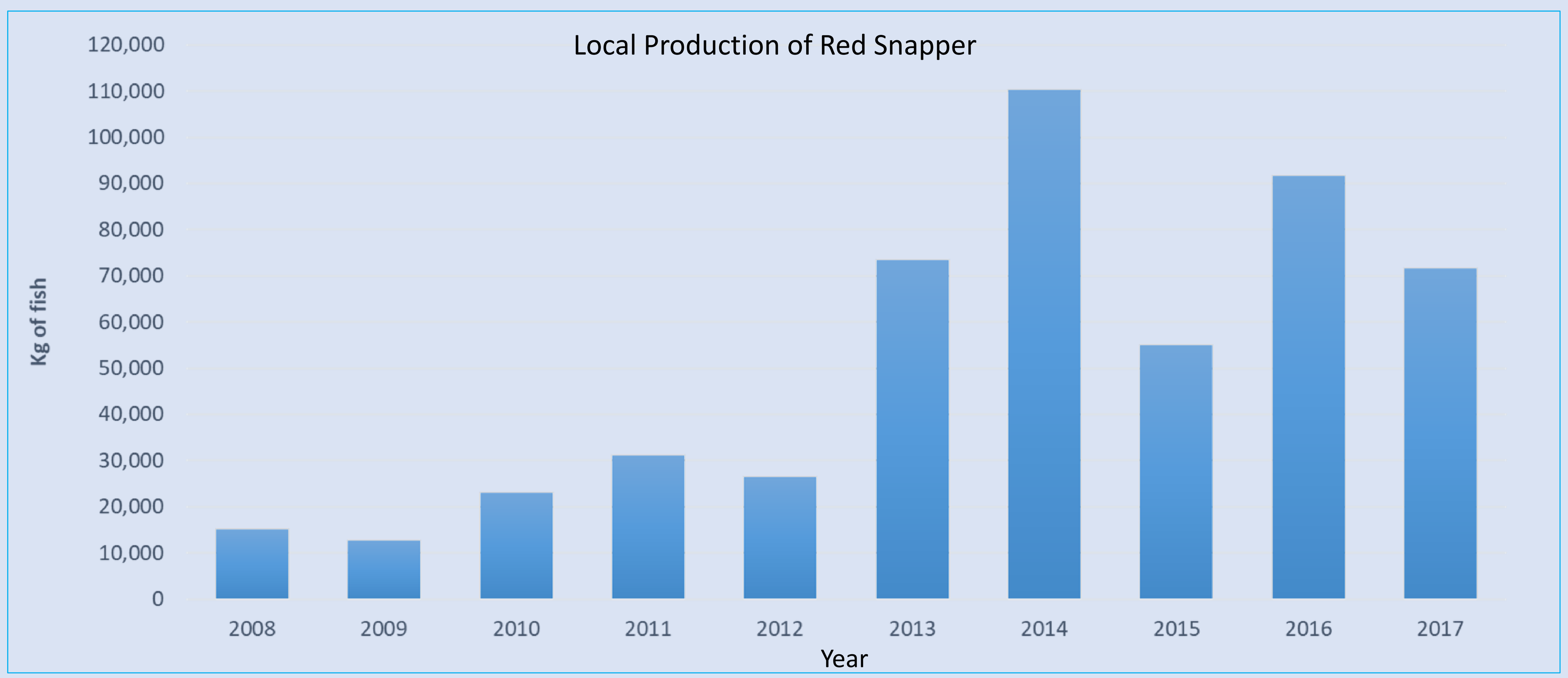
Development of Hatchery Technology for Red Snapper (*Lutjanus spp.*)

Aquaculture Department, Urban Food Solutions, SFA; in collaboration with James Cook University Singapore

Background

Red snapper is a popular marine foodfish which fingerlings are still extensively produced in outdoor ponds. Understanding the technical challenges faced by hatcheries in producing red snapper fingerlings using indoor tank systems would benefit the industry by enabling intensive production. MAC also collaborates with JCUS to understand snapper larval requirement with the aim of developing a large-scale indoor fry production protocol.



Red snapper production had increased over the years to about 80MT/year in the last 5 years. Approximately **320,000pcs** of snapper fingerlings are required annually to support local farms.

Conventional farming method

Pro & Cons of Outdoor Pond System:

- No control over water quality; subjected to externalities
- Large footprint
- Low operation cost and ease of maintenance
- Natural supply of live feeds

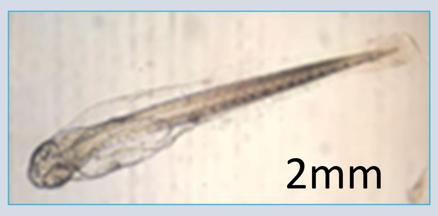
Indoor culture

Pro & Cons of Indoor / RAS:

- Control of water parameters
- Smaller footprint
- Intensive production compared to outdoor pond
- Need expertise in area of live feed production

Key Research Findings

Key Development Stages of Red Snapper Larva

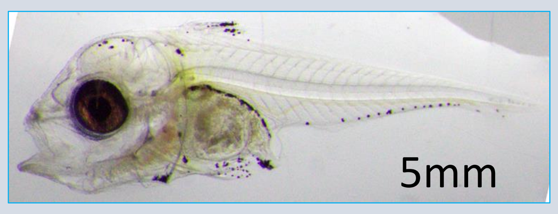


DPH 1:

- Eyes and gut not well-developed
- Mouth not opened

DPH 7:

- Swim bladder inflated
- Feeding on rotifers



DPH 15:

- Dorsal fin developing
- Feeding on Artemia nauplii
- Initial phase of "Shock-syndrome"

DPH 21:

- Weaning from live feeds to pelleted feeds
- Highly cannibalistic

DPH 35:

- Fully metamorphosed
- Red pigmentation

Protocol Development

A. Feeding and enrichment of live-feeds with DHA (fatty acids)

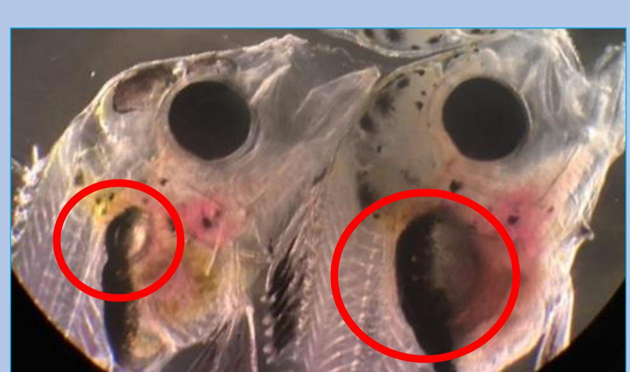
- More complex developmental stages (as compared to Seabass larva) → require higher level of essential fatty acids
- Small mouth gape → need smaller rotifers (>120µm, through sieving), critical for initial feeding on Day 2-5
- Need to feed frequently to minimise fish aggression and cannibalism

Enriched Artemia with filled gut

Larva gut filled with rotifers and Artemia

B. Overcoming shock-syndrome

- Larvae are extremely sensitive to lighting - sudden switching on/off of lights resulted in shock-syndrome and mass mortality (up to 50%)
- Larvae displaying shock-syndrome observed with overly-inflated swim bladders
- Increased water temperature (by 3ºC) and adjustment of photoperiod (24hr light) during the critical phase helped improve growth and reduced shock-syndrome



Comparison of swim bladder between normal larvae (left) and shocked larvae (right)

Quality Improvement

C. Observation of skeletal deformity

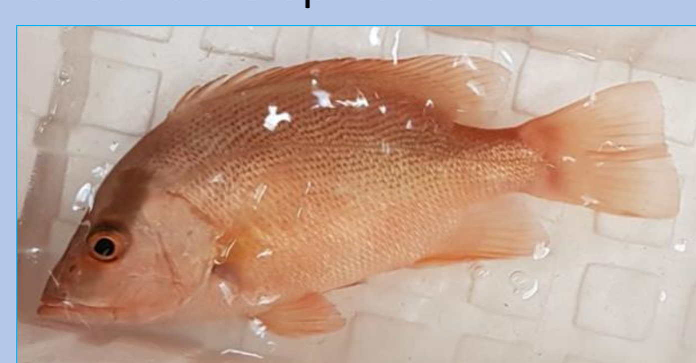
- Possibly related to swim bladder development during early stage
- Deformity observed in fish with abnormal swim bladder (20-30%)
- Need to overcome deformity issues by improving swim bladder inflation

Normal

Deformed (Spinal)

D. Development of pigmentation

- Colouration affects market value of harvested fish
- The fish's pigmentation is influenced by diet and formulated feeds with krill-meal or astaxanthin (an algae-derived carotenoid pigment) can enhance the red colouration
- Environmental factors influences pigmentation tone (light/dark) but not colour development



Generic fish feed

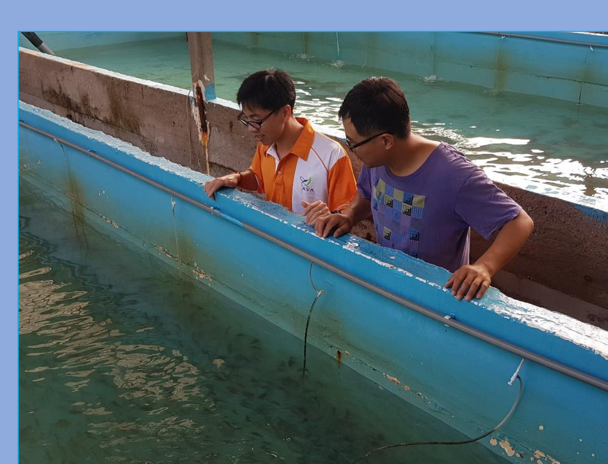
Fish feed with krill-meal

Achievements and Tech-transfer to Farms

- Significant improvements in survival rate (2-3% → 20%) achieved through overcoming shock-syndrome during early larval phase.
- Worked closely with commercial farms on field trials and transfer of technology.
- Will continue to improve hatchery protocol to achieve higher survival rates with less skeletal deformities by further improvements in culture environment and egg quality through brood stock management.

Larviculture trial with JCUS @ MAC

Indoor culture trial @ local hatchery



Observation of MAC bred fingerlings @ FVAT