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NATIONAL RIVERS AUTHORITY
BIOLOGY
TEDDINGTON LOW FLOW SURVEY 1991

NRA

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SUMMARY

Due to low rainfall and water abstraction in the upper Thames, flows over Teddington Weir into the tidal Thames decreased throughout 1991, falling to a minimum around mid October. However, for most of the summer there were no restrictions on the minimum flow over Teddington Weir, the target flow remaining at 800tcmd. Flows during summer 1991 were slightly higher than in 1989 and 1990.

Samples were taken to investigate the effects of low flows on the biological community of the river. As with the Teddington Low Flow Surveys of 1989 and 1990, five sites were visited once every month until the target flow fell below 800tcmd, from which time samples were taken every fortnight.

The BMWP scores during 1991 never attained the higher values of 1989 or 1990. This may have been due to the very low flows of winter 1990/1991, reducing the natural drift of macroinvertebrates in the current of the river, and therefore preventing recolonisation downstream.

Low flows produced pronounced increases in salinity and an influx of estuarine macroinvertebrates such as the shrimp *Corophium lacustre* and the prawn *Palaemon longirostris*.

Macrophytes remained at low levels for most of the year. *Lemna* (duckweed), *Azolla* (water fern) and *Elodea* (Canadian waterweed) were recorded. No extensive mats formed downstream of the weir, such as those experienced during 1989 and 1990.

Phytoplankton levels increased throughout the spring to a maximum around May-June, and then gradually fell to low levels in the Autumn. Downstream of Teddington Weir, blue-green algae were present at Teddington and Isleworth; the highest levels were recorded at Isleworth in December. Upstream of the Weir, blue-green algae were present at all sites, the highest levels were at Raven's Ait in November.

There was an obvious increase in benthic algae downstream of the weir throughout the year, peaking around mid October. However, levels did not constitute a problems such as those experienced in 1990.

It is proposed to continue the same 1991 sampling programme into 1992.

This is not Summary

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1. INTRODUCTION

In 1976, following a very dry spring and early summer, a drought order was brought in to allow increased abstraction from the River Thames to take place, in order to maintain drinking water supplies. Consequently, flows over Teddington weir fell to extremely low levels. Due to the conditions of the Thames Water Authority abstraction licence, restrictions on flow could not be invoked early on in the year. It was proposed that if there had been more flexible restrictions on flow, there would have been less need for drastic flow reduction, and reservoir supplies could still have been maintained.

The effects of these low flows in 1976, and the resulting public inquiry of 1986 led to the creation of the Teddington Flow Proposal. This allowed Thames Water Authority to vary the conditions of its licence to abstract water from the River Thames between Windsor and Teddington. Increased abstraction during the winter and spring period was allowed, in order to maintain reservoir levels and prevent excessive abstraction during the summer. The minimum target flow over the weir could be reduced, when necessary, to 200 thousand cubic metres of water per day (tcmd).

The Proposal recommended biological monitoring of the river, the results of which, as well as further information regarding the Proposal, are detailed in the Teddington Low Flow Survey reports of 1989 and 1990 (Attrill, 1990 and 1991).

This document presents the results of the 1991 Teddington Low Flow Survey.

2. METHOD

2.1 SITES

DOWNSTREAM OF TEDDINGTON WEIR

Five sites were sampled downstream of the weir; Teddington, Isleworth, Kew, Hammersmith Bridge and Cadogan Pier, at the same position as for the previous Teddington Low Flow Surveys. Figure 1 shows the positions of these sites.

UPSTREAM OF TEDDINGTON WEIR

Upstream of the weir, 4 sites were sampled for phytoplankton only; Teddington (upstream), Raven's Ait, Walton and Littleton. At the Teddington site, macroinvertebrates were sampled every 2 months, as a comparison with the downstream community. The 4 upstream sites at Littleton, Walton, Raven's Ait, and Kingston used in the 1989 and 1990 surveys, were not sampled for macroinvertebrates this year, as it was felt that low flows had no noticeable effect upon these communities. Figure 2 shows the position of these sites.

2.2 SAMPLING METHODOLOGY

The aim was for each site to be visited once every four weeks, until the target flow over Teddington weir fell below 800 tcmd. The sampling frequency was then to be increased to once every 2 weeks. Phytoplankton samples, however, were taken once every 2 weeks regardless of flow, except in December, January and February, when once a month was sufficient. The parameters measured were the same as for the 1989 and 1990 surveys, except coliform bacteria were not recorded, as it was felt that low flows had no noticeable effect on bacteria levels. The sites, the dates on which they were sampled, and the type of sample taken are listed in Table 1.

2.2.1 MACROINVERTEBRATES

75 macroinvertebrate samples were taken in 1991, with the standardised kick sample method used in the 1989 and 1990 Teddington Low-Flow Surveys.

Macroinvertebrates were identified to family level, and the Biological Monitoring Working Party (BMWP) score calculated for each site. The score gives an indication of species richness, and the ~~degree~~ response of ~~tolerance~~ of the macroinvertebrate community to any organic pollution. A high score tends to indicate a healthy environment. In addition, the Average Score Per Taxon (ASPT) was calculated for each sample, by dividing the BMWP score by the number of scoring families (n). This can offer a reliable index, and shows if the spread of BMWP scoring groups are biased towards pollution-tolerant or sensitive families.

At the 5 tidal sites the presence of non BMWP-scoring, primarily estuarine macroinvertebrates was also recorded, to give an indication of the salinity at these sites.

2.2.2 PHYTOPLANKTON

105 samples were taken downstream, and 88 upstream of the weir at Teddington. The method of sample collection and identification followed that of the two previous surveys.

2.2.3 MACROPHYTES

The presence of aquatic macrophytes, particularly *Lemna* (duckweed), *Azolla* (water fern) and *Elodea* (Canadian waterweed) was recorded.

2.2.4 BENTHIC ALGAE

The extent of benthic algae growth was monitored at the estuarine sites. A score was devised to indicate the extent of mud deposition and of benthic algae cover on the mud.

2.2.5 TEMPERATURE

On-site temperature of river water was recorded on each sampling visit.

2.2.6 SALINITY

Salinity values for the estuarine sites were obtained from weekly boat-run data. The values are mid-tide corrected for ease of comparison.

3. RESULTS AND DISCUSSION

PHYSICAL FACTORS

In order to put the effects of low flows on the flora and fauna into perspective, the flow, salinity and temperature regimes for 1991 are first detailed.

3.1 TARGET FLOW

Under the terms of the Teddington Flow Proposal, minimum allowable flows over Teddington Weir are set throughout the year depending upon the demands of water supply and the natural flow of the River Thames; this is termed the target flow.

3.1.1 TARGET FLOW DURING 1991

Figure 3 displays the target flow for 1991. Low flows in winter 1990 meant that the target flow early in 1991 remained at 200 tcmd, the minimum permitted under the terms of the Teddington Flow Proposal. Flows then increased, and for a month between weeks 4 and 9, the target flow was increased to 600 tcmd. Subsequently, restrictions on flow were lifted as the target flow was further increased to 800 tcmd, and remained at this level for 28 weeks, until 11th September (week 37). Low flows until week 43 caused the target to be reduced to 600 tcmd, and then further reduced to 300 tcmd for a month until week 47. Heavy rain then fell, and the target flow was raised to 600 tcmd, and subsequently to 800 tcmd, as flow restrictions were again lifted from week 50, until the end of the year.

3.2 GAUGED FLOW

The amount of water that flows over Teddington Weir into the tidal part of the Thames is referred to as the gauged flow.

3.2.1 GAUGED FLOW DURING 1991

Figure 3 also shows the gauged flow for the whole of 1991. The mean weekly gauged flow has been calculated from the mean daily values, and therefore shows the general pattern of flow. After low flows in winter 1990, moderate to heavy periods of rainfall in the first 3 weeks of January produced a gauged flow higher than at any other time in 1991. Flows then declined, until heavy rainfall between 5th and 7th March caused another high peak in gauged flow around week 10. There was then no significant rainfall until week 18. Only light rain followed for the next 6 weeks. Moderate to heavy rainfall occurred between weeks 24 and 27, and again in weeks 29 and 31; gauged flows only increased slightly during this period. Heavy rainfall in week 39 caused a moderate increase in flow, and again around weeks 46 and 47 producing a more pronounced peak.

3.2.2 COMPARISON WITH 1989 AND 1990

Figure 4 compares the mean weekly flow for the summer and winter period of 1976, 1989, 1990, 1991 and a 10 year monthly mean. In 1989 and 1990 summer restrictions on flow, (i.e. a target flow of less than 800 tcmd) were introduced in weeks 29 and 23 respectively. Flows then remained very low for the rest of the summer in both years, in general at a lower level than in 1991. Flows in summer 1989 remained low until heavy rainfall by week 49 brought a dramatic rise in flow. In 1990 however, the target flow reached a lower level (200 tcmd), and remained at this level until the end of the year.

3.3 SALINITY REGIME

The salinity in the upper reaches of the tidal Thames reflects the amount of freshwater or gauged flow, over the weir.

3.3.1 SALINITY DURING 1991

Figure 5 shows the salinity values at 4 sites: Cadogan, Hammersmith, Kew and Richmond. The values are mid-tide corrected, at high-tide the values would be higher. Salinity was generally highest at Cadogan, however the low flows clearly had an effect on the salinity levels at the more upstream sites. Salinity first peaked around weeks 5 and 7, in between 2 periods of substantial freshwater flow. High salinity in weeks 21 to 25 coincided with a period when at most, only light showers were recorded. Another peak in salinity around week 29, was followed by episodes of increasing salinity towards the end of the year, in weeks 34 and 35, and subsequently around week 42, when some of the lowest flows of the year produced high salinity levels.

3.3.2 COMPARISON WITH 1989 AND 1990

Salinity levels for 1991 tended to follow the pattern of the previous two years, except that 1990 had slightly higher levels due to lower flows.

3.4 TEMPERATURE

Figures 6 and 7 display the on-site temperatures for the sites downstream and upstream of Teddington weir; the results are given in Appendix 1. Water temperature increased gradually throughout the spring and summer, rising to a maximum in August, except at the Teddington site upstream of the weir (Figure 7). The latter site gave a maximum reading in July. Temperature then decreased for the rest of the year. The NRA Thames Region standard for maximum estuarine water temperature is currently at 28°C; this standard was not exceeded at any of the 5 tidal sites.

BIOLOGICAL EFFECTS

3.5 MACROINVERTEBRATES

3.5.1 BMWP SCORES

Figure 8 illustrates the BMWP scores for the 5 tidal sites. Detailed macroinvertebrate results are given in Appendix 2. Table 2 provides a summary of the abundance of each taxa found at each site.

There is a general reduction in the number of taxa downstream, although some taxa such as Oligochaeta (worms), Hydrobiidae (snails), Lymnaeidae (pond snails), and Gammaridae (shrimps) are present in high numbers at all sites.

Teddington was the highest or joint highest scoring site on every sampling occasion. The BMWP score varied from 28 (3rd January) to 74 (7th November). This was the greatest range recorded at any site, presumably as it had more high-scoring sensitive taxa to lose. The score at Teddington was consistently high when maintenance of the Richmond half-tide lock (7.11, 25.11, 9.12), allowed a natural low-tide, and greater diversity of habitats to be sampled on the river bed. Only on 2 other occasions (12th August and 1st October) was the score as high.

Isleworth produced the lowest score (15) of all the sites (15th January); the highest score recorded at this site was 41 (9th September). The low score may be due to the influence of Mogden Sewage Treatment Works, whose effluent enters the river just upstream of this site.

The BMWP score at **Kew** varied from 16 (3rd January) to 42 (12th August), a range of 31.

The score at **Hammersmith Bridge** was the most consistent with a range of only 10. The lowest score was 22 (12th August, 9th September, 24th October, 7th November, 25th November) and the highest was 32 (11th July).

Cadogan Pier had more low scores than any other site. The lowest score was 16 (7th November) and highest was 30 (15th April).

3.5.2 COMPARISON WITH THE NRA STANDARD AND WITH 1989 AND 1990

The NRA Thames Region biological standard for the upper reach of the Tideway, is a BMWP score of at least 25. Figure 8 also illustrates this standard against the results achieved. **Teddington** never failed, which is an improvement from 1990 when this site failed twice. **Isleworth** failed on 5 occasions (which represents 36% of samples); in 1990 only 26% failed. **Kew** failed on 2 sampling occasions (14%), whilst in 1990 11% of samples failed at this site. **Hammersmith Bridge** failed 6 samples (43%), which is similar to the 1990 figure of 47%. Finally, at **Cadogan Pier** 6 samples failed in 1991 (43%), as opposed to 53% of samples in 1990. Table 3 summarises these results, and compares them with those of 1989.

3.5.3 COMPARISON OF TEDDINGTON WITH 1989 AND 1990

Figure 9 compares the BMWP scores at Teddington for 1989, 1990 and 1991. The BMWP score at Teddington for 1991 did not achieve the higher values of the previous years, except when maintenance of the Richmond half-tide lock allowed greater access to the river bed. When there were no restrictions in flow in 1989, Teddington scored up to 90, similarly in 1990 the score was around 80, and yet in 1991 the score only reached 64. Under normal flow conditions many benthic macroinvertebrates are dislodged and swept into the current, and can drift downstream for distances which can measure up to tens of metres per day

(Hynes, 1979). The low winter flows and lack of winter floods in 1990/1991 may have reduced this drift of fauna, and thus prevented recolonisation downstream of the weir.

3.5.4 COMPARISON OF TEDDINGTON SITES UPSTREAM AND DOWNSTREAM OF WEIR

Table 4 compares the upstream and downstream Teddington sites. The difference in fauna represents those not being washed over the weir, or those that can not tolerate the downstream conditions. The main taxa absent downstream, cover a range of BMWP scores from 3 (Physidae - bladder snails), to 7 (Rhyacophilidae and Limnephilidae - caddis-flies). There are also representatives from scoring groups in between these extremes - Viviparidae (river snails) and Platycnemidae (damselfly) scoring 6; Corixidae (lesser waterboatmen), Haliplidae (beetle), Dytiscidae (diving beetle) scoring 5; and Baetidae (mayfly) and Piscicolidae (fish leech) scoring 4.

3.5.5 ASPT VALUES

Figure 10 displays the ASPT values. From this and the earlier Figure 8, it is clear that a fall in BMWP score does not necessarily produce a corresponding fall in ASPT value. If pollution was affecting the macroinvertebrate community, then it would be expected that as the more pollution sensitive, high-scoring families were removed, the ASPT value would decrease. This infers that salinity, rather than pollution is probably playing an important role in removing taxa. The effects of salinity on the distribution of macroinvertebrates can be shown by reference to the family Corophiidae; the estuarine *Corophium lacustre* was present at Cadogan Pier, in smaller quantities at the more upstream site of Hammersmith Bridge, and on only one occasion at Kew. However, the freshwater *Corophium curvispinum* was present at Teddington, at Isleworth on one occasion, but not at Kew, Hammersmith Bridge or Cadogan Pier.

3.5.6 ESTUARINE MACROINVERTEBRATES

The presence of estuarine macroinvertebrates in kick samples reflects the level of salinity encroachment into the upper reaches. Table 5 lists those found in 1991. There is a clear increase in estuarine fauna at times of low flow, particularly towards the end of the year in weeks 41 and 42 (01.10 and 24.10), when high levels of salinity were recorded. Estuarine macroinvertebrates were recorded more often in 1990 compared with 1989 or 1991, reflecting the lower flows and higher salinity in this year. However, in 1989 estuarine fauna (sand gobies) penetrated up to Teddington, whilst in 1990 estuarine fauna (mysids) were found only as far upstream as Kew, and as far as Isleworth in 1991 (prawns, mysids and gobies).

3.6 PHYTOPLANKTON

3.6.1 SITES DOWNSTREAM OF TEDDINGTON WEIR

Figure 11 illustrates the levels of phytoplankton at the estuarine sites; results are given in Appendix 3. Abundance was low until April, and then increased to a maximum in May at Isleworth, Kew and Hammersmith Bridge, in June at Teddington, and in July at Cadogan Pier. Abundance then fell off to low levels (<500 cells/ml) by October. A maximum count of 15,399 cells/ml was recorded at Teddington on 13th June. The sudden decline in abundance on 27th June (week 26), coincided with a period of heavy rainfall, and it appears that the phytoplankton were to some extent washed away in the increasing flows. Blue-green algae (*Oscillatoria* type) were only present at Teddington and Isleworth. They were present on 5 occasions at Teddington, and on 4 occasions at Isleworth; with the highest concentration at Isleworth (11% abundance) on 9th December. Figure 12 shows the relative proportion of the various types of algae at each site for the whole year. The composition of phytoplankton was similar

for all sites; centric diatoms dominated except at Isleworth, where pennate diatoms were more profuse.

3.6.2 SITES UPSTREAM OF TEDDINGTON WEIR

Figure 13 illustrates the levels of phytoplankton at the sites upstream of Teddington Weir; the results are given in Appendix 3. Abundance was relatively low until April, rising quickly to a maximum in May due to the spring diatom bloom. Abundance then fell off to relatively low levels (<800 cells/ml) by October. A maximum count of 98,000 cells/ml was recorded at Teddington on 14th May. Blue-green algae (*Oscillatoria*, *Merismopedia*, *Microcystis* and *Anabaena* species) were recorded at all sites, although mainly at levels of <1%. Blue-green algae were present at Littleton on 9 occasions, at Walton on 6, at Raven's Ait on 11 and at Teddington on 13 occasions. The highest concentration was found at Raven's Ait (13% abundance) on 25th November; levels were not as high however, as those seen in October 1990, when a bloom of *Aphanizomenon* was recorded at Teddington. Figure 14 shows the relative proportion of the various types of algae at each site for the whole year; protozoans were not recorded. The composition of algae is similar to that found downstream of the weir; however, there was a higher diversity, especially with respect to the greens (Chlorophyceae), presumably due to the less harsh conditions upstream of the weir.

3.7 MACROPHYTES

Tables 6 and 7 display those macrophytes found at the sites downstream and upstream of Teddington Weir. *Lemna* (duckweed), *Azolla* (water fern) and, downstream of the weir, *Elodea* (Canadian waterweed) were present for most of the year, although generally at low levels. A maximum of 30-40% river coverage was recorded at Raven's Ait on 26th September. No extensive mats formed downstream of the weir such as those experienced during 1989 and 1990.

3.8 BENTHIC ALGAE

Figure 15 displays the relative benthic diatom cover during the survey period; results are given in Appendix 4. The cover was particularly extensive on the intertidal mud areas at Kew and Cadogan Pier. The former site has a long, shallow river bank which accumulates mud and benthic algae. The highest recorded cover of benthic algae was at Kew, on 9th September. No such algae were found at Teddington where very little mud is deposited. The cover at Isleworth remained constant throughout the year, although not at excessive levels. Benthic algae cover did not result in queries and complaints from the public, unlike in 1990.

4.0 CONCLUSIONS

4.1 After low flows in winter 1990, moderate to heavy periods of rain in early January and March, produced the two highest peaks of gauged flow over Teddington Weir recorded in 1991. Flows then declined during the spring and summer, and remained at this low level, except for an increase in flows in November.

4.2 Salinity levels increased at times of low flow; the highest levels were recorded in October.

4.3 River temperature increased gradually throughout spring and summer, rising to a maximum in July and August. The NRA estuarine water temperature standard was not exceeded.

4.4 There was a general reduction in the number of macroinvertebrate taxa downstream of Teddington Weir. This probably reflects increasing saline encroachment at times of low flows. Samples from Isleworth, Kew, Hammersmith Bridge and Cadogan Pier failed the NRA BMWP standard on at least two occasions. There was a clear increase in estuarine fauna at times of low flows, particularly in October.

4.5 Phytoplankton abundance increased to a maximum in May and June. Blue-green algae were present at Littleton, Walton, Raven's Ait, Teddington (upstream), Teddington (downstream), and Isleworth; these levels did not constitute a bloom.

4.6 *Lemna* (duckweed), *Azolla* (waterfern) and *Elodea* (Canadian waterweed) were present for most of the year, although generally at low levels. A maximum of 30-40% coverage was recorded at Raven's Ait in September.

4.7 Benthic algae covered intertidal mud areas at Kew and Cadogan Pier; the maximum coverage was recorded at Kew in September.

4.8 The monitoring programme will be continued for 1992. A separate review with recommendations will be compiled.

5.0 REFERENCES

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FIGURE 1 : SITES DOWNSTREAM OF TEDDINGTON WEIR

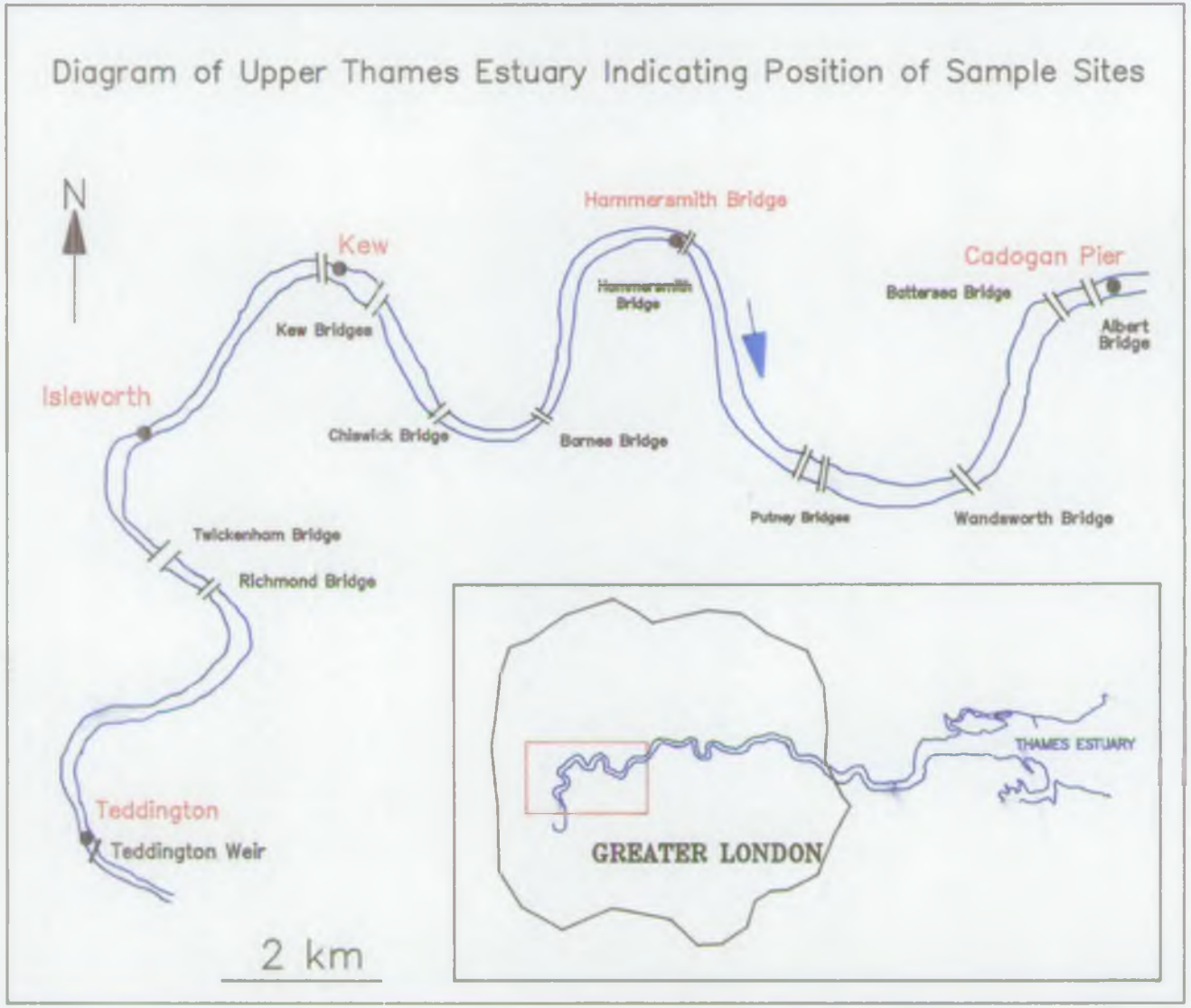


FIGURE 2 : SITES UPSTREAM OF TEDDINGTON WEIR

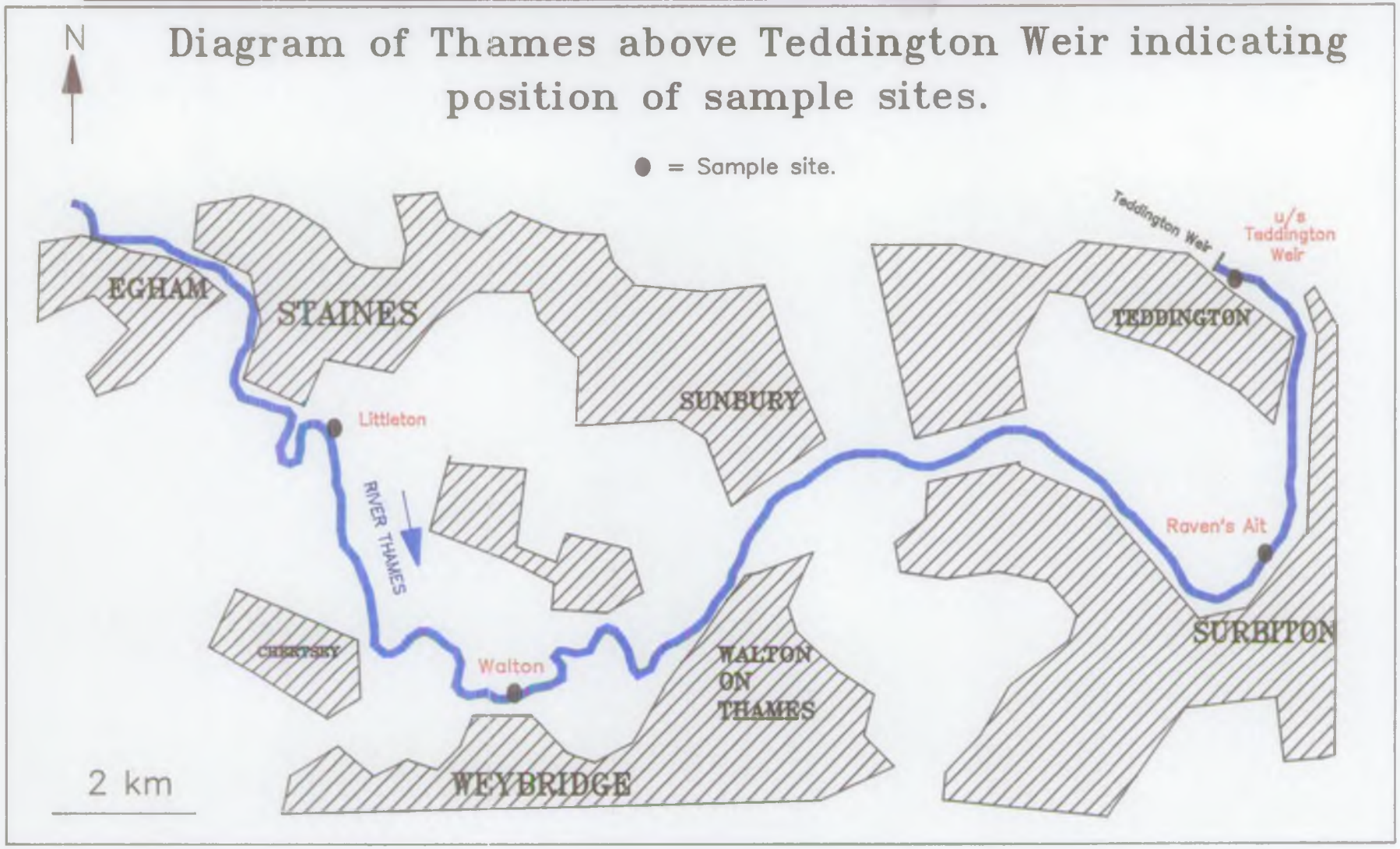


FIGURE 3 : GAUGED AND TARGET FLOWS

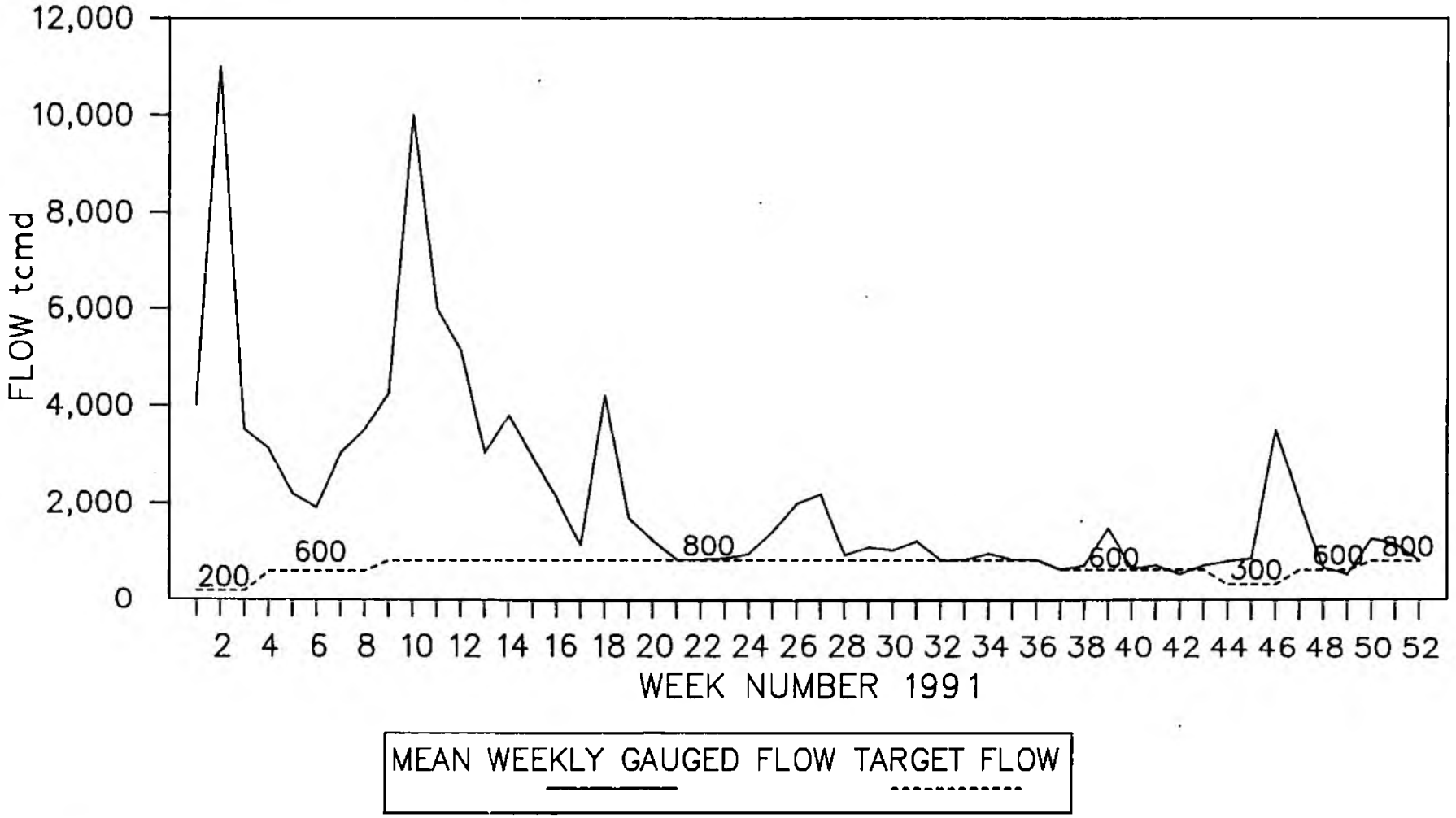


FIGURE 4 : MEAN WEEKLY FLOW
COMPARISON OF 1976, 1989, 1990 & 1991

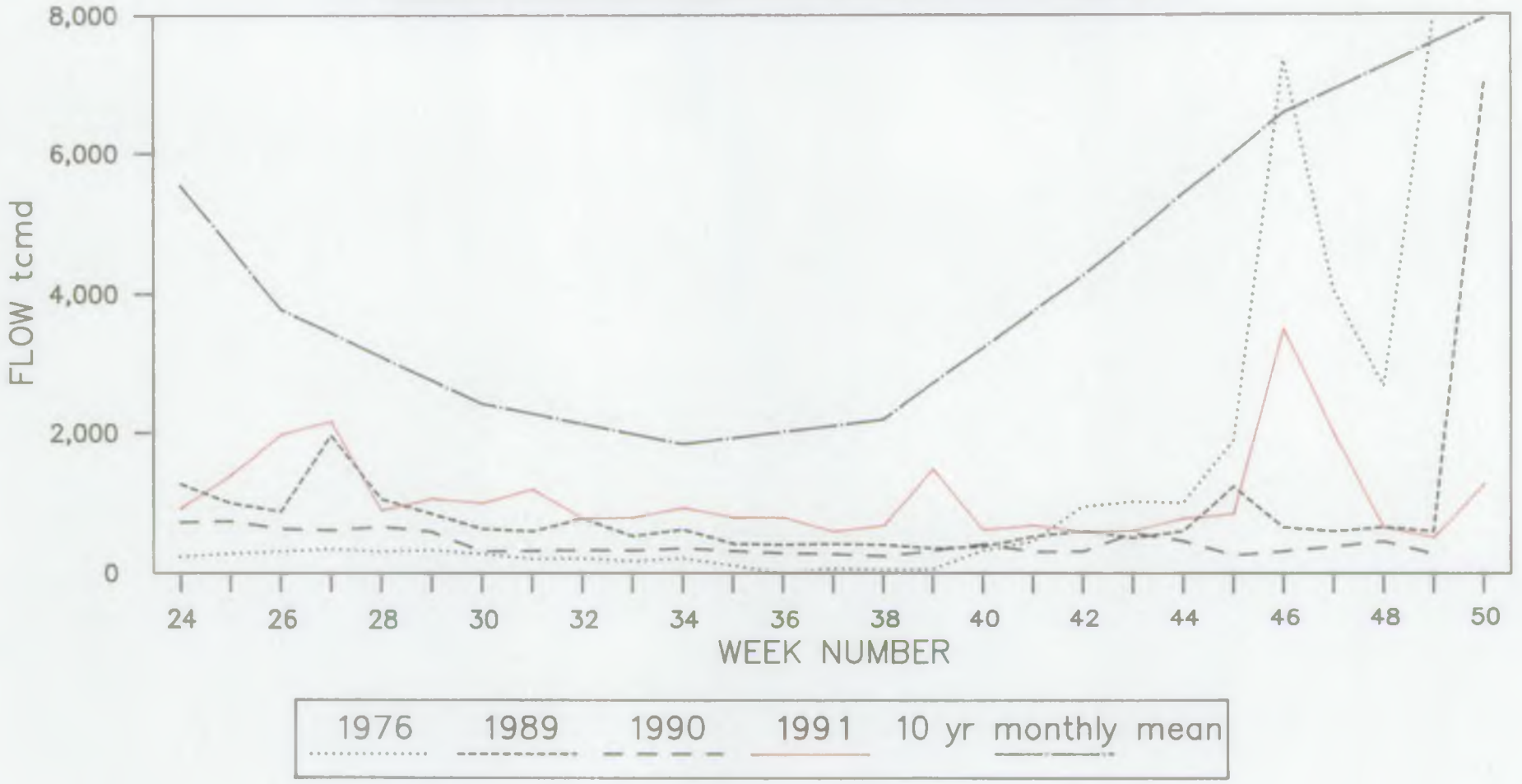


FIGURE 5 : SALINITY

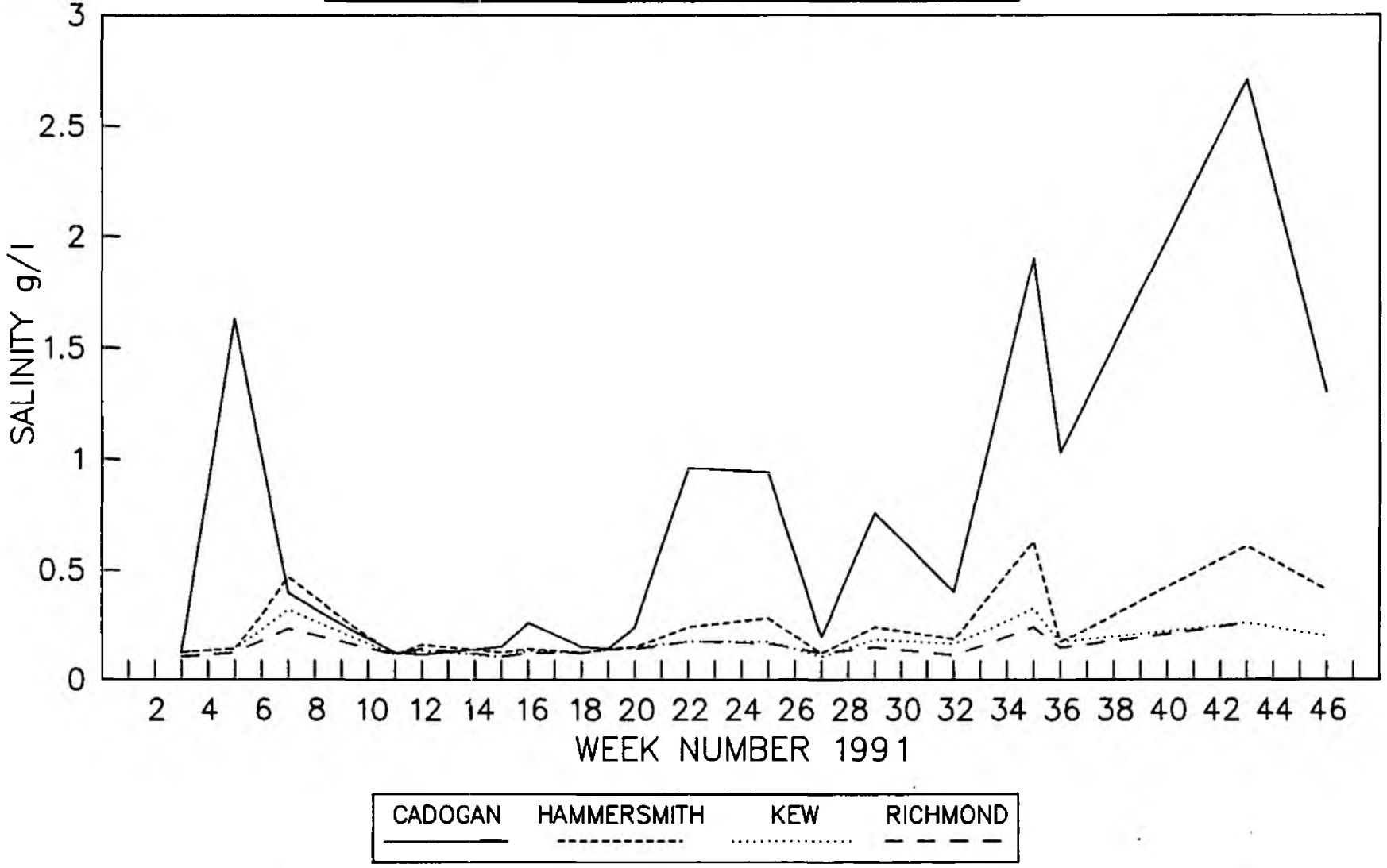
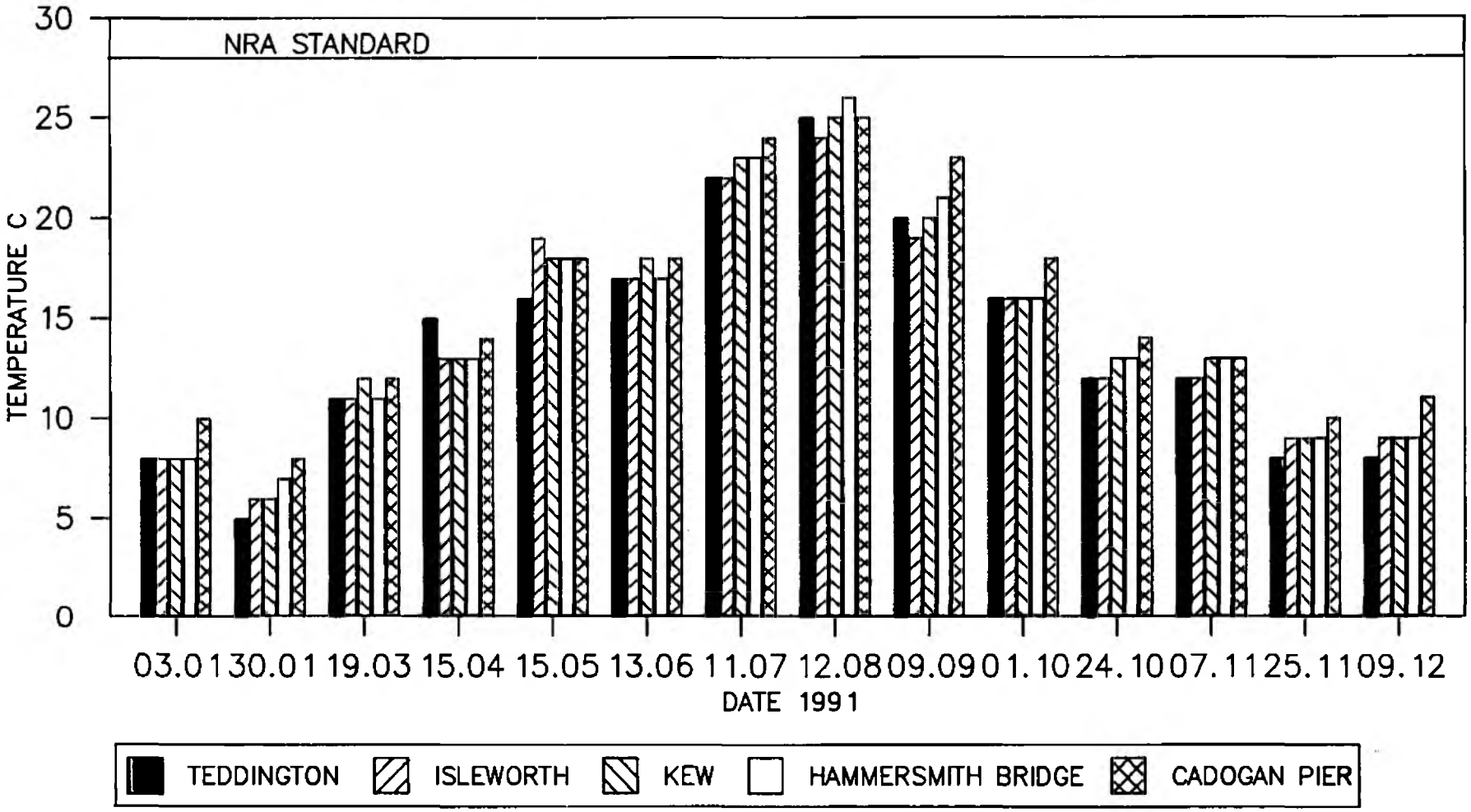


FIGURE 6 : TEMPERATURE
SITES DOWNSTREAM OF TEDDINGTON WEIR



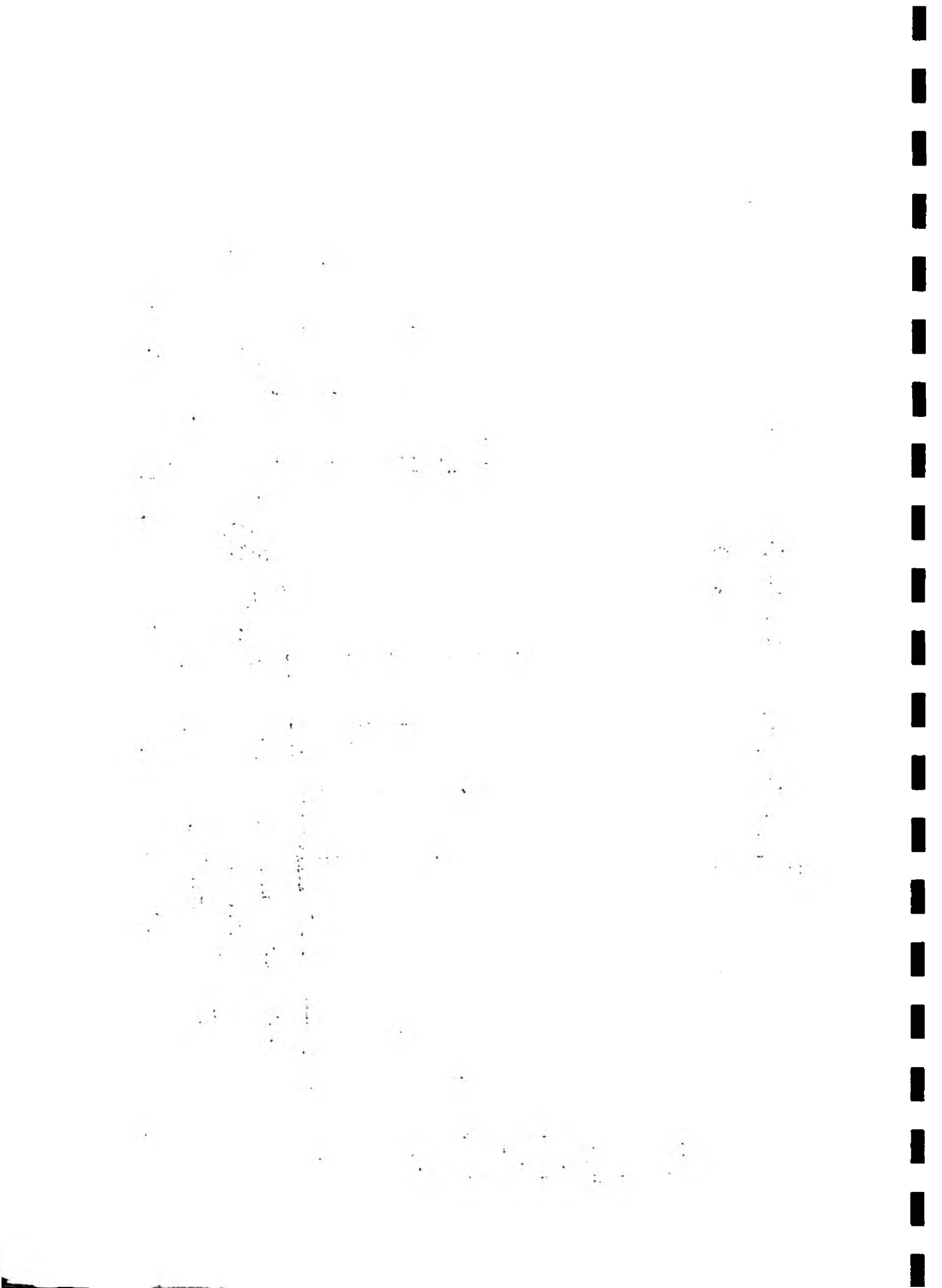


FIGURE 7 : TEMPERATURE
SITES UPSTREAM OF TEDDINGTON WEIR

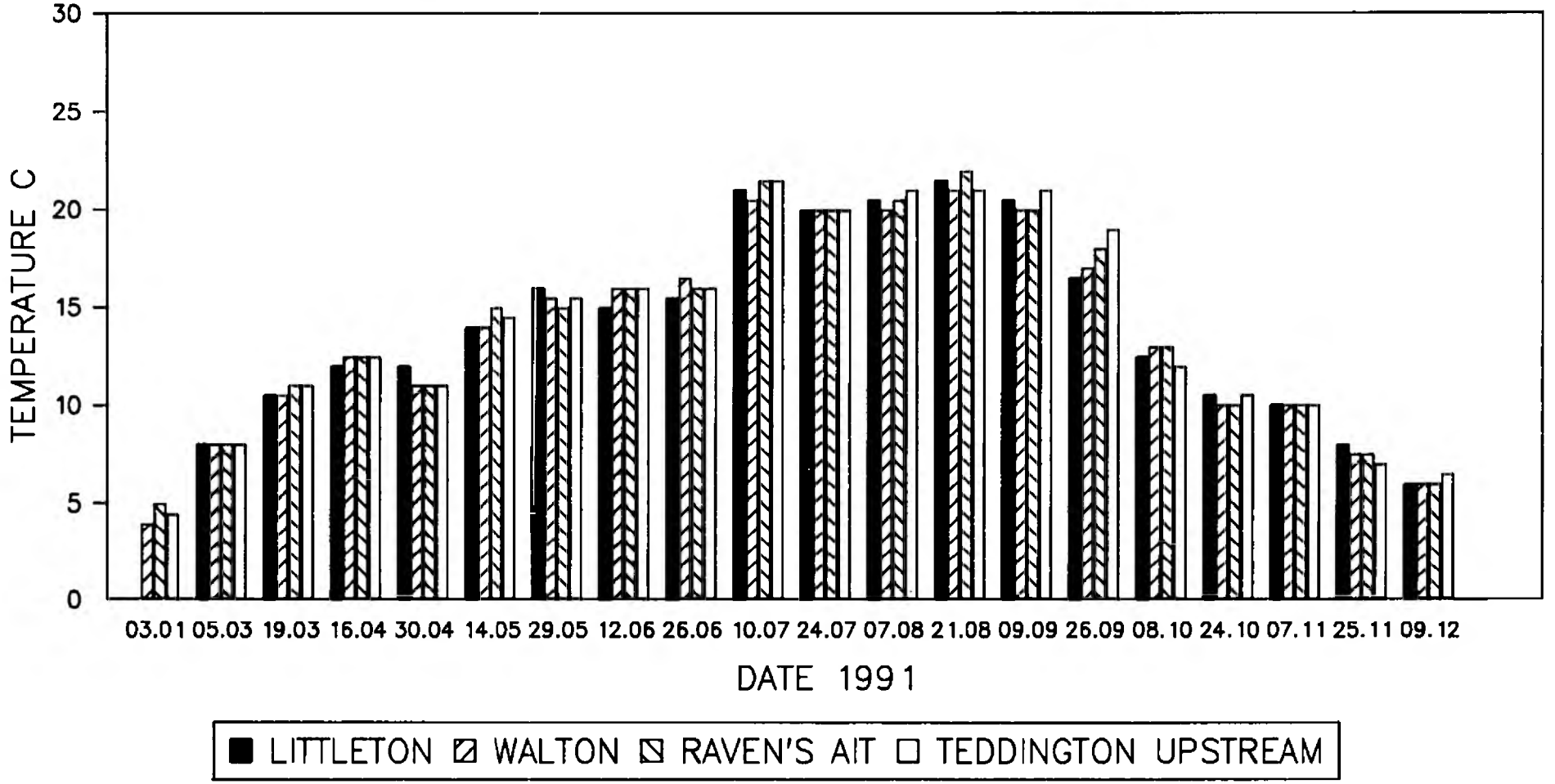


FIGURE 8 : BMWP SCORES

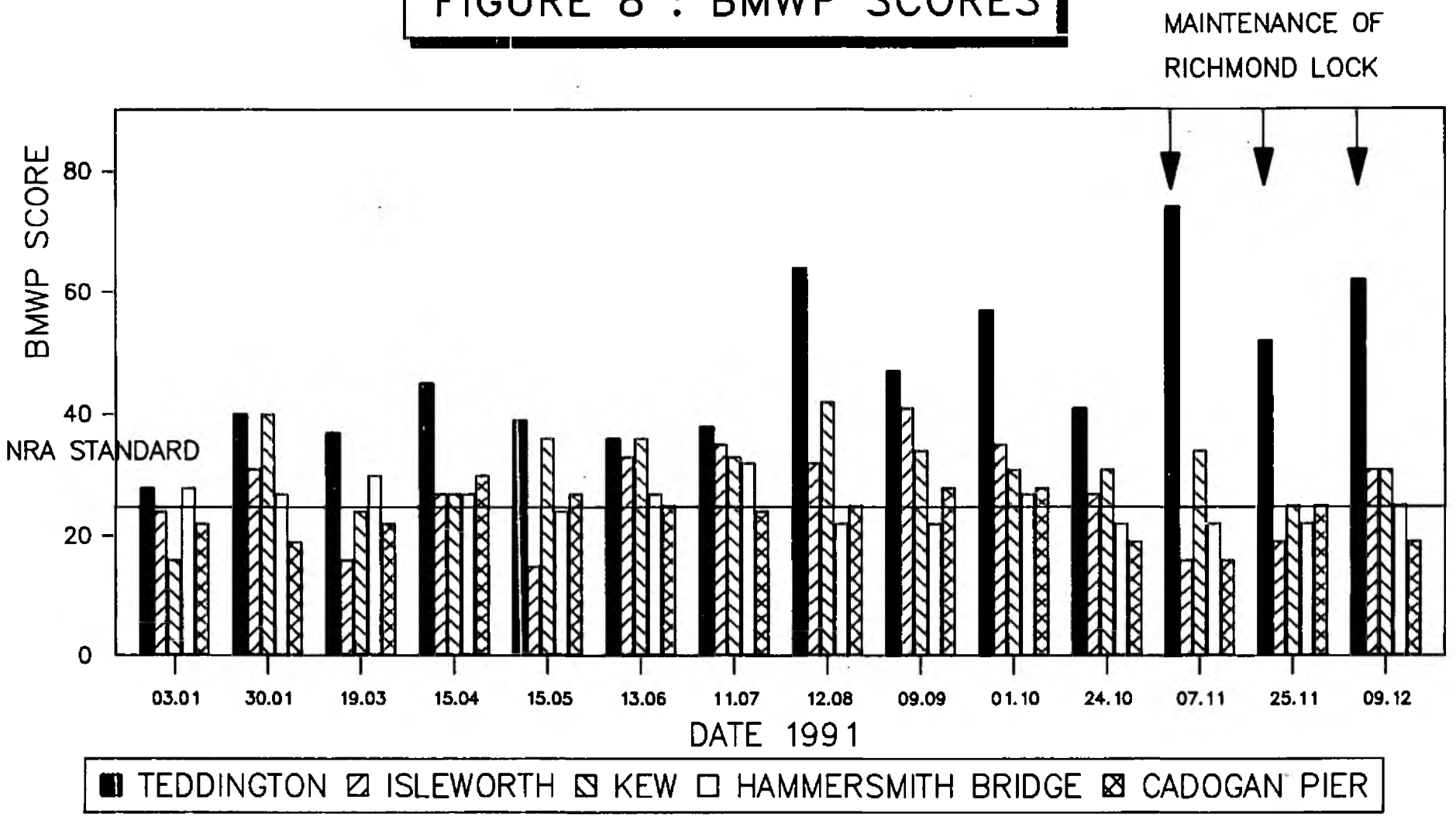


FIGURE 9 : BMWP SCORES

TEDDINGTON – COMPARISON OF 1989, 1990 & 1991

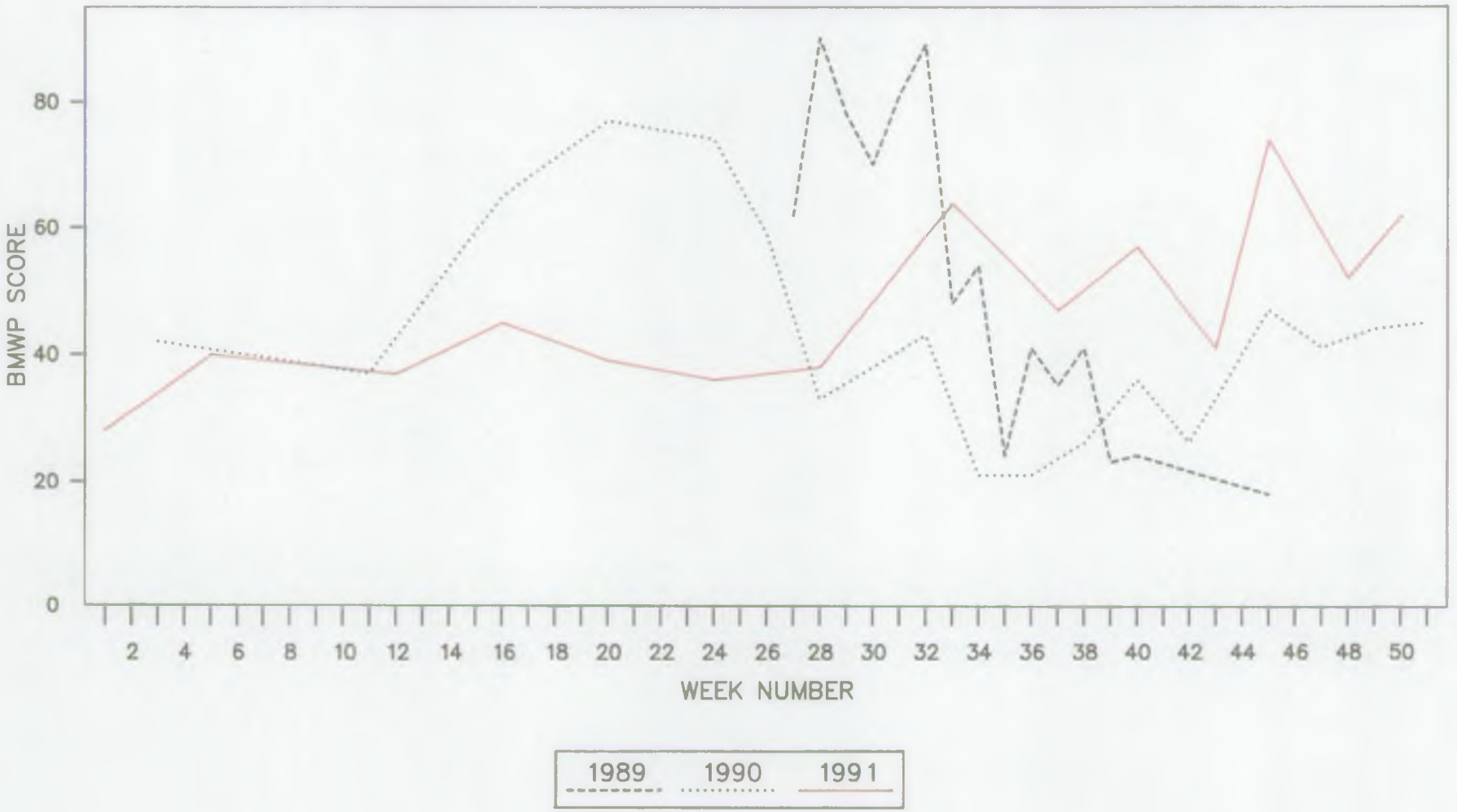


FIGURE 10 : ASPT VALUES

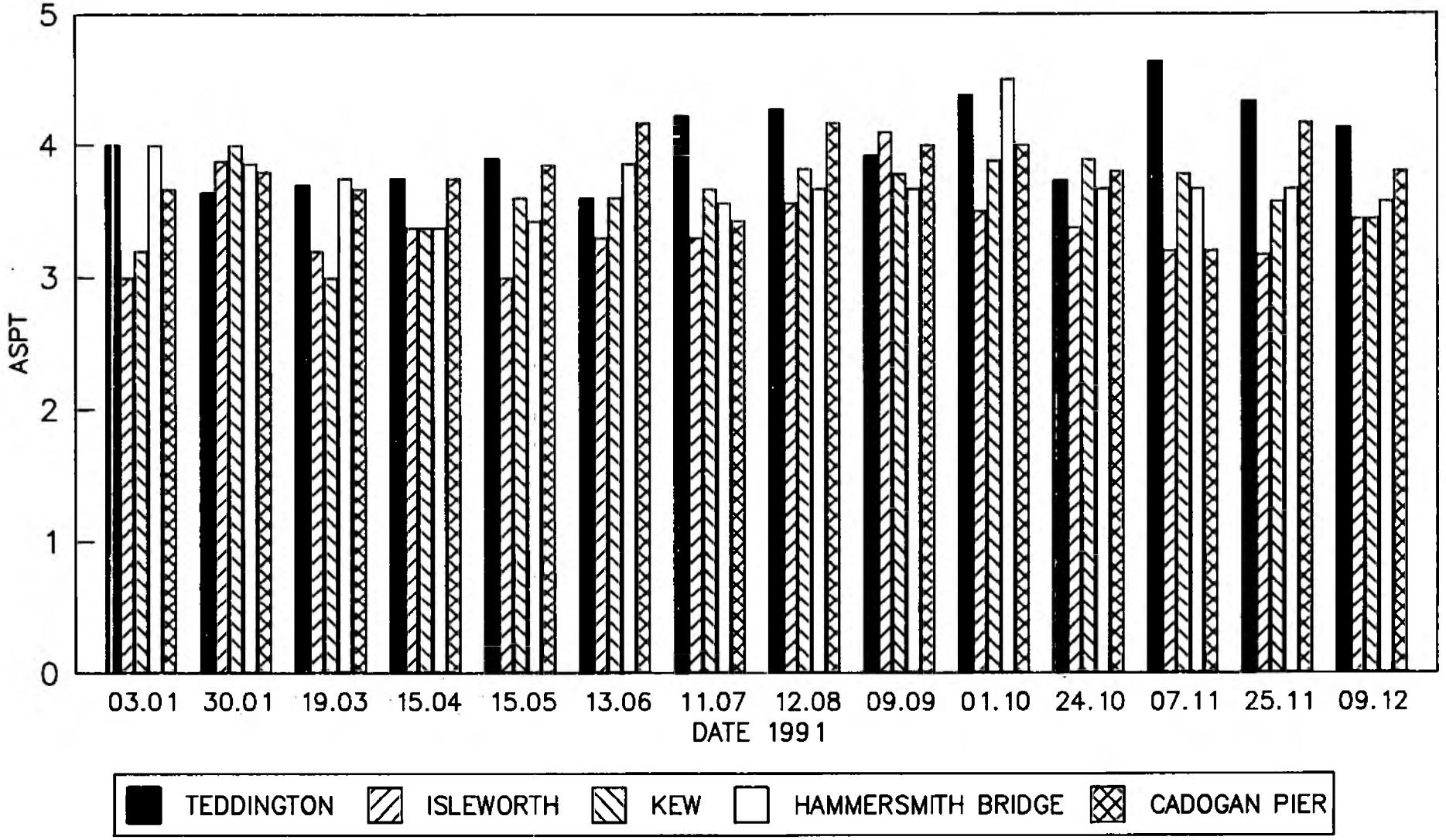
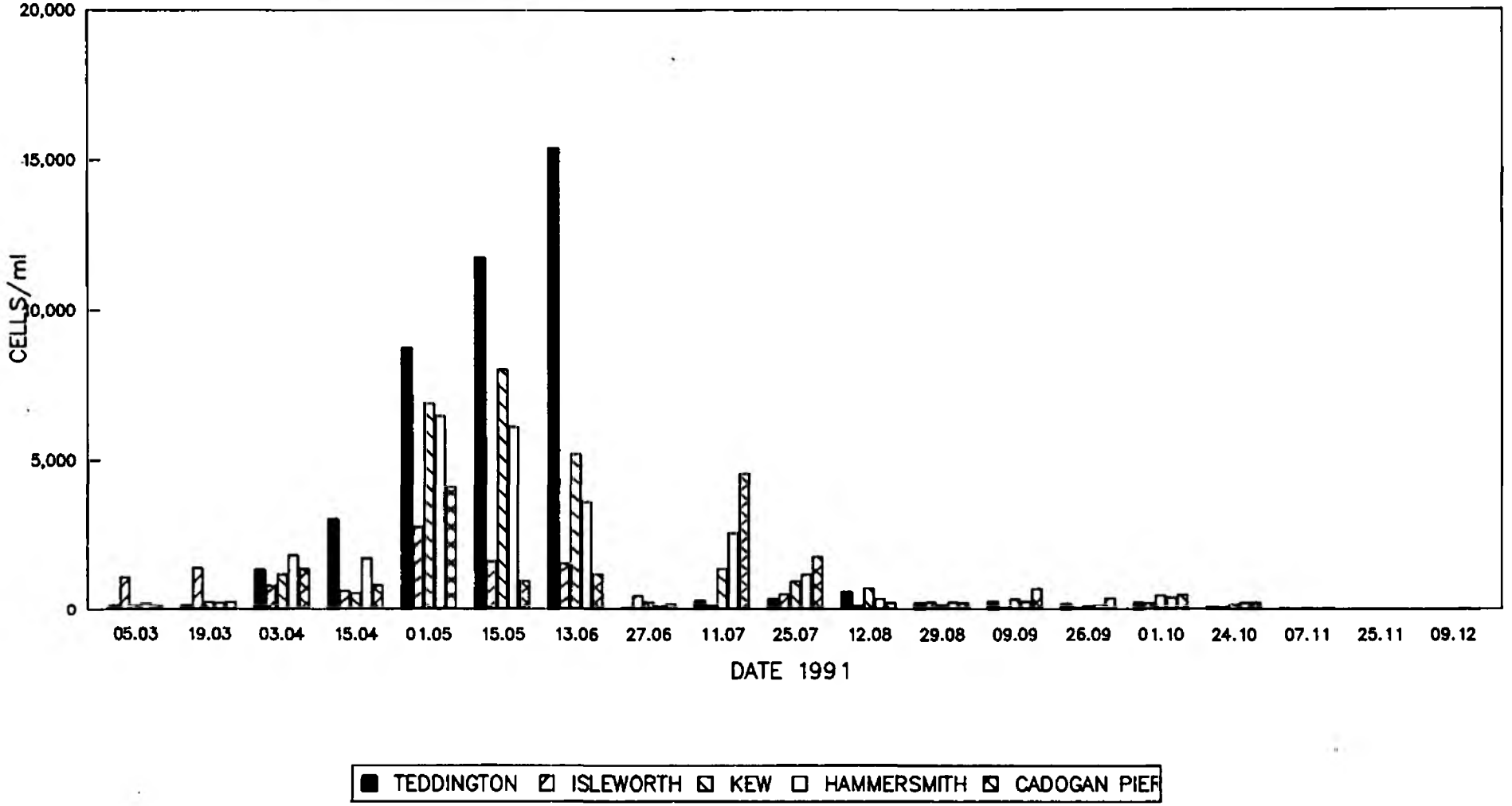


FIGURE 11 : PHYTOPLANKTON ABUNDANCE
SITES DOWNSTREAM OF TEDDINGTON WEIR



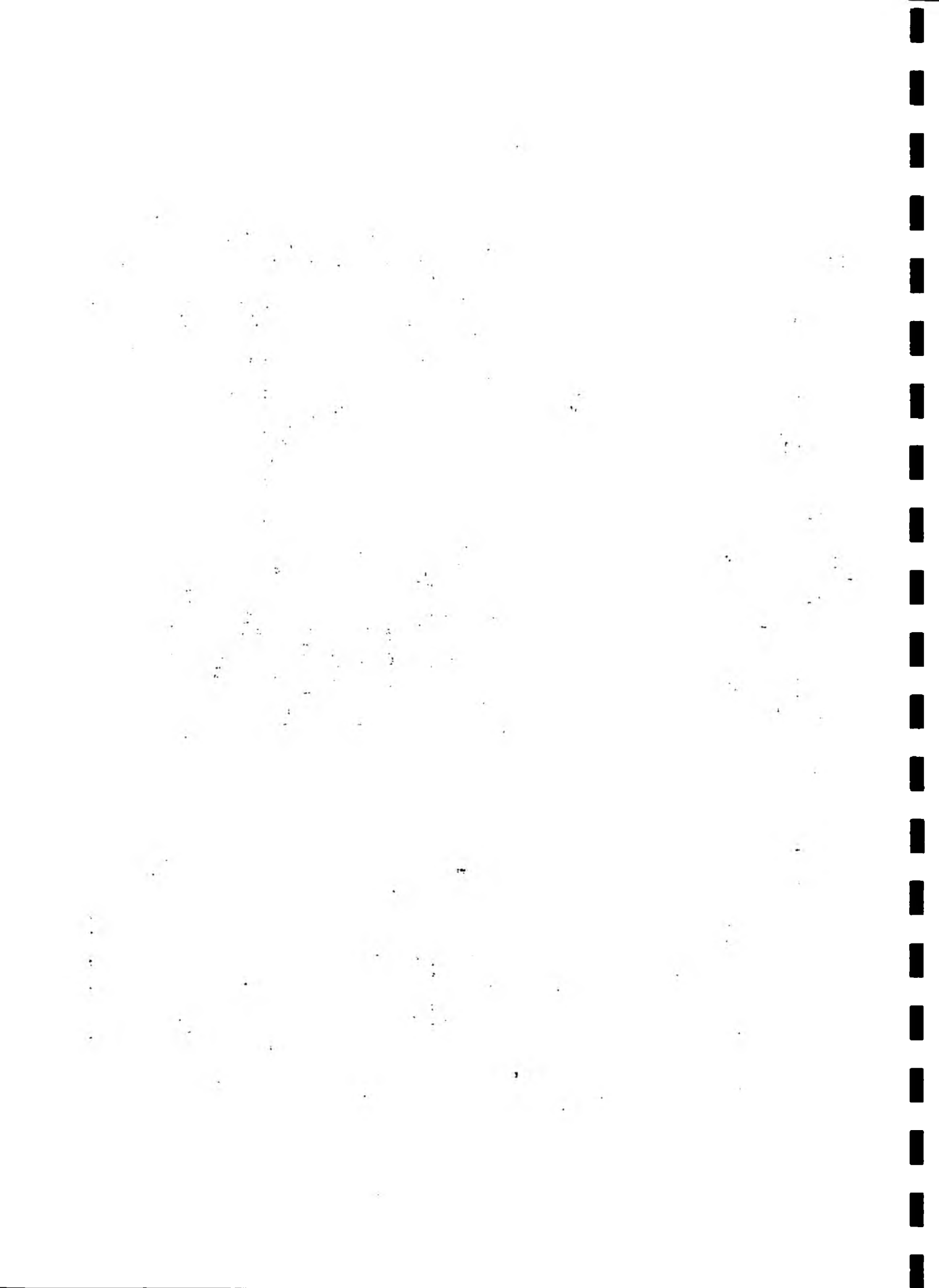


FIGURE 12 : TYPES OF ALGAE PRESENT DURING 1991

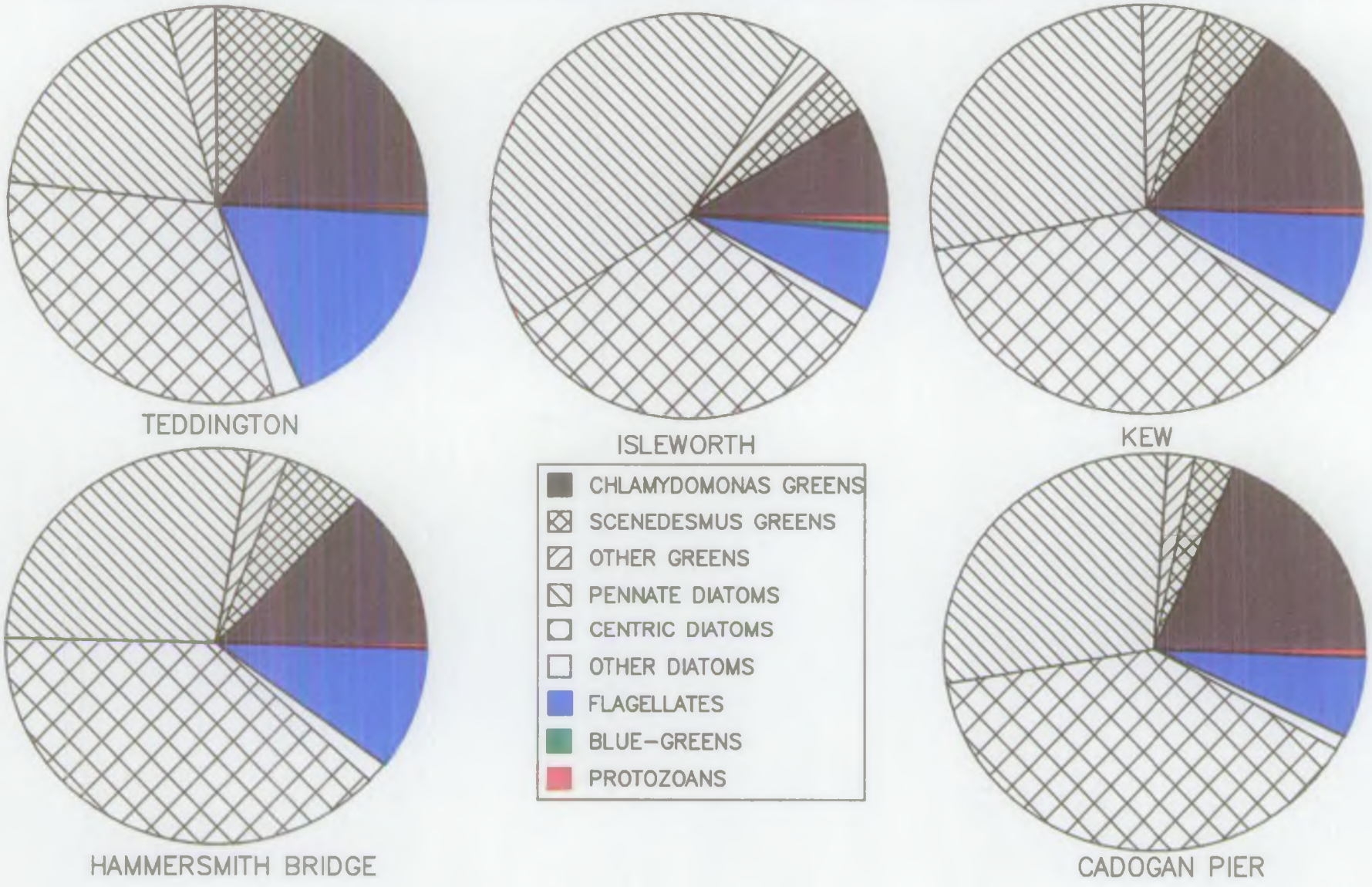
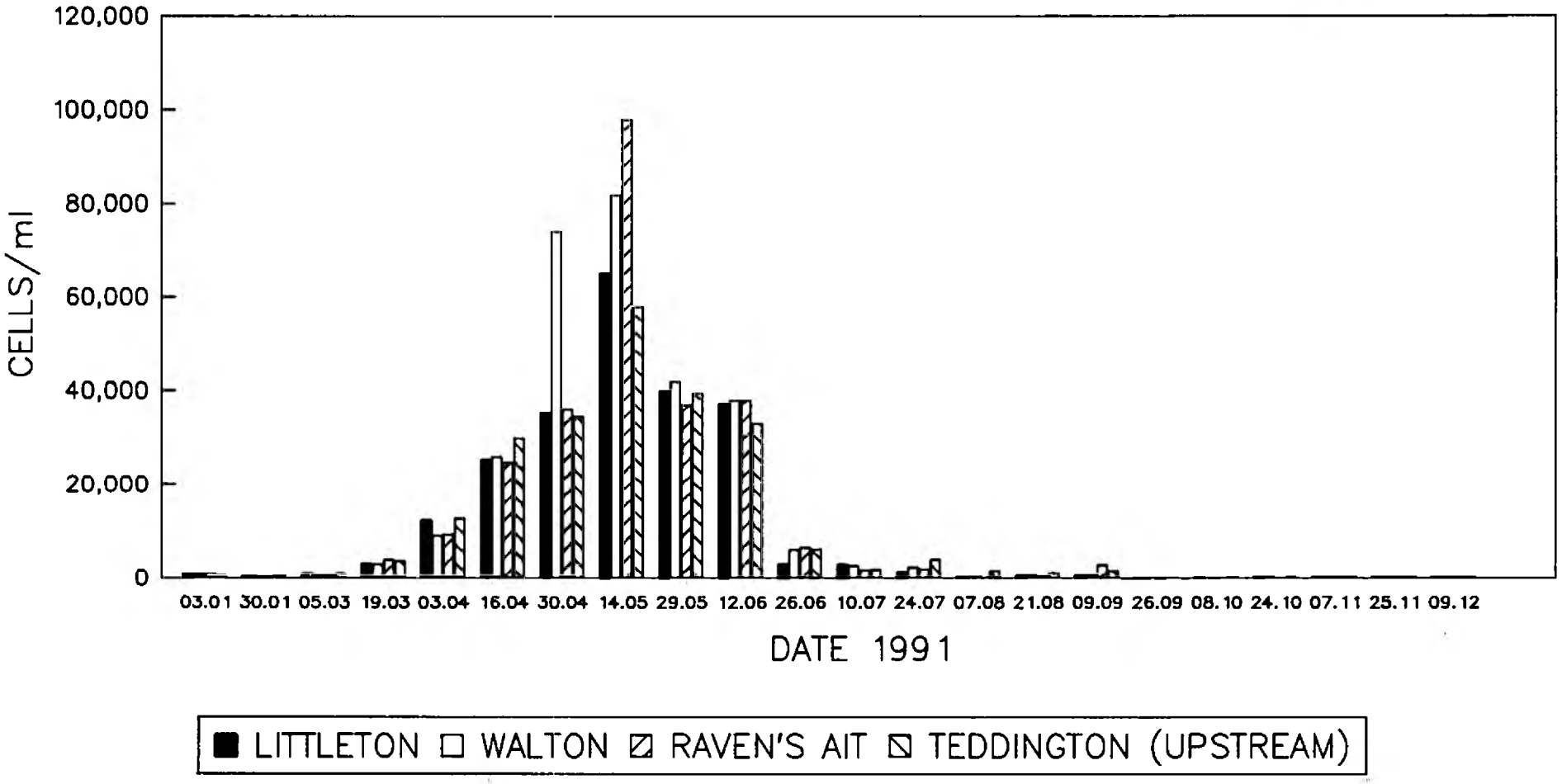


FIGURE 13 : PHYTOPLANKTON ABUNDANCE

SITES UPSTREAM OF TEDDINGTON WEIR



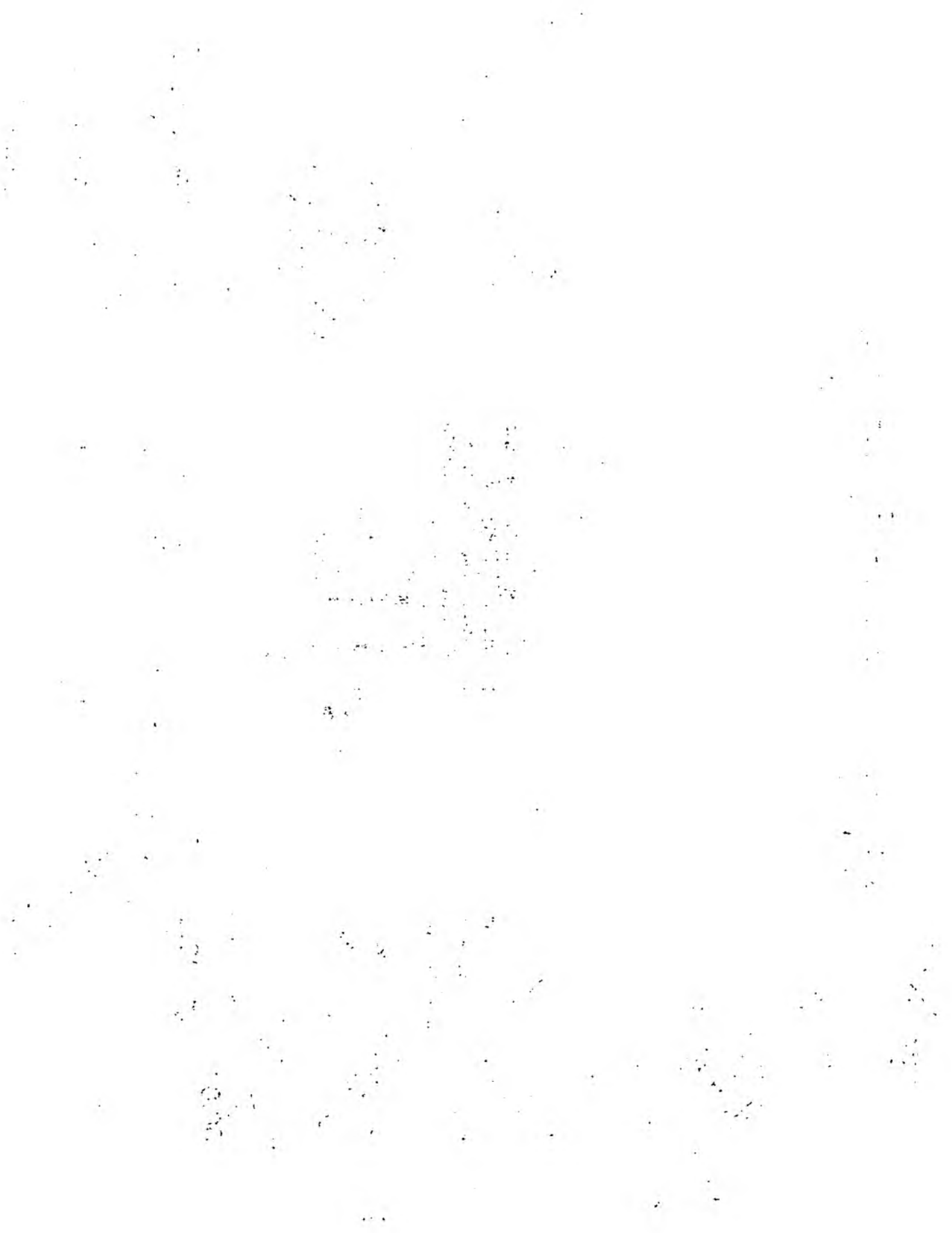


FIGURE 14 : TYPES OF ALGAE PRESENT DURING 1991

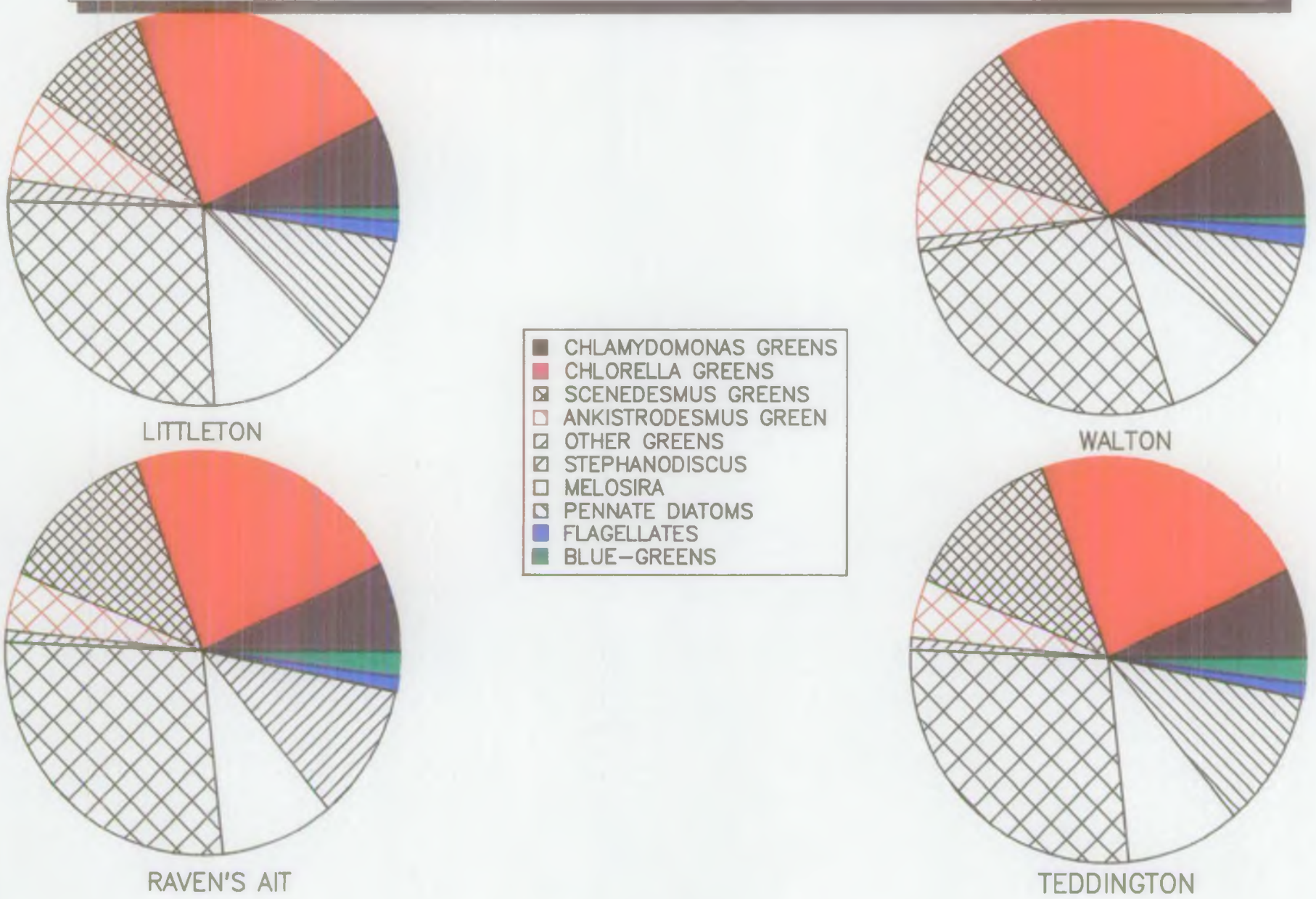


FIGURE : 15 BENTHIC ALGAE COVER

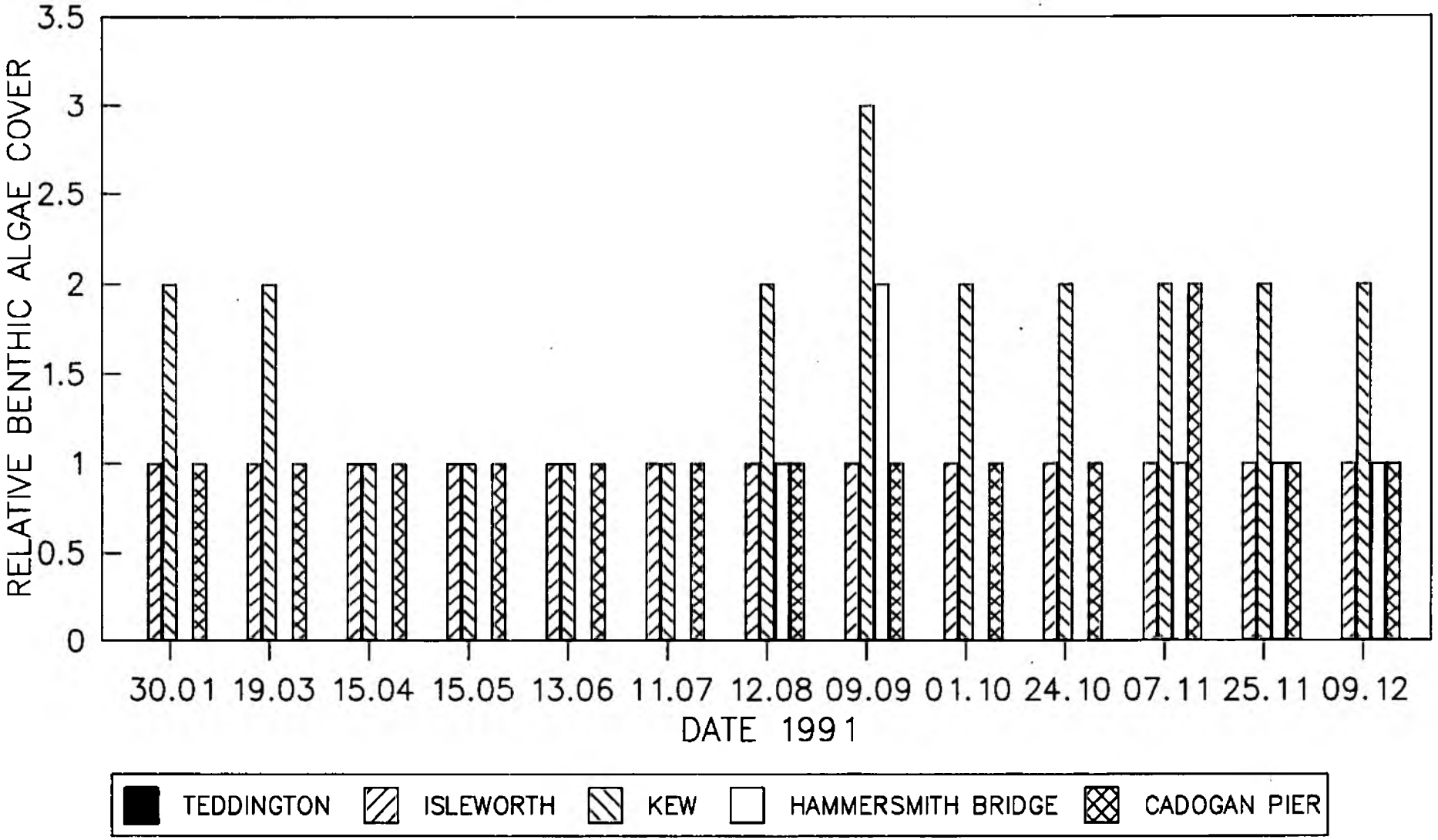


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TABLE 1 SAMPLING PROGRAMME

DATE 1991	WEEK	CADOGAN PIER TQ 27457761	HAMMERSMITH BRIDGE TQ 22967808	KEW TQ 18107780	ISLEWORTH TQ 16957606	TEDDINGTON DOWNSTREAM TQ 16607125	TEDDINGTON UPSTREAM TQ 17007130	RAVENS AIT TQ 17406770	WALTON TQ 10506810	LITTLETON TQ 04606940
03.01	01	MI	MI	MI	MI	MI	PH	PH	PH	PH
30.01	05	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH	PH
05.03	10	PH	PH	PH	PH	PH	PH	PH	PH	PH
19.03	12	PH MI	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH
03.04	14	PH	PH	PH	PH	PH	PH	PH	PH	PH
15.04	16	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH	PH(16.04)
01.05	18	PH	PH	PH	PH	PH	PH	PH	PH	PH(30.04)
15.05	20	PH MI	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH(14.05)
29.05	22	PH	PH	PH	PH	PH	PH	PH	PH	PH
13.06	24	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH	PH(12.06)
27.06	26	PH	PH	PH	PH	PH	PH	PH	PH	PH(26.06)
11.07	28	PH MI	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH(10.07)
25.07	30	PH	PH	PH	PH	PH	PH	PH	PH	PH(24.07)
12.08	33	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH	PH(07.08)
29.08	35	PH	PH	PH	PH	PH	PH	PH	PH	PH(21.08)
09.09	37	PH MI	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH
26.09	39	PH	PH	PH	PH	PH	PH	PH	PH	PH(26.09)
01.10	41	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH	PH(08.10)
24.10	43	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH	PH
07.11	45	PH MI	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH
25.11	48	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH	PH
09.12	50	PH MI	PH MI	PH MI	PH MI	PH MI	PH	PH	PH	PH

KEY:

MI = Macroinvertebrate sample taken
PH = Phytoplankton sample taken

TABLE 2 : PERCENTAGE OCCURENCE OF EACH TAXON AT EACH SITE

	UPSTREAM TEDDINGTON	DOWNSTREAM TEDDINGTON	ISLEWORTH	KEW	HAMMERSMITH BRIDGE	CADOGAN PIER
LEPTOCERIDAE	**	**				
PSYCHOMYIIDAE	*****	**				
CAENIDAE	****	****	*	**		
RHYACOPHILIDAE	*					
LIMNEPHILIDAE	*					
NERITIDAE		*	*			
VIVIPARIDAE	***			***		
ANCYLIDAE	***	**	***	*****	*****	****
HYDROPTILIDAE	**	**				
UNIONIDAE	***	**				
COROPHIIDAE	**	***	*	*	**	****
GAMMARIDAE	*****	*****	*****	*****	*****	*****
PLATYCNEMIDAE	*					
COENAGRIIDAE	**	*				
CORIXIDAE	*					
HALIPLIDAE	***					
DYTISCIDAE	***					
ELMIDAE	*	**	*			
PLANARIIDAE	****	**	*			
DENDROCOELIDAE	****	**	**	*	*	
BAETIDAE	**					
PISCICOLIDAE	*					
BITHYNIIDAE				*		
VALVATIDAE	*****	**				
HYDROBIIDAE	*****	*****	****	****	****	*****
LYMNAEIDAE	*****	***	*****	*****	*****	*****
PHYSIDAE	**					
PLANORBIDAE	*****	***		*		
SPHAERIIDAE	*****	*****	****	*****	***	*
GLOSSIPHONIIDAE	*****	****	****	***	**	*
ERPOBDELLIDAE	*****	****	*****	*****	***	**
ASELLIDAE	*****	****	***	**	**	
CHIRONOMIDAE	*****	****	****	***	**	**
OLIGOCHAETA	*****	*****	*****	*****	*****	*****

KEY :

*	= 0 - 20%
**	= 20 - 40%
***	= 41 - 60%
****	= 61 - 80%
*****	= 81 - 100%

TABLE 3 PERCENTAGE OF SAMPLES FAILING THE NRA STANDARD OF A BMWP SCORE OF AT LEAST 25

	TEDDINGTON	ISLEWORTH	KEW	HAMMERSMITH BRIDGE	CADOGAN PIER
1989	27	33	33	100	47
1990	11	26	11	47	53
1991	0	36	14	43	43

TABLE 4 : COMPARISON OF UPSTREAM AND DOWNSTREAM TEDDINGTON SITES

MACROINVERTEBRATE FAMILIES	DATE									
	19.03		15.05		11.07		09.09		07.11	
LEPTOCERIDAE			*		*					+
PSYCHOMYIIDAE	*		*		*	+	*		*	
CAENIDAE	*	+	*	+	*	+	*	+		+
RHYACOPHILIDAE			*							
LIMNEPHILIDAE	*									
VIVIPARIDAE			*		*		*			
ANCYLIDAE	*		*					+	*	+
HYDROPTILIDAE	*		*	+				+		
UNIONIDAE					*		*		*	+
COROPHIIDAE	*	+							*	+
GAMMARIDAE	*	+	*		*	+	*	+	*	+
PLATYCNEMIDAE							*			
COENAGRIIDAE	*		*	+						
CORIXIDAE	*									
HALIPLIDAE	*						*		*	
DYTISCIDAE			*		*		*			
ELMIDAE									*	+
PLANARIIDAE	*		*			+	*		*	+
DENDROCOELIDAE	*		*				*		*	+
BAETIDAE	*						*			
PISCICOLIDAE							*			
VALVATIDAE	*		*		*		*	+	*	
HYDROBIIDAE	*	+	*	+	*	+	*	+	*	+
LYMNAEIDAE	*		*		*		*		*	+
PHYSIDAE	*				*					
PLANORBIDAE	*	+	*	+	*		*	+	*	+
SPHAERIIDAE	*	+	*	+	*		*	+	*	+
GLOSSIPHONIIDAE	*	+	*	+	*	+	*	+	*	+
ERPOBDELLIDAE	*		*		*	+	*	+	*	
ASELLIDAE	*	+	*	+	*		*	+	*	
CHIRONOMIDAE	*	+	*	+	*	+	*		*	+
OLIGOCHAETA	*	+	*	+	*	+	*	+	*	+
No. of taxa	24	10	22	10	18	9	22	12	19	16

KEY : * = TAXA PRESENT AT THE UPSTREAM TEDDINGTON SITE
+ = TAXA PRESENT AT THE DOWNSTREAM TEDDINGTON SITE

TABLE 5 : ESTUARINE MACROINVERTEBRATES

SITE	DATE													
	03.01	30.01	19.03	15.04	15.05	13.06	11.07	12.08	09.09	01.10	24.10	07.11	25.11	09.12
TEDDINGTON														
ISLEWORTH								PRAWN		MYSID	GOBY MYSID			
KEW			SHRIMP											
HAMMERSMITH BRIDGE	SHRIMP	SHRIMP	SHRIMP							SHRIMP				
CADOGAN PIER	SHRIMP	SHRIMP	SHRIMP	SHRIMP	SHRIMP	SHRIMP		PRAWN	PRAWN	PRAWN	PRAWN BROWN SHRIMP		SHRIMP	

KEY:

SHRIMP = *Corophium lacustre*
PRAWN = *Palaemon longirostris*
GOBY = *Pomatoschistus microps*
MYSID = *Neomysis integer*
BROWN SHRIMP = *Crangon crangon*

TABLE 6 : MACROPHYTES FOUND DOWNSTREAM OF TEDDINGTON WEIR

SITE	DATE													
	03.01	30.01	19.03	15.04	15.05	13.06	11.07	12.08	09.09	01.10	24.10	07.11	25.11	09.12
TEDDINGTON	*Lemna* *Elodea*	*Lemna*	*Elodea*	*Lemna*				*Lemna*						
ISLEWORTH	*Elodea*													
KEW	*Elodea*									*Lemna*				*Lemna*
HAMMERSMITH BRIDGE														
CADOGAN PIER														

Every occurence of macrophyte, either *Lemna* (duckweed) or *Elodea* (Canadian waterweed) were present only in small quantities

TABLE 7 : MACROPHYTES FOUND UPSTREAM OF TEDDINGTON WEIR

SITE	DATE											
	03.01	30.01	05.03	19.03	03.04	16.04	30.04	14.05	29.05	12.06	26.06	10.07
LITTLETON		*Lemna*	*Lemna*									
WALTON			*Lemna*						*Lemna*	*Lemna*		
RAVEN'S AIT	*Lemna*	*Lemna*	*Lemna*									
TEDDINGTON UPSTREAM	*Lemna*	*Lemna*	*Lemna*									*Lemna*

SITE	DATE									
	26.07	07.08	21.08	09.09	26.09	08.10	24.10	07.11	25.11	09.12
LITTLETON							*Lemna*			
WALTON					*Lemna* *Azolla*		*Lemna*			
RAVEN'S AIT		*Lemna*	*Lemna*	*Lemna* 10%	*Lemna* 30-40%	*Lemna*	*Lemna*	*Lemna*		
TEDDINGTON UPSTREAM	*Lemna*	*Lemna* 10%	*Lemna* 5%		*Lemna* 20-40%	*Lemna*	*Lemna*		*Lemna*	

Every occurence of *Lemna* (duckweed) and *Azolla* (waterfern) was in small quantities unless otherwise stated.

APPENDIX 1

TEMPERATURE

TEMPERATURE °C

SITES DOWNSTREAM OF TEDDINGTON WEIR

DATE 1991	TEDDINGTON	ISLEWORTH	KEW	HAMMERSMITH BRIDGE	CADOGAN PIER
03.01	8	8	8	8	10
30.01	5	6	6	7	8
19.03	11	11	12	11	12
15.04	15	13	13	13	14
15.05	16	19	18	18	18
13.06	17	17	18	17	18
11.07	22	22	23	23	24
12.08	25	24	25	26	25
09.09	20	19	20	21	23
01.10	16	16	16	16	18
24.10	12	12	13	13	14
07.11	12	12	13	13	13
25.11	8	9	9	9	10
09.12	8	9	9	9	11

SITES UPSTREAM OF TEDDINGTON WEIR

DATE 1991	LITTLETON	WALTON	RAVEN'S AIT	TEDDINGTON UPSTREAM
30.01	-	4.0	5.0	4.5
05.03	8.0	8.0	8.0	8.0
19.03	10.5	10.5	11.0	11.0
16.04	12.0	12.5	12.5	12.5
30.04	12.0	11.0	11.0	11.0
14.05	14.0	14.0	15.0	14.5
29.05	16.0	15.5	15.0	15.5
12.06	15.0	16.0	16.0	16.0
26.06	15.5	16.5	16.0	16.0
10.07	21.0	20.5	21.5	21.5
24.07	20.0	20.0	20.0	20.0
07.08	20.5	20.0	20.5	21.0
21.08	21.5	21.0	22.0	21.0
09.09	20.5	20.0	20.0	21.0
26.09	16.5	17.0	18.0	19.0
08.10	12.5	12.0	13.0	12.0
24.10	10.5	10.0	10.0	10.5
07.11	10.0	10.0	10.0	10.0
25.11	8.0	7.0	7.5	7.0
09.12	6.0	5.0	6.0	6.5

APPENDIX 2

FRESHWATER MACROINVERTEBRATE TAXA LIST, ABUNDANCE AND BMWP SCORES

ABUNDANCE KEY

*	= 1-9
**	= 10-99
***	= 100-999
****	= 1000+

TEDDINGTON 1991 - TAXA LIST, ABUNDANCE AND BMWP SCORES

MACROINVERTEBRATE FAMILIES	DATE													
	3.01	30.01	19.03	15.04	15.05	13.06	11.07	12.08	9.09	1.10	24.10	7.11	25.11	9.12
LEPTOCERIDAE								*		P		*		
PSYCHOMYIIDAE		**					*	*			*			
CAENIDAE	*		***	***	***	***	*	**	*			*	*	**
NERITIDAE										P				
ANCYLIDAE									*	P		*	*	*
HYDROPTILIDAE				*	*				*					
UNIONIDAE		*						*				*	*	*
COROPHIIDAE	*	**	*									**	*	*
GAMMARIDAE	**		**	**		***	***	***	****	****	****	***	**	**
COENAGRIIDAE					*									
ELMIDAE				*								*	**	
PLANARIIDAE							*			P		*		P
DENDROCOELIDAE										P		*	**	P
VALVATIDAE		**						*	*					
HYDROBIIDAE	*		**	*	*	**	P	*	*	*	*	*		*
LYMNAEIDAE		*				*		P		P	P	P		P
PLANORBIDAE		**	*	*	P	P			*			*	*	
SPHAERIIDAE	*	*	**	**	**	**		**	**	**	**	**	P	**
GLOSSIPHONIIDAE		P	*	P	*		*	**	*	**	**	*		*
ERPOBDELLIDAE		*		*		*	*	*	*	*	*		**	P
ASELLIDAE		**	*	P	*	*		*	*		*		*	**
CHIRONOMIDAE	***	***	**	***	**	**	*	**			*	*		*
OLIGOCHAETA	**		***	***	***	***	**	***	**	*	*	**	**	**
NON-SCORING TAXA:														
HYDRACARINA		*	**	**	**	**		**					**	
CLADOCERA														
NEMATODA													**	
OSTRACODA		*				*		**						
CERATOPOGONIDAE				*			*							
COPEPODA				*	*									
MICROTURBELLARIA					*									
SPONGELLIDAE									P					P
BMWP SCORE	28	40	37	45	39	36	38	64	47	57	41	74	52	62
ASPT	4.00	3.64	3.70	3.75	3.90	3.60	4.22	4.27	3.92	4.38	3.73	4.63	4.33	4.13
SCORING FAMILIES	7	11	10	12	10	10	9	15	12	13	11	16	12	15

ISLEWORTH 1991 - TAXA LIST, ABUNDANCE AND BMWP SCORES

MACROINVERTEBRATE FAMILIES	DATE 3.01	30.01	19.03	15.04	15.05	13.06	11.07	12.08	9.09	1.10	24.10	7.11	25.11	9.12
CAENIDAE		*												
NERITIDAE									*					
ANCYLIDAE				P		*	*	*	*	P	*			*
COROPHIIDAE		*												
GAMMARIDAE	***	***	****	***	***	****	****	***	****	****	****	***	***	**
ELMIDAE									*					
PLANARIIDAE							P		*					
DENDROCOELIDAE								P		P				
HYDROBIIDAE	*					*	*	P		*	*	*	*	*
LYMNAEIDAE	*	P	*	P	**	***	**	*	**	P	P	P	*	P
SPHAERIIDAE						*	*		*	*	**	*	**	*
GLOSSIPHONIIDAE	*		*	*		*	**	*	*	*				P
ERPOBDELLIDAE	*	*	*	*		**	**	**	*	*	**		**	*
ASELLIDAE	**	*		*	**	*								*
CHIRONOMIDAE	*	*		*	*	*	*	*		*	*			
OLIGOCHAETA	****	****	***	***	***	***	**	***	*	****	***	**	***	***
NON-SCORING TAXA:														
CLADOCERA	*													
SPONGELLIDAE									P		P			
BMWP SCORE	24	31	16	27	15	33	35	32	41	35	27	16	19	31
ASPT	3.00	3.88	3.20	3.38	3.00	3.30	3.30	3.56	4.10	3.50	3.38	3.20	3.17	3.44
SCORING FAMILIES	8	8	5	8	5	10	10	9	10	10	8	5	6	9

KEW 1991 - TAXA LIST, ABUNDANCE AND BMWP SCORES

MACROINVERTEBRATE FAMILIES	DATE 3.01	30.01	19.03	15.04	15.05	13.06	11.07	12.08	9.09	1.10	24.10	7.11	25.11	9.12
CAENIDAE		*						*				*		
VIVIPARIDAE					P	*	*		*	*	*			
ANCYLIDAE		***		*	*	*	*	*	*	*	**	*	P	P
COROPHIIDAE		*												
GAMMARIDAE	***	***	***	****	****	****	****	****	****	****	****	***	***	***
DENDROCOELIDAE								P						
BITHYNIIDAE									*					
HYDROBIIDAE	P	*	P		*	*		*		P	*	**	**	*
LYMNAEIDAE	P	P	P	*	*	*	*	*	**		P	*	*	P
PLANORBIDAE					P									*
SPHAERIIDAE		**	*	*		***	*	**	**	**	**	**	**	**
GLOSSIPHONIIDAE							*	*	*	*		*		P
ERPOBDELLIDAE	P	*	P	P	P	P	*	*	*	*	*	*	*	*
ASELLIDAE			*	P	P	P								
CHIRONOMIDAE		*	*	*	*	**	**	*						
OLIGOCHAETA	***	****	****	****	***	****	**	***	***	***	***	***	***	***
NON-SCORING TAXA:														
LUMBRICULIDAE									*					
SPONGELLIDAE									P		P			
BMWP SCORE	16	40	24	27	36	36	33	42	34	31	31	34	25	31
ASPT	3.20	4.00	3.00	3.38	3.60	3.60	3.67	3.82	3.78	3.88	3.89	3.78	3.57	3.44
SCORING FAMILIES	5	10	8	8	10	10	9	11	9	8	8	9	7	9

HAMMERSMITH BRIDGE 1991 - TAXA LIST, ABUNDANCE AND BMWP SCORES

MACROINVERTEBRATE FAMILIES	DATE 3.01	30.01	19.03	15.04	15.05	13.06	11.07	12.08	9.09	1.10	24.10	7.11	25.11	9.12
ANCYLIDAE	P	P	*	P	P	P	P	P	**	*	P	P	P	P
COROPHIIDAE	*	P	P							P				
GAMMARIDAE	**	*	**	***	***	***	****	**	***	***	***	**	***	**
DENDROCOELIDAE						P								
HYDROBIIDAE	P				*	P	P	P	*	P		P	*	*
LYMNAEIDAE	P	P	*	P	*	*	P	*	*	P	*	P	*	P
SPHAERIIDAE						*	P	**	*		*	*	*	*
GLOSSIPHONIIDAE			P	*	P									
ERPOBDELLIDAE		P		*			*			P	*			P
ASELLIDAE	*		*	*			*							
CHIRONOMIDAE		*	*	*	*		*							
OLIGOCHAETA	**	**	***	***	***	*	*	**	*		*	*	**	**
NON-SCORING TAXA:														
NEMATODA									*					
PSYCHODIDAE	*													
GRAPSIDAE	P													
BMWP SCORE	28	27	30	27	24	27	32	22	22	27	22	22	22	25
ASPT	4.00	3.86	3.75	3.38	3.43	3.86	3.56	3.67	3.67	4.50	3.67	3.67	3.67	3.57
SCORING FAMILIES	7	7	8	8	7	7	9	6	6	6	6	6	6	7

CADOGAN PIER 1991 - TAXA LIST, ABUNDANCE AND BMWP SCORES

MACROINVERTEBRATE FAMILIES	DATE 3.01	30.01	19.03	15.04	15.05	13.06	11.07	12.08	9.09	1.10	24.10	7.11	25.11	9.12
ANCYLIDAE				P	P	*	P	P	*	*	P		P	*
COROPHIIDAE	**	***	**	*	*	**		*	*	*			**	
GAMMARIDAE	***	***	***	****	***	***	****	****	****	***	***	***	***	***
HYDROBIIDAE	**	*	*	*	*	**	**	P	**	**	**	**	**	**
LYMNAEIDAE	*	P	P	P	*	P	*	*	**	*	*	*	*	P
SPHAERIIDAE												P		
GLOSSIPHONIIDAE							*							
ERPOBDELLIDAE	*		P	*					*	*				
CHIRONOMIDAE				*	*		*							
OLIGOCHAETA	****	***	****	****	***	***	***	***	****	****	****	***	***	***
BMWP SCORE	22	19	22	30	27	25	24	25	28	28	19	16	25	25
ASPT	3.67	3.80	3.67	3.75	3.85	4.17	3.43	4.17	4.00	4.00	3.80	3.20	4.17	3.80
SCORING FAMILIES	6	5	6	8	7	6	7	6	7	7	5	5	6	5

APPENDIX 3

PHYTOPLANKTON: TAXA LIST AND PERCENTAGE ABUNDANCE

TEDDINGTON 1991 - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE																	
	30 01	05 03	19 03	03 04	15 04	01 05	13 06	27 06	11 07	25 07	12 08	29 08	09 09	26 09	01 10	24 10	07 11	25 11	09 12
GREENS																			
Chlamydomonas	59	35	42	9	9		P	33	6		4	10	8	8		5	35	5	40
Scenedesmus				P		P	2	5	16	9	9	2	4	35	31	22	11	17	
Actinastrum					P														
Chlorella							P					3		3	4				
Micractinium							P												
Cryptomonas										29									
Coelastrum									4	2	P						2		
Pediastrum									P	5			P	P					
Tribonema													8	P				5	
Dictyosphaerium																P			
DIATOMS																			
Pennate	33	40	46	10	13	6	P	33	16	5	3	60	7	14	17	P	11	5	40
Centric	4	10	10	73	70	90	92	29	20	50	37	14	21	6	4	38	16	5	
Melosira				7	5	2	2		2					7					
Diatoma					P													5	
Asterionella					P														
Fragillaria															9				
FLAGELLATES																			
Euglena	P	15	2	P	2				35			3	5					5	
Cryptomonas											47	8	46	25	7	34	25	50	20
BLUE-GREENS																			
Oscillatoria	P					1							P	P	4				
PROTOZOANS	P				P		P		P	P		P				P			P
CELLS/ml	*	165	176	1439	3087	8750	15399	60	305	352	600	220	266	192	230	118	55	18	10

* = Cells/ml not calculated

ISLEWORTH 1991 - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE																	
	30 01	05 03	19 03	03 04	15 04	01 05	13 06	27 06	11 07	25 07	12 08	29 08	09 09	26 09	01 10	24 10	07 11	25 11	09 12
GREENS																			
Chlamydomonas	6	14	18	9		4	4	14	4	2	4	24	9	6		8	12	12	17
Scenedesmus	8	P	10	P	3	3	P	1	8	7	6		4	13	4	P			
Actinastrum						P													
Chlorella												3		2	10				
Cryptomonas										5									
Coelastrum										24									
Pediastrum										5									
Tribonema																	5		
Dictyosphaerium						P	2												
DIATOMS																			
Pennate	86	82	70	10	17	35	7	61	23	10	61	56	48	45	29	71	57	33	33
Centric		P		73	71	55	83	20	60	48	17	8	30	28	38	4	10	38	22
Melosira				6	8	5	P	3						2					
Diatoma					P														
Asterionella					P														
FLAGELLATES																			
Euglena		2	2	P		3			4		11	6	4	4	4	3			
Cryptomonas											P	3	4		14	8	14	17	17
BLUE-GREENS																			
Oscillatoria							P	1									2		11
PROTOZOANS	P				P		P	P	P		P	P				P	P	P	P
CELLS/ml	*	1192	1487	900	715	2825	1660	480	112	525	131	242	71	72	210	90	42	24	18

* = Cells/ml not calculated

KEW 1991 - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE																		
	30 01	05 03	19 03	03 04	15 04	01 05	13 06	27 06	11 07	25 07	12 08	29 08	09 09	26 09	01 10	24 10	07 11	25 11	09 12
GREENS																			
Chlamydomonas	53	49	48	8	2	3	5	8	6		7	22	8	8	11	13	19	6	15
Scenedesmus			2		P	1	4	8	3	13	5	1	5	6	11	6	10	13	5
Pediastrum					P			1		4	P								
Actinastrum							P						P						
Chlorella								1	2		P	10	3						
Coelastrum									2		2					2			
Cryptomonas										42									
Tribonema											6		6			2	7		
DIATOMS																			
Pennate	44	37	37	8	21	14	P	35	5	11	23	38	15	32	74	42	14	21	55
Centric		9	11	73	62	81	86	45	66	27	44		61	35	2	23	16	33	10
Melosira				9	11		P		P					P			1	6	
Diatoma						P										P	1		
Asterionella					P														
FLAGELLATES																			
Euglena	3	3	2	2	P		3	2	16		2	1					1		
Cryptomonas											10	28	7	17	2	11	3	21	15
BLUE-GREENS																			
Oscillatoria																			
PROTOZOA	P		P		P			P		P		P		P		P	P	P	P
CELLS/ml	*	164	292	1299	630	6920	5250	249	1471	1000	735	144	334	118	470	163	69	15	20

* = Cells/ml not calculated

HAMMERSMITH BRIDGE 1991 - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE																	
	30 01	05 03	19 03	03 04	15 04	01 05	13 06	27 06	11 07	25 07	12 08	29 08	09 09	26 09	01 10	24 10	07 11	25 11	09 12
GREENS																			
Chlamydomonas	42	56	58	4		3	5	9	6		6	22	4	7	10	4	12		5
Scenedesmus	8		2	P	P	1	4	16	3	4	6	1	11	16	10	4	10	19	
Chlorella									3			18	3						
Coelastrum										3	2								
Pediastrum											P				5				
Tribonema													2		2		2		
Unidentified spp																		13	
DIATOMS																			
Pennate	25	41	26	11	5	9	4	17	3	16	21	41	19	13	42	43	56	56	72
Centric		P	10	72	87	81	87	57	84	43	52		47	46	17	26	15		9
Melosira				10	7	6		1							2				
Asterionella																		6	
FLAGELLATES																			
Euglena	25	2	4	2							P	2	2						
Trachelomonas									1										
Cryptomonas										33	12	16	11	16	12	23	5	6	14
BLUE-GREENS																			
Oscillatoria																			
PROTOZOANS	P		P	P	P									P	P	P		P	P
CELLS/ml	*	258	265	1906	1820	6480	3657	116	2622	1255	353	240	266	164	400	230	52	16	22

* = Cells/ml not calculated

CADOGAN PIER 1991 - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE																		
	30 01	05 03	19 03	03 04	15 04	01 05	13 06	27 06	11 07	25 07	12 08	29 08	09 09	26 09	01 10	24 10	07 11	25 11	09 12
GREENS																			
Chlamydomonas	80	74	64	7	2	5	23	14	5	1		13	8	18	10		12	18	
Scenedesmus			4	2		P	18	8			P			P	8	4	5	6	
Pediastrum									1	1			P						
Chlorella												1							
Coelastrum										5		2	P						
Tribonema											3					8	5		
Haematococcus								1											
Ankistrodesmus															4				
Trachelomonas																	1		
Unidentified species																	5		
DIATOMS																			
Pennate	20	21	28	10	21	9	18	20	18	31	25	2	35	21	59	38	42	64	60
Centric		5	3	67	66	83	39	56	75	44	41	52	51	39	16	25	26	12	33
Melosira				12	8	2													
FLAGELLATES																			
Euglena			P	2	4		2	1			3	2		P					
Cryptomonas										18	27	28	5	P	2	17	1		7
BLUE-GREENS																			
Oscillatoria																			
PROTOZOA				P	P			P	P		P	P	P	P	P	P		P	P
CELLS/ml	*	134	297	1483	920	4167	1292	193	4599	1889	217	212	694	373	490	240	73	17	15

* = Cells/ml calculated

LITTLETON - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE										
	03 01	30 01	05 03	19 03	03 04	16 04	30 04	14 05	29 05	12 06	26 06
GREENS											
Ankistrodesmus		3	10	9	7	8	5	P			P
Chlamydomonas type	15	P	5	15	7	2	3	5	5	4	P
Chlorella type	22	49	42	22	26	7	6	9	6	13	P
Scenedesmus	3		4	6	7	3	5		10	5	
Dictyopsphaerium			3		2	P			P	P	
OTHER GREENS						P	P	P	P	P	
DIATOMS											
CENTRIC TYPES	26	16	20	29	39	71	69	74	68	68	69
PENNATE TYPES	34	30	16	17	12	7	7	6	6	6	13
FLAGELLATES											
Euglena					P	P	P	P		P	
Trachelomonas				P	P		P		P		
Cryptomonas				P			P		P		
BLUE-GREENS											
Oscillatoria		P		P		P	P	P			
Merismopedia				P							
Microcystis											
Anabaena											
CELLS/ml	1227	620	1130	3175	12100	25300	35200	65000	40000	37250	3200

LITTLETON 1991 - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE										
	10 07	24 07	07 08	21 08	09 09	26 09	08 10	24 10	07 11	25 11	09 12
GREENS											
Ankistrodesmus	6	34	39	16	P	7	P	P	P		2
Chlamydomonas type	13		2		2		P	5	P	50	24
Chlorella type	6	42	32	57	81	63		18	18	9	24
Scenedesmus	39	7	4	6	5	26	21	18	10	9	22
Dictyopsphaerium				2					5		
OTHER GREENS	P	P	9	9	2						
DIATOMS											
CENTRIC TYPES	6	7	4	3	7	3	42	43	41	11	6
PENNATE TYPES	10	7	10	7			18	9	12	18	18
FLAGELLATES											
Euglena	10							P	P		2
Trachelomonas											
Cryptomonas	6							P			P
BLUE-GREENS											
Oscillatoria										2	P
Merismopedia											
Microcystis					P						
Anabaena					P						
CELLS/ml	3100	1460	476	680	1123	136	190	220	510	733	560

WALTON - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE										
	03 01	30 01	05 03	19 03	03 04	16 04	30 04	14 05	29 05	12 06	26 06
GREENS											
Ankistrodesmus	P	3	3	6	5	4	6	P	P	P	5
Chlamydomonas type	13		3	18	8	3	2	7	4	3	8
Chlorella type	23	50	46	24	24	9	5	4	13	7	8
Scenedesmus		3	6	3	4	P	2		10	5	20
Dictyopsphaerium				P					P	P	
OTHER GREENS					2	P	P	P	P	2	
DIATOMS											
CENTRIC TYPES	21	24	24	32	14	67	77	66	56	70	45
PENNATE TYPES	39	19	17	11	10	13	6	18	13	9	10
FLAGELLATES											
Euglena			P		P	P	P			P	
Trachelomonas	P					P	P	P	P		P
Cryptomonas					P			P		P	P
BLUE-GREENS											
Oscillatoria	P										
Merismopedia											
Microcystis											
Anabaena											
CELLS/ml	969	583	710	3175	9000	26000	74000	82000	42000	38000	6200

WALTON 1991 - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE										
	10 07	24 07	07 08	21 08	09 09	26 09	08 10	24 10	07 11	25 11	09 12
GREENS											
Ankistrodesmus	10	28	13	15	6	7			5	13	P
Chlamydomonas type	10				2	7		6	5	31	36
Chlorella type	7	44	36	53	79	74		39	15	25	20
Scenedesmus	28	15	46	25	10		15		5		8
Dictyopsphaerium	P										P
OTHER GREENS	P	P	P	P	P						
DIATOMS											
CENTRIC TYPES	7	P			2	4	37	33	37	6	8
PENNATE TYPES	10	6	2	2	P	7	7	18	16	25	16
FLAGELLATES											
Euglena	7							P	P		1
Trachelomonas											
Cryptomonas	10						P		P		P
BLUE-GREENS											
Oscillatoria	P						P		P		
Merismopedia											
Microcystis		P									
Anabaena											
CELLS/ml	2900	2600	470	791	808	169	135	330	420	300	340

RAVEN'S AIT - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE										
	03 01	30 01	05 03	19 03	03 04	16 04	30 04	14 05	29 05	12 06	26 06
GREENS											
Ankistrodesmus	2	P	3	14	4	2	10	P		2	5
Chlamydomonas type	9		P	14	5	2	3	8	3	4	8
Chlorella type	19	58	41	26	29	5	7	12	5	6	8
Scenedesmus	11		3	2	4	P			5	5	20
Dictyopsphaerium				P	P	P			P	P	
OTHER GREENS					P	P	P		P	P	
DIATOMS											
CENTRIC TYPES	21	21	21	27	45	81	60	63	74	66	45
PENNATE TYPES	28	17	20	14	7	6	17	14	9	6	10
FLAGELLATES											
Euglena	2	P		P	P		P	P		P	
Trachelomonas	3			P	P	P				P	P
Cryptomonas				P		P	P			P	P
BLUE-GREENS											
Oscillatoria		2	P	P						P	
Merismopedia							P				
Microcystis											
Anabaena											
CELLS/ml	1320	597	800	4050	9200	24800	36000	98000	37000	38000	67000

RAVEN'S AIT 1991 - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE										
	10 07	24 07	07 08	21 08	09 09	26 09	08 10	24 10	07 11	25 11	09 12
GREENS											
Ankistrodesmus	P	24	14	19	P	5		P	P		P
Chlamydomonas type	15				8	10		P	5	14	34
Chlorella type	10	59	31	67	33	56		30	21	33	21
Scenedesmus	20	P	27		56	19	50	15	9		14
Dictyopsphaerium							P				P
OTHER GREENS	P	P	P	3							P
DIATOMS											
CENTRIC TYPES	10	5		3			28	30	31		10
PENNATE TYPES	15	5	17	1		10	14	7	24	40	12
FLAGELLATES											
Euglena	P	P						P			P
Trachelomonas											
Cryptomonas	10						P	P	P		P
BLUE-GREENS											
Oscillatoria	P							P		13	
Merismopedia							P				
Microcystis											
Anabaena		P		1							
CELLS/ml	2000	2200	367	609	3080	105	140	270	370	250	360

TEDDINGTON (UPSTREAM) 1991 - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE										
	03 01	30 01	05 03	19 03	03 04	16 04	30 04	14 05	29 05	12 06	26 06
GREENS											
Ankistrodesmus	6	P	17	8	10	3	14	10	P	P	P
Chlamydomonas type	22		P	21	10	2	5	7	5	2	8
Chlorella type	14	54	31	24	22	3	3	9	10	7	13
Scenedesmus	5	P	13	5	2			P	15	8	10
Dictyopsphaerium					P	P		P	P	P	
OTHER GREENS					2	P	P			P	
DIATOMS											
CENTRIC TYPES	12	25	20	29	41	82	66	64	57	71	58
PENNATE TYPES	37	17	17	10	9	10	14	7	6	8	5
FLAGELLATES											
Euglena				P	2	P	P			P	
Trachelomonas	P		P		P	P		P	P		P
Cryptomonas					2	P	P				
BLUE-GREENS											
Oscillatoria	P	2			2					P	
Merismopedia			P		P	P	P		P	P	
Microcystis						P			P		
Anabaena											
CELLS/ml	897	905	1230	3875	12500	29700	34400	58000	39500	33000	6300

TEDDINGTON (UPSTREAM) 1991 - PHYTOPLANKTON TAXA LIST AND PERCENTAGE ABUNDANCE

TAXA LIST	DATE										
	10 07	24 07	07 08	21 08	09 09	26 09	08 10	24 10	07 11	25 11	09 12
GREENS											
Ankistrodesmus	9	18	22	14	2	4			P		P
Chlamydomonas type	14	P	P	P	P	2	P	P	P	21	32
Chlorella type	P	30	24	52	70	24		36	18	33	23
Scenedesmus	38	24	45	14	5	46	66		10	33	12
Dictyopsphaerium									P		
OTHER GREENS				P	5		P				
DIATOMS											
CENTRIC TYPES	P	15	5	1			11	39	32		8
PENNATE TYPES	10	8	2	6	P	2	5	15	24	13	15
FLAGELLATES											
Euglena									P		5
Trachelomonas	P										
Cryptomonas	14						P	P	P		P
BLUE-GREENS											
Oscillatoria		P						P			2
Merismopedia											
Microcystis											
Anabaena		P	2	2							
CELLS/ml	2100	4170	1800	1320	1857	270	610	330	670	600	720

APPENDIX 4

BENTHIC ALGAE COVER

BENTHIC ALGAE COVER

DATE 1991	TEDDINGTON	ISLEWORTH	KEW	HAMMERSMITH BRIDGE	CADOGAN PIER
30.01	0A	1A	2D	0A	1A
19.03	0A	1A	2D	0A	1A
15.04	0A	1A	1D	0A	1A
15.05	0A	1A	1A	0A	1B
13.06	0A	1B	1B	0A	1B
11.07	0A	1B	1B	0A	1B
12.08	0A	1D	2D	1B	1B
09.09	0A	1D	3D	2B	1C
01.10	0A	1D	2E	0A	1B
24.10	0A	1B	2C	0A	1B
07.11	0A	1B	2C	1A	2B
25.11	0A	1B	2C	1A	1A
09.12	0A	1B	2B	1A	1A

MUD AREAS	ALGAL COVER
0 = No mud present on shore	A = No algae present on mud
1 = Small patches of mud covering <10% of shore	B = Small patches of algae on mud
2 = Moderate mud cover (10-50% of shore area)	C = Large dark patches of algae on mud
3 = Heavy mud cover (50-90% of shore area)	D = Mud totally covered by thin layer of algae
4 = Mud covering >90% of shore	E = Mud totally covered by thick layer of algae