

Individual variation in feed intake and growth of sole: A Pilot study

PhD candidate: Julia Mas Munoz

Collaborating institutions and supervisors:

Aquaculture and Fisheries group: Johan Schrama & Johan Verreth

Animal Breeding and Genetics group: Hans Komen & Johan van Arendonk

IMARES: Oliver Schneider



Outline

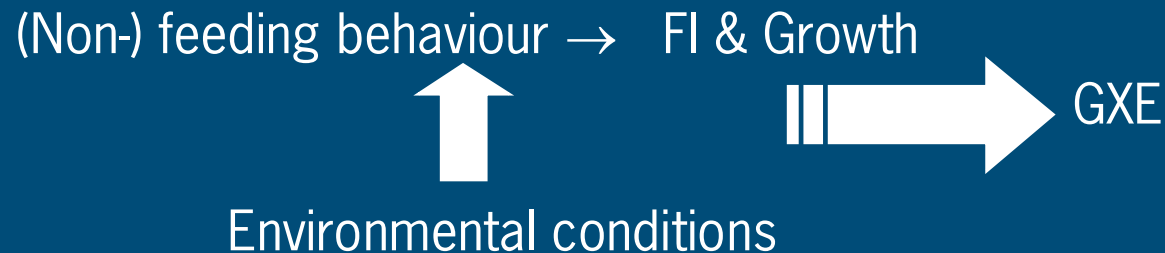
- Scope of the study
- Introduction
- Problem Definition
- Research Questions
- Materials & Methods
- Results
- Discussion & Conclusions
- Further Research



Scope of the study

■ Initial study for the PhD Project:

“Feeding behaviour and growth of Sole bred in captivity”



■ Specific objective of this pilot study:

To study in 100 sole relationship between:

- Behavioural traits
- Feed intake
- Growth



Introduction: SOLE CULTURE

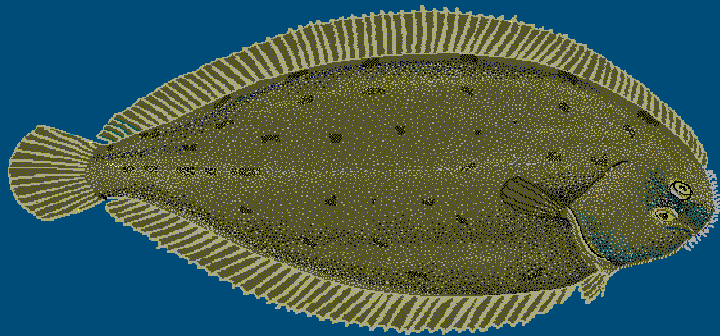
- Potential of Sole culture
 - Consumer popularity
 - High market value
 - Decline of natural stocks
 - Diversification of present marine fish industry
- Sole culture in The Netherlands
 - Intensive RAS system “Solea BV”
 - Extensive integrated system “Zeeuwse tong project”



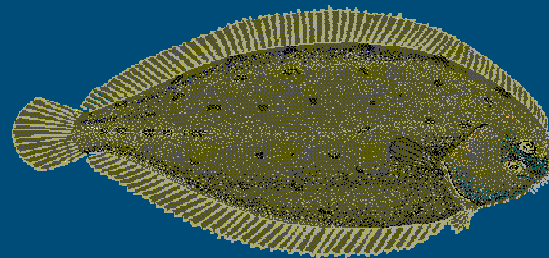
Bottleneck Sole culture: GROWTH

■ Slow and unpredictable growth

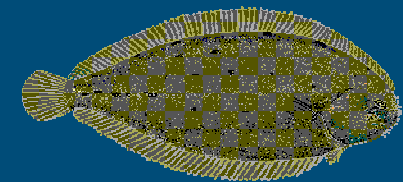
- Mean growth low:
 - SGR 0.4 - 0.7 %BW/day (Schram et al., 2006)
 - current lead time: 2-3 years
- High individual variation growth: 30-50% (Blonk et al., unpublished data)
After 36 months, final weight:



270gr



180gr



88gr



Behaviour in Flatfish

- Anti-predator behaviour: minimum detection
- Feeding behaviour → Trade off between Fear & Hunger

Non-feeding behaviour

- Anti-predator: hiding motivation
- Activity levels
- Copying styles



Feeding behaviour

- Feeding motivation
- Feeding frequency, meal size



Fear



RESEARCH QUESTIONS

HYPOTHESIS:

Variation behaviour → variation feed intake → variation growth

■ Research questions:

- How much of the individual variation in growth is explained by individual differences in feed intake?
- Are differences between individuals in growth and feed intake related to (non-)feeding behavioural characteristics?



MATERIALS AND METHODS I: Experimental design

Period-1: 4 weeks



N=100

BW initial \approx 60g

Tank = 2x1x0.4m

Period-2: 4 weeks

A



B

Group Housed

N=84

BW initial \approx 67g

Tank = 2x1x0.4m



Individually Housed

N=16

BW initial \approx 70g

16 tanks of 30L



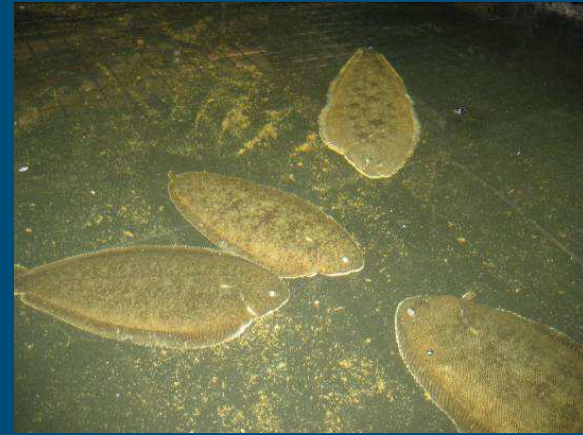
MATERIALS AND METHODS II: Housing & Feeding

- Subjects:
 - 100 sole individually tagged
- Light regime reversed (12D:12L)
- Feeding
 - 3 mm Pellets
 - Group housed: ad libitum, 8h, belt feeder
 - Individually housed: Hand fed, 3 times/day during 30 min (8.00, 12.00 & 17.00h)



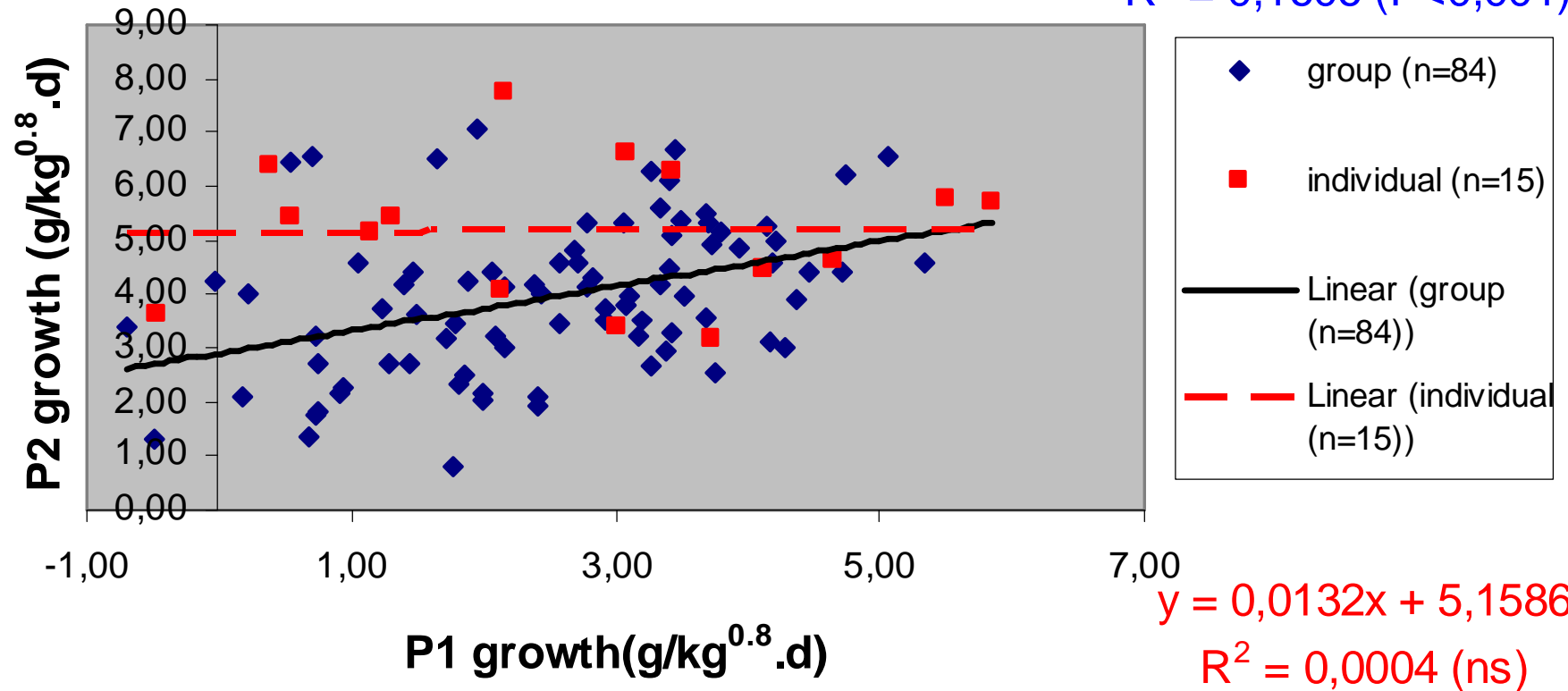
MATERIALS AND METHODS III: Measurements

- Group Housed Fish
 - Growth
 - Behavioural Tests
- Individually Housed Fish
 - Growth
 - Feed intake
 - Live Behavioural observations
 - Behavioural Tests



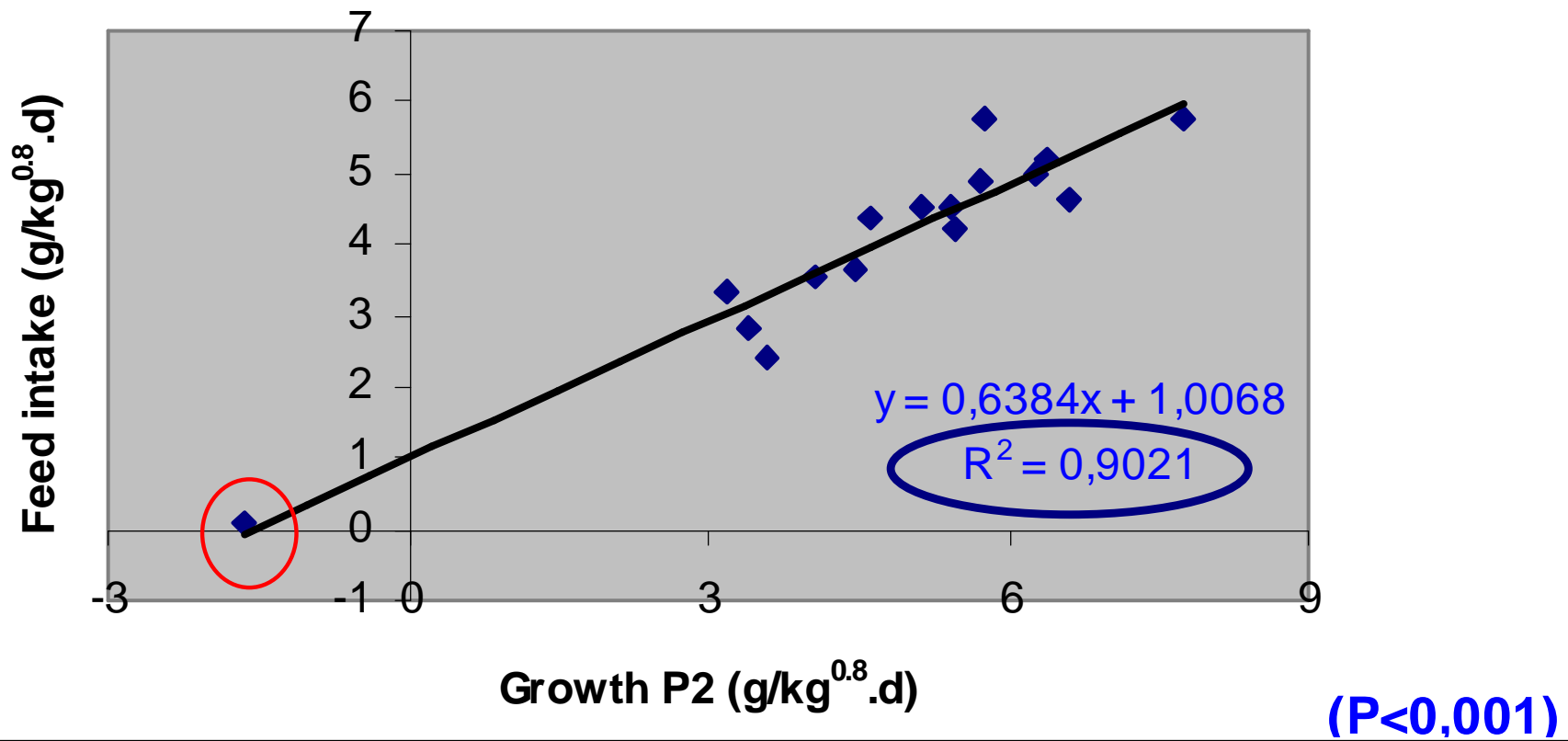
RESULTS I: Growth performance

Relation growth (P1 & P2)



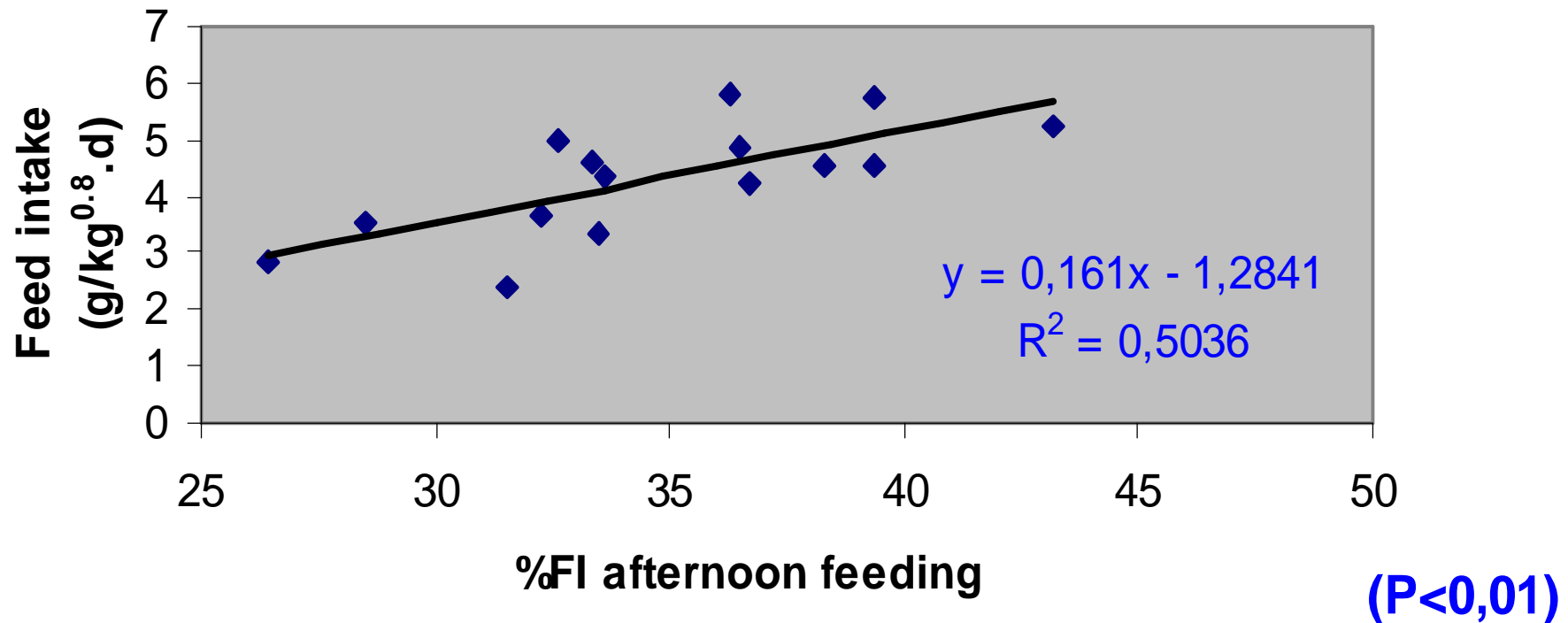
RESULTS II: Feed intake and Growth

Relationship between Feed intake and Growth



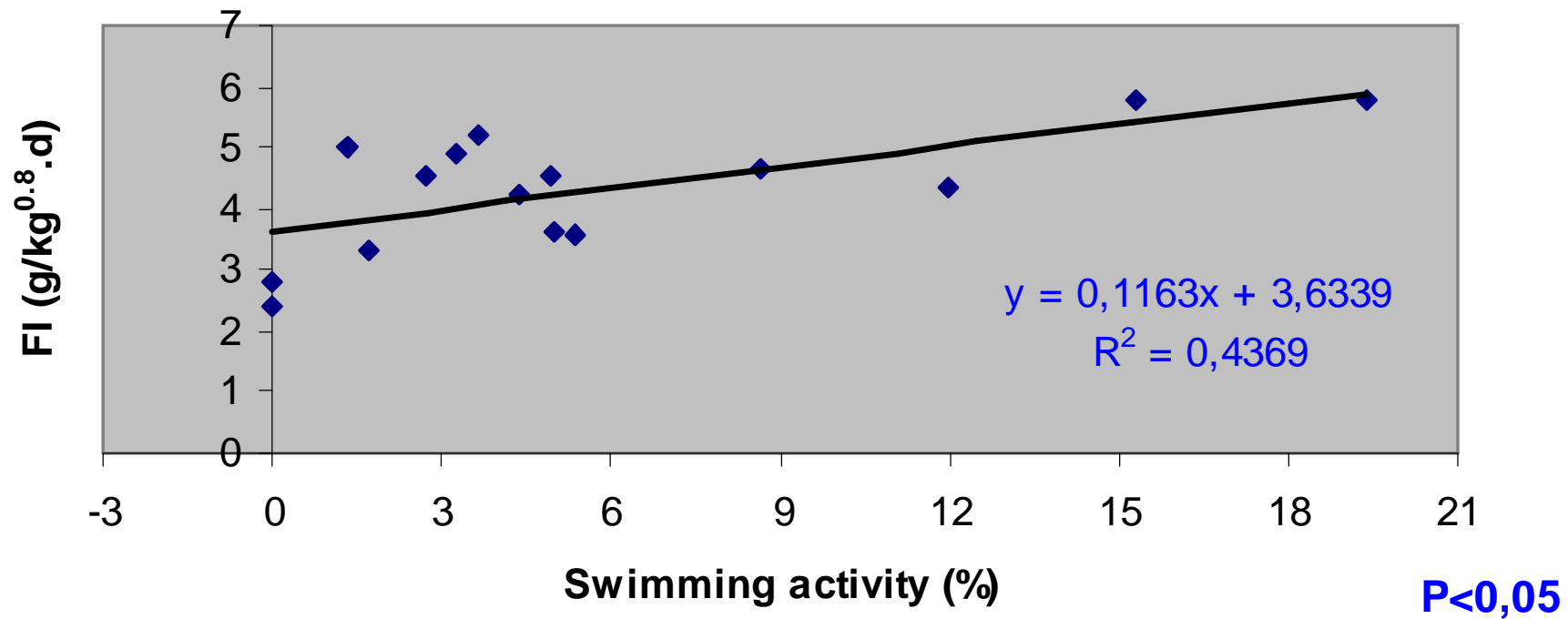
Results III: Feeding behaviour (Feeding pattern within day)

Relationship between Feed intake and %FI in afternoon feeding



RESULTS IV: Non-feeding behaviour (Activity level)

Relationship between Mean Swimming and Feed Intake



Discussion & Conclusions I

- ↑ CV Growth (57%)
- FI ↔ Growth
- Housing → Growth
 - ↑ Growth when individually housed
 - Differences in housing
 - Different tanks, feeding procedure, social environment



Discussion and Conclusions II

■ Feed Intake of individual fish related to:

- Feeding pattern (feeding behaviour)

- $\uparrow\%FI$ in the afternoon \leftrightarrow \uparrow total FI and Growth

- Non-feeding behaviour (activity)

- Active fish \leftrightarrow higher feed intake (and growth)
- Suggestion bold fish have higher FI \rightarrow Question: is this a tradeoff of low anti-predator behaviour?



Further Research...

- Phase I: Behavioural tests development
 - Novel environment
 - Feeding motivation
 - Light avoidance
 - Anti-predator behaviour: reaction to chemical cues
- Phase II: Environmental factors → behavioural traits, FI & growth
- Phase III: GxE interaction



Significance and Utilization

- Improve understanding of fish growth & individual variation
- Optimize culture systems
- Behavioural traits related with high FI/growth can be used in selection strategies
- Insight GxE can be used for future genetic selection of fish with high adaptive capacity



PROGRESS IN SOLE CULTURE



THANK YOU!
QUESTIONS??



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