

Earthworm (*Perionyx excavatus*) as a main protein source for growing zig-zag eel (*Mastacembelus armatus*)



Phan Phuong Loan
pploan@agu.edu.vn

Nguyen Huu Yen Nhi
nhynhi@agu.edu.vn

An Giang university, Vietnam

Introduction (1)

- In order to increase the livestock production, it is needed to reduce the pollution caused mainly by manure.
- Earthworm (*Perionyx excavatus*) can live well in manure and in an environment which has a lot of organic substances which are decomposing
- Earthworm is considered as valuable additional nutrition source for poultry, fish and shrimp.

Introduction

- Mature earthworm consists (as % DM) of
 - 80 to 85% water
 - protein: 68-70%,
 - lipid: 7-8%,
 - carbohydrate 12–14%,
 - ash 11–12% (DM basic)



Earthworms

Introduction

- Zig-zag eel (*Mastacembelus armatus*)
- Lives in freshwater, brackish water
- pH = 6.5 – 7.5
- Temperature 22-28°C

Introduction (3)

- In nature, zig-zag eel widely distributes from Pakistan to Vietnam and Indonesia.
- They often bury their body under sand and look for food
- The main food is animal, taking the bait at night
- Their food is worms, larva of zoobenthos, mature zoobenthos, shrimp, young fish and detritus

Sources: Pethiyagoda, 1991 and Rainboth, 1996



Zig-zag eel



Introduction (4)

- Zig-zag eel is large-sized fish
 - **Maximum length is 90 cm and weight is 1.000g**
 - **Delicious flesh and high economic value**
- In nature, they are unusual fish because fishermen exploit them strongly so this conducts to decrease source of income

**Sources: Khoa and Huong, 1993; Yen, 1992;
Pethiyagoda, 1991; Nelson, 1994 and
Binh Thuan aquaculture office, 2007**

The purposes

- The purpose of the present study was to show:
 - (i) Zig-zag eels can live and grow well in captive culture in artificial conditions such as huge plastic containers
 - (ii) Earthworms produced from live stock manure can be a good protein source and can replace the natural feed sources for growing zig-zag eels in artificial culture

Objectives

- Study looks at finding alternative protein sources that can be produced on the farm to feed growing zig-zag eel in captive culture systems.

Materials and Methods

- *Location:* at farms of Angiang University (AGU), Vietnam
- *Duration:* March to June, 2008
- *Fish/fingerling and stocking density of zig-zag eel*
 - Live weight (29.9 – 32.7g) and length (20.4 – 21.6cm).
 - 30 fish/ tank

Materials and Methods

- 9 plastic tanks (1m³) were used to conduct the experiment
- Surface of tank covered about 1/3 by water hyacinth so fish can shelter under water hyacinth



Plastic tanks

Experimental design

- 3 treatments, with 3 replicates
 - 100% of small shrimps as control (SS)
 - 100% of earthworms (EW)
 - Commercial fish feed (Con).
- The experiment was a complete randomized block design

The layout of the experiment

Rep 1	Rep 2	Rep 3
EW	SS	Con
SS	Con	EW
Con	EW	SS



Earthworms



Concentrate feed



Small shrimps

The Feeds

- Small shrimps bought from local market, which are collected from the fields
- Concentrate feed is from UP (Uni - President), with protein level about 33%
- Earthworms were cultured on cow manure in the AGU experimental farm.

Feeding and management

- Feeding twice a day, with the amount of 5-7% of body weight (DM basis).
- Water was changed at weekly intervals at 50% of total volume.

Process of culturing earthworms

- Raising in three wooden boxes (2 x 2x 0.4 m), which are surrounded by plastic netting with 20 cm height
- Seed earthworm 2kg/m².
- Feeding fresh cow manure according to earthworm's demands was twice a week.

Process of culturing earthworms

- A black net to control the humidity of substrate, prevent insect and animal predators covers the surfaces of the boxes.
- Water was sprayed to keep humid degree inside boxes
- After 60 days, we can harvest adult earthworm for feeding fishes in the experiment.

Statistical analysis

- The data were subjected to ANOVA procedure for Randomized Complete Block designs using the general linear model (GLM) in MINITAB 13.3 (Minitab, 2003).
- Pairwise comparisons with a confidence level of 95% were used to determine the effect of dietary treatment.

Results and discussion

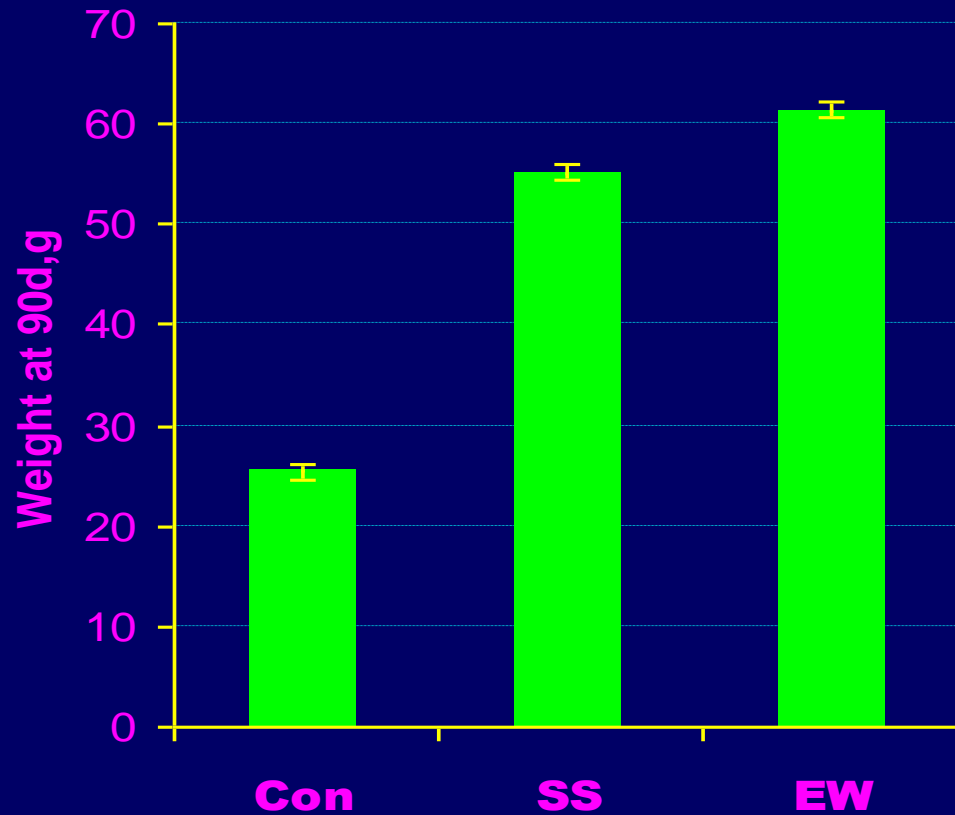
Culturing earthworms

- Putting 2kg earthworms seed /m²
- Putting 5-7kg fresh cow manure/m² twice a week
- Applying water every day
- After 2 months, earthworm biomass collected 3.5-3.6kg/m²

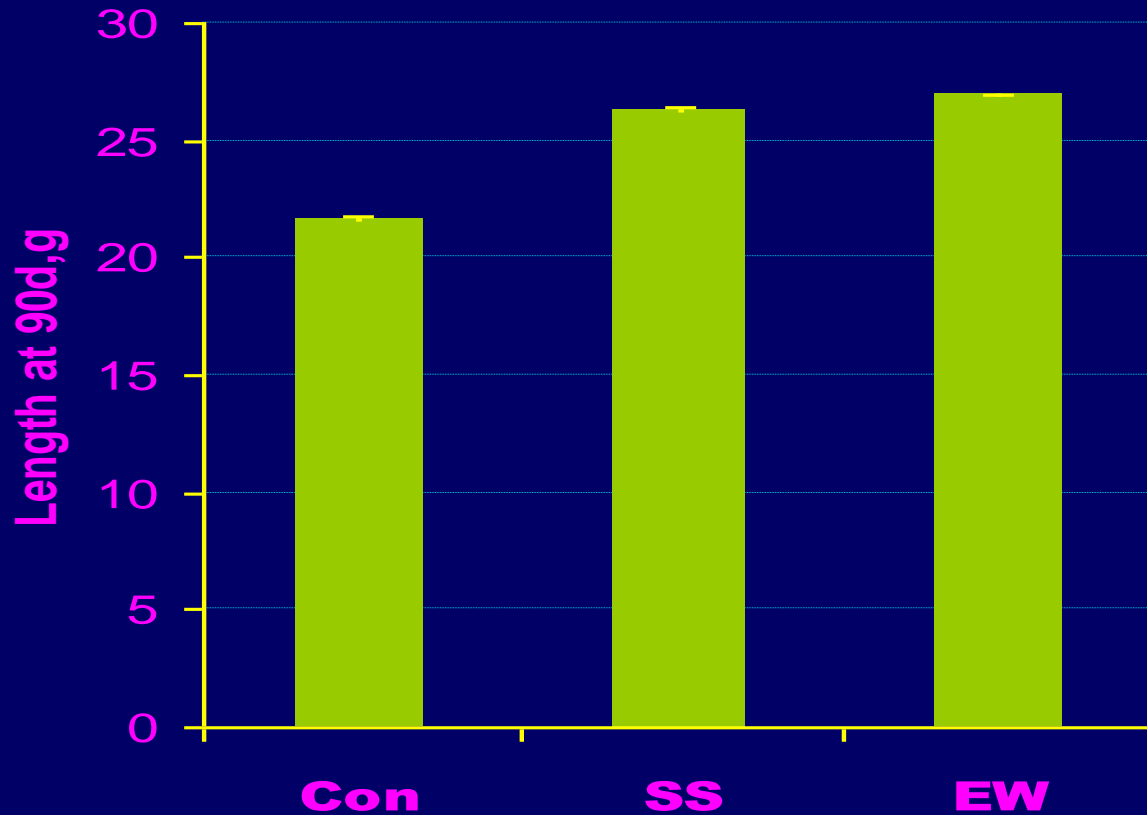
Environmental condition

Treatments	Small shrimp (SS)	Concentrate feed (Con)	Earthworm (EW)
Temperature	29,6 ± 1,46	29,7 ± 1,39	29,7 ± 1,351
pH	7,7 ± 0,6	7,56 ± 0,56	7,61 ± 0,54
DO	4,6 ± 0,6	4,495 ± 0,583	4,576 ± 0,526

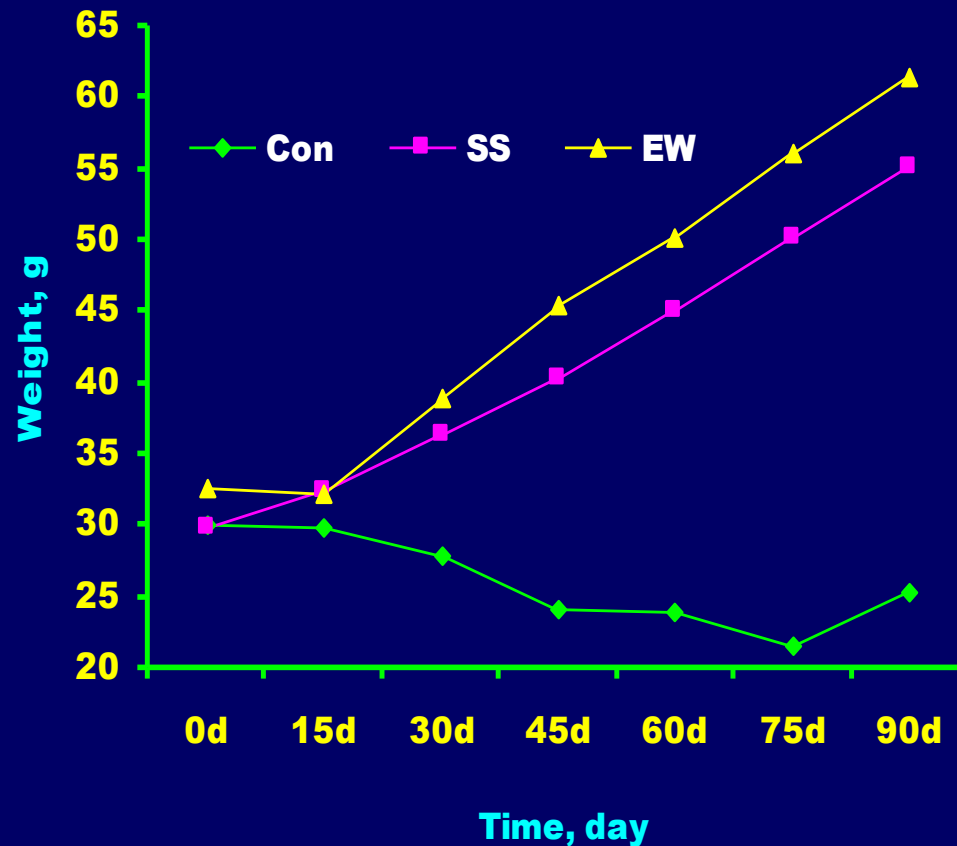
Weight of zig-zag eel fish at 90 days



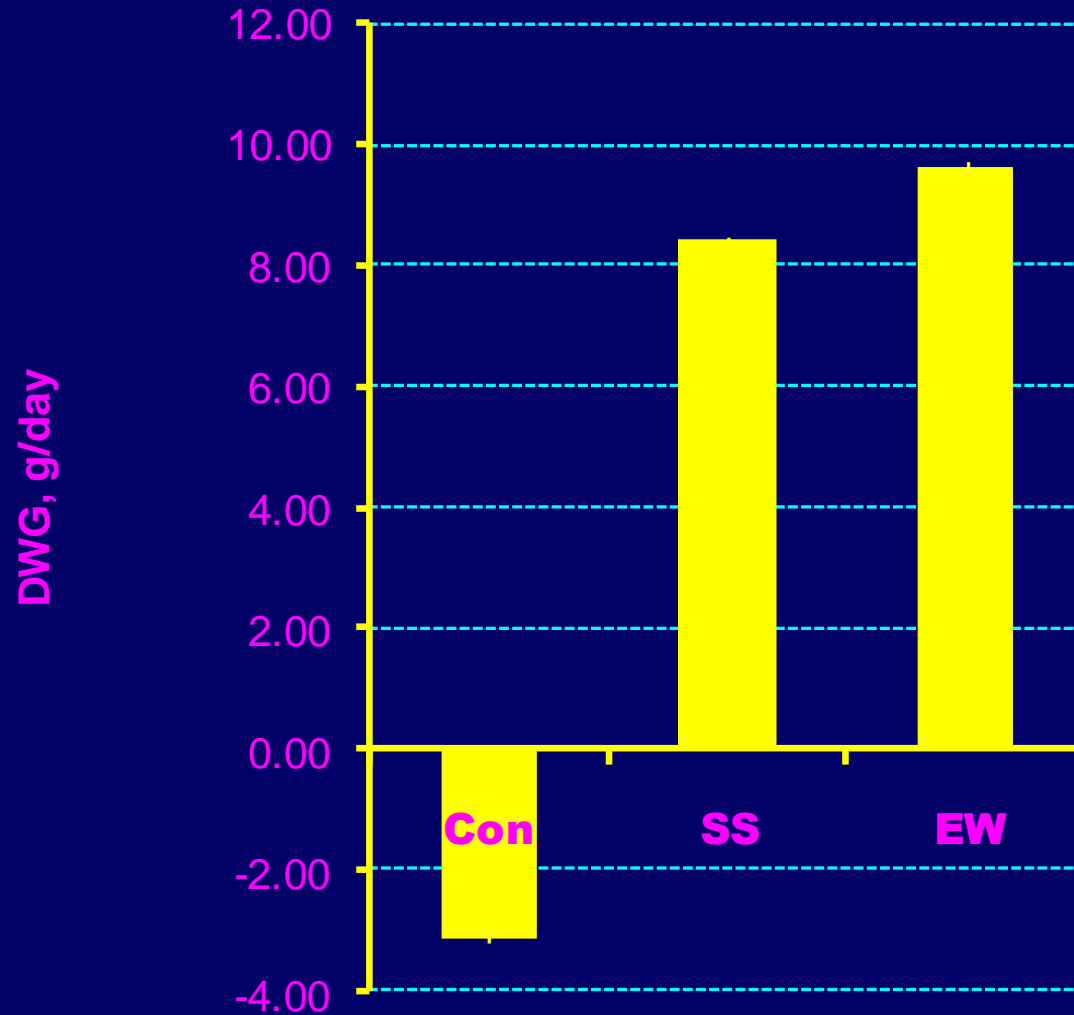
Weight of eel fish at 90 days



Growth rate of zig-zag eel during the experiment



Zig-zag eel daily weight gain



Survival rate of zig-zag eels

- *During the experiment time, survival rate was 100% for all the treatments*
- *Zig-zag eel can live well in plastic tanks and quiet*

Conclusion

- Earthworm can replace the natural feed sources for growing zig-zag eels in artificial culture
- There was no effect of feed source on fish survival rate
- Commercial fish feed did not support growth of zig-zag eels

**Thank you for your
attention**