

STOCKING THE BLACKWOOD RIVER ESTUARY WITH THE BLACK BREAM *ACANTHOPAGRUS BUTCHERI*.

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During recent decades, commercially and recreationally-targeted fish species have been subjected to levels of exploitation that have the potential to threaten the sustainability of their fisheries. This problem in estuaries has sometimes been exacerbated by the detrimental effects of adverse anthropogenic changes. Species whose entire life cycle is restricted to estuaries, such as the recreationally and commercially-important black bream *Acanthopagrus butcheri* in Western Australia, are especially vulnerable as their numbers are unlikely to be enhanced by recruitment from outside the estuary.

The sole commercial fisher and regular recreational fishers in the Blackwood River Estuary consider that the abundance of black bream in this system has declined. This view is supported by the fact that the numbers of black bream we obtained through extensive sampling in this estuary were far lower than those caught during a detailed study of the fish fauna of this estuary in the 1970s. In response, a carefully-designed research program was initiated to determine whether it would be feasible and economically worthwhile to stock black bream in this estuary.

Our initial sampling showed that black bream is largely found in the riverine component of the Blackwood River Estuary and particularly in its upper reaches. The abundance in those upper reaches is greatest in spring. As spawning occurs in this season, and the samples from these upper reaches contained many maturing, mature, and spent black bream, it is concluded that *A. butcheri* migrates some distance upstream and spawns mainly in those upstream waters of the estuary.

For our stocking research, 56 females and 50 males were collected from the Blackwood River Estuary as brood stock. The otoliths of the cultured juveniles were tagged by immersion in a solution of alizarin complexone (ALC). The resultant pink stain on the otoliths was still clearly visible more than three and a half years after tagging. The cultured individuals were certified as disease free before release into the riverine section of the Blackwood River Estuary in which black bream had previously been identified as being most abundant. Seventy thousand (2001 year-class) and 150,000 (2002 year-class) fish were introduced at several sites in 2002 and 2003 respectively at about 6 months age.

The maximum total length and age of native black bream caught during our study was 440 mm and 31 years. The latter age is the maximum yet recorded for any estuary in Western Australia. Analysis of our length and age data demonstrated that, on average, the individuals of the native population of black bream reach total lengths of 143, 200, 244, and 279 mm at the end of their first, second, third, and fourth years of life, respectively. The lengths of the stocked fish at ages 1 to 4 were 119, 182, 219 and 242 mm, respectively, which were less than those for native fish of those ages (Figure 1). Comparisons of mean lengths at successive age intervals confirm that native black bream grow more rapidly than stocked black bream. However, the growth of black bream stocked in the Blackwood River Estuary is

still substantial, as is illustrated by the fact that it is greater than that of native stocks of this species in some other Western Australian estuaries.

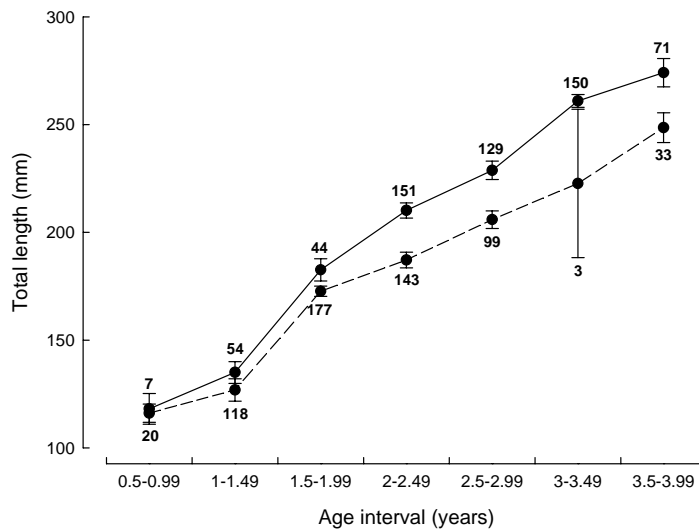


Figure 1: Mean lengths $\pm 95\%$ confidence intervals of native (solid line) and stocked (dashed line) black bream *Acanthopagrus butcheri* from the Blackwood River Estuary. Numbers = sample size.

The average length at first maturity of female and male native black bream was 178 and 155 mm, respectively. After adjustment for the number of the larger stocked black bream that had not matured, the average length of the females and males of stocked black bream at first maturity were 202 and 189 mm, respectively. Thus, stocked black bream are larger at maturity than native black bream. The majority of females (84%) and males (94%) of native black bream attain maturity by the end of their second year, whereas only 75% and 54% of the females and males of stocked black bream have reached maturity by the end of their third year. Some stocked fish will require further years to reach maturity and some may never mature.

The stocked black bream that were cultured and released in 2001 and 2002, survived well and comprised 75 and 92% of all black bream that we caught of the 2001 and 2002 year classes, respectively. The cost of broodstock capture and maintenance, juvenile production and release of the juveniles was estimated at AU\$2.12 per recruit to the fishery.

In summary, this study showed that the abundance of black bream in the Blackwood River Estuary was markedly enhanced through the introduction of cultured fish. The ease and relatively low cost of culturing black bream, the hardiness of this species, and its restriction to its natal estuary make the stocking of black bream an economically viable and valid proposition when a stock of this species has become highly depleted. Thus, such stocking provides a further tool for fisheries managers for sustaining the stocks of black bream in Australian estuaries.