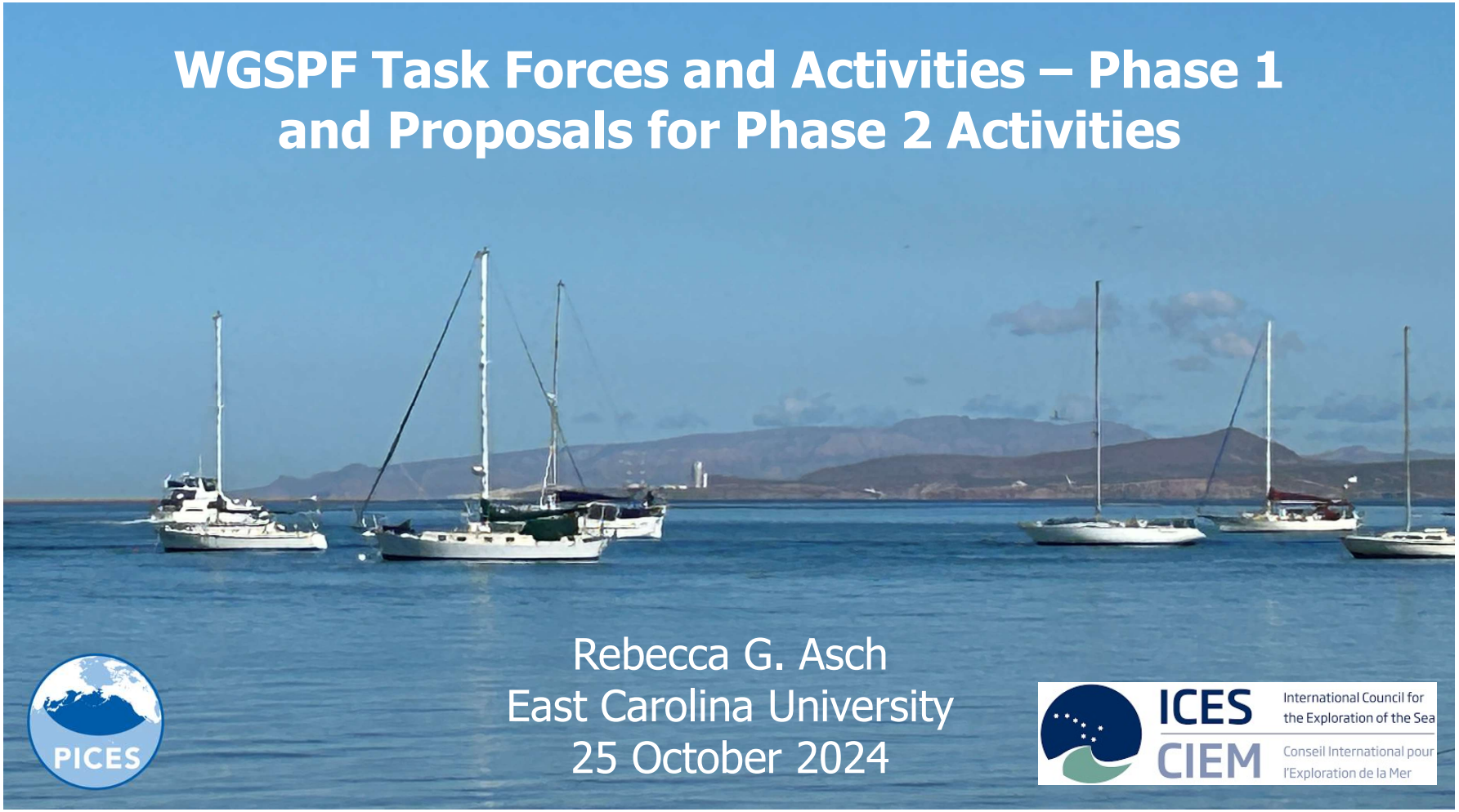
WGSPF Task Forces and Activities – Phase 1 and Proposals for Phase 2 Activities



Rebecca G. Asch
East Carolina University
25 October 2024

PICES

ICES International Council for the Exploration of the Sea
CIEM Conseil International pour l'Exploration de la Mer

Task Force Activity Descriptions Based on 2024 Report on Joint ICES-PICES Working Group on Small Pelagic Fish

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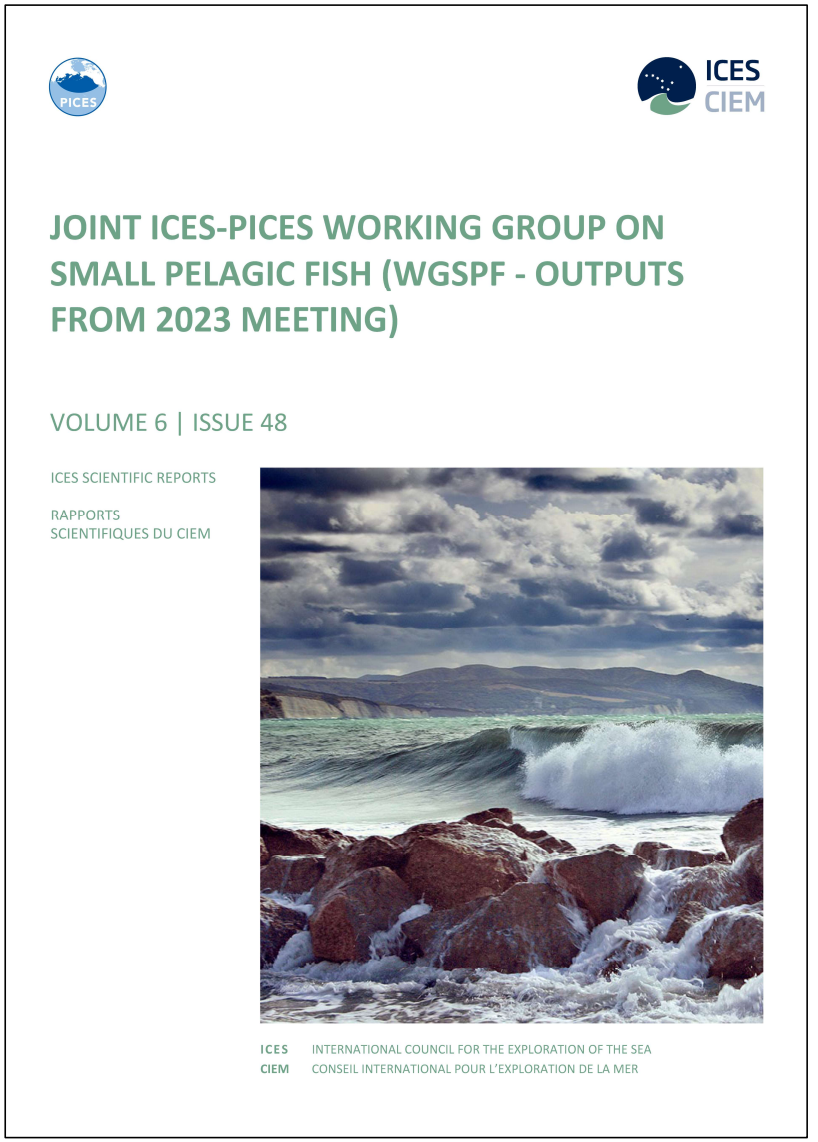
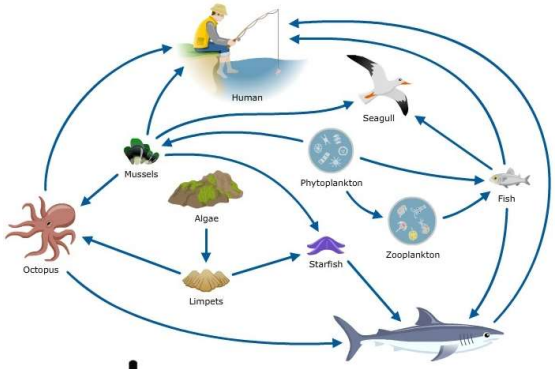
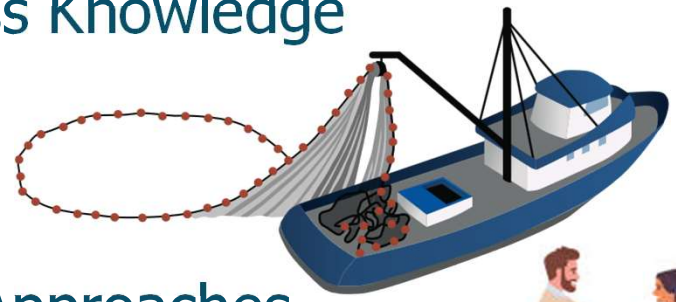


2020-2024 WGSPF Task Forces

1. Task Force 1 – Ecological Process Knowledge



2. Task Force 2 – Translating Process Knowledge



3. Task Force 3 – Social-Ecological Approaches

For Phase 2 of WGSPF, we are thinking of fusing task forces 2 and 3.

Activities Associated with Task Force 1 – Ecological Process Knowledge

Activity 1 – Critical Review, evaluation and testing of classic hypotheses

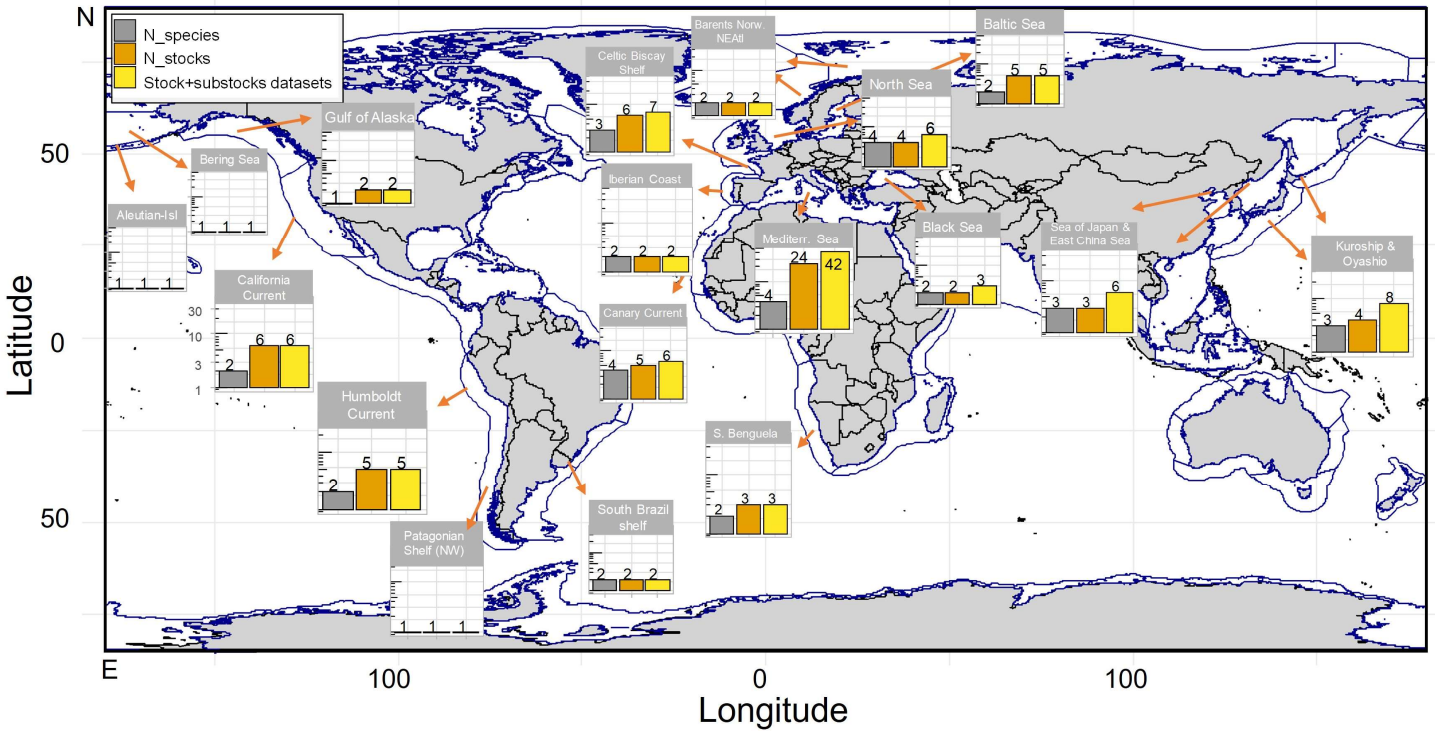
- Leads: Akinori Takasuka (Japan), Myron Peck (Netherlands)
- Objective: Critical review and evaluation of hypotheses on processes related to SPF population dynamics and recruitment based on the scientific literature
- Progress to date:
  - → > 40 hypotheses gathered via discussion
  - → Classified into classic and advanced hypotheses
  - → Table describing each hypothesis, identifying its source, discussing pros and cons, and assessing whether the hypothesis is testable
  - → Plans to develop a review paper
  - → Contributed to 2022 SPF Symposium via presentations in Session 2 and a keynote on this subject

Activity 2 – Life cycle closures – bottlenecks and gaps in knowledge

- Leads: Ignacio Catalan (Spain), Noelle Bowlin (USA)
- Objective: Comparative review of processes related to life cycle closure, focusing on individual-based models applied to early life history stages (ELHS)
- Progress to date:
  - → 29 participants, 5 meetings during phase 1
  - → 4 publications (Baltazar-Soares et al., 2023; Van der Kooij et al., 2024; Lima et al., 2022a, b)
  - → Collaborative review paper titled "Worldwide appraisal of knowledge gaps in the space usage of small pelagic fish: highlights across stock uncertainties and research priorities"
  - → Organized Session S2 at SPF symposium: 24 presentations & 16 posters

Collaborative Paper on Gaps in SPF Space Usage

- Examined gaps in knowledge related to nursery areas, spawning grounds, larval connectivity, feeding migrations, adult distribution
- Reviewed > 3,000 papers on 78 stocks of 17 species from 19 LMEs
- Manuscript is under revision



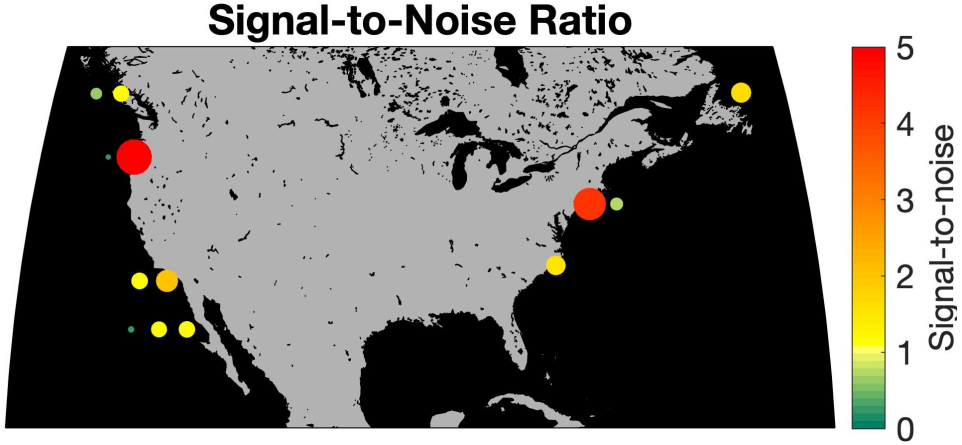
Activity 3 – Drivers of spatial distribution and phenology

- Leads: Rebecca Asch (USA), Marta Moyano (Norway)
- Objective: Understand how biotic and abiotic variables influence SPF spatial distribution and timing of reproductive activities
- Progress to date:
  - → 49 participants from 18 countries
  - → Two comparative sub-activities identified: (1) Signal-to-noise ratios in phenology trends; (2) Defining the fundamental vs. realized niche of SPF based on acoustic and trawl surveys
  - → Both sub-activities have initial results focused on a subset of regions (North America and Europe)
  - → 2022 SPF Symposium session on population shifts and tipping points: 48 abstracts from 18 countries

Initial Results from Activity 3

SPF Reproductive Phenology

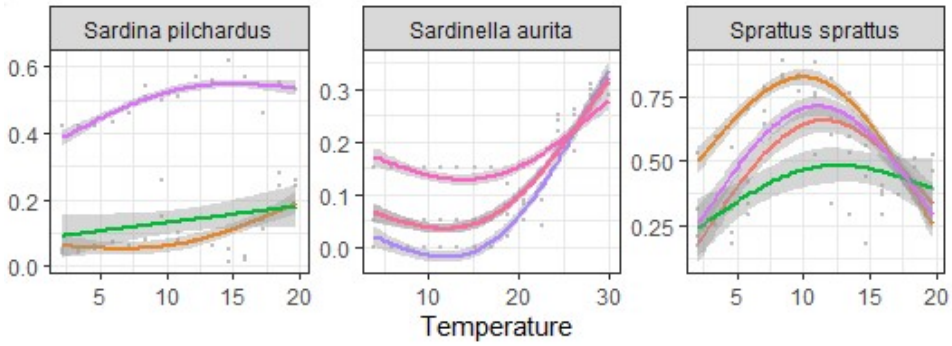
- Identified 57 time series on 24 species
- Code developed for unified analyses at different temporal resolutions
- Trial analysis for 13 time series
- Differences between spring & fall spawners
- Rate of temperature change inversely correlated with phenological thermal sensitivity



9 of 13 time series have signal-to-noise ratio > 1
Climate trends > Climate variability

Ecological Niches from Survey Data

- Led by Martin Lindegren (Denmark)
- Focus on Atlantic herring, European anchovy, European sardine, and sprat
- Dataset compiled for trawl & acoustic surveys
- GAM using presence/absence data with temp, sal, depth, & phyto as independent variables
- Temperature most important variable
- Response curves differ among stocks of a single species



Probability of occurrence varies across both species and stocks as a function of temperature

Activity 4 – Food web dynamics

- Leads: Richard Brodeur (US), Susana Garrido (Portugal)
- Objective: Understand variability in trophic interactions and promote use of novel techniques in food web studies
- Progress to date:
  - → Identified 5 research priorities: 1) Spatio-temporal variation in predation pressure; 2) Diets of SPF predators; 3) Bottom-up control of SPF; 4) Energy flow and trophic transfer efficiency; 5) Intraguild predation and competition
  - → 20 publications tied to this activity
  - → Sponsored Session 1 at the 2022 SPF Symposium: 27 oral presentations and 16 posters
  - → Goal for next phase: Create an open database of diet information for use in cross-regional comparative studies and ecosystem models

Activity 5 – Internal and external drivers of growth, reproduction, and survival

- Leads: Florian Berg (Norway), Martin Huret (France), Martin Lindegren (Denmark)
- Objective: Determine whether interspecific and cross-region variations in life history traits relate to intrinsic (physiological, genetic) vs. external (environmental) factors
- Progress to date:
  - → Two datasets compiled: 1) Growth rates from laboratory experiments; 2) field-based data on SPF size, weight, and abundance-at-age
  - → GAMs and bioenergetics modelling used to analyze these datasets, with two posters presented at the 2022 SPF Symposium
  - → Co-sponsored Session 2 at 2022 SPF Symposium

Results from Activity 5 Analyses

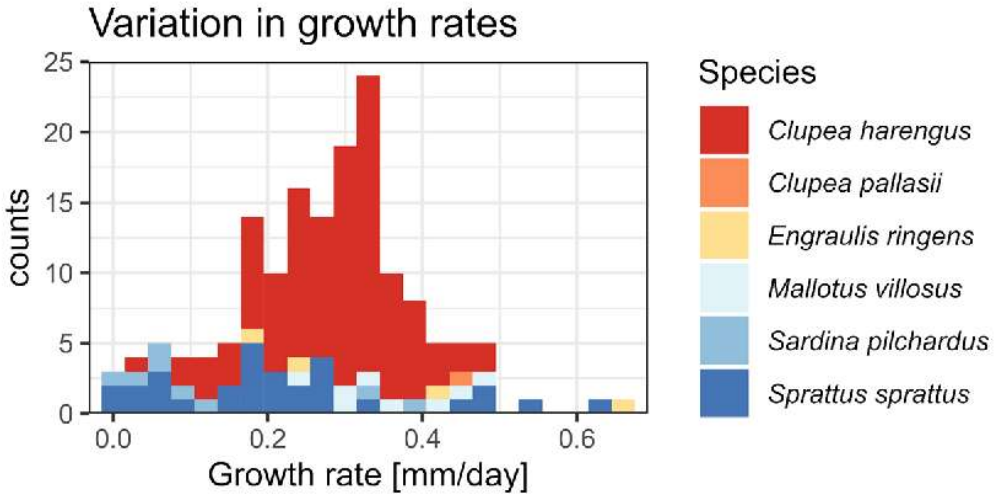
Laboratory Experiments

- Data from ~40 experiments on 6 species
- GAMs highlighted temperature effects, as well as density dependence

Field datasets

- 31 stocks of European, Japanese and Californian sardine and anchovy, plus European herring
- GAMs highlighted density dependence, domed-shaped temperature effects, saturating response to zooplankton concentration
- DEB modeling revealed that latitudinal and east-west gradients related to regional differences in food and temperature

Growth rates from laboratory experiments

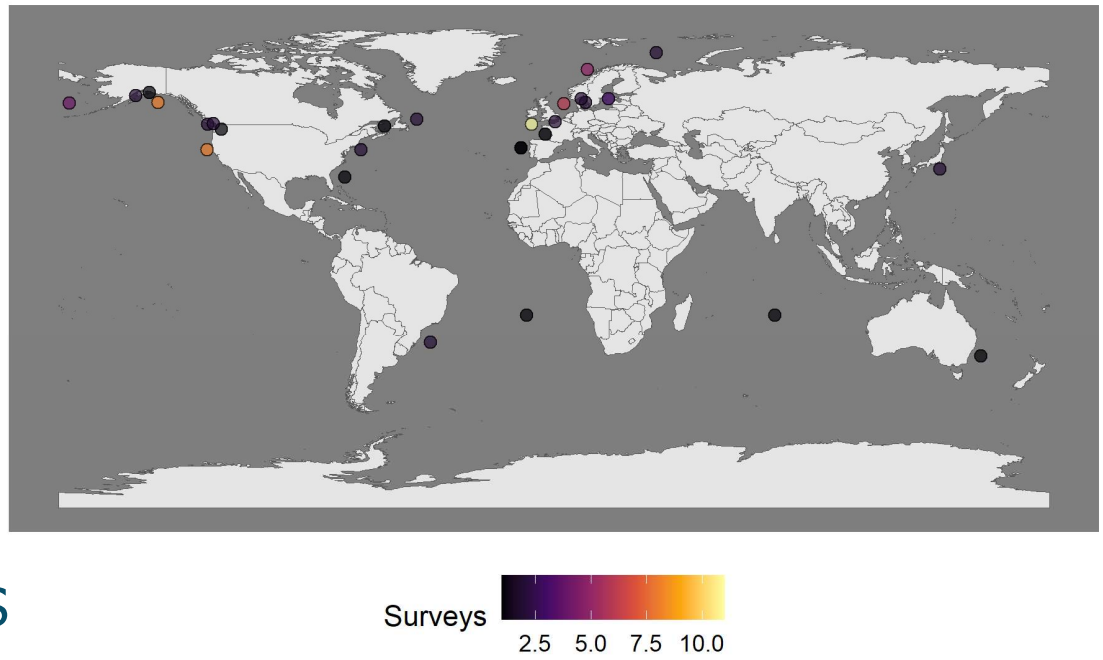


Next steps: (1) Integration of Pacific herring data; (2) Publication under development

Activities Associated with Task Force 2 – Translating Process Knowledge

Activity 6 – Survey design and monitoring

- Leads: Matthias Kloppmann (Germany), Chris Rooper (Canada)
- Objectives: 1) Compile a database describing existing SPF surveys; 2) Examine recent methodological advances in survey technology
- Progress to date:
  - → Information on 77 surveys in database
  - → Results reveal: (1) More northern hemisphere surveys; (2) Combined acoustic/capture surveys most common for adult SPF; (3) Plankton nets most common gear for ELHS



Activity 6 – Survey design and monitoring

- Progress to date (continued):
  - → Workshop at 2022 SPF Symposium: "Recent Advances in Daily Egg Production Method (DEPM): Challenges and Opportunities" (15 presentations)
  - → Session at 2022 SPF Symposium: "Progress in Pelagic Surveys: From Biomass to Monitoring Ecosystems" (27 presentations, 21 posters)
  - → Session at 2024 PICES annual meeting: "Advances in Observational, Analytical, and Modeling Tools that Lead to Better Observations and Improved Understanding of Small Pelagic Fish" (16 presentations, 6 posters)
  - → Two manuscripts in CJFAS (Gaichas et al., 2023; Citores et al., 2024)s

- Future directions:
  - → Lesson learned manuscript
  - → Workshop on collecting acoustic data with commercial fishing vessels

Activity 7 – Improving short-term forecasts and long-term projections

- Leads: Stefan Koenigstein (USA), Ryan Rykaczewski (USA)
- Objective: Understand mechanisms controlling predictability of SPF using ocean circulation & ecosystem models across time scales
- Progress to date:
  - → Sponsored one workshop (5 presentations) and one session (29 presentations) at the 2022 SPF Symposium
  - → Session at 2023 PICES Annual Meeting (10 presentations)
  - → Two publications in MEPS special issue
  - → Planned manuscript: 1) Quantifying environmental links to recruitment; 2) Improved understanding SPF pop dynamics from modeling; 3) Links between plankton dynamics & SPF; 4) Food web links to competitors & predators; 5) Improved prediction of spatio-temporal distributions

Activity 8 – Improvements to management

- Leads: Salvador Lluch-Cota (Mexico), Richard Nash (UK), Andres Uriarte (Spain), Isaac Kaplan (USA)

- Objectives: (1) Best strategies to management highly variable SPF populations; (2) Incorporating climate variability and change into MSE

- Progress to date:

  → 2022 SPF Symposium workshop on economics and fleet responses to stock variability (4 presentations) and coupling SDMs to complex ecosystem models (4 presentations)

  → Two oral presentations at ICES ASC 2023

  → Four publications in CJFAS special issue

  → Manuscripts on economic and fleet responses (Quezada et al.) and coupling SDMs to complex ecosystem models (Kaplan et al.) in final prep.

Activities Associated with Task Force 3 – Social-Ecological Approaches

Activity 9 – Networks, vulnerability, and opportunities of dependent human communities

- Leads: Myron Peck (Netherlands)
- Objectives: Advance the discussion of socio-ecological analyses and sustainable policies for dependent human communities
- Progress to date:
  - → 2022 SPF Symposium session (7 oral presentations and a poster presentation) – Focused on role of SPF in nutrition, food security & employment
  - → Half-day workshop on equitable distribution & nutritional benefits of SPF
  - → Quezada et al. (2024) published in CJFAS special issue
  - → Need for more "well-worked" examples of SPF management that accounts for the vulnerability of human communities

Activity 10 – Quantifying trade-offs in goods & services. Activity 11 – Bioeconomic modeling

- Leads: Cecilie Hansen (Norway, Activity 10), Isaac Kaplan (USA, Activity 10), Myron Peck (Netherlands, Activity 11)
- Objectives: Connect ecological and economic models to understand consequences of SPF variability and to suggest management policies
- Progress to date:

  → Session 6 at 2022 SPF symposium focused on reconciling ecological roles of SPF and harvest goals using MSE

  → Related publications: Ni et al. (2023), Lujanet et al. (2023), de Moor et al. (2023)

  → Knowledge needs: Bioeconomic models need to incorporate variability due to recruitment cycles, changes in predator-prey overlap, climate change & other anthropogenic impacts

Proposed Phase 2 Task Forces & Activities

Task Force 1 – Ecological Process Knowledge

- Activity 1: Critical review, evaluation, and testing of SPF hypotheses
- Activity 2: Life cycle closures – Bottlenecks and gaps in knowledge
- Activity 3: Drivers of spatial distribution and phenology
- Activity 4: Food-web dynamics
- Activity 5: Internal and external drivers of growth, reproduction, and survival

Task Force 2 – Translating Process Knowledge

- Activity 6: Advancing technologies and methodologies for assessing SPF
- Activity 7: Improve short-term forecasts and long-term projections
- Activity 8: Improvements to management
- Activity 9: Social-ecological analysis

Discussion Topics

1. Are there any major research areas ripe for a global syntheses that are not represented by proposed WGSPF activities?

2. Should any activities be combined or separated out further?

3. What new directions and products to you envision for each activity?

4. Who is interested in leading activities? Do current leads want to continue? Who is interested in participating?

Discussion of these topics will continue after lunch in breakout groups