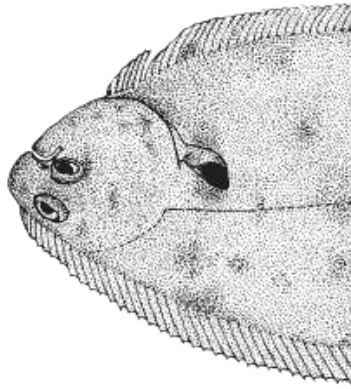
Patterns of reproductive investment: a case study of common sole (*Solea solea*) in the North East Atlantic



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[1]Ghent University

[2]Flanders Research Institute for Agriculture, Fisheries and Food (ILVO)

[3]Wageningen University and Research (WUR)

GHENT UNIVERSITY

MARINE BIOLOGY

ILVO Flanders Research Institute for Agriculture, Fisheries and Food

WAGENINGEN UNIVERSITY & RESEARCH

fwo Research Foundation Flanders Opening new horizons

Introduction

Otolith increments in common sole (*Solea solea*) reveal fish growth plasticity to temperature

Tuan Anh Bui [a,b,*], Marleen De Troch [a], Jan Jaap Poos [c,d], Adriaan Rijnsdorp [d], Bruno Ernande [e], Karen Bekaert [b], Kélig Mahé [f], Kelly Díaz [a], Jochen Depestele [b]

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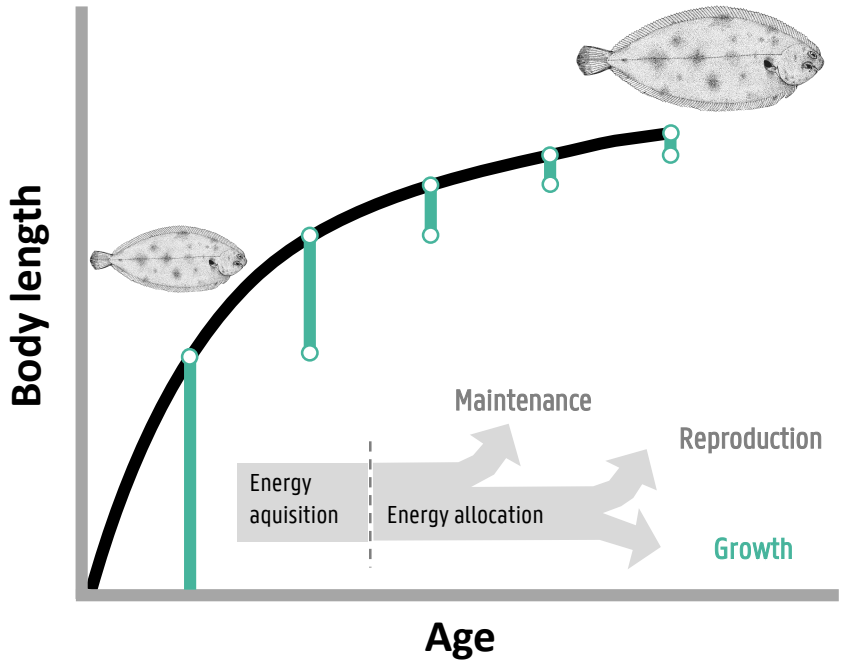
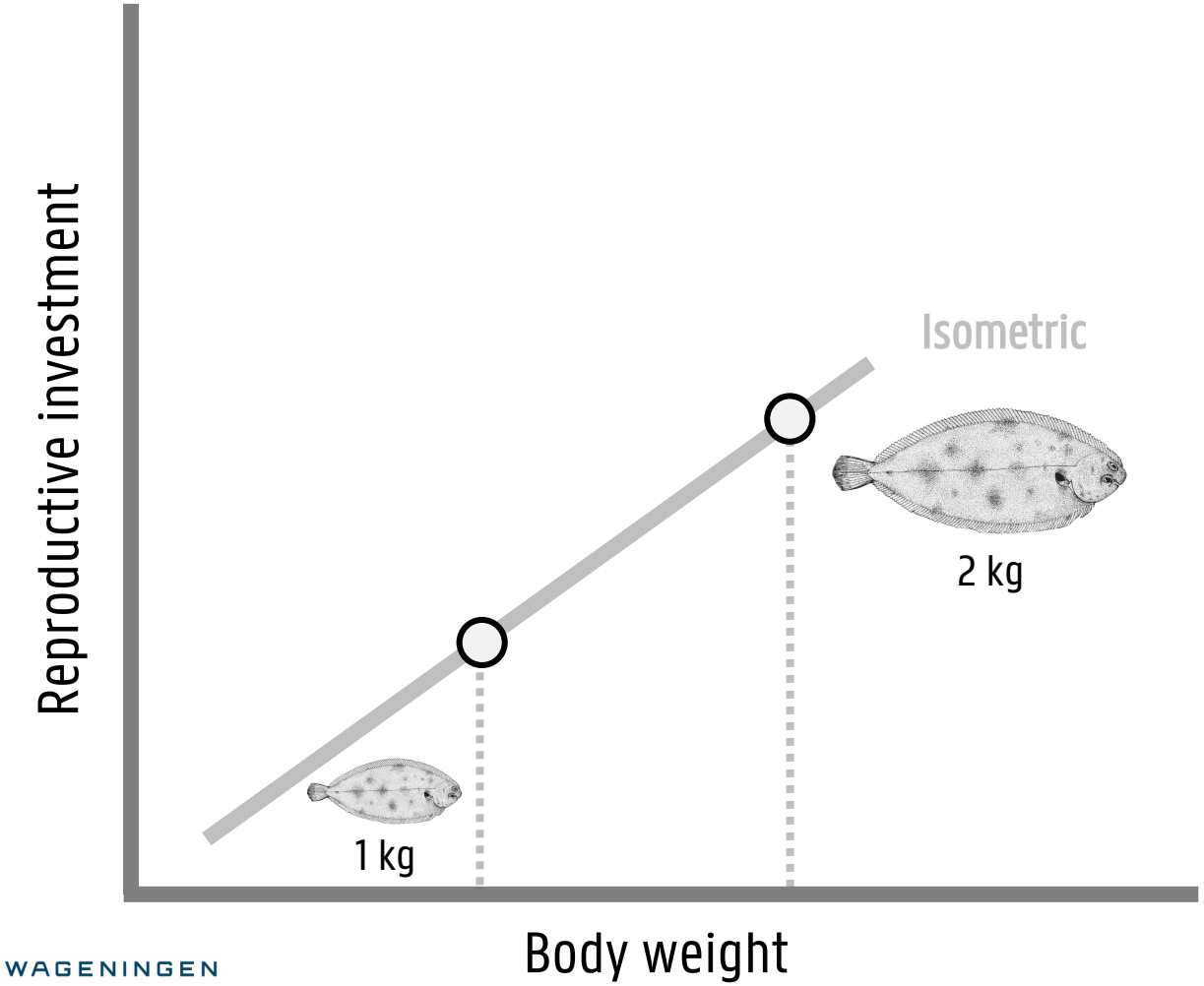


Q1. How reproductive investment scales with body size?



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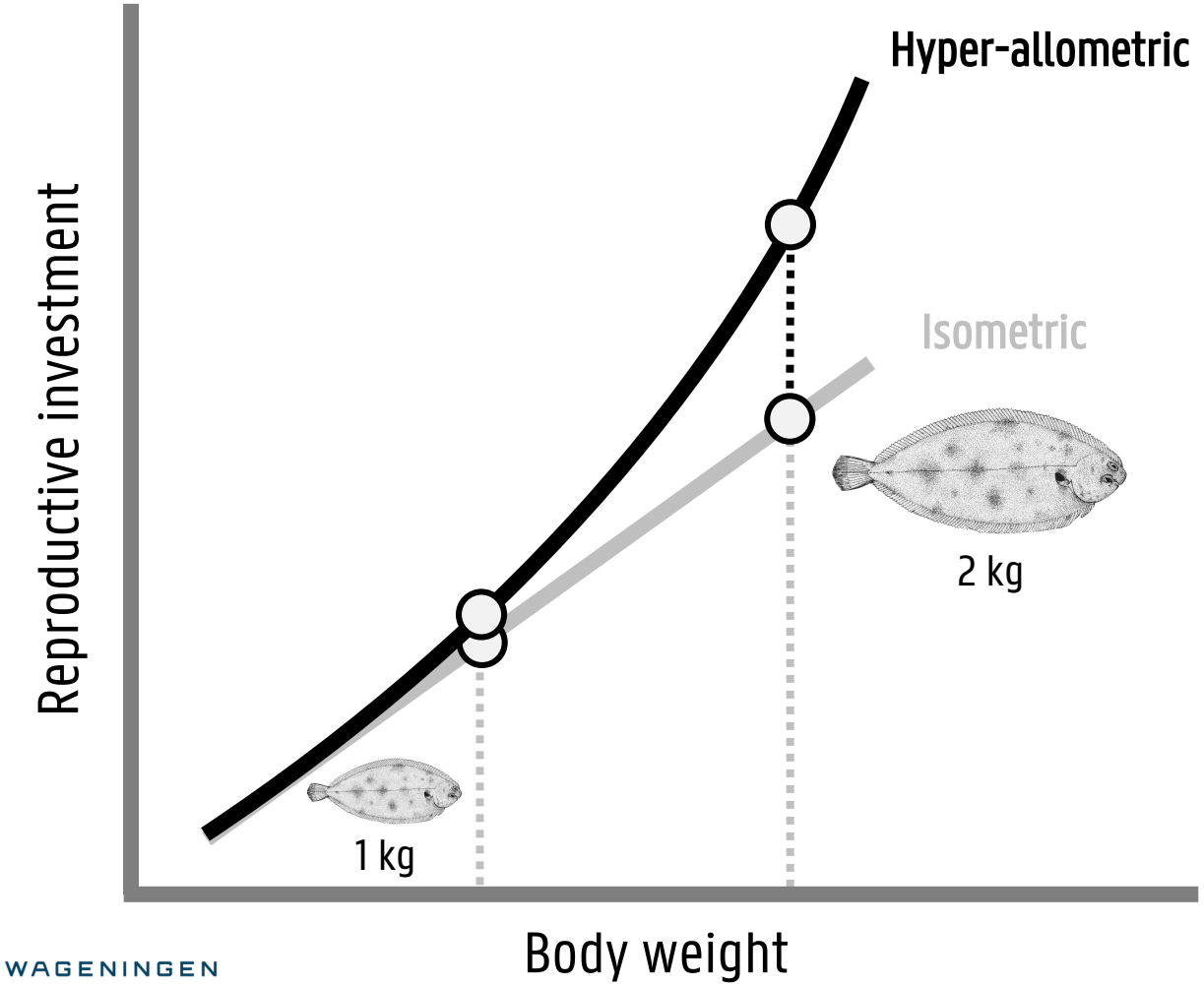

Q1 | Methods

Gonad weight as a proxy of reproductive investment

- Female

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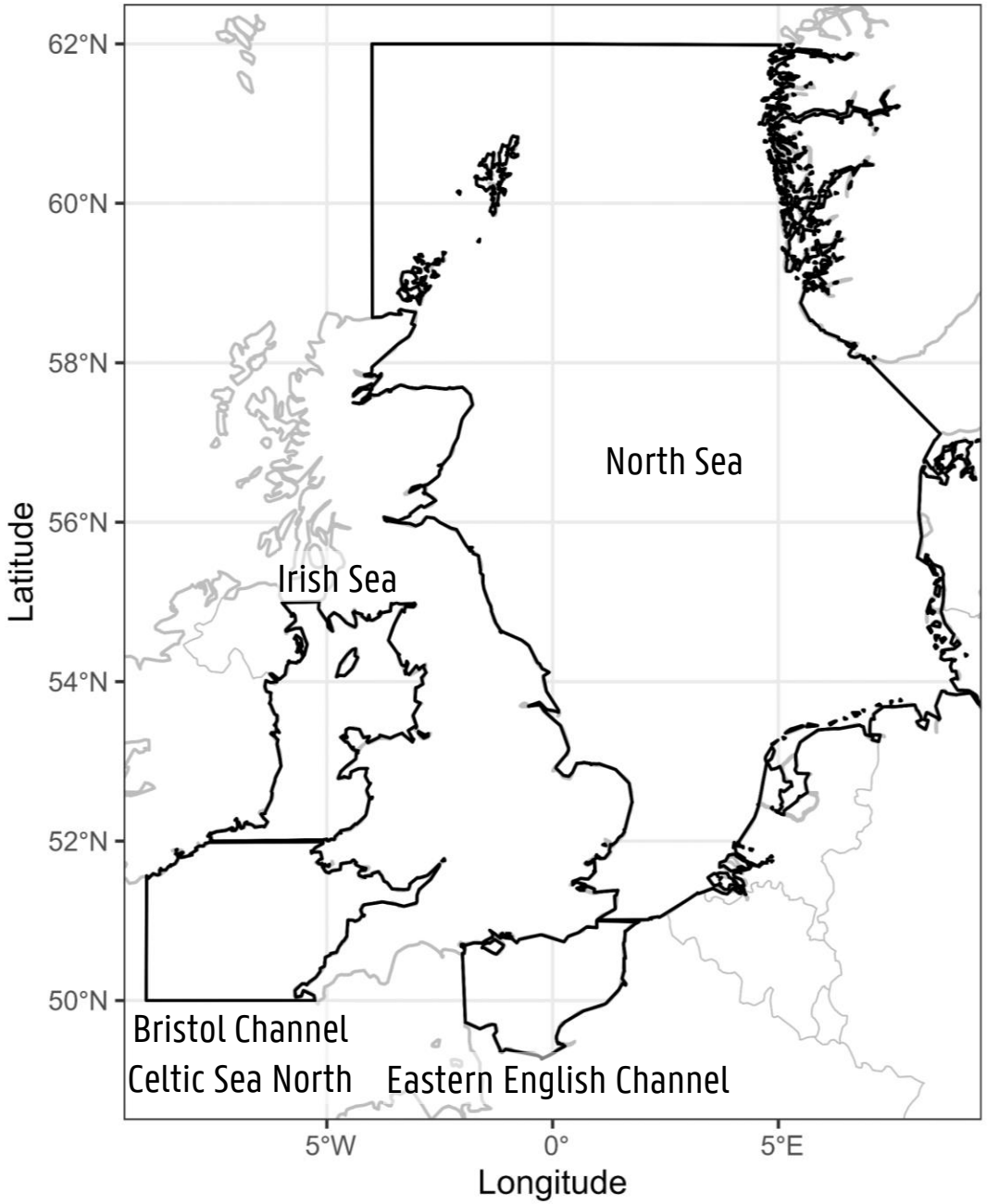

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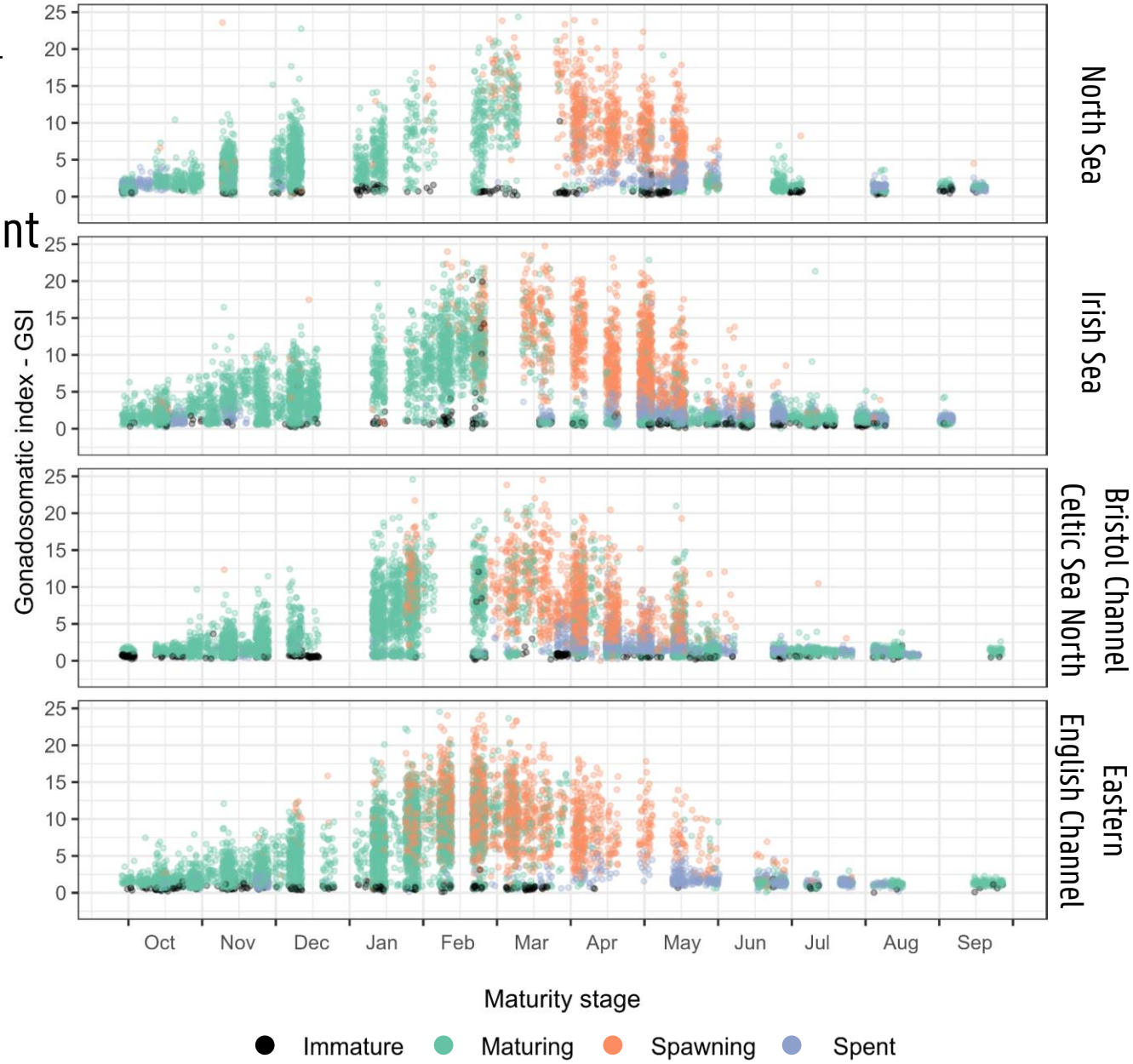

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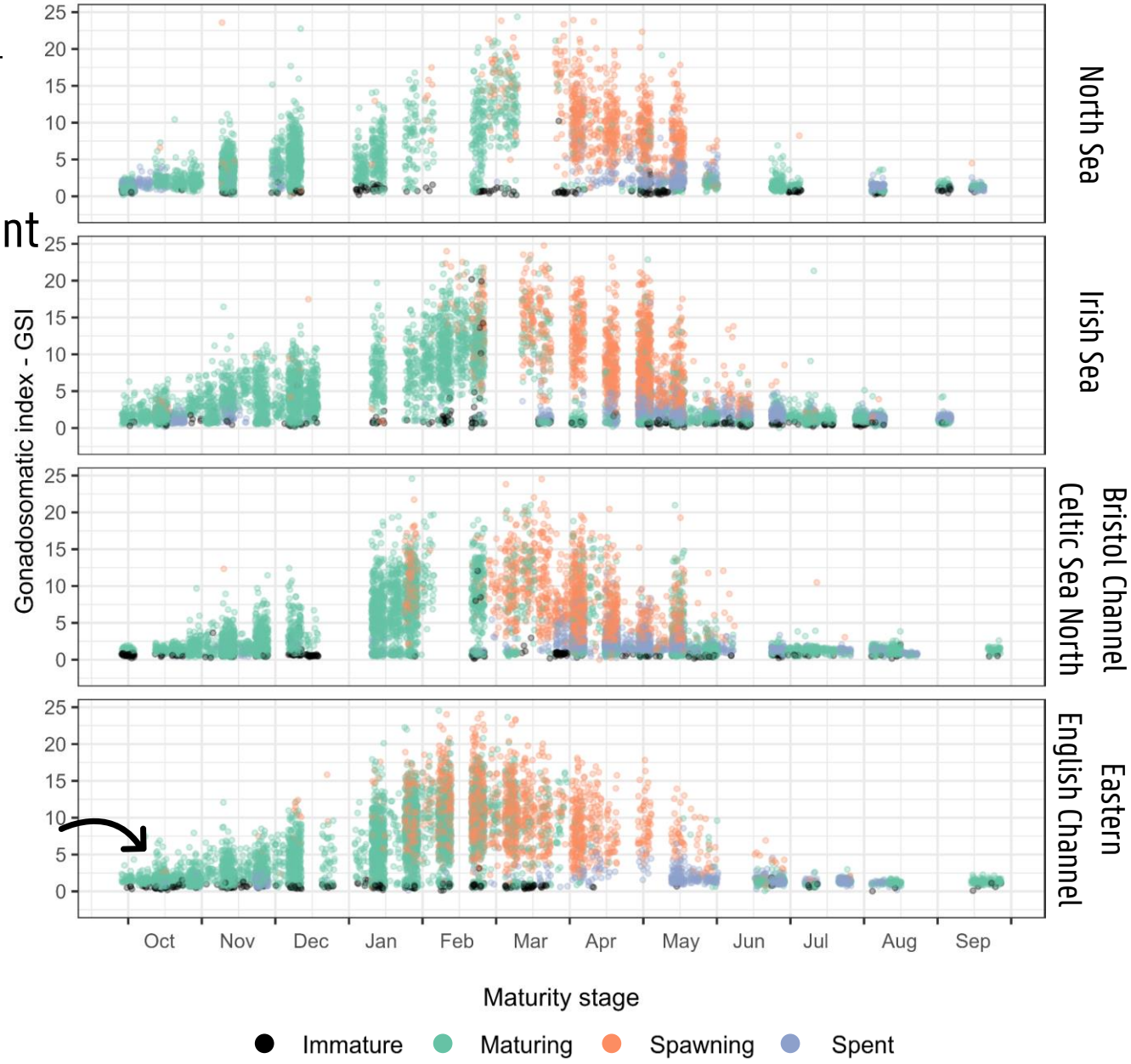

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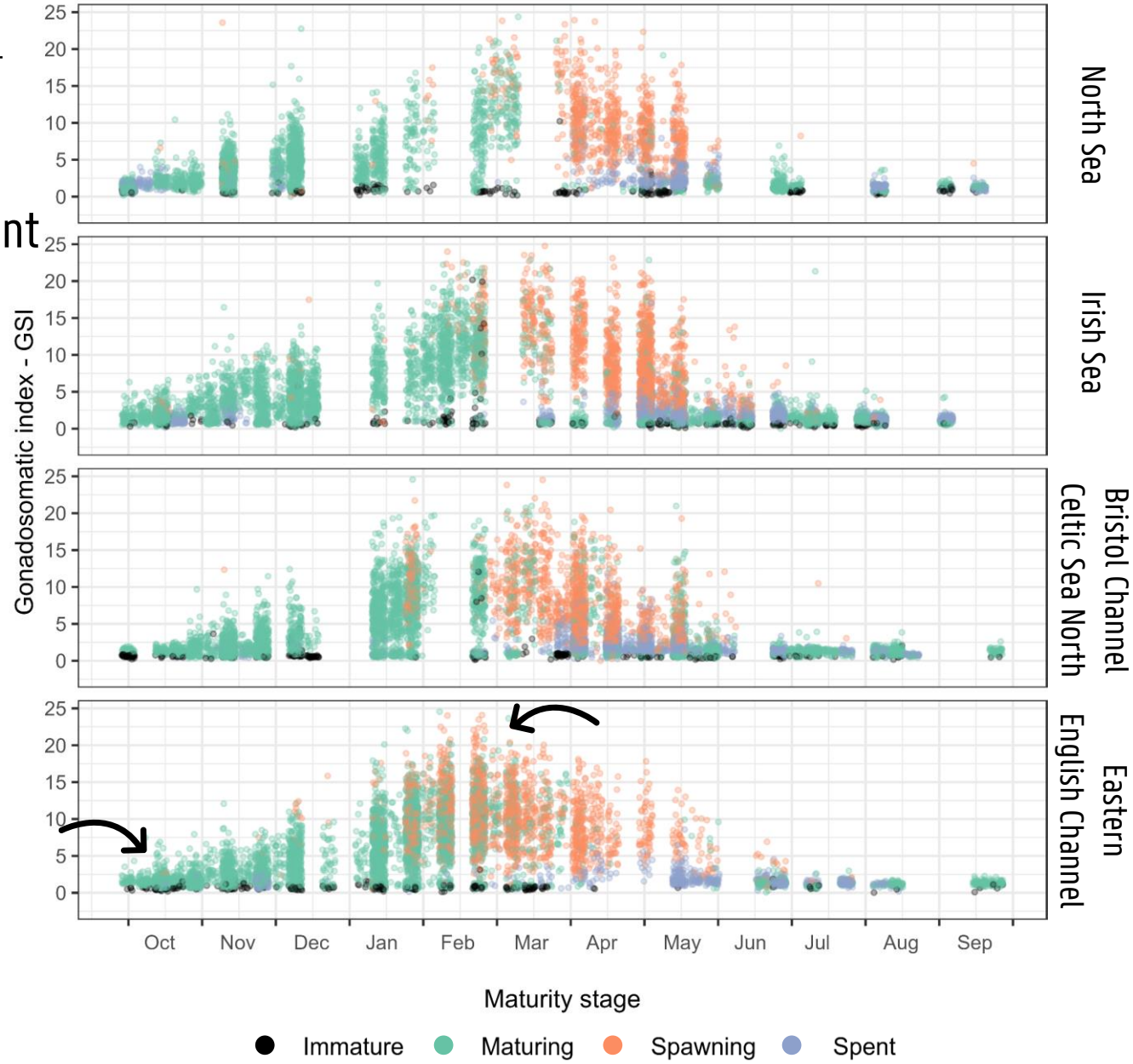

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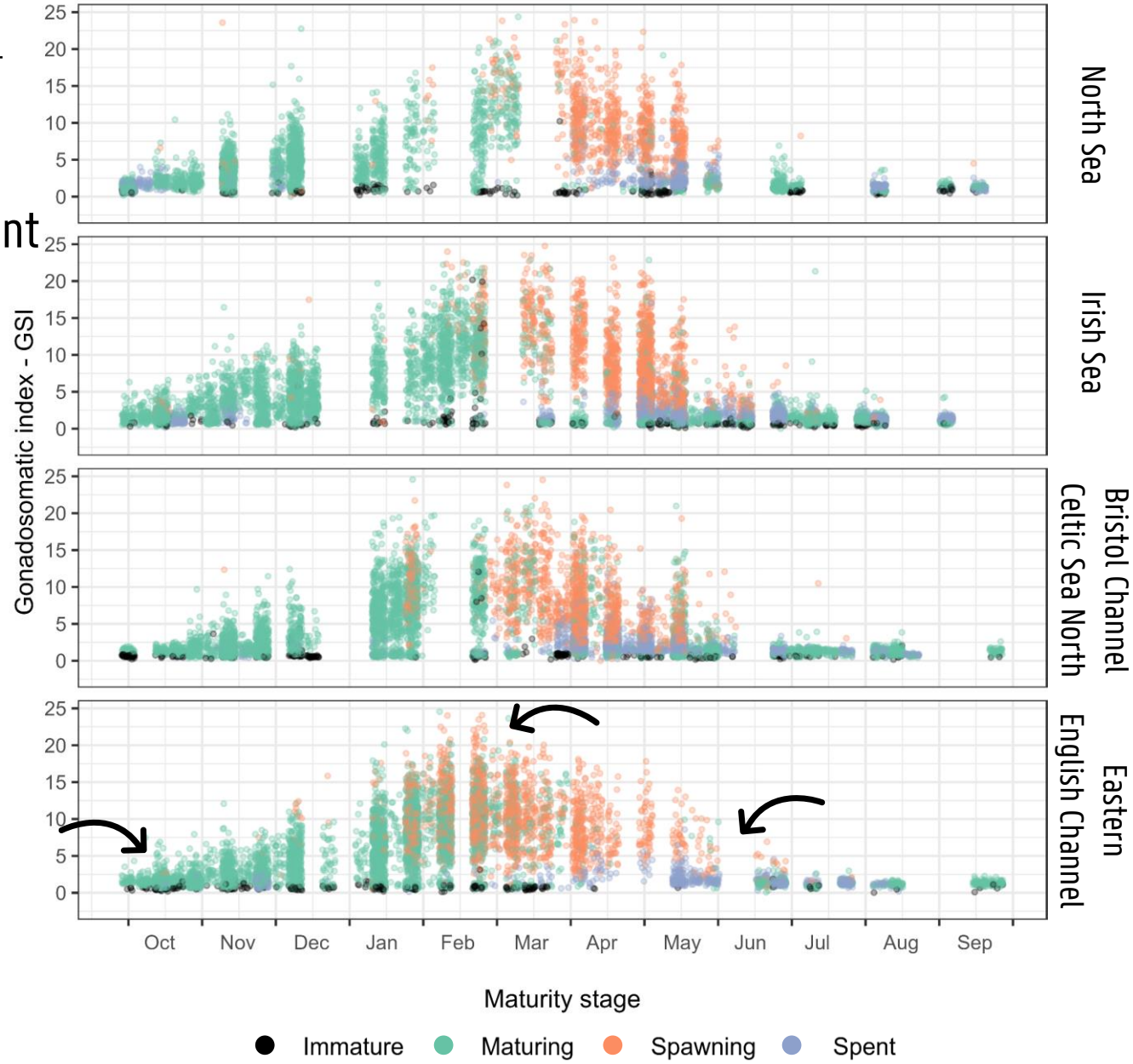

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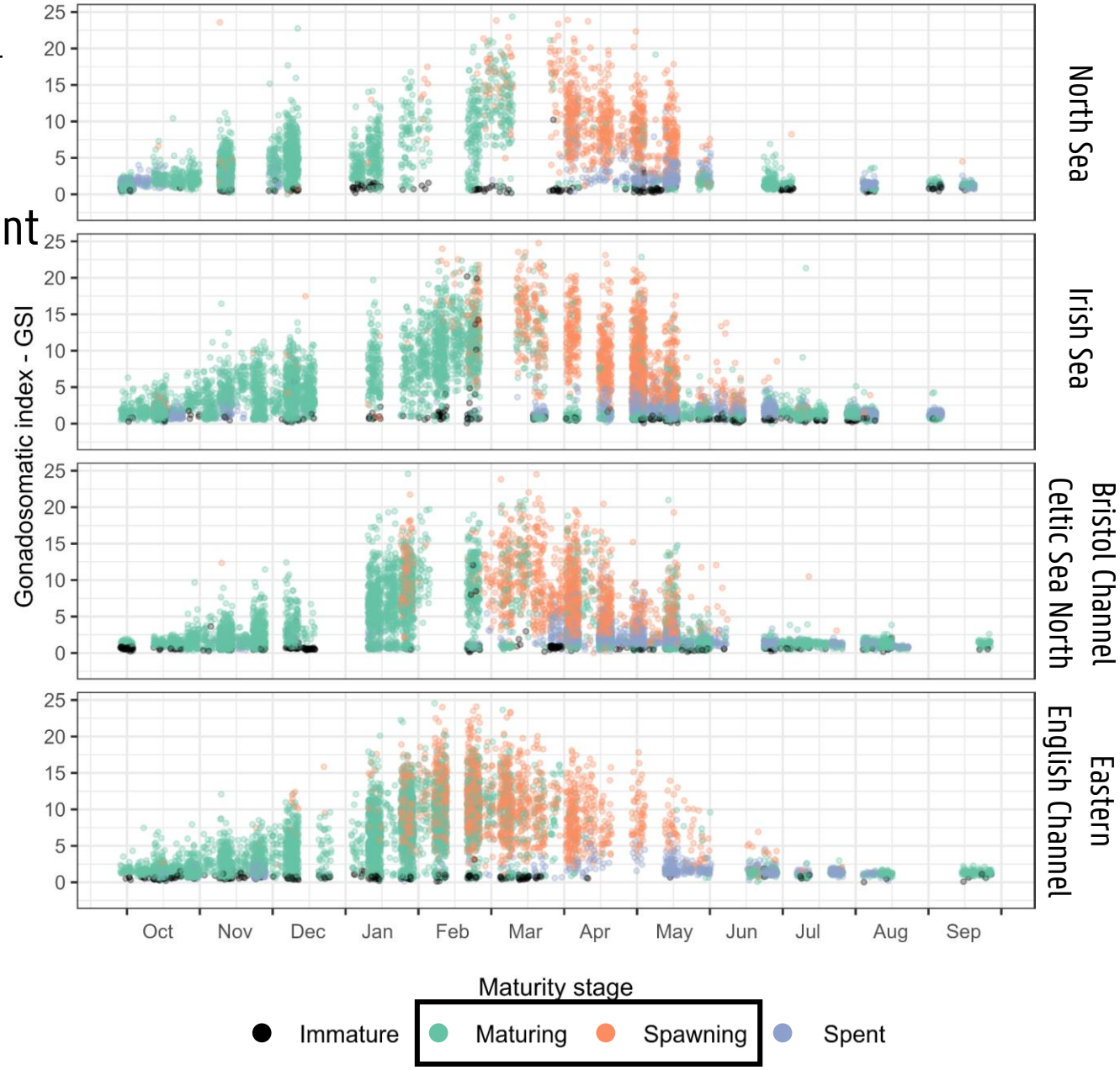

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Gonad weight as a proxy of reproductive investment

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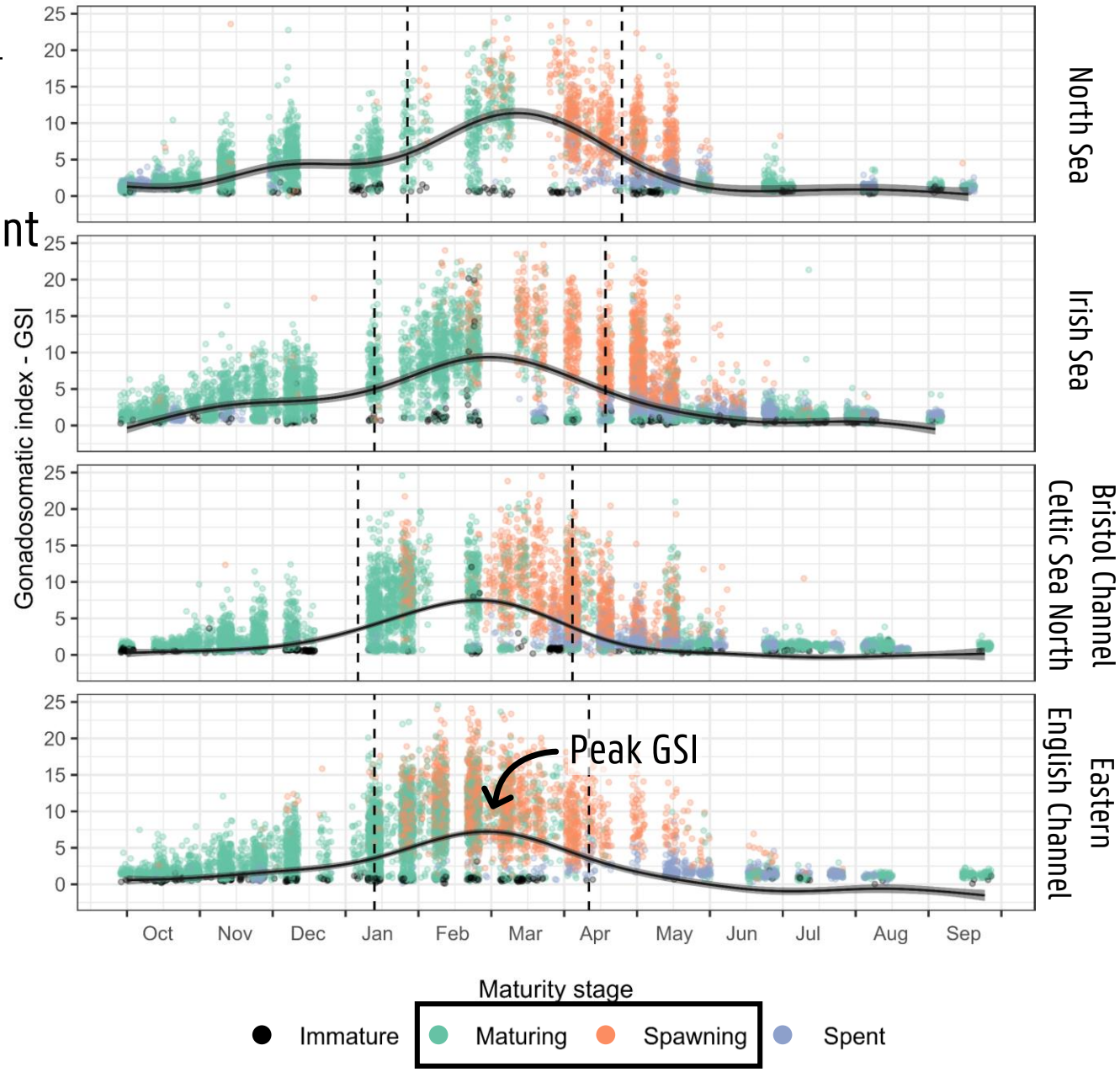
- Period: average GSI ≥ 50% peak GSI



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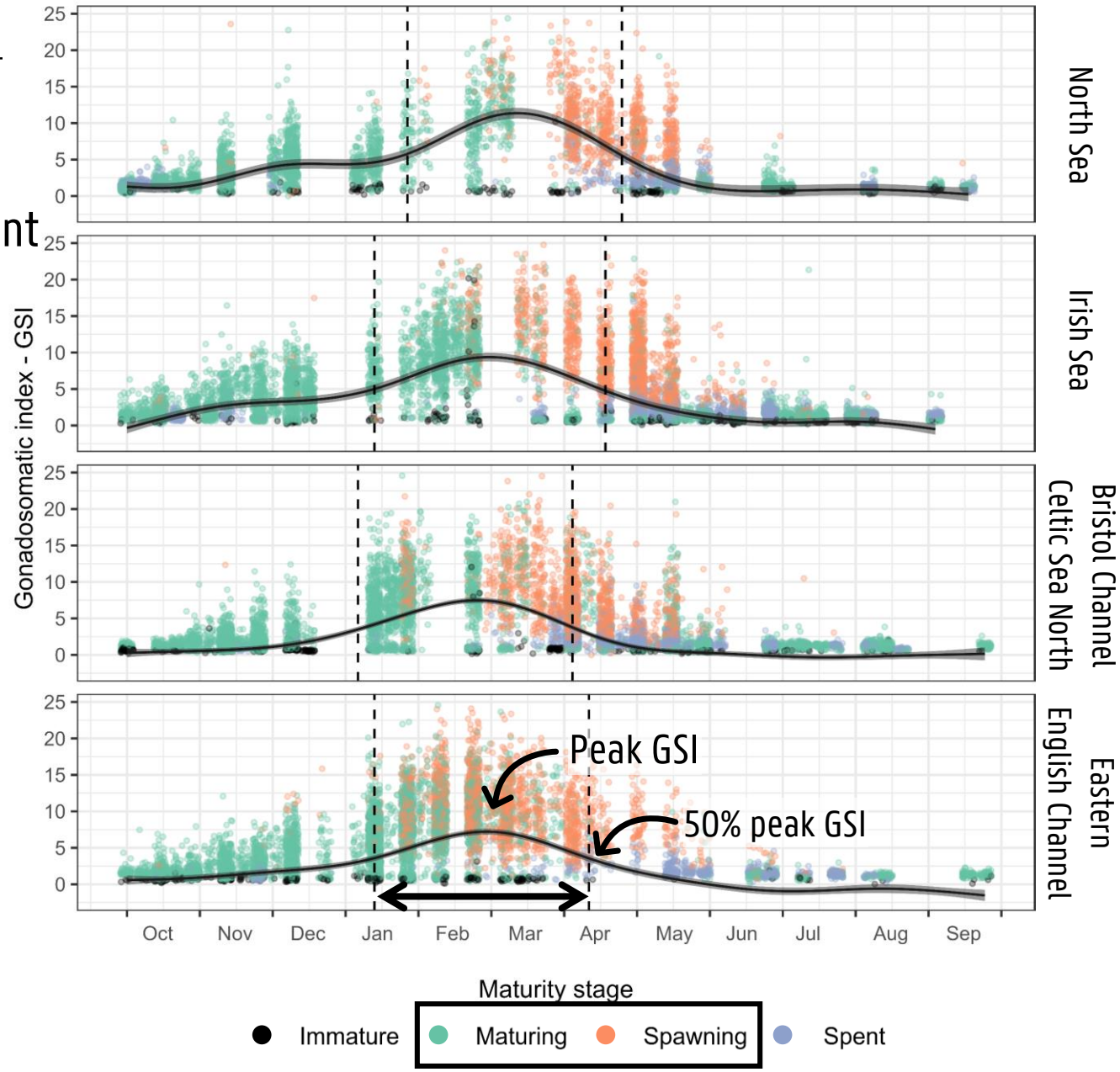

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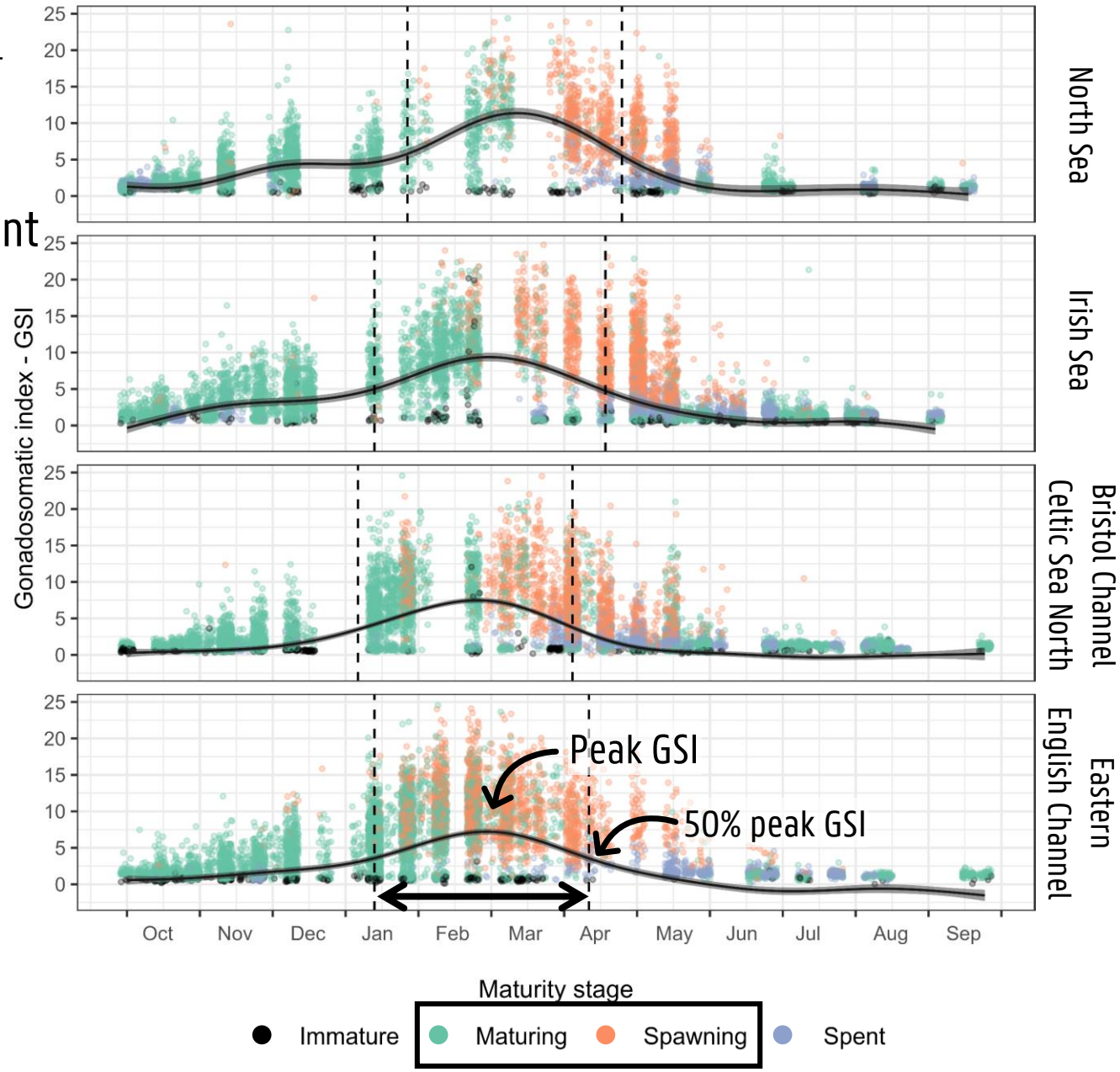
Final dataset: 7906 observations (2004-2022)



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Reproductive investment scaling

$$W_{gonad} = aW_{body}^{\beta}$$

$\beta = 1$ isometric scaling

$\beta > 1$ hyper-allometric scaling

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Reproductive investment scaling

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$\beta > 1$ hyper-allometric scaling

$$W_{gonad} = aW_{body}^{\beta}$$

$$ln(W_{gonad}) \sim ln(a) + \beta * ln(W_{body}) + \beta_c * ln(c) + \beta_m * m + a_w + a_y + \varepsilon$$

Body condition

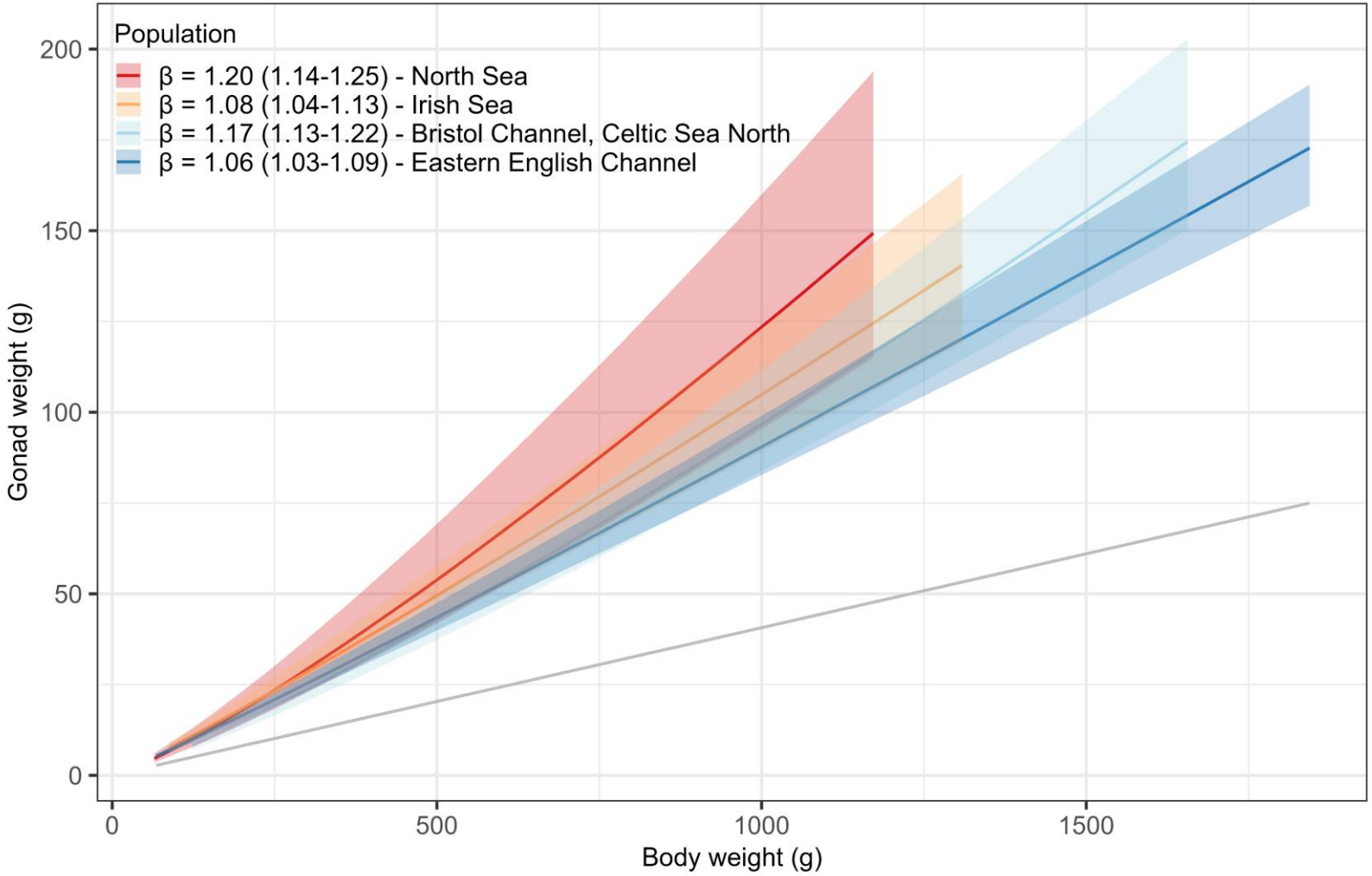
Maturity stage

Week

Year

Q1 | Results and Discussion

Reproductive investment scales **hyper-allometrically** with body size



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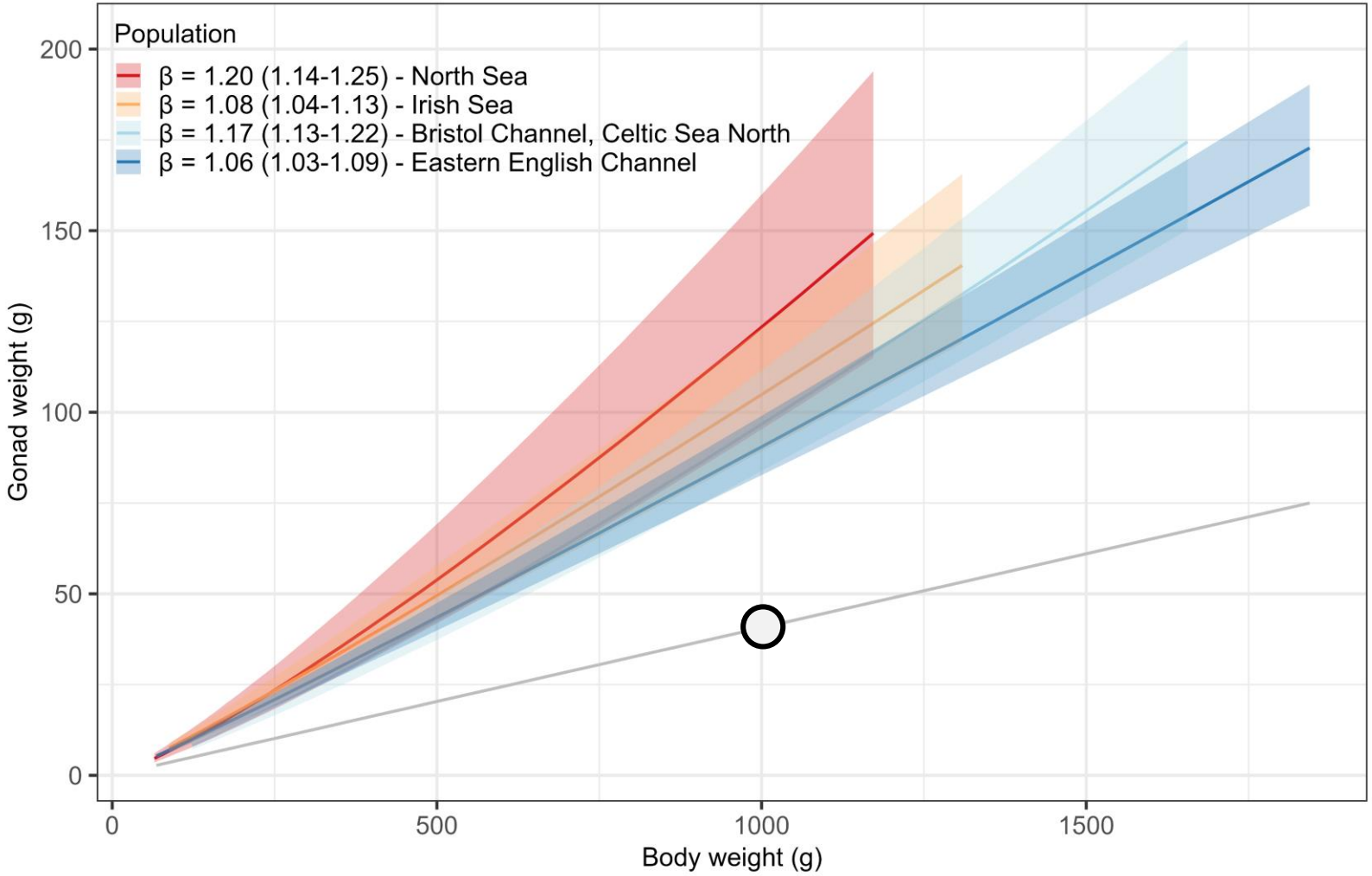

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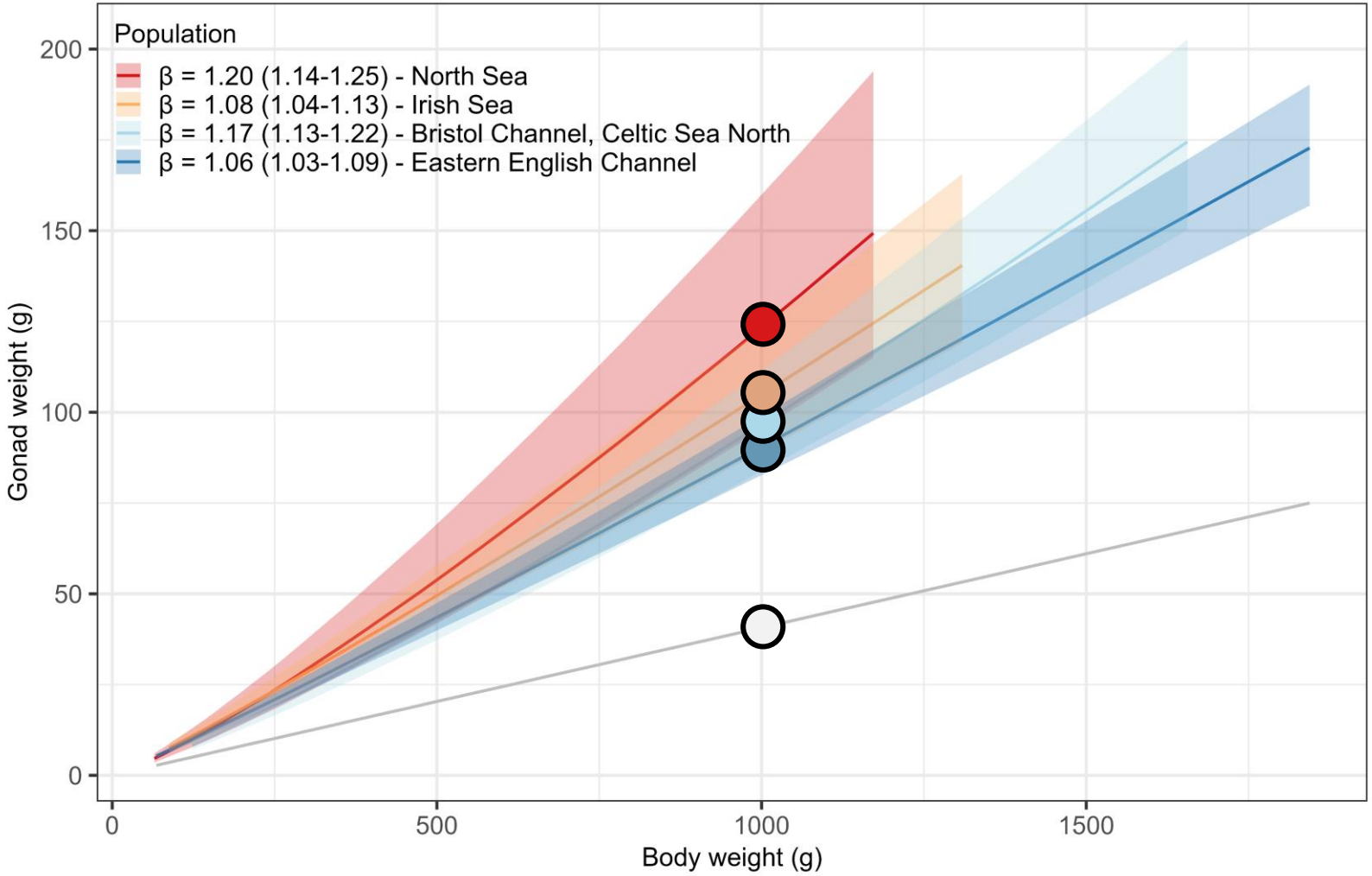


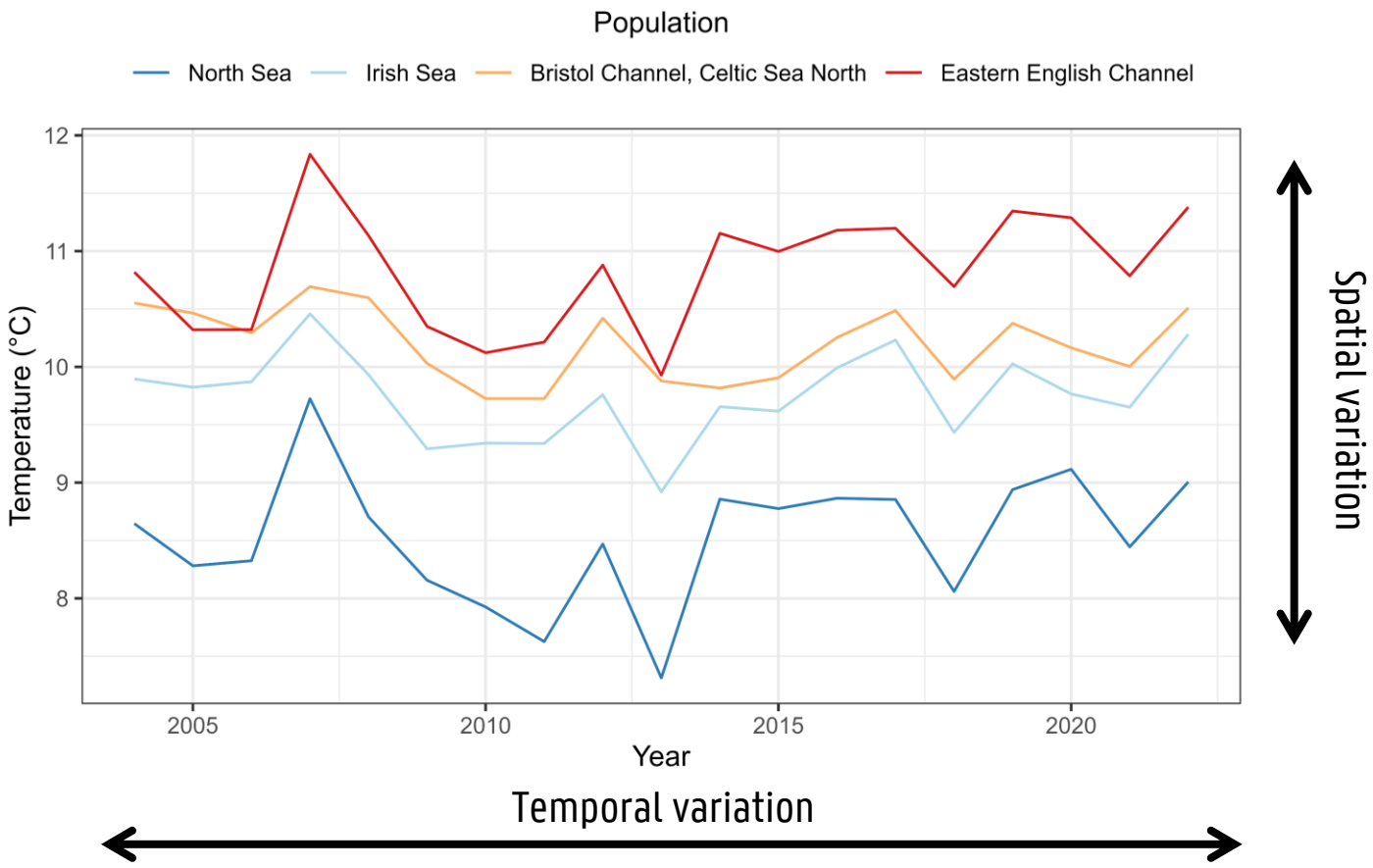
Q1 | Results and Discussion

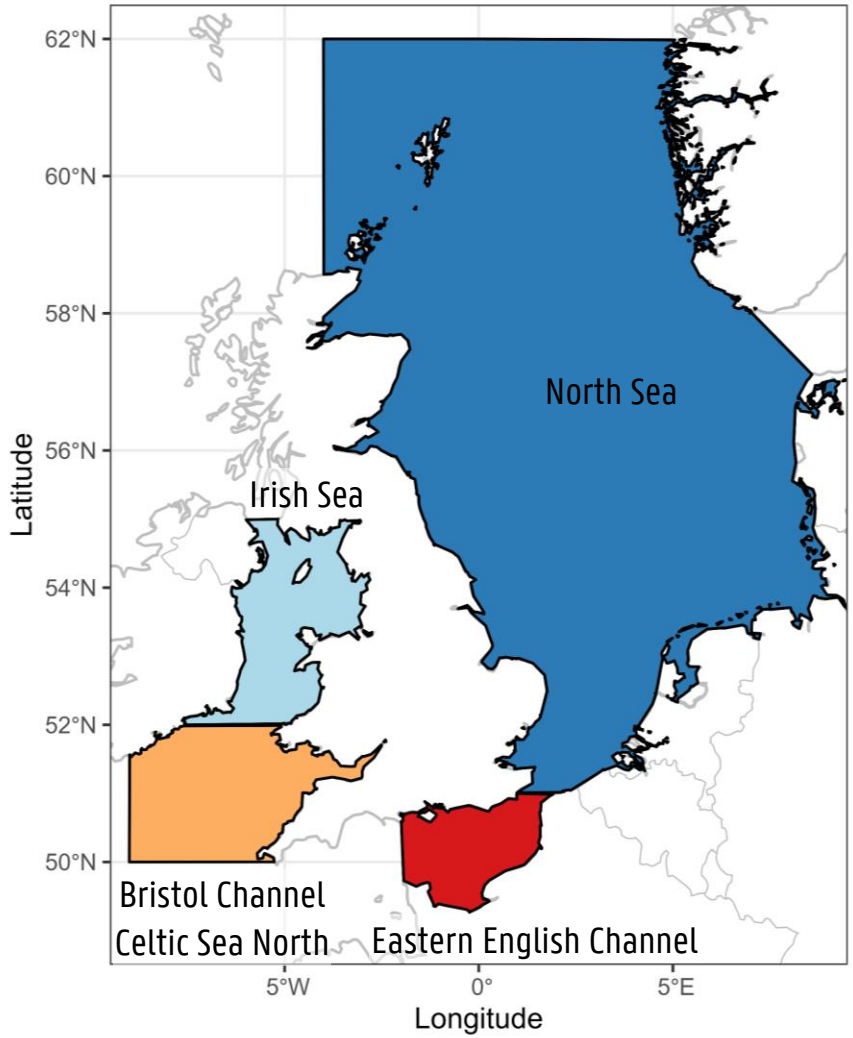
Management implication

Not account for hyper-allometric reproductive investment -> over-estimation of stock reproductive potential?

- Limited (< 10%) Andersen et al. (2019)
- Significant (3-78%) Marshall et al. (2021)

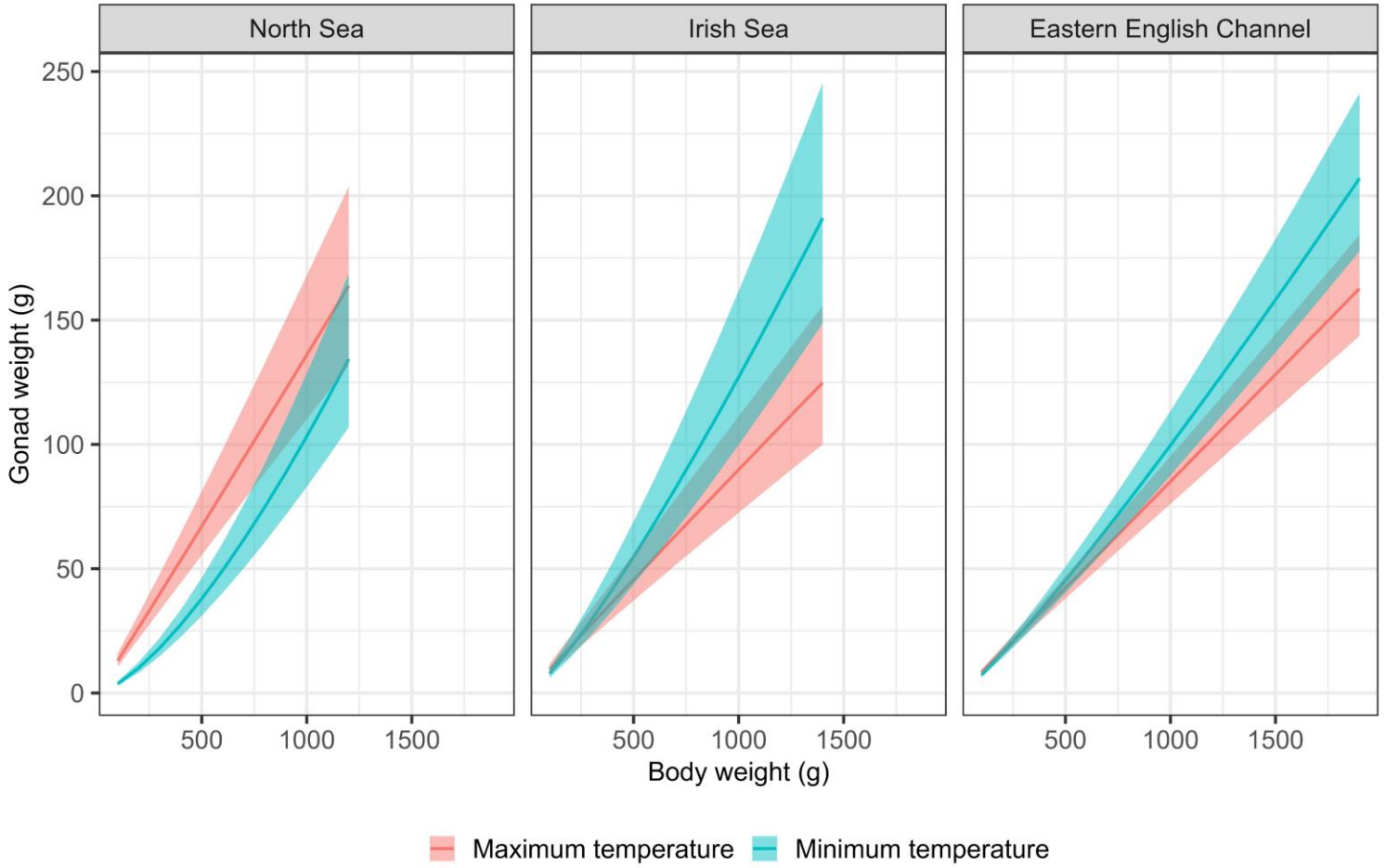
Q2: How temperature affects reproductive investment?





Q2 | Results and Discussion (preliminary)

Temporal temperature variation

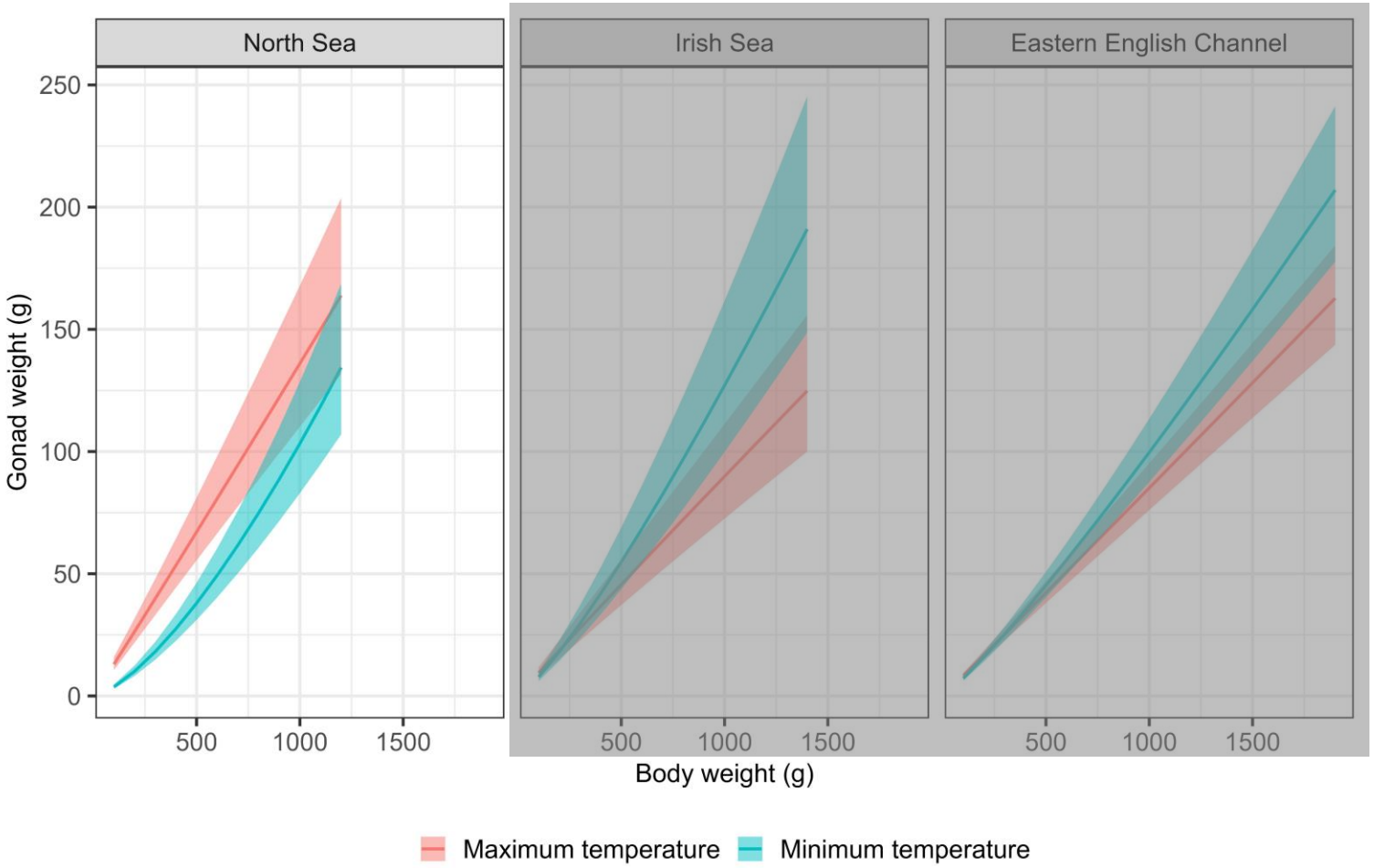


Q2 | Results and Discussion (preliminary)

Temporal temperature variation

North Sea

- ↑ food availability
- ↑ reproductive hormones synthesis
- growth-reproduction trade-offs



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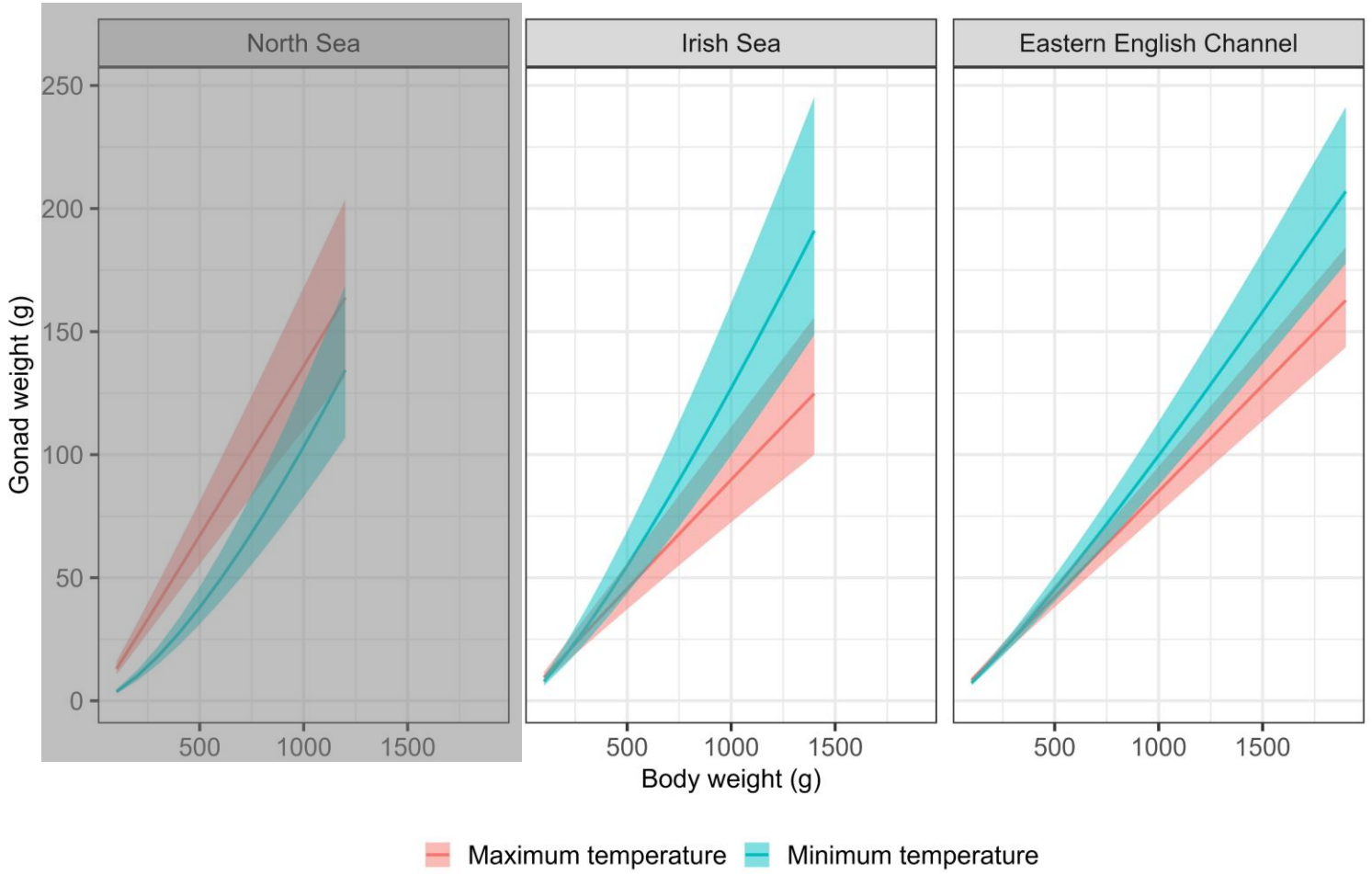
Temporal temperature variation

Irish Sea, Eastern English Channel

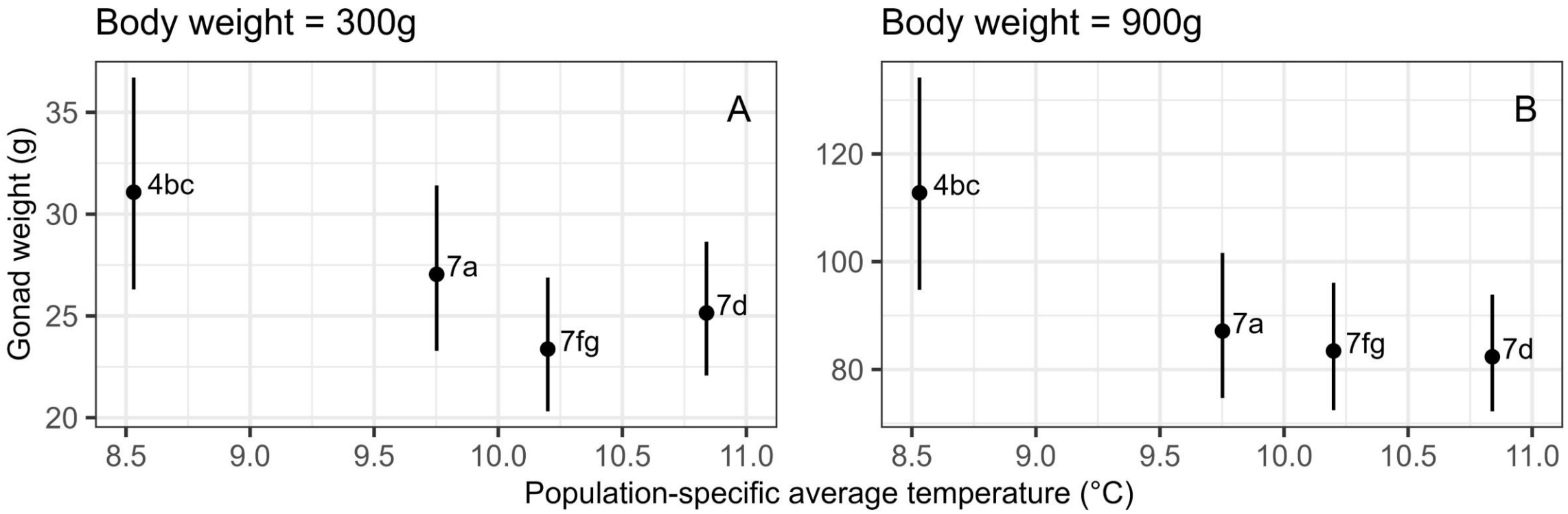
- ↓ reproductive hormones synthesis



Q2 | Results and Discussion (preliminary)

Spatial temperature variation

- Higher size-specific reproductive investment in North Sea population (4bc)
- No clear trend related to spatial temperature variation

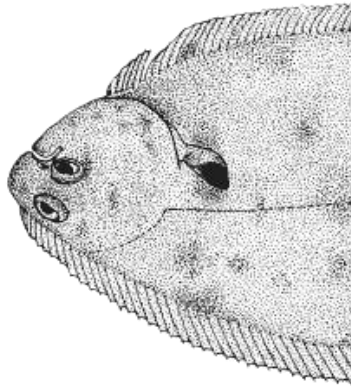


Conclusion

- Q1: Sole's reproductive investment scales **hyper-allometrically** with body size
- Q2: Temporal temperature variation **affects** size-specific reproductive investment

Future study

- Implication of hyper-allometric reproduction for stock reproductive potential



Thank you for your attention

Thanks to my supervisors: Marleen De Troch (UGent), Jan Jaap Poos (WUR), Jochen Depestele (ILVO)

Thanks to my ILVO colleagues: Karen Bekaert, Klaas Sys, Laura Lemey

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