

# Feeding behavior of Sole, bred in captivity

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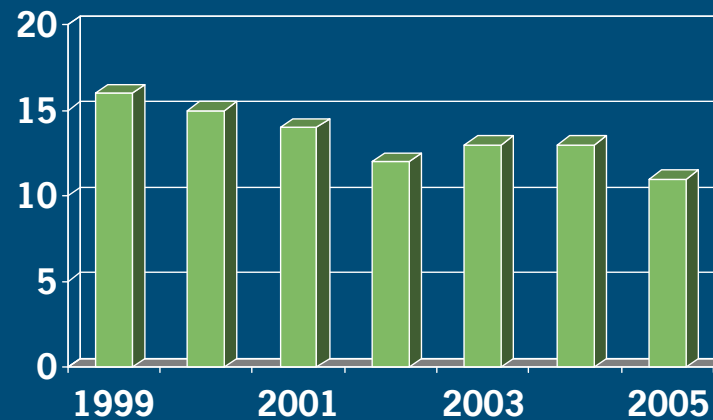


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# Potential of Sole culture

- Theme 3. The use of sea and coastal areas for new production and marine biotechnology.
  - Aquaculture, which species?

Dutch Sole fisheries (unit 1000 tons)



# Development: Sole culture

## Type of Sole culture

### ■ Intensive: “Solea BV”

- Dry feed
- No hiding substrate
- High control environment
- ...



### ■ Extensive: “Zeeuwse tong”

- Life feed (rag worms)
- Hiding substrate
- Low control environment
- ...



# Bottleneck Sole culture: growth

- Slow and unpredictable growth  
(Mean growth low; individual variation high)
  - Current lead time: 2 years
- Specific growth rate
  - Sole (Schram et al., 2006: 40-75 g fish): 0.4 - 0.7 %/d
  - Nile tilapia (Tran-duy et al., 2008; 50-150 g fish): 2.7 - 2.8 %/d

Slow growth  $\leftrightarrow$  Low feed intake



# Improving growth: past and current research

## ■ Nutrition:

- Attractants
- Natural food (e.g., rag worms: Phd IMARES)
- ...

## ■ Breeding:

- Selective breeding for growth (Phd project Solea w. ABG)

### This project:

interface feeding and non-feeding behaviour  $\leftrightarrow$   
(genetic potential) growth and feed intake



# Hypothesis

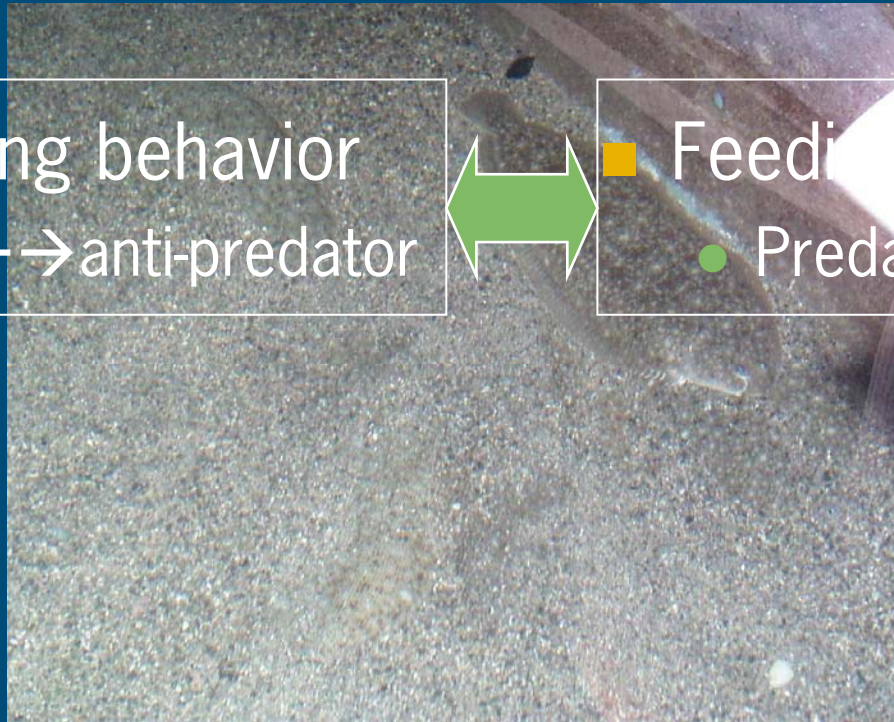
- In sole: Low feed intake related to behavior.

Conflict:

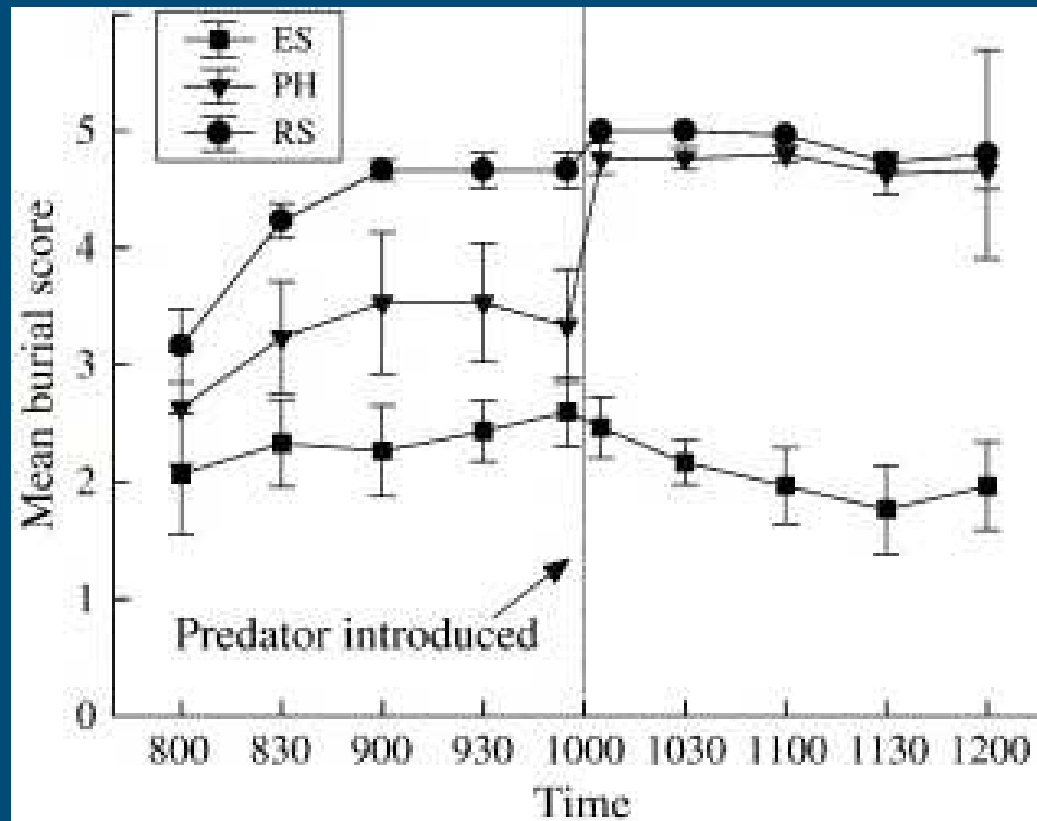
- Non-feeding behavior
  - Hiding ← → anti-predator



- Feeding behavior
  - Predation risk



# Anti-predator behavior flatfish

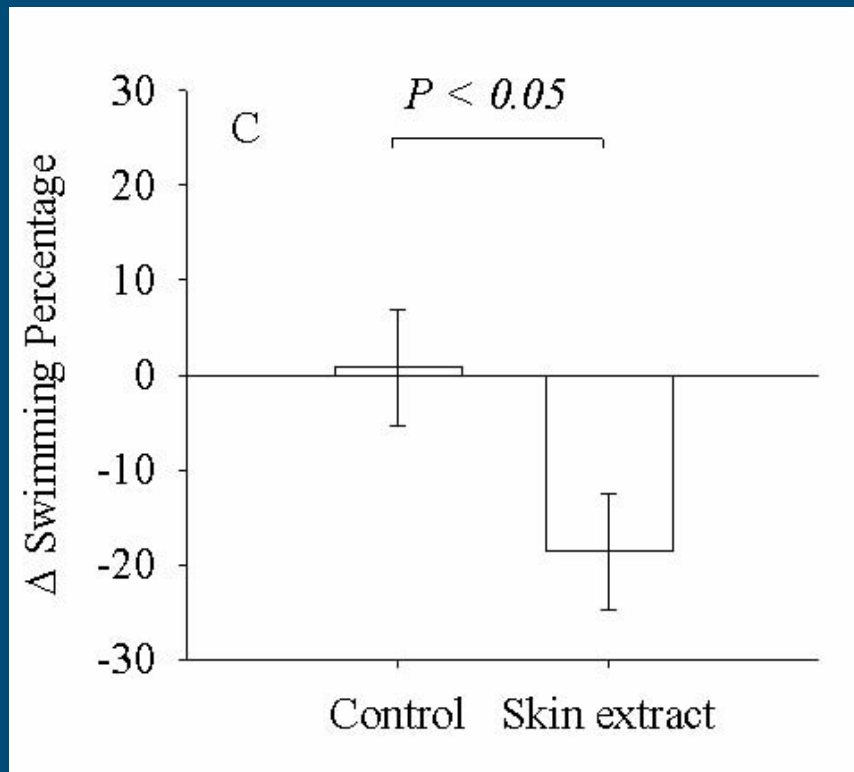


ES= English sole; PH= Halibut; RS = Rock sole (Lemke & Ryer, 2008)

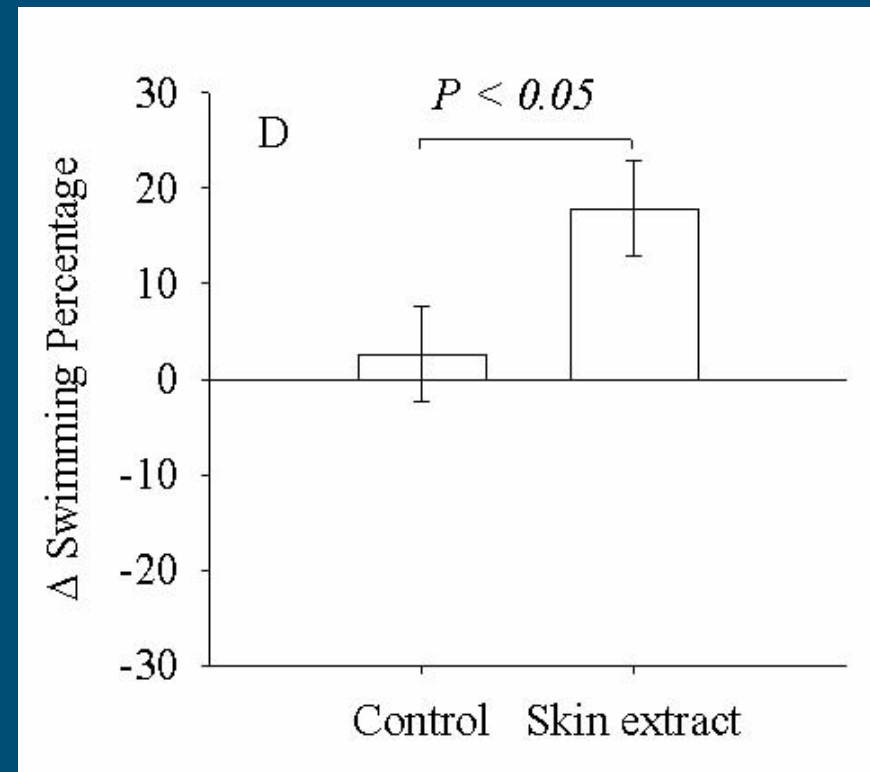


# Anti-predator behavior: relation growth $\leftrightarrow$ feed intake

High feed efficiency



Low feed efficiency

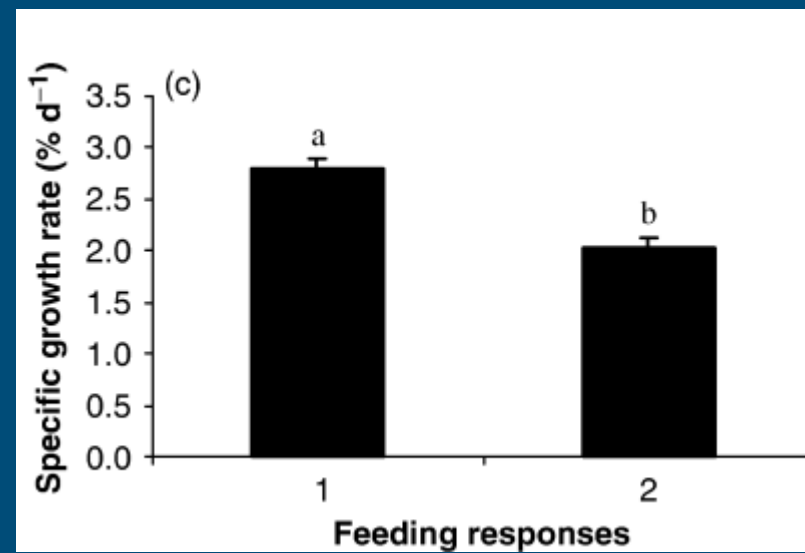
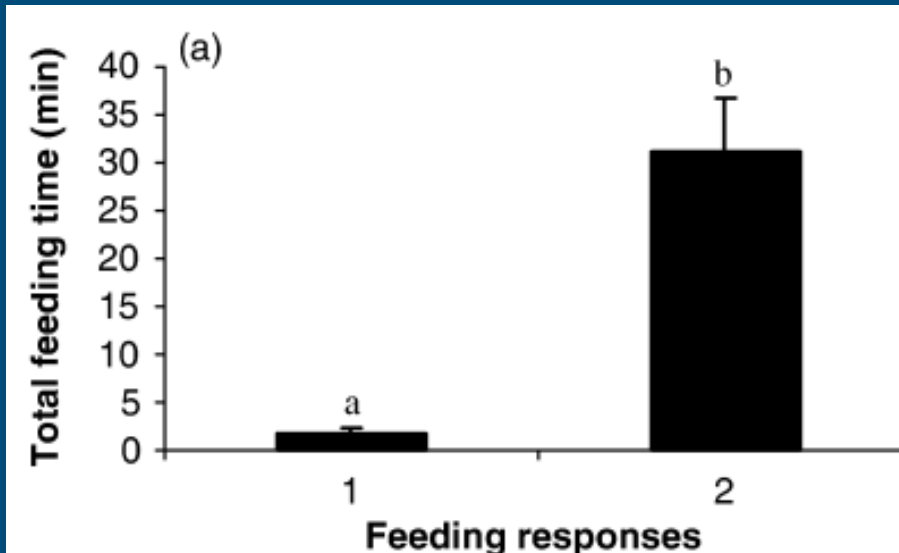


African catfish: alarm pheromones (van de Nieuwegiessen et al., 2008)





# Feeding behavior: relation growth $\leftrightarrow$ feed intake



African catfish: Fast versus slow eating individuals (Martins et al., 2005)



# Hypothesis

- In sole: Low feed intake related to behavior.

Conflict:

- Non-feeding behavior
  - Hiding  $\leftrightarrow$  anti-predator



- Feeding behavior
  - Predation risk

- Variation behavior  $\rightarrow$  variation in growth
- Environment  $\rightarrow$  relation behavior & growth
- Genotype by environment interaction



# Objectives

- Main: assess the importance of (non-)feeding behavior of sole in relation to growth and environmental conditions; and the extend/degree of genotype by environment (GxE) interaction.
  - To develop behavioral tests to explain variation in feed intake and growth.
  - To quantify/quantify which (non-)feeding behavior traits contribute to variation in feed intake and growth.
  - To asses environmental factors affecting the relationship between behavioral traits and growth/feed intake.
  - To assess the existence of GxE interaction.



# Thank you

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