Rick Bartow
courtesy of
Froelick Gallery

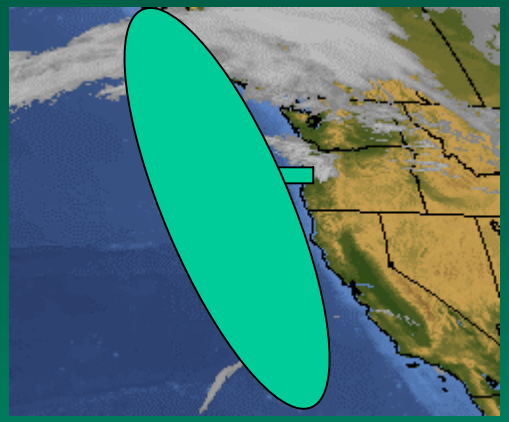
Climate impacts on OPI coho salmon *(Oncorhynchus kisutch)* production:

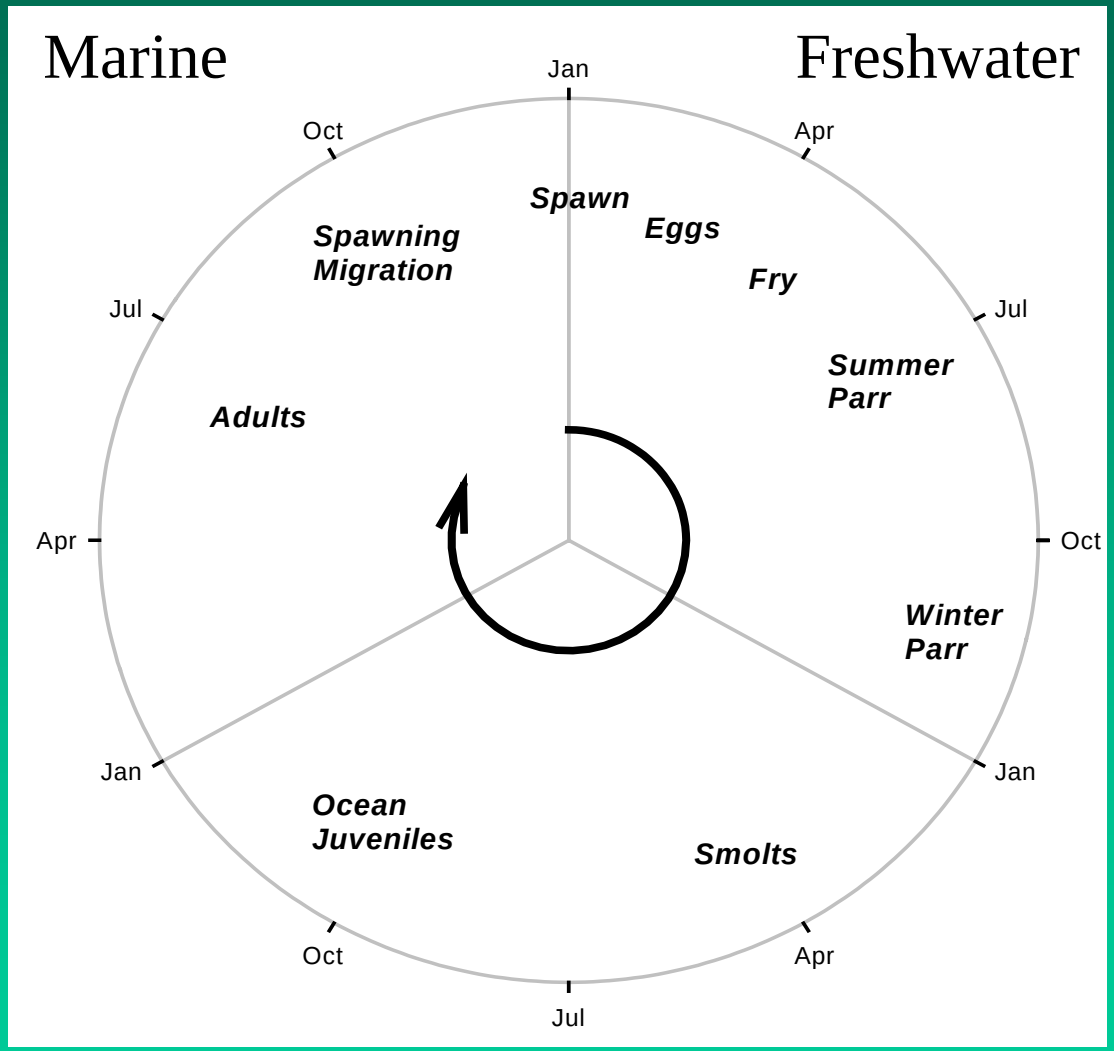
insights from a species sensitive to habitat change at daily to centennial time scales

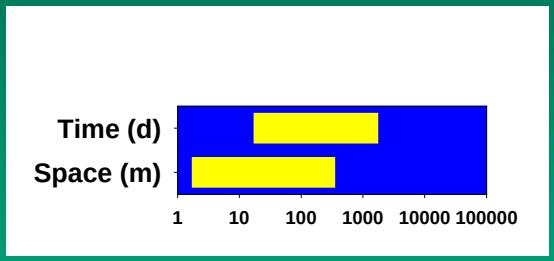
Peter W. Lawson
NOAA Fisheries

Rick Bartow
courtesy of
Froelick Gallery

Coho Salmon Life-Cycle



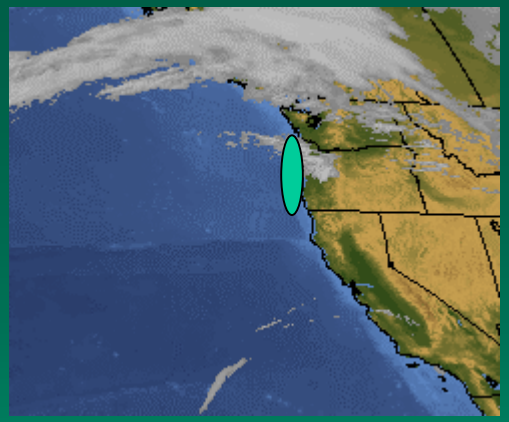


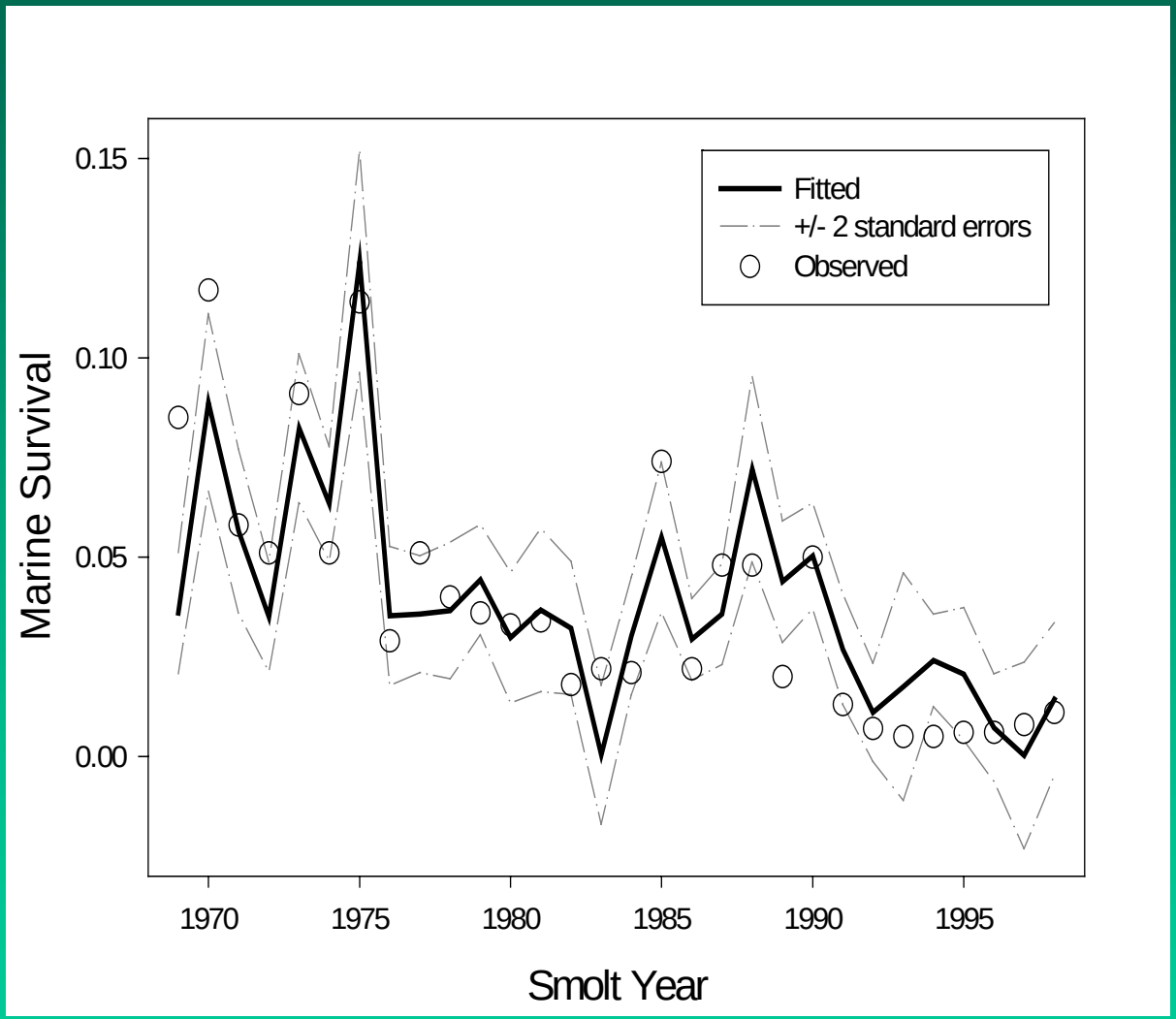


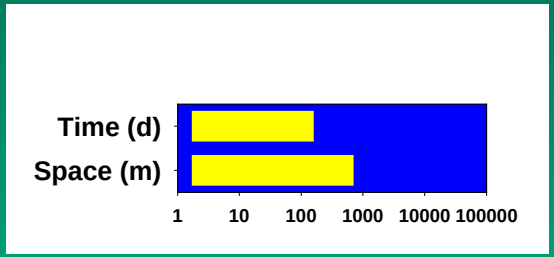
- 3-year life cycle
- Divided evenly
  - Freshwater
  - Marine

- Recruitment variability also split evenly

Marine Survival as a function of environmental processes



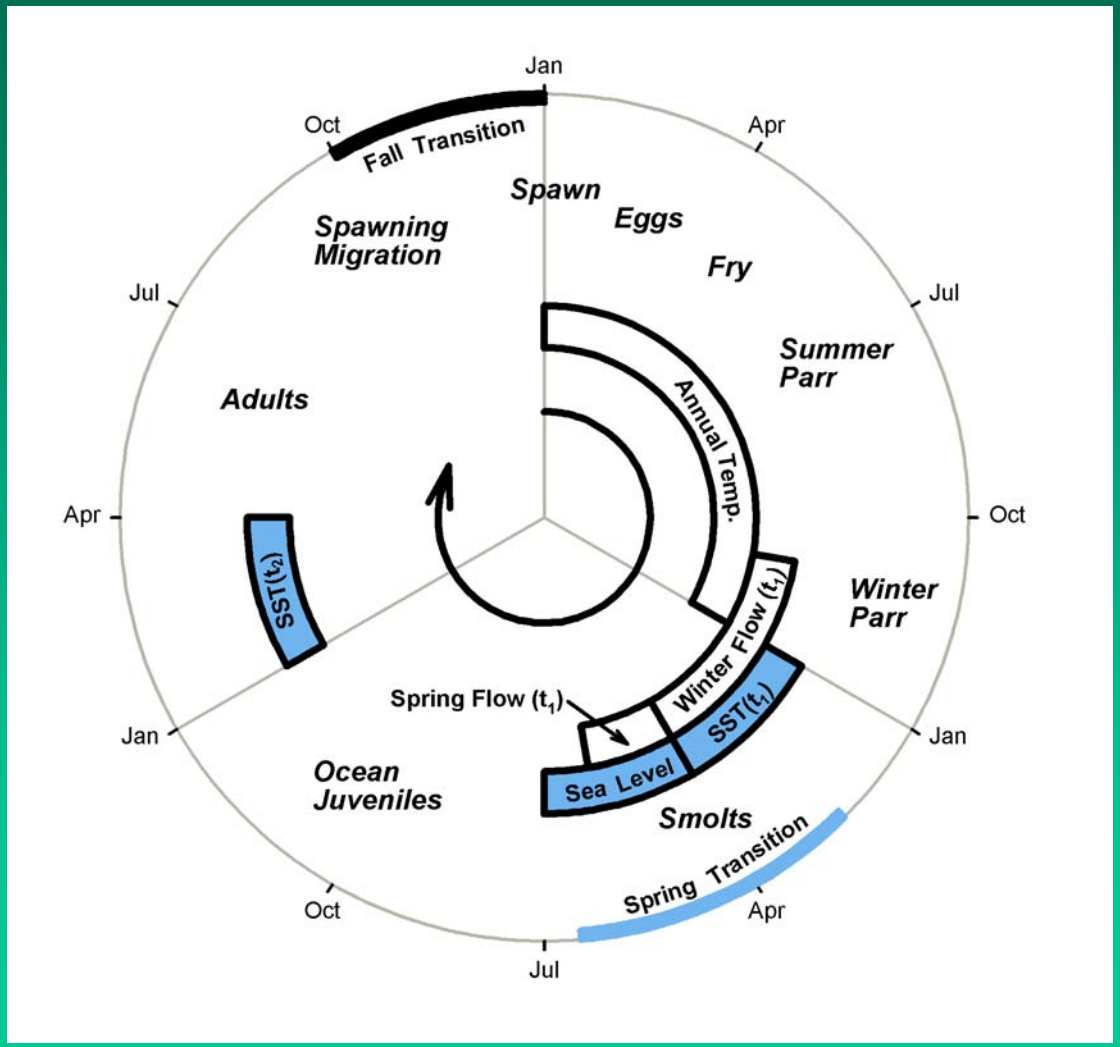


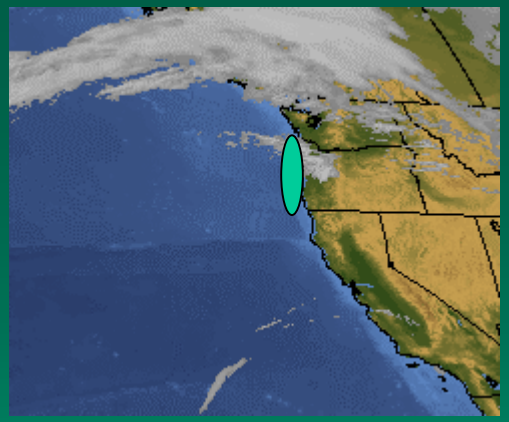


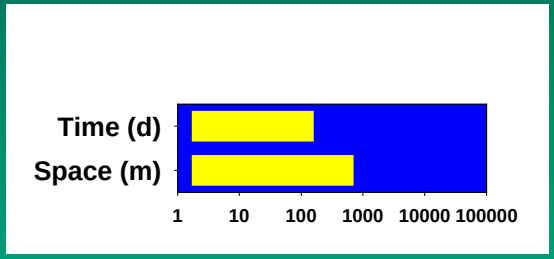
- SST
  - (1st winter)
- Upwelling
  - (1st spring)
- Spring transition
- SST
  - (2nd winter)

Logerwell et al. 2003

Environmental processes affecting marine survival mapped onto the life-cycle

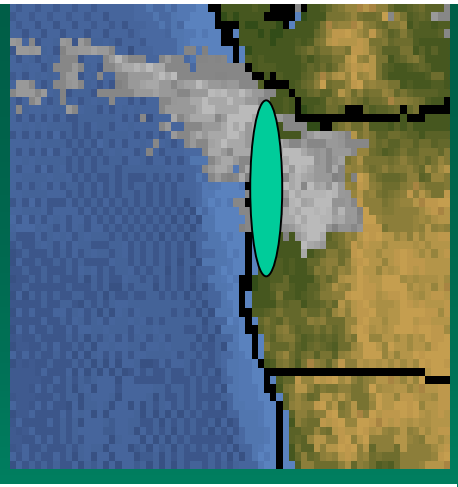


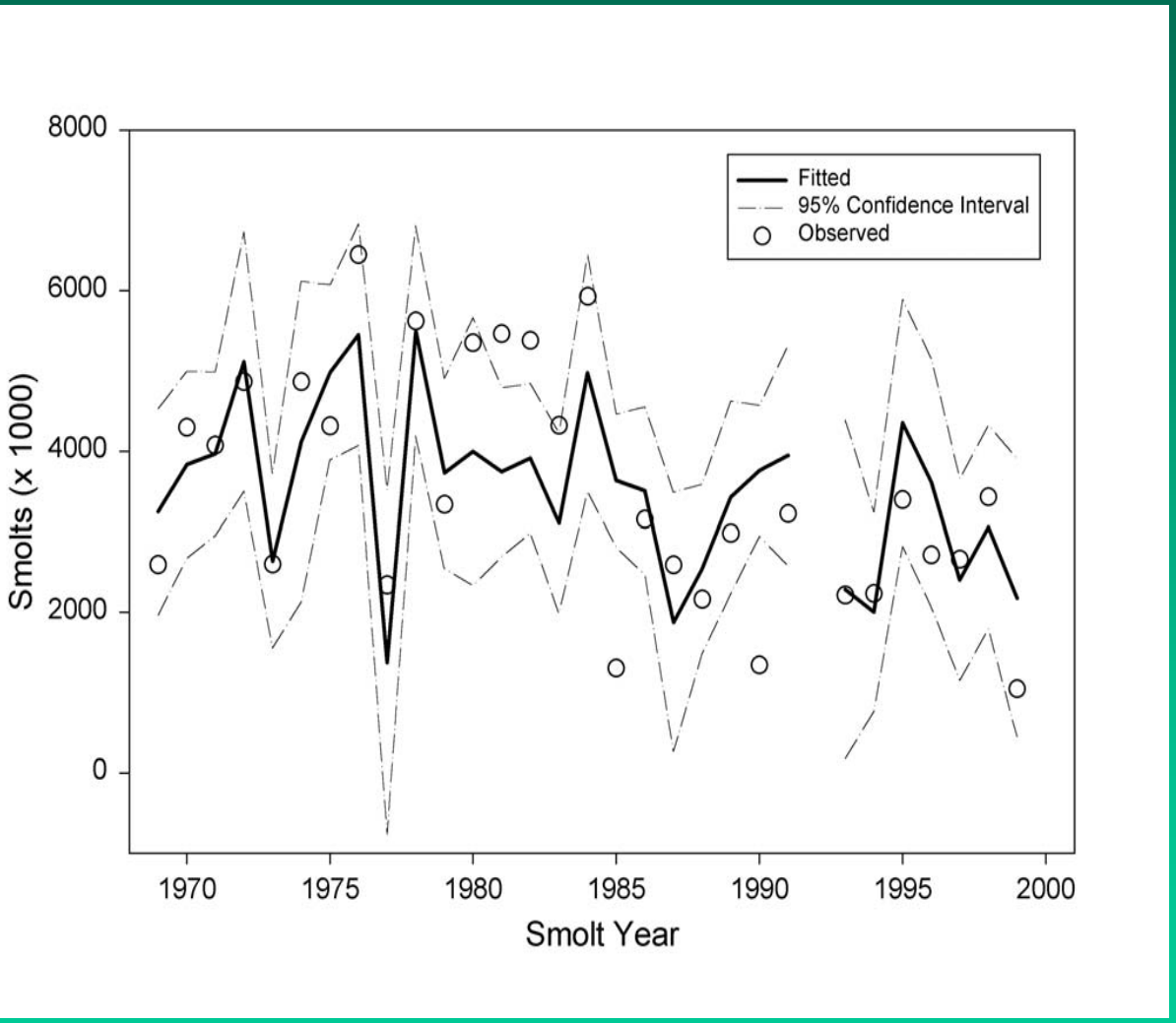


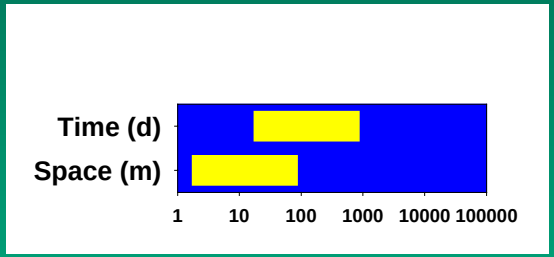


Concentrated around the time of ocean entry

Freshwater Survival as a function of environmental processes



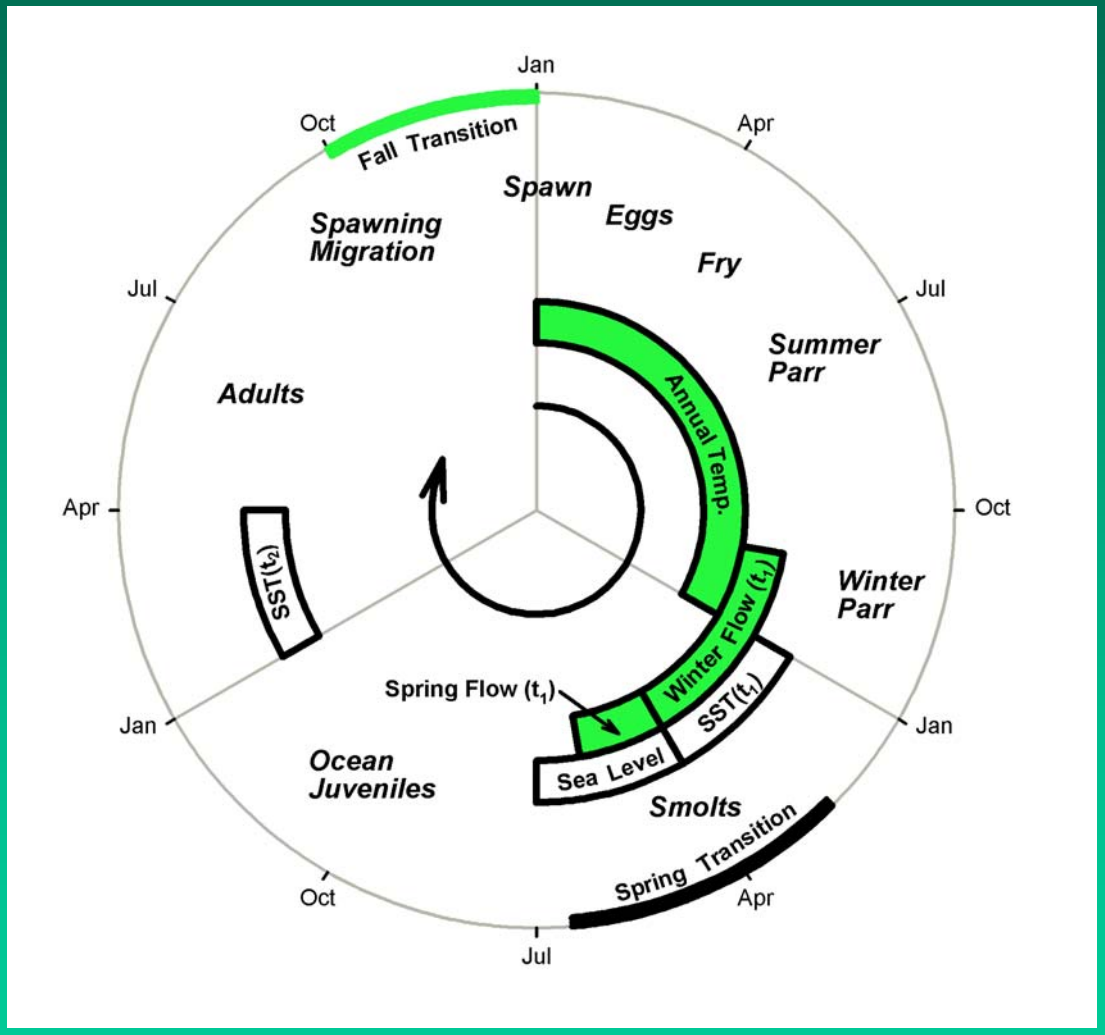


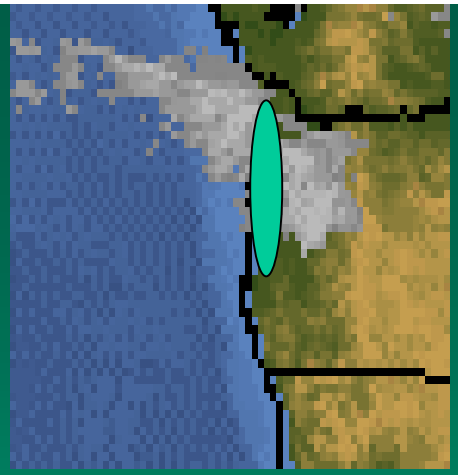


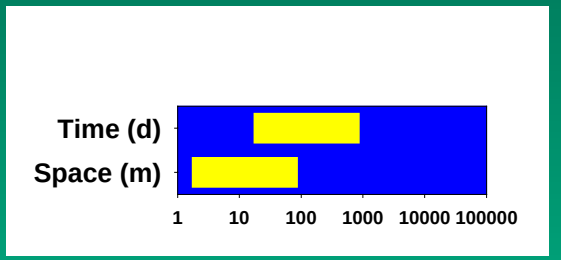
- **Fall transition**
- **Annual air temp.**
- **Winter flows**
  - **2nd winter**
- **Spring flows**
  - **2nd spring**

Lawson et al. 2004

Environmental processes affecting freshwater survival mapped onto the life-cycle

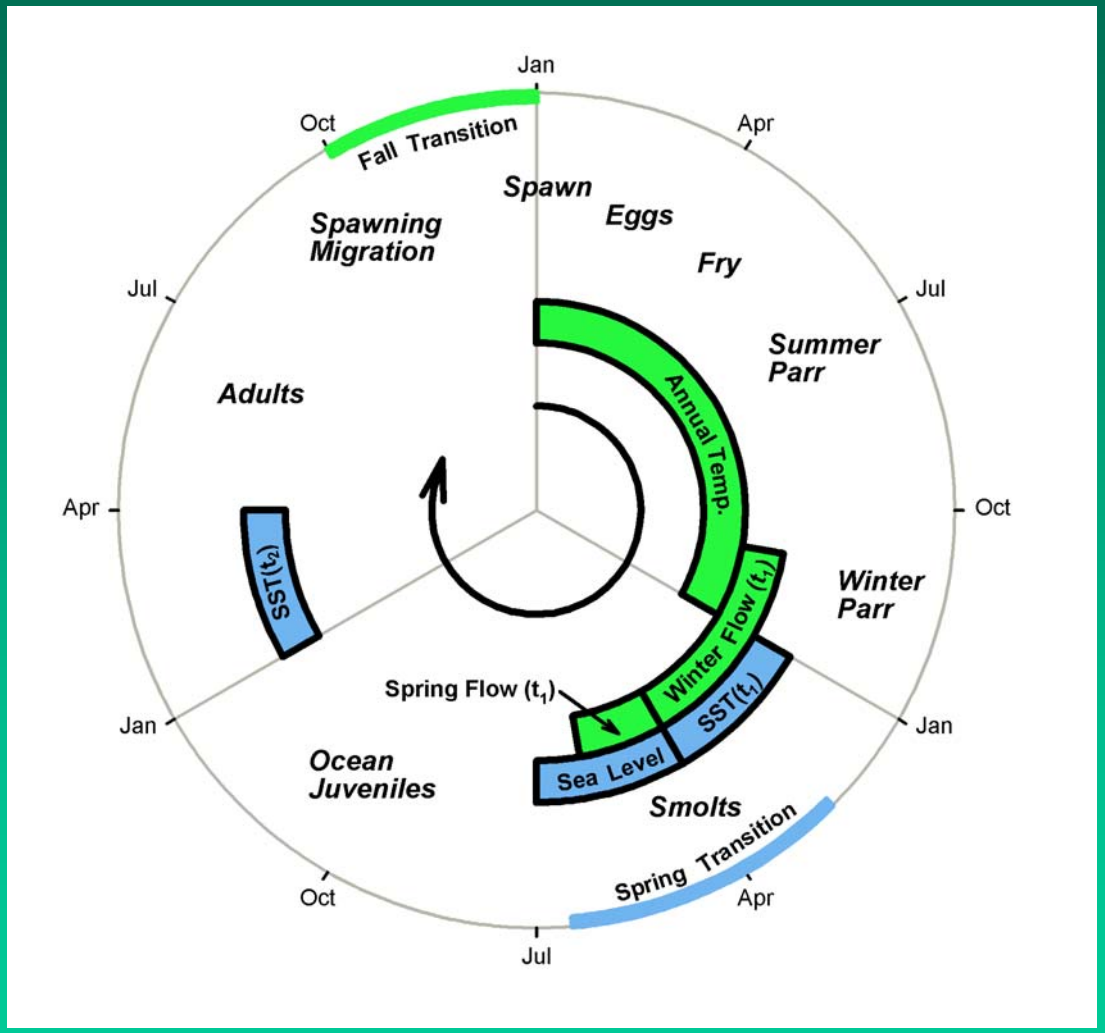


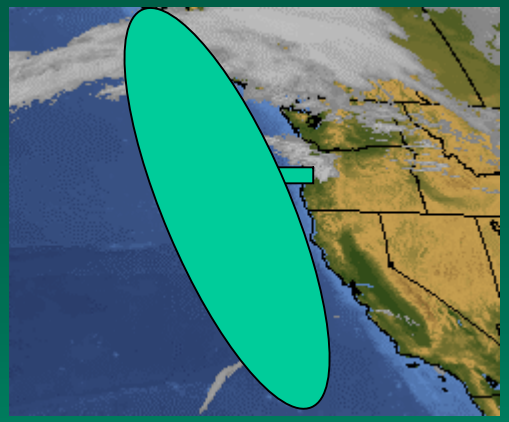


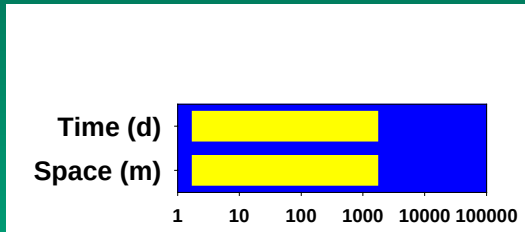


- Throughout freshwater residency
- Flow important around the time of ocean entry

Environmental processes affecting both marine and freshwater survival

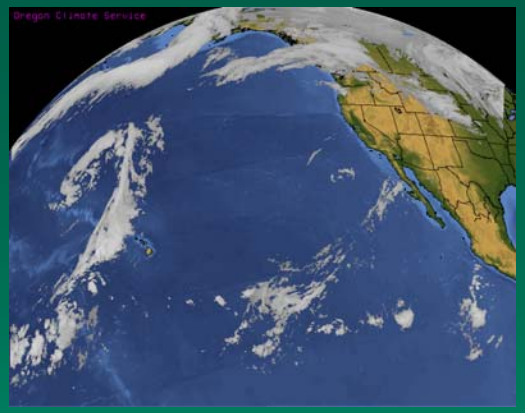




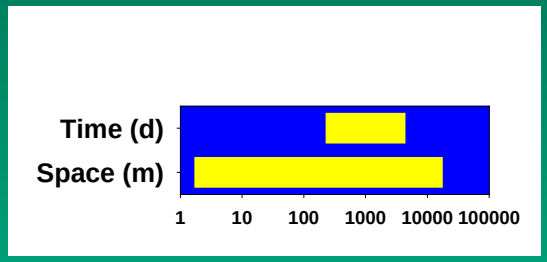


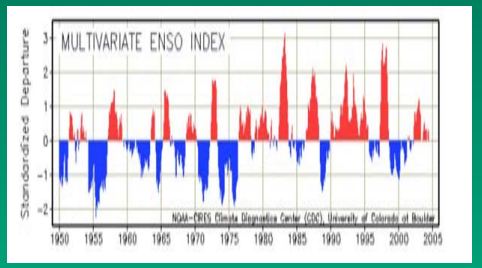
- Both freshwater and marine concentrated around the time of ocean entry
- Effects are positively correlated

Climate Drivers

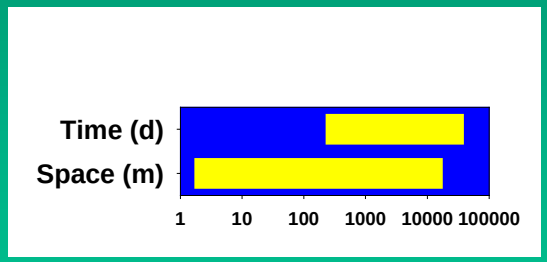


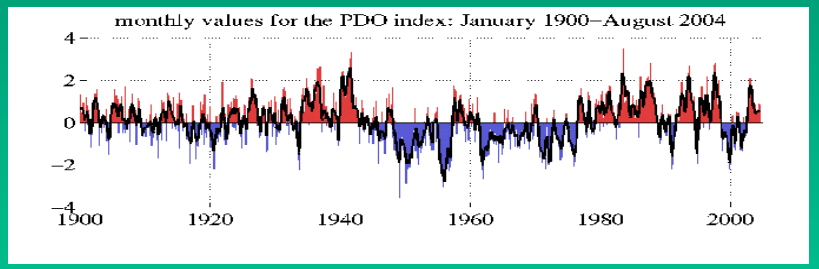
- **ENSO**



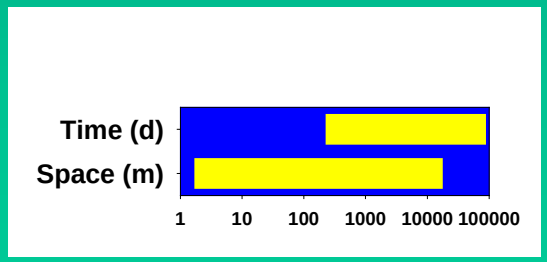


- **PDO**





- **Trend**

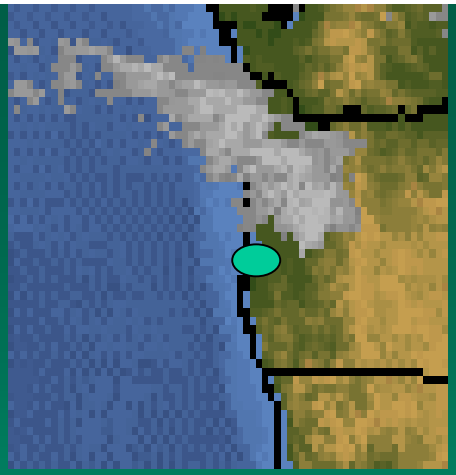


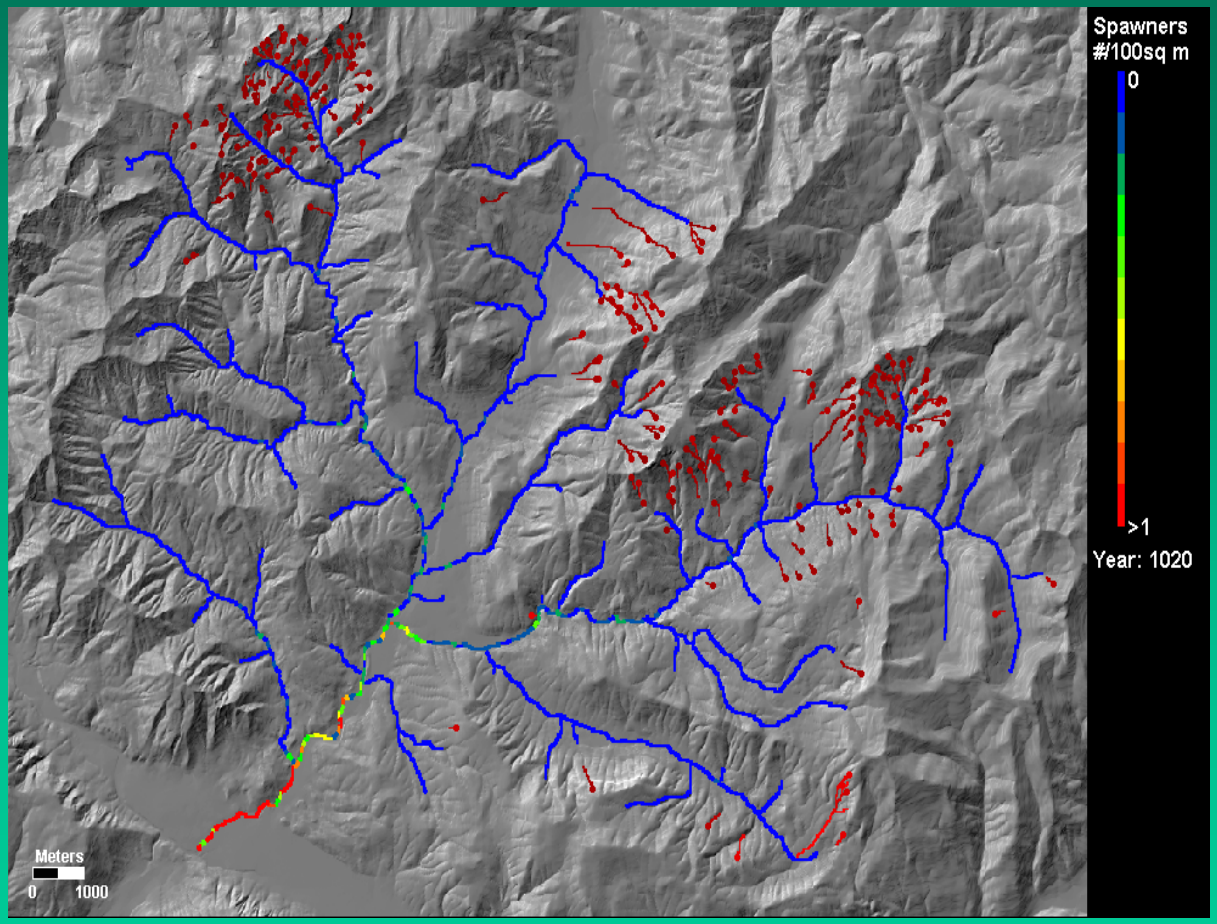
?

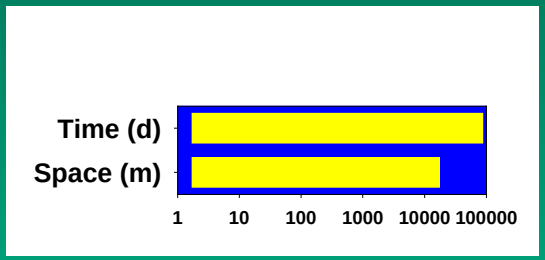
Both models assume stationary background conditions

- Habitat
- Ecosystem
- Freshwater
- Marine

A landscape-based, dynamic, spatially distributed coho salmon-population model to explore interactions between population dynamics and habitat variability in space and time

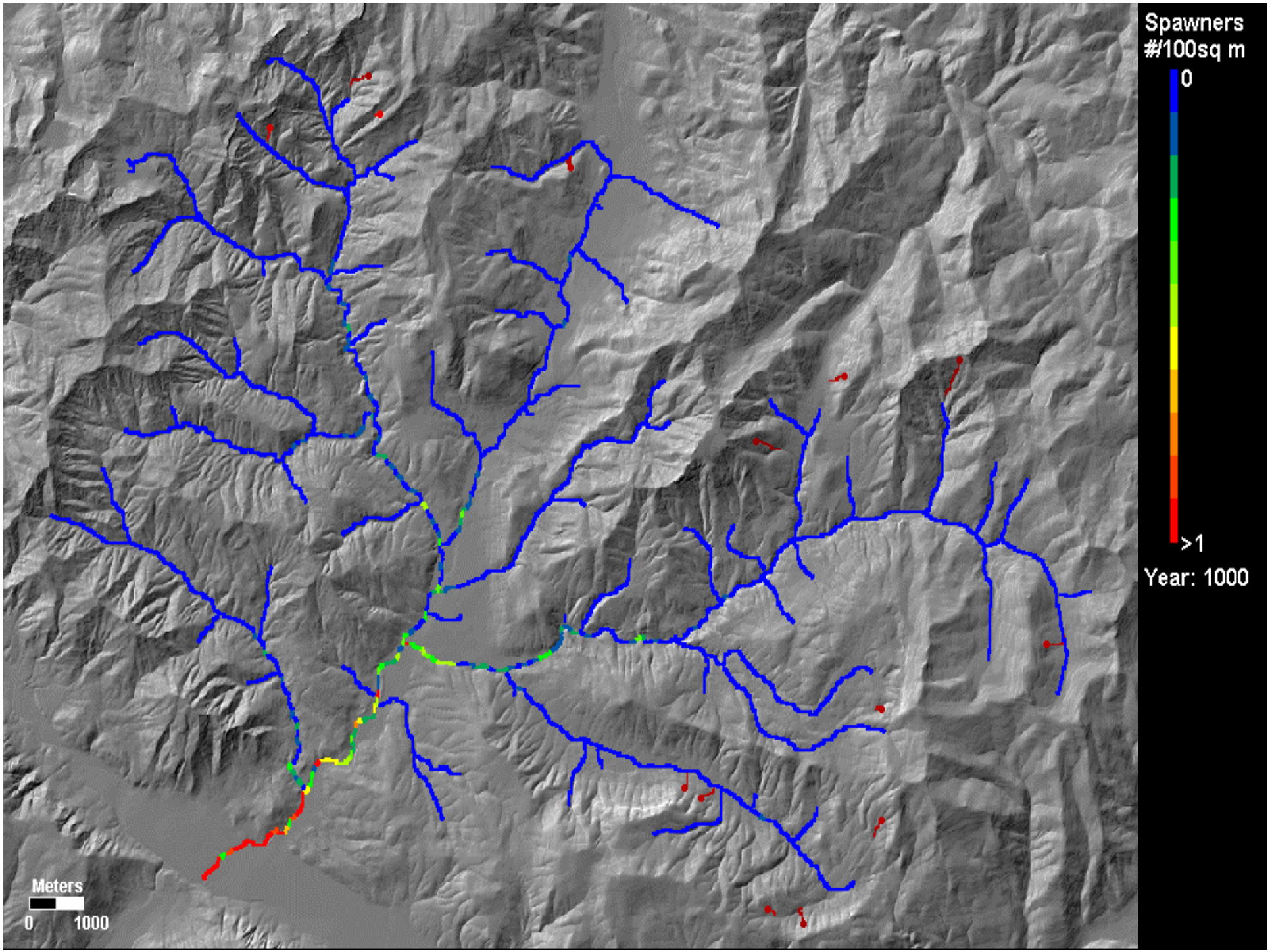




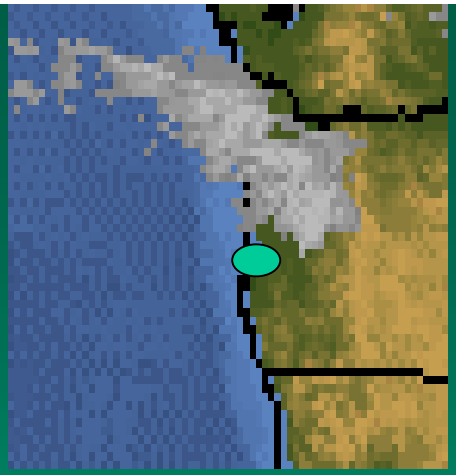


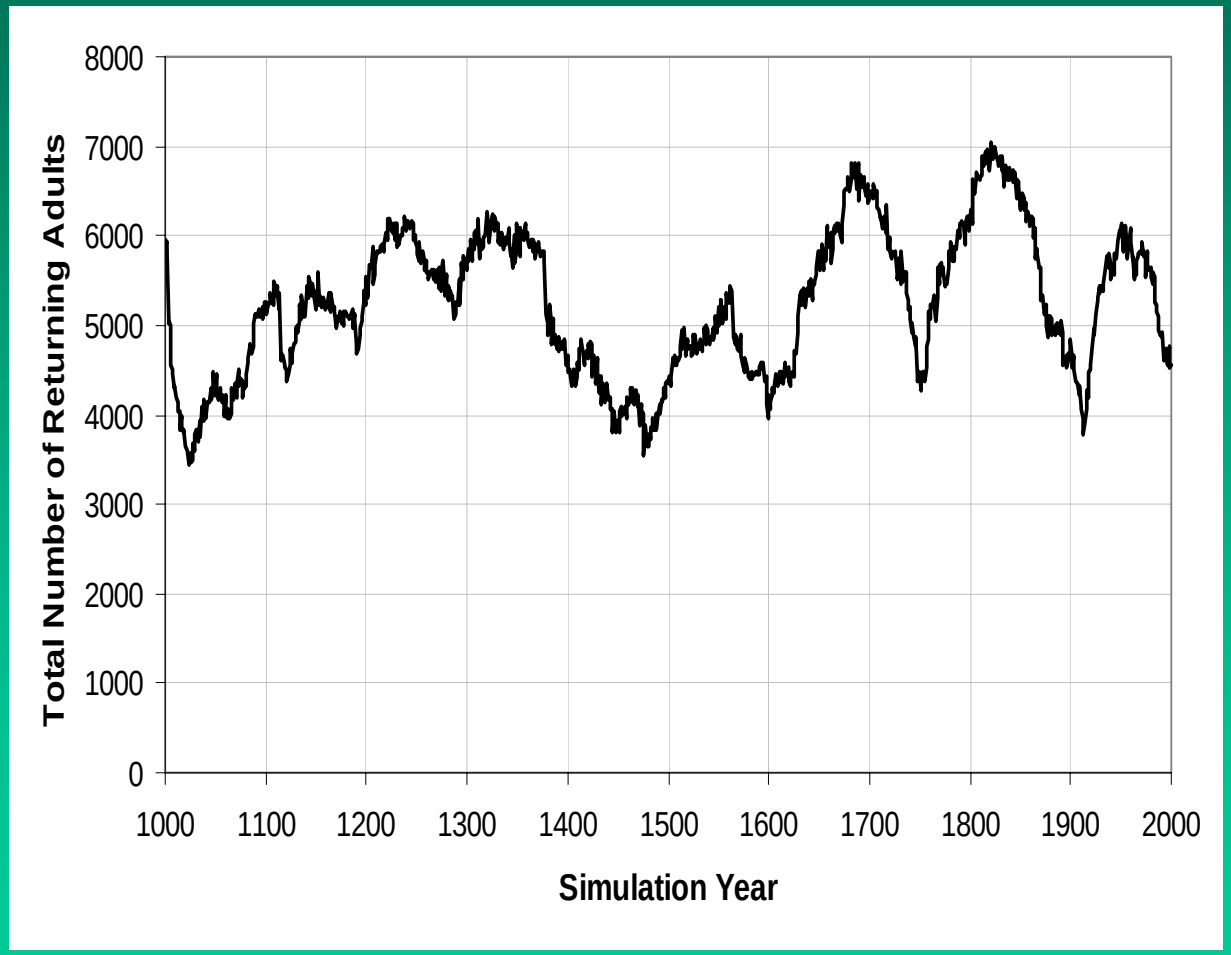
- Tree growth
- Fire
- Landslides
- Stream habitat
  - wood
  - gravel
- Precipitation

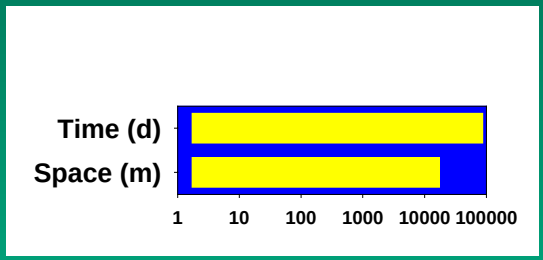
Dan Miller


Spawners
#/100sq m
0
>1
Year: 1000
Meters
0
1000

Total number of returning adults
1000 years of simulation
A different long-term dynamic!







Intrinsic cycles

- 100 yr
- 500 yr ?

- Tree growth
- Climate
  - stochastic (not cyclic)

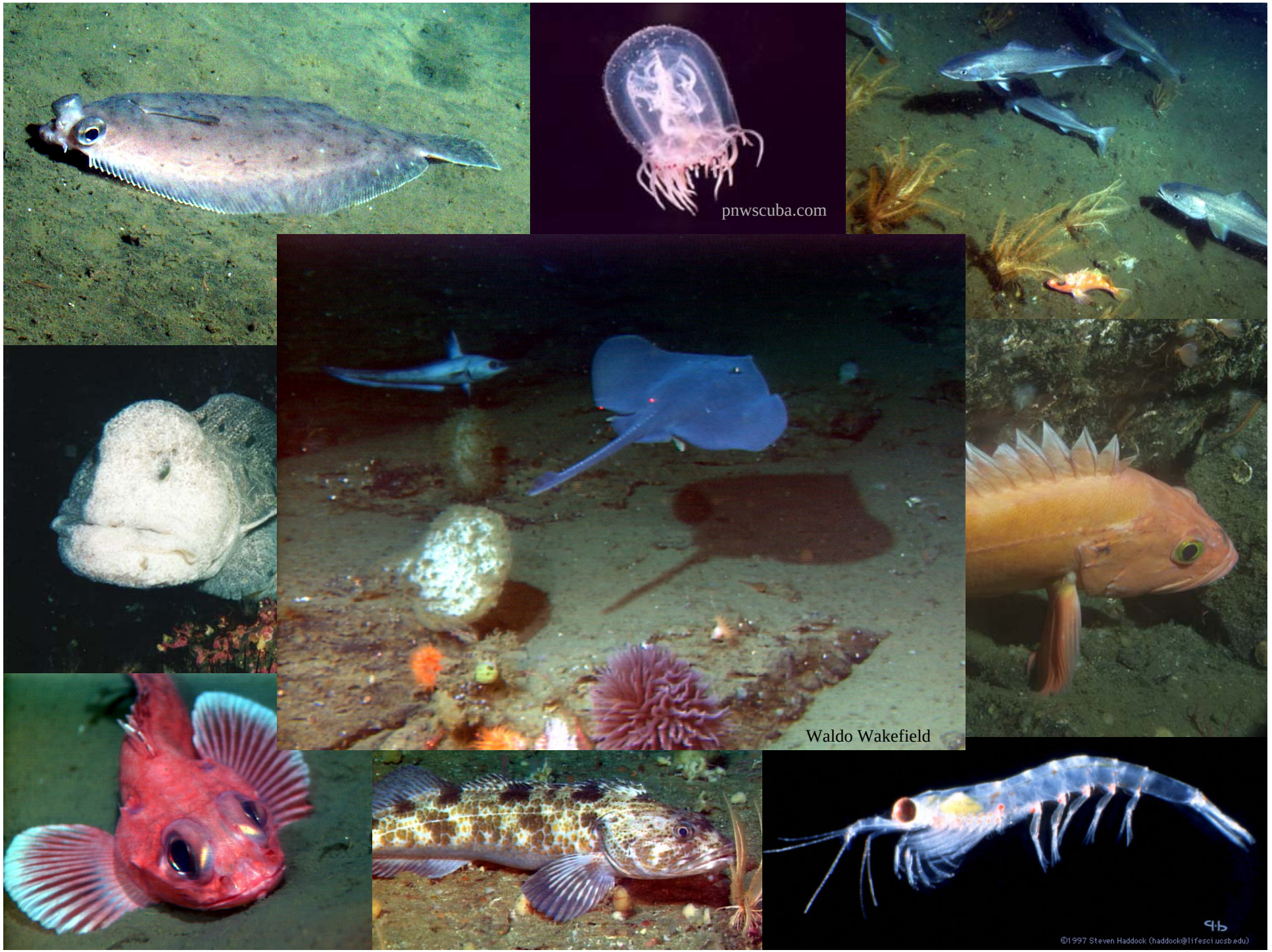
Dan Miller

Is this also happening in the ocean?

Waldo Wakefield

Are rockfish the trees of the ocean?

Waldo Wakefield


pnwscuba.com
Waldo Wakefield
©1997 Steven Haddock (haddock@lifesci.ucsb.edu)

Rick Bartow
courtesy of
Froelick Gallery