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Land-based Mulloway (Argyrosomus japonicus) farming: a diversification opportunity for Northern NSW prawn farmers

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Land-based Mulloway (Argyrosomus japonicus) farming: A diversification opportunity for Northern NSW prawn farmers.

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Northern NSW prawn industry
Palmers Island Yamba

Tru Blue 100-130 t farm

Fortune & Pearler 200 t farm

Ausfarm 150 t farm
Industry downturn since 2003


Why diversify into marine fish?

1. Increasing competition from cheaper Asian prawns.
2. Biosecurity risk in single species (i.e. disease outbreak).
3. New markets, new opportunities, off season crop (Aust. domestic consumes 50,000 tons of white fleshed fish)

150 ton Palmers Island prawn farm (2002-2003 Income)

- Fresh
- IQF

In direct competition with imported IQF product

Made in China: fruit and veg worth $110m

Farmers claim lost markets and biosecurity risk

Fears as Chinese food pours in
What temperate marine fish to grow?

Sciaenids are considered good aquaculture species (euryhaline, highly fecund, fast growing with good food conversion ratios).

In NSW commercial quantities of Mulloway eggs and fry available year round.

Domestic market estimated at 2,000 t/year based on large fish (>1.5 kg) (consultant opinion).

Native, iconic in northern NSW, highly sought after recreational species

Also known in Australia as Jewfish, Japan as Suzuki and South Africa as the dusky Kob.
Originally Pearler prawn farm (purchased in May 2008)

12 ponds

Pond 7 dimensions
102m x 83m x 1.7m
0.85ha / 14.4ML

Processing shed and hatchery

Settlement pond

Clarence River
Production cycle
(2 years to market)

P1 - P4  Year 1
-15,000/pond x 4
-Oct-May (8 months)
-500-600g

P5 - P12  Year 2
-7,500/pond x 8
-June-Sept (16 months)
-1.8kg+
**Project Aims and Objectives**

**AIM:** provide existing prawn farmers in Northern NSW with a new farming opportunity.

**Objective 1:** To confirm, develop and assess the grow-out production technology for mulloway.

Can you grow Mulloway in prawn ponds?

**Objective 2:** To determine the profitability of farming mulloway

Can you make any money out of farming Mulloway?
Project themes and timeline

- T1. Juvenile rearing (NMSC)
- T2. Fish growth performance (PIM)
- T3. Development of husbandry techniques (PIM)
- T4. Quality control, processing & promotion (PIM/NMSC)
- T5. Economics and profitability (NMSC)

Timeline:
- FRP - Jan 08
- Funding - Sept 08
- 2008 to 2011

Themes:
- T1 Hatchery
- T2 Fish growth
- T3 Husbandry
- T4 QC, P & P
- T5 Economics

Sales start (60te)
Objective 1. Develop skills and expertise in local area. To date 40,000 fingerlings stocked in Yamba.

Objective 2. Optimise survival using a modified green-water technique. This translates into lower fingerling production costs.

Dr. Ken Cowden [kcowden@nmsc.edu.au]
### T1. Juvenile rearing trials 2008-2009

<table>
<thead>
<tr>
<th>Date</th>
<th>No. of days</th>
<th>Water temp.</th>
<th>Stocking rate</th>
<th>Survival</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept. to Nov. 2008</td>
<td>87</td>
<td>19-23°C</td>
<td>30 larvae/L 1000L tanks</td>
<td>T1 11.4%  T2 12.5%</td>
<td>Shock syndrome at 20 DAH (24% &amp; 34% losses)</td>
</tr>
<tr>
<td>July to Oct. 2009</td>
<td>72</td>
<td>19-23°C</td>
<td>23 larvae/L 35 larvae/L 1000L tanks</td>
<td>B1 43.5%    B2 42.6%</td>
<td>alleviated by EBS at 3 x the 2008 level</td>
</tr>
<tr>
<td>Aug to Sep. 2009</td>
<td>31</td>
<td>20-25°C</td>
<td>30 larvae/L 200L tanks</td>
<td>T1 14.9%  T2 42.4% T3 36.3%</td>
<td>EBS better than ER and ER+EBS</td>
</tr>
</tbody>
</table>
**T2. Average pond water temperatures**

[data is monthly average of twice daily readings]

**PIM POND 12**

- **Highest temp. was 31.6°C**
- **Lowest temp was 13.7°C**
- **Lowest DO was 2.8mg/L**
- **Lethal 1.7 mg/L**

Growing season

- >18°C but <30°C
- 7 to 8 months

Fitzgibbon et al. (2007)

Critical DO level 1.8mg/L
T2. Fish growth and FCR's

**Year 1: 2008-2009 (15,000 fish/pond)**

- Pond 1
- Pond 2
- Pond 3
- Pond 4

**Year 2: 2009-10 (7,500 fish/pond)**

- Pond 5
- Pond 6
- Pond 7
- Pond 9
- Pond 10
- Pond 12

**Year 1: 2008-2009 (Ponds 1-4)**

**Year 2: 2009-10 (Ponds 5-7,9,10,12)**
T2. Health and survival

Minor health issues
- Low level monogenean infection (*Diplectanum glandulosum?*)
- Bacterial infection after DO crash, however stock recovered
- Excess fat deposits

<table>
<thead>
<tr>
<th>Year 1 2008-2009 (15,000 fish/pond)</th>
</tr>
</thead>
<tbody>
<tr>
<td>POND 1</td>
</tr>
<tr>
<td>POND 2</td>
</tr>
<tr>
<td>POND 3</td>
</tr>
<tr>
<td>POND 4</td>
</tr>
</tbody>
</table>

Williams 1989
73. Harvesting techniques
(adapted from silver perch industry)

1. Seine fish

<table>
<thead>
<tr>
<th>Pond 1</th>
<th>Harvest Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seine 1 20/5/2009</td>
<td>5,900 (91%)</td>
</tr>
<tr>
<td>Seine 2 26/5/2009</td>
<td>400 (6%)</td>
</tr>
<tr>
<td>Seine 3 26/5/2009</td>
<td>200 (3%)</td>
</tr>
<tr>
<td>Seine 4 26/5/2009</td>
<td>8</td>
</tr>
</tbody>
</table>

2. Crowd fish

3. Sedate fish (AQUI-S)

4a. Transfer for on-growing

4b. Pond side slurry for market
### T4. Nutrition profile farmed versus wild (100g of raw product)

[data is fillet without skin and average of 3 farmed and wild specimens]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Farmed</th>
<th>Wild (line caught)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>574 kj</td>
<td>331 kj</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>74 mg</td>
<td>46 mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>25 mg</td>
<td>42 mg</td>
</tr>
<tr>
<td>Total fat (oil)</td>
<td>7.36 g</td>
<td>0.83 g</td>
</tr>
<tr>
<td>- Saturated fat</td>
<td>36.2% of tot. fat</td>
<td>48.5% of tot. fat</td>
</tr>
<tr>
<td>- Mono-unsat fat</td>
<td>37.2% of tot. fat</td>
<td>31.5% of tot. fat</td>
</tr>
<tr>
<td>- Poly-unsat fat</td>
<td>26.1% of tot. fat</td>
<td>20.0% of tot. fat</td>
</tr>
<tr>
<td>Omega-3, EPA</td>
<td>600 mg</td>
<td>&lt;100 mg</td>
</tr>
<tr>
<td>Omega-3, DHA</td>
<td>433 mg</td>
<td>100 mg</td>
</tr>
<tr>
<td>Omega-6, AA</td>
<td>&lt;100 mg</td>
<td>&lt;100 mg</td>
</tr>
</tbody>
</table>

Farmed fish have high levels of omega-3 fatty acids providing important health benefits.
T4. Processing yield (1.6kg)
[data is average of 14 farmed specimens 1.5-1.7kg]

Mulloway is a good species for processing
Northern Rivers farmed product is well received due to the regions clean growing environment.
1.4 Product evaluation

Roberto’s @ The Royal Oak Hotel
28 Bay Street, Double Bay
NSW 2028

Palmers Island Mulloway has appeared in Sydney’s top seafood restaurants including Pier, Quay and the Balmoral Bathers

Mulloway is very similar to Barramundi
1.4 Taste testing
(how similar to Barramundi?)

Researchers luring fish tasters

SEAFOOD lovers on the Coffs Coast are being asked to put their taste buds to the test at a ‘fish tasting’ of locally farmed mulloway.

Researcher Dr Jeffrey Guy said a joint research project is investigating the potential of pond grown mulloway (jewfish) as a suitable product for the seafood market.

“Our research has shown that in the last five years imports of cheaper and smaller prawns from South East Asia, particularly China, have increased dramatically, seriously impacting the northern NSW prawn industry,” Dr Guy said.

“As a result the industry is not as

through sensory evaluation. Attributes of visual appearance through smell, taste, texture, after-taste and overall liking of the product need to be determined,” he said.

Researchers are looking for around 80 volunteers (over 18 years of age) to take part in the fish tasting. Participants will be given a free guided tour of the National Marine Science Centre aquarium.

Drinks and canapes will also be provided as part of the fish tasting. The research project is a collaboration between the National Marine Science Centre and the Rural Industries Research and Development Corporation.

**Overall how much do you like or dislike the 3 fish samples?**
(10 responses randomly from 2 sittings = 20 of 72 people)
## T5. Price (chilled-whole 20kg boxes)

<table>
<thead>
<tr>
<th>Date</th>
<th>No. of boxes</th>
<th>Total wt. (kg)</th>
<th>Fish size (kg)</th>
<th>Min. price</th>
<th>Max. price</th>
<th>Average price (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/12/2009</td>
<td>18</td>
<td>307.94</td>
<td>1.23</td>
<td>$8.37</td>
<td>$8.99</td>
<td>$8.76</td>
</tr>
<tr>
<td>16/12/2009</td>
<td>19</td>
<td>325.2</td>
<td>1.22</td>
<td>$8.03</td>
<td>$8.85</td>
<td>$8.49</td>
</tr>
<tr>
<td>22/12/2009</td>
<td>18</td>
<td>319.5</td>
<td>1.32</td>
<td>$8.18</td>
<td>$9.71</td>
<td>$9.00</td>
</tr>
</tbody>
</table>

- Medium to Low market value

**Economic constraints**

**Cost and availability of seed**
Eggs $0.012
Fry (40mm) are worth over $1.00 (Govt. hatchery prices)

**Cost of feed**
Currently exceed $AUD 2,200/tonne (+GST & Freight)
Primarily due to the small scale of operation?

**Market price**
Low farm gate price ($9-9.30/kg)
**Summary**

**Production**
Technically feasible in prawn ponds (high survival, good growth rates, minimal disease) with production rates over 10 ton per hectare.

**Bloom management**
Bloom management key to successful production (TAN <1mg/L)

**Pond culture**
Easily caught and processed however has a strong taste

**Market**
Well received product although demand is for large fish (1.8kg+)
**Future work**

**Economic analysis** (due 2011)
- Cost-benefit and sensitivity analysis
- Optimum farm size (economies of scale)

**Species specific diet**
The current practice of feeding mulloway feeds formulated for barramundi or more generic “marine fish” formulations may not be ideal.

This is because some commercial feeds typically contain 21.4gDPMJ DE⁻¹

Diets formulated with excess energy may promote excessive lipid deposition

Piecewise regression analyses identified significant changes in DP:DE requirement at 111, 582 and 1120 g

Pirozzi et al. / Aquaculture 302 (2010) 235–242
Thank you

"When the winds of change blow, some people build walls and others build windmills."
Chinese Proverb

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