tigation of Elastomer Visible Implant (EVI) tag retention rates and the effect of tagging on the growth and survival of barbel (Barbus barbus L.)

Coho salmon

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A preliminary investigation of Elastomer Visible Implant (EVI) tag retention rates and the effect of tagging on the growth and survival of barbel (Barbus barbus L.).

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Summary

The Elastomer Visible Implant system (EVI) is a relatively new technique for batch marking fish. The aim of this study was to assess retention rates and the possible effects of tagging on the growth and mortality of barbel, Barbus barbus, (81-197mm, fork length) over approximately 2 months using a syringe injection system.

69 fish were tagged and 66 were used as a control. 4 tagging sites were selected for evaluation. The following retention rates were obtained; 91.3% for the base of the caudal fin, 82.6% for the dorso post-orbital tissue (head), 82.6% for the base of the anal fin and 47.8% for the post-orbital adipose tissue. It was not possible to investigate the relationship between tag retention and fish length because of the small sample size and the narrow length range of the fish.

The quality of retained tags, expressed as a percentage of the total number of tags applied, was subjectively classified on a scale ranging from good to very poor. Tag quality was highest (i.e. those classed as good) for the caudal (53.6%) and head (50.7%) locations.

Although tag retention was highest for the caudal site, it was very difficult to tag in this region, thus the head location may be the most practical site for tag application with the syringe injection system.

There was no significant difference between the growth of the tagged and control fish. No mortalities were recorded during the experiment.

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1. Introduction

The ability to be able to differentiate between fish, whether it be at an individual level or batch level, is often a fundamental requirement of studies concerned with obtaining data on which to make informed decisions regarding the management of the stock.

The elastomer visible implant (EVI) tag system provides a relatively benign and easily recognisable technique for batch marking fish. The tagging system used in this study comes in the form of a starter kit which is manufactured and supplied by Northwest Marine Technology. This consists of a fluorescent colourant (red in this instance) and a hardener, which when mixed can be applied using a hypodermic syringe. This mixture sets into a solid form within hours of injection.

Ideally the tag should be placed in clear tissue, although semi-transparent and translucent tissue may also be suitable. The EVI tag can be easily detected by the naked eye, although visibility is enhanced under ultraviolet light.

The objectives of this study were to determine the most suitable area for tag placement and to assess tag retention rates, growth and mortality of barbel over a time period of 57 days. The experiment was carried out at the N.R.A.'s rearing facility in Leyland.

2. Method

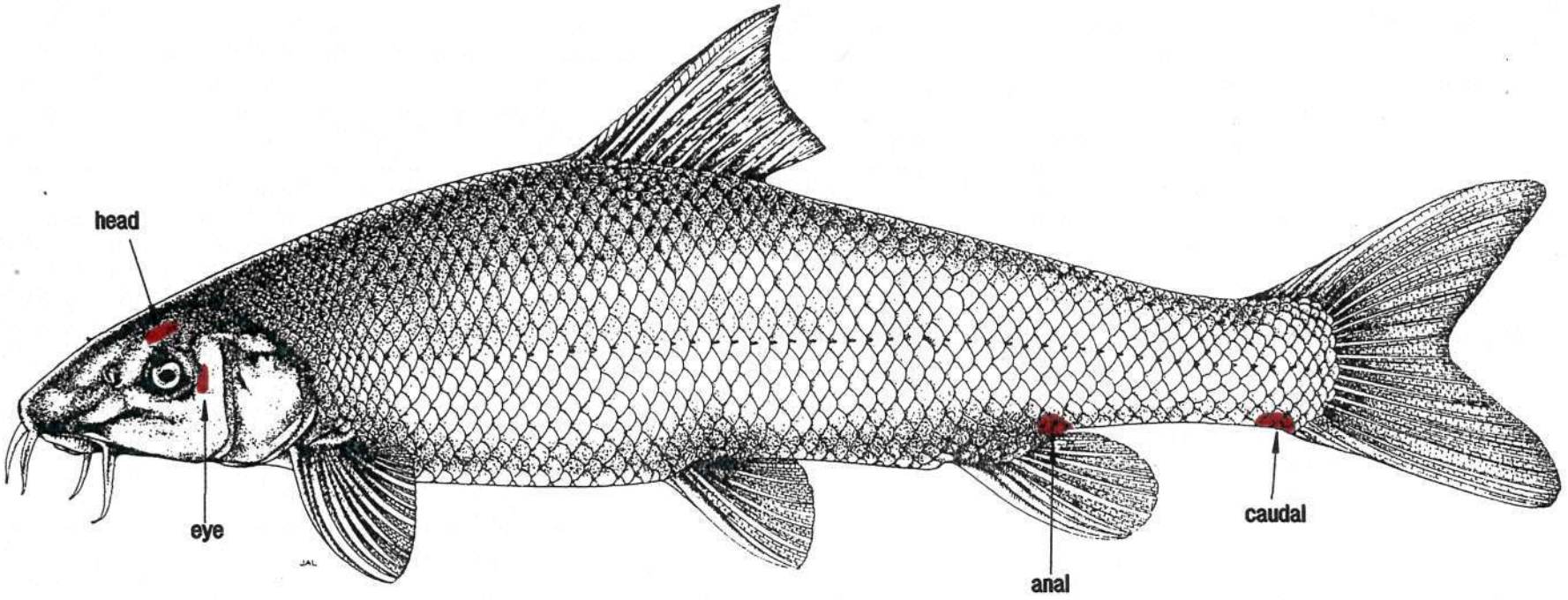
Four potential injection sites were identified (see Fig. 1.), these were:

1. Dorso post-orbital tissue (head)
2. Post-orbital adipose tissue (eye)
3. At the base of the anal fin (anal)
4. At the base of the caudal fin (caudal)

135 fish were selected at random, anaesthetised using phenoxy-ethanol and the fork length recorded (mm). 69 of these fish were then tagged in each of the four sites by two personnel using a straight 27 G 1/2 needle, the remainder were used as a control. The control and tagged fish were held in separate rearing tanks under identical conditions and fed at regular intervals.

After a period of approximately one month, the fish from both tanks were anaesthetised and their fork length recorded. The quality of the fluorescent marks on the tagged fish was assessed with the naked eye and

Figure 1. Tagging sites on barbel (diagram taken from Maitland 1972)



classified on a subjective scale ranging from good, through poor, very poor to absent.

This procedure was repeated after a further period of 1 month. For logistical reasons the duration of this experiment was confined to 57 days.

A t-test was used to compare the mean length of the control and tagged fish on each of the three sampling occasions, with a null hypothesis (Ho) that the tagged and control fish grow at the same rate.

3. Results

EVI tag retention rates for the four target areas are presented in Table 1. and Fig. 2. The most favourable site was found to be at the base of the caudal fin (91.3%) while the post-orbital adipose tissue appears to be the least suitable site (47.8%). A retention rate of 82.6% was achieved for the other two tag locations.

Typically the tag should appear as a small elongated mark equivalent to the volume of a coded wire tag i.e. about 0.05ul, however when applied to the base of the anal and caudal fin it tends to take on a more diffuse nature. The condition of the retained tags, expressed as a percentage of the total number of tags for each location, is presented in Table 2. Tags classed as good were in virtually the same condition as when implanted. Poor tags showed evidence of fragmentation and very poor tags were reduced to small fragments. The highest level of tag quality was obtained for the base of the caudal fin (53.6%) and the dorso post-orbital tissue (50.7%).

Table 3. shows the size range, mean length and standard deviation of the control and tagged fish on each of the sampling occasions. The individual length measurements are presented in Appendix 1.

Fig. 3. indicates that the control fish and tagged fish grew at a similar rate. The instantaneous growth rate for the control fish (3.97×10^{-4}) and tagged fish (4.74×10^{-4}) over the duration of the experiment were very similar. The results of the t-test showed that there was no significant difference between the mean length of tagged and control fish ($P<0.5$). No mortalities were recorded during the course of the experiment.

Table 1. Percentage of tags retained.

	Percentage tag retention			
Time (days)	Head	Eye	Anal	Caudal
29	97.1(67)	82.6(57)	97.1(67)	100.0(69)
57	82.6(67)	47.8(33)	82.6(57)	91.3(63)

N.B. Figures in parentheses show the number of tags retained.

Table 2. Tag quality at each location.

		Percentage of tags			
	Day	Good	Poor	V.poor	Absent
Head	1	100.0 (69)	0.0 (0)	0.0 (0)	0.0 (0)
	29	73.9 (51)	21.7 (15)	1.4 (1)	2.9 (2)
	57	50.7 (35)	24.6 (17)	7.2 (5)	17.4 (12)
Eye	1	100.0 (69)	0.0 (0)	0.0 (0)	0.0 (0)
	29	69.6 (48)	10.1 (7)	2.9 (2)	17.4 (12)
	57	29.0 (20)	10.1 (7)	23.2 (16)	55.2 (36)
Anal	1	100.0 (69)	0.0 (0)	0.0 (0)	0.0 (0)
	29	52.2 (36)	40.6 (28)	4.3 (3)	2.9 (2)
	57	36.2 (25)	31.9 (22)	14.5 (10)	17.4 (12)
Caudal	1	100.0 (69)	0.0 (0)	0.0 (0)	0.0 (0)
	29	71.0 (49)	27.5 (19)	1.4 (1)	0.0 (0)
	57	53.6 (37)	26.1 (18)	11.6 (8)	8.7 (6)

N.B. Figures in parentheses show the number of tags retained.

Figure 2. Percentage tag retention for each region.

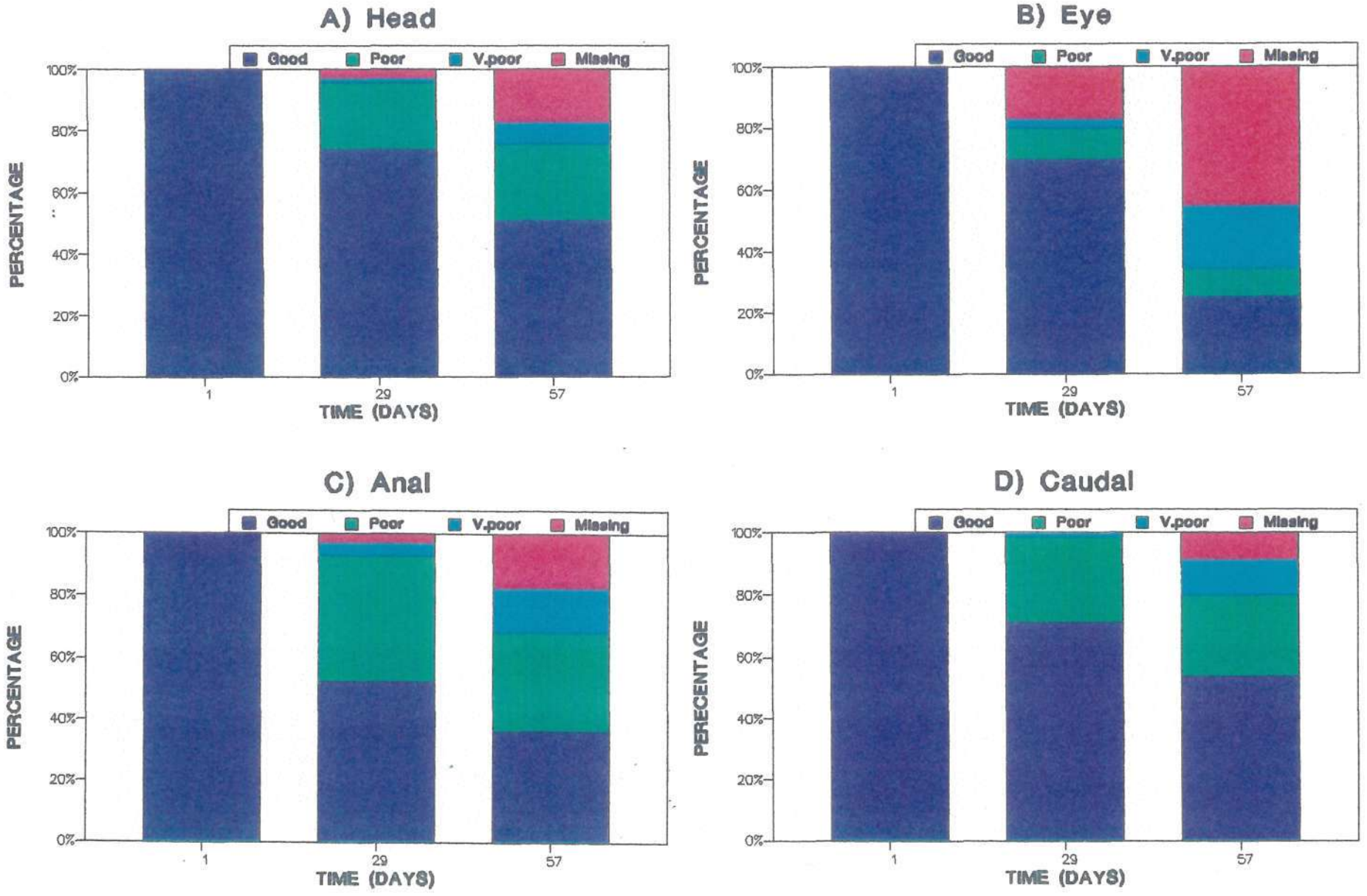
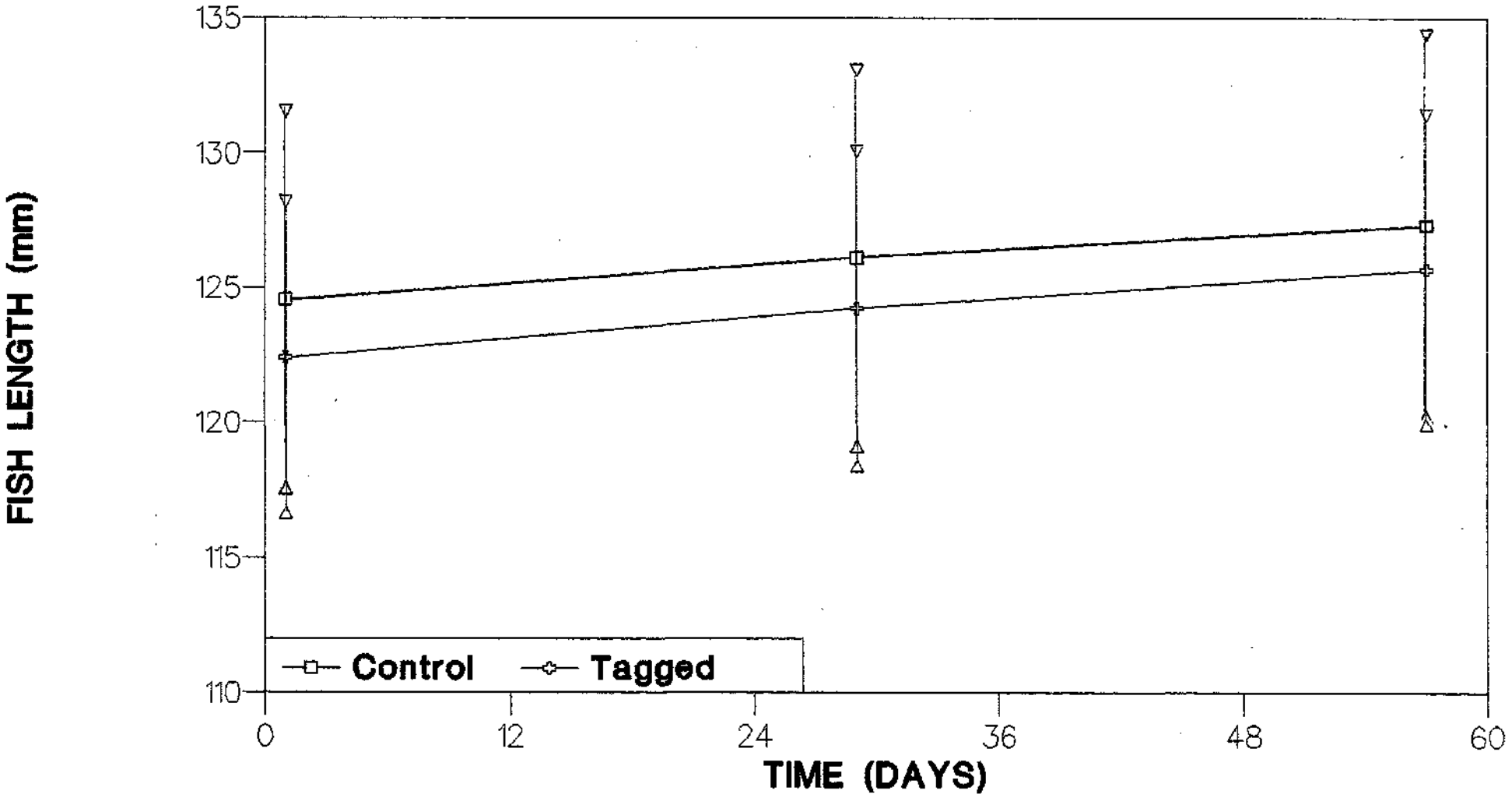


Table 3. Range, mean length, standard deviation and sample size for control and tagged fish.

	Control			Tagged		
	10/10/94	07/11/94	05/12/94	10/10/94	07/11/94	05/12/94
Range(mm)	79-232	81-236	81-236	82-195	81-195	84-197
Mean length(mm)	124.53	126.09	127.33	122.41	124.23	125.70
S.D.	28.99	28.90	29.33	24.46	24.69	24.29
Number	66	66	66	69	69	69

Figure 3. Mean length of fish with 95% confidence limits.



4. Discussion

The tag site at the base of the caudal fin achieved the best retention rate (91.3%). Tag retention rates for the base of the anal fin and the dorso post-orbital tissue were the same (82.6%) however, tag quality was much higher for the dorso post-orbital tissue. In addition, tag placement in the base of the caudal fin and anal fin locations was more difficult and hence more time consuming.

Due to the small sample size (n=69) and the narrow length range of the tagged fish (84% of the sample having length class mid points between 110 and 140 mm) it was not possible to determine the relationship between fish length and tag retention rates.

A large amount of pressure was required to release a tag from the hypodermic syringe. This may have resulted in less precise tag insertion and hence lower retention rates. It may also have effected tag quality. Northwest Marine Technology provide a compressed air tag injection system which is likely to be more effective than the syringe injector.

5. Conclusion

Relatively high tag retention rates (82.6 - 91.3%) were obtained for 3 of the 4 target areas studied. The post-orbital adipose tissue was the least successful site with a retention rate of 47.8%.

There was no difference between the growth rate and mortality rate of the tagged and control fish.

6. Recommendations

1. On the basis of this study, taking into account tag retention rate, tag quality and ease of application it is recommended that the dorso post-orbital tissue be targetted as the most suitable location for tags on barbel, of size between 81-197mm.

2. Tag retention rates were based on the presence of all or part of the tag. The persistance of fragmented tags will require a more long term study.

7. Acknowledgements

The authors would like to thank Miran Aprahamian and Simon Nicholson for their help in producing this paper. Thanks to Rod Taylor and John Stone for supplying and maintaining the fish at Leyland Hatchery. Thanks also to Northwest Marine Technology for permission to use the photographs on the front cover.

8. References

Maitland, P. S. (1972). Key to British Freshwater Fishes. Freshwater Biological Association Scientific Publication No. 27.

Appendix 1. Fish length at each recording interval.

10/10/94 Control Length (mm)	07/11/94 Control Length (mm)	05/12/94 Control Length (mm)	10/10/94 Tagged Length (mm)	07/11/94 Tagged Length (mm)	05/12/94 Tagged Length (mm)
131	140	105	127	150	136
140	236	141	122	111	113
105	140	217	114	114	197
216	125	118	185	172	185
167	130	157	191	116	193
172	137	160	170	177	94
146	127	90	141	132	168
143	184	106	104	122	136
123	179	153	133	115	135
153	98	123	122	126	116
130	163	133	146	139	153
124	146	135	136	121	142
131	147	138	127	145	120
125	130	130	123	167	178
141	122	131	113	185	125
131	215	122	116	144	144
178	128	120	106	195	132
146	100	95	109	119	101
232	135	109	152	111	140
99	127	99	195	140	122
132	90	91	176	152	105
117	155	81	160	119	85
152	136	123	120	109	126
137	132	164	92	121	142
136	125	118	109	122	149
102	129	93	121	107	130
115	175	142	91	94	174
120	108	175	131	91	149
146	89	130	104	133	146
137	160	149	138	148	129
134	117	150	82	125	121
110	136	131	113	133	108
98	126	147	114	126	125
93	112	121	94	131	106
121	94	132	139	114	118
106	119	140	124	102	101
86	155	101	141	142	128
155	117	127	113	130	120
124	119	118	96	104	120
103	117	236	99	91	115
136	98	118	115	112	109
181	90	126	102	126	134
108	148	135	95	192	155
122	120	140	109	116	116
106	98	125	142	141	124
132	110	97	143	98	147
122	151	112	153	120	145
129	131	127	127	115	118
117	121	103	105	117	114
120	92	122	125	107	144
90	122	101	136	98	92
117	142	185	118	87	128
89	134	180	100	101	123
105	89	137	121	83	111
102	105	160	142	96	114
90	101	142	95	123	99
99	111	106	125	81	118
100	108	137	118	118	119

Appendix 1 continued

10/10/94 Control Length (mm)	07/11/94 Control Length (mm)	05/12/94 Control Length (mm)	10/10/94 Tagged Length (mm)	07/11/94 Tagged Length (mm)	05/12/94 Tagged Length (mm)
116	85	111	104	140	113
128	81	125	112	126	101
100	117	112	118	109	97
88	100	98	123	156	89
79	122	92	111	106	84
86	104	89	117	115	116
84	124	87	105	111	122
116	98	86	85	142	108
			136	108	113
			95	98	100
			80	135	93