



Small Pelagic Fish: New Frontiers in Science and Sustainable Management

November 7 - 11, 2022
Lisbon, Portugal



ICES
CIEM



Food and Agriculture
Organization of the
United Nations

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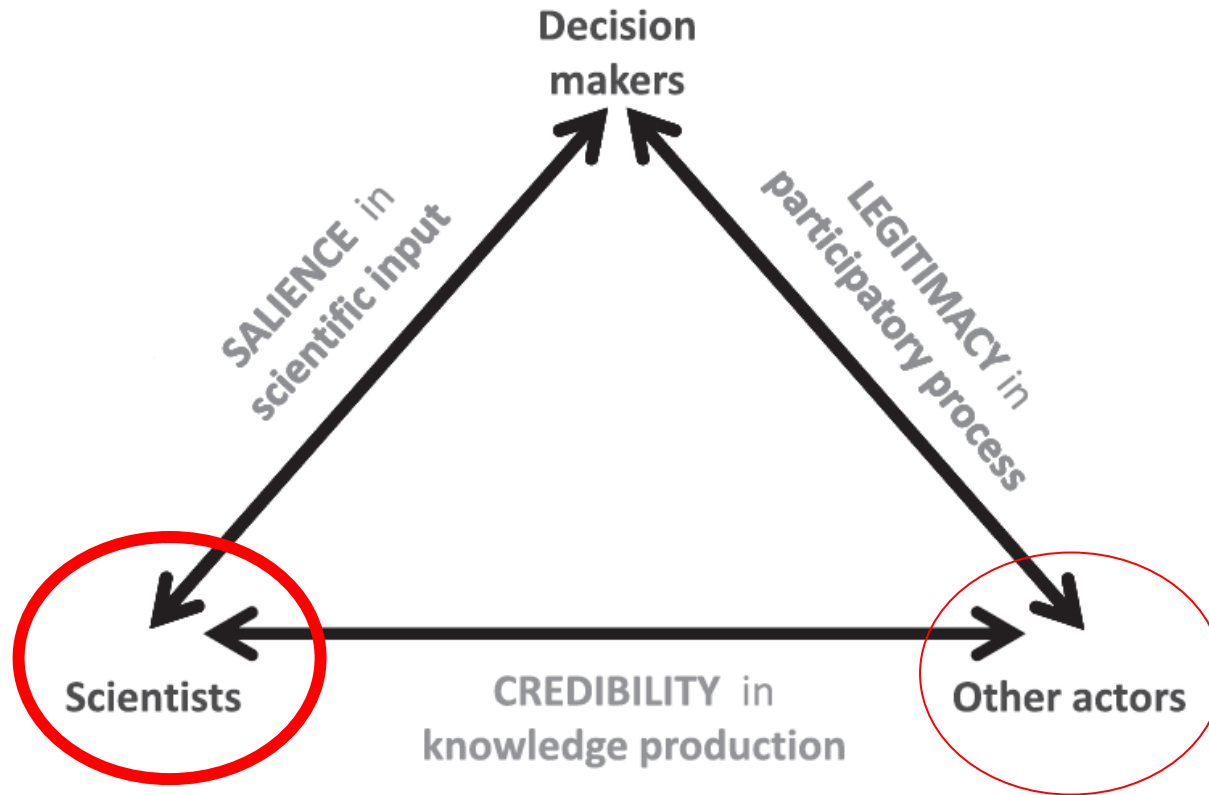
2021
2030

United Nations Decade
of Ocean Science
for Sustainable Development

Panel Discussion. Last Plenary Session. November 11th, 2022

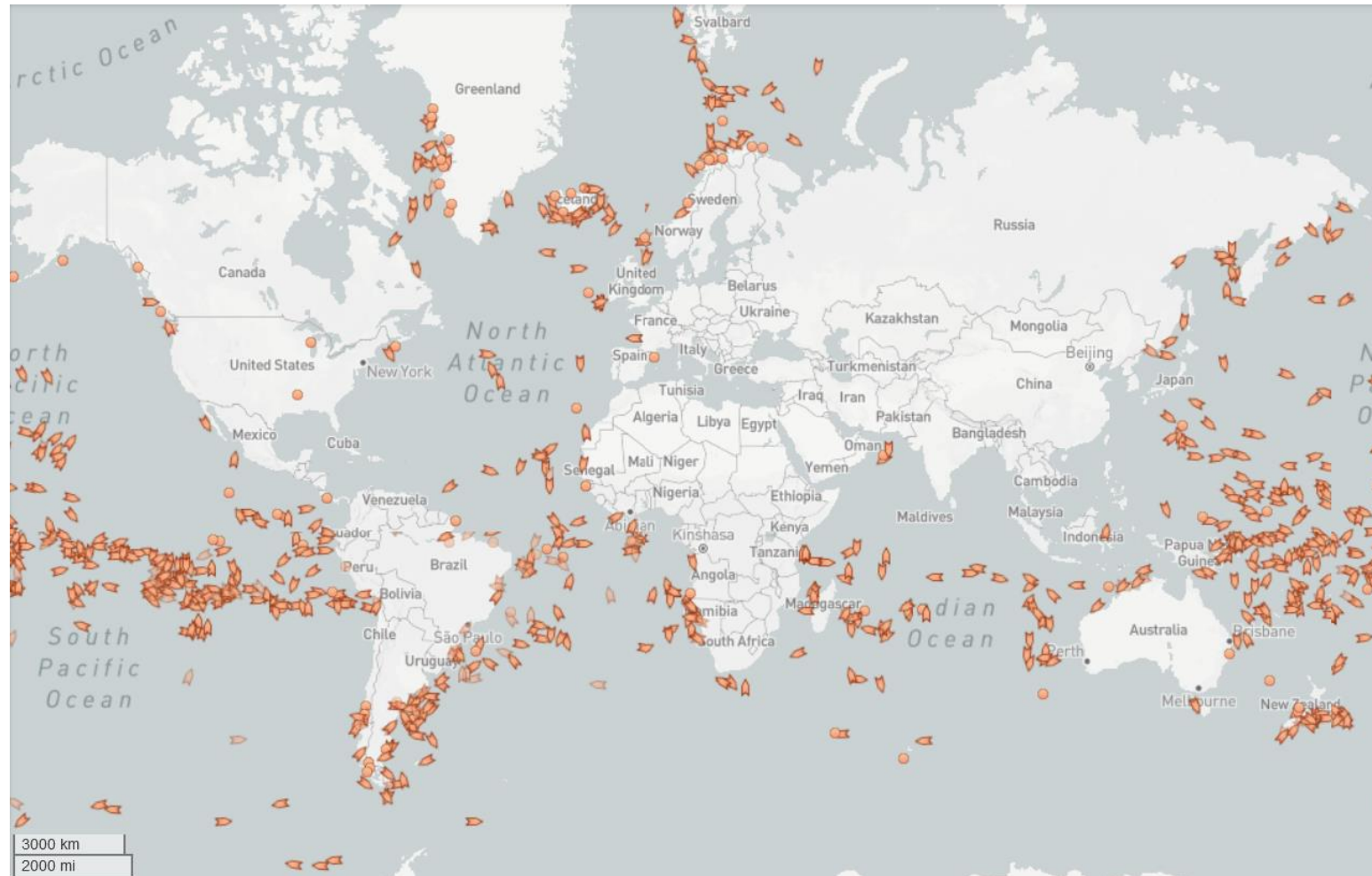
- 1) What could be improved for future meetings
- 2) What type of international Project would be a game changer

What was missing from the symposium?



How are SPF used after fishing?
Fishmeal/oil, human consumption, food security

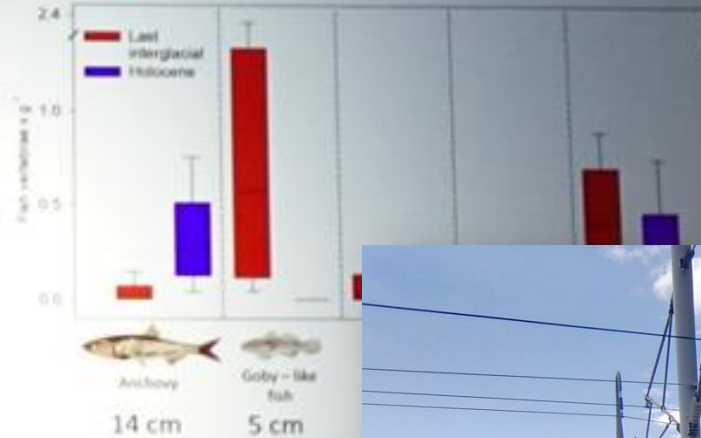
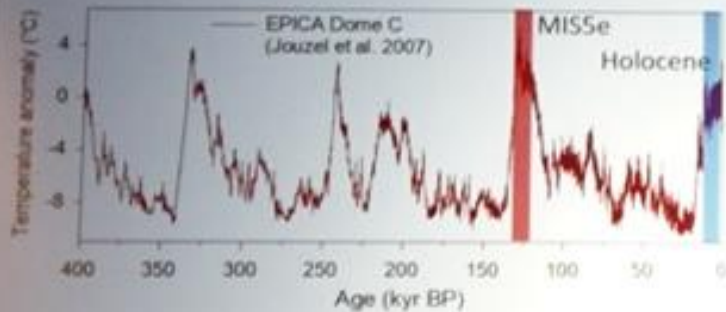
What type of international project would be a game changer in advancing our knowledge of SPF?



Dilemmas

Most impressive message/slide

The fish community inhabiting the HCS during the last interglacial differed dramatically from the communities found during the Holocene



MIS5e

- High sea-level
- Warm temperatures
- Low sub-surface oxygenation
- Sulfidic conditions
- Similar conditions to the RCP8.5 scenario

H2. Change of community



1. What is missing from the symposium?

Although Session 4 was explicitly about SPF responses to climate variability and change at decadal and centennial time scales, there were not that many presentations in that session (10 oral and 6 poster presentations), and many of those didn't appear to explicitly discuss climate change or SPF responses to that.



So, it seems to me that CC impacts on SPFs (or SPF responses to CC) were not well covered at this symposium. In particular, I think that improving understanding of things like

- (i) changing SPF distributions in direct response to CC/warming and how that might impact fisheries (particularly if SPF move across national jurisdictions) and ecosystems via changed pelagic trophic structure and functioning;
- (ii) CC impacts on lower trophic levels (like the predicted increased frequency/intensity of HABs) and how those may impact SPF productivity; and (iii) CC effects on SPF physiology/energetics.



2. What type of international project would be a game changer in advancing our knowledge of SPF?

No specific suggestion, but I would advocate that such a project be

- comparative (species, systems),
- spread across multiple ecosystems,
- and attempt to include all SPF life history stages.



What was lacking in this symp

- Not much, comprehensive program. Great progress in incorporating socioeconomic issues into the SPF, but we want more.

Minor suggestions

- Sessions focused on issues, not regions or disciplines (i.e., collapses, species substitution, cc impacts).
- It would be useful to have an assessment(s) of progress reached during the last symposium (common baseline). It would save time and help focusing new contributions.



Future projects

- Comprehensive open data set on small pelagic fisheries.

Few specific questions for projects/papers:

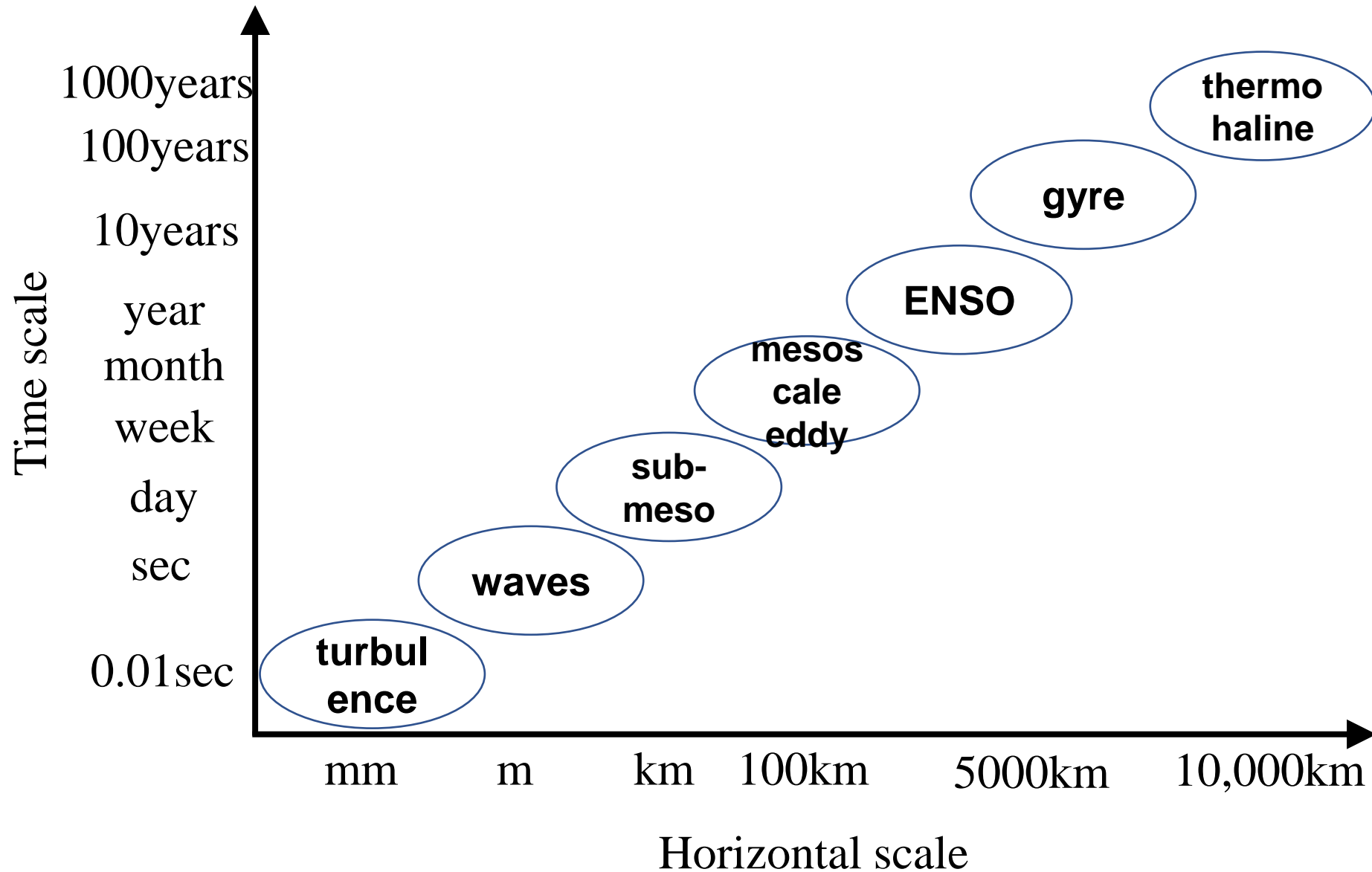
- How “realistic” are projections of future SPF distributions? Are we considering all key factors, such topographically fixed distributions centers?
- How variable is spawning (to spawn or not to spawn, that’s another question)
- Has resilience of fishing systems (socioeconomics) increased by learning the lessons from collapses in the past?

What is missing from the symposium?

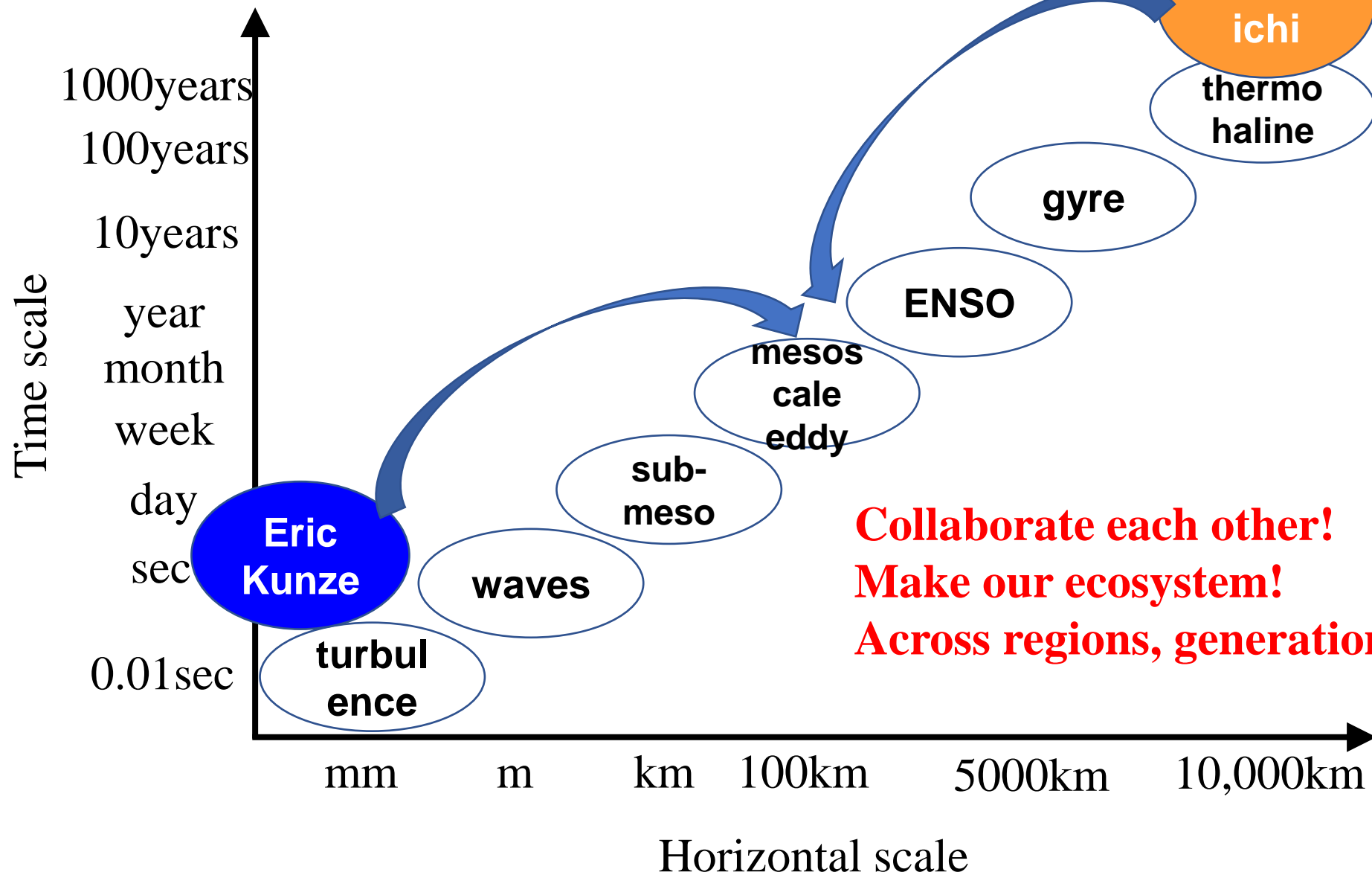


- **Other knowledge types:** Indigenous knowledge (forage fish fisheries: cultural, commercial, traditional use), Traditional Ecological Knowledge, and Local Ecological Knowledge to fill forage fish knowledge gaps
- **Integration:** more examples/projects integrating science, social and economic considerations (e.g., PICES Social, Ecological, Environmental system; “interactions across disciplinary dimensions to facilitate and understand large-scale ecosystem changes and resulting impacts both ocean-wide and on coastal communities”)
- **Species groups:** more projects on freshwater forage fish, and mesopelagic forage fish?
- **Link to fisheries management:** include Fishery managers – of forage fish and predatory fish

Phenomena in the ocean

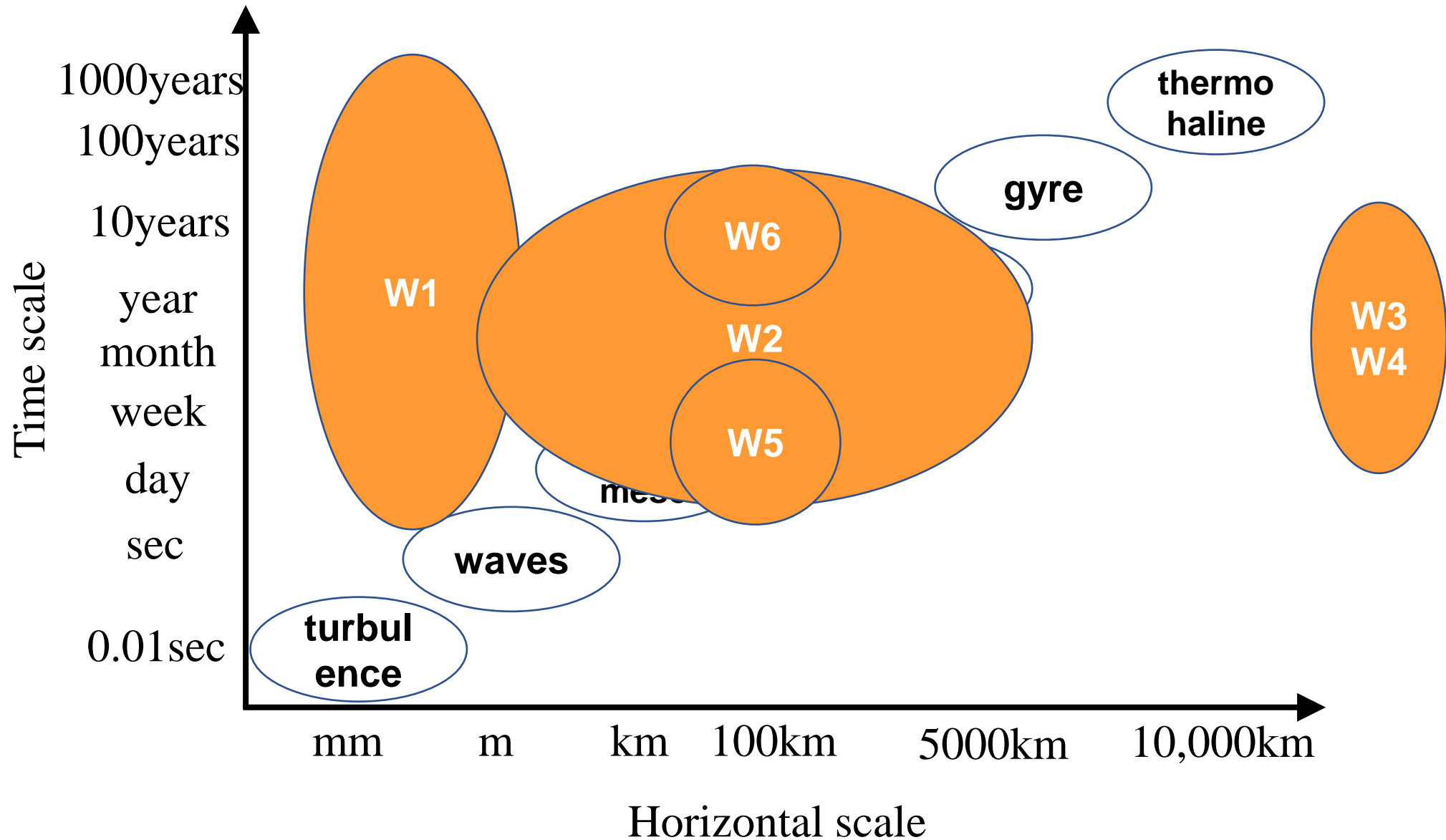


Take home message 1

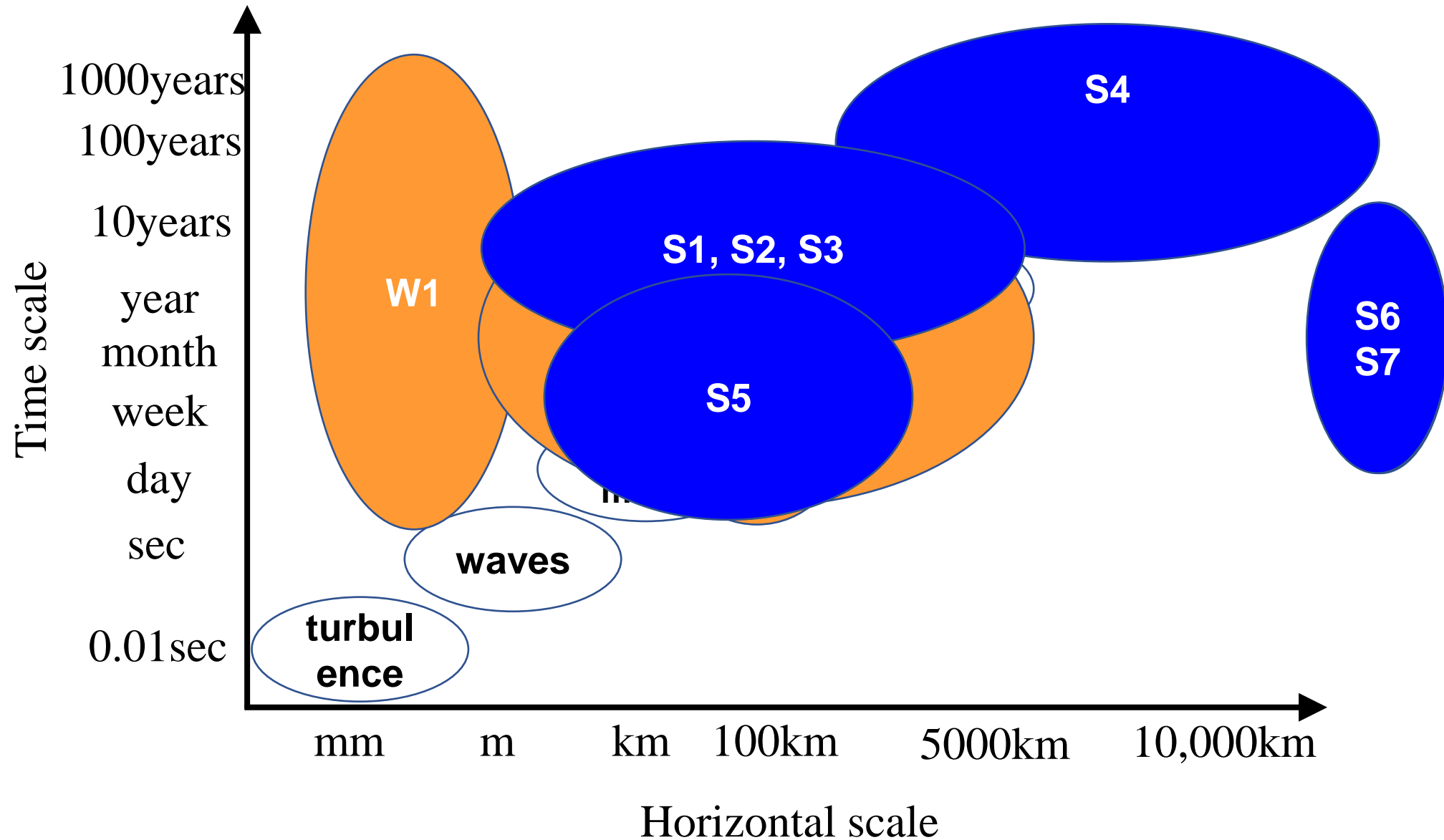


Collaborate each other!
Make our ecosystem!
Across regions, generations, subjects!

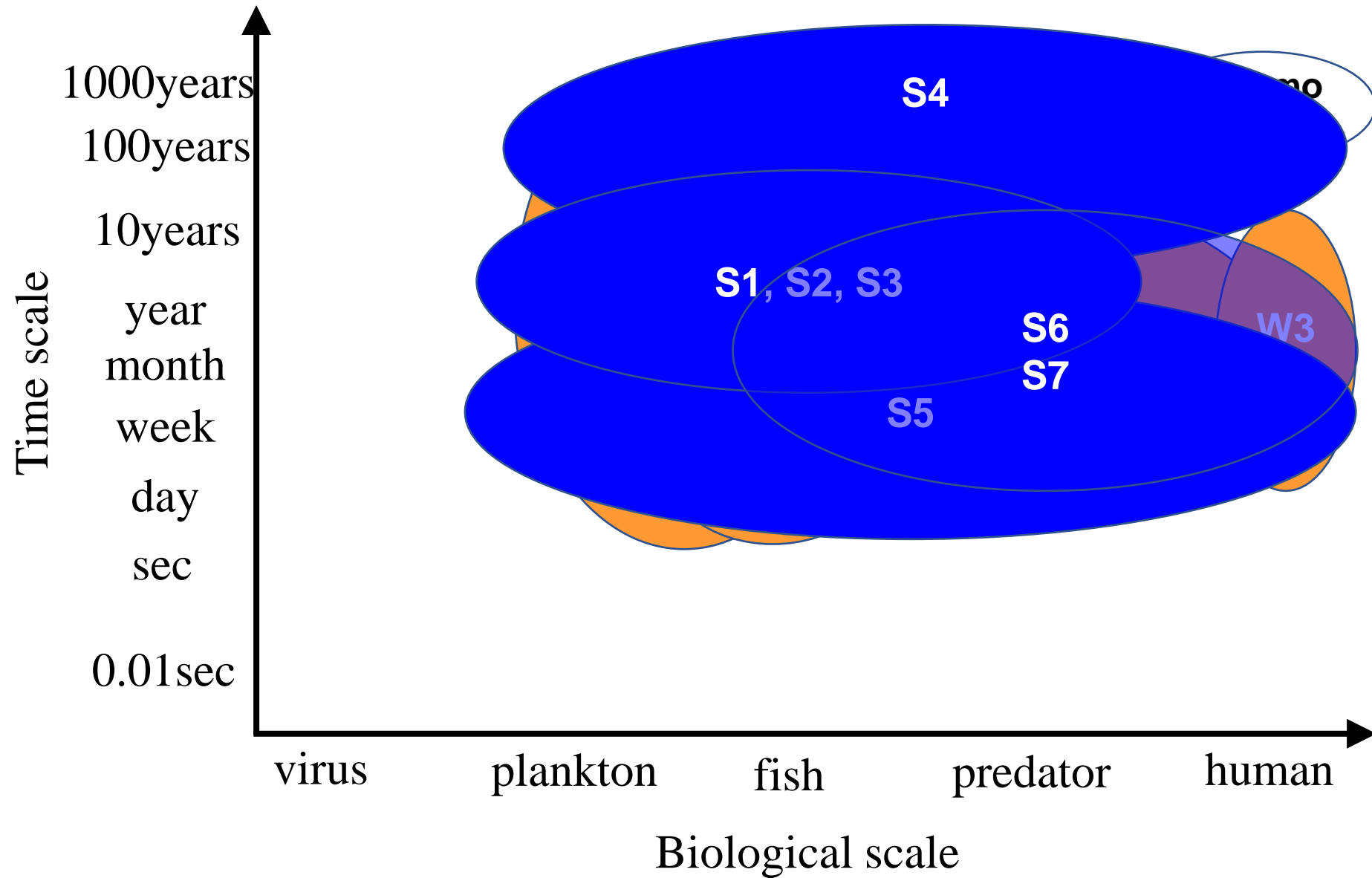
Small Pelagic Symposium 2022



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What is missing from the symposium?



1. Influence of **turbulence and wave** (feeding, energy cost, Stokes drift, etc.)
2. Influence of **frontogenesis** (aggregation, 3d-circulation, etc.)
3. Coastal transition zone
4. Influence of stressors: acidification, deoxygenation, microplastic, etc.
5. Endocrinology and **brain science** (hormone, decision making, etc.)
6. **Behavior**: typhoon, micro-patch, communication, catchability, bycatch, MPA, etc.
7. Health check (**omics** in stomach)
8. **Mortality (mechanism)**: starvation, virus, parasite, or predation?
9. Light: poleward shift limitation, phenological limitation
10. Sounds (noise): marine wind farm, ship, etc.
11. Acclimation
12. Closing migration: homing (smell, light, magnetic?)
13. Stress by fisheries: even if escaping from net...
14. **Linkage** with zooplankton (zooplankton behavior, zooplankton life strategy, nutrition)
15. **Linkage** with predator (escaping behavior from predator)
16. Mechanism of density dependent: stress, prey shortage, or stress on spawner?
17. Local knowledge & Indigenous knowledge
18. SGDs & UNDOS (4: Education, 5: Gender, 12: Responsible consumption and production)

What type of international project would be a game changer in advancing our knowledge of SPF?



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10. SGDs & UNDOS (4: Education)

1. What is missing from the symposium?

Q1 was hard to answer as I think it has been a great workshop!

What is missing > science communication - workshop on communicating our science to stakeholders - what do fisheries managers care about?



2. What type of international project would be a game changer in advancing our knowledge of SPF?

Synthesis of existing experimental data from all SPF systems worldwide to inform mechanistic SPF projections under climate change; expanding SSB-TEP analysis from Japan to other systems and comparing best methods to account for density dependence and environmental drivers in SPF stock assessments.

