Trophic interactions and competition between salmonids and micronekton in the open subarctic Pacific

Szymon Surma[1,2], Evgeny A. Pakhomov[1,2], Brian P. V. Hunt[1,2], and Kerim Y. Aydin[3]

[1]Institute for the Oceans and Fisheries, University of British Columbia
[2]Department of Earth, Ocean, and Atmospheric Sciences, University of British Columbia
[3]Alaska Fisheries Science Center, National Oceanic and Atmospheric Administration



INTERNATIONAL YEAR OF THE SALMON



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Introduction

- salmon: ecologically, economically, & culturally vital to PICES
- open subarctic Pacific: primary feeding ground for salmonids
- crucial to the growth & survival of salmon and steelhead trout
- micronekton: both prey & potential competitors for salmonids
- principal micronekton groups: small (meso)pelagic fish & squid
- trophic roles of salmon & micronekton still under active study

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Research question

- How strong are trophic & competitive interactions between Pacific salmonids & micronekton in open subarctic waters?

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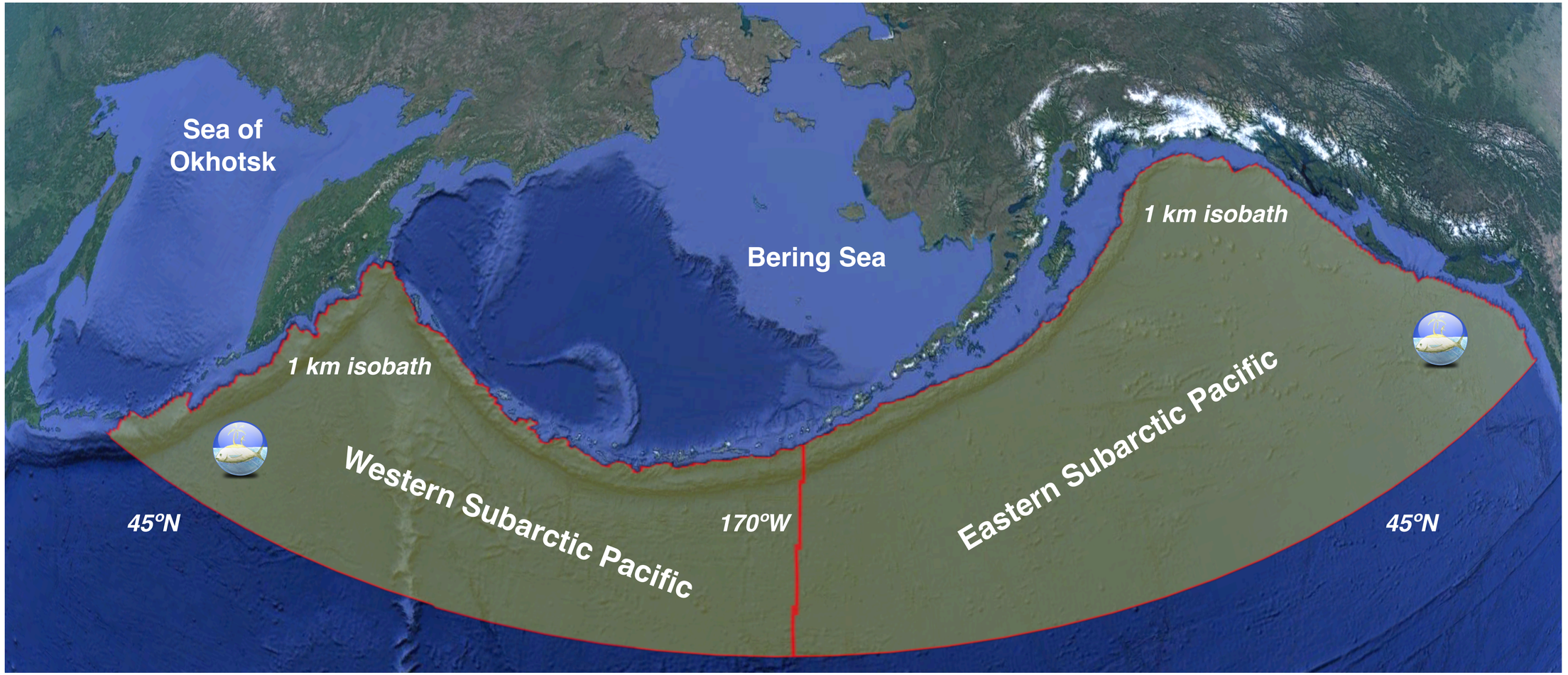
Open subarctic Pacific



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Ecopath with Ecosim

basic principle: mass balance

- **Ecopath**: static food web snapshot (nodes; pools & fluxes)
- Ecosim: dynamic ecosystem simulation (hindcast & forecast)



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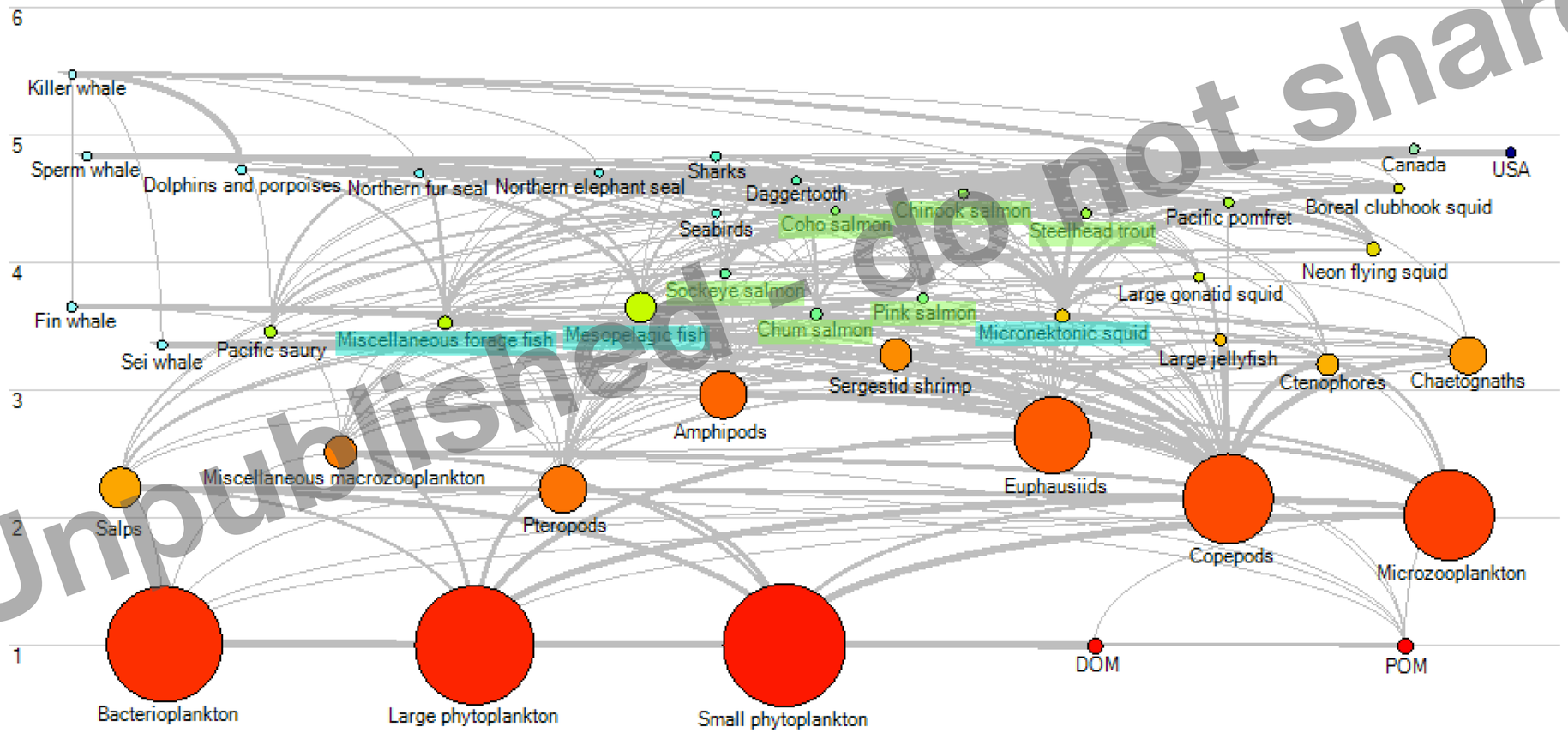
Eastern subarctic Pacific food web



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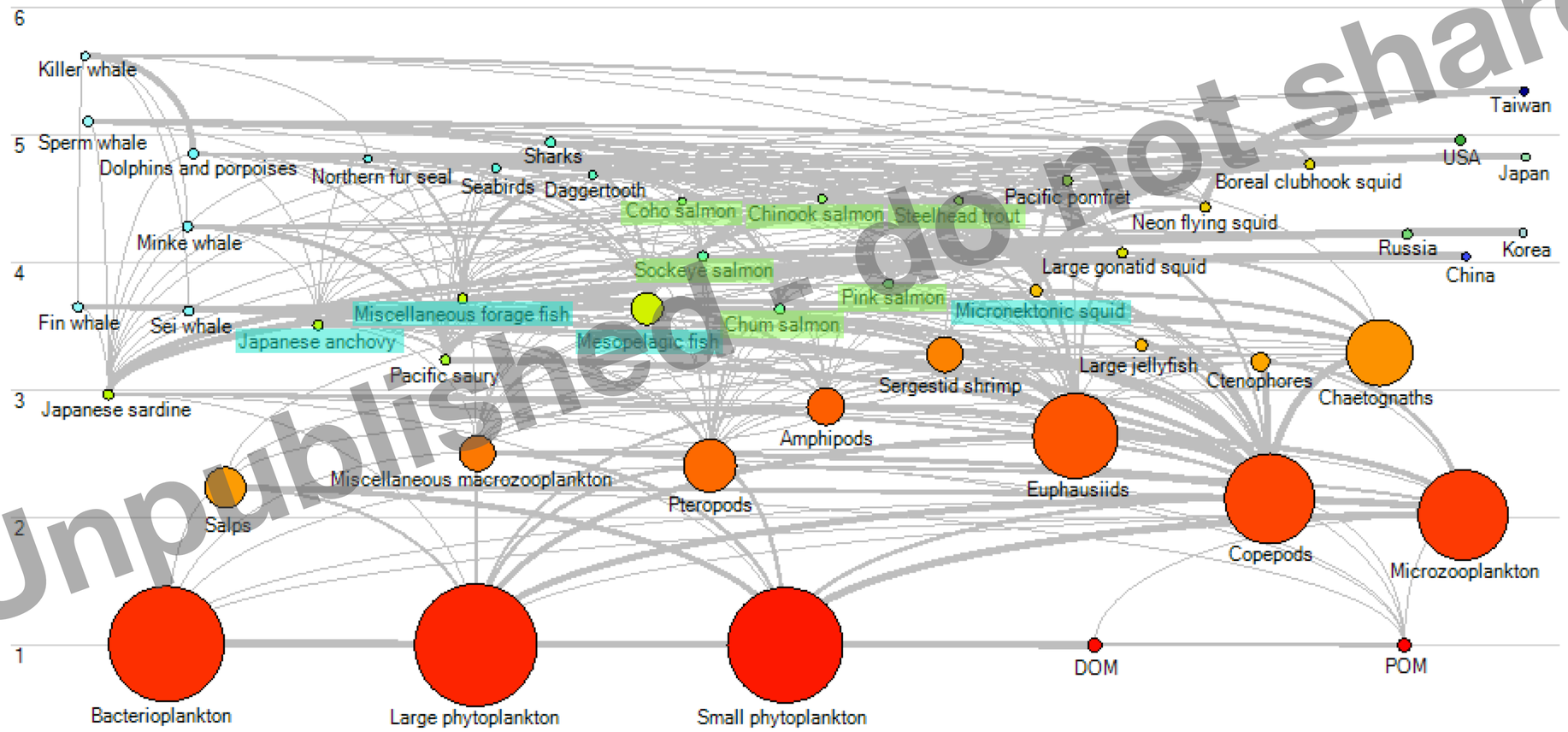
Western subarctic Pacific food web



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Trophic indicators

two model-generated metrics of trophic & competitive interactions:

- prey niche overlap: pairwise similarity between consumer diets (0–1)
- mixed trophic impact: instantaneous effect of a unit biomass change in one functional group on another (all direct & indirect trophic pathways)

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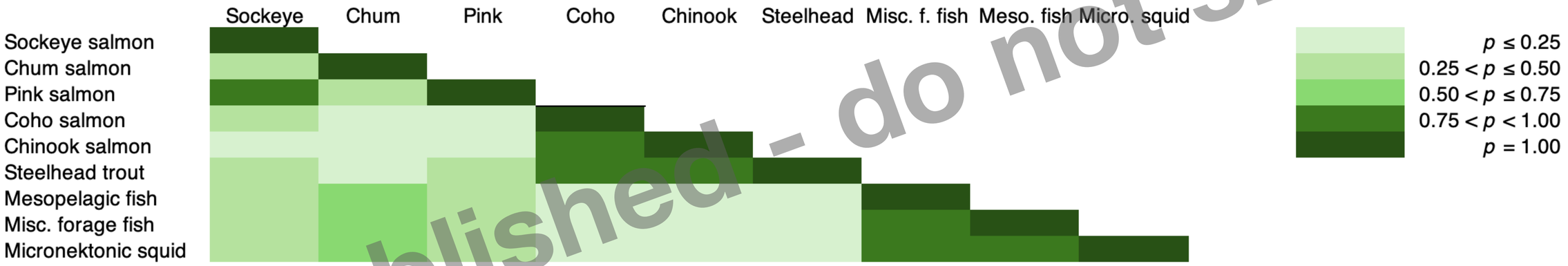
Prey niche overlap (east)



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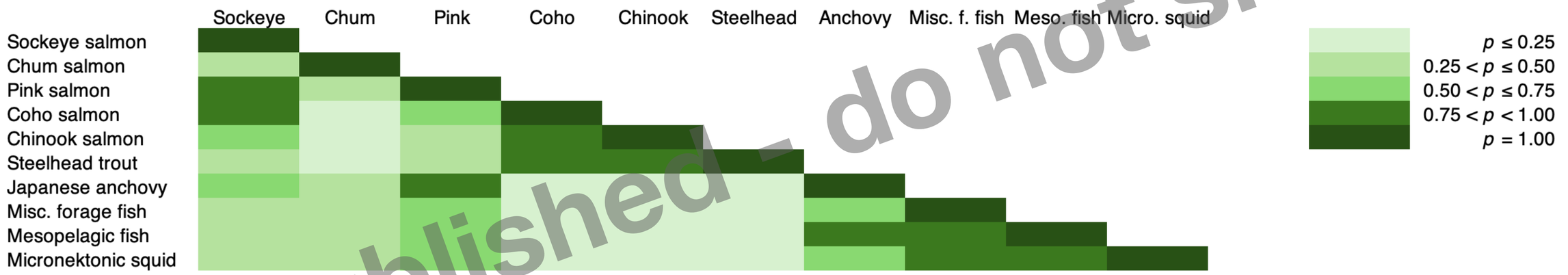
Prey niche overlap (west)



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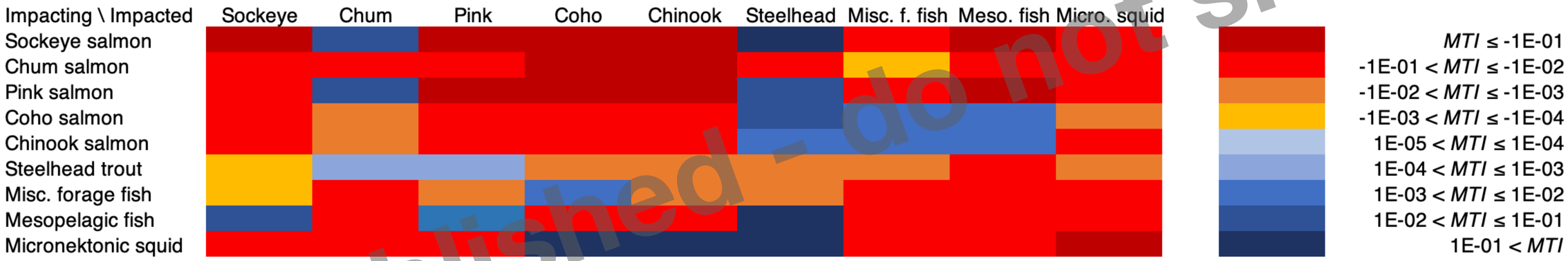
Mixed trophic impacts (east)



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Mixed trophic impacts (west)



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Conclusions

- sockeye, chum, & pink niches overlap substantially with micronekton
- some evidence for competitive impacts of micronekton on salmonids
- most detected impacts of this type are quite weak (< 10% biomass)
- impacts of salmonids on micronekton include competition & predation
- negative impacts are strongest within salmonid & micronekton guilds
- climate change & prey energy density may affect balance of impacts

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