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The evaluation of a recreational fishing stock enhancement trial of black bream (*Acanthopagrus butcheri*) in the Swan River, Western Australia

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Contents

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Abstract

During 1995, a study was undertaken to monitor and evaluate the recovery of Swan River black bream stock which had been supplemented with fish produced from a captive-breeding program. Fish were individually tagged and subsequently released into the Swan River. The objectives of the study were (a) to determine both the survival and the growth rate to a size at which hatchery-reared fish could enter the recreational fishery and (b) whether they could then be caught by the recreational fishers. Of the 767 fish released into the upper Swan River on 28 March 1995, 97 fish (12.6%) were recaptured to the end of October 1997.

The results from this initial study show that captive-bred black bream released into the Swan estuary can survive and grow in the wild and may also be more catchable than wild fish. The results also show that captive-bred fish introduced into the wild can ultimately contribute to the recreational black bream fishery.

1.0 Introduction

In 1993, the Western Australian Recreational and Sport Fishing Council (WARSFC) sponsored a Landcare Environmental Action Programme project based at the South Metropolitan College of TAFE's Fremantle Maritime Centre (FMC). The "Mariculture Restocking Programme", as it was known, had as one of its initial aims, the production of juveniles for use in the restocking of marine recreational finfish resources, and, at the same time, training students in techniques used in the aquaculture industry.

Tarwhine (*Rhabdosargus sarba*) was the first species targeted by this project. Juveniles grown from fertilised eggs, collected from Underwater World at Sorrento Quay and raised at FMC, were released into wild marine populations off the Perth metropolitan area. Besides ensuring that juveniles released into wild populations were produced from broodstock from that population and that all juveniles were disease free, no attempt was made to evaluate the success of these releases.

Subsequently during 1995, WARSFC proposed that, in association with FMC, Fisheries Western Australia (FWA) and Murdoch University (MU) Fish Group, hatchery-bred Swan River black bream (*Acanthopagrus butcheri*), which had been successfully raised at FMC for several years, be released into the Swan River. *Acanthopagrus butcheri* was chosen as it is a relatively easy species to breed in captivity, is extremely hardy and is considered to be one of the most important recreational species in Western Australia (Potter *et al.* 1996). The Swan River was selected for these trials, not because the bream stock in this system was considered badly depleted, but because of the proximity of the river to FMC, the high recreational angling presence within this system with its close proximity to the capital of the State, and the opportunity to readily access data from angler caught tagged fish.

After consultation with FWA, it was decided that, in the first instance, in order to monitor the success of introducing captive-bred black bream into the Swan River for stock enhancement, the fish should be grown to a size (at least 12 months old) that would enable them to be individually marked with external tags. All juveniles were produced from Swan River broodstock, and were to be certified free of disease prior to release. The monitoring of the recaptures was to be undertaken by FWA, with MU Fish Group providing additional resources. The monitoring was intended to provide data on the survival and growth of the captive-bred fish present in recreational angler catches, and acceptance by the anglers of these fish relative to wild-stock fish (e.g. fighting qualities, appearance, taste). Thus, the primary purpose of this study was to monitor the recovery of individually tagged captive-bred black bream released into the Swan River, to determine their survival and growth rate to a size at which they entered the recreational fishery (minimum legal size), and whether they are vulnerable to capture by these fishers.

This report presents the results of this study, together with all validated data sets which may be needed for more detailed analyses in the future.

2.0 Methods

Swan River black bream have been maintained as broodstock at FMC since 1990. Broodstock have been maintained in seawater at 35 ppt in a flow-through system and fed on a fresh diet supplemented with vitamins. The first eggs for culture trials were collected from these fish with the aid of hormones (HCG) in 1993. Black bream broodstock have subsequently spawned naturally since 1994, producing over 90 million eggs from December to February each year (Jenkins 1995).

Black bream larvae were reared intensively in 5,000 litre cylindroconical fibreglass tanks at FMC in 35 ppt seawater. The larvae were initially fed a diet of rotifers at a rate of four to 10 rotifers per ml, with the algae *Nannochloropsis oculata* being maintained at an average cell density of 500,000 cells per ml during this period. When larvae reached an average length of 7 mm, they were weaned onto a diet of *Artemia* over a six-day period. *Artemia* were then fed to the larvae at a rate of 0.4 per ml until the larvae reached an average length of 10 mm. Larvae were then weaned onto micro-pellets over a 10-day period. The micro-pellet diet was continued until the juvenile stage was reached. Juveniles were subsequently fed a Nippia-ML pellet diet.

During 1995, a large number (thousands) of juvenile black bream from the 1994 breeding program were made available for the stock enhancement trial. One week prior to release, 775 of the 14-month-old black bream were individually marked with an external plastic T-bar anchor tag. The weight (gm) and fork length (mm) of each fish were also recorded when tagged (Appendix 1). During the tagging process, the fish were anaesthetised with Benzocaine at 50 ppm and the T-bar inserted between, and locked behind, the dorsal pterygiophores of the fish. The tags had a yellow cylindrical body on which instructions for return were inscribed. Fish were maintained at FMC for one week after tagging to ensure that the tags were secure and that all fish to be released had recovered from the process.

Most (767) of these fish were released into the Swan River at the south side of Ron Courtney Island (Figure 1), on 28 March 1995. The fish release was publicised through the media (Appendix 2) with recreational anglers being encouraged to contact the Coastal/Estuarine Branch of FWA Research Division and provide details of the recapture, in return for a reward (a "Scratch and Win" lottery ticket, provided by the WA Lotteries Commission).

Anglers that reported black bream recaptures to FWA were asked to provide the following information: tag number, date caught, recapture site, details of gear used, and demographic information relating to each angler (Appendix 3). Recaptured fish were classed as:

1. Fish and Tag return if the whole fish or filleted frame, and the tag were returned.
2. Tag Only return if only the tag was returned.
3. Re-Release if the tag was left intact and the number recorded and the fish was returned to the water.

The recapture site information for the Fish and Tag returns, Tag Only returns and Re-Releases, was used to calculate the distance travelled (in metres) by the black bream from the release site, using an estimated river centreline as the standard path travelled. The number of days at liberty was determined by simply subtracting the release date from the recapture date. The number of days at liberty was used to estimate the age of each fish recaptured by adding the time at liberty to the age at release in months [i.e. age = time at liberty + release age].

The daily rainfall for the period 22/03/95 (just prior to release) through to 31/10/97 for the Perth area was extracted from Bureau of Meteorology monthly reports. This information was used to examine the possible effect of rainfall (and thus river flow) on tagged black bream movements in the river.

Angler demographics were used to determine the distribution of residential locations of the recreational anglers that caught tagged fish.

Whole fish and filleted frames that were returned to FWA, were forwarded to the MU Fish Group for detailed biological examination. On examination, each fish was measured (TL ± 1 mm). Reproductive organs, where available, were dissected and stored in Bouins solution for subsequent histological examination. Alimentary canals were removed and stored in 70% ethanol. Stomach fullness, on a scale from 1 to 10 (distended), was estimated and contents examined under a binocular microscope. Each dietary item was identified to the lowest possible taxon. The percentage frequency and the relative contributions of each dietary item to the total number in the stomach of each fish was calculated. Volumes of dietary items were expressed using the 'points' method (Hynes 1950, Hyslop 1980), which takes into account stomach fullness. Since volumetric data best represent the relative importance of any particular dietary category, especially in cases where advanced digestion of some prey may make it difficult to identify the number of individuals of a prey species (Hyslop 1980), subsequent analyses were performed using only volumetric data of the dietary categories.

The age of each returned tagged black bream was extrapolated from its known hatchery birth date if the recovery date was known.

3.0 Results

Of 767 fish tagged and released, 97 fish were recaptured (Appendix 3) to 31 October 1997. Of these, 40 were returned as Fish and Tag returns, 40 were Tag Only returns and 17 were Re-Released (Table 1). There were also reports of the capture of a further 11 tagged fish subsequent to 31/10/97, however, as recapture details could not be confirmed, these fish were not considered in the analyses. Further, three of the Re-Released fish have since been recaptured and, together with tags, returned intact to FWA. This relatively high recapture rate provides direct evidence that hatchery-reared fish can survive long durations in the wild.

Examination of the recapture and release data in arbitrary distances both downstream and upstream from the release site (Figure 1) showed that of the 97 fish recaptured, 23 fish were caught within 2 km of the release site, 34 fish between two and 10 km of the release site, 24 fish between 10 and 15 km of the release site, and 16 fish were caught at a distance greater than 15 km from the release site. Sixty-two of the fish were caught upstream of the release site, four fish were recaptured near the release site and the remaining 31 fish downstream. The greatest recapture distances were 42 km downstream and 25.4 km upstream from the release sight. The average recapture distance from the release site was 2.1 km upstream. The least number of days at liberty was nine, the greatest was 945 and the average was 317 days (Table 1).

The location of fish recaptures did appear to be influenced by the magnitude of the winter rainfall (≈ river flow). After the first substantial rains for 1995 (during mid-May) and during the ensuing winter (June and July), 71% of the recaptured fish were caught downstream of the release site (Figure 2). During the spring and summer period after the last rains for 1995, a greater proportion of the recaptures were taken upstream of the release site. However, within the first 12 months after release, there was no statistically significant correlation ($R^2 = -0.04$) between daily rainfall and recapture site (expressed as distance from the release site) (Figure 2). It is difficult to determine the extent to which the spatial pattern of recaptures was related to the distribution of fish and angler effort. It could be assumed that both the distribution of fish and anglers varies with season.

Forty fish were returned (32 whole and eight others). Of these 40 fish, three were recaptured within 46 days of release and showed no increase in length. The remainder increased in length by as little as 2 mm and as much as 58 mm (Appendix 4). As expected, the greatest increases in length and weight were observed in fish that were at liberty the longest.

The lengths and estimated ages of the only recaptured fish for which there were adequate data, i.e. nine males and 14 females, were fitted to von Bertalanffy growth curves developed by Potter *et al.* (1996), and compared with the equivalent cohort of wild Swan River black bream using a Students T-Test (Appendix 5). There was a statistical difference ($p < 0.05$) between the length-age relationships, with the lengths of the captive-bred fish which had been grown in optimum laboratory conditions for 14 months being greater for the ages examined than wild-caught fish.

Dietary analysis of the 22 fish examined with food in their stomachs and intestines (Appendix 4), showed that prey items included bivalve mussels (Swan River Mussel, *Xenostrobus* sp., another small bivalve, *Tellina deltoidalis*, and the small brown bivalve *Arthritica semen*), the amphipod *Paracorophium excavatum* (approximately 5 mm in size), some plant material, polychaetes (the Swan River bloodworm *Marphysa sanguinea*) and prawn pieces. These last

two prey items were most probably bait used to catch the fish. Each of these prey items had been shown to be present in the diet of wild stock Swan River Black bream (Potter *et al*. 1996). Twelve of the fish examined had empty guts, but six of these had prey items in the intestine.

Fifteen of the fish were determined to be male (TL 142 mm to 253 mm) and seventeen fish were determined to be female (TL 163 mm to 253 mm). The remaining fish could not be sexed as no gonads were retained. Analysis of available gonads indicated that three males (lengths 184 mm, 191 mm and 234 mm, aged 1.6 yrs, unknown age, and unknown age, respectively) and two females (lengths 236 mm and 253 mm, aged 1.9 yrs and unknown, respectively) were sexually mature with gonads of stage 5 (Appendix 4). However, most recaptured fish examined were not mature, either because they were recaptured outside the spawning period, or because they had yet to reach the length of maturity. The lengths and ages of these fish were comparable with the lengths and ages for sexually mature Swan River wild-stock black bream (Potter *et al*. 1996).

A number of anglers who returned tagged fish also reported wild fish in their catch, however, most of these had relatively few wild fish in their catch. Few recreational fishers reported relatively large numbers of wild fish in catches that included tagged fish (usually only a single tagged fish). However, a high proportion (34%) of individual angler catches contained one or two tagged bream as the sole catch. These data suggest that tagged black bream were more catchable than individuals from the wild population. The geographical distribution of the recreational fishers that reported catching tagged black bream were mainly from suburbs within 10 kilometres of the Swan River, on the upstream side of Perth city (Figure 3).

For reasons of confidentiality, the names of the people that reported tag recaptures to researchers cannot be published, but there were 76 individuals who provided information, with one person catching five tagged fish, two people catching four tagged fish, two people catching three tagged fish and seven people catching two tagged fish (Table 1). Several of the 76 respondents commented that they were fishing specifically for black bream in the Swan River and had "special hot-spots" that they targeted depending upon the time of day and weather conditions prevailing at the time, and that the fish that they caught had "fought" like a fish of much greater size.

4.0 Discussion

The results from this initial study show that captive-bred black bream released into the Swan estuary can survive and grow in the wild for at least three years. The prey items present in the stomachs and intestines of those fish examined, were also present in wild-stock Swan River black bream (Potter *et al* 1996). This would suggest that captive-bred black bream are capable of foraging for prey items that constitute a natural diet. When compared with the wild fish, growth rates of the captive-bred fish indicate they grew at least as well as the wild fish in the Swan River, suggesting they have adapted well to their natural environment.

The results of this study also show that captive-bred fish introduced into the wild do contribute to the recreational black bream catch (97 recreational recaptures reported to 31 October 1997, out of a possible 767 released fish, i.e. 12.6% recaptured).

Unfortunately, the total numbers of wild-stock black bream caught over the same period of time by recreational fishers were not available, precluding a direct comparison between the magnitude of catches of wild-stock black bream and captive-bred black bream. Such a

comparison could have revealed any differences in the ability of anglers to catch hatchery-bred fish relative to wild stock, which is an important consideration for recreational fisheries managers (i.e. are the captive-bred fish more or less catchable when compared with wild fish). However, from the small number of anglers that provided total catch composition information with fish recapture reports, it appeared that the hatchery-bred fish may be more catchable than wild fish. There are also no data available on the spatial and temporal distribution of recreational fishing effort during the period of the study. This lack of recreational catch-effort data makes the precise interpretation of fish movement from the recapture data difficult. Nevertheless, the available results appeared to indicate that the captive-bred fish behaved similarly to wild fish in response to annual events such as winter rains. Some knowledge of how the captive-bred fish responded to the intrusion of marine water into the Swan River would also have assisted in deciding how well the fish have adapted to their natural environment. The important point here is, the better the stocked fish adapt to the natural estuarine environment, the greater the chance of survival, with the ultimate result that more fish are likely to become available in the recreational fishery.

5.0 Conclusions

This initial recreational stock enhancement trial has shown that captive-bred fish grown initially to about 15 cm in the hatchery, and then introduced into the wild, can ultimately contribute to the recreational fishery. However, several further issues need to be considered, these include:

To what extent can the introduced hatchery-bred fish enhance the recreational fish stocks? Part of the answer to this question involves an assessment of whether younger, smaller, and hence cheaper to produce, juvenile black bream will survive equally well in the wild and ultimately contribute to the recreational fishery.

There is also the important issue of the quantification of the cost and benefit of stocking black bream in the Swan River.

The ability of introduced fish to quickly adapt to a natural diet is likely to be a telling factor influencing their rate of survival. This factor will assume greater importance if smaller fish are released as mortality of smaller fish is generally higher than that of larger fish.

In an attempt to address some of these issues, a second restocking trial in the Swan River was undertaken. The FMC and FWA released approximately 30,000 small, juvenile black bream (< 70 mm TL) into the Swan River. Fish were tagged using a fluorochrome dye, oxytetracycline, and released at a much smaller, and thus more cost-effective size. Unfortunately, the planned comprehensive monitoring program to evaluate recreational angler-caught fish returns, commencing between 18 months and 2 years post-tagging, could not be undertaken due to lack of funding.

6.0 References

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7.0 Table and Figures

Table 1 Summary of information from tagged black bream tag recaptures reported prior to 31 October 1997.

Fish and Tag returns (includes two Re-Released fish)	40 fish
Tag Only returns	40 fish
Re-Released fish	17 fish
Total	**97 fish**
Distance from Ron Courtney Is. release site:	
Furthest upstream	25.4 km
Furthest downstream	42.0 km
Average recapture distance	2.1 km downstream
Days at liberty for recaptured fish:	
Least number of days	9 days
Greatest number of days	945 days
Average number of days	317 days
Number of recreational anglers that reported catching tagged fish:	
Five fish	1 person
Four fish	2 person
Three fish	2 people
Two fish	7 people
One fish	64 people

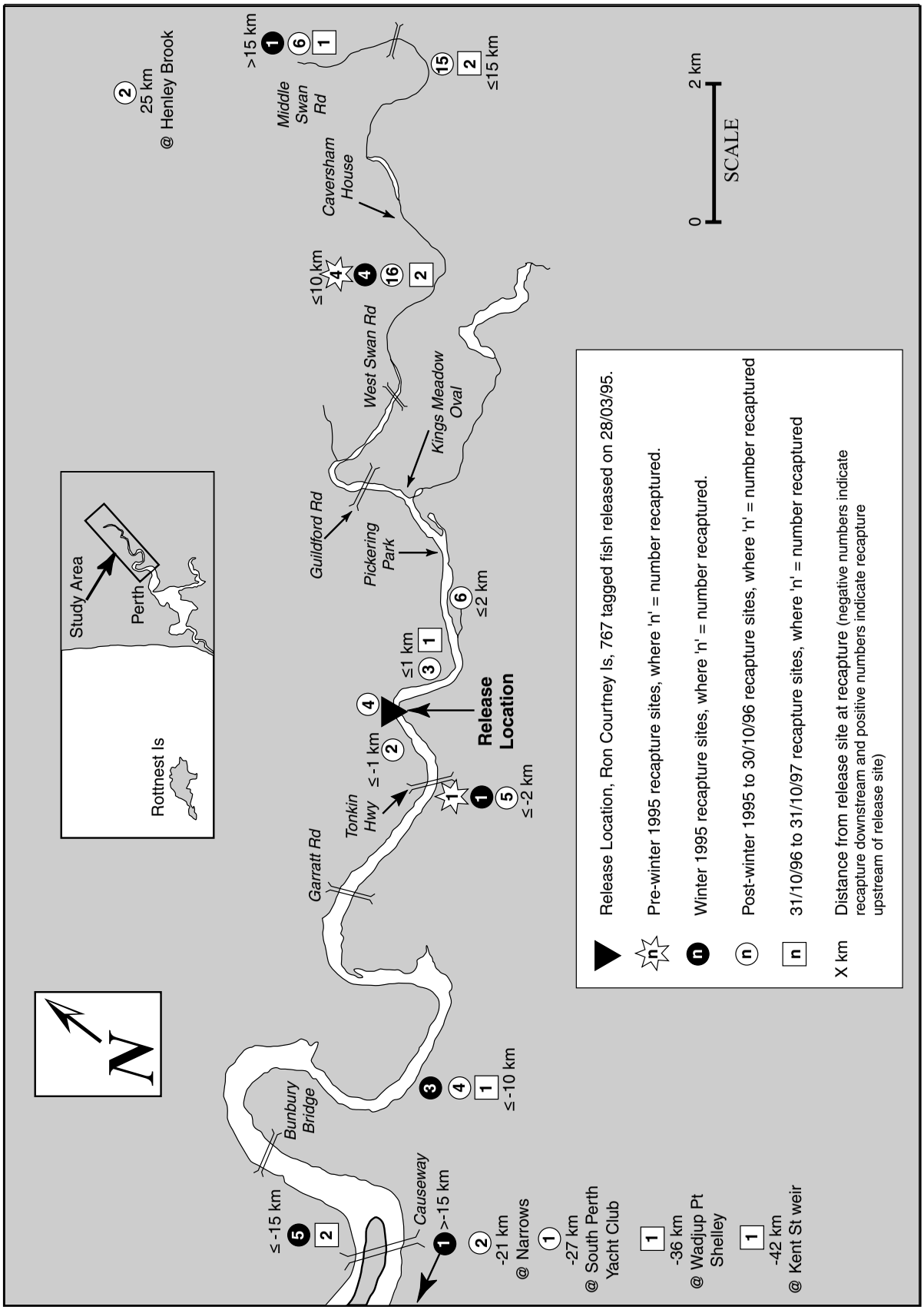

Figure 1 The tag release and recapture locations of black bream in the Swan River stock enhancement trial.

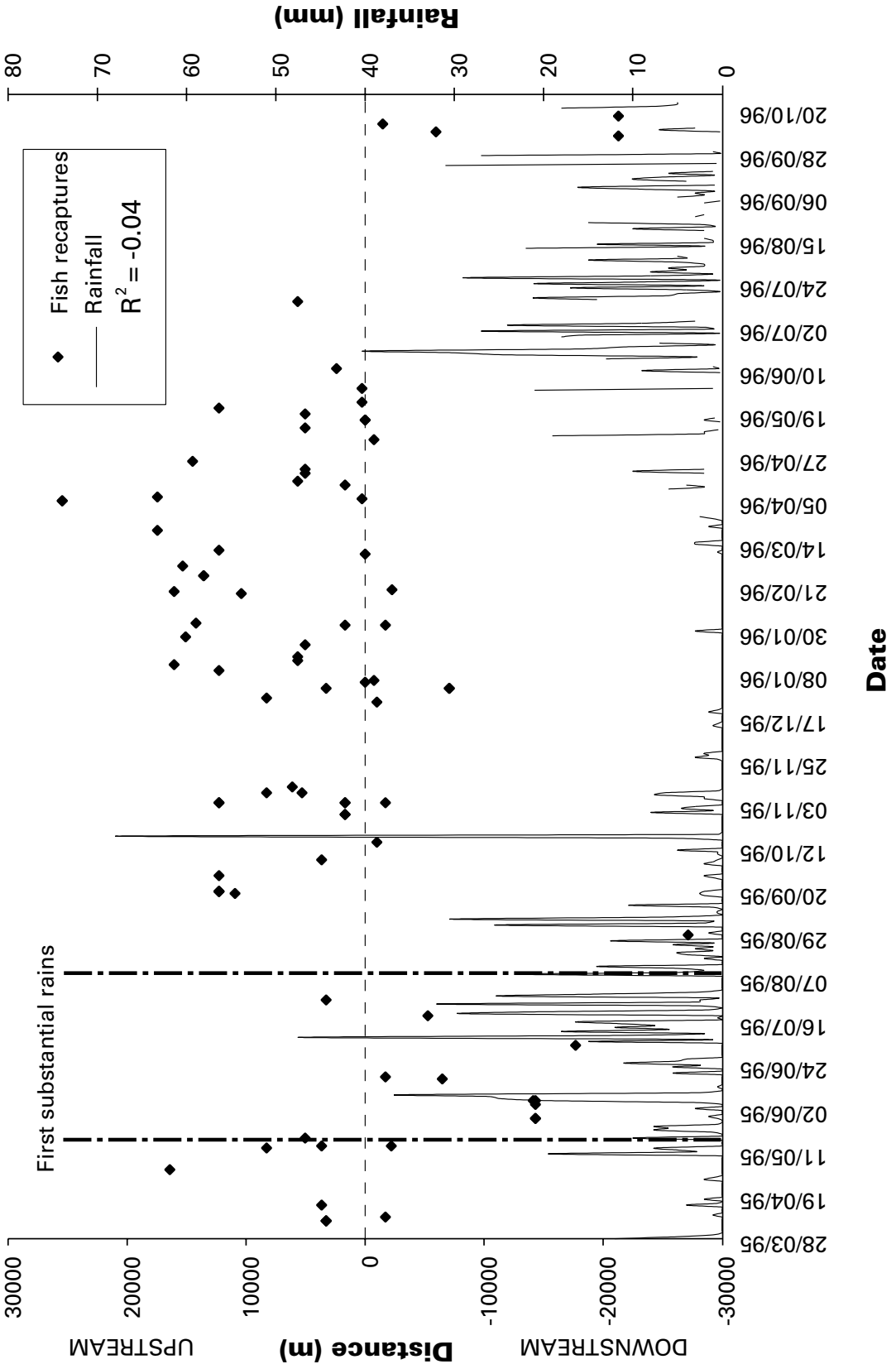

Figure 2 Daily rainfall in the Perth metropolitan area and distribution of recaptured black bream relative to the place of release for the period 22/03/95 to 31/10/95.

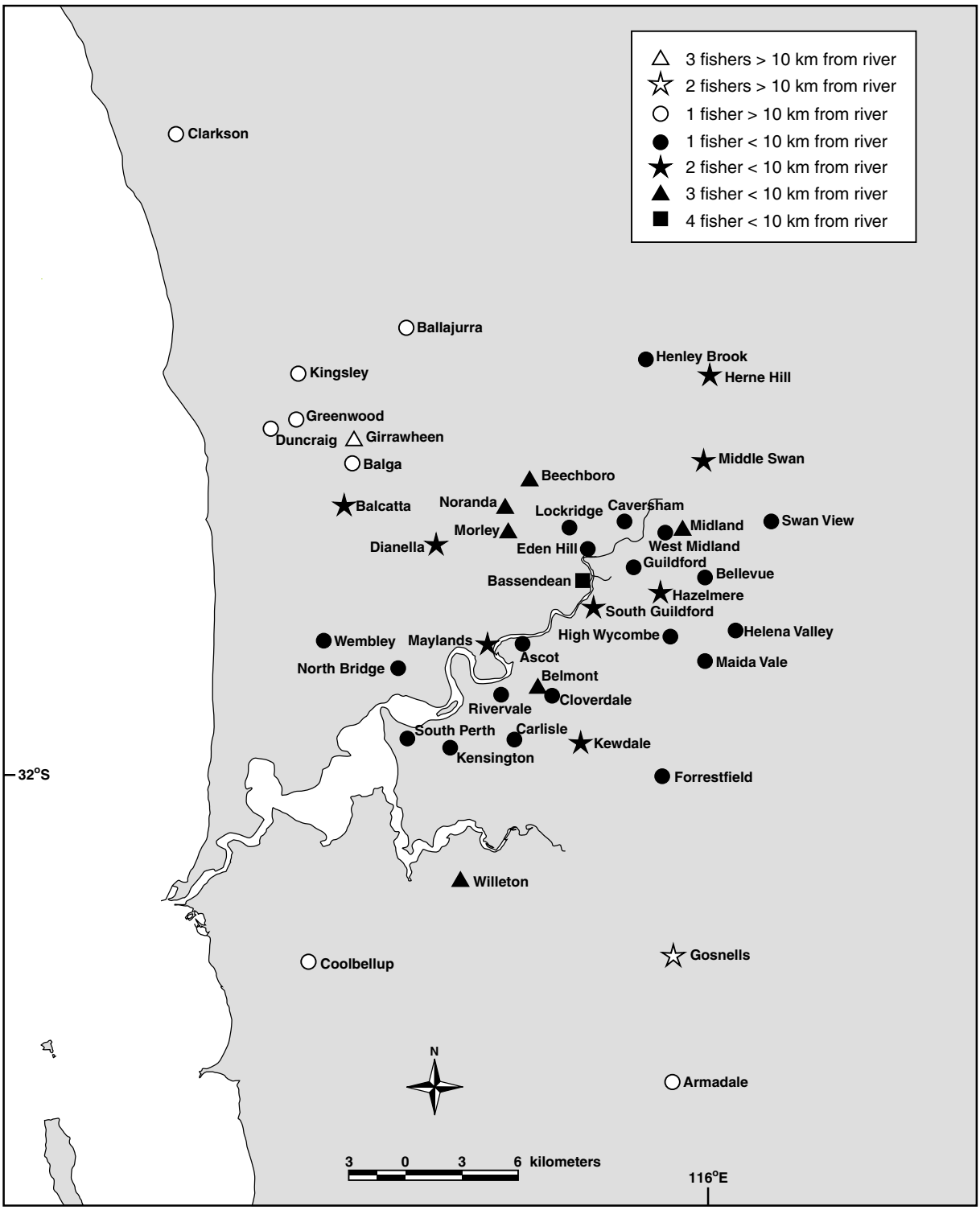

Figure 3 Spatial distribution of the residential locations of recreational fishers that reported catching tagged black bream.

8.0 Appendices

Appendix 1 Tagged black bream release information

Tag Number	Fork Length (mm)	Weight (g)	Comment
0001	147	86	
0002	176	130	
0003	142	64	Tag lost
0004	153	90	
0005	141	66	Tag lost
0006	191	166	
0007	173	135	
0008	153	106	
0009	155	89	
0010	155	90	
0011	150	85	
0012	155	87	
0013	155	87	
0014	157	98	Tag lost
0015	155	97	
0016	190	164	
0017	160	102	
0018	169	143	
0019	146	81	
0020	170	124	
0021	150	103	
0022	146	89	
0023	168	125	
0024	160	109	
0025	150	75	
0026	145	90	
0027	150	89	
0028	185	148	
0029	156	95	
0030	166	116	
0031	161	116	
0032	157	92	
0033	168	115	
0034	173	143	Tag lost
0035	158	108	0036
0036	165	108	
0037	152	88	
0038	165	121	
0039	173	133	
0040	145	73	
0041	160	98	
0042	168	120	
0043	133	59	
0044	169	119	
0045	167	112	
0046	147	81	
0047	160	102	
0048	187	168	
0049	165	122	
0050	164	97	
0051	163	120	
0052			Tag damaged
0053	150	81	
0054	165	113	
0055	186	152	
0056	145	72	
0057	152	99	
0058	165	111	
0059	153	112	
0060	155	92	
0061	155	91	
0062	173	140	
0063	177	143	
0064	155	102	
0065	141	80	
0066	160	100	
0067	130	75	
0068	140	52	
0069	174	126	
0070	161	95	
0071	193	166	
0072	161	105	
0073	140	66	
0074	157	97	
0075	151	84	
0076	164	117	
0077	150	170	
0078	134	54	
0079	153	83	
0080	165	105	
0081	142	64	
0082	148	82	
0083	139	63	
0084	160	102	
0085	155	96	
0086	145	81	Tag lost
0087	145	80	
0088	157	90	
0089	160	97	
0090	162	104	
0091	184	144	
0092	150	78	
0093	158	102	
0094	169	140	
0095	141	66	
0096	177	136	
0097	132	61	
0098	166	109	
0099	186	160	
0100	165	106	
0101	160	110	
0102	140	71	
0103	165	107	
0104	191	162	
0105	136	57	
0106	167	118	
0107	166	127	
0108	162	100	
0109	135	56	
0110	175	129	
0111	174	112	
0112	159	110	
0113	176	123	2 Tags
0114	175	114	
0115	163	106	
0116	138	61	
0117	122	42	
0118	156	91	
0119	153	86	
0120	135	62	
0121	137	70	
0122	131	46	
0123	183	162	
0124	140	59	
0125	160	99	
0126	182	148	
0127	149	88	
0128	155	94	
0129	166	107	2 Tags
0130	168	117	

Appendix 1 Tagged black bream release information (continued)

Tag Number	Fork Length (mm)	Weight (g)	Comment
0131	152	84	
0132	156	97	
0133	152	85	
0134	126	45	
0135	184	146	
0136	145	76	
0137	138	76	
0138	152	92	
0139	167	123	
0140	135	68	
0141	180	139	
0142	160	96	
0143	160	105	
0144	164	107	
0145	151	78	
0146	176	141	
0147	154	94	
0148	161	108	
0149	148	97	
0150	153	84	
0151	180	143	
0152	152	87	
0153	168	127	
0154	172	124	
0155	158	94	
0156	154	95	
0157	155	96	
0158	155	90	
0159	122	46	
0160	145	77	
0161	165	102	
0162	162	108	
0163	183	148	
0164	152	102	
0165	170	121	
0166	136	57	
0167	171	111	
0168	163	109	
0169	167	118	
0170	162	115	
0171	173	141	
0172	148	85	
0173	142	75	
0174	157	98	
0175	190	175	
0176	159	91	
0177	145	73	
0178	165	123	
0179	177	132	
0180	154	85	
0181	151	81	
0182	175	133	
0183	150	96	
0184	165	111	
0185	152	78	
0186	155	89	
0187	162	121	
0188	185	105	
0189	135	60	
0190	170	117	
0191	169	110	
0192	174	116	
0193	157	97	
0194	160	100	
0195	162	101	Ab Tag
0196	156	97	
0197	138	65	
0198			Tag damaged
0199	140	72	
0200	163	103	
0201	160	88	
0202	149	83	
0203	144	63	
0204	160	97	
0205	198	193	
0206	173	135	
0207	161	105	
0208	155	87	
0209	150	76	
0210	160	102	
0211	138	74	
0212	150	80	
0213	162	118	
0214	172	129	
0215	164	105	
0216	177	151	
0217	160	115	
0218	150	83	
0219	145	76	
0220	188	133	
0221	182	150	
0222	160	102	
0223	170	121	
0224	152	85	
0225	158	97	
0226	160	103	
0227	145	85	
0228	154	98	
0229	191	164	
0230	156	83	
0231	145	70	
0232	180	147	
0233	164	109	
0234	160	95	
0235	142	64	
0236	143	74	
0237	152	85	
0238	155	97	
0239	154	101	
0240	168	112	
0241	160	110	
0242	169	102	
0243	153	88	
0244	171	134	
0245	162	118	
0246	160	104	
0247	144	71	
0248	160	102	
0249	158	98	
0250	164	117	
0251	148	92	
0252	160	99	
0253	163	96	
0254	154	89	
0255	160	106	
0256	162	108	
0257	163	117	
0258	180	138	2 Tags
0259	142	56	
0260	155	96	
0261	146	78	
0262	165	98	

Appendix 1 Tagged black bream release information (continued)

Tag Number	Fork Length (mm)	Weight (g)	Comment
0263	179	157	
0264	172	122	
0265	172	120	
0266	159	93	
0267	139	70	
0268	150	76	
0269	155	94	
0270	162	102	
0271	164	103	
0272	152	75	
0273	154	98	
0274	137	55	
0275	164	108	
0276	129	49	
0277	155	88	Tag lost
0278	147	70	
0279	142	59	
0280	165	119	
0281	167	132	
0282	152	98	
0283	147	72	
0284	203	204	
0285	139	74	
0286	180	142	
0287	154	89	
0288	138	78	
0289	156	86	
0290	179	167	
0291	180	137	
0292	171	122	
0293	162	108	
0294	163	114	
0295	165	123	
0296	145	71	
0297	162	106	
0298	173	122	
0299	190	165	
0300	161	96	
0301	165	101	Tag lost
0302	175	140	
0303	155	77	Tag lost
0304	147	79	
0305	145	70	
0306	155	92	
0307	165	109	
0308	147	74	
0309	137	64	
0310	151	79	
0311	151	79	
0312	167	101	
0313	146	88	
0314	165	105	
0315	162	113	
0316	159	104	
0317	155	101	
0318	169	115	
0319	155	87	
0320	143	66	
0321	149	74	
0322	167	123	
0323	154	85	
0324	159	102	
0325	149	75	
0326	145	68	
0327	167	116	
0328	149	76	
0329	147	91	
0330	133	66	
0331	155	100	
0332	175	131	Tag lost
0333	141	67	
0334	169	109	
0335	160	91	
0336	165	106	
0337	144	64	
0338	165	115	
0339	167	126	
0340	153	81	
0341	159	117	
0342	152	108	
0343	169	112	
0344	143	71	
0345	160	102	
0346	155	84	
0347	165	118	
0348	152	112	
0349	150	89	
0350	159	88	
0351	140	58	
0352	155	48	
0353	160	88	Mort
0354	164	96	
0355	160	103	
0356	160	99	Mort
0357	160	98	
0358	167	134	
0359	170	116	Mort
0360	178	134	
0361	148	77	
0362	150	85	
0363	138	68	
0364	170	111	
0365	163	110	
0366	166	108	
0367	147	75	
0368	175	141	
0369	181	131	
0370	155	86	
0371	143	76	
0372	164	118	
0373	170	113	
0374	160	121	
0375	160	101	Mort
0376	164	89	
0377	150	70	
0378	164	97	
0379	165	102	
0380	160	101	
0381	151	84	
0382	179	152	
0383	175	125	
0384	153	87	
0385	162	104	
0386	160	102	
0387	155	91	
0388	150	80	
0389	171	122	
0390	156	91	
0391	153	89	
0392	165	102	
0393	161	95	
0394	160	101	

Appendix 1 Tagged black bream release information (continued)

Tag Number	Fork Length (mm)	Weight (g)	Comment
0395	167	113	
0396	153	90	
0397	182	143	Tag lost
0398	150	74	
0399	162	84	
0400	144	71	
0401	164	104	
0402	161	109	
0403	120	38	Tag lost
0404	164	108	
0405	128	41	
0406	168	120	
0407	152	90	
0408	171	124	
0409	140	83	
0410	155	111	
0411	191	158	
0412	167	104	
0413	163	114	
0414	175	152	
0415	167	103	
0416	174	128	
0417	165	99	
0418	123	36	Tag lost
0419	132	54	
0420	163	123	
0421	161	102	
0422	180	150	
0423	167	117	
0424	158	102	
0425	148	72	
0426	160	104	
0427	161	103	
0428	165	102	
0429	152	92	
0430	187	162	
0431	157	107	
0432	159	85	
0433	152	92	
0434	150	73	
0435	164	97	
0436	147	86	
0437	157	94	
0438	155	97	
0439	154	84	
0440	172	126	
0441	163	97	
0442	164	104	
0443	148	76	
0444	175	134	
0445	150	85	
0446	142	68	
0447	163	110	
0448	173	118	
0449	200	190	
0450	166	116	
0451	147	80	
0452	153	95	Tag lost
0453	165	121	
0454	170	104	
0455	152	82	
0456	160	94	Tag lost
0457	150	81	
0458	159	89	
0459	149	76	
0460	168	118	
0461	172	138	
0462	140	64	
0463	160	98	
0464	158	96	
0465	152	68	
0466	186	144	Mort
0467	161	108	
0468	186	148	
0469	136	54	
0470	148	78	
0471	165	111	
0472	160	89	
0473	155	75	
0474	165	110	Mort
0475	149	75	
0476	180	144	
0477	154	90	
0478	166	102	
0479	150	90	
0480	191	173	
0481	164	117	
0482	179	136	
0483	168	124	Tag lost
0484	157	94	
0485	152	91	
0486	158	104	
0487	181	141	
0488	173	105	
0489	172	111	
0490	152	94	
0491	187	152	
0492	175	133	
0493	169	121	
0494	151	80	
0495	163	117	
0496	149	83	
0497	152	81	
0498	155	99	
0499	166	122	
0500	171	131	
0501	150	81	
0502	143	66	
0503	139	137	
0504	145	74	
0505	156	90	
0506	185	137	
0507	185	162	
0508	165	108	
0509	170	117	
0510	179	135	
0511	164	106	
0512	162	88	
0513	176	133	
0514	155	90	
0515	171	127	
0516	160	89	
0517	165	119	
0518	167	96	
0519	161	103	Tag lost
0520	158	91	
0521	140	63	
0522	158	104	
0523	195	184	
0524	158	89	Tag lost
0525	165	108	
0526	170	116	

Appendix 1 Tagged black bream release information (continued)

Tag Number	Fork Length (mm)	Weight (g)	Comment
0527	154	90	
0528	151	77	
0529	182	125	
0530	163	107	
0531	160	89	
0532	174	124	
0533	138	79	Tag lost
0534	170	135	
0535	160	106	
0536	155	89	Tag lost
0537	164	99	
0538	166	112	
0539	163	100	
0540	183	149	
0541	165	105	
0542	151	81	
0543	175	129	
0544	147	77	
0545	159	102	Tag lost
0546	170	113	
0547	162	94	
0548	147	72	
0549	154	87	
0550	178	136	
0551	135	53	
0552	145	68	
0553	164	90	
0554	166	121	
0555	175	128	
0556	175	118	
0557	130	40	
0558	169	130	
0559	161	89	
0560	185	150	
0561	170	121	
0562	152	90	
0563	164	100	
0564	154	90	
0565	122	40	
0566	164	112	
0567	207	215	
0568	120	38	Tag lost
0569	174	141	
0570	165	114	
0571	150	85	
0572	143	80	
0573	181	128	
0574	166	103	
0575	152	83	
0576	146	69	
0577	140	65	
0578	175	121	
0579	167	112	
0580	192	146	
0581	161	110	
0582	154	77	
0583	160	111	
0584	144	68	
0585	163	117	Tag lost
0586	152	90	
0587	155	84	
0588	172	148	
0589	167	104	
0590	165	101	
0591	150	84	
0592	172	122	
0593	175	118	
0594	188	168	
0595	160	95	
0596	137	82	
0597	162	98	
0598	150	82	
0599	164	107	
0600	175	135	Tag lost
0601	169	116	
0602	164	75	2 Tags
0603	154	85	
0604	162	116	
0605	155	96	
0606	167	108	
0607	176	124	
0608	154	96	
0609	168	110	
0610	158	98	
0611	179	135	
0612	147	76	
0613	153	97	
0614	175	130	
0615	147	87	
0616	129	53	
0617	142	72	
0618	157	93	
0619	162	98	
0620	168	120	
0621	156	96	
0622	171	116	
0623	157	110	
0624	170	105	
0625	174	128	
0626	139	61	
0627	152	87	
0628	155	80	
0629	197	187	
0630	160	100	
0631	145	68	
0632	168	103	
0633	149	83	
0634	174	126	
0635	157	95	
0636	159	84	
0637	168	120	
0638	169	118	
0639	165	108	
0640	159	93	
0641	166	112	
0642	153	77	
0643	190	166	
0644	171	116	
0645	165	101	
0646	166	105	
0647	145	80	
0648	168	115	
0649	125	41	
0650	151	82	
0651	163	102	
0652	167	110	
0653	148	88	
0654	154	79	
0655	175	134	
0656	148	84	
0657	154	83	
0658	161	92	

Appendix 1 Tagged black bream release information (continued)

Tag Number	Fork Length (mm)	Weight (g)	Comment
0659	180	137	
0660	159	90	
0661	152	83	
0662	164	107	
0663	172	127	
0664	160	85	
0665	163	97	
0666	165	121	
0667	137	77	
0668	160	97	
0669	148	90	
0670	180	131	
0671	154	79	
0672	133	53	
0673	164	110	
0674	178	138	
0675	173	117	
0676	159	123	
0677	169	109	
0678	182	132	
0679	153	86	
0680	141	64	
0681	172	112	
0682	188	169	
0683	152	88	
0684	175	135	
0685	155	99	
0686	160	98	
0687	149	75	
0688	160	98	
0689	145	82	
0690	169	113	
0691	175	128	
0692	184	148	
0693	177	139	
0694	153	88	
0695	150	88	
0696	160	91	
0697	176	135	
0698	133	51	
0699	160	105	
0700	164	107	
0701	160	95	
0702	125	44	
0703	129	71	
0704	166	105	
0705	149	69	
0706	150	78	
0707	180	136	
0708	150	84	
0709	154	84	
0710	155	74	
0711	125	59	
0712	170	113	
0713	173	105	
0714	134	52	
0715	170	120	
0716	150	88	
0717	184	138	
0718	149	81	
0719	185	136	
0720	147	71	
0721	174	139	
0722	165	125	
0723	155	96	
0724	170	123	
0725	155	91	
0726	150	83	
0727	148	74	
0728	154	83	
0729	160	97	
0730	172	117	
0731	159	96	
0732	150	80	
0733	162	96	
0734	172	111	
0735	149	82	
0736	192	168	
0737	165	105	
0738	187	150	
0739	151	90	
0740	142	68	
0741	155	91	
0742	181	140	
0743	159	101	
0744	165	97	
0745	174	126	
0746	180	137	
0747			Tag damaged
0748	162	103	
0749	165	105	
0750	141	79	
0751	160	99	
0752	162	98	
0753	135	76	
0754	173	116	
0755	145	68	
0756	130	47	Tag lost
0757	140	61	
0758	140	64	
0759	166	118	Tag lost
0760	178	130	
0761	161	107	
0762	148	68	Tag lost
0763	166	118	
0764	169	120	
0765	127	67	
0766	165	105	
0767	154	90	
0768	160	91	
0769	161	104	
0770	169	134	
0771	196	174	
0772	171	111	
0773	145	76	
0774	179	143	
0775	153	83	

MEDIA STATEMENT

GOVERNMENT OF WESTERN AUSTRALIA

March 28, 1995 MINISTER FOR FISHERIES

Swan River anglers are being urged to participate in a tagging and recapture program that may help boost recreational fishing stocks.

Fisheries Minister Monty House today helped release nearly 1,000 black bream fingerlings into the Swan River as part of a joint project between the Western Australian Fishing and Aquaculture Centre, the WA Recreational and Sportfishing Council, Murdoch University and the Fisheries Department.

The fingerlings were tagged, weighed and measured specifically for the project prior to release today into the river at Redcliffe.

Mr House said the bream were the first to be commercially grown at TAFE's Fremantle aquaculture centre and released into the Swan River as part of a detailed study of black bream in that estuarine system.

"This program will provide valuable information for researchers when restocking the waterways with popular native angling species," he said.

"The public need to participate in the spirit of the program to recover the tagged fish in the future and contact the Fisheries Department so survival and growth rates can be calculated.

"All recreational and commercial fishermen are urged to report the capture of any of these tagged fish to the Research Division of the Fisheries Department."

The black bream project was originally a WA Recreational and Sportfishing Council and TAFE training exercise which has expanded due to the significant industry interest.

GOVERNMENT MEDIA OFFICE: 17th FLOOR, CAPITA CENTRE
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The juvenile tagged bream have been reared from broodstock induced to spawn at the WAFAC facility.

Over 60,000 fingerlings were reared at the centre in 1994, with some used to stock farm dams and seacages in the river and ocean.

Black bream are commonly found in WA's southern estuaries and the upper reaches of the Swan River. The species can cope with a variety of water salinity ranging from fresh to salt water.

Black bream are an important commercial fish, with about 80 tonnes caught in the State annually and are highly sought after as a table delicacy by recreational fishermen.

The species has a relatively long life span and may live more than 14 years, although most are four to five years of age and weigh about 1.5 kilograms.

Mr House said the State Government had recognised aquaculture as a major opportunity for WA to produce both native and exotic species on a commercial scale.

"We have made a clear commitment to assist regional co-ordination of research and development, improve promotion and marketing strategies and attract enterprise investment," he said.

The $4.5 million expansion plan for the aquaculture industry initiated by Mr House involved the establishment of an Aquaculture Development Council, the appointment of regional development officers, more aquaculture research and development facilities in Broome and the South-West, and a specific aquaculture unit in the Fisheries Department.

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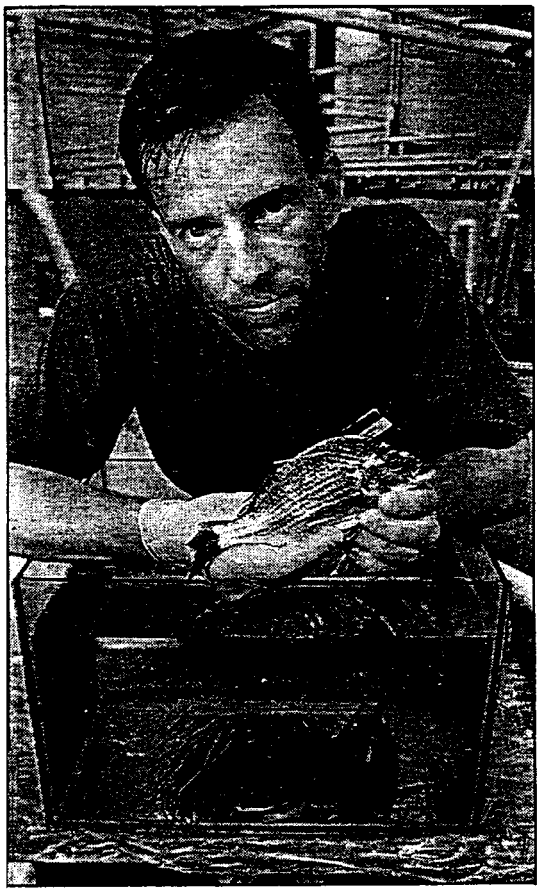
The WA Fishing and Aquaculture Centre - part of South Metropolitan College of TAFE and funded by the Department of Training - is also playing a key role in boosting aquaculture development and training opportunities in WA.

Media contacts: Will Henwood 481 2044 or 041 9901500

Rod Lenanton Research Division Fisheries Department 246 8444



Experiment: Kevin Smith, of the aquaculture centre, checks one of the tagged fish. PICTURE: JOHN MOKRZYCKI

Swan survival test for fish from hatcheries

BY MICHAEL ZEKULICH

FISHING Industry history will be made in WA today at Redcliffe when 775 tagged black bream will be released into the Swan River.

The release is part of a research project which could lead to the restocking of depleted South-West rivers with the prize table and sporting fish.

It is said to be the biggest project of its kind in Australia involving black bream.

The release is the culmination of the first stage of the research program, Greg Jenkins, project manager at the Fremantle Fishing and Aquaculture Centre, said.

The centre is part of the South Metropolitan College of TAFE. The project also involves the Fisheries Department, the Recreational Fishing Council and Murdoch University.

Mr Jenkins said the researchers were seeking to establish whether the 14-month-old tagged fish, bred and raised in a hatchery, could survive in the wild.

Black bream were a robust species and the weight of the fish at release should ensure their survival for at least a week.

He hoped that by then, their natural instincts and hunger would lead to healthy feeding in the Swan.

"There is no point in restocking a river with hundreds of thousands of fish we have bred if they cannot survive," Mr Jenkins said.

The centre was also investigating ways to reduce the cost of producing juvenile fish in the big numbers needed for restocking.

"If all goes well, restocking of South-West waterways, depleted through netting and overfishing, could begin in two to three years," he said.

Anglers were asked to return tagged fish to the Fisheries Department.

Tagging scheme a bid to boost stocks

15/4/95

Go2Ap

SWAN River anglers are assured of a good catch in the future thanks to the WA Fishing and Aquaculture Centre in Fremantle.

Earlier this month almost 1000 black bream fingerlings bred at the centre were released into the Swan River at Redcliffe.

The release is part of an ongoing programme to protect fish stocks in the river for future generations of fishermen.

Now, its up to anglers to do their part by participating in a joint research project between the WA Fishing and Aquaculture Centre in Fremantle; the WA Recreational and Sportfishing Council, Murdoch University and the Fisheries Department.

The fingerlings were tagged, weighed and measured before their release.

Anglers are asked to contact the research division of the Fisheries Department if they capture any tagged fish so survival and growth rates can be calculated.

The programme will provide valuable information for researchers when re-stocking the waterways with popular native angling species.

Fisheries minister Monty House said the bream were the first to be commercially grown at TAFE's Fremantle aquaculture centre and released into the river as part of a detailed study of black bream in that estuarine system.

The project was originally a WA Recreational and Sportfishing Council and TAFE exercise. It was expanded due to significant industry interest.

The juvenile bream were reared from brood stock induced to spawn at the WAFAC facility.

More than 60,000 fingerlings were reared at the centre in 1994, with some used to stock dams and sea cages.

Appendix 3 Tagged black bream recapture information

Tag no.	Date of capture	Recapture status	Suburb of fisher	Days at liberty	Increase in length (mm)	Distance from release site (m)	Season
0015	06/04/95	TO	South Guildford	9	-	3277	Autumn
0018	06/04/95	FT	South Guildford	9	3	3277	Autumn
0020	06/04/95	FT	Girraween	9	0	3277	Autumn
0696	08/04/95	FT	Lockridge	11	0	-1721	Autumn
0040	14/04/95	TO	South Guildford	17	-	3650	Autumn
0722	02/05/95	FT	West Midland	35	2	16400	Winter
0529	13/05/95	FT	Caversham	46	0	8273	Winter
0157	14/05/95	FT	Ascot	47	9	-2205	Winter
0538	14/05/95	FT	Balga	47	9	3650	Winter
0061	18/05/95	TO	Beechboro	51	-	5035	Winter
0434	28/05/95	FT	South Perth	61	13	-14331	Winter
0648	28/05/95	FT	South Perth	61	6	-14331	Winter
0134	04/06/95	TO	Greenwood	68	-	-14331	Winter
0074	06/06/95	FT	Morley	70	8	-14128	Winter
0482	06/06/95	FT	Bassendean	70	9	-14331	Winter
0187	17/06/95	RR	Rivervale	81	-	-6500	Winter
0370	18/06/95	RR	Rivervale	82	-	-1721	Winter
0050	04/07/95	TO	Kensington	98	-	-17696	Winter
0452	19/07/95	TO	Maylands	113	-	-5285	Winter
0464	27/07/95	TO	Coolbellup	121	-	3277	Winter
0581	29/08/95	RR		154	-	-27158	Spring
0165	19/09/95	FT	Midland	175	14	10937	Spring
0236	20/09/95	FT	Middle Swan	176	12	12271	Spring
0291	20/09/95	FT	Henley Brook	176	11	12271	Spring
0140	22/09/95	FT	Middle Swan	178	7	12271	Spring
0117	28/09/95	RR	Midland	184	-	12271	Spring
0764	06/10/95	RR	Kewdale	192	-	3650	Spring
0106	15/10/95	RR	Beechboro	201	-	-1004	Spring
0448	29/10/95	FT	Noranda	215	-	1676	Spring
0579	29/10/95	FT	Noranda	215	-	1676	Spring
0029	04/11/95	FT	Noranda	221	-	12271	Summer
0180	04/11/95	FT	Noranda	221	-	1676	Summer
0219	04/11/95	FT	Balcatta	221	-	-1721	Summer
0340	04/11/95	FT	Noranda	221	-	12271	Summer
0347	04/11/95	FT	Noranda	221	-	1676	Summer
0108	09/11/95	FT	Henley Brook	226	-	8273	Summer
0266	09/11/95	FT	South Guildford	226	13	5300	Summer
0311	12/11/95	RR	Bellevue	229	-	6105	Summer
0594	25/12/95	FT	Gosnells	272	25	-1004	Summer
0249	27/12/95	RR	Willeton	274	-	8273	Summer
0072	01/01/96	TO	Balcatta	279	-	-7081	Summer
0123	01/01/96	RR		279	-	3277	Summer
0143	01/01/96	TO	Balcatta	279	-	-7081	Summer
0622	04/01/96	TO	Bassendean	282	-	0	Summer
0775	05/01/96	TO	Armadale	283	-	-757	Summer
0261	10/01/96	TO	Bassendean	288	-	12271	Summer
0616	13/01/96	TO	SwanView	291	-	16050	Summer
0319	15/01/96	TO	Beechboro	293	-	5655	Summer
0181	17/01/96	FT	Midland	295	45	5655	Summer
0382	23/01/96	TO	Helena Valley	301	-	5035	Summer
0588	27/01/96	FT	Middle Swan	305	33	15084	Summer
0058	01/02/96	TO	Belmont	310	-	-1721	Autumn
0300	01/02/96	FT	Carlisle	310	45	1676	Autumn
0104	02/02/96	FT	Middle Swan	311	45	14200	Autumn
0184	18/02/96	FT	Noranda	327	57	10400	Autumn
0684	19/02/96	FT	Herne Hill	328	57	16050	Autumn
0106	20/02/96	FT	Kewdale	329	53	-2265	Autumn
0031	27/02/96	TO	Duncraig	336	-	13558	Autumn
0508	27/02/96	TO	Duncraig	336	-	13558	Autumn
0584	03/03/96	RR	Noranda	341	-	15326	Autumn

Appendix 3 Tagged black bream recapture information (continued)

Tag no.	Date of capture	Recapture status	Suburb of fisher	Days at liberty	Increase in length (mm)	Distance from release site (m)	Season
0172	09/03/96	FT	Girraween	347	60	0	Autumn
0629	11/03/96	FT		349	56	12271	Autumn
0223	21/03/96	FT	Duncraig	359	58	17448	Autumn
0185	05/04/96	RR	Herne Hill	374	-	25451	Autumn
0571	05/04/96	RR	Herne Hill	374	-	25451	Autumn
0171	06/04/96	FT	Cloverdale	375	53	255	Autumn
0744	09/04/96	FT	Eden Hill	378	70	17448	Autumn
0334	13/04/96	TO	Forrestfield	382	-	1676	Autumn
0687	15/04/96	TO	Hazelmere	384	-	5655	Autumn
0188	19/04/96	TO	Kingsley	388	-	5035	Autumn
0488	21/04/96	TO	Guildford	390	-	5035	Autumn
0200	25/04/96	RR	Gosnells	394	-	14500	Autumn
0479	06/05/96	RR	Morley	415	-	0	Winter
0286	12/05/96	FT	Kingsley	411	73	5035	Winter
0479	16/05/96	FT	Belmont	405	60	-757	Winter
0560	16/05/96	FT	Belmont	415	75	0	Winter
0279	19/05/96	FT	Kingsley	418	92	5035	Winter
0422	22/05/96	TO	Balcatta	421	-	12271	Winter
0400	25/05/96	RR	Dianella	424	-	255	Winter
0260	01/06/96	TO	Maida Vale	431	-	255	Winter
0592	11/06/96	RR	Morley	441	-	2400	Winter
0051	15/07/96	FT	Girraween	475	-	5655	Winter
0358	07/10/96	TO	Wembley	559	-	-21303	Spring
0467	09/10/96	TO	High Wycombe	561	-	-5953	Spring
0604	13/10/96	TO	Bassendean	565	-	-1496	Spring
0238	17/10/96	FT	Northbridge	569	-	-21303	Spring
0196	03/01/97	TO	Lynwood	647	-	-7532	Summer
0322	06/02/97	TO	Stratton	681	-	16050	Autumn
0668	09/02/97	TO	Bayswater	684	-	-42964	Autumn
0028	17/02/97	FT	Swan View	692	0	649	Autumn
0629	11/03/97	FT		714	83	12271	Autumn
0007	16/03/97	RR	Balcatta	719	-	5655	Autumn
0654	30/03/97	TO	Hazelmere	733	-	11131	Autumn
0596	25/04/97	FT	Bedford	759	123	3670	Autumn
0513	21/08/97	FT	Ferndale	877	-	-36666	Spring
0141	26/10/97	TO	Clarkson	943	-	-12225	Spring
0089	28/10/97	TO	Ballajurra	945	-	-14128	Spring
				317.58		2171.515464	

Recapture Status: TO - Tag Only return
FT - Fish and Tag return
RR - Re-Release

Blanks indicate insufficient information returned from fishers

Appendix 4 Recaptured tagged black bream biological information

Prey item key

#1 = crustacean body parts
#2 = Swan River mussel, *Xenostrobus* sp.
#3 = small white mussel
#4 = filamentous algae, possible indirect ingestion
#6 = sand
#7 = polychaete, Swan River bloodworm
#8 = crustacean, amphipods ~5 mm
#9 = small brown bivalve, *Arthritica semen*

Tag no.	Days at liberty	Age (months)	Release fork length (mm.)	Recapture fork length (mm)	Release weight (gm)	Recapture weight (gm)	Sex	Gonad stage	Gonad weight (gm)	Gut fullness (0 = empty 10 = full)	Prey item/s in gut	No. of prey items	Comments
722	34	15.1	165	167	125	139	H	3	0.24	0	-	-	empty gut
434	60	16.0	150	163	73	87	F	2	0.42	8	#1	-	prawn - most likely bait used
157	36	15.2	155	164	96	114	M	2	0.28	1	#1	-	prawn - most likely bait used
538	36	15.2	166	175	112	140	M	2	0.30	0	-	-	empty gut
74	69	16.3	157	165	97	87	F	2	0.18	7	#1 & #2	1 -	prawn - most likely bait used
648	80	16.6	168	174	115	121	M	2	0.26	0	-	-	empty gut
482	6	14.2	179	188	136	152	F	3	1.04	5	#2	20	prey in intestine only
696	7	14.2	160	160	91	91	M	2	0.58	1	#3	2	prey in intestine only
529	16	14.5	182	182	125	134	F	2	0.49	0	-	-	empty gut
18	9	14.3	169	172	143	140	M	2	0.20	2	#2 & #4	2 -	prey in intestine only #4 - intestine also
15	9	14.3	155	NA	97	NA	NA	NA	NA	NA	-	-	no head, guts or gonads
20	8	14.3	170	170	124	129	F	2	0.40	10	#1	1	prawn - most likely bait used
481	NA	-	164	165	117	117	M	2	0.19	8	#1	1	prawn - most likely bait used
266	192	20.3	159	172	93	114	F	2	0.28	6	#4	6	#4 - intestine also
236	145	18.8	143	155	74	91	M	2	0.11	2	#9	5	#9 & #2 in intestine also
181	254	22.3	151	196	81	166	?	NA	NA	5	#1, #4 & #2	1 - 3	#2, Crab and sand (#6) in intestine also
594	231	21.6	188	213	168	NA	NA	NA	NA	NA	-	-	no head, guts or gonads
											-	-	distinct Moore River fish shape
586	NA	-	152	200	90	205	F	3	1.46	10	#2	50	prey in intestine only
587	NA	-	152	200	90	205	F	3	1.46	10	#6	-	distinct Moore River fish shape
140	NA	-	135	142	68	81	M	1	0.05	NA	-	-	distinct Moore River fish shape
106	288	23.5	167	220	118	235	NA	NA	NA	0	-	-	large vol. of #2 in intestine
588	266	22.7	172	205	148	255	F	3	2.22	5	#1, #4 & #8	- - 2	moderate vol #2 in intestine
165	144	18.7	170	184	121	150	M	5	1.89	0	-	-	#2 in intestine
457	NA	-	150	156	81	92	M	2	0.30	0	-	-	
104	270	22.9	191	236	162	324	F	4	2.63	8	#7	1	#7 most likely bait used, intestine empty
184	287	23.4	165	222	111	282	M	2	0.20	9	#1	-	large vol. of #2 in intestine
											#2	10	pink hue to scales
684	287	23.4	175	232	135	NA	NA	NA	NA	NA	-	-	no guts or gonads
											-	-	pink hue to scales
300	269	22.8	161	206	96	213	F	3	1.50	10	#2 & #7	5 1	#2 in intestine #7 most likely bait used
291	NA	-	180	191	137	157	M	4/5	1.76	0	-	-	some #2 and sand (#6) in intestine
286	NA	-	180	253	142	NA	F	4	4.40	2	#1	-	prawn - most likely bait used
279	NA	-	142	234	59	NA	M	3	0.56	5	#1	-	prawn - most likely bait used
280	NA	-	142	234	59	NA	M	4	0.57	6	-	-	some #1 and #2 in intestine
560	415	27.6	185	235	150	307	F	3	1.73	0	-	-	#2 in intestine
479	415	27.6	150	210	90	232	F	3	2.77	0	-	-	#2 in intestine
172	347	25.4	148	208	85	NA	NA	NA	NA	NA	-	-	no guts or gonads
223	359	25.8	170	225	121	276	F	3	1.57	0	-	-	#2 in intestine
744	378	26.4	165	235	97	306	F	3	2.45	10	#1	-	prawn - most likely bait used
629	349	25.5	197	253	187	369	M	3	0.84	10	#1	1	
171	375	26.3	173	226	141	299	F	4	3.00	0	-	-	

Appendix 5 Tagged black bream vs wild stock black bream growth comparison

	Tag no.	Days at liberty	Release fork length (mm)	Recapture fork length (mm) of tagged fish	Predicted fork length(mm) based on Potter *et al.,* 1996	Release weight (gm)	Recapture weight (gm)	Sex	LN recapture FL/ predicted FL
Males	696	7	160	160	140.5	91	91	M	0.129854023
	18	9	169	172	141.0	143	140	M	0.198880424
	157	36	155	164	147.2	96	114	M	0.108313014
	538	36	166	175	147.2	112	140	M	0.17323256
	648	80	168	174	157.0	115	121	M	0.103093265
	165	144	170	184	170.6	121	150	M	0.075735296
	236	145	143	155	170.8	74	91	M	-0.096989537
	184	287	165	222	198.6	111	282	M	0.111625415
	629	349	197	253	209.7	187	369	M	0.187731463
	140	NA	135	142		68	81	M	
	457	NA	150	156		81	92	M	
	481	NA	164	165		117	117	M	
	291	NA	180	191		137	157	M	
	279	NA	142	234		59	NA	M	
	280	NA	142	234		59	NA	M	

Sample-no: 9 *t-test:* 3.741901 *Mean:* 0.110163992 *DoF:* 8 *Variance:* 0.007800767 *t-signif:* 2.306@0.05

	Tag no.	Days at liberty	Release fork length (mm)	Recapture fork length (mm) of tagged fish	Predicted fork length(mm) based on Potter *et al.,* 1996	Release weight (gm)	Recapture weight (gm)	Sex	LN recapture FL/ predicted FL
Females	482	6	179	188	141.7	136	152	F	0.282582995
	20	8	170	170	142.2	124	129	F	0.178583209
	529	16	182	182	144.1	125	134	F	0.233530321
	434	60	150	163	154.3	73	87	F	0.054701688
	74	69	157	165	156.4	97	87	F	0.053711142
	266	192	159	172	182.9	93	114	F	-0.061701531
	588	266	172	205	197.7	148	255	F	0.036113159
	300	269	161	206	198.3	96	213	F	0.038044562
	104	270	191	236	198.5	162	324	F	0.173025396
	223	359	170	225	215.1	121	276	F	0.044923016
	171	375	173	226	218.0	141	299	F	0.036131624
	744	378	165	235	218.5	97	306	F	0.072740106
	479	415	150	210	225.0	90	232	F	-0.068916816
	560	415	185	235	225.0	150	307	F	0.043561167
	586	NA	152	200		90	205	F	
	587	NA	152	200		90	205	F	
	286	NA	180	253		142	NA	F	

Sample-No: 14 *t-test:* 2.931847 *Mean:* 0.07978786 *DoF:* 13 *Variance:* 0.010368574 *t-signif:* 2.160@0.05