SPECIFIC GROWTH RATE, FEED EFFICIENCY AND OVARIAN HISTOLOGICAL OBSERVATIONS OF JUVENILE *Channa striata* TREATED BY RECOMBINANT GROWTH HORMONE

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Sex determination in fish

Genetic sex determination: GSD

Sex is determined by genotype at the time of fertilization

XX → ♀

Oryzias latipes

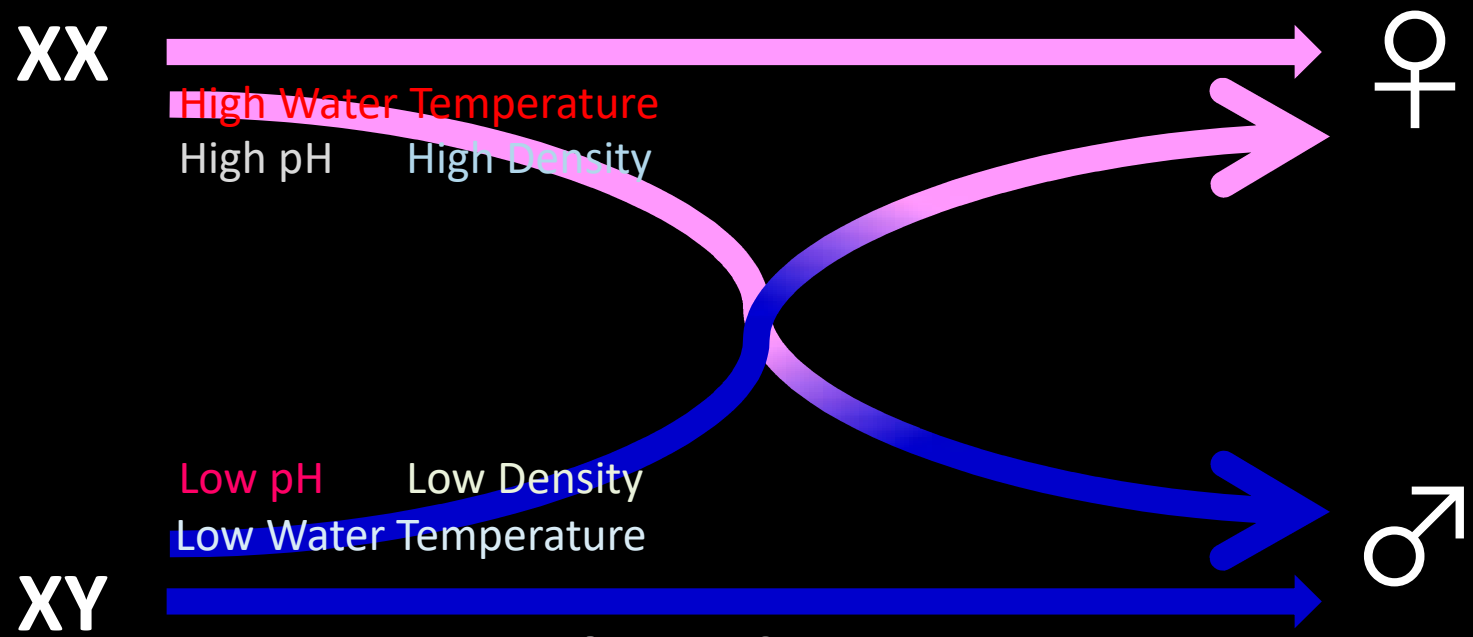
XY → ♂

Medaka has homomorphic XY sex chromosomes, Y-specific DM-domain gene is required for male

Sex determination in fish

Genetic sex determination: GSD

Sex is determined by genotype at the time of fertilization



Environmental sex determination: ESD

Sex is under strong influence of environmental factors after fertilization

Fish exhibit high phenotypic plasticity in response to environmental changes and this plasticity can affect gonadal development

Sexual growth dimorphism in fish

♂ > ♀

Oreochromis niloticus

Oncorhynchus mykiss

♂ < ♀

Anguilla anguilla

Paralichthys lethostigma

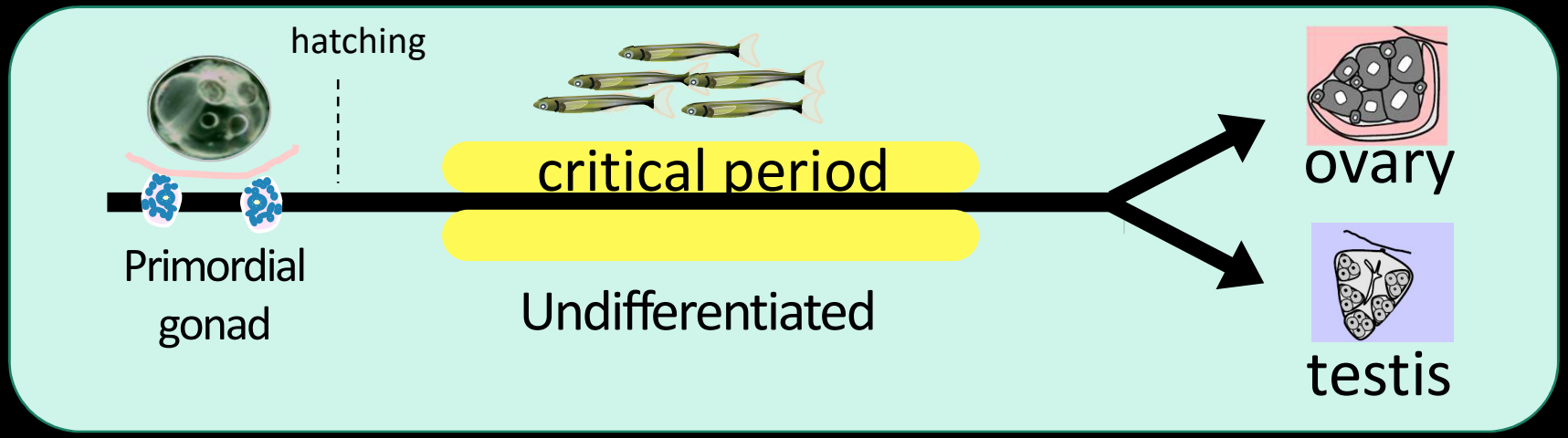
These can have undesirable consequences if the sex with the highest growth does not predominate in the cultured stocks

Growth and sex differentiation in fish

Introduction

The onset of sex differentiation is usually more related to size than to age

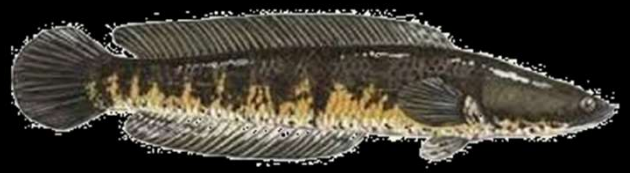
There is an association between early growth rates and sex differentiation



At the time of sex differentiation, an abundance of females among the largest growing fish

Introduction

The snakehead

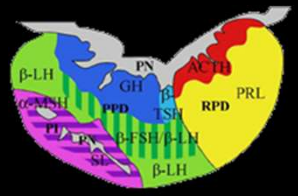


Channa striata

The snakehead or “Gabus” is one of major commodities of Lampung province that has very high economic value.

However, its growth is very slow and the histological gonadal differentiation during juvenile is still unknown!

Fish growth hormone (FGH)



pituitary gland

It regulates growth & development in fish

Ephinephelus lanceolatus Growth Hormone, r-*El*GH

So far, r-ElGH is most effective to enhance the growth in fish

Dipping and Oral Methods

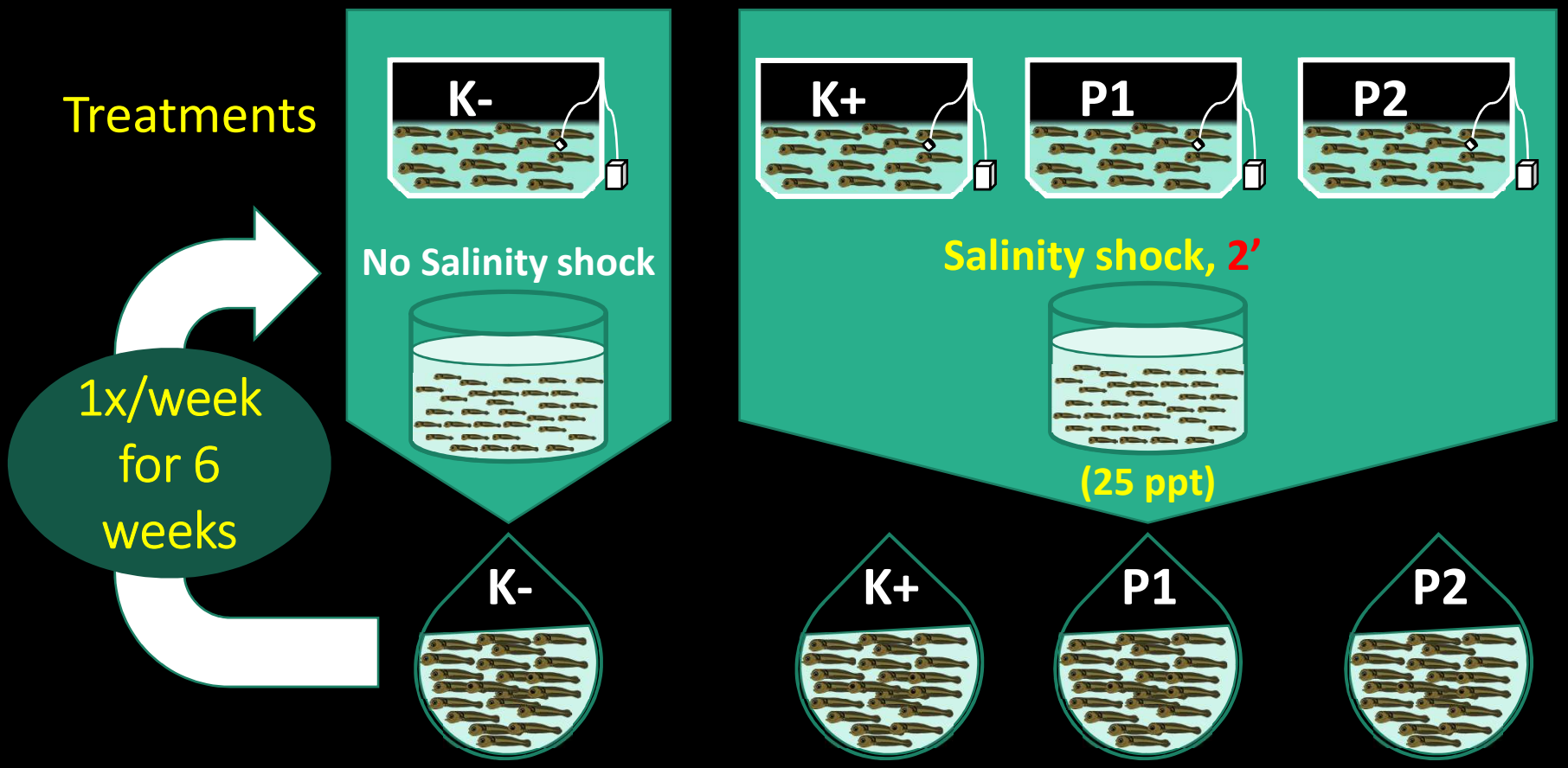
r-*El*GH

Objective

1. To investigate the effect of recombinant *Epinephelus lanceolatus* growth hormone (r-*El*GH) on growth performance
2. To clarify the gonadal differentiation in *Channa striata*

Rearing and Sampling

1st Experiments: Dipping method



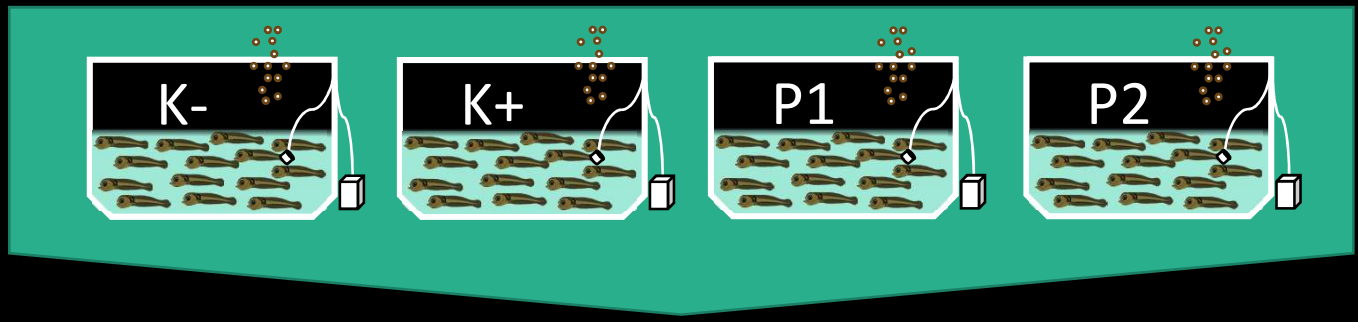
Larvae were immersed either in water or in hormone solutions for 1h

Rearing and Sampling

1st Experiments: Dipping method

Rearing

12 weeks



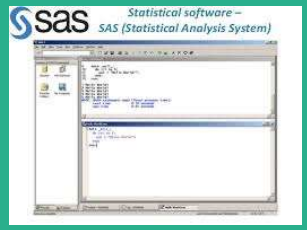
Sampling, monthly

Length & Weight

Trunk

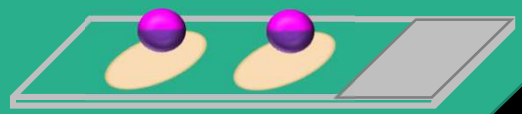
Growth analysis
: specific growth rate, feed efficiency

Anova



Histological analysis
: Gonadal sex differentiation

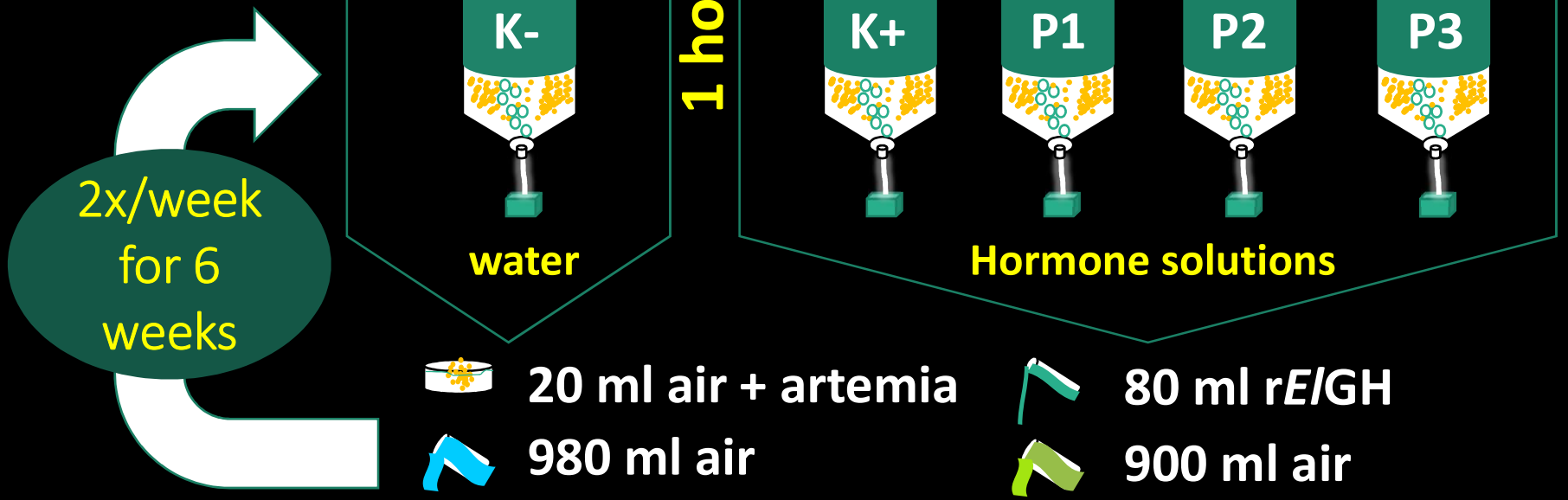
HE- staining



Rearing and Sampling

2nd Experiments: Oral method

Treatments



20 ml air + artemia

980 ml air

80 ml r*El*GH

900 ml air

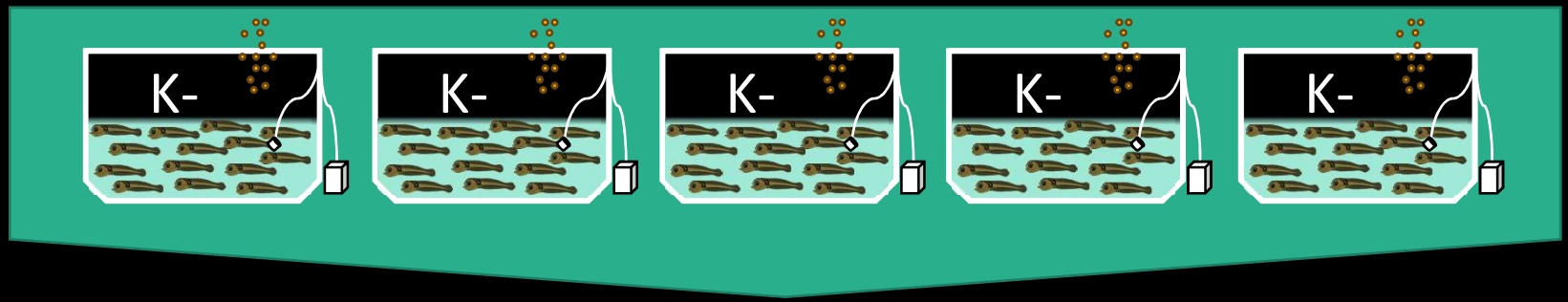
Hormone solution: r-ElGH (0, 2, 4, 6 mg/L), BSA 0.01% and NaCl 0.9%

Naupli artemia were immersed either in water or in hormone solutions for 1h

Rearing and Sampling

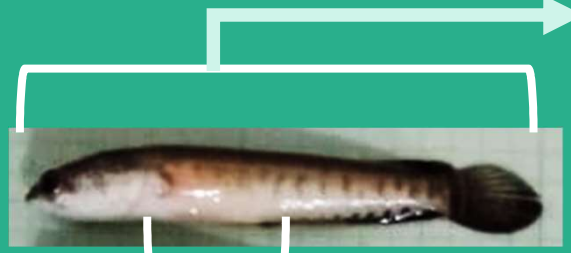
2nd Experiments: Oral method

Rearing, 12 weeks



Sampling, monthly

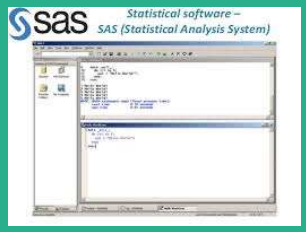
Length & Weight



Trunk

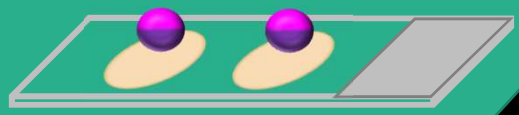
Growth analysis
: specific growth rate, feed efficiency

Anova



Histological analysis
: Gonadal sex differentiation

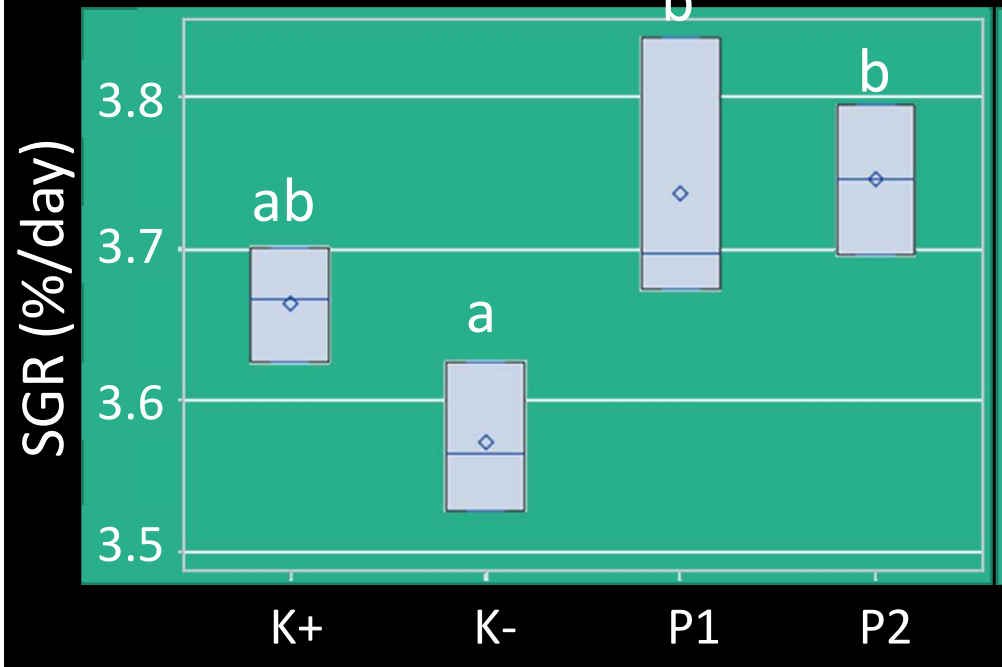
HE- staining



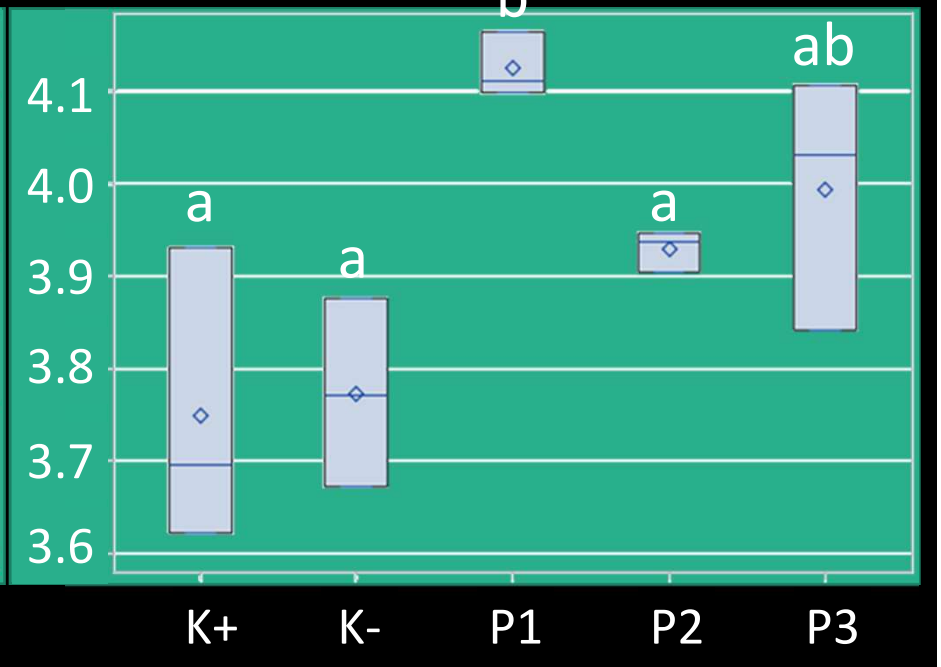
Specific growth rate

Results and Discussion

Dipping method



Oral method

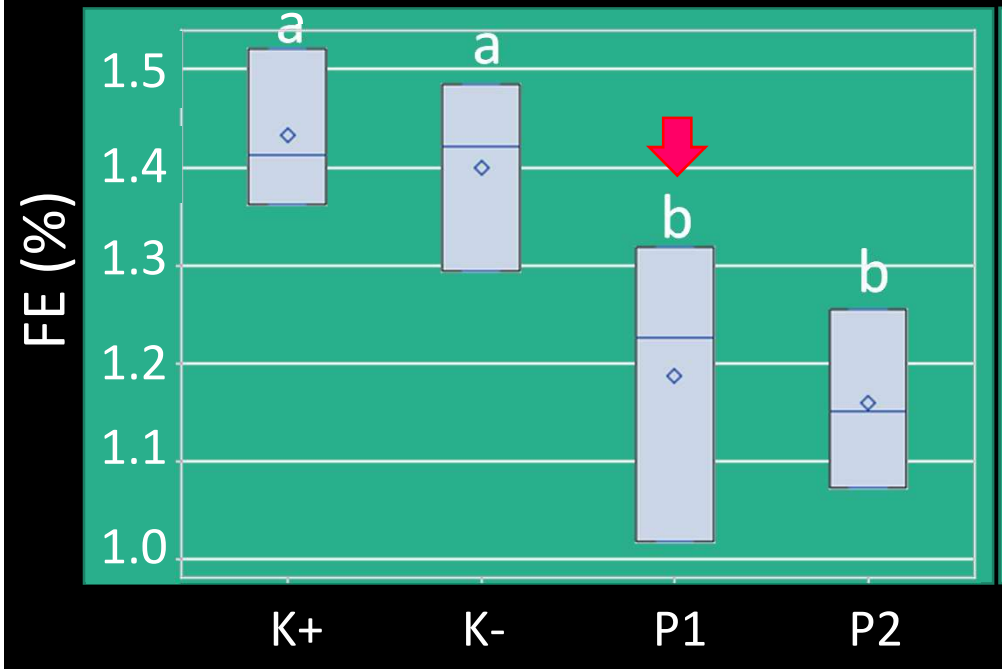


- ✓ Both experiments show a significant effect of r-*El*GH different dosage on specific growth rate; the SGR in oral method is higher than in dipping method
- ✓ In Dipping method: K+, P1, and P2 were not significantly different, but both P1 and P2 were significantly different from K-
- ✓ In Oral method: P1 was significantly different from others but not with P3

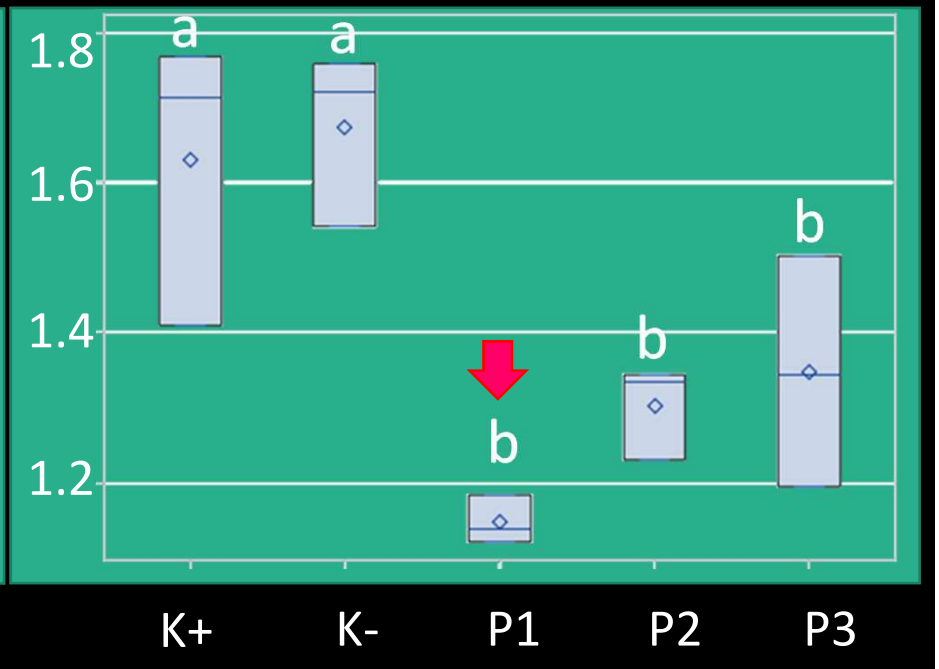
Feed efficiency

Results and Discussion

Dipping method



Oral method



- ✓ Both experiments show a significant effect of r-*El*GH different dosage on feed efficiency; the FE in oral method is higher than in dipping method
- ✓ Dosage 2 mg/L (in both Exp.) shows a tendency of lower Feed Efficiency compared to other treatments

Histology Sex Differentiation

Results and Discussion

Stage of Sex Differentiation	Age (months)			
	0.5	1.5	2.5	5
Bipotential Gonad	30	0	0	0
Undifferentiated	0	40	19	2
Presumptive Female	0	39	43	14
Female	0	4	19	26
Presumptive Male	0	0	0	33
Male	0	0	0	3
Female and Male	0	0	0	7

Ovarian differentiation started at 1.5 months

Testicular differentiation started at 5 months

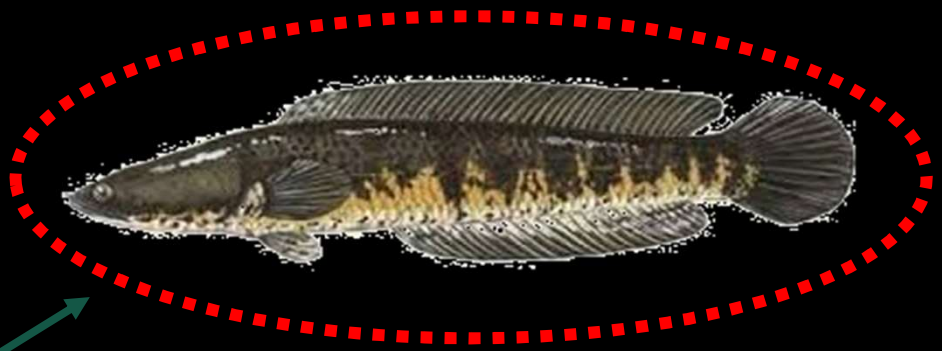
Results and Discussion

Giant Grouper Recombinant Growth Hormone (rElGH)

Growth Hormone

Igf-1

Igf-1



Specific Growth Rate ↑

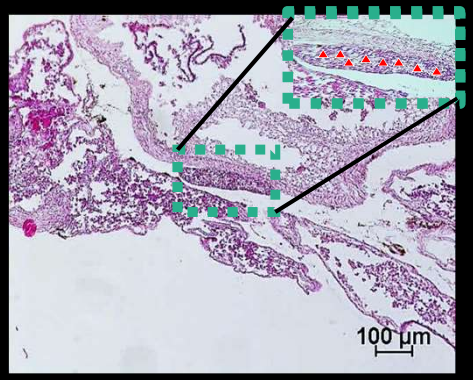
Feed Efficiency ↓

Gonadal Sex Differentiation X

Ontogeny of Gonadal Sex Differentiation in Snakehead

Results and Discussion

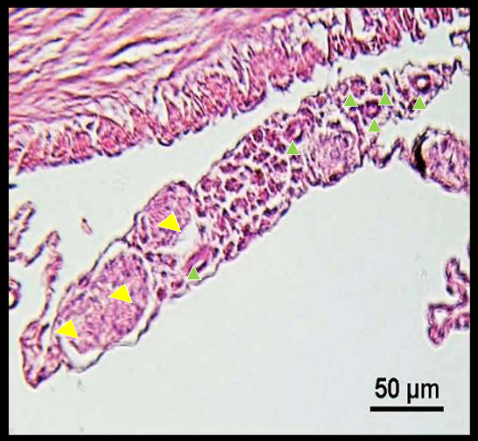
Bipotential Gonad



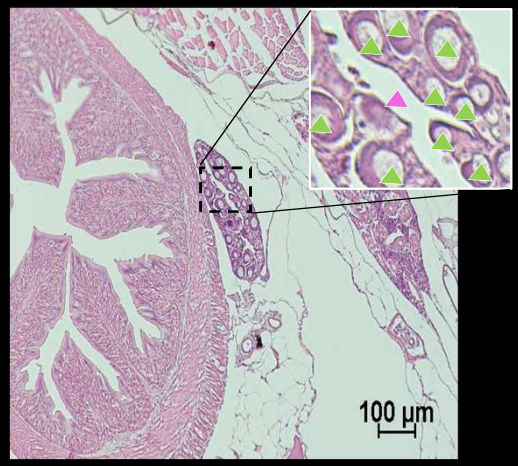
▲ Somatic cells (SCs)

Undifferentiated

Presumptive Female



Female



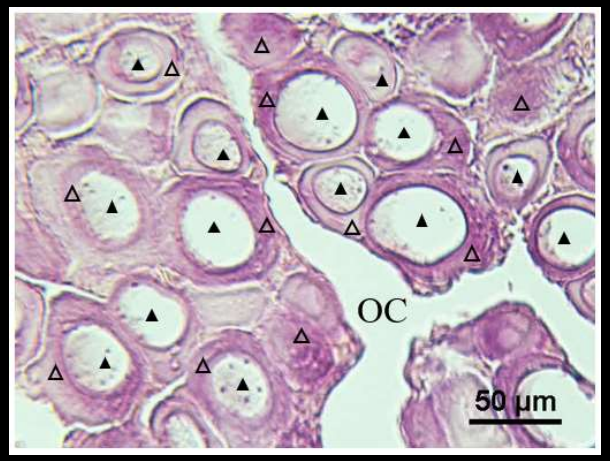
▲ Mitotic germ cells ▲ Primary oocytes ▲ Ovary cavity

0.5 m → **1.5 m** → **2.5 m**

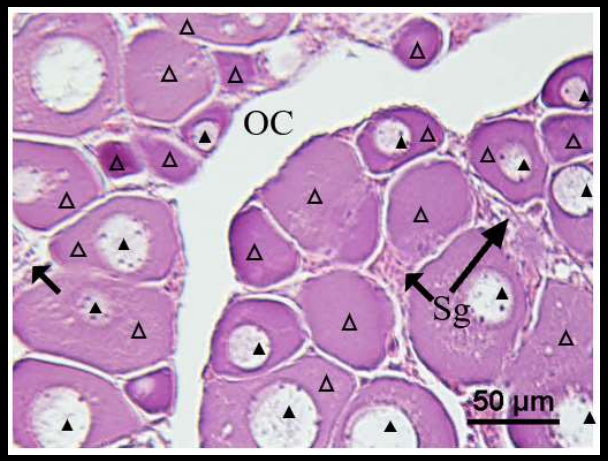
Ontogeny of Gonadal Sex Differentiation in Snakehead

Results and Discussion

Female



Female + Male



Male

▲ Primay oocytes (PO)	△ Perinucleolar oocytes (PnO)
↑ Spermatogonia (Sg)	Ovarian cavity (OC)
Germ Cells (GCs), Blood Vessel (BV), and Mesentery (M).	

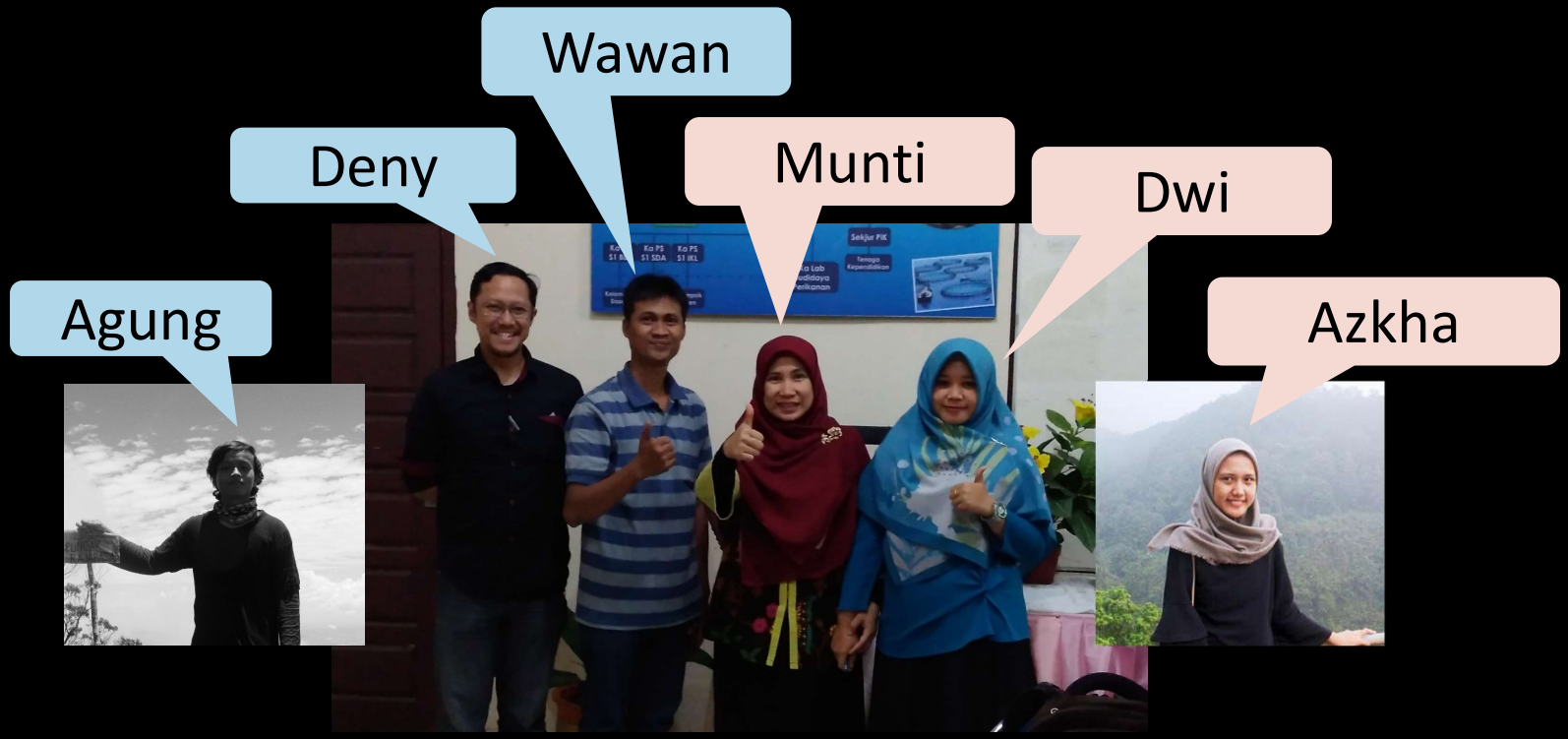
5 m

Conclusion

- ✓Both experiments of the r-*E*/GH show that the growth were due to a specific action of r-*E*/GH and gonadal differentiation was not affected.
- ✓The gonadal sex differentiation in Snakehead is Gonochorist Undifferentiated.

Thank you for your attention

University of Lampung Snakehead Research Team



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