PICES-ICES WG53/WGSPF meeting (May 2026)

Activity 3 : Internal and external drivers of growth, reproduction and survival

Activity leaders:

Martin Huret (Ifremer, Fr.), **Martin Lindegren** (DTU Aqua, Dk.), **Florian Berg** (IMR, No.), **Motomitsu Takahashi** (FRA, Japan)

Participants (+data contributors) : Marta Albo-Puigserver, Rebecca Asch, Matthew Baker, Benoit Berges, Jennifer Boldt, Jacob Burbank, Ignacio Catalan, Ali Cemal Gucu, Jaclyn Cleary, Brad Erisman, Susana Garrido, Cecilie Hansen, Tarek Hattab, Brian Hunt, Nis S. Jacobsen, Isaac Kaplan, Stefan Koenigstein, Zhang Kui, Raul Laiz-Carrion, Salvador Lluch-Cota, Marta Moyano, Shin-ishiro Nakayama, Richard Nash, Haruka Nishikawa, Cristina Nunes, Martin Pastoors, Laure Pecquerie, Vladimir Radchenko, Fernando Ramos, Margarita Rincon, Isabel Riveiro, Alba Serrat Llinas, Gonçalo Silva, Dongwha Sohn, Stelios Somarakis, Peng Sun, Motomitsu Takahashi, Akinori Takasuka, Jeroen Van der Kooij, Carl Van der Lingen, Sebastien Vasquez

Objectives

- Describe the **across region and across species/stocks** variability in the life history traits of SPF
- Analyse the **drivers** of this variability among **internal and external drivers**, and links to **recruitment variability**

Sub-activities

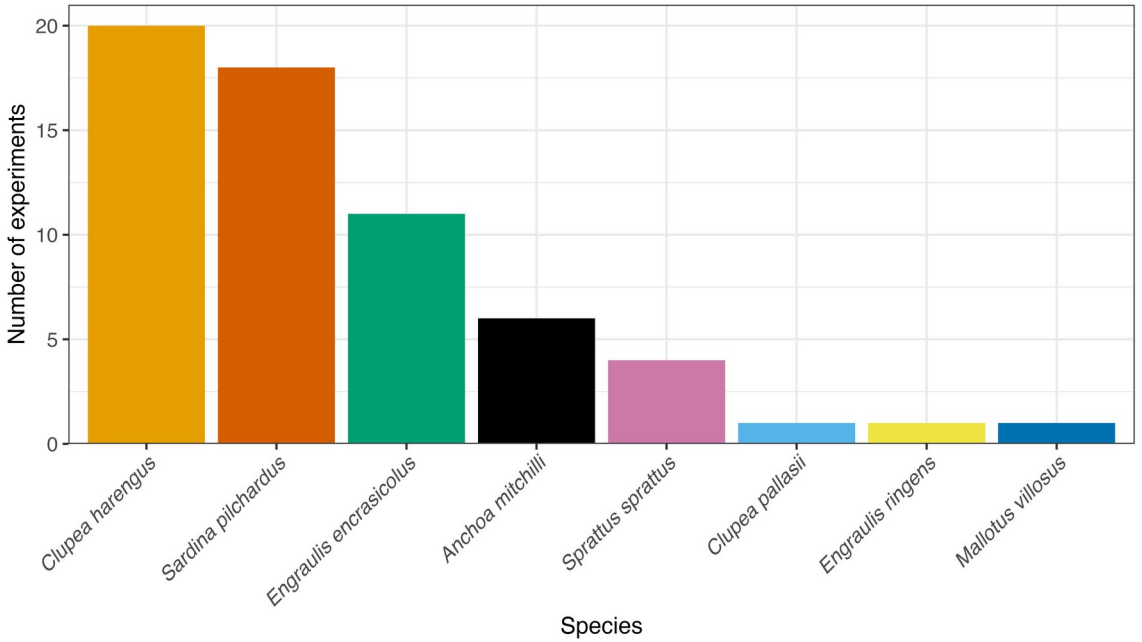
1) **Experimental** (Florian Berg)
   - Review and analysis of available data on traits and associated experimental conditions

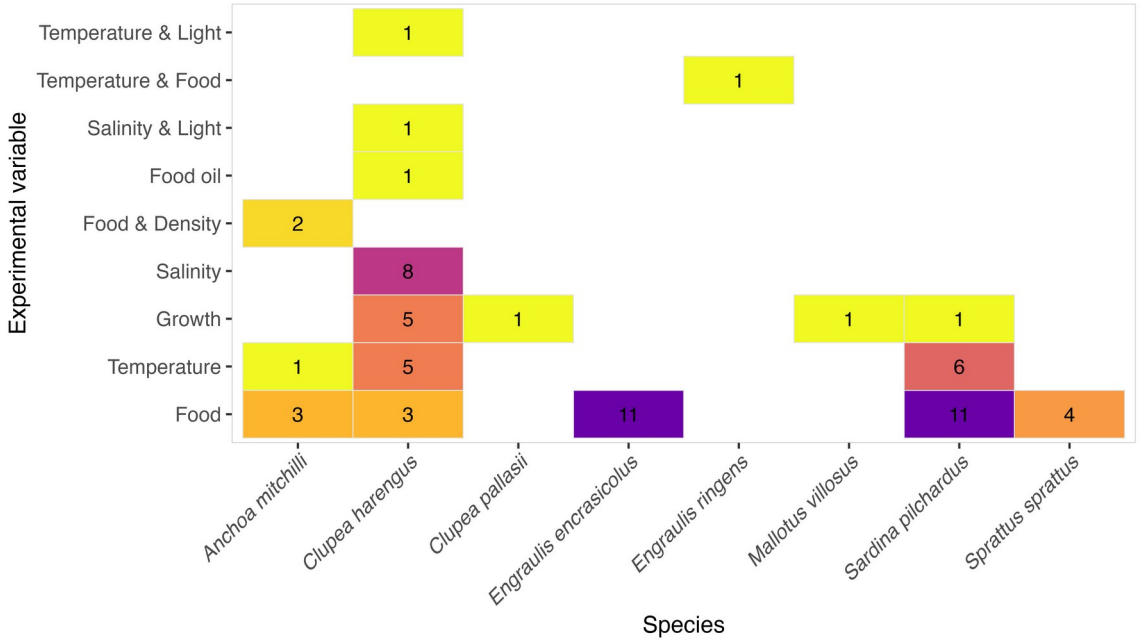
2) **Statistical modelling** (Martin Lindegren)
   - meta-analysis on the variability of the traits across many different stocks

3) **Mechanistic modelling** (Martin Huret)
   - bioenergetics to explore the variability in growth across stocks and responses to regional external factors
   - DEB modelling on anchovy, sardine

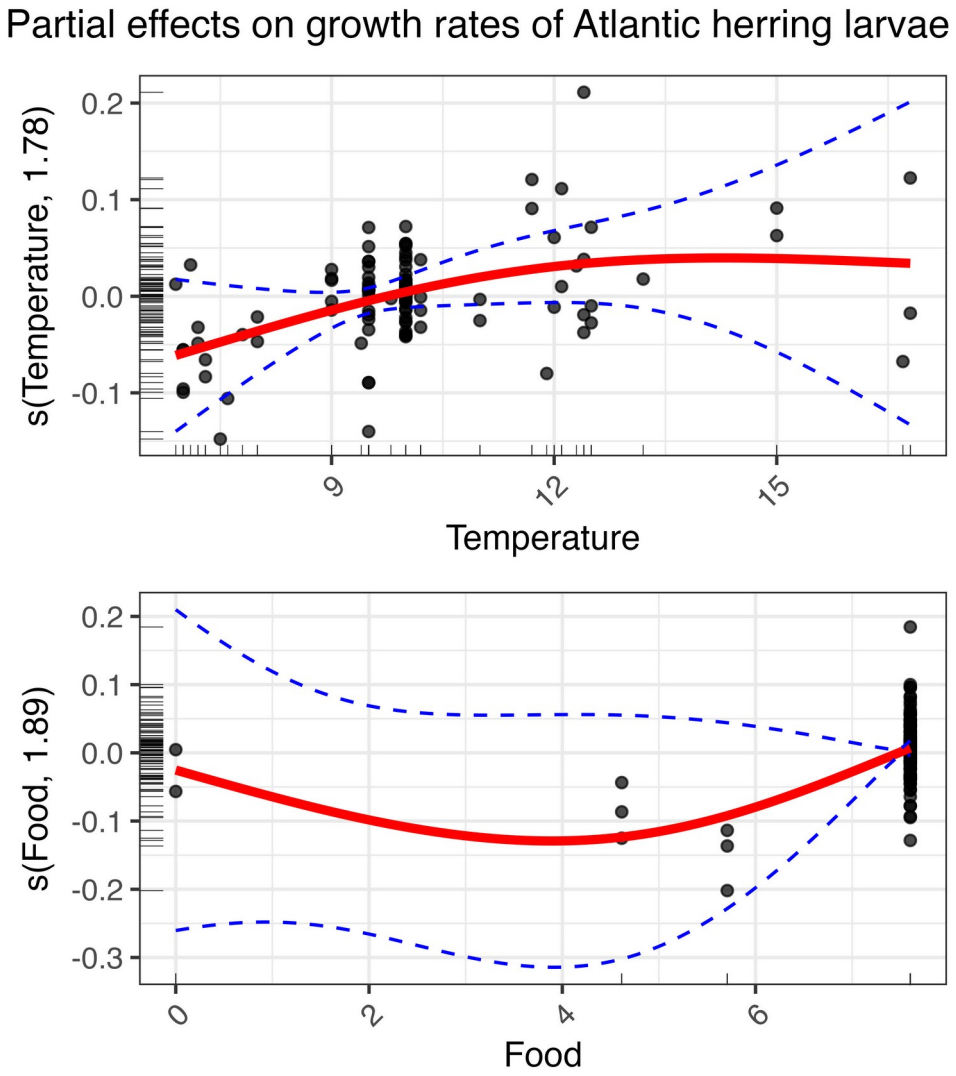
4) **Analysis of recruitment variability** (Moto Takahashi) :
   - Effect of internal and external drivers on recruitment variability

Activity progress: results
1. Experimental approach



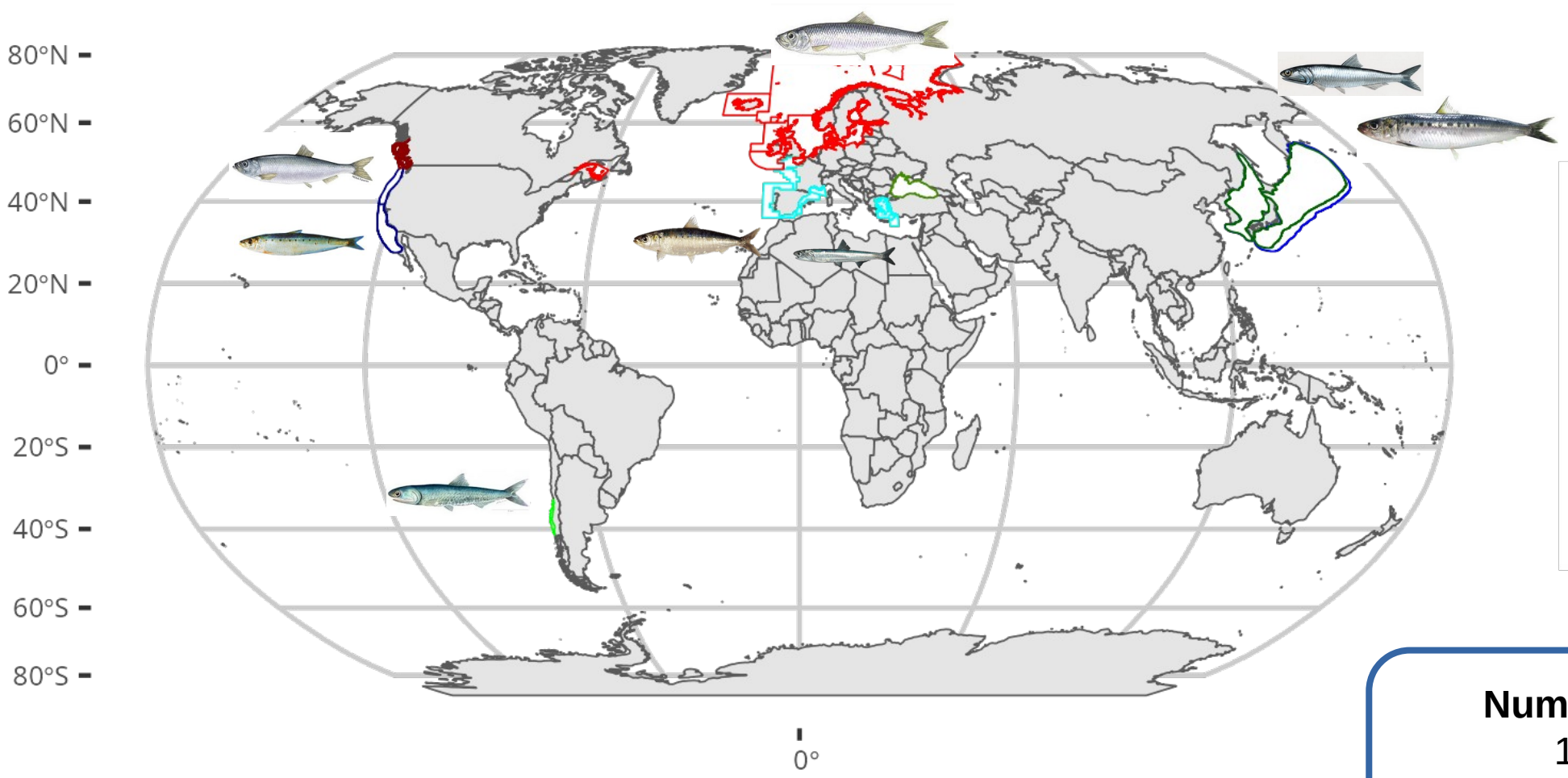


Activity progress: results
1. Experimental approach



GAM modeling on growth

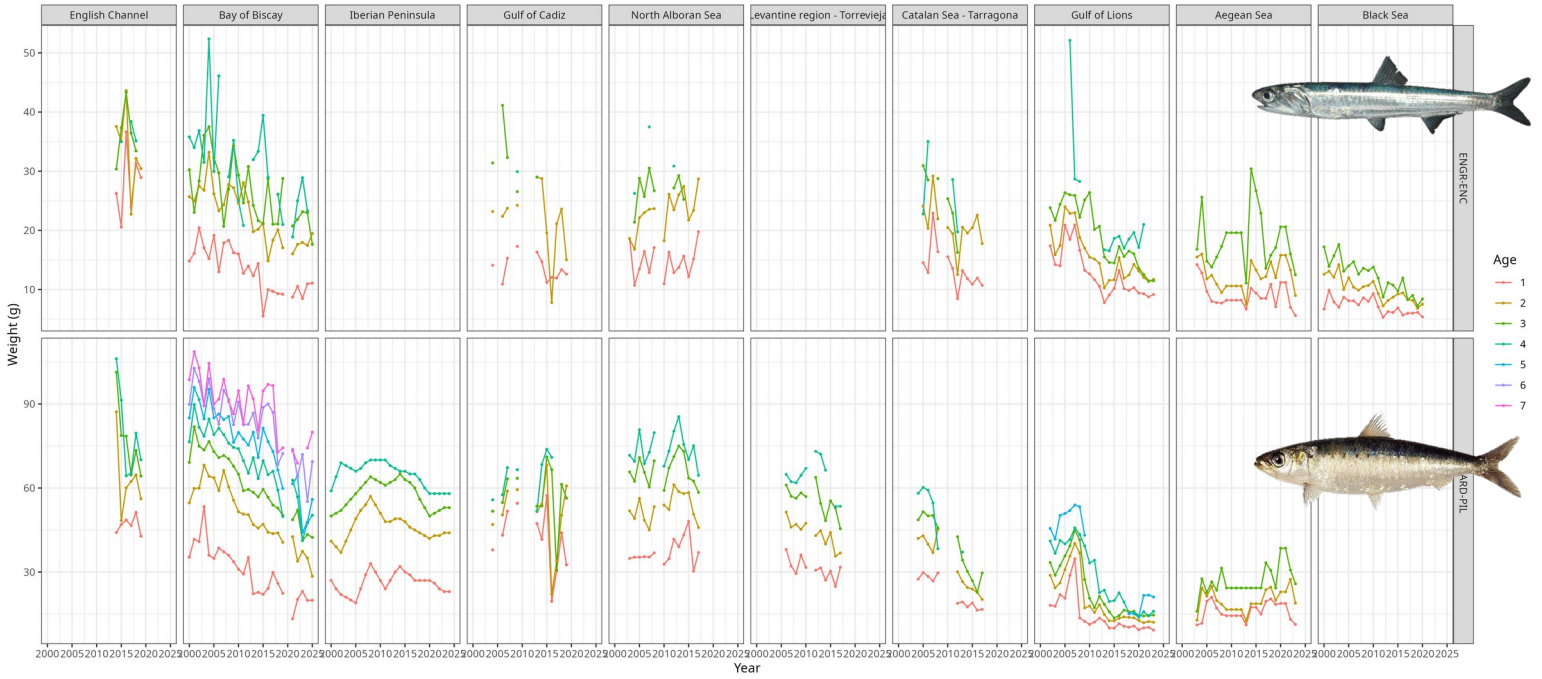
Activity progress: results
2. Dataset on LHT of stocks

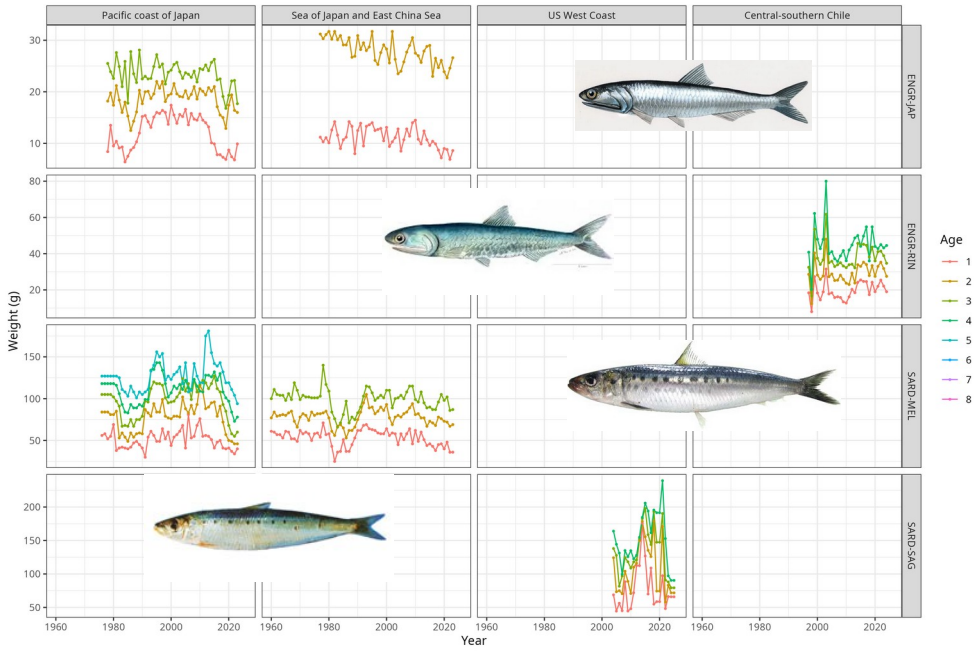


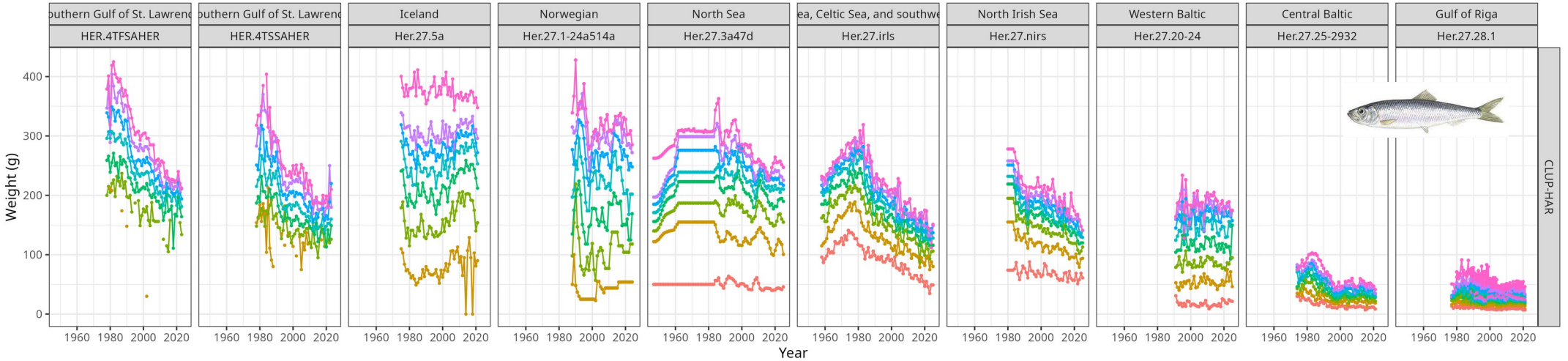
Number of stocks :

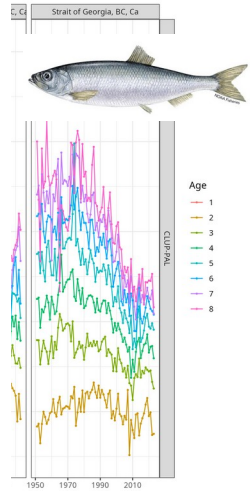
11	anchovy
12	sardine
15	herring

Activity progress: results
2. Dataset on LHT of stocks









Activity progress: results
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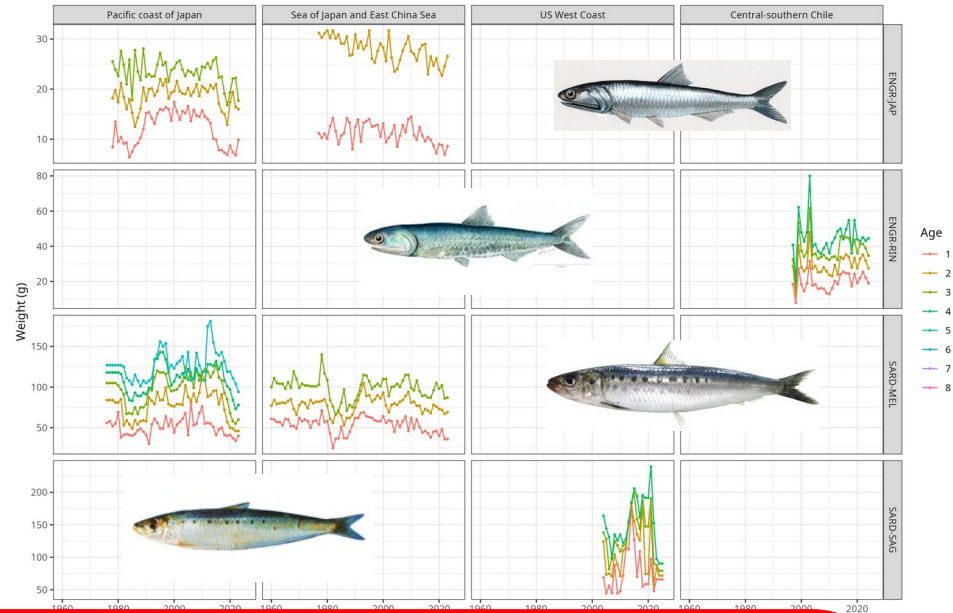
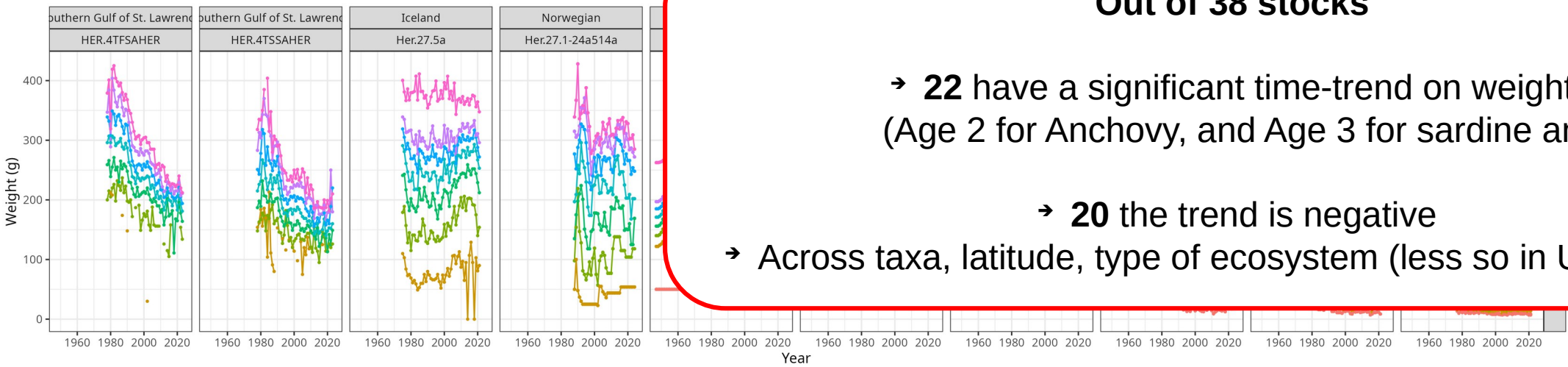


Weight
+ size, abundance, maturity
SSB, recruitment, fishing mortality



Out of 38 stocks

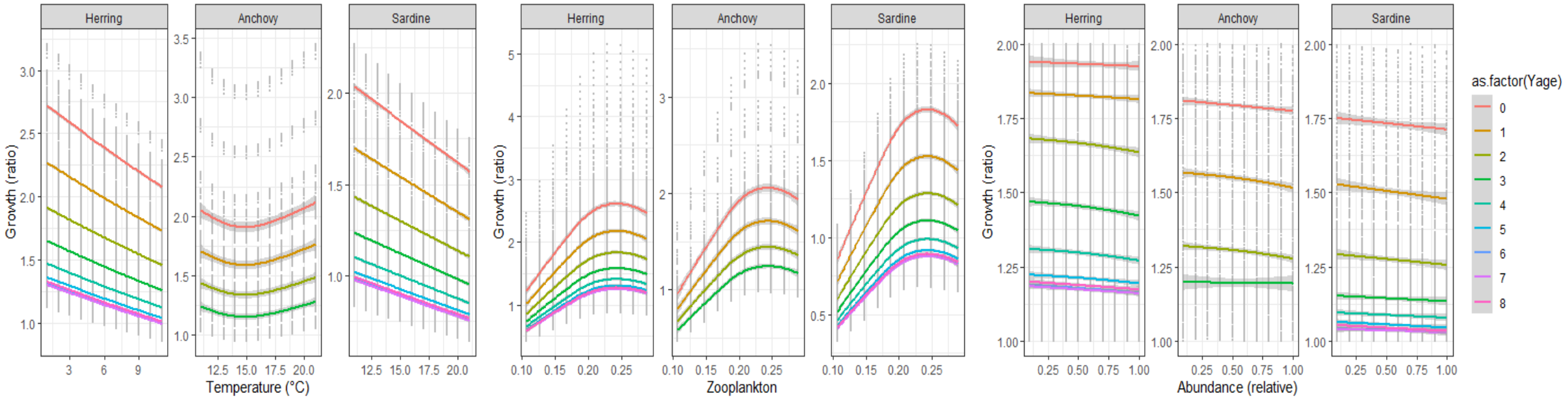
- **22** have a significant time-trend on weight
(Age 2 for Anchovy, and Age 3 for sardine and herring)

- **20** the trend is negative
- Across taxa, latitude, type of ecosystem (less so in Upwellings)

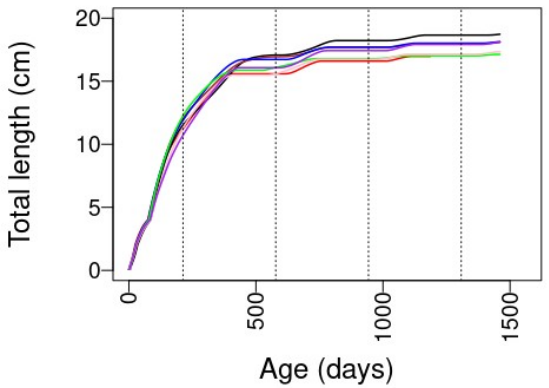
Activity progress: results
2. Meta-analysis

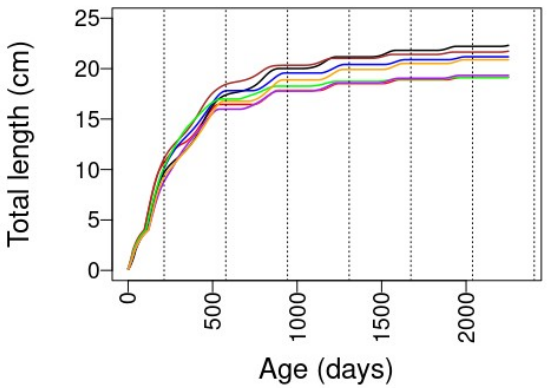
$\log(W_{y+1}/W_y) \sim s(age) + s(Abundance) + s(Temp, by\ taxa) + s(Zoo) + s(Stock, bs='re')$

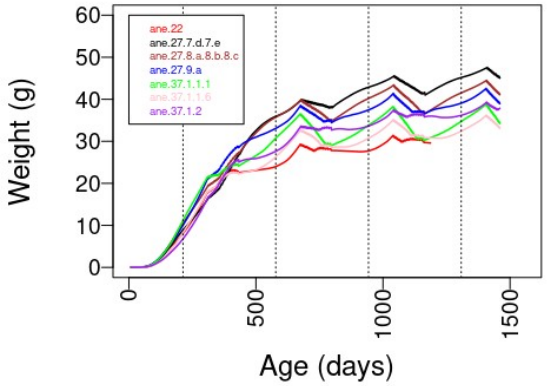
GAMMs

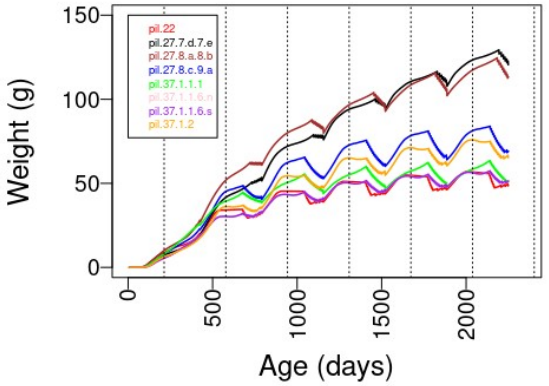


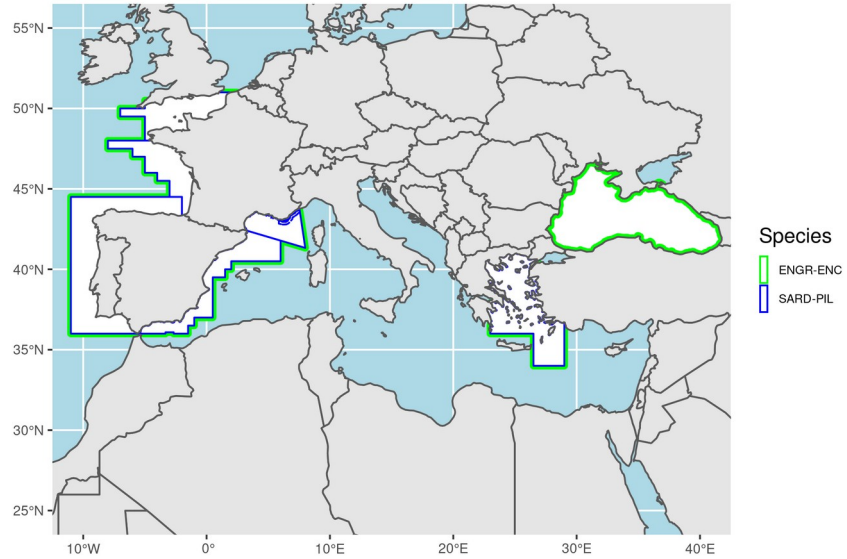
Activity progress: results
3. Bioenergetics











Planned work

- Pursue the work with analysis of drivers of the variability in growth and other LHT
- Generalisation on other species ? Herring, anchoveta
- Review of existing bioenergetics-IBM globally and what they are good for (initiated within an European project)

Activity progress: meetings

- November PICES meeting (11-13/11, online, Yokohama) → Progress and feedback from the group
- E-mail exchanges among leaders
- Online meeting to prepare prsentations for the Symposium
- Online meeting in June among co-leaders to debrief on the feedback from symposium presentations, and decide on next steps (papers)

Activity progress: Deliverables

- Convene session S3 (Symposium)
  - ‘*Life History Variation Across Space, Time, and Ontogeny: Implications for Populations, Ecosystems, and Fisheries*’ -
  - M. Huret (Fr.), J. Burbank (Ca.), L. Ibaibarriaga (Sp.), M. Takahashi (Jap.)
  - ~45 abstracts (25 Oral + 15 posters)

- Presentations from Activity 3
  - Lindegren M., Huret M., Berg F. et al. *A cross-system comparison of internal and external forcing regulating growth of small pelagic fish throughout ontogeny.* Oral in S3.
  - Berg F. et al. Understanding the underlying mechanisms affecting growth of small pelagic fish: an experimental meta-analytical approach. Oral in S3.

- Draft on meta-analysis on factors on growth, to be finalised this year

Activity progress: discussion

- Planned joint analyses
  - Already ongoing but new ideas always welcome
  - Most advanced : statistical meta-analysis, start writing after the Symposium, already a draft
  - Analysis on impact of internal and external drivers on recruitment to start

- Breakout group topics ?
  - Can be useful for going in more details of the results
  - Get feedback from stock experts on data and from anybody on methods

- Data needs ?
  - Always welcome data on new stocks
  - Can not secure inclusion in meta-analysis depending on publication timing

General points for WG meeting

- List some points for the general discussion and opportunities for cross-activity collaboration
  - Change in LHT and impact on spatio-temporal processes (Act. 1)
    - Stock characterisaion in relation to LHT and population structure (Brad's sub-activity)
  - Change in LHT and impact on distribution and connectivity (Act. 4)

- Ideas for how your activity can contribute to the Small Pelagics in 2050 Synthesis
  - Anticipate change in LHT under global change
  - Modelling projections ? → contribution to activity 8