	+	-
Pisidium personatum	-	+
Pisidium subtruncatum	-	+
Hydropsyche siltalai	-	+
Lype reducta	-	+
Agapetus sp.	-	+
Silo pallipes	-	+
Halesus digitatus/radiatus	+	-
Potamophylax cingulatus/ latipennis	-	+
Polypedilum sp.	-	+
Dicranota sp.	-	+
SALTWOOD 2		
Zonitoides nitidus	+	-
Pisidium nitidum	+	-
Nais communis group	-	+
Hydropsyche angustipennis	+	-
Hydropsyche siltalai	+	-
Rhyacophila dorsalis	+	-
Limnephilus lunatus	+	-
Micropterna sequax	-	+
Thienemannimyia gp.	+	-
Rheotanytarsus sp.	+	-
Hemerodromia type	+	-
Oxycera sp.	+	-
Rhypholophus sp.	+	-

Table F. Seabrook stream

SEABROOK 1		
Aulodrilus pluriseta	+	-
Tubifex tubifex	+	-
Lumbricidae	+	-
Centroptilum luteolum	+	-
Elmis aenea	+	-
Riolus subviolaceus	-	+
Lype reducta	+	-
Tinodes unicolor	-	+
Rhyacophila dorsalis	-	+
Ceratopogonidae	+	-
Apsectrotanypus trifascipennis	+	-
Zavrelimyia group	+	-
Epoicocladius flavens	+	-
Orthocladius/Cricotopus	-	+
Paratrissocladius sp.	+	-
Tanytarsus/Micropsectra	+	-
Chelifera type	+	-
Hemerodromia type	-	+
Ptychoptera paludosa	+	-

Table F (contd)

	New in 1989	Missing in 1989 (but present in 1987 and 1988)
SEABROOK 3		
(*Pisidium* sp.)	+	- (*P. casertanum* in 1987)
Nais communis group	+	-
Hydropsyche siltalai	-	+
Beraea maurus	+	-
Chelifera type	+	-
Simulium ornatum group	-	+
Eloeophila group	+	-
SEABROOK 4		
Potamopyrgus jenkinsi	+	-
Pisidium casertanum	+	-
Limnodrilus hoffmeisteri	-	+
Tubifex tubifex	+	-
Ceratopogonidae	+	-
Apsectrotanypus trifascipennis	+	-
Chaetocladius sp.	+	-
Paratrissocladius sp.	+	-
Dixa nubilipennis group	+	-
Simulium angustitarse group	+	-
Simulium ornatum group	-	+
Dicranota sp.	-	+
Eloeophila sp.	+	-

CHANNEL TUNNEL PROJECT

FOLKESTONE TERMINAL
AND
ASHFORD CHANNEL TUNNEL DEVELOPMENT

STREAM SURVEY AND ASSESSMENT

IN THE ASHFORD AND FOLKESTONE AREAS

SPRING 1989

REV.	DATE	BY AUTEUR	CHECKED VERIFIE	APPROVED APPROUVE	MODIFICATIONS	STATUS STATUT
B	Sept 1989				Minor amendments	VLA
A	Aug 1989				Original Version	VLO

APPROVED BY TML							
	REV.	B					
	SIGNED						
	DATE	15 Sept 89					

EUROTUNNEL

TRANSMANCHE-LINK
CONTRACTOR / ENTREPRENEUR

CHANNEL TUNNEL – TUNNEL SOUS LA MANCHE

ORIGINATOR IDENTITY AND INTERNAL DOCUMENT NUMBER:
Natural Environmental Research Council
Freshwater Biological Association TO4019-1/1

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TYPE: R P — STATUS: V L A

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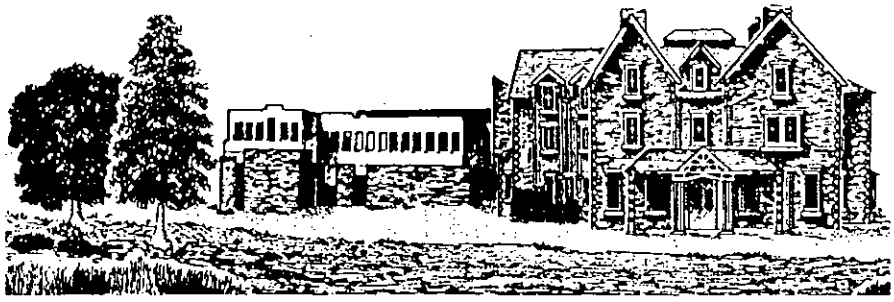

The **Freshwater Biological Association** is the leading scientific research organisation for the freshwater environment in the United Kingdom. It was founded in 1929 as an independent organisation to pursue fundamental research into all aspects of freshwater biology and chemistry. The FBA has two main laboratories. The headquarters is at Windermere in the Lake District and the River Laboratory is in the south of England. A small unit has recently been established near Huntingdon to study slow-flowing eastern rivers.

The FBA's primary source of funding is the Natural Environment Research Council but, in addition, the Association receives substantial support from the Department of the Environment and the Ministry of Agriculture, Fisheries and Food who commission research projects relevant to their interests and responsibilities. It also carries out contracts for consulting engineers, water authorities, private industry, conservation bodies, local government and international agencies.

The staff includes scientists who are acknowledged experts in all the major disciplines. They regularly attend international meetings and visit laboratories in other countries to extend their experience and keep up to date with new developments. Their own knowledge is backed by a library housing an unrivalled collection of books and periodicals on freshwater science and with access to computerized information retrieval services. A range of experimental facilities is available to carry out trials under controlled conditions. These resources can be made available to help solve many types of practical problems. Moreover, as a member of the Terrestrial and Freshwater Sciences Directorate of the Natural Environment Research Council, the FBA is able to link up with other institutes to provide a wider range of environmental expertise as the occasion demands. Thus, the FBA is in a unique position to bring relevant expertise together for problems involving several disciplines.

Recent contracts have involved a wide variety of topics including biological monitoring, environmental impact assessment, fisheries problems, salmon counting, ecological effects of reservoirs and other engineering works, control of water weeds, control of insect pests and effects of chemicals on plants and animals.

Windermere Laboratory
The Ferry House
Ambleside
Cumbria LA22 0LP
Telephone: 09662-2468
Telex: 8950511 ONEONE G
REF 16173001
Facsimile: 09662-6914

River Laboratory
East Stoke
Wareham
Dorset BH20 6BB
Telephone: 0929-462314
Telex: 8950511 ONEONE G
REF 16174001
Facsimile: 0929-462180

● **FRESHWATER BIOLOGICAL ASSOCIATION**
The Ferry House, Far Sawrey
Ambleside, Cumbria LA22 0LP
Tel: 09662 2468 Fax: 6914
Telex: 8950511 ONEONE G
REF 16173001

○ **The River Laboratory**
East Stoke, Wareham
Dorset BH20 6BB
Tel: 0929 462314 Fax: 462180
Telex: 8950511 ONEONE G
REF 16174001

■ **INSTITUTE OF HYDROLOGY**
Wallingford, Oxon OX10 8BB
Tel: 0491 38800 Fax: 32256 Telex: 849365

□ **Plynlimon Office**
Staylittle, Llanbrynmair
Powys SY19 7DB
Tel: 05516 652

INSTITUTE OF TERRESTRIAL ECOLOGY

▲ **Edinburgh Research Station**
Bush Estate, Pencuik, Midlothian EH26 0QB
Tel: 031-445 4343 Fax: 3943 Telex: 72579

△ **Banchory Research Station**
Hill of Brathens, Glassel
Banchory, Kincardineshire AB3 4BY
Tel: 03302 3434 Fax: 3303 Telex: 739396

△ **Merlewood Research Station**
Grange-over-Sands, Cumbria LA11 6JU
Tel: 04484 2264 Fax: 4705 Telex: 65102

▲ **Monks Wood Experimental Station**
Abbots Ripton, Huntingdon, Cambs PE17 2LS
Tel:04873 381 Fax: 467 Telex: 32416

△ **Bangor Research Station**
Penhros Road, Bangor, Gwynedd LL57 2LQ
Tel: 0248 364001 Fax: 355365 Telex: 61224

△ **Furzebrook Research Station**
Wareham, Dorset BH20 5AS
Tel: 0929 51518 Fax: 51087

◆ **INSTITUTE OF VIROLOGY**
Mansfield Road, Oxford OX1 3SR
Tel: 0865 512361 Fax: 59962 Telex: 83147

★ **UNIT OF COMPARATIVE PLANT ECOLOGY**
Dept of Plant Sciences, Sheffield University, Sheffield S10 2TN
Tel: 0742 768555 Fax: 760159 Telex: 547216

◆ **UNIT OF WATER RESOURCES SYSTEMS RESEARCH**
Dept of Civil Engineering
Newcastle University
Newcastle upon Tyne NE1 7RU
Tel: 091-232 8511 Fax: 261 0191 Telex: 53654

▼ **DIRECTORATE OF TERRESTRIAL & FRESHWATER SCIENCES**
Natural Environment Research Council
Polaris House, North Star Avenue
Swindon SN2 1EU
Tel: 0793 40101 Fax: 511117 Telex: 444293

DIRECTORATE OF TERRESTRIAL & FRESHWATER SCIENCES

Natural Environment Research Council