



ENVIRONMENT
AGENCY

**ENVIRONMENT PROTECTION DEPARTMENT
CORNWALL AREA**

FINAL DRAFT REPORT

**ENVIRONMENTAL MONITORING OF
THE FAL ESTUARY TO SUPPORT THE
FAL SWAN STUDY**

December 1997

COR/97/025

**Author: Rob Hocking
Investigations Officer**

**Geoff Boyd
Area Manager**

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ENVIRONMENT AGENCY

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ENVIRONMENTAL MONITORING OF THE FAL ESTUARY TO SUPPORT THE FAL SWAN STUDY

1. INTRODUCTION

1.1 Background

The River Fal Estuary is situated on the south coast of Cornwall. With the estuary, its many tidal creeks contain a wide range of wildlife habitats, some of which are of national and international importance. The estuary and its inputs have been affected over the last two centuries by three main industries.

- i) China clay abstraction, one of the largest industries in Cornwall is predominant around the upper reaches of the Fal.
- ii) Falmouth docks and marinas which repair and berth pleasure craft and ocean going merchant vessels.
- iii) The mining industry for metals which has taken place since the 18th century. The industry now, all but extinct still leaves a legacy of hundreds of miles of underground shafts and adits (horizontal tunnels which drain water from the mines). The last mine to close within the Fal estuary catchment was in March 1991. It took eight months for the mine to flood to the surface, the flood water then flowed into the Carnon River, an input to the Restronguet Creek.

Together with the run off from the many spoil heaps in the Carnon River catchment there are several adits which discharge water from abandoned mines into the Carnon River. These discharges are acidic and contain high concentrations of dissolved metals.

Since the autumn of 1992, numbers of the mute swan population within the Fal estuary have been sighted, either dead or behaving unnaturally. Between 1993 and 1995 at least fifty-four dead or dying swans were collected between Restronguet Creek and Falmouth docks. The birds were taken to the Polwhele Veterinary Investigation unit where post mortem examinations were conducted (see Ref 1).

The post mortem examinations showed that the tissues from the swans in the Fal estuary contained high concentrations of metals, in particular zinc. Levels of zinc found in the swan's pancreas were between fifteen and thirty times greater than that of the swans found elsewhere.

1.2 Objectives

Determine metal and organotin concentrations in the sediments and biota within the Fal estuary and Restronguet Creek.

2. METHODS

The following methods were adopted to meet the above objectives.

- i) Six surveys were conducted between March 1995 and November 1996. After each survey the results were tabulated and reviewed, these results then determined the framework for the following surveys.

The matrix below shows the chronology and analytical details of the surveys.

Date	Sediments (Organics)	Sediments (Total Metals)	Sediments *(Bio-available metals)	Algae (Metals)	Organotins
09/03/95	✓	-	-	-	-
16/03/95	-	✓	✓	-	✓
27/04/95	-	✓	-	-	-
16/06/95	-	✓	✓	✓	✓
16/02/96	-	✓	-	-	✓
12/11/96	-	✓	✓	✓	✓

** These concentrations are of digestible metals. The abstraction technique uses 0.1 molar of Hydrochloric acid to imitate conditions found in digestive systems.*

The first two surveys conducted on 9th and 16th March concentrated on routine monitoring sites within the Fal estuary and Restronguet Creek. Additional data were gathered from four extra sites within Restronguet Creek.

Later surveys required the sites to be at key points, mainly within Restronguet Creek. The sample points were located further up the shoreline, in areas where swans were known to feed. This was also a more reliable source of seaweed for analysis along with decreasing the logistical difficulties.

- ii) Six extra samples were taken on 16/02/96 from sites in Restronguet Creek and Falmouth. These samples were sent to M-Scan Ltd to be screened for the presence of organometallic species. To reduce costs three key samples were initially analysed (sites V, Y and M). The results from the screening proved negative so the remaining samples were disregarded.

3. RESULTS

- 3.1 A map showing the Fal Estuary system with the sample points used is shown in Figure 1.
- 3.2 Charts showing lead and zinc concentrations in sediments and algae (from three of the surveys) are shown in figures 2 to 7.

- 3.3 Summaries of the metals data collected from the six surveys are shown in Tables 1 to 10, Tributyl Tin data are shown in table 11. Table 12 shows Organic Carbon data and table 13 shows Organics data. All tables show data for both sediments and algae.

4. DISCUSSION

- 4.1 The results identify two key areas where lead and zinc concentrations are at their highest,
- i) Restronguet Creek.
 - ii) Penryn River at the Eastern Breakwater.
- 4.2 As indicated in Figure 1, Site V (Penpol Creek) is the site of an abandoned lead smelter which closed approximately a century ago. Samples taken on 16 June 1995 showed bioavailable lead concentrations at Site V to be 1239 mg/kg (78% of the total lead detected). Site M, Penryn River at the Eastern Breakwater had second highest bioavailable lead concentrations with 675 mg/kg (54% of the bioavailable lead detected at Site V). Bioavailable lead concentrations outside Restronguet Creek were found to be as low as 8.3 mg/kg (0.67% of the bioavailable lead found at Penpol Creek).
- 4.3 Bioavailable zinc concentrations were highest at Site M (Penryn River at the Eastern Breakwater) where 9767 mg/kg were detected. This figure is approximately 2½ times greater than the highest concentrations found on that day at Restronguet Creek. The concentrations found at Restronguet Creek were not low though, the highest bioavailable zinc concentrations were found at E19A14 on 16 March 1995 (4326 mg/kg). One higher bioavailable zinc result was received from site X on 12 November 1996 but it must be noted that most of the bioavailable metals concentrations were higher than the total concentrations in that particular survey. After discussions with the laboratory it was found that the bioavailable results were rounded up, hence higher bioavailable than total concentrations. This has made quantifying bioavailable metals difficult for this survey.

5. REFERENCES

1. Simpson, V.R. An Investigation into mortality of Mute Swans (*Cygnus olor*) on the River Fal Estuary, Cornwall
2. Geatches, T. February 1997. Upper Fal Estuary Urban Waste Water Treatment Directive Sensitive Area (Eutrophic) Designation.

Table 1

Arsenic in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004	5596.2	199.0				
E19A14	2176.3	348.0				
E19A30	2752.5	473.0				
F	1133.6	148.0				
G	1302.8	206.0				
H	1116.4	234.0				
I	969.2	189.0				
E19A12	1955.5	301.0				
E19A26	285.7	73.7				
E19A22	115.6	15.6				
E19A28	581.3	174.0				
E19A27	283.1	70.4				
E19A7	56.7	7.7				
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A	87.0	20.6				
B	61.0	15.2				
C	41.0	2.9				
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K	49.8	<2.0	61.9	73.9	13.9	12.1
L	42.6	<2.0	45.1	69.3	20.1	12.9
M	51.2	2.3	37.8	45.8	8.2	9.1
N	7.2	<2.0			12.2	11.8
O	77.7	17.5	73.9	81.3	17.9	27.4
P	228.0	74.9	88.8	93.9	51.3	37.4
Q	10.3	2.2	74.8	65.1	10.8	8.1
R	73.0	16.9	85.0	70.7	30.2	19.8
S	868.0	305.0	114.0	106.0	88.1	225.0
T	81.9	25.5	149.0	106.0	45.2	65.3
U	1401.0	771.0	135.0	160.0	205.0	163.0
V	673.0	378.0	453.0	21.8	No result	294.0
W	1816.0	788.0	169.0	157.0	473.0	378.0
X	1862.0	935.0				
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M	272.0					
N						
O						
P						
Q						
R						
S						
T						
U						
V	593.0					
W						
X						
Y	22.7					
Z	17.2					

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S	638.0	830.0	175.0		142.0	
T	538.0	570.0	69.0			
U	796.0	810.0	126.0			
V	1278.0	1300.0	221.0			
W	1185.0	1200.0	187.0			
X	2240.0	2300.0	342.0			
Y	48.0	55.0	120.0		33.5	
Z						

Site code	Site description
R19E004	River Carnon at Devon
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Carrick Roads North, Off Restronguet Point
E19A22	Carrick Roads NE, Opposite Restronguet Creek
E19A28	Carrick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Carrick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Penderis Point
O	Mylor Creek at Greatwood Quay
P	Carrick Roads at Greatwood
Q	Carrick Roads at Messack
R	Carrick Roads at Porthgidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Talsack Creek
Y	Carrick Roads at Turnstone Point
Z	Hefford Estuary at Frenchmans Creek

Table 2

Cadmium in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004	3.99	2.17				
E19A14	4.10	1.42				
E19A30	3.85	0.47				
F	4.39	0.39				
G	3.14	0.30				
H	2.87	0.74				
I	1.43	0.63				
E19A12	1.98	0.87				
E19A26	0.83	0.25				
E19A22	0.39	0.11				
E19A28	0.83	0.25				
E19A27	1.03	0.48				
E19A7	0.11	<0.10				
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A	0.46	0.25				
B	0.76	0.22				
C	0.43	0.11				
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K	<0.10	<0.10	0.45	0.48	<0.10	<0.10
L	0.10	<0.10	0.37	0.29	<0.10	<0.10
M	0.65	<0.10	0.26	0.31	<0.10	<0.10
N	<0.10	<0.10			<0.10	<0.10
O	0.22	<0.10	0.41	0.59	<0.10	<0.10
P	0.97	0.64	0.44	0.45	<0.10	<0.10
Q	<0.10	<0.10	0.50	0.37	<0.10	<0.10
R	0.27	0.20	0.42	26.00	<0.10	<0.10
S	1.27	0.48	0.23	0.48	0.16	0.28
T	0.41	0.24	0.41	0.33	0.11	<0.10
U	1.77	0.79	0.54	0.33	0.24	0.26
V	0.77	0.48	0.62	0.56	0.52	0.45
W	2.00	0.62	0.31	0.38	0.54	0.42
X	2.45	0.99				
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M	1.91					
N						
O						
P						
Q						
R						
S						
T						
U						
V	0.78					
W						
X						
Y	<0.10					
Z	0.31					

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S	1.21		0.51		0.33	
T	1.65		0.17			
U	1.47		0.38			
V	1.59		0.34			
W	1.90		0.43			
X	2.58	2.50	0.67			
Y	0.21		0.41		0.13	
Z						

Site code	Site description
R19E004	River Camon at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Carrick Roads North, Off Restronguet Point
E19A22	Carrick Roads NE, Opposite Restronguet Creek
E19A28	Carrick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Carrick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Carrick Roads at Greatwood
Q	Carrick Roads at Messack
R	Carrick Roads at Porthgidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Telfacks Creek
Y	Carrick Roads at Turnaware Point
Z	Helford Estuary at Frenchmans Creek

Table 3

Chromium in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K			<1.0	1.4	2.1	3.2
L			1.2	<1.0	5.4	3.0
M			1.2	<1.0	2.2	2.5
N					7.7	4.0
O			1.8	1.2	4.5	3.3
P			2.7	1.3	5.5	4.5
Q			2.7	1.1	1.8	2.8
R			2.5	2.2	4.6	4.0
S			3.2	1.6	3.7	6.0
T			7.3	3.3	3.3	4.5
U			3.8	4.0	7.9	4.8
V			10.8	9.9	11.3	14.6
W			<1.0	<1.0	17.1	10.8
X						
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S			28.0	2.0	7.6	
T			48.0	<1.0		
U			43.0	1.0		
V			43.0	4.0		
W			44.0	1.5		
X			36.0	5.7		
Y			20.0	<1.0	9.1	
Z						

Site code	Site description
R19E004	River Camron at Devonian
E19A14	Restronguet Creek at Devonian
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Carrick Roads North, Off Restronguet Point
E19A22	Carrick Roads NE, Opposite Restronguet Creek
E19A28	Carrick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Carrick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Carrick Roads at Greatwood
Q	Carrick Roads at Messack
R	Carrick Roads at Porthgwynn
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Tallocks Creek
Y	Carrick Roads at Turnware Point
Z	Hellord Estuary at Frenchmans Creek

Table 4

Copper in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004	3477.6	2086.0				
E19A14	3370.3	2455.0				
E19A30	4006.6	704.0				
F	2513.9	38.8				
G	2718.9	60.1				
H	2221.6	493.0				
I	2057.6	1503.0				
E19A12	2225.8	1397.0				
E19A26	965.9	360.0				
E19A22	239.6	52.1				
E19A28	1195.4	690.0				
E19A27	750.2	261.0				
E19A7	110.0	36.8				
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A	380.0	6.7				
B	464.0	2.0				
C	459.0	<1.0				
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K	69.5	25.5	37.9	48.2	30.9	17.7
L	149.0	30.7	54.1	57.8	73.1	46.4
M	2532.0	806.0	43.8	40.0	23.9	21.7
N	24.5	3.7			16.8	18.1
O	180.0	94.3	62.8	60.7	32.3	40.5
P	576.0	133.0	95.5	85.4	110.0	95.4
Q	17.1	7.5	31.6	22.4	9.0	8.3
R	215.0	137.0	68.6	64.2	49.9	37.8
S	1498.0	795.0	131.0	122.0	139.0	333.0
T	232.0	84.2	265.0	151.0	84.9	147.0
U	2306.0	1478.0	288.0	394.0	437.0	341.0
V	843.0	810.0	876.0	43.9	525.0	528.0
W	2592.0	1523.0	452.0	497.0	807.0	646.0
X	2922.0	1912.0				
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M	5004.0					
N						
O						
P						
Q						
R						
S						
T						
U						
V	1107.0					
W						
X						
Y	57.2					
Z	51.1					

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S	1110.0	1100.0	162.0		315.0	
T	1302.0	1300.0	66.3			
U	1693.0	1700.0	180.0			
V	2172.0	2100.0	451.0			
W	2065.0	2000.0	311.0			
X	2647.0	2600.0	857.0			
Y	76.7	76.0	47.4			
Z						

Site code	Site description
R19E004	River Camon at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Camick Roads North, Off Restronguet Point
E19A22	Camick Roads NE, Opposite Restronguet Creek
E19A28	Camick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Camick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Camick Roads at Greatwood
Q	Camick Roads at Messack
R	Camick Roads at Porthgidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chychose
X	Restronguet Creek at Tallacks Creek
Y	Camick Roads at Turnaware Point
Z	Helford Estuary at Frenchmans Creek

Table 5

Iron in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004	170368	60980				
E19A14	91729	27566				
E19A30	86443	33926				
F	65589	33075				
G	71715	36241				
H	85457	20499				
I	59204	18407				
E19A12	73632	27761				
E19A26	36844	14145				
E19A22	23794	5004				
E19A28	46152	16671				
E19A27	35336	11598				
E19A7	17542	2178				
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K	17814	149	370	681	1059	914
L	29781	300	263	201	3301	857
M	128789	12627	535	400	565	684
N	10280	271			13075	9393
O	39696	2580	373	230	1249	2018
P	37946	10588	440	283	4029	2949
Q	27851	1464	503	184	631	2578
R	45908	3098	670	1248	3423	2287
S	48116	14117	894	551	4105	6774
T	33329	2971	6460	2717	2775	3633
U	58269	25030	3573	4951	10604	6324
V	51769	12927	16285	15635	15632	22423
W	64881	27162	1912	1971	23273	17387
X	72660	28601				
Y						
Z						

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S	44045.0	37000.0	1833.0		8258.0	
T	45098.0	38000.0	3495.0			
U	52023.0	43000.0	1330.0			
V	56160.0	49000.0	5125.0			
W	52710.0	46000.0	1600.0			
X	71851.0	61000.0	7340.0			
Y	26819.0	23000.0	601.0		13944.0	
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A	41101	9262				
B	38726	10576				
C	No result	10535				
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M	31636.0					
N						
O						
P						
Q						
R						
S						
T						
U						
V	52276.0					
W						
X						
Y	51806.0					
Z	28120.0					

Site code	Site description
R19E004	River Camron at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Camick Roads North, Off Restronguet Point
E19A22	Camick Roads NE, Opposite Restronguet Creek
E19A28	Camick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Camick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Camick Roads at Greatwood
Q	Camick Roads at Messack
R	Camick Roads at Porthgidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Tallacks Creek
Y	Camick Roads at Turnaware Point
Z	Hefford Estuary at Frenchmans Creek

Table 6

Lead in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004	450.3	231.0				
E19A14	290.2	166.0				
E19A30	433.4	198.0				
F	259.4	64.2				
G	243.3	54.9				
H	1061.7	765.0				
I	566.3	456.0				
E19A12	208.8	109.0				
E19A26	97.6	60.3				
E19A22	76.5	32.0				
E19A28	146.8	94.1				
E19A27	117.2	67.2				
E19A7	55.1	17.5				
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K	173.0	20.5	4.3	7.4	11.8	6.7
L	140.0	27.0	5.1	4.4	28.3	7.9
M	1424.0	675.0	5.8	4.3	5.0	5.1
N	19.2	8.3			24.8	12.1
O	102.0	30.5	2.5	1.8	6.3	9.6
P	97.7	54.7	3.2	1.9	16.9	11.9
Q	14.1	9.0	1.7	1.2	2.9	2.9
R	70.3	33.8	3.3	5.2	11.7	8.7
S	141.0	80.5	4.9	3.6	15.6	32.2
T	136.0	74.9	27.7	12.9	11.1	15.9
U	216.0	161.0	17.7	25.7	45.6	31.2
V	1589.0	1239.0	170.0	13.9	187.0	459.0
W	332.0	245.0	18.2	20.1	469.0	241.0
X	267.0	181.0				
Y						
Z						

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S	101.0	110.0	10.5		27.5	
T	170.0	180.0	6.3			
U	188.0	210.0	9.0			
V	800.0	850.0	80.5			
W	313.0	310.0	14.5			
X	309.0	310.0	40.4			
Y	33.6	37.0	3.5		20.8	
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A	208.0	138.0				
B	240.0	118.0				
C	275.0	265.0				
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M	329.0					
N						
O						
P						
Q						
R						
S						
T						
U						
V	527.0					
W						
X						
Y	62.1					
Z	47.6					

Site code	Site description
R19E004	River Carnon at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Carrick Roads North, Off Restronguet Point
E19A22	Carrick Roads NE, Opposite Restronguet Creek
E19A28	Carrick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Carrick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Carrick Roads at Greatwood
Q	Carrick Roads at Messack
R	Carrick Roads at Porthgidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Tallocks Creek
Y	Carrick Roads at Turnaware Point
Z	Helord Estuary at Frenchmans Creek

Table 7

Manganese in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004	565.0	69.4				
E19A14	482.6	49.8				
E19A30	855.8	44.8				
F	514.0	90.8				
G	445.3	83.1				
H	454.8	106.0				
I	586.8	300.7				
E19A12	495.1	91.1				
E19A26	326.6	60.6				
E19A22	160.1	50.2				
E19A28	381.9	125.0				
E19A27	314.9	61.9				
E19A7	194.9	62.4				
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K	424.0	37.4				
L	608.0	76.1				
M	2309.0	957.0				
N	216.0	40.2				
O	847.0	43.5				
P	604.0	136.0				
Q	258.0	48.2				
R	662.0	36.1				
S	671.0	160.0				
T	457.0	27.8				
U	640.0	213.0				
V	910.0	231.0				
W	665.0	173.0				
X	655.0	216.0				
Y						
Z						

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S	509.0	510.0				
T	392.0	420.0				
U	558.0	540.0				
V	665.0	650.0				
W	584.0	570.0				
X	483.0	480.0				
Y	253.0	240.0				
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A	352.0	79.8				
B	363.0	98.0				
C	416.0	92.3				
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M	3458.0					
N						
O						
P						
Q						
R						
S						
T						
U						
V	512.0					
W						
X						
Y	788.0					
Z	643.0					

Site code	Site description
R19E004	River Camron at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Camick Roads North, Off Restronguet Point
E19A22	Camick Roads NE, Opposite Restronguet Creek
E19A28	Camick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Camick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Penderis Point
O	Mylor Creek at Greatwood Quay
P	Camick Roads at Greatwood
Q	Camick Roads at Messack
R	Camick Roads at Porthgidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Tallacks Creek
Y	Camick Roads at Turnaware Point
Z	Helford Estuary at Frenchmans Creek

Table 8

Mercury in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K			0.131	0.096	0.117	0.130
L			2.827	2.256	0.663	0.490
M			0.029	0.085	0.064	0.090
N					0.030	0.040
O			0.018	0.015	0.024	0.050
P			0.025	0.021	0.069	0.060
Q			0.013	0.012	0.014	<0.010
R			0.019	0.035	0.051	0.100
S			0.017	0.018	0.050	0.080
T			0.062	0.066	0.032	0.058
U			0.030	0.031	0.087	0.060
V			0.161	0.266	0.142	0.124
W			0.021	0.026	0.150	0.105
X						
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S			0.023		0.046	
T			0.034			
U			0.020			
V			0.048			
W			0.020			
X			0.068			
Y			0.024		0.028	
Z						

Site code	Site description
R19E004	River Camron at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Carrick Roads North, Off Restronguet Point
E19A22	Carrick Roads NE, Opposite Restronguet Creek
E19A26	Carrick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Carrick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Carrick Roads at Greatwood
Q	Carrick Roads at Messack
R	Carrick Roads at Porthowidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chychoose
X	Restronguet Creek at Talsacks Creek
Y	Carrick Roads at Turnaware Point
Z	Helford Estuary at Frenchmans Creek

Table 9

Nickel in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004	33.7	13.0				
E19A14	52.4	19.6				
E19A30	46.1	11.7				
F	39.1	11.7				
G	47.5	12.0				
H	54.7	10.5				
I	41.9	11.9				
E19A12	32.8	11.3				
E19A26	28.6	3.3				
E19A22	18.8	1.5				
E19A28	31.7	5.3				
E19A27	27.1	3.2				
E19A7	18.8	0.8				
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K	23.6	<0.5	3.2	3.1	3.2	1.7
L	41.1	1.0	2.9	2.5	6.2	2.5
M	320.0	106.0	2.4	2.4	2.5	2.7
N	12.7	<0.5			13.1	8.5
O	43.0	2.4	4.1	3.0	1.7	2.0
P	38.0	3.1	3.0	2.6	4.6	3.9
Q	28.3	<0.5	3.1	2.2	1.5	3.2
R	43.7	1.3	3.8	3.5	3.7	2.5
S	25.4	6.7	1.8	2.0	3.3	6.1
T	30.8	2.9	8.2	4.1	3.4	3.8
U	38.5	15.6	4.6	5.9	10.5	7.1
V	45.7	12.6	14.2	16.8	13.6	27.8
W	39.9	15.0	2.8	3.4	18.9	20.0
X	41.5	17.0				
Y						
Z						

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S	29.4	30.0	6.3		6.6	
T	37.4	37.0	5.6			
U	35.7	38.0	3.8			
V	43.4	41.0	4.7			
W	36.6	40.0	3.5			
X	43.9	48.0	6.0			
Y	19.8	24.0	4.2			
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A	31.0	4.2				
B	33.0	5.0				
C	37.0	8.8				
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M	558.0					
N						
O						
P						
Q						
R						
S						
T						
U						
V	46.1					
W						
X						
Y	33.6					
Z	32.0					

Site code	Site description
R19E004	River Camron at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Carrick Roads North, Off Restronguet Point
E19A22	Carrick Roads NE, Opposite Restronguet Creek
E19A28	Carrick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Carrick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Carrick Roads at Greatwood
Q	Carrick Roads at Messack
R	Carrick Roads at Porthgidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Tallacks Creek
Y	Carrick Roads at Turnaware Point
Z	Helford Estuary at Frenchmans Creek

Table 10

Zinc in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004	2704.7	1675.0				
E19A14	5760.8	4326.0				
E19A30	4032.2	2279.0				
F	4492.2	2669.0				
G	4890.7	3068.0				
H	4220.1	2208.0				
I	2840.2	2425.0				
E19A12	3340.4	2562.0				
E19A26	849.8	620.0				
E19A22	474.8	231.0				
E19A28	1610.5	1287.0				
E19A27	1092.7	699.0				
E19A7	189.9	77.3				
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A	584.0	376.0				
B	830.0	491.0				
C	1238.0	686.0				
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K	186.0	83.9	328.0	379.0	51.8	31.0
L	534.0	124.0	426.0	429.0	98.5	47.1
M	21327.0	9767.0	305.0	321.0	27.2	27.5
N	84.7	34.8			75.1	51.8
O	460.0	309.0	635.0	773.0	97.2	168.0
P	1311.0	1095.0	748.0	587.0	270.0	245.0
Q	176.0	116.0	452.0	322.0	37.6	39.9
R	631.0	413.0	515.0	359.0	131.0	126.0
S	2016.0	1465.0	452.0	569.0	332.0	619.0
T	555.0	386.0	815.0	474.0	192.0	248.0
U	4082.0	3159.0	948.0	897.0	919.0	739.0
V	1831.0	1699.0	1905.0	96.4	1131.0	1141.0
W	4408.0	3317.0	900.0	1060.0	1783.0	1564.0
X	5096.0	3869.0				
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L	48326.0					
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V	1811.0					
W						
X						
Y	177.0					
Z	162.0					

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S	1282.0	1300.0	551.0		330.0	
T	1994.0	2100.0	578.0			
U	2180.0	2200.0	449.0			
V	3205.0	3300.0	592.0			
W	2914.0	3000.0	520.0			
X	4281.0	4400.0	893.0			
Y	305.0	310.0	318.0		151.0	
Z						

Site code	Site description
R19E004	River Carnon at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Carrick Roads North, Off Restronguet Point
E19A22	Carrick Roads NE, Opposite Restronguet Creek
E19A28	Carrick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Carrick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Carrick Roads at Greatwood
Q	Carrick Roads at Messack
R	Carrick Roads at Porthgidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Tallacks Creek
Y	Carrick Roads at Turnswane Point
Z	Helford Estuary at Frenchmans Creek

Table 11

Tributyl tin in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

16 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28	<0.060					
E19A27	<0.088					
E19A7	<0.080					
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K	<0.94					
L	<0.94					
M	<0.107					
N	<0.108					
O	<0.91					
P	<0.179					
Q	<0.107					
R	<0.118					
S	<0.195					
T	<0.124					
U	<0.224					
V	<0.103					
W	<0.338					
X	<0.245					
Y						
Z						

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S	<0.035					
T	<0.070					
U	0.186					
V	<0.088					
W	<0.086					
X	<0.051					
Y	<0.038					
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A	0.100					
B	0.785					
C	7.746					
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M	0.771					
N						
O						
P						
Q						
R						
S						
T						
U						
V	0.110					
W						
X						
Y	<0.027					
Z	<0.027					

Site code	Site description
R19E004	River Camron at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Carrick Roads North, Off Restronguet Point
E19A22	Carrick Roads NE, Opposite Restronguet Creek
E19A28	Carrick Roads off Greatwood House
E19A27	Mylor Creek, near Trelaw
E19A7	Carrick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Carrick Roads at Greatwood
Q	Carrick Roads at Messack
R	Carrick Roads at Porthgwithen
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Tadacks Creek
Y	Carrick Roads at Yumaware Point
Z	Helford Estuary at Frenchmans Creek

Table 12

Organic carbon in sediment and algae

Key ST - Sediment total SB - Sediment bioavailable FU - Fucus unwashed FW - Fucus washed EU - Enteromorpha unwashed EW - Enteromorpha washed

18 March 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004	3.40					
E19A14	2.80					
E19A30	2.40					
F	2.60					
G	1.20					
H	1.20					
I	2.50					
E19A12	0.60					
E19A26	3.80					
E19A22	2.10					
E19A28	4.50					
E19A27	4.80					
E19A7	4.20					
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

27 April 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A	2.85					
B	2.71					
C	2.45					
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

16 June 1995

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K	28900.00					
L	31600.00					
M	35100.00					
N	32500.00					
O	31800.00					
P	32500.00					
Q	23200.00					
R	20400.00					
S	31700.00					
T	29400.00					
U	30800.00					
V	31600.00					
W	29400.00					
X	41800.00					
Y						
Z						

16 February 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M	13200.00					
N						
O						
P						
Q						
R						
S						
T						
U						
V	7900.00					
W						
X						
Y	15800.00					
Z	14300.00					

12 November 1996

Site code	ST	SB	FU	FW	EU	EW
R19E004						
E19A14						
E19A30						
F						
G						
H						
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

Site code	Site description
R19E004	River Carnon at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Carrick Roads North, Off Restronguet Point
E19A22	Carrick Roads NE, Opposite Restronguet Creek
E19A28	Carrick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Carrick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Carrick Roads at Greatwood
Q	Carrick Roads at Messack
R	Carrick Roads at Porthgidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Tallacks Creek
Y	Carrick Roads at Turnaware Point
Z	Helford Estuary at Frenchmans Creek

Table 13

Organics in sediment and algae

9 March 1995

Site code	Alcohol	Alcohols/Aldehyde	C5H8O	Hydrocarbon	PAH'S	Tributylchloro Tin (approx)
R19E004						
E19A14	0.2		1.0	0.3		
E19A30				0.3		
F						
G		0.8				
H					0.2	
I						
E19A12						
E19A26						
E19A22						
E19A28						
E19A27						
E19A7						
A						
B						
C						10.0
K						
L						
M						
N						
O						
P						
Q						
R						
S						
T						
U						
V						
W						
X						
Y						
Z						

Site code	Site description
R19E004	River Camon at Devoran
E19A14	Restronguet Creek at Devoran
E19A30	Restronguet Creek West of Point
F	Restronguet Creek at Penpol Creek
G	Restronguet Creek at Penpol Creek
H	Restronguet Creek at Penpol Creek
I	Restronguet Creek at Penpol Creek
E19A12	Restronguet Creek at Harcourt
E19A26	Carrick Roads North, Off Restronguet Point
E19A22	Carrick Roads NE, Opposite Restronguet Creek
E19A28	Carrick Roads off Greatwood House
E19A27	Mylor Creek, near Trelew
E19A7	Carrick Roads at St Mawes
A	Penryn River N of Royal Cornwall Yacht Club
B	Penryn River West of Falmouth docks
C	Penryn River at Falmouth Docks
K	Penryn River at Royal Cornwall Yacht Club
L	Penryn River at County Wharf
M	Penryn River at Eastern Breakwater
N	Penryn River at Pendennis Point
O	Mylor Creek at Greatwood Quay
P	Carrick Roads at Greatwood
Q	Carrick Roads at Messack
R	Carrick Roads at Porthgidden
S	Restronguet Creek at Restronguet Point
T	Restronguet Creek at Restronguet Passage
U	Restronguet Creek at Harcourt
V	Restronguet Creek at Penpol Creek
W	Restronguet Creek at Chycoose
X	Restronguet Creek at Tallacks Creek
Y	Carrick Roads at Turnaware Point
Z	Helford Estuary at Frenchmans Creek

Figure 1. Sediment and algae sampling sites

A key with site codes and descriptions is shown on all results tables.

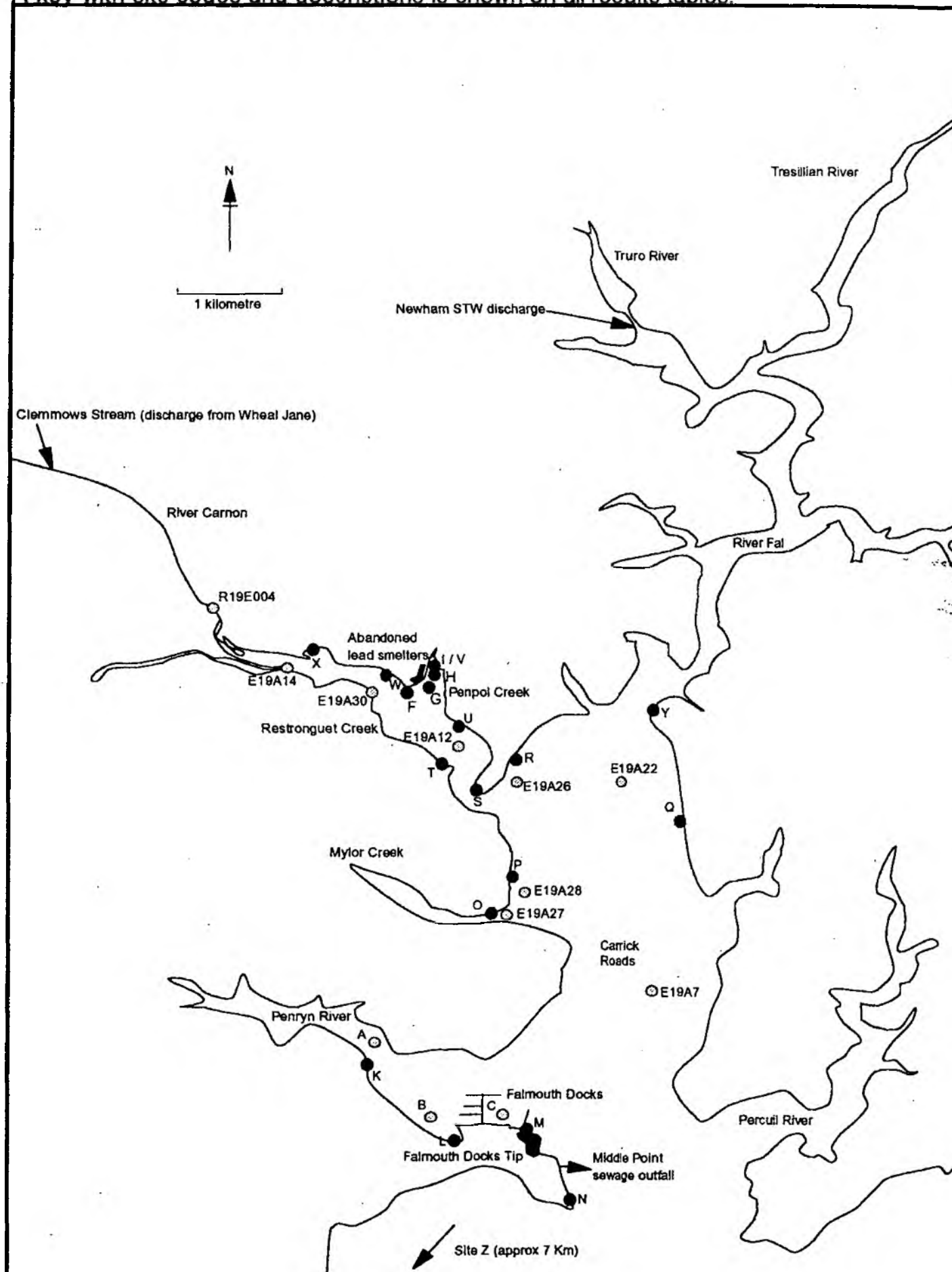
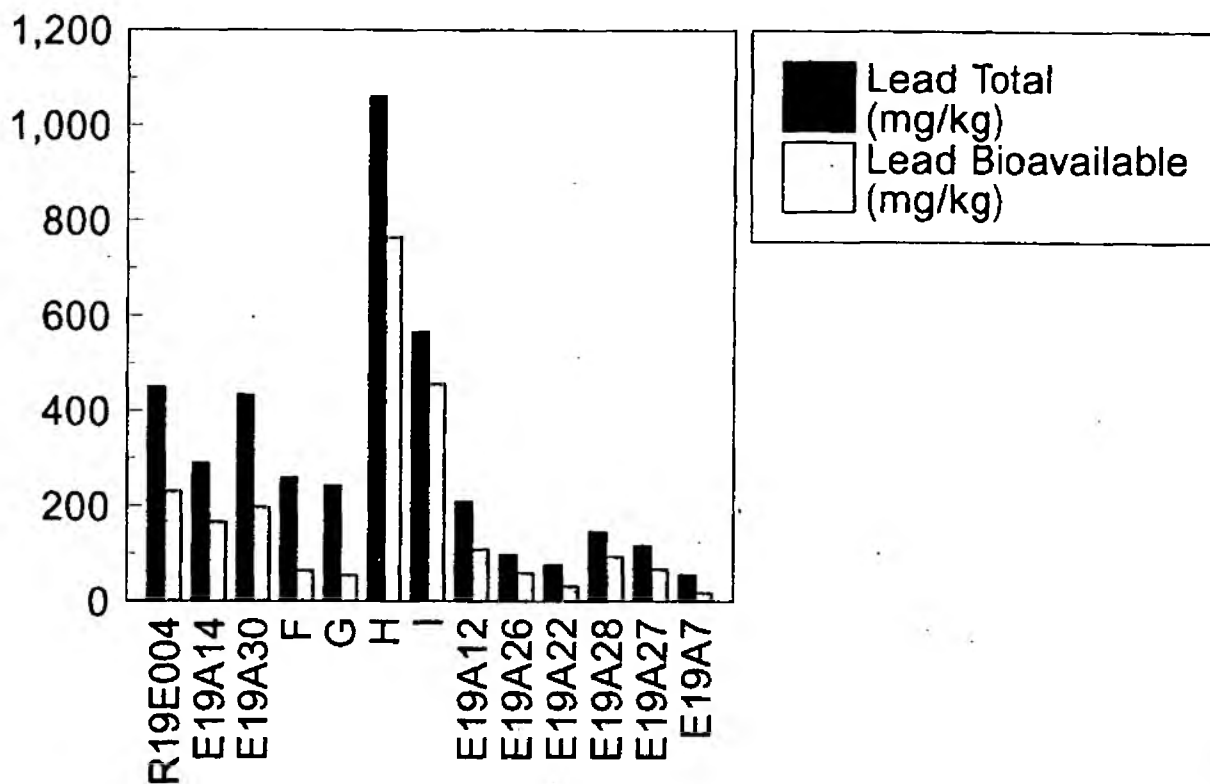


Figure 2.

Sediment Lead 16 March 1995



Sediment Zinc 16 March 1995

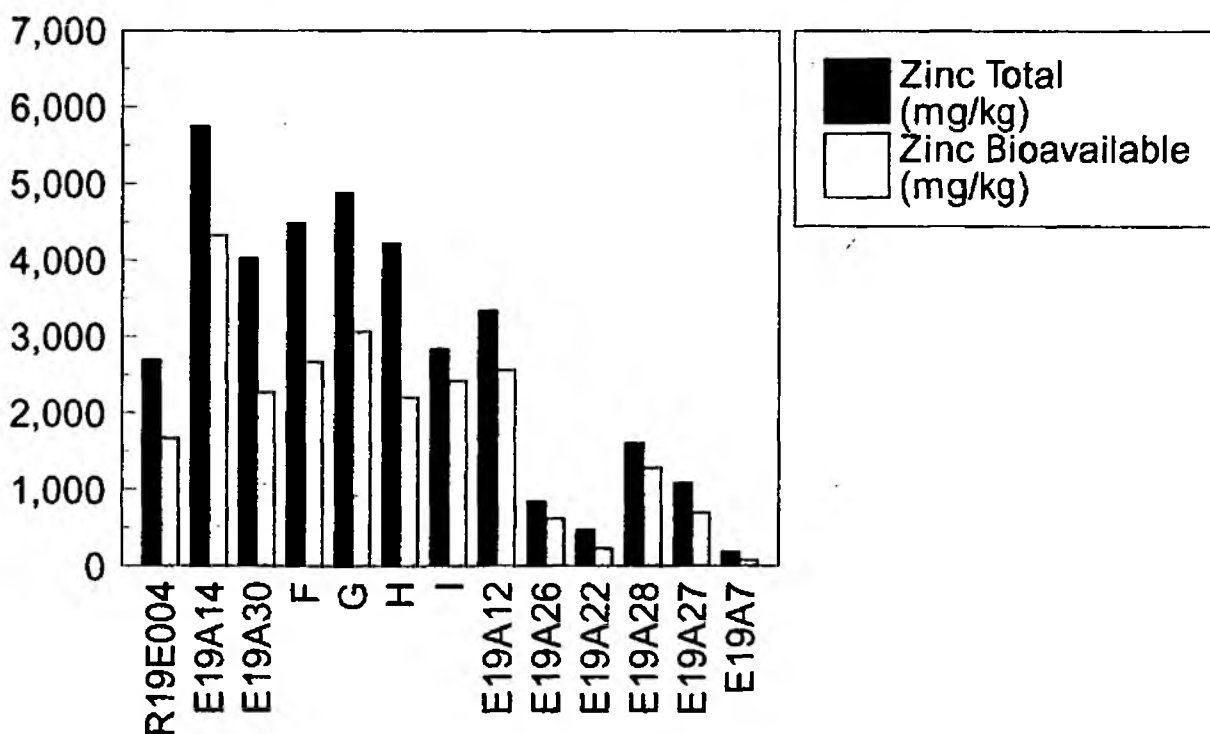
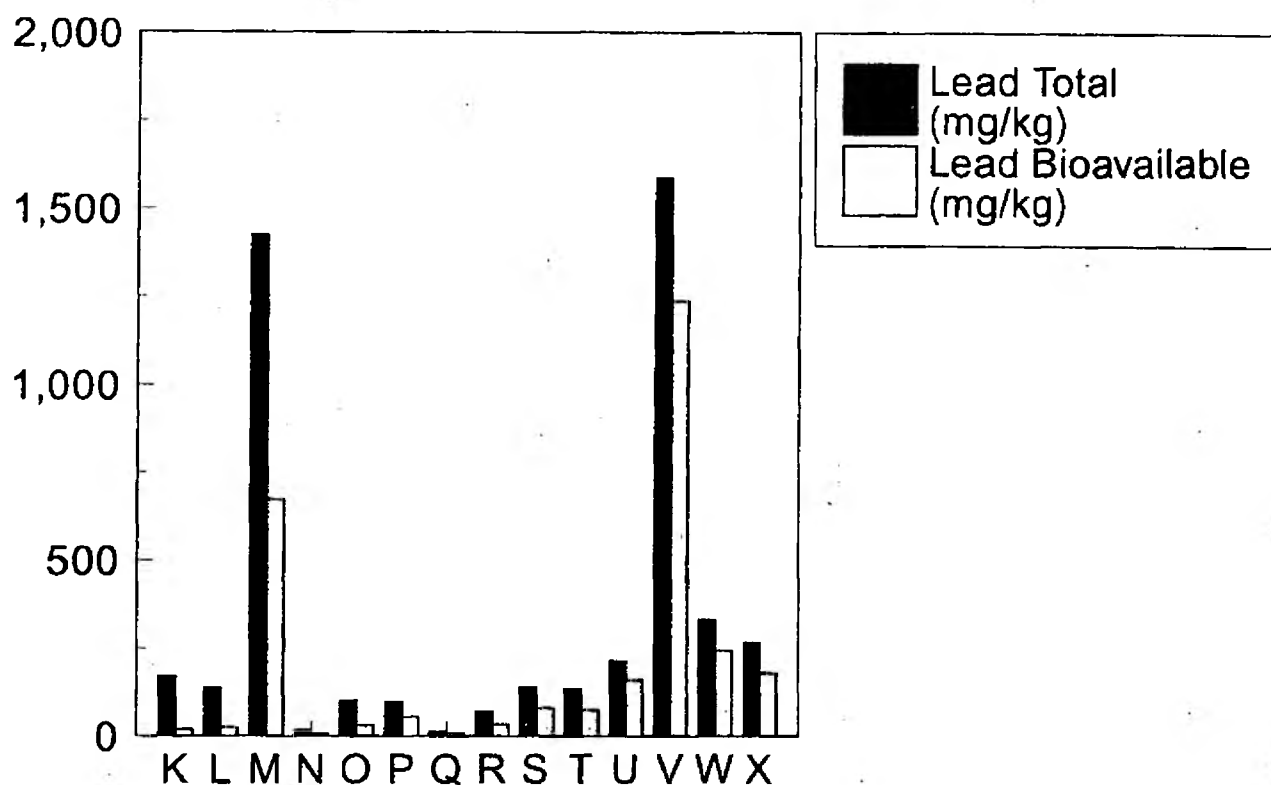


Figure 3.

Sediment Lead 16 June 1995



Sediment Zinc 16 June 1995

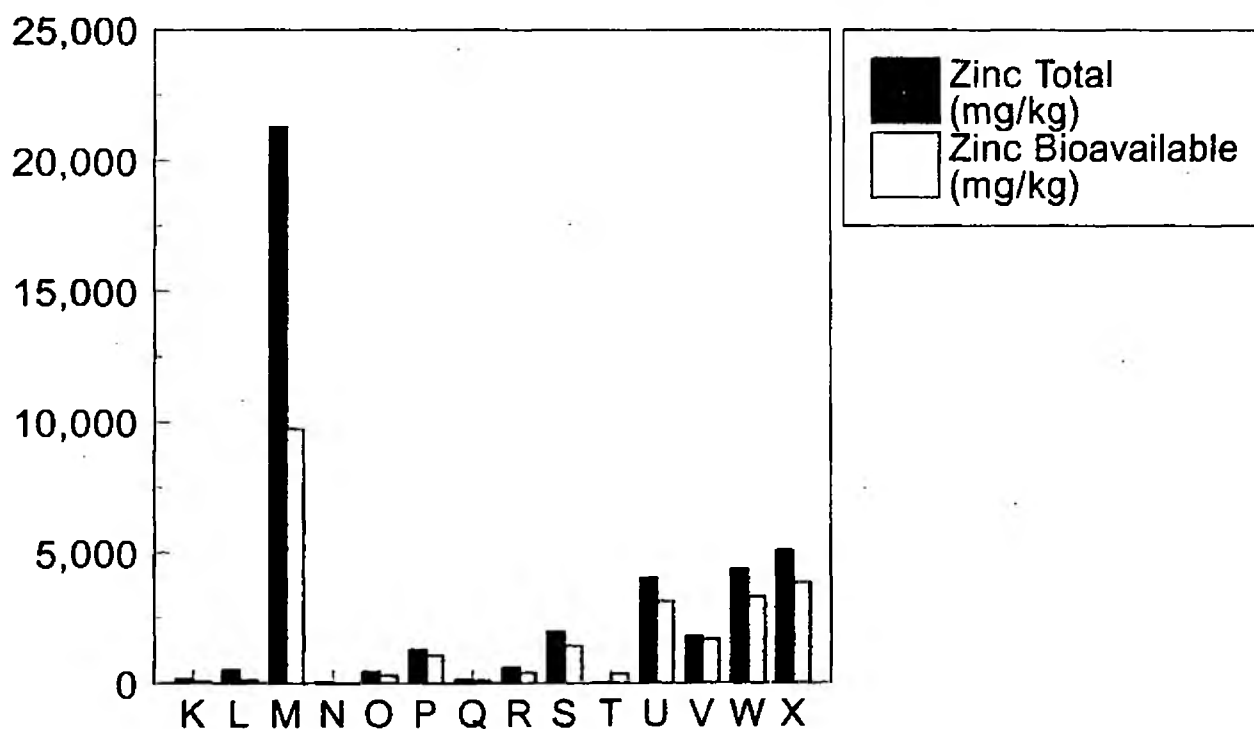
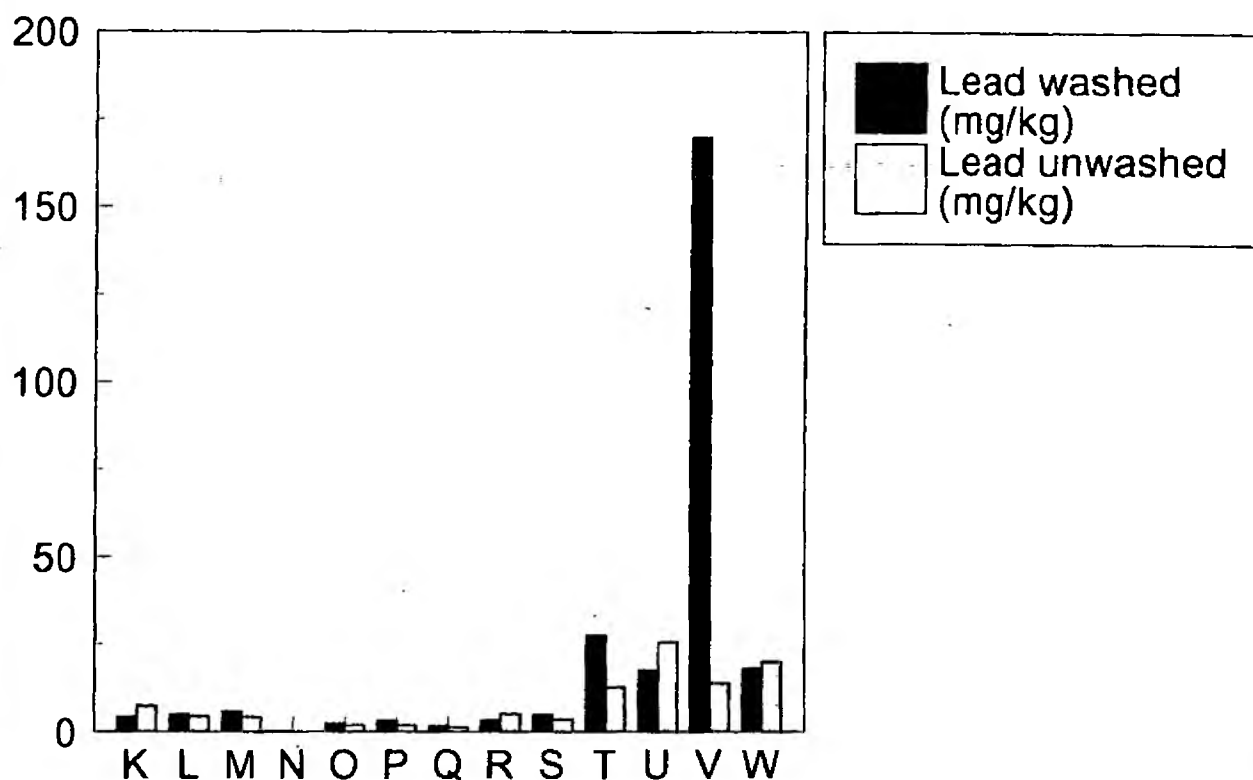
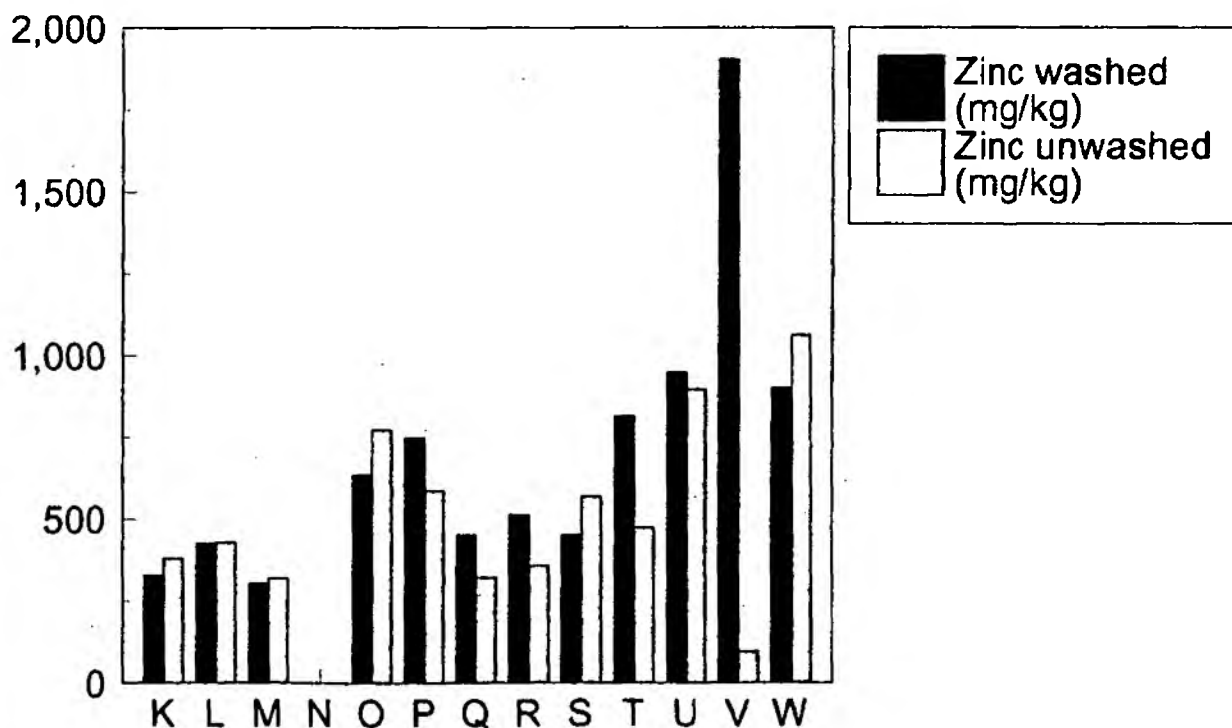


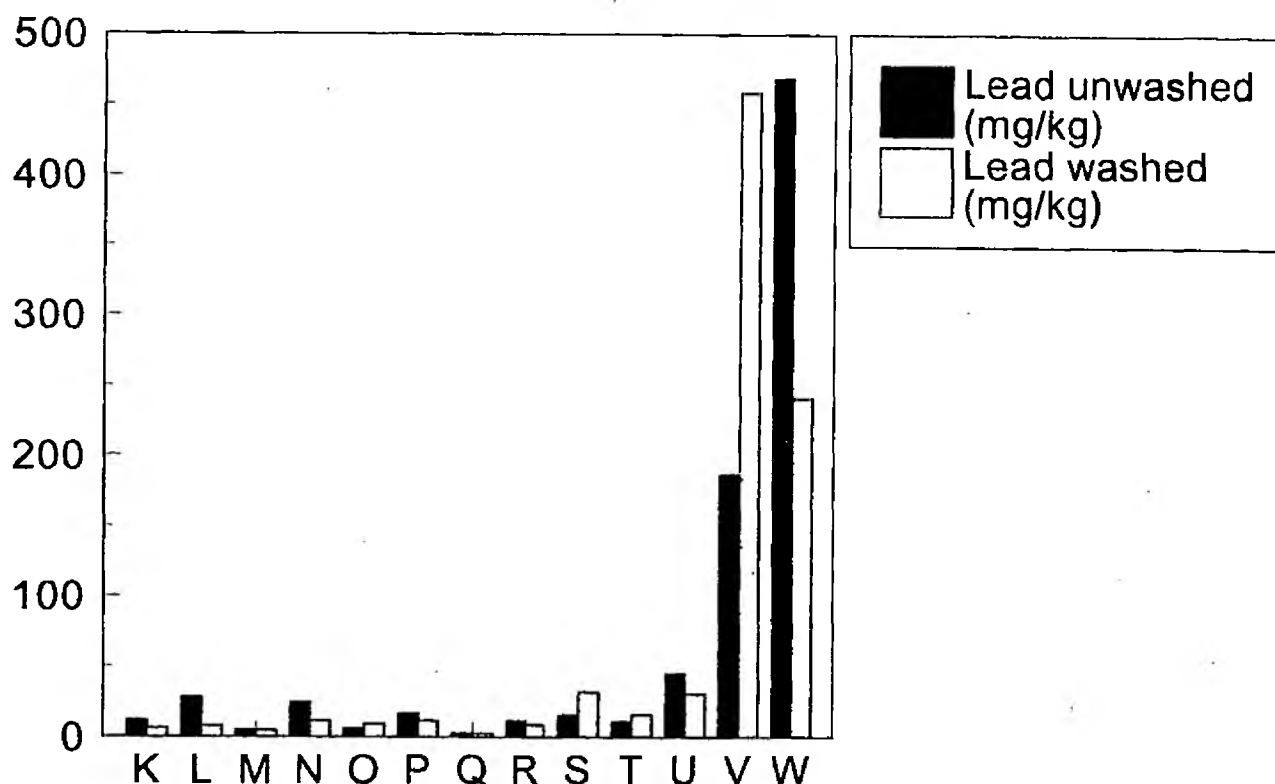
Figure 4. Lead in Fucus vesiculosus
16 June 1995



Zinc in Fucus vesiculosus
16 June 1995



**Figure 5. Lead in Enteromorpha spp.
16 June 1995**



**Zinc in Enteromorpha spp.
16 June 1995**

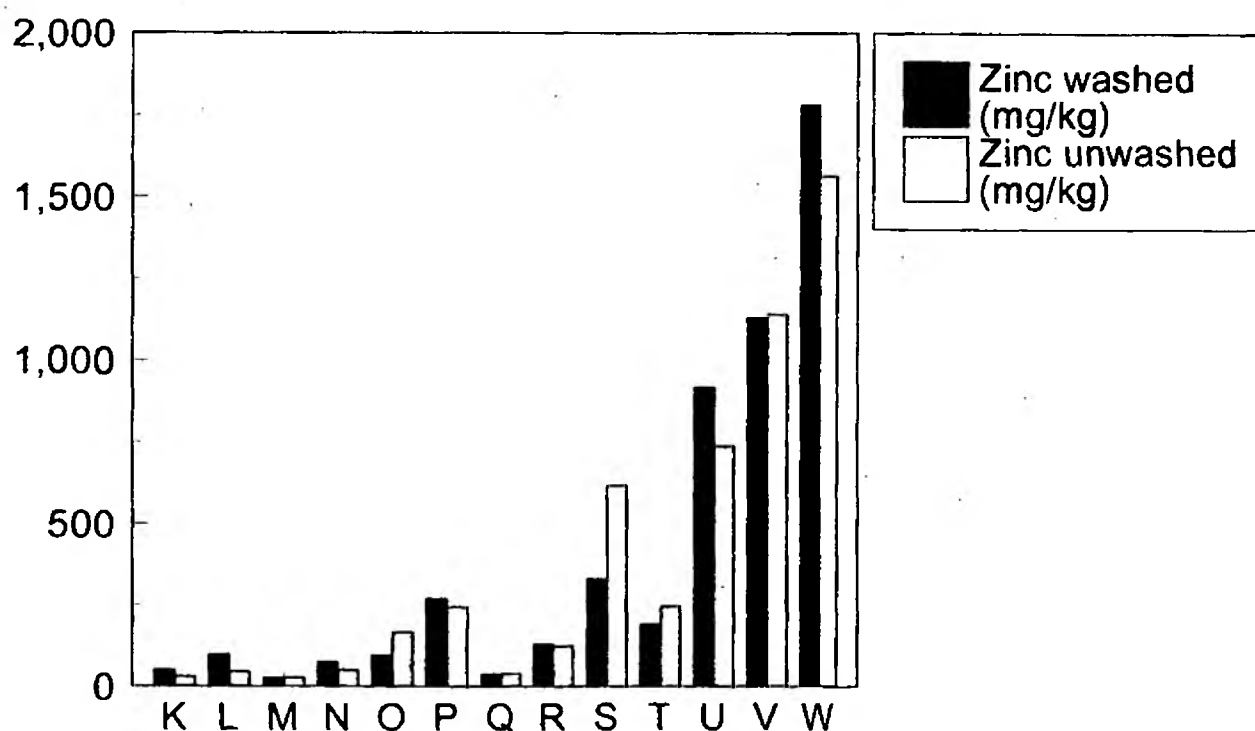
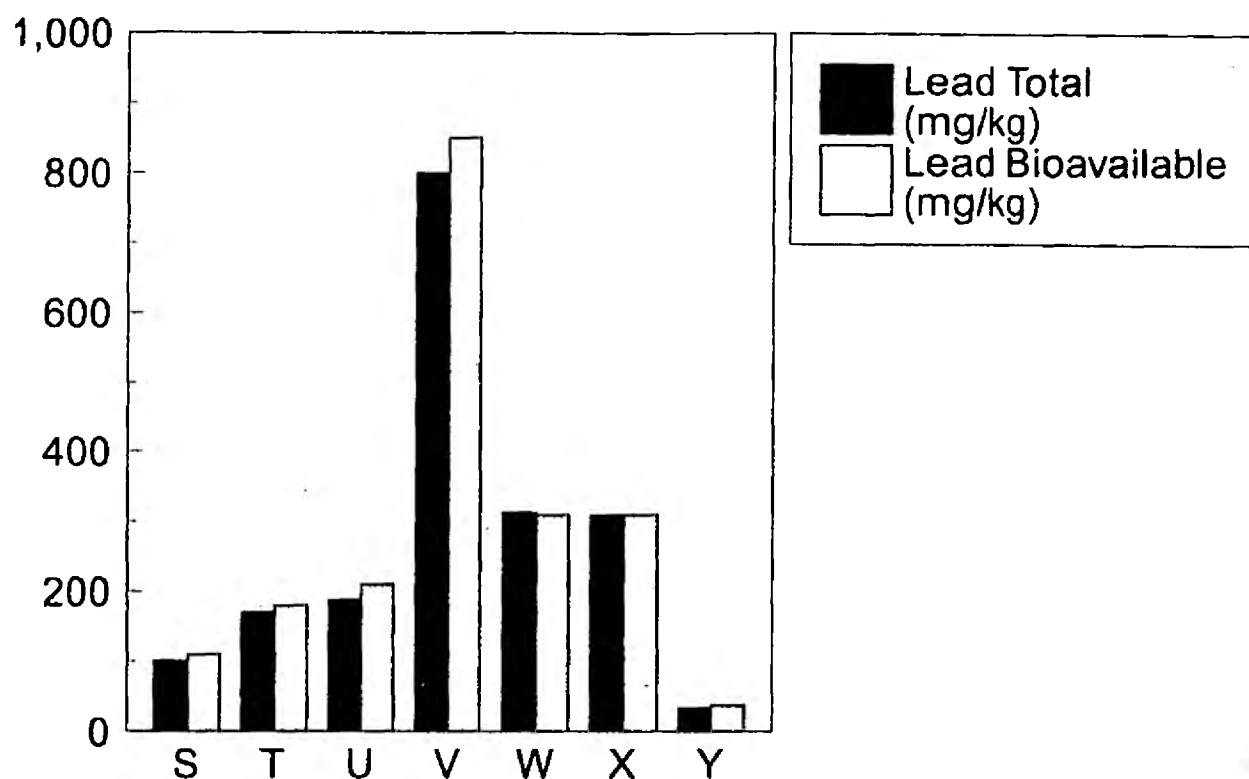


Figure 6.

Sediment Lead 12 November 1996



Sediment Zinc 12 November 1996

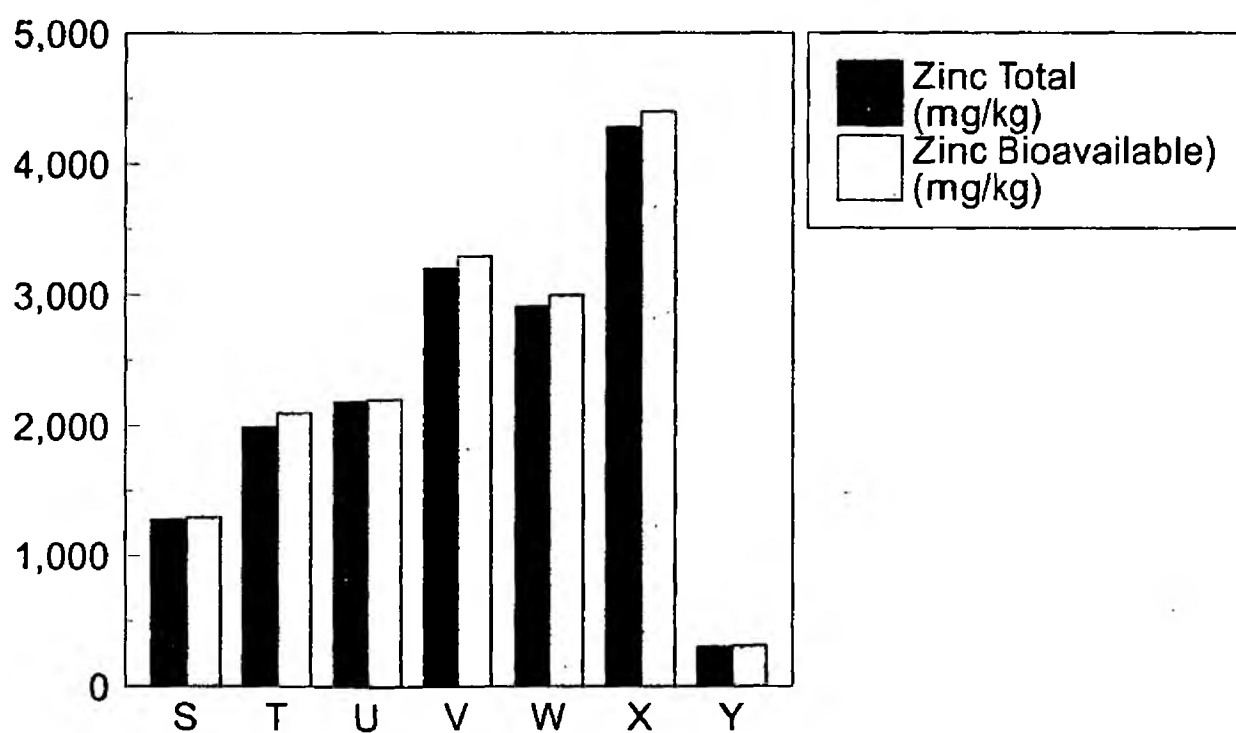
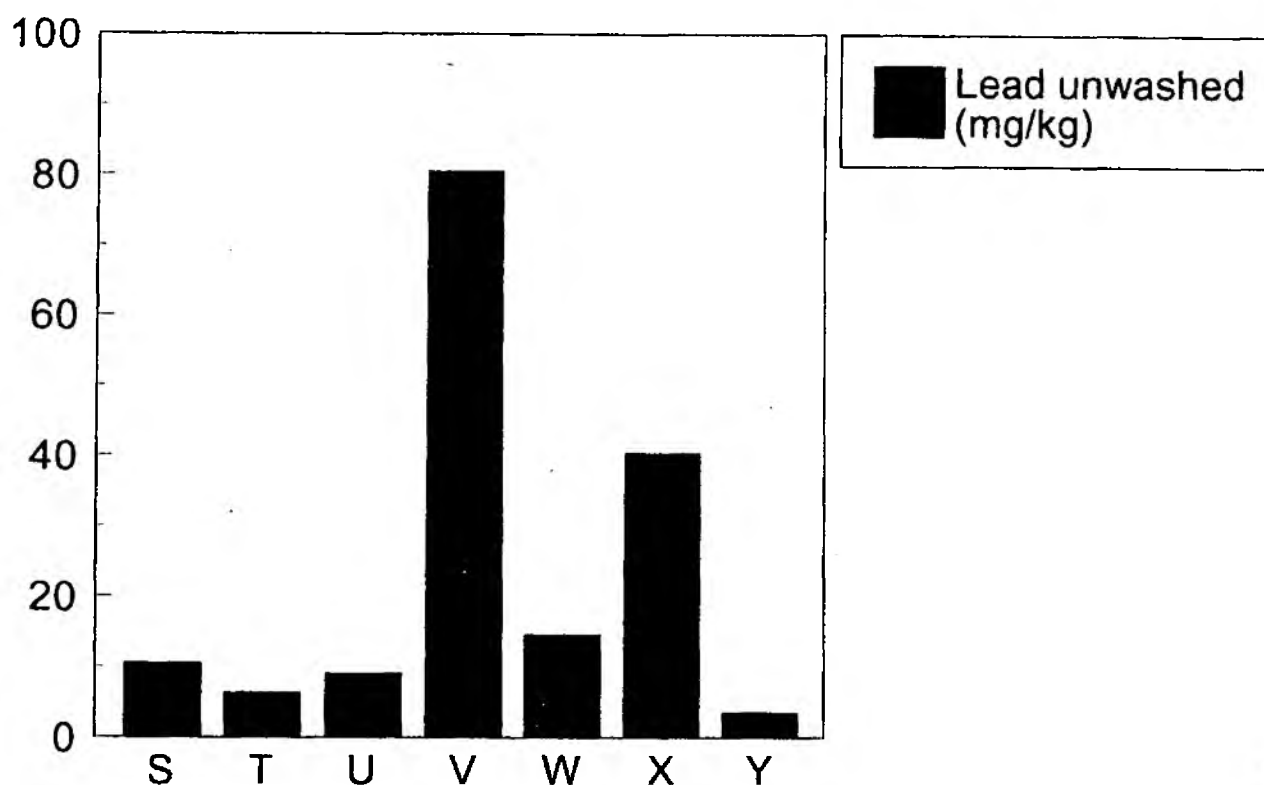


Figure 7. Lead in *Fucus vesiculosus*
 12 November 1996



Zinc in *Fucus vesiculosus*
 12 November 1996

