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# Black tiger breeding program yields record shrimp harvests in Australia

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## High-throughput genotyping tracks pedigrees, monitors diversity and assists with assignments to mating groups

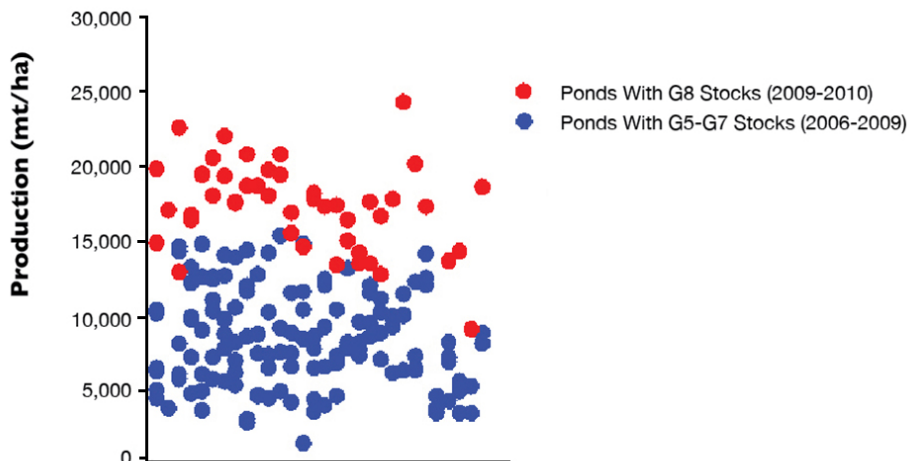


Fig. 1: Farmed pond yields of domesticated, selectively bred shrimp at Gold Coast Marine Aquaculture. During the 2006-2009 seasons, the farm was stocked with a mixture of domesticated stocks and wild stocks.

Australia is one of the few shrimp-farming countries that will not introduce exotic shrimp species, including *L. vannamei*. Most Australian farmers produce black tiger shrimp (*Penaeus monodon*), although one farm has successfully produced banana shrimp (*P. merguensis*) for several years. Traditionally, Australian farmers have relied on wild *P. monodon* broodstock, but over the past 10 years, substantial progress has been made in the domestication and selective breeding of Australian stocks of *P. monodon*.

## Working with industry

In collaboration with the Australian companies Pacific Reef Fisheries, Australian Prawn Farms and Gold Coast Marine Aquaculture, and with support from the Queensland government, Commonwealth Scientific and Industrial Research Organisation (CSIRO) scientists are currently focusing on the development and implementation of technology to enable cost-effective, on-farm domestication and selective breeding of *P. monodon*. This includes screening of domesticated broodstock for endemic and exotic viruses, and the cost-effective application of genetic markers for tracking pedigrees and mate allocation.

Many of the major shrimp-breeding programs in the world rely on rearing separate families, artificial insemination and physical tagging. These techniques are not practical or cost-effective for the smaller-scale, on-farm breeding programs in Australia. Instead, the research collaboration between CSIRO and Australian industry partners is based on the use of high-throughput genotyping to track pedigrees, monitor diversity and assist with the assignment of individual males and females to pooled mating groups.

## Increased performance

The three Australia companies have established on-farm founder stocks and are at different stages of development in their domestication and selective breeding of *P. monodon*. Gold Coast Marine Aquaculture (GCMA) has advanced the farthest to date.



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Over the past four years, there has been a progressive increase in the performance of the domesticated and selectively bred GCMA stocks. In the 2008-2009 production season, the selected GCMA stocks yielded an average of 12.8 metric tons (MT) per hectare (ha), which was 50 percent greater than the average yields from adjacent ponds stocked at the same time with the progeny of wild broodstock.

This production season, GCMA was the first Australian company to stock its entire farm with eighth-generation domesticated, selectively bred *P. monodon*. The performance of these stocks was outstanding, with an average yield for the whole farm of 17.5 metric MT/ha. Several ponds produced more than 20 mt/ha with a maximum in one pond of 24.2 MT/ha.

Comparison of the whole farm performance of these stocks with those of the previous three years, including ponds with domesticated stocks and ponds with wild stocks, demonstrates the enhanced performance of the eighth-generation stocks (Fig. 1).

## Perspectives

The progressive improvement of the GCMA stocks has provided strong incentive for the other Australian farms to continue to develop their own *P. monodon* domestication and selective breeding programs. In parallel with the improvement in growth rates and survival, viral screening has revealed that the stocks have low loads of endogenous viruses. Furthermore, the improvements in yields have been achieved without compromising the market quality of the stocks. These are all vital factors for the long-term growth and prosperity of the Australian *P. monodon*-farming industry.

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