

# Breeding of Aquaculture Species – Jade Perch (*Scortum barcoo*) as Case Example

*RECENT ADVANCES IN FINFISH & CRUSTACEAN AQUACULTURE*

*Friday 25 Oct 2019*

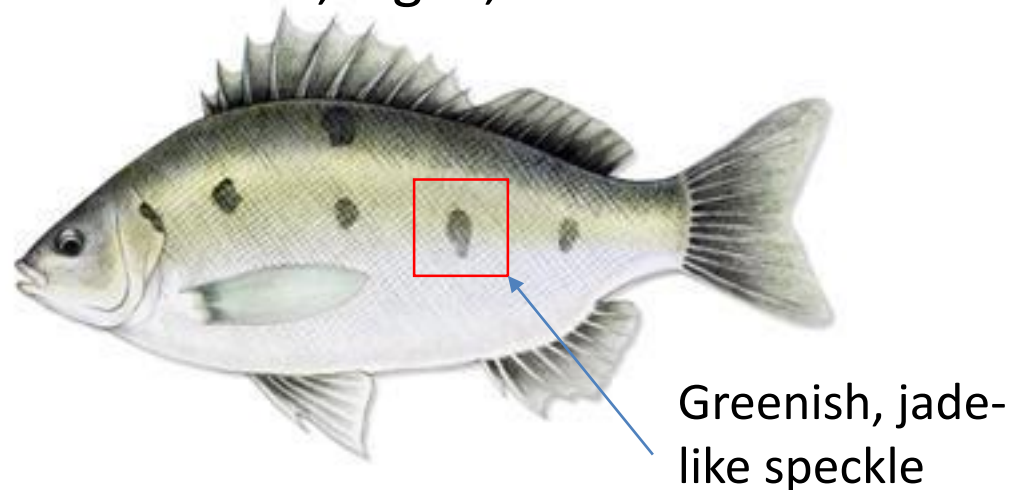
*Nanyang Polytechnic*

- 1. Background on jade perch**
- 2. Spawning of jade perch**
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# Background on jade perch

## Introduction

- Jade perch (aka Barcoo grunter) is a freshwater finfish species native to Australia
- Commonly farmed in Australia, Malaysia and China.
- It's hardy and a fast grower (reach market size in 7 months)
- Omnivorous: feed on zooplankton, small crustaceans, aquatic insects, algae, etc

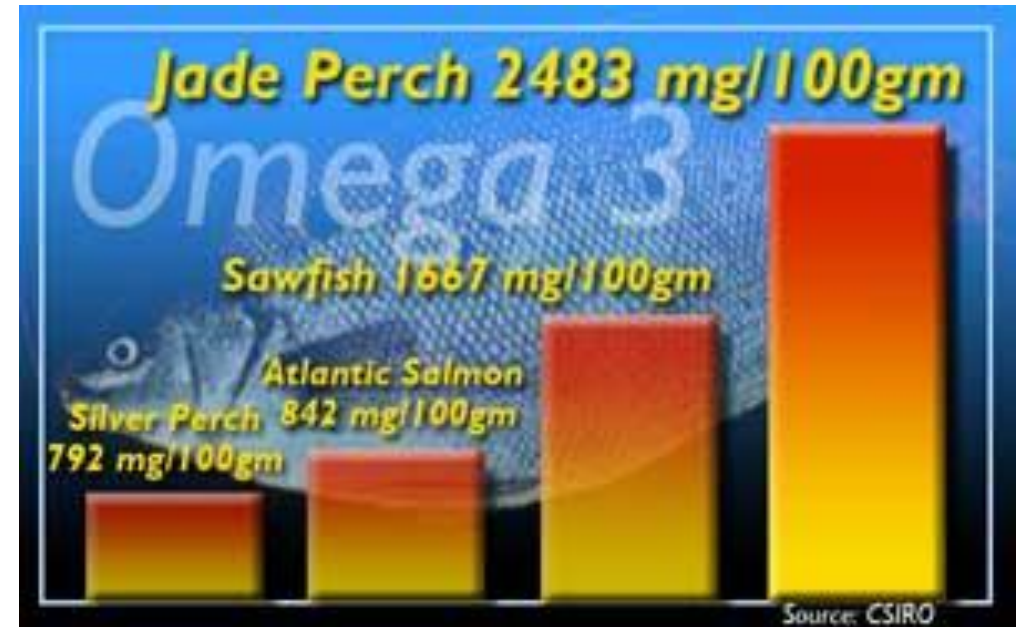


# Background on jade perch

## Advantages of jade perch

- High Omega-3
- High nutritional value
- Good taste
- High market value

Item	Weight (gm)	Percentage	Omega-3 per 100 gm
Whole fish	791.78	100%	-
Muscle-back	270.30	34.14%	5660 mg
Muscle-belly	112.92	14.26%	7069 mg
Fillet total	383.22	48.40%	6075 mg
Fat	96.60	12.20%	-



- Fillet from jade perch cultured at MAC was sent for Omega-3 testing.
- The average omega-3 content per 100 gm of fish fillet is 6075 mg.



# Spawning of jade perch

## Broodstock development

There are local farms expressing interest to spawn jade perch locally to reduce reliance on overseas fry supply.

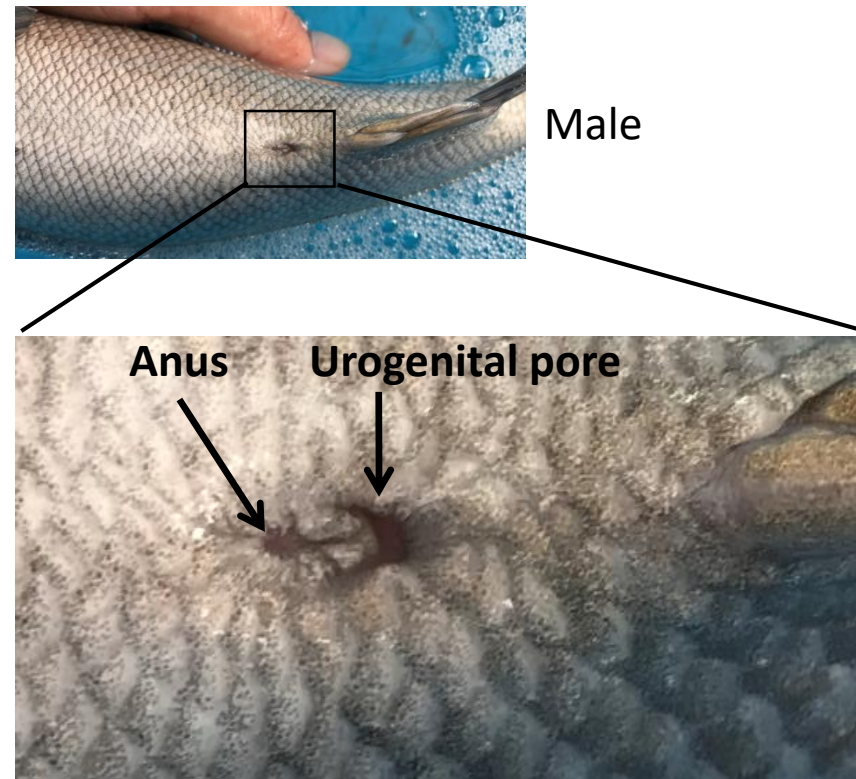
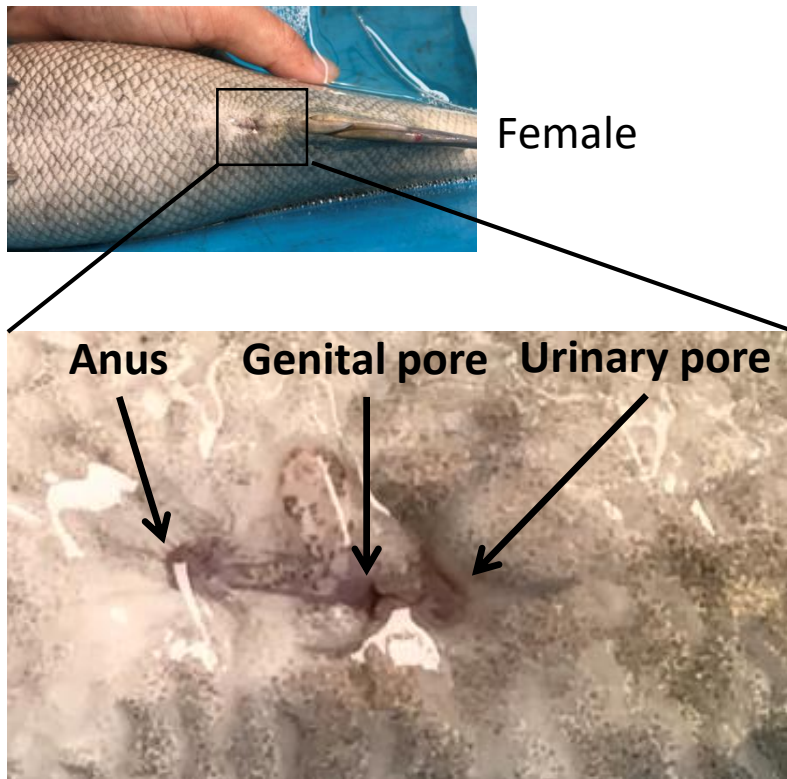
- Source of Fish: Australia (imported as fry)
- Age: 2 years old
- Stocking density: 2 – 5 kg/m<sup>3</sup>
- Feeding: Dry pellets supplemented with shrimp
- Broodstock were measured and tagged for individual identification.



# Spawning of jade perch

## Identification of females and males

### 1) Number of visible openings





# Spawning of jade perch

## Broodstock fish selection

### 2) Size

Avg weight of males = 0.9 kg

Avg weight of females = 1.2 kg



### 3) Sampling of eggs and milt:

Females egg size: ~850 um (uniform size)

Males: Flowing milt with gentle massage  
(sperm stops moving after 2 mins)



**Sex ratio of selected males to females is 1:1**

# Spawning of jade perch

## Hormonal Induction

### **Injection of Ovaprim (Salmon Gonadotropin Releasing Hormone Analog 20 µg/ml + Domperidone 10 mg/ml)**

- 0.5 ml per kg as per manufacturer instructions
- Used 1 ml sterile syringe and 25G size needle
- Intra-peritoneal injection instead of intra-muscular injection.
- Temperature: 27-29 °C

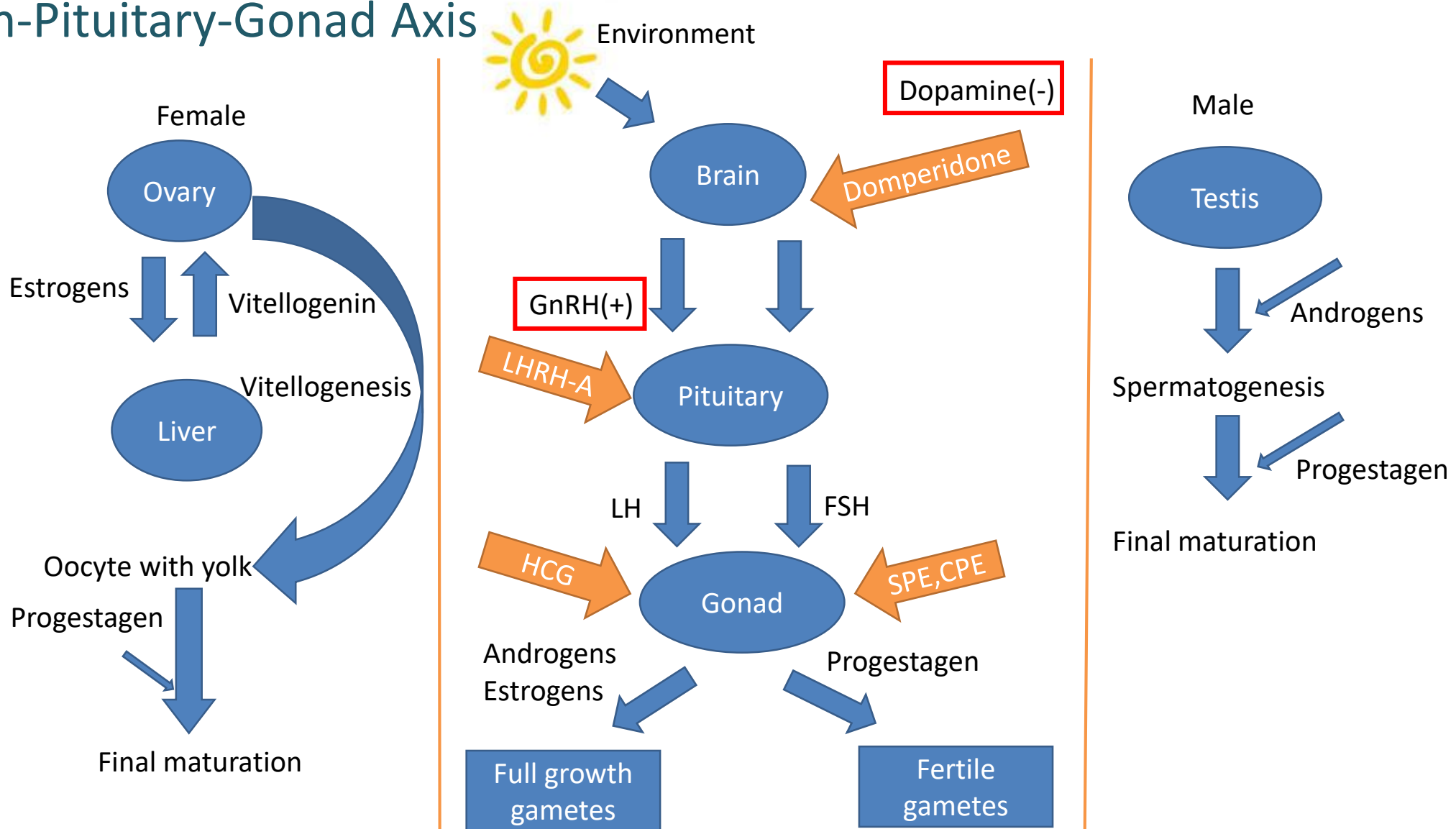


\*To allow Ovaprim to reach room temperature before injection to reduce viscosity



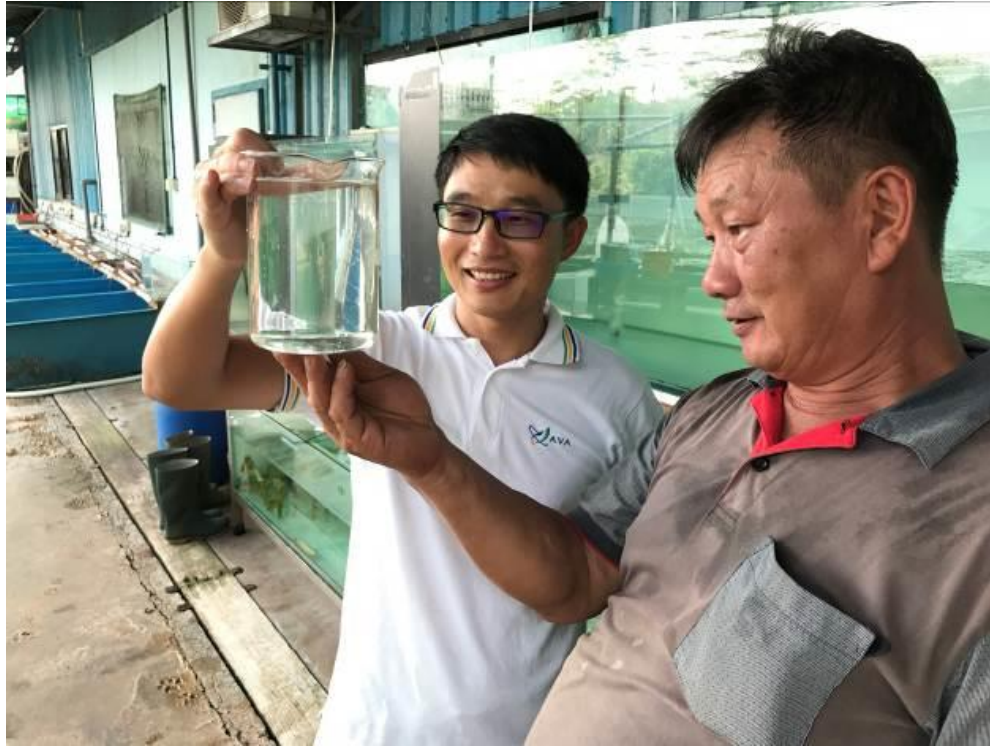
# Spawning of jade perch

## Brain-Pituitary-Gonad Axis



# Spawning of jade perch

## Spawning on the next day

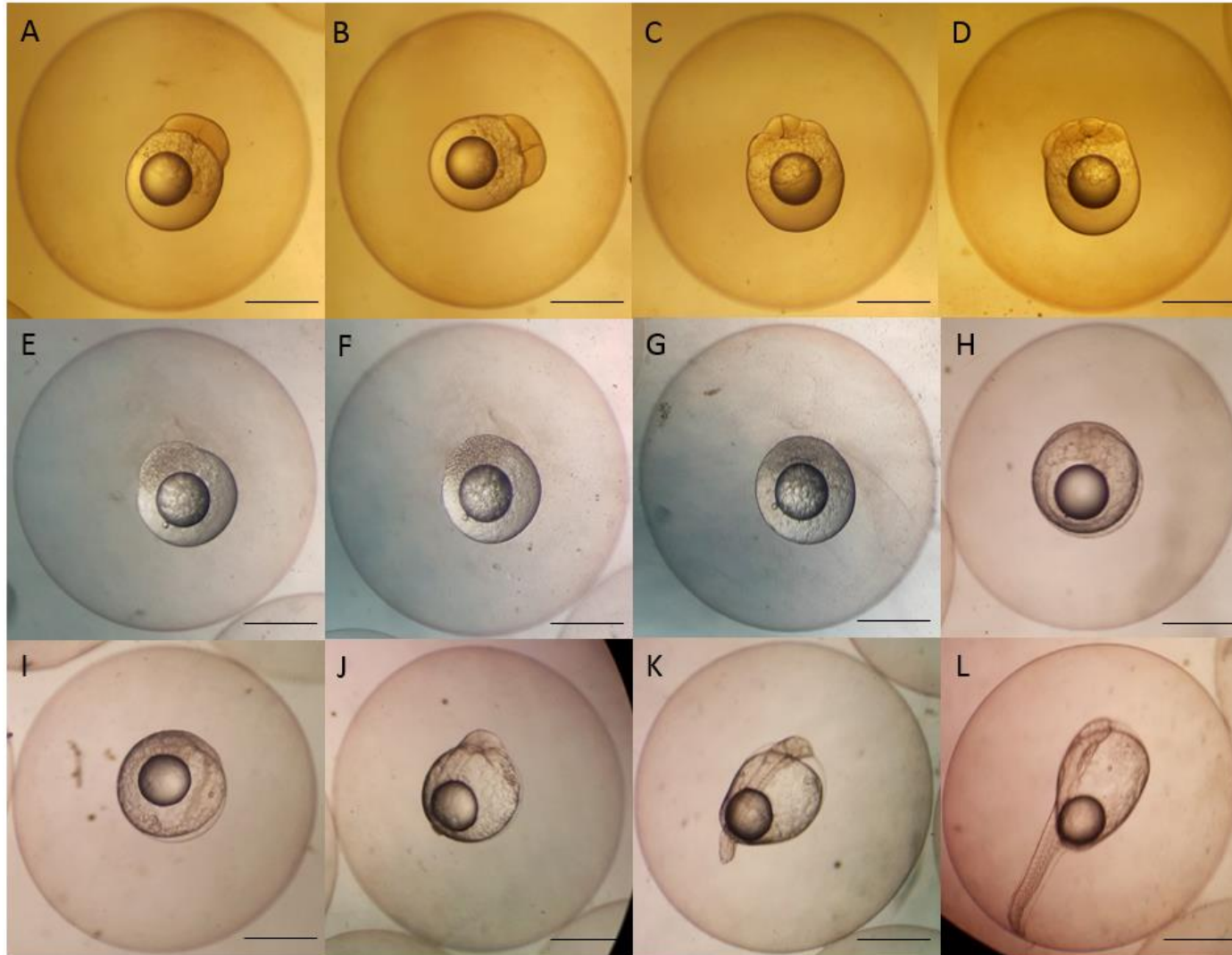


Stocking  
density:  
1,075 eggs/L

Water  
exchange rate:  
30% per hr

- Spawning occurred at 26-28 hours after injection.
- In total 430,000 fertilized eggs were collected and stocked into a 400 L fiber glass hatching tank after spawning.
- The eggs hatched at 16-18 hours post fertilization.
- In total 202,500 larvae hatched out (46% hatching rate)

## Different stages of embryonic and early larval development



Picture	Embryonic Period	Time After Fertilization
A to D	Cleavage	1.2 – 1.4 hr
E to F	Blastula	2.5 – 4.5 hr
G to H	Gastrula	4.5 – 7.0 hr
I	Neurula	7.0 – 8.5 hr
J to K	Organogenesis	8.5 – 12.5 hr
L	Hatching	14.5 hr

- The average size of eggs and larvae is 2mm.
- Larvae hatched out around 18 hpf.

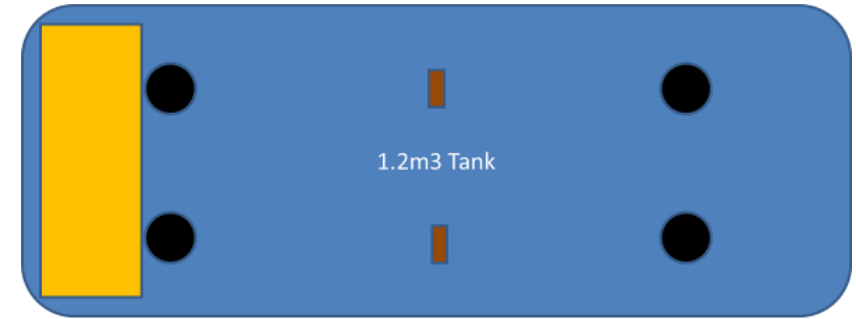


# Larviculture trial

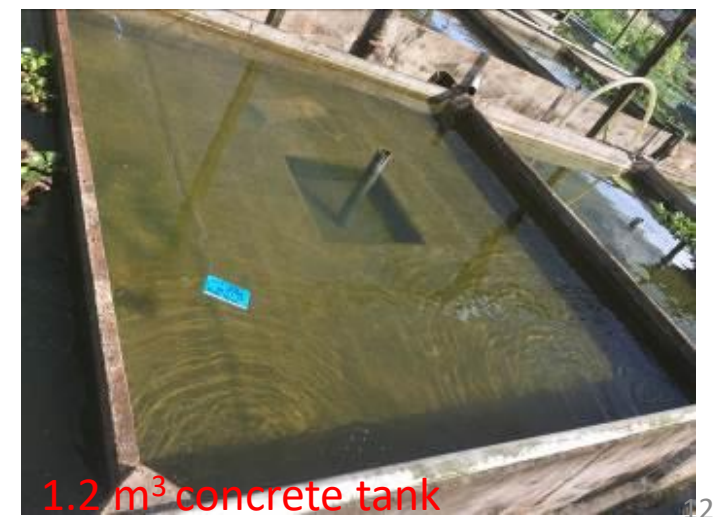
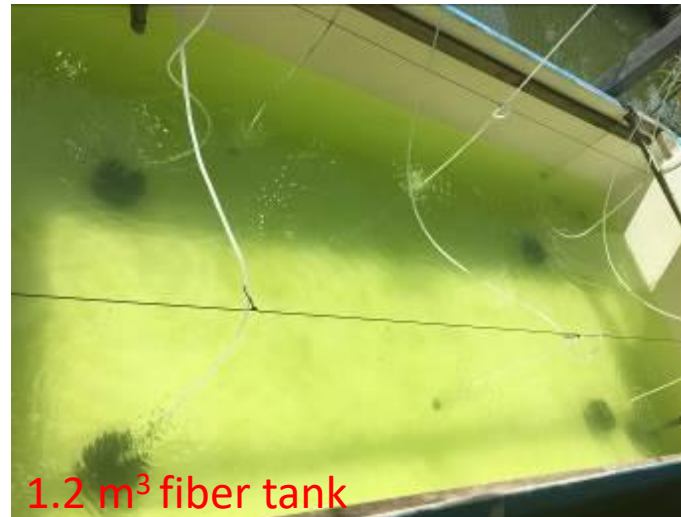
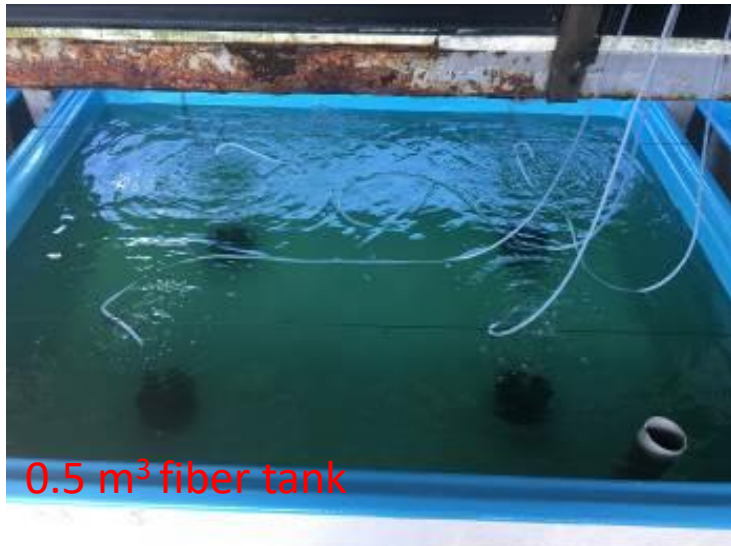
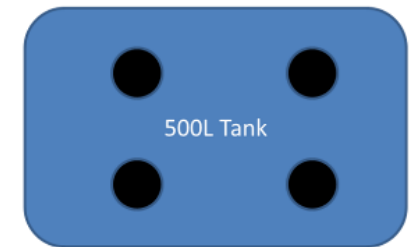
## Stocking

The larvae were stocked into 3 different types of larviculture tanks at the density of 15 pcs/L

Tank type	Indoor/Outdoor
0.5 m <sup>3</sup> fiber tank	Indoor
1.2 m <sup>3</sup> fiber tank	Indoor
1.2 m <sup>3</sup> concrete tank	Outdoor

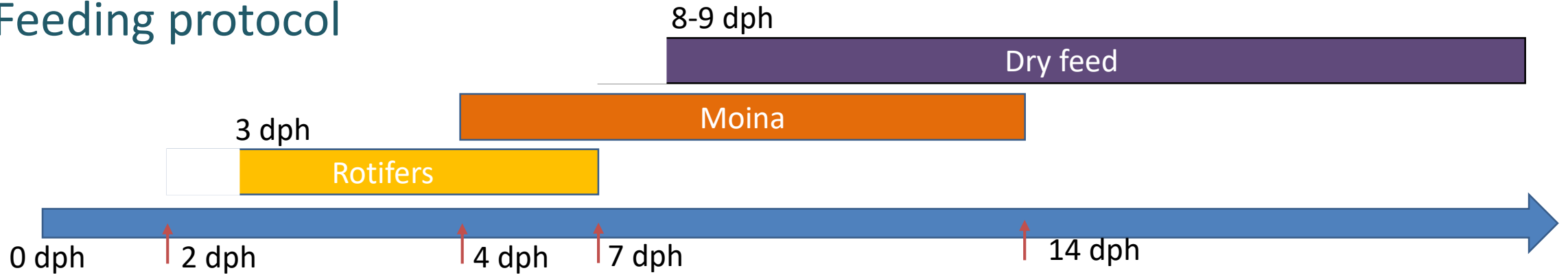


- -Sponge Air-lift Filter
- -Air Stone
- -DIY Filter Box



# Larviculture trial

## Feeding protocol



Harvesting rotifers from the ponds



Size comparison between 4 dph larvae and unfiltered Moina<sup>13</sup>



# Larviculture trial

## Grading and weaning

- In total 13,000 fry were weaned to dry feed at 15 dph.
- Grading was done to separate fish of different sizes.





# Larviculture trial

## Key observations:

- Feeding of rotifer and dry feed can start from 3 dph and 9 dph.
- Jade perch was highly cannibalistic from 7 dph.
- Tanks with longer exposure to direct sunlight and higher temperature have visually faster growth.
- Using bigger tanks for larviculture are recommended as the water parameters tend to be more stable.
- Although it's a fresh water species, the early stage of its larviculture is similar to marine fish species, which requires live feeds such as rotifer and Moina/Artemia
- Nutritional requirements of the larvae to be investigated

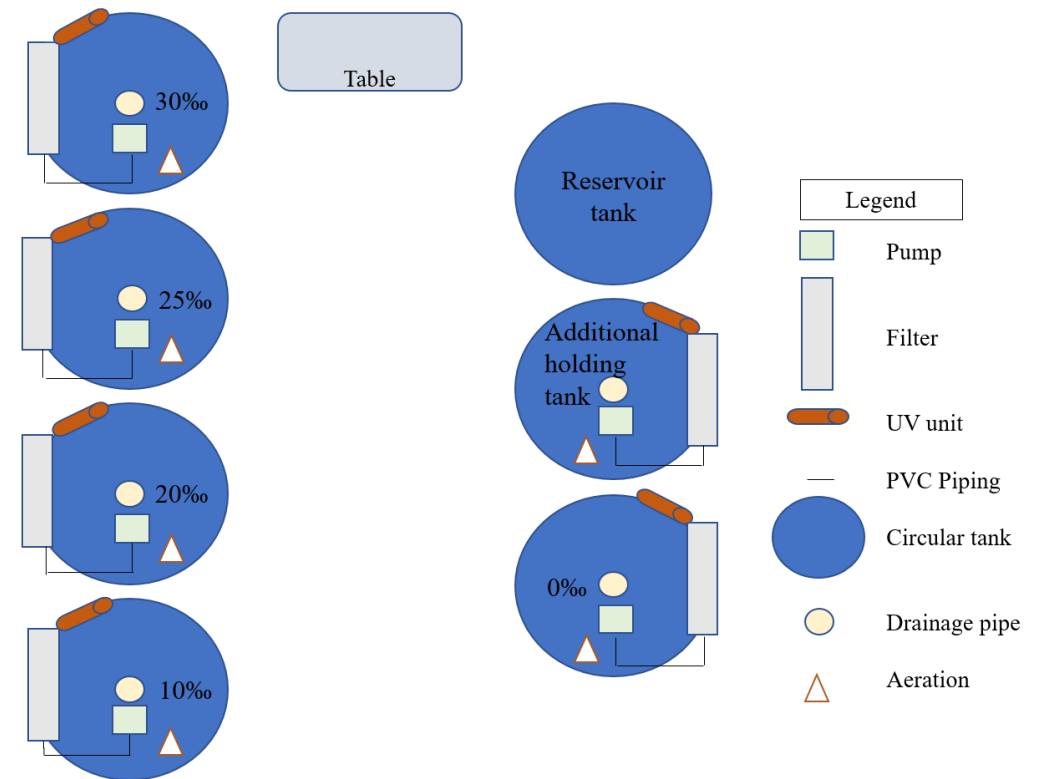


# Salinity tolerance trial

## Experiment setup

To investigate the effects of salinity on jade perch growth performance and survival rate

- 50 pcs of jade perch in a 2.5 ton tank
- 5 experimental tanks with different salinities



Quarantine (1 month) > Acclimatization (3 months) > Growth measurement (4 months)

# Salinity tolerance trial

## Results - Feeding Behaviour

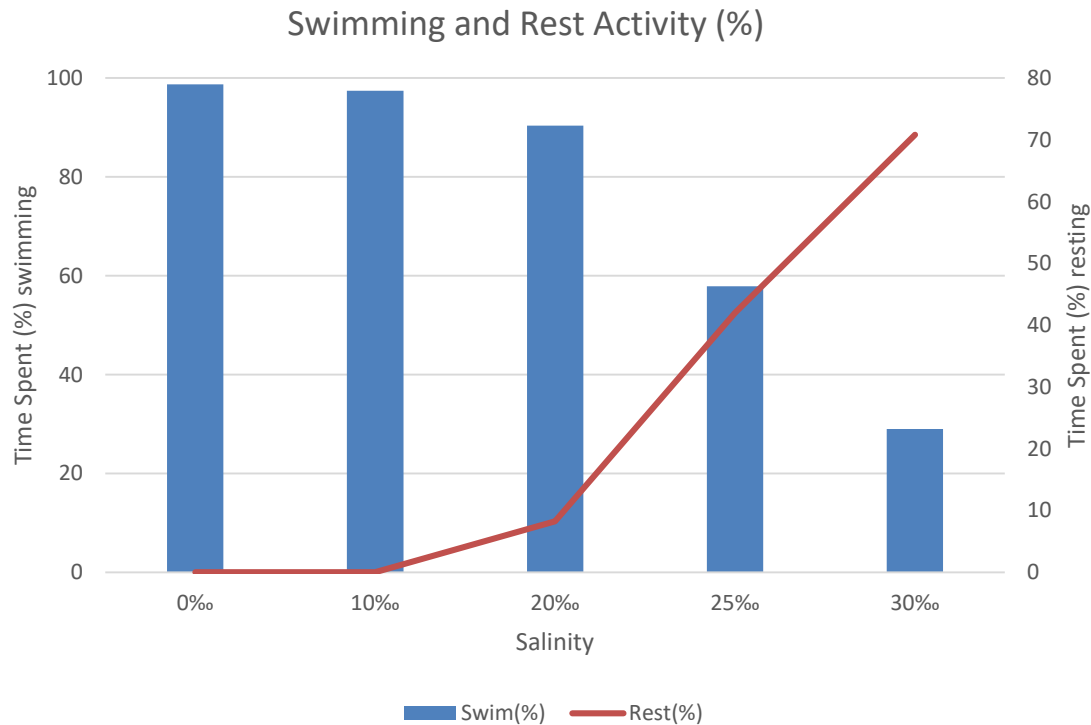
Salinity (ppt)	1 <sup>st</sup> month	2 <sup>nd</sup> month	3 <sup>rd</sup> month	4 <sup>th</sup> month
0	Normal	Normal	Normal	Normal
10	Normal	Normal	Normal	Depressed
20	Normal	Normal	Depressed	Depressed
25	Normal	Depressed	Depressed	Depressed
30	Depressed	Depressed	Depressed	Depressed

- Jade perch was fed twice daily based on 2% body weight using auto feeder and/or hand feeding.
- Depressed appetite was observed in all brackish and sea water groups.
- Uneaten feed was siphoned away and weighed for FCR measurements.



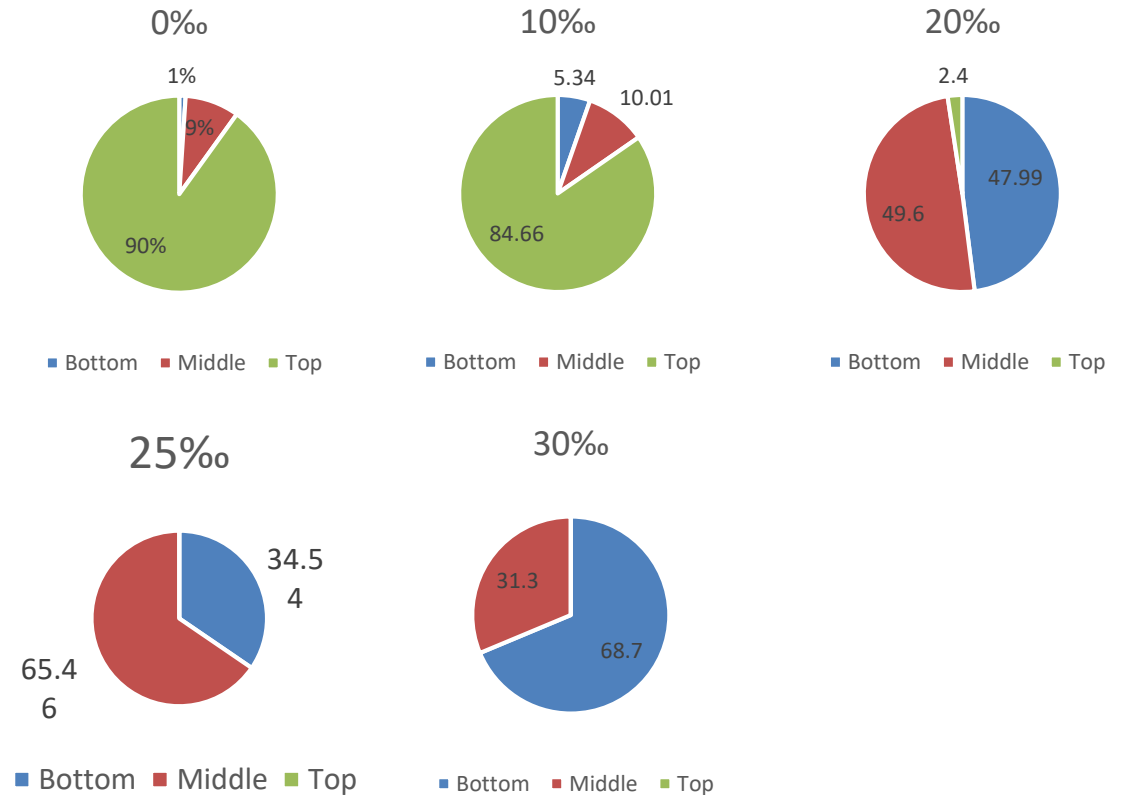
# Salinity tolerance trial

## Results - Swimming and Rest Activity



Time spent (%) on swimming and resting

## Water Column Preference



Time spent (%) on the different water column

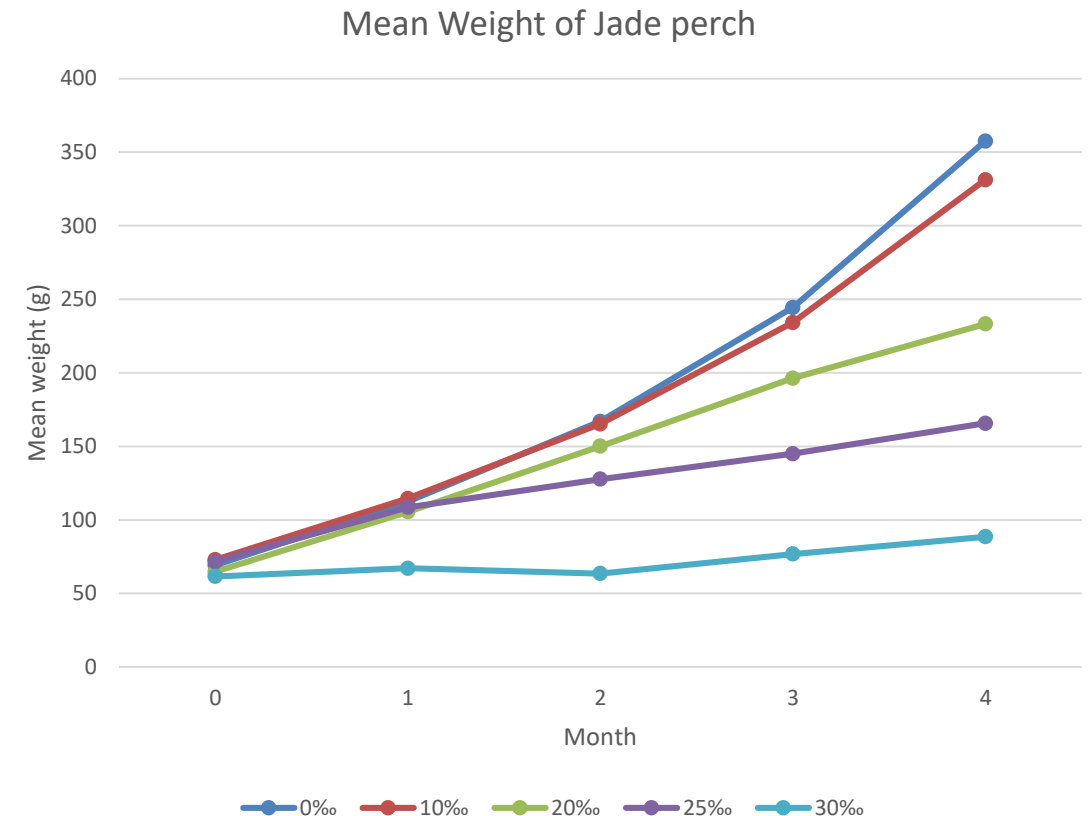
As the salinity increases, the fish swim less and prefer to stay more at the tank bottom.

# Salinity tolerance trial

## Results - Growth Performance

Mean weight(g) of control and 4-salinity treatment groups in the different months

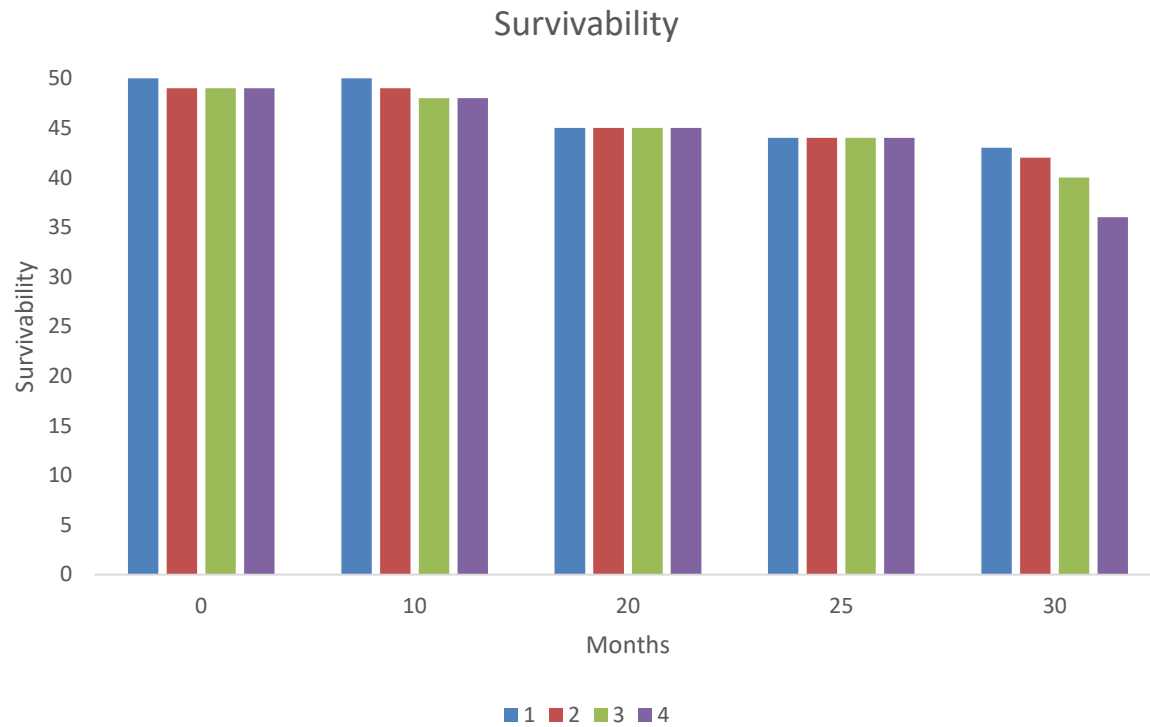
MONTH	0‰	10‰	20‰	25‰	30‰
0	69.06±9.6	72.88±10.9	64.68±7.7	71.51±8.2	61.61±7.3
1	112.36±14.0	114.52±15.2	105.53±12.3	108.52±23.5	67.09±9.7
2	167±21.2	165.2±20.8	150.1±18.7	127.7±35.5	63.5±9.3
3	244.4±32.9	234.2±24.5	196.3±28.5	145±43.6	76.8±13.3
4	357.5±40.9	331.2±39.8	233.2±40.8	165.7±50.7	88.5±18.0



As the salinity increases, the fish in 20 – 30 ppt groups grew slower.

# Salinity tolerance trial

## Results - Survival Rate



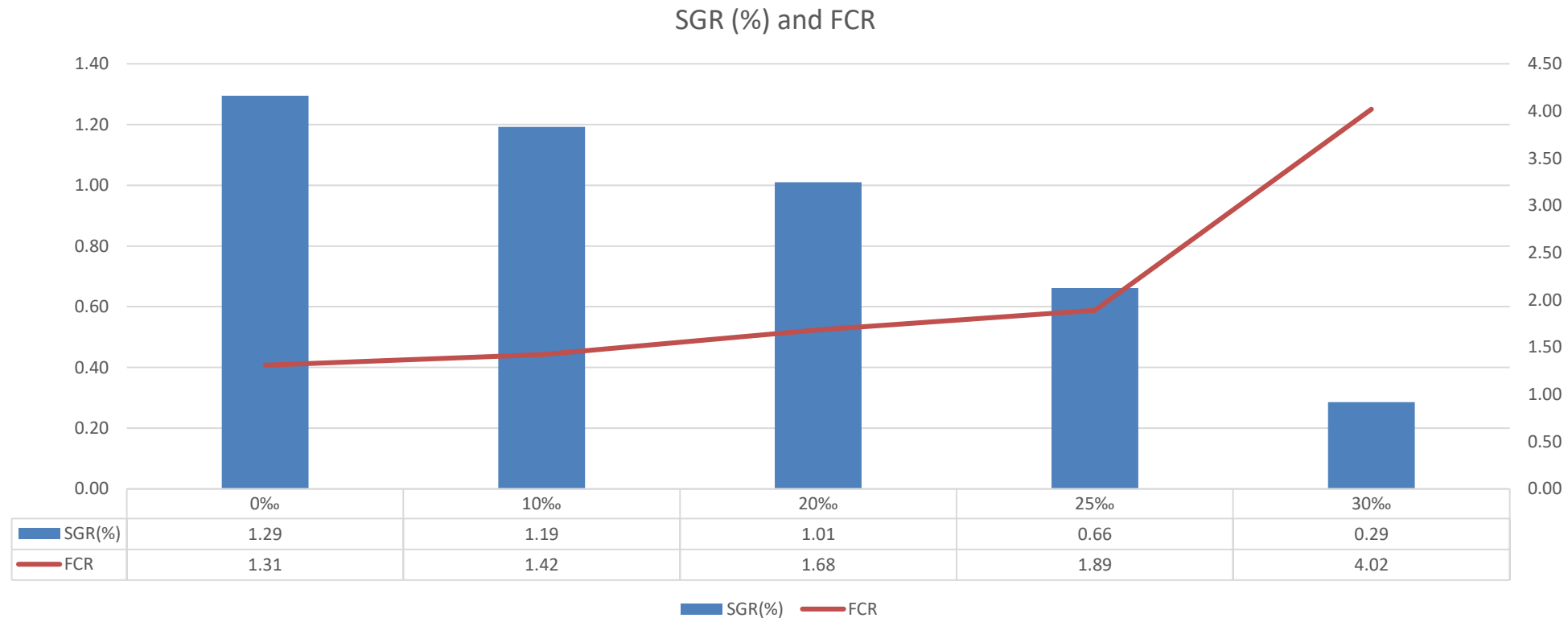
Salinity (ppt)	Survival rate
0	98%
10	96%
20	90%
25	88%
30	72%

Survival rate is negatively affected in increased salinity.



# Salinity tolerance trial

## Results - Other Growth Performance Indicators



- As the salinity increases, the specific growth rate (%/day) decreases while the FCR increases.
- Probably due to the energetically demanding osmoregulative mechanisms associated with salinity stress

- Jade perch can be bred and cultured locally in Singapore.
- Although it's a fresh water species, the early stage of its larviculture is similar to marine fish species, which requires live feeds such as rotifer and *Moina/Artemia*. Thus rotifer production needs to be set up.
- Its growth and survival are negatively affected in brackish and saline condition (salinity  $\geq 20$  ppt) probably due to additional osmoregulation and salinity stress.
- Jade perch is gaining popularity in local land-based farms as an ideal species for indoor RAS and aquaponics system owing to its high value and nutrition.

**Thank You!**