S1 – Environmental controls of variability in small pelagics

S1: Environmental control of spatio-temporal changes in population size, distribution and migration of small pelagic fish in the ecosystem context

Convenors:
Emanuele Di Lorenzo (Georgia Institute of Technology, USA)
Dimitri Gutierrez (IMARPE, Peru)
Svein Sundby (Institute of Marine Research, Norway)
Yongjun Tian (Ocean University of China, China)

Plenary Speaker:
David Field (Hawai'i Pacific University, USA)

Invited Speaker:
Bryan Black (University of Texas at Austin, USA)

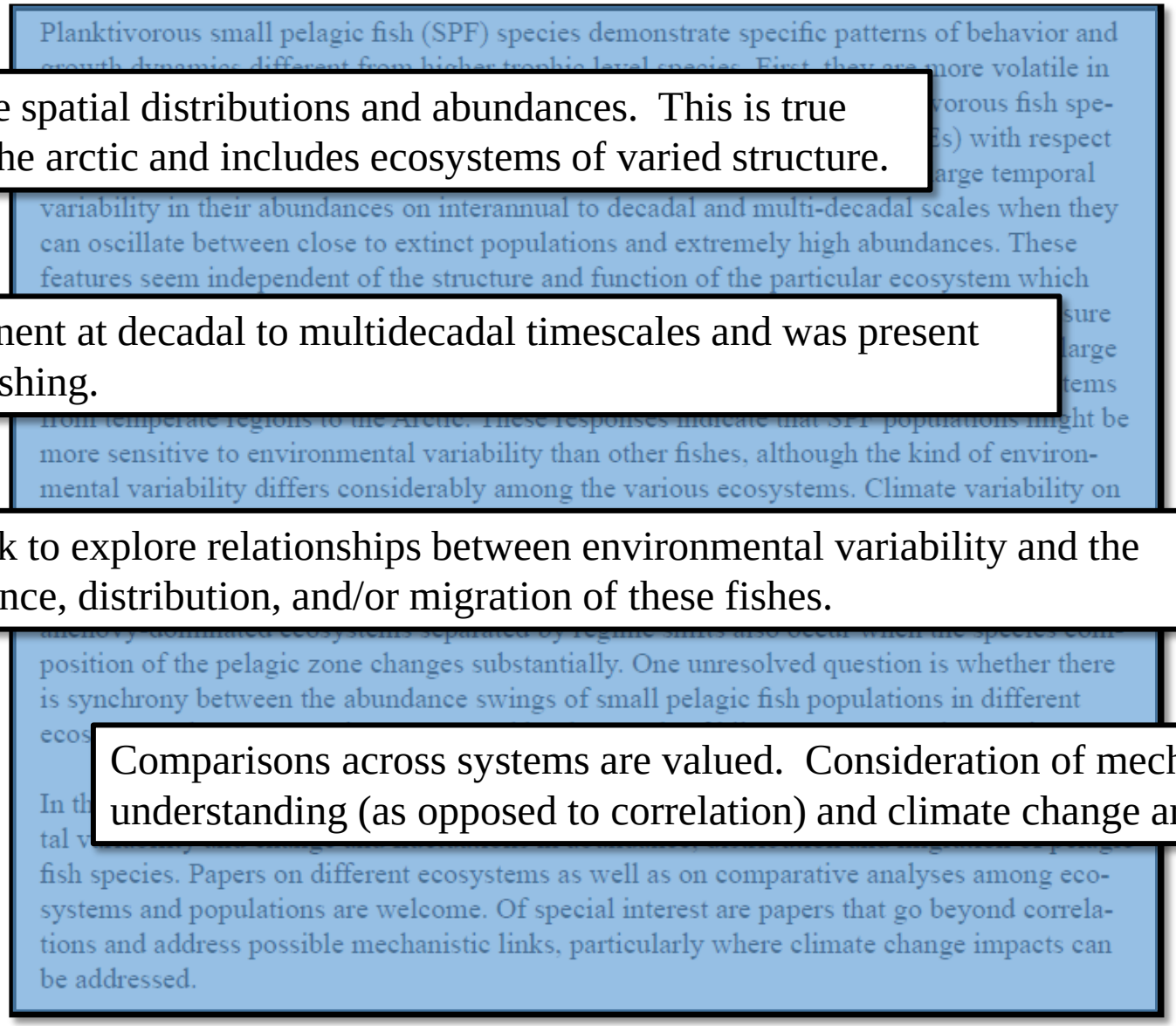
S1 – Environmental controls of variability in small pelagics

Small pelagics have volatile spatial distributions and abundances. This is true from temperate regions to the arctic and includes ecosystems of varied structure.

Variability is prominent at decadal to multidecadal timescales and was present prior to industrial fishing.

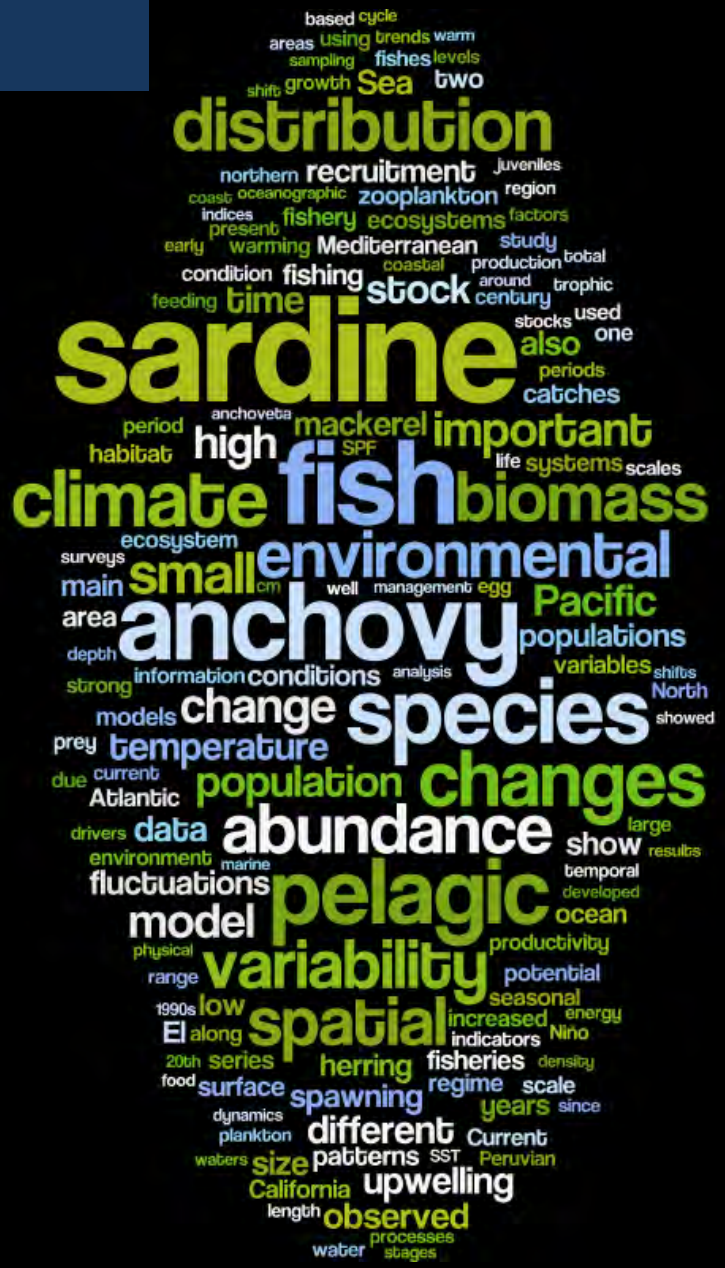
We seek to explore relationships between environmental variability and the abundance, distribution, and/or migration of these fishes.

Comparisons across systems are valued. Consideration of mechanistic understanding (as opposed to correlation) and climate change are emphasized.

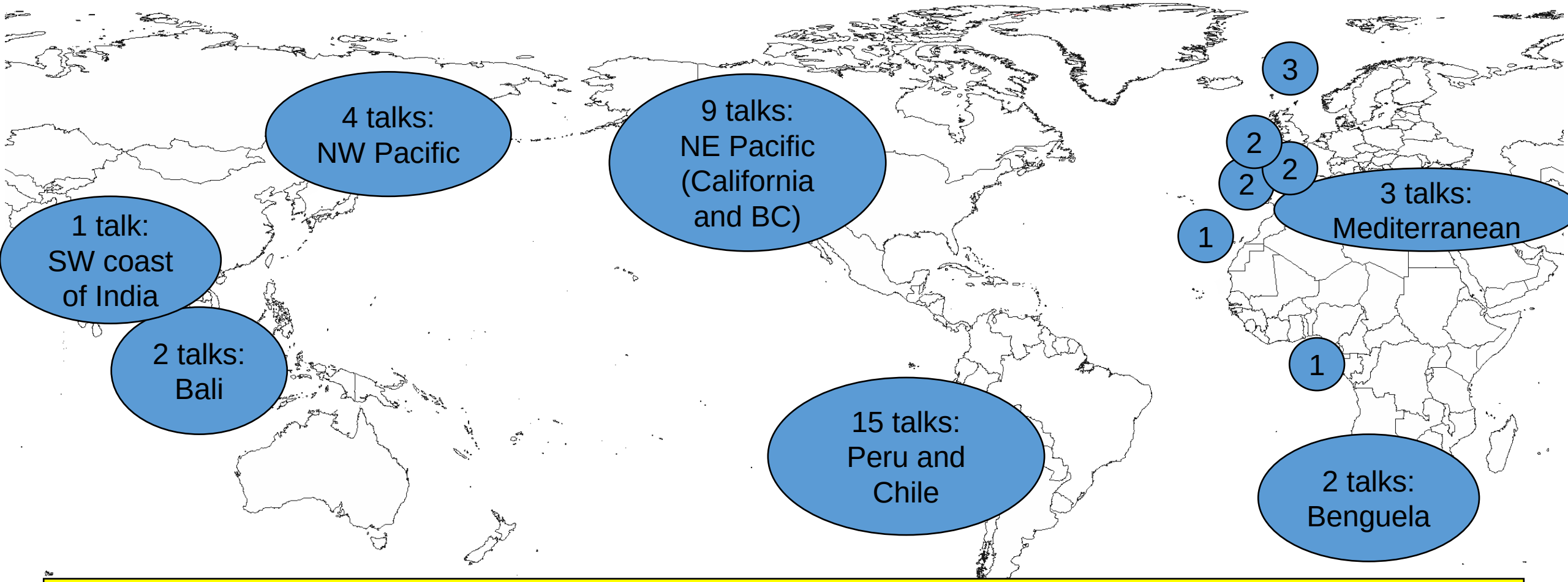


Planktivorous small pelagic fish (SPF) species demonstrate specific patterns of behavior and growth dynamics different from higher trophic level species. First, they are more volatile in ... vorous fish spe- ...s) with respect ...arge temporal variability in their abundances on interannual to decadal and multi-decadal scales when they can oscillate between close to extinct populations and extremely high abundances. These features seem independent of the structure and function of the particular ecosystem which ...sure ...large ...tems ...ght be more sensitive to environmental variability than other fishes, although the kind of environmental variability differs considerably among the various ecosystems. Climate variability on ... position of the pelagic zone changes substantially. One unresolved question is whether there is synchrony between the abundance swings of small pelagic fish populations in different ecos... In th... tal v... fish species. Papers on different ecosystems as well as on comparative analyses among ecosystems and populations are welcome. Of special interest are papers that go beyond correlations and address possible mechanistic links, particularly where climate change impacts can be addressed.

Family Feud!



TERM	*PERCENTAGE*
sardine	1.24%
fish	0.91%
anchovy	0.91%
pelagic	0.71%
species	0.71%
climate	0.62%
changes	0.61%
population	0.59%
distribution	0.58%
model	0.57%
abundance	0.54%
biomass	0.54%
spatial	0.53%
variability	0.53%
environmental	0.51%



4 talks were explicitly global in approach and explored response to low-frequency variability; anthropogenic climate change and species distributions; synchrony in landings (or lack thereof); and broad descriptions of genetics, abundances, mechanisms of nutrient supply, and future challenges

Sufficiency of understanding across regions varies

The status of our understanding varies—from descriptions of the stock structure, migration, and demographics for species that are more recently considered…

…To more mechanistic considerations for stocks that are associated with longer time series and more comprehensive historical observations.

Approaches, processes explored, and environmental factors considered

SE Pacific
ENSO
Coastal runoff
Wind stress; upwelling
Temperature
Comprehensive models of distribution
Oxygen content
Zooplankton composition
Fisheries
Clearly NOT just fisheries
Phenology

NE Pacific
ENSO
Temperature
Clearly NOT temperature
Certainly NOT just fisheries
Spawning intensity

NE Atlantic
Shifts in species distribution
Species interactions
Temperature
Clearly NOT just temperature
Frontal processes
Oxygen

NW Pacific
Atmospheric forcing of mixing
Rossby wave propagation

Regarding issues of synchrony and alternation

In my opinion, we have, thus far, made little progress.

Regarding issues of synchrony and alternation

Multiple forcing factors exists; non-stationarity needs to be considered.

The presence of synchrony and multiple forcing factors are NOT mutually exclusive.

Often something that is empirically correlated to temperature, but this is likely a proxy for multiple processes. Relationships between controlling mechanisms and SST may change over time. (Or, the controlling mechanism may change over time.)

Clear developments in recent approaches
Acoustics (consideration of spatial ecology)
Quantitative modeling and more complex statistical packages
Simple statistical approaches
Stable isotopes, both for trophic positioning but also as a tracer of migration