

# **Development of a Barramundi Selective Breeding Entity II**

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**For distribution to ABFA participants only**



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# Non-Technical Summary

## 2009/730 Development of a barramundi selective breeding entity II

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### PROJECT OBJECTIVES:

- To develop a funded business entity that will run the Barramundi breeding program (BBP)
- To characterise broodstock available to the BBP and identify foundation stock
- To run a pilot scale trial of synchronized spawning to check/demonstrate feasibility of its use with the BBP
- To seek notional approval from Government agencies for the translocation of animals needed to establish the BBP and to supply farms

The first project objective was not achieved, but variation requests were approved which affectively added a final objective which was:

- To evaluate relevant data that should be collected by hatcheries and farms and to develop and establish a database that can be used to implement barramundi selective breeding

### OUTCOMES ACHIEVED

*Here we summarise the outcomes achieved by the project against each of the project objectives.*

#### **1 To develop a funded business entity that will run the BBP**

Company structure defined, company (Barratek) registered and genetic business plan and lobbying document developed. The Barratek Board has met three times formally and a large number of times informally to progress the business model, including assessing options for funding. The model as proposed has been supported by industry and in principle by potential funders. Funding has been sought from a number of sources but at this stage no funding has been committed, but activity is ongoing beyond the completion of this CRC project. Globally tight economic times coinciding with reduced government expenditure has meant that funding via government sources at this stage appears unlikely. We are unsure when expenditure focussed on projects such as Barratek will increase. A range of other options are still being investigated.

#### **2 To characterise broodstock available to the BBP and identify foundation stock**

Samples have been collected from all farms and hatcheries who have indicated an interest in contributing broodstock. The PhD student (Shannon Loughnan) has re-extracted DNA from the wild population collection at James Cook University for the background genetic study of wild populations, and has completed the genotyping and analysis of these samples. All samples from potential broodstock in farms and hatcheries have been genotyped and analysed. Kinship relationships within and between hatchery populations have been determined. Wild genetic diversity has been found to be well represented in the existing captive broodstock population, and

the best sources of supplementary wild fish for initiating the selective breeding program have been determined (based on genetic diversity and stock structure).

**3 To run a pilot scale trial of synchronized spawning to check/demonstrate feasibility of its use with the BBP**

The spawning trial was completed (batches of fish were followed through the grading process until they reached 80mm). In the spawning tank were 11 females, 20 males and 2 animals of unknown sex (not canulated and not treated with hormones). Results from the parentage analysis show that on the first night 11 out of 12 females and 19 out of 21 males contributed to the spawning. On the second night 8 out of 12 females contributed and 21 out of 21 males contributed to the spawn. Overall, only one female (treated with hormones) did not contribute at all over the two consecutive nights, while all males contributed. This is a very positive result, and if the same result was replicated across 7-8 tanks when the breeding program starts, sufficient numbers of families would be produced contemporaneously by the breeding program for avoiding inbreeding depression of fitness and generating genetic improvement. Some small males were present that were only conditioned for around 2 weeks, and these males were found to contribute to the spawn (although the contribution was low, 1-2% for these newer fish, but enough for the breeding program). Of the two animals of unknown sex, both contributed to the spawn, one as a female (not treated with hormones) and one as a male.

**4 To seek notional approval from Government agencies for the translocation of animals needed to establish the BBP and to supply farms**

Notional approval has been received for the translocation of Barramundi across state/territory boundaries as a product of future selective breeding program activities from the Aquaculture Council, which consists of state and Territory representatives from around Australia.

**5 To evaluate relevant data that should be collected by hatcheries and farms and to develop and establish a database that can be used to implement barramundi selective breeding**

Traits and other factors that need recording were determined in consultation with farms and hatcheries. A database was devised and implemented and is now being used by the main barramundi hatcheries. Fact sheets advising farmers on the collection of data and use of the database have been produced and circulated among relevant hatcheries and farms.

**In summary,** we have made significant progress towards the establishment of the selective breeding program for barramundi by:

1. Registering a company for selective breeding of barramundi (Barratek) and producing a genetic business plan and lobbying document.
2. Identifying and characterising potential broodstock which could be used to establish the selective breeding program.
3. Demonstrating that sufficient broodstock will contribute to the spawning performed at GFB to allow for strong genetic improvement in key traits while limiting inbreeding and loss of genetic variability. Limiting loss of genetic variability and inbreeding is necessary so that the adaptability, robustness and fitness of the fish to diverse and changing environmental conditions can be maintained.
4. Obtaining notional approval from Government agencies for the translocation of animals needed to establish the BBP and supply farms.

5. Mapping existing genetic variation and making recommendations about where to source stock to establish the base population for selective breeding
6. Devising and installing a database system and data collection processes that can be used to implement selective breeding

#### **LIST OF OUTPUTS PRODUCED**

- Business plan for Barratek
- Funding proposal/prospectus that aligns with the Barratek Business Plan
- Moreton Rye's report on commercialisation options
- PhD thesis
  - Loughnan S. (2013) Capturing and maintaining genetic diversity for the establishment of a long-term breeding program for barramundi (*Lates calcarifer*) aquaculture. PhD thesis, Flinders University.
- Article published in the journal *Aquaculture* on the trial spawning:
  - Loughnan S.R., Domingos J.A., Forrester J., Smith-Keune C., Jerry D.R., Beheregary L.B., Robinson N.A. (2013). Broodstock contribution after mass spawning and size grading to prevent cannibalism in barramundi (*Lates calcarifer*, Bloch). *Aquaculture* **404**, 139-149.
- Contribution to article published with lead authorship by James Cook University:
  - Domingos J.A., Smith-Keune C., Robinson N., Loughnan S., Harrison P. and Jerry D.R. (2013) Heritability of harvest growth traits and genotype-environment interactions in barramundi *Lates calcarifer* (Bloch). *Aquaculture* **402**, 66-75.
- Manuscripts in preparation entitled:
  - Assignment of captive barramundi broodstock to wild Australian stock sources guides captive base population recruitment for selective breeding
  - Genetic diversity and relatedness estimates for captive barramundi (*Lates calcarifer*) broodstock populations informs efforts to form a base population for selective breeding
  - Comparison of the use of different source stock for establishing base populations for selective breeding of barramundi (*Lates calcarifer*).
- Database for implementing barramundi selective breeding
- Spreadsheets to assist the collection of data by farms
- Final report for project

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