GROWTH RATES OF YABBY STRAINS

C. S. Lawrence[1,2], I. H. Williams[2], P. E. Vercoe[2] and N. M. Morrissy[1]

[1]Fisheries WA, Research Division, North Beach, WA 6020
[2]Animal Science Group, Faculty of Agriculture, The University of Western Australia, Nedlands, WA 6907

SUMMARY

Yabby populations collected from 12 geographically isolated locations, representing different strains and species of *Cherax,* were bred and reared under homogenous conditions. There was a significant difference in the growth rates of cohort groups representing yabby strains from different localities ($P<0.001$). The fastest growing strain (0.056 ± 0.024 g/day), grew over 9 times faster than the slowest growing strain (0.006 ± 0.001 g/day). The range of growth rates recorded in this study indicates potential for selecting a faster growing strain of yabby for aquaculture.

Keywords: Crayfish, strains, growth, *Cherax*

INTRODUCTION

There is a paucity of information about the growth rates of different yabby strains. This is mainly because farmers have traditionally grown yabbies that have been serendipitously translocated to farm dams or they have stocked new farms with essentially wild populations of yabbies. Consequently, these yabbies are used without any evaluation of growth rates or other production characteristics and the producers may be using strains with poor growth rates.

Species and strains of crayfish that have been isolated geographically have been shown to have different growth rates (Jones and Ruscoe 1996; Henryon 1996). For example, the growth rates of both redclaw (*Cherax quadricarinatus*) and marron (*Cherax tenuimanus*) vary among different river systems in Australia (Jones and Ruscoe 1996; Henryon 1996). Yabbies represent a number of species and geographically isolated populations, from a wide range of ecotypes, many of which have been separated since the Tertiary period (Sokol 1988). Therefore, it is probable that variation in growth rate also exists among yabby populations.

There are 7 morphologically different species of yabbies, but previous studies comparing the growth rate of yabbies have focused upon only 2; *Cherax destructor* and *Cherax albidus*. Geddes *et al.* (1988) showed there was very little variation in growth rates between populations of *C. destructor* isolated from three geographically discrete populations. In contrast, Austin *et al* (1997) showed a significant difference in growth rates between 2 populations of *C. destructor* and *C. albidus*, with both the "destructor" populations growing faster than the "albidus" population.

The objective of this experiment was to perform a comparison of the growth rates of yabbies from geographically isolated populations around Australia, representing the 7 morphologically different species *C. albidus, C. destructor, C. dispar, C. esculus, C. davisi, C. cuspidatus and C. rotundus* originally described by Reik (1969).

METHODS

The yabby strains were collected by hand, trapping, scoop-nets and seine net during a 6 week expedition in September - October 1995.

The expedition obtained 14 different populations of yabbies representing the morphotypes of *C. destructor*, *C. albidus*, *C. dispar*, *C. rotundus*, *C. esculus*, *C. davisi* and *C. cuspidatus* described by Reik (1969) and one as yet undescribed yabby (Barmah sp. nov.) thought to be a new species of *Cherax*, (the taxonomic status of these animals is still under review C.M. Austin pers. comm.). The 14 populations were treated as separate strains.

Immediately after collection, yabbies from each site were packed into polystyrene boxes and transported alive back to a laboratory in Perth which conformed to strict state quarantine protocols. The laboratory contained 104 individual aquaria each 120L capacity and 5 sets each of 10 battery tanks for breeding trials. Each aquarium had a recirculating biological filtration system. Yabbies were fed daily to satiation on the Crayfish Reference Diet (Morrissy 1991) and earthworms.

Breeding populations of the strains were established in December 1995. Berried females were removed from population tanks and placed into separate aquariums. Therefore each cohort was the result of a single pair mating between a dam and an unknown sire. Cohorts of juveniles from each spawning of the different strains were reared in separate aquaria. Growth rates of cohorts reared under identical conditions were recorded between 1995 and 1998. The Clayton (*C. destructor*) strain produced only 2 cohorts and the, as yet undescribed, Barmah sp. nov. strain produced only 1 cohort. Therefore, the growth rates of these 2 strains were not included in the analysis of growth rates.

RESULTS AND DISCUSSION

The growth rates of yabbies collected from different geographical regions in Australia were significantly different ($P<0.001$). The strain Karuah (*C. rotundus*) had the highest growth rate (0.056 ± 0.024 g/day), which was over 9 times higher than the strain with the lowest growth rate, Oxley creek (*C. dispar*) (0.006 ± 0.001 g/day) (Table 1).

Table 1. Number of cohorts, growth rate and size range over which growth was recorded for each yabby strain

Strain	No of cohorts	Mean growth rate (g/day)*	s.e.	Size range (g)	
				min	max
Oxley Creek	6	0.006 [a]	0.001	0.26	29.42
Lake Hiawatha	9	0.008 [a]	0.002	0.10	17.63
Merwyn Swamp	7	0.015 [b]	0.003	0.19	88.21
Nurrabiel	7	0.015 [b]	0.002	0.10	30.98
WA	6	0.018 [b, c]	0.003	1.09	34.86
Barrack Creek	6	0.019 [b, c]	0.003	0.18	69.23
Peel River	3	0.030 [c, d]	0.003	0.13	82.74
Snowy Mountains	4	0.030 [c, d]	0.009	1.00	60.64
Barmah	8	0.030 [c, d]	0.004	0.10	40.09
Dalhousie	7	0.031 [c, d]	0.005	0.14	45.42
Algebuckina	4	0.047 [d]	0.011	0.27	79.15
Karuah	4	0.056 [c, d]	0.024	1.00	29.11

* Means sharing a similar letter are not significantly different ($P>0.05$)

The growth rates of strains conformed closely with the geographic distribution of allopatric populations of yabbies and in general followed the morphological taxonomy of this group (Reik 1969; Sokol 1988; Campbell *et al* 1994; Austin 1996) (Figure 1). These results support the conclusions of Austin (1996) that the 7 species originally described by Reik (1969) actually represent 5 morphologically variable species.

The growth rates recorded for yabbies in this study can be divided into the following 4 morphologically similar groups: i) The Dispar group in northern Australia, east of the dividing range; ii) The Rotundus group in central Australia, east of the dividing range; iii) The Albidus group in southern Australia, west of the dividing range; and iv) The Destructor group in northern and central Australia, west of the dividing range (Figure 1). There was a significant difference in the average growth of yabbies from the Dispar, Albidus, Destructor and Rotundus groups ($P<0.01$).

Strains with the lowest growth rates belong to the Dispar group, whilst the strains with the highest growth rates belong to the Rotundus and Destructor groups. The Destructor group showed the greatest variation in growth rates, particularly between geographically isolated catchments. Within the Destructor group growth of the 4 strains from the Murray-Darling catchment was slower than the Algebuckina strain from the Lake Eyre catchment (Figure 1)

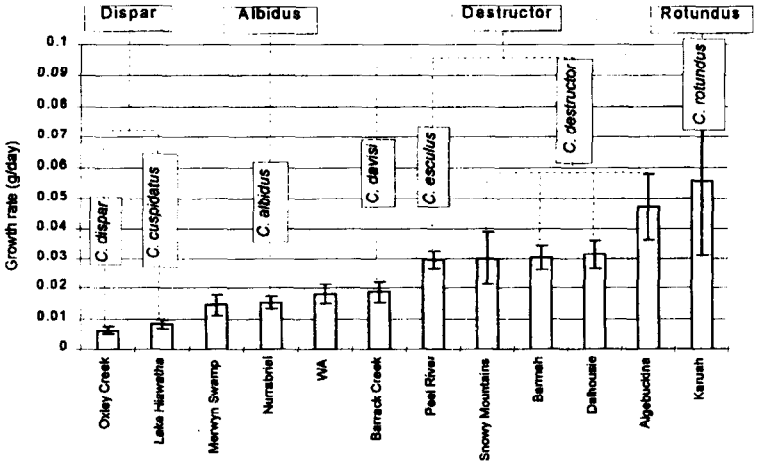

Figure 1. Growth rate (g/day) and morphological taxonomic relationships of cohorts from 12 strains of yabbies.

Morrissy and Cassells (1992) hypothesised that yabbies in Western Australia were translocated from Merwyn Swamp, Victoria. This small founding population of 10 animals formed the basis of the highly successful yabby industry in Western Australia. The low initial number of animals has however led to claims that the yabbies in Western Australia are stunted due to inbreeding. In our experiment, there was no significant difference in the growth rate of Albidus populations (*C. albidus*) from Merwyn swamp, Nurrabiel and Western Australia (P= 0.67). This supports the hypothesis of Morrissy and Cassells (1992) and contradicts the claims that stunting of yabbies in farm dams is due to inbreeding

It is apparent from our results that there is great scope for breeding for higher growth rates in yabbies. It will now be important to estimate heritability of growth rate, and other growth characteristics in yabbies to enable the development of breeding and selection programs.

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