CHRISTCHURCH CITY COUNCIL DRAINAGE AND WASTE MANAGEMENT UNIT

LABORATORY

A BIOLOGICAL RE-EVALUATION

OF THE KAPUTONE STREAM

A REPORT PREPARED
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MARCH 1993

FORWARD:

The Kaputone Stream lies to the north of the city of Christchurch and drains a large area of the Belfast rural catchment. Until recently this stream was badly neglected and regularly polluted by a variety of illegal industrial and agricultural discharges. In the 1990 Fisheries Survey of the Styx River catchment, MAF staff had some harsh things to say about the management of the Kaputone:

"Kaputone Stream is notorious for pollution incidents. — Quite apart from industrial pollution, the stream suffers from stock effluent, rubbish dumping, over-intensive land use and the use of herbicides, both in and out of the water. Kaputone Stream is an indictment of human endeavour. If New Zealand cannot do better than this at its present population level, there would seem to be little future for waterways adjacent to large centres of population" (p 26).

During the last 18 months though, the adoption by the local and regional councils of environmentally-sensitive maintenance policies and more pro-active surveillance programmes have helped to enhance the conditions of our local rivers and streams. This report was initiated to assess the nature and extent of ecological changes that have taken place within the Kaputone Stream since it was last surveyed at the beginning of 1987. A brief fisheries update by NIWAR staff is appended.

Two graduates from the University of Canterbury were involved in the preparation of this report:

Leonie Voyce (BSc) — fieldwork & report preparation **Mark Wilson** (BSc) — fieldwork

Phil Gnad, laboratory EDP co-ordinator, provided assistance with computing and file management.

We are also endebted to **Kate McCombs** (MSc) for assistance with plant identification and **Prof M J Winterbourn,** Zoology Department, University of Canterbury, for his advice and assistance with invertebrate identification.

J A Robb (Dr) Environmental Scientist & project co-ordinator

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FIGURES AND TABLES

1. INTRODUCTION

A biological survey was carried out on the Kaputone Stream in January-February 1993 by staff of the CCC Drainage & Waste Management Unit's laboratory to review the stream's ecological status. The Kaputone Stream is 11km long, spring-fed and is a natural tributary of the Styx River. In the past, effluent discharged into this stream has had undesirable effects on the invertebrate community (CCC, unpublished data). This survey was primarily directed at documenting current ecological conditions and to check for major changes that have taken place in the stream's community structure since it was last surveyed in 1987.

A brief fish re-survey was also carried out concurrently by staff of NIWAR (refer to attached report in Appendix 2).

2. METHODS

A systematic sampling program was carried out on the Kaputone Stream. Eleven of the 30 sites sampled in 1978-79 (CDB, 1980) were re-sampled to determine the composition and densities of benthic invertebrates and aquatic macrophytes. The sites were relocated by descriptions and maps from the 1980 report (Appendix 1). An area approximately 20m either side of the designated site was sampled in order to include all possible habitats. Three pieces of apparatus (raked nets, Surber and core samplers) were used to collect samples as outlined in the CDB report of 1986. Criteria used for sample collection were the same as those outlined in previous surveys. Samples collected were taken back to the laboratory, identified and given an abundance rating. Three categories of abundance were determined as follows:

- O Only one or two individuals/trace quantities of aquatic plant present. Scarce.
- * Species present in moderate numbers/abundance - i.e. not difficult to find, but not prolific.
- + Prolific. Indicates that it was the most abundant (or, in some instances, co-abundant) species within the area sampled.

Results are presented in Table 1.

The **Macro Invertebrate Community Index - MCI** (Stark, 1985) was used as a descriptive statistic to evaluate the community composition. For further information relating to local applications refer to Robb (1992). Statistical information computed from the data was as follows:

1. Total number of invertebrate taxa represented.
2. Number of freshwater invertebrates present.
3. Percentage of freshwater invertebrates present.
4. MCI Scores.

3. RESULTS

3.1 Plants:

A total of 38 taxa were recorded from the eleven sites sampled (Table 2). Individual site counts ranged from 9 at sites 1 & 16 to 20 at site 15. The mean number of taxa per site was 13.8 (SD 3.9). *Potamogeton crispus* was prolific at site 15 but was not recorded elsewhere.

3.2 Animals:

Forty seven invertebrate taxa, forty five of them strictly freshwater species, were recorded from the eleven sites sampled (Tables 1 & 2). Individual site totals ranged from 14 at site 10 to 28 at site 15. The mean number of freshwater taxa per site was 19.3 (SD 3.8). MCI scores ranged from 60 at site 10 to 74 at sites 1 & 26 (Figure 1).

4. DISCUSSION

Plant taxa represented are reasonably predictable and in line with those recorded during earlier surveys (i.e. CDB, 1980, 1986 & 1989). It was noted with interest that *Potamogeton crispus* was recorded for the first time - i.e. at site 15 where it was prolific. In other Canterbury waterways this species has created enormous management problems and is currently a source of great concern for CCC & CRC staff (CDB, 1980, 1986, 1989).

Eight benthic invertebrate taxa not represented in 1987 are now well established* throughout the catchment and **at least 16 others** are appreciably more abundant and widely distributed. On the other hand, three taxa *(Oecetis unicolor,* an unidentified species of Acarina and a representative of the Orthocladinae) that were well represented* in 1987 failed to feature this time. A considerable amount of variation in the number of freshwater invertebrate taxa was noted between sites with a general

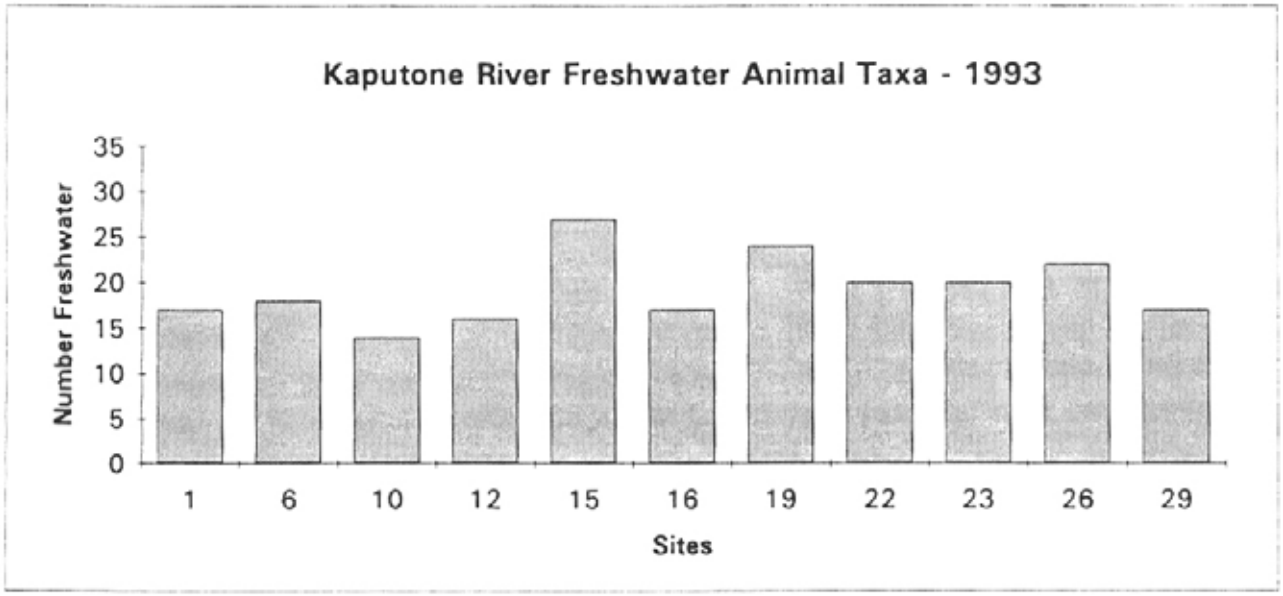
* Taxa present at three or more sites

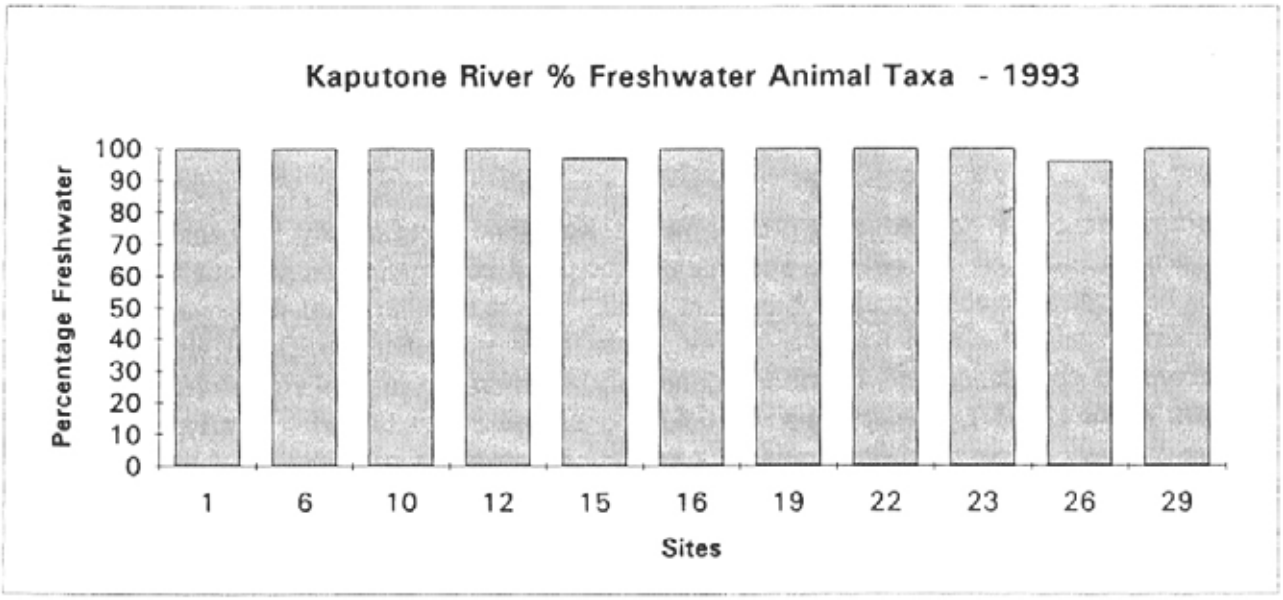
Table 1. Kaputone Stream Biological Data - 1993

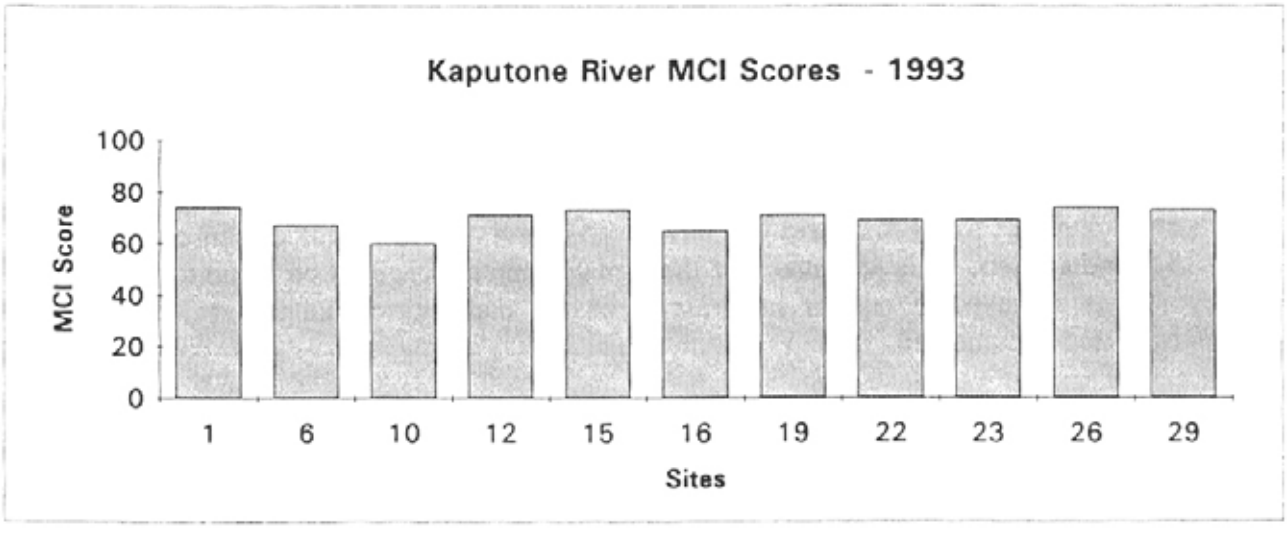
	Invertebrate				Plants
Site no.	Spp. no.	Spp no. FW	% no. FW	MCI	spp.no.
1	17	17	100	74	9
6	18	18	100	67	18
10	14	14	100	60	13
12	16	16	100	71	12
15	28	27	97	73	20
16	17	17	100	65	9
19	24	24	100	71	16
22	20	20	100	69	11
23	20	20	100	69	14
26	23	22	96	74	19
29	17	17	100	73	11

FW = freshwater invertebrates

Figure 1:


Kaputone River Freshwater Animal Taxa - 1993
Number Freshwater
35
30
25
20
15
10
5
0
1
6
10
12
15
16
19
22
23
26
29
Sites


Kaputone River % Freshwater Animal Taxa - 1993
Percentage Freshwater
100
90
80
70
60
50
40
30
20
10
0
1
6
10
12
15
16
19
22
23
26
29
Sites


Kaputone River MCI Scores - 1993
MCI Score
100
80
60
40
20
0
1
6
10
12
15
16
19
22
23
26
29
Sites

trend towards higher numbers with increased stream size. Sites 1 & 2 for example, were almost dry. Only a damp channel remained. Sampling would have been impossible here were it not for a farmer's excavations that resulted in the development of a small pond. The small number of animal taxa present at site 10 may be due to a combination of reduced channel width (0.3m) and a proliferation of aquatic macrophytes (especially *Lemna minor, Glyeria fluitans & Rorippa* spp.).

As expected, the percentage of freshwater invertebrate taxa was consistent, with all but two sites (15 & 26) scoring 100%. These two sites each contained one species capable of tolerating brackish conditions (i.e. an unidentified Sciomyzidae and *Paracorophium excavatum* respectively).

The **MCI** scores between the sites were also constant with only 13 points separating the highest and lowest values. The range noted (60-74) is consistent for data collected recently from the Avon and Heathcote catchments (Robb, 1992; CCC, *in prep.)* and indicates that the community structure here is in line with other healthy New Zealand lowland streams (Robb, 1992).

5. CONCLUSIONS

The appearance of *Potamogeton crispus* in the Kaputone Stream may be cause for some concern. Continued surveillance and maintenance will be required to prevent this species from becoming the ecological problem that it has become in other local waterways. A data comparison with the 1984-85 CDB survey points to several other significant differences in macrophyte abundance and distribution, notably an increase in *Glyceria fluitans* (40%), *Azolla rubra* (130%), *Rorippa* spp. (120%) and *Lemna minor* (43%). In all probability, these differences merely reflect variations in river maintenance practices prior to sampling. But it is also conceivable that they are in some way related to other factors.

The Kaputone Stream currently supports a good diversity of freshwater animal taxa. Most sites contained one or more dominant taxa (+), several with intermediate abundance (*) and a few with low incidence (O). On balance, there has been a substantial increase in the diversity and abundance of freshwater invertebrates inhabiting the Kaputone since 1987, suggesting that there has been an appreciable improvement in its ecological status. This view is reinforced by conclusions drawn from the NIWAR fish report (Appendix 2) and is probably a reflection of the environmentally-sensitive maintenance policies and more stringent pollution control measures that have been exercised within this catchment over the last 18 months or so. It is essential that these management practices continue and that the catchment is surveyed at regular intervals to ensure that future changes are adequately monitored and documented.

Two additional field observations were made during this survey that are considered to be important:

(1) The Kaputone headwaters (sites 1 & 2) were, for the most part, reduced to a damp channel without any visible signs of water. Whether this is a seasonal phenomenon or whether it is related to something more long-term, has yet to be determined.

(2) A considerable amount of silt was observed in the stream at several sites (notably at site 6 where almost a metre was recorded).

These observations suggest that the Kaputone Stream is in danger of further deterioration unless immediate steps are taken to regulate water-depletion and land-fill practices within the catchment. Regular monitoring during the last 15 years has resulted in the adoption by Council of more sensitive maintenance and management practices. Already, these have led to appreciable improvements in the structure of the freshwater community. It is therefore essential that a comprehensive surveillance programme is maintained so that we are kept aware of any changes that may take place within this catchment.

Table 2. Kaputone River Plant and Animal Distributions

PLANTS	Sites										
	K1	K6	K10	K12	K15	K16	K19	K22	K23	K26	K29
Plantago lanceolata				+						O	
Plantago major		★			O		★		★	★	
Azolla rubra		+	★	+	★		★		★		★
Lemna minor	★	+	+	★	★		★	★	★	★	★
Callitriche stagnalis	+			★			★	★			
Ranunculus repens	★	★	★		★	★	★		★	★	★
Ranunculus sceleratus	★	O	★								
Glyceria maxima									★		
Glyceria fluitans	★		+	★				+	★	★	★
Filamentous green algae	★	★	★		+	★	★		+		
Festuca arundinacea								+	★	O	
Nitella hookeri				★		O	★	★	★	★	★
Mimulus guttatus			★	★						★	
Phormium tenax		O			★						
Rumex spp.	★	★	★		★	★	★	★	★	★	★
Leptodictyum riparium		★	O	★	★		O		★	★	★
Juncus articulatus	★			★	+			★			
Juncus effusus		★			★		★	★	★	★	★
Mentha spp		★									
Mentha piperita										★	
Rorippa spp.	★	★	+	★	+	★	★	+	★	★	+
Epilobium					★	★				★	
Carex geminata		★									
Carex virgata		★									
Carex spp. *			O	★			O				
Blechnum penna-mania		★								★	
Blechnum chambersii										O	
Blechnum minus		★					★			★	
Dryopteris filix-mas		★	O		O	★	★		O	★	★
Myosotis spp.				★	★	★					
Marchantia berteroana		O	★		O	★	O			★	★
Potamogeton crispus					+						
Myriophyllum spp.					★						
Veronica anagallis-aquatica					★			★			
Veronica serphyllifolia					★						
Eleocharis spp.					★						
Pteridium aquilinum							★				
Polygonum spp.								★			

* (not in flower) either geminata or virgata.

KEY one or two individuals O medium numbers ★ prolific +

Table 2. (ctd)

ANIMALS	Sites										
	K1	K6	K10	K12	K15	K16	K19	K22	K23	K26	K29
Chlorohydra viridissia								★		★	
Hydra spp.							O				
Cura pinguis	O	★	+	★	★	★	★	★	O	O	★
Phaenocora spp		O					★	O			O
Neppia montana					★	O					
Tubificidae spp.	★	★	★	★	★	★	★	+	+	★	
Lumbriculidae spp.	★	O	★	★	★	★	★	★	+	★	
Potamopyrgus antipodarum	O	★	★	★	+	★	★	★	+	★	+
Physa spp.	★	O	★	★	★	★	★	+	★	★	
Gyraulus corinna		O	★	★	★	★	★	O	★		
Sphaerium novaezelandiae	★	★	+		★	★	★	★	★		★
Pisidium spp.	★	★	★		★	★	★	O	★		O
Herpetocypris pascheri	★		★	O	★	★	O	★	★	★	O
Eucyclops serrulatus	+	★	★	★				★	★	★	★
Paracorophium excavatum										★	
Paracalliope fluviatilis	★	+			★	★	★	O		★	+
Daphniidae	★			★	O		★	★			★
Chydoridae										O	
Cypretta spp.	O					★					
Simocephalus									★	★	★
Anisops assimilis	★										
Sigara arguta	★			★	+	★	+	O	★	★	★
Microvelia macgregori	+	+	★	+	★	★			+	★	
Oxyethira albiceps		O			O	O	★	★	★	★	
Triplectides obsoleta					O		O		★	★	★
Pycnocentria evecta					O						
Liodessus plicatus	★	O					O				
Rhantus pulverosus	★			O			O				
Eylais waikawae	★									O	
Piona uncata	O			O	O		★				
Austrolestes colensonis					★						
Culex spp.	★	★	O		O		O		O	★	O
Xanthocnemis zealandica				★		O		★	★	★	
Paroxyethira hendersoni					★						
Stratiomyidae					O		O				
Ceratopogonidae spp.							O				
Austrosimulium tillyardianum					★					★	O
Procordulia spp.					O					O	O
Tipulidae spp.		O						★	★		
Chironomidae: Tanypodinae	★	★	★	O	★		★	+	+	★	★
Chironomus zealandicus	★	★	★	★		★	★	O	★	★	★
Antiporus strigosulus	★										
Cypridopsis spp.					★						
Arrenurus spp.					O						
Sciomyzidae					O						
Gobiomorpus breviceps									O		
Gobiomorpus cotidianus										O	

6. REFERENCES

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Appendix 1. Sampling sites

K 1 Headwaters, top end of Englefield Road

K 6 Just downstream of Meadowland playground

K 10 Just upstream of Main North Road

K 12 Halfway between Main North Road and railway line

K 15 Access by Thompson's Road, below culvert under race to paddock

K 16 Freezing works paddock

K 19 5 m below Belfast Road

K 22 5m downstream end of Ford Road

K 23 Upstream end of Ouruhia Park, off Chenery Avenue

K 26 By pump shed, 132 Guthries Road

K 29 10m below Belfast Road

Appendix 2.

29 January 1993

Dr Jim Robb

Drainage and Waste Management Unit

Christchurch City Council

PO Box 237

CHRISTCHURCH

Dear Jim

KAPITONE STREAM ELECTRIC FISHING, 27 JANUARY

1 Blakes Road

The situation is virtually identical to that pertaining in January 1990. There is rather more cover for fish this year - willow debris and watercress beds. For this reason fish were harder to catch, but the end results are similar (see attached table for all comparative data).

2 Recreation Reserve

Little change here either. Shortfinned eel numbers are still well down on what they were prior to the 1990 fish kill. The few longfinned eels are back. Common bully numbers are the same, but the fish are much larger than 1990 pre-kill. Upland bullies are greatly increased in numbers, but are smaller. We caught no inanga this time, but these fish usually move in shoals, and either there is a shoal present or there is not.

3 Ford Road

We did a quick look-over a 20 m length of fast shallow run. It is atypical of the Kapitone Stream as a whole, and so was not surveyed in 1990. We found common bullies to be common (N = 16, mean length 84 mm, size range 60-105); and upland bullies to be twice as common (N = 32, mean length 50 mm, size range 40-63 mm). A single inanga measured 103 mm. Seven shortfinned eels were handled but others were seen (m = 300 m, range 114-535).

The results from this reach indicate that water quality is OK. Low numbers of fish, other than eels, elsewhere, reflect poor habitat conditions. Eel numbers at the recreation reserve indicate that they have not yet recovered from the 1990 fish kill. This is hardly surprising, as recruitment from the lower reaches would have been greatly affected, but outmigration of native fish would have continued.

You may notice some very minor changes to 1990 population estimates. The new estimates come from a more sophisticated statistical method we now use. They are not significant.

Thank you for the contract. We appreciate the opportunity to follow up on previous work, especially on our urban rivers, and more especially when results show an improved situation.

Yours sincerely

Tony Eldon

Table. Kapitone Stream at Recreation Reserve

Species	1990 prior to kill No.	Mean length	Length range	1990 after kill No.	Mean length	Length range	1993 No.	Mean length	Length range
KAPITONE STREAM AT RECREATION RESERVE									
Shortfinned eels									
1st sweeep	115	328	135-635	83	355	76-640	59	360	158-660
2nd sweep	56	303	122-494	13	307	204-398	31	312	106-499
3rd sweep	-	-	-	-	-	-	13	271	106-390
Estimated population	217			97			114		
Longfinned eels									
1st sweep	5	434	280-640	0			2	422	277-566
2nd sweep	2	252	246-257	0			1	324	
3rd sweep	-	-	-	-			1	303	
Total	7	386	246-640	0			4	368	277-566
Estimated population	7			0			4		
Common bullies									
1st sweep	7	69	56-84	0			6	82	76-88
2nd sweep	6	68	54-93	0			6	84	77-95
3rd sweep	-	-	-	0			2	89	86-91
Total	13	69	54-93	0			14	84	76-95
Estimated population	16			0			15		
Upland bullies									
1st sweep	2	55	54-55	0			11	48	43-51
2nd sweep	0	0	0	0			9	48	43-51
3rd sweep	-	-	-	0			3	45	43-49
Total	2	55	54-55	0			23	47	43-51
Estimated population	2			0			25		

Species	1990 prior to kill No.	Mean length	Length range	1990 after kill No.	Mean length	Length range	1993 No.	Mean length	Length range
BLAKES ROAD									
Shortfinned eels									
1st sweep	44	339	140-518	-			21	333	188-484
2nd sweep	24	296	174-464	-			19	291	204-414
3rd sweep	-	-	-	-			13	276	135-440
Total	68	323	140-518	-			53	304	135-484
Estimated population	88			-			82		
Upland bullies									
1st sweep	2			-			3		
2nd sweep	1			-			0		
3rd sweep	-			-			0		
Total	3*			-			3		
Estimated population	3*			-			3		

* + 6 x 50 dozen