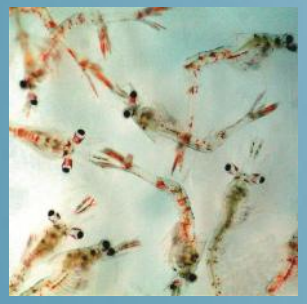
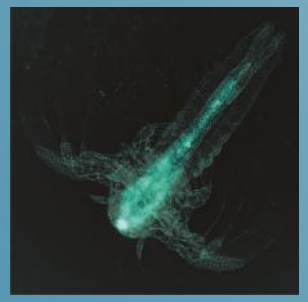
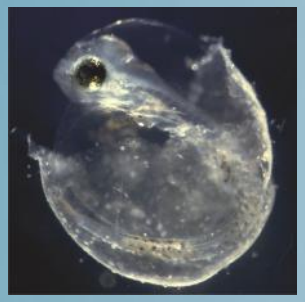
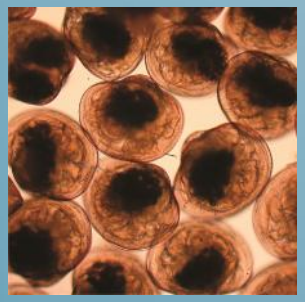




larvi 2013

6th fish & shellfish larviculture symposium

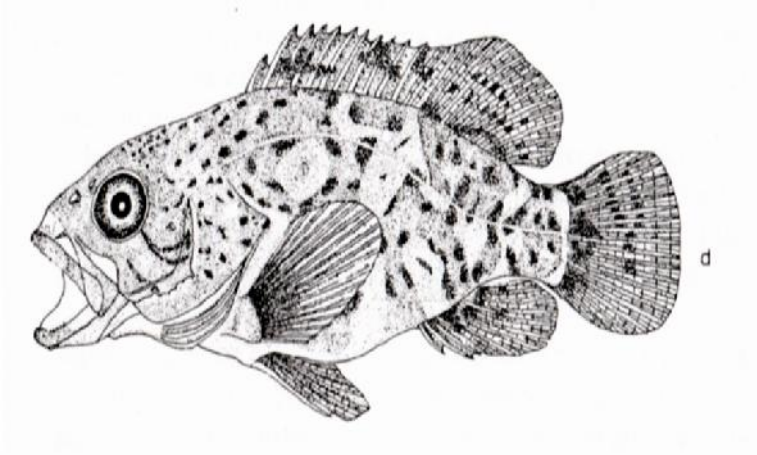
The development of an NNV SPF hatchery and the production of SPR fingerling of *Epinephelus coioides*

Yang Huey-Lang

ghent university, belgium, 2-5 september 2013

Development of a NNV-free SPF larvae rearing system and production of SPR Grouper fingerling

From R&D to production to market



Huey-Lang Yang, & Alex C.C. Lin

Merit Ocean Biotech., Taiwan

Content

A. *The reasons for selecting grouper*

B. *Disease and vaccine development*

C. *Parameters and nutrition of larval rearing study*

D. *Design and construction of an indoor RAS grouper hatchery*

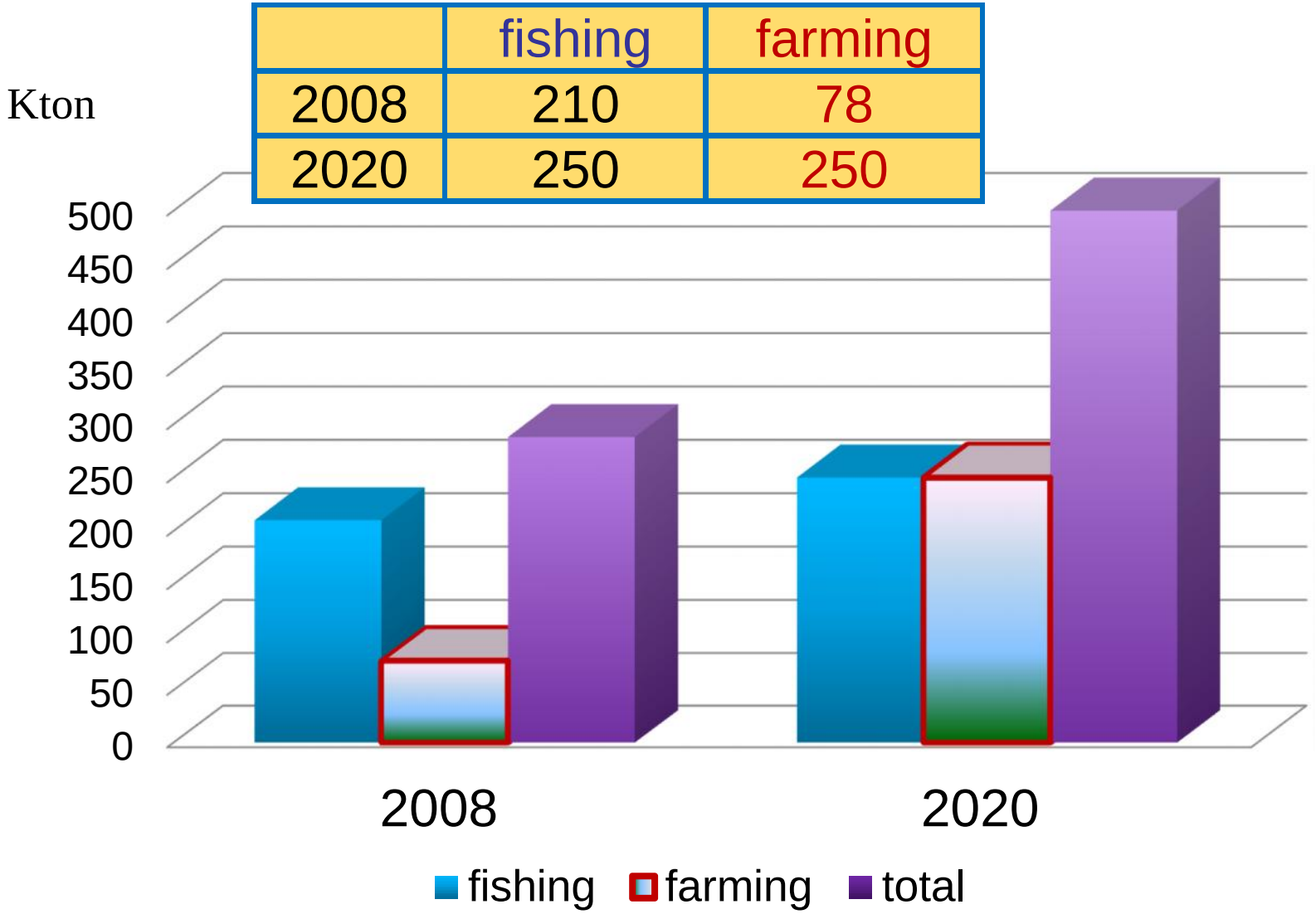
E. *Marketing strategy: Pre-immunized Specific Pathogen Resistant fingerling - SPR fingerling*

A. Why Grouper?

- **Market:** Grouper is a high-value marine fish with stable market demand in Asia and Arabia.
- **Variety:** Found in oceans around the world.
- **Fingerling:** Over ten species of grouper have completed farm cycle and fingerling are commercially available.
- **Product:** can be used for **table fish** and **frozen fillet**.
- **FCR:** Grouper is a demersal fish, does not swim frequently, has higher FCR (some reported FCR of 0.8)
- **Diminishing natural resource:** Several grouper species are already listed as endangered to near endangered species.

Global grouper production expected to grow FAO

	fishing	farming
2008	210	78
2020	250	250



Farmed grouper species (larvae)

E. coioides 1 Kg first year,

Hybrid
Sperm: giant grouper, Egg: tiger grouper

Plectropomus leopard 1 kg/2 year

E. lanceolatus, giant grouper
2 kg/1 year, 15-20 Kg/3 year

Giant grouper has fast growth rate: the largest demersal fish

1st year 1.5 - 3 kg ⇨ 3rd year 15-25 Kg

length/height 2.4-3.4

- http://www.mesotw.com/bbs/viewthread.php?tid=334

Giant grouper vs. salmon

	Salmon	Giant grouper
Growth rate	3 year 4-5 Kg	3 year 15-25Kg
FCR	1.0-1.5	0.8-1.5
Meat quality	Rich in oil and DHA Pink meat	Rich in oil and DHA White meat
Supply	>95% Atlantic salmon farmed	Farmed, near endangered species

Current grouper hatcheries in Asia

Easily affected by weather conditions and NNV infection

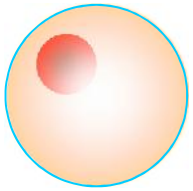
Total outdoor (mesocosms)

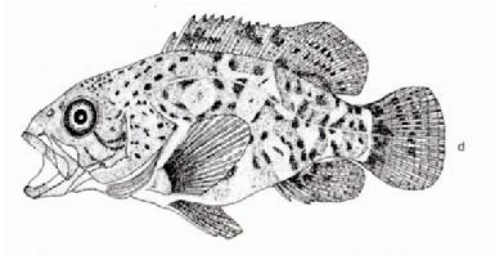
Semi-outdoor

High quality and stable supply of fingerling is the key for farming.
Grouper hatcheries need to be improved

Key bottleneck of grouper larval rearing

Reproducibility of larval rearing $< 1/10$





Key bottlenecks

- Disease
- Rearing condition: Physical, chemical and biological parameters
- Nutrition: Nutrient and quantity of starting feeds

Can not be controlled in current grouper hatcheries

B. Disease and Vaccine R&D :
Grouper has NNV infection at the larval stage

Epidemics

Hatchery
From hatch to 2 inches (60 days)

NNV

Grow-out

From 2 inches to market size (1 year)

NNV, Irido

Vibrio spp, Photobacterium, Aeromonas, Streptococcus and parasites

Grouper viral nervous necrosis disease (VNN)

Caused by Nervous Necrosis Virus, NNV

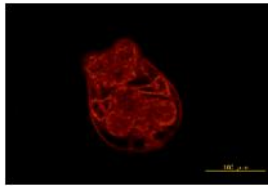
- *A simple RNA virus found around the world*
- *Has caused high mortality at larval stage and total loss of grouper hatcheries,* ***globally***

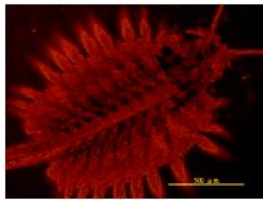
Spiral swimming pattern

NNV has multiple pathways of infection

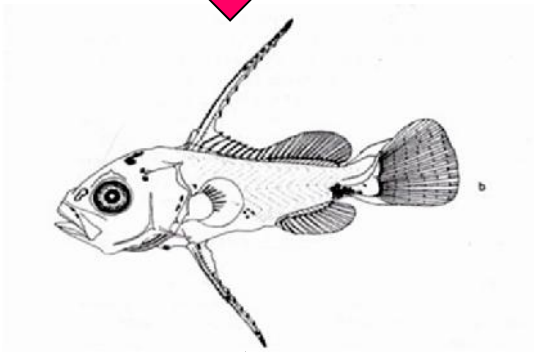
Fertilized eggs

Starting feed





Water



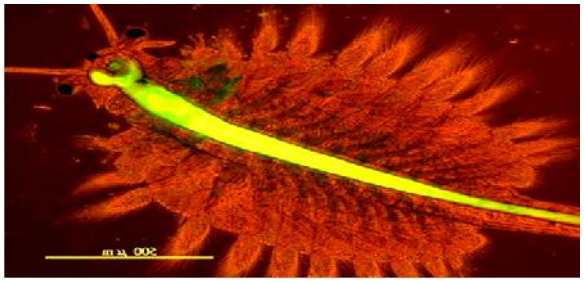
Nearby infected Hatchery

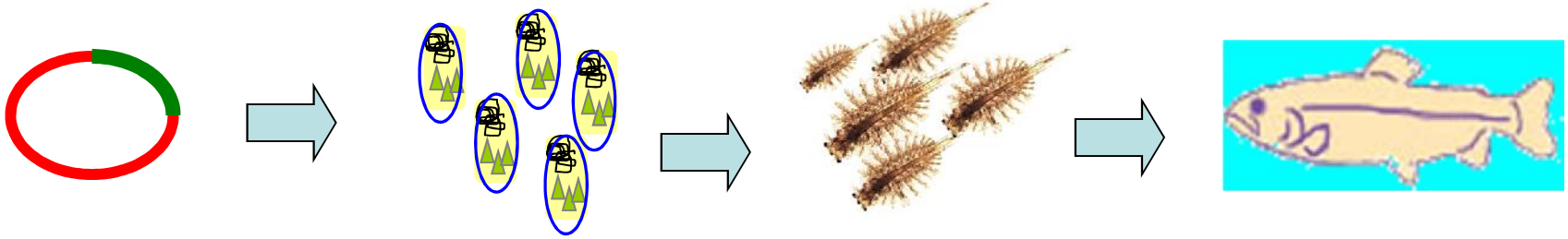
Personnel & visitors

Environment and equipment

1. A NNV oral vaccine for the larvae stage

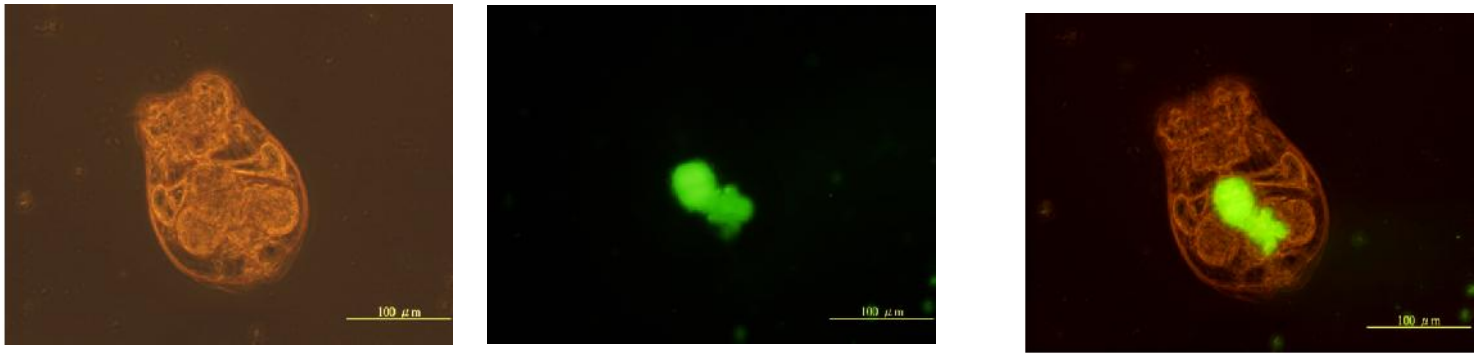
Developed based on the “**natural food chain”** of fish larvae





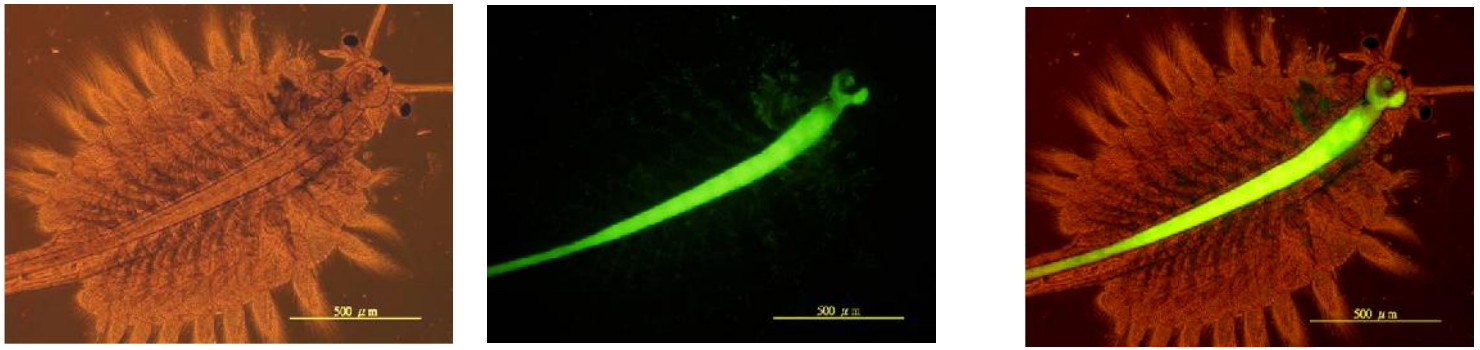
1. Oral vaccine: antigen encapsulated in various live starting feed of larvae

Rotifer



Small Artemia

Large Artemia



2. Multi-valent injective vaccine for grow-out stage

Surviving rate: Field trial at Pinhu farm, in one farming year

Trail	Non-vaccinated	Vaccinated
A farm	18.9 % (478/2517)	89.3 % (2234/2509)
B farm	47.4 % (356/750)	92.9 % (697/750)

Very difficult to convince farmers to use vaccine

B. Complete vaccines to cover most of the diseases found in Taiwan's grouper farms

Oral NNV vaccine	Multi-valent injective vaccine

Larval stage

Fertilized egg to 3 inch

(80 days)

NNV

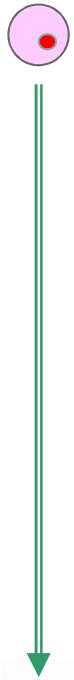
Grow-out stage

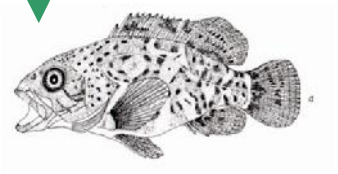
from 3 inch to market size
(8 months to 3 years)

NNV, Irido

Vibrio, Photobacterium, Aeromonas, Streptococcus

C. Analysis of grouper larval rearing parameters





- •Environment
- • Nutrition

- pH
- Aeration
- Photoperiod
- Light intensity
- color of tank
- Wavelength
- Starting feed: quality and quantity
- Ammonium
- Bacteria
- Algae etc.,

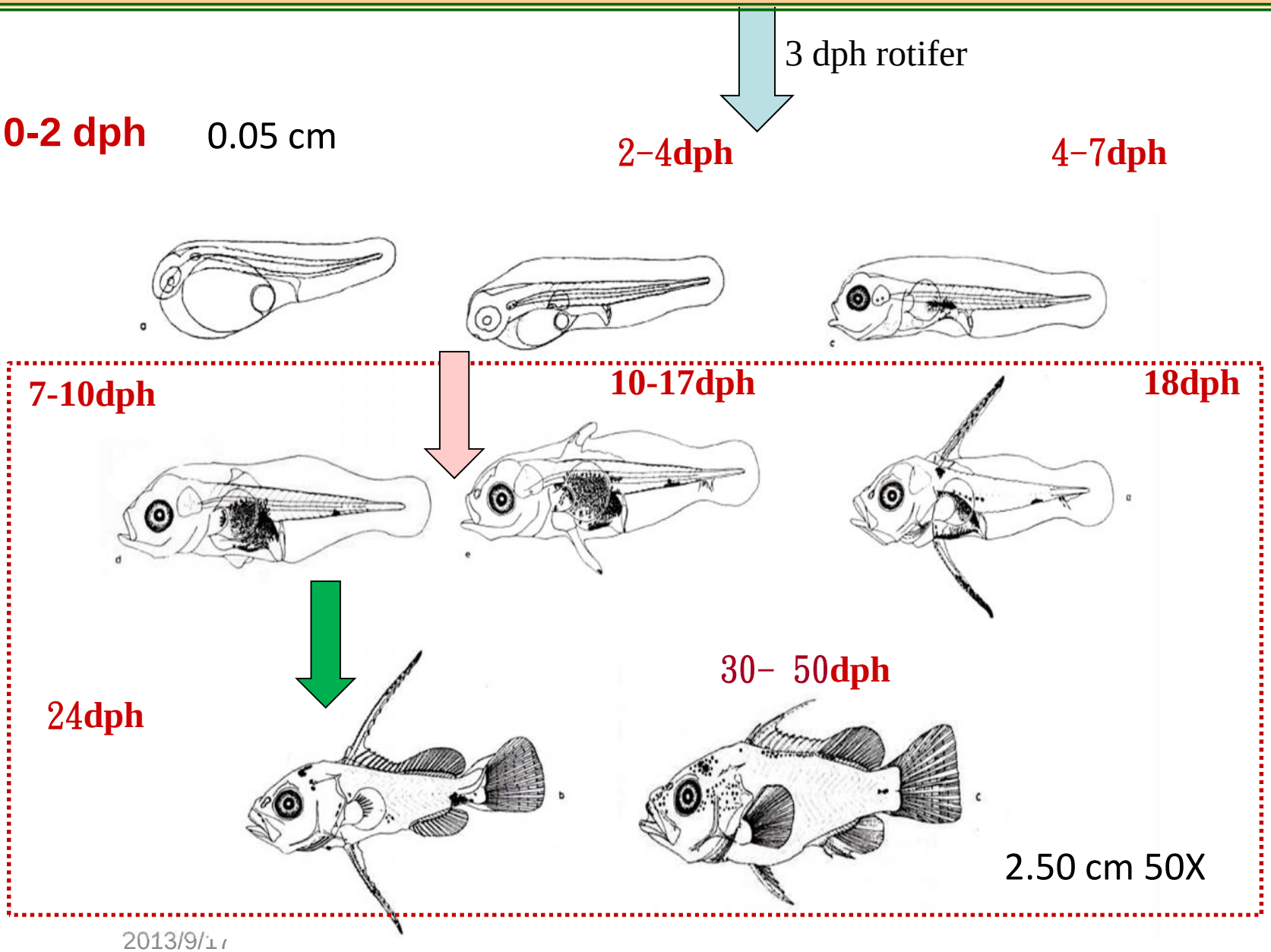
Algae in weaning tank

	A	*B*	*C*
larvae yield (*pcs*/L)	1.730	1.190	0.390

Light intensity

	Condition A (Lux)	Condition B (Lux)
larvae yield (*pcs*/L)	1.380	0.370

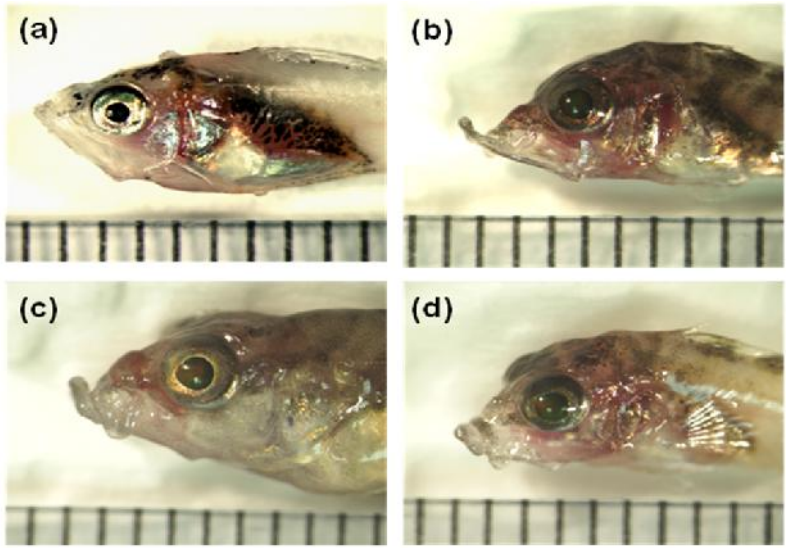
Nutrition: Larval development



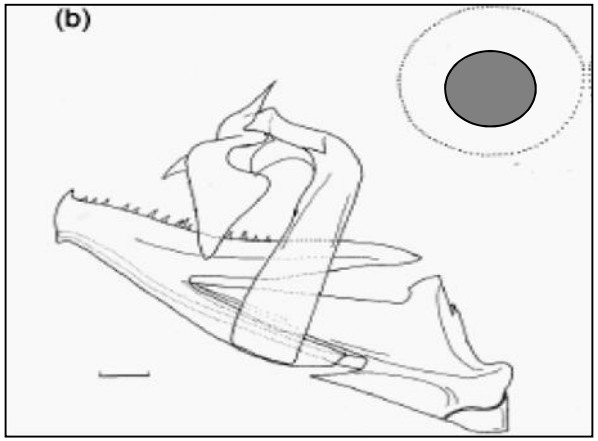
Feeding schedule, nutrition and deformity

- 3 dph feeding with rotifers
- 14 dph Artemia
- 25 dph co-feeding
- 30 dph commercial pellet feed

- Co-feeding earlier than 25 dph increase deformity from 5% to 8-10 % in *E. coioides*



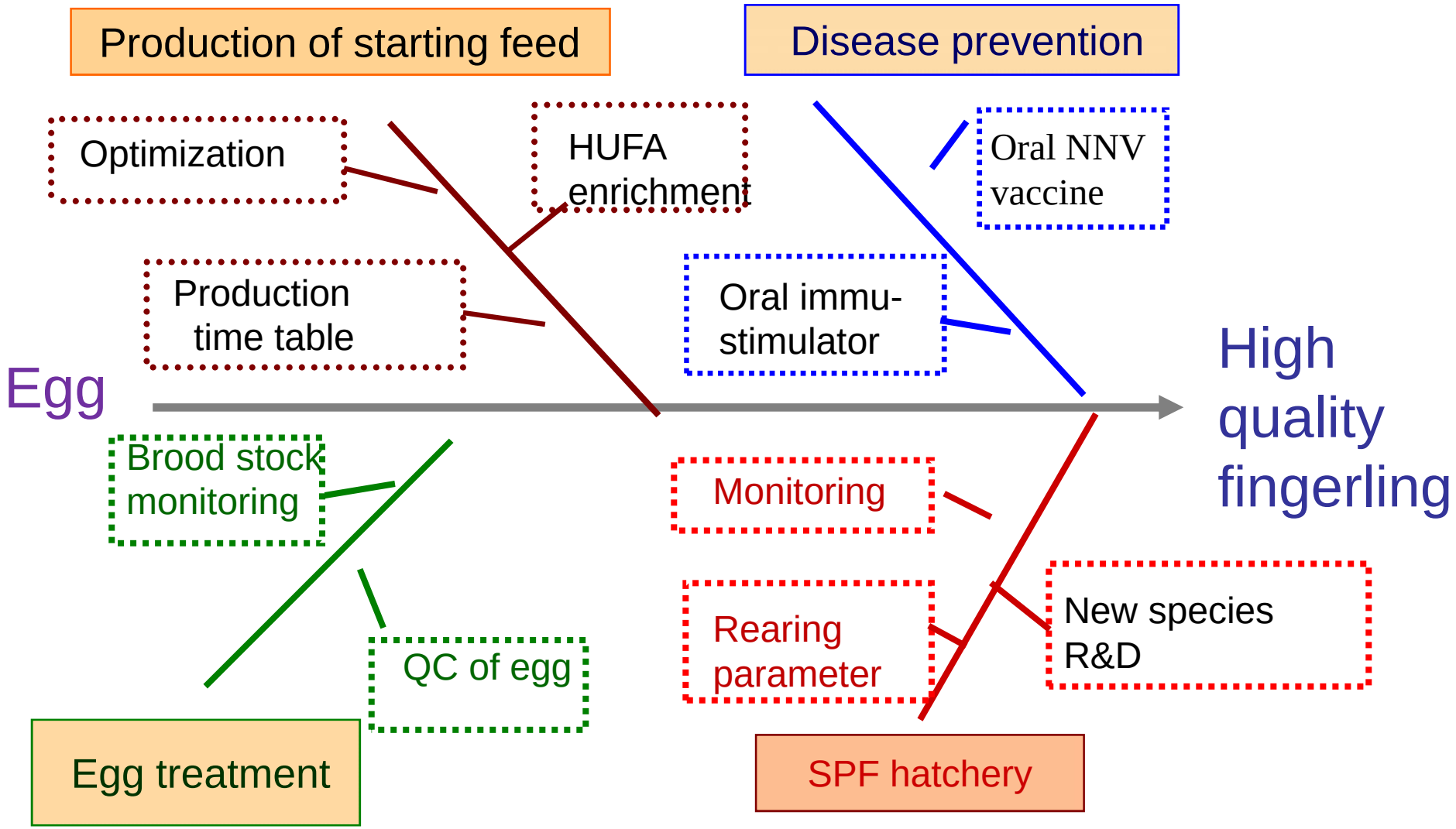
	Formula 1	Formula 2
Trial 1	**0%**	64.7%
Trial 2	**0.1%**	40.2%



Different grouper species have their specific nutrition requirement

	E. coioides	*E. lanceolatus*	*Hybrid*	*Tiger*
Deform rate	< 5%	> 60%	20%	< 5%

SOP for grouper hatcheries



D. Commercialization:

A production scale indoor grouper hatchery

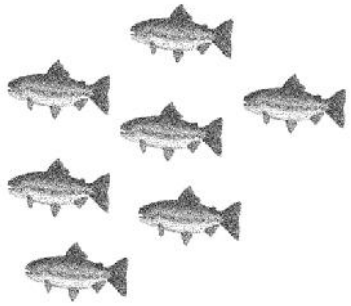
Weaning facility:
from egg to 3 cm

Fingerling Nursery:
from 3 cm to 9 cm

Over 85000 m^2, annual production capacity:
6 million *pcs E. coioide* or 1 million *pcs E. lanceolatus*

E. Product marketing strategy

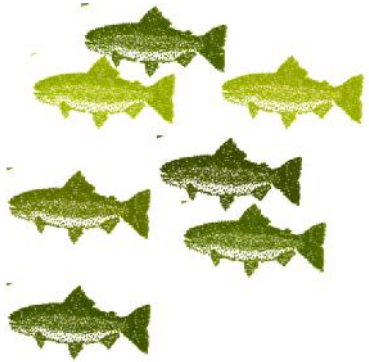
PI-SPR fingerling (Special Pathogen Resistant)



fingerling

Immunization w/ multivalent vaccine

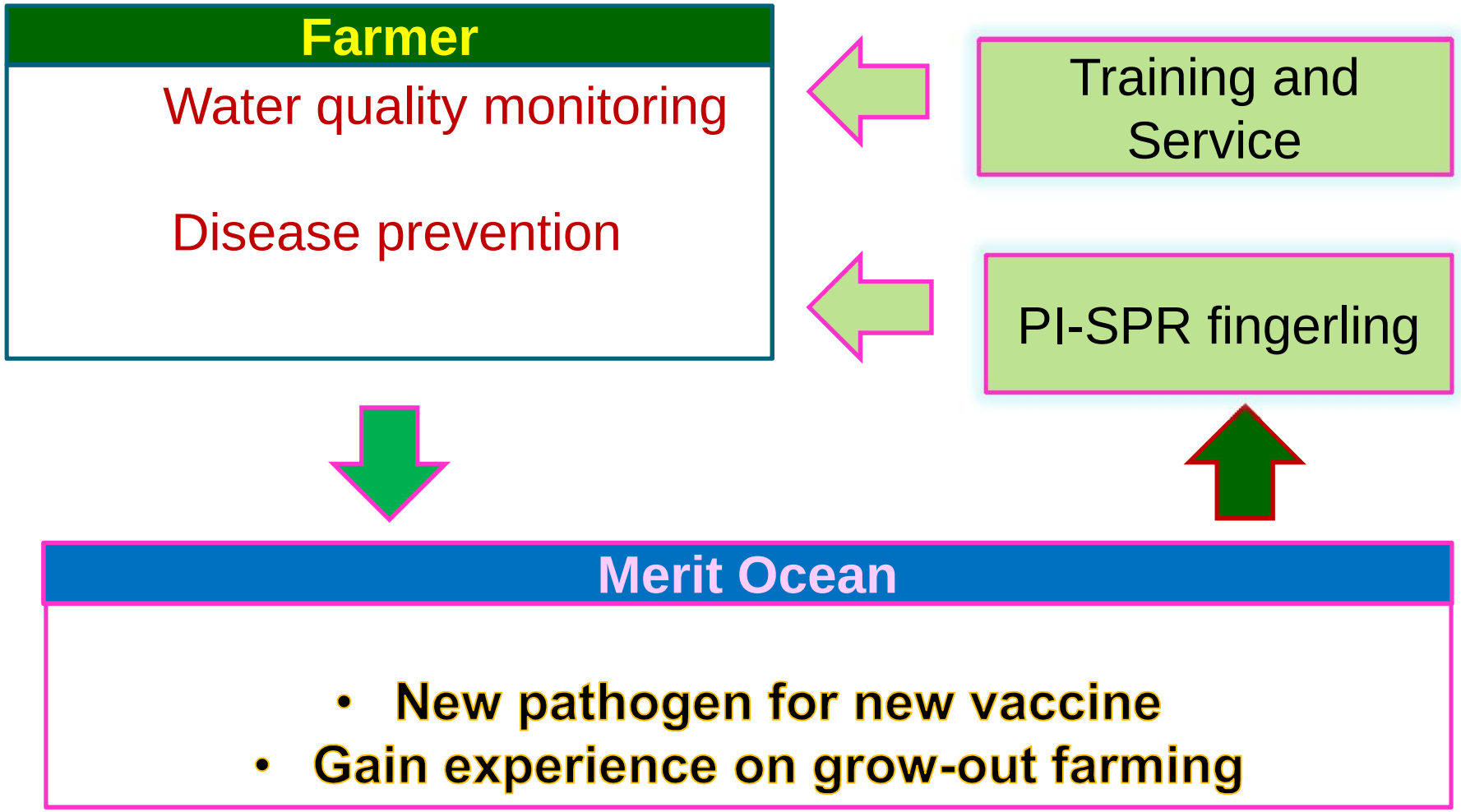
PI-SPR



Advantage of PI-SPR fingerling

- Easy to use, user friendly
- Elevated survival rate, increased profit
- Decreased antibiotic use

Technology training and service for farmer



Result of the SPR fingerling and service
2011-2013

- Used by over 30 farms @ 15,000- 30,000 pcs/farm
- With a total of 1,000,000 SPR fingerling
- At various locations in Taiwan
- With different farming conditions and stocking densities
- In a one year farming period

Over 80% of the farms achieved a 75-85% survival rate

Performance of SPR hatchery system

	Method	Reproducibility	Deform rate(%)	Productivity (pcs/ton)	Farm survival rate
Current	Mesocosm By nature	1/10	20-40%	2-30	20-50%
Ours	Digitalized SOP	100% stable	＜5%	>1000	80%

*From R&D to production to **helping the farmer***

Thank you for

your attention