## Activity 2: Food-web dynamics of small pelagic fish

**Leaders**: Susana Garrido (Portugal), Brian Hunt (Canada)

### Background

Small pelagic fish (SPF) occupy a pivotal role in food webs, linking zooplankton to higher trophic levels including top predators. The population dynamics of SPF is therefore influenced by both bottom-up and top-down food web processes. Bottom-up processes are controlled by ocean conditions and their drivers (climate and other anthropogenic impacts in coastal regions) through phytoplankton and zooplankton production and composition, which ultimately shape the growth, nutritional health, and recruitment of SPF. Top-down processes include the effect of predation by fish, birds and mammals, as well as fisheries, on small pelagic fish, and can be impacted by changes in predator abundance and distribution. During the 2020–2024 term, the "Food web Dynamics" Activity sponsored a session at the International Symposium on "Small Pelagic Fish: New Frontiers in Science and Sustainable Management" (SPF-2022), which included 27 oral presentations and 16 posters on the trophodynamic processes involving SPF from 13 geographic regions. Six studies involving global scale comparisons were initiated as a result of the Activity; using stable isotopes or food-web models to compare the structure of the pelagic food webs, studying predator-prey size relationships in SPF, and reviews on larval feeding ecology and the accumulation and diversity of contaminants and trophic parasites in SPF. During the 2024–2028 term, Activity 2 will continue to address all aspects of SPF food web dynamics, benefiting from the global community of experts involved in this WG activity, but will have a focus on interactions with higher trophic levels. Diet studies on SPF and their predators remain particularly relevant and timely, to document long-term trends related to climate change and as required inputs to ecosystem models. An ultimate goal of the Activity is also to standardize and bring together the existing SPF trophic datasets into an open database for use in cross-regional comparative studies and ecosystem models.

### Objectives of the activity for 2024–2028 [with links to WG's ToR]

- Compile metadata on top predator diet databases from different regions (*ToR 1 & 2*);
  *Lead: S. Garrido, B. Hunt*
- Review paper on SPF nutrition (*e.g.*, energy density, fatty acids, lipid content, essential vitamins) as it related to top predator health (*ToR 1, 2 & 4*);
  *Lead: B. Hunt, H. Pethybridge*
- Review of predator-prey allometric relationships of SPF—top predators using already available data on 29 species and data on tuna (albacore, bluefin) and billfish (swordfish) diet from the California Current System offered by Brad Erisman (*ToR 1, 2 & 4*);
  *Lead: F. Juanes*
- Modification of ecosystem models to divide species into stanzas (life history stages of larger fish species that overlap with SPF during early life history) and compare outputs (*ToR 1, 2, 4 & 5*). Discuss as a study comparing select Ecopath models from different regions (*e.g.*, ACT NOW project for European region, MICE model in the Northern Baltic);
  *Leads: J. Ruzicka, S. Garrido, D. Szalaj*
- Application of semi-quantitative stomach fullness categories (from empty to full; categories 1–4) to examine, *e.g.*, seasonal and diel variations in feeding, as well as spatial variation, using data available for multiple species (juvenile and adult) from Portugal, Bay of Biscay, and Spain (*ToR 2 & 4*);
  *Lead: S. Garrido*

- Review and recommendations for best practice in evaluating larval fish diets using molecular methods (*ToR 2 & 4);*
  *Lead: S Garrido*
- Further development of a paper on a global stable isotope-based trophic level comparison of SPF using Initial development conducted by Todd Miller and Ric Brodeur and connecting with CLIOTOP project on mesopelagic micronekton stable isotope (*ToR 1 & 2*);
  *Leads: R. Brodeur, H. Pethybridge, B. Hunt*
- Assessment and characterization of SPF functional traits across freshwater, coast to offshore habitats, considering SPF feeding modes and predator-prey interactions context and using the existing trait database as a starting point (*ToR 1, 2 & 3*).
  *Leads: R. Brodeur, B. Hunt*

**Deliverables and anticipated timeline**

| Deliverable/objective | Timeline |
|---|---|
| Email WG for feedback on predator-prey datasets availability | April 2025 |
| Convene topic session and/or workshop on trophic dynamics of SPF at the 2026 Symposium (SPF-2026)2026 Symposium | May 2026 |
| Predator-prey allometric relationships – build data set, including more data from the southern hemisphere; need individual prey length data | May 2026 |
| SPF nutrition review | May 2026 |
| Email WG on intentions to collaborate in the different objectives | May/June 2026 |

**Membership**

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