Tweedley, J., Valesini, F., Hoeksema, S. and Potter, I. (2011) Relationships between fish and benthic macroinvertebrate faunas and habitat types in Broke Inlet, Western Australia. In: 48th Annual Conference of the Australian Marine Science Association, 3 - 7 July, Fremantle, Western Australia.

Relationships between fish faunas and habitat types in a seasonally-open estuary

Photo: Bryn Farmer

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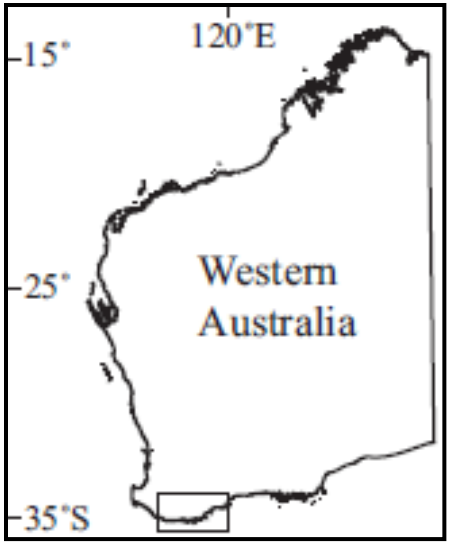
Broke Inlet

- Located on south coast of Western Australia
- One of largest estuaries on the south coast
- Morphology
  - Large central basin
  - Narrow entrance channel
  - Seasonally-open: opens to the ocean each year
- Large seasonal and interannual fluctuations in salinity
- Extensive shoaling banks
- Relatively shallow (≤2m)



Why study Broke Inlet?

- Only estuary in south-western Australia classified as "near pristine" (NLWRA Survey 2001)
- Limited quantitative data on the faunal assemblages
- Provides an important comparison with other seasonally–open south coast estuaries, e.g. Wilson Inlet (Denmark)

Study aims

- Quantitatively classify the nearshore habitat types within Broke Inlet
- Examine, on a seasonal basis, for two years,
  - Characteristics of the fish fauna
  - Water quality (salinity, temperature and dissolved oxygen content)
- Ascertain the "match" between the ichthyofaunal assemblages and habitat types

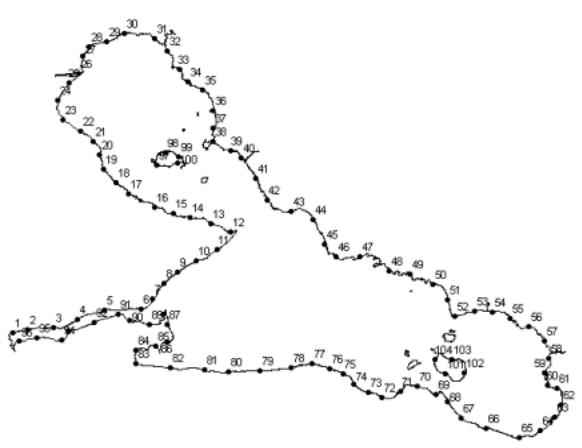
Photo: Water and Rivers Commission

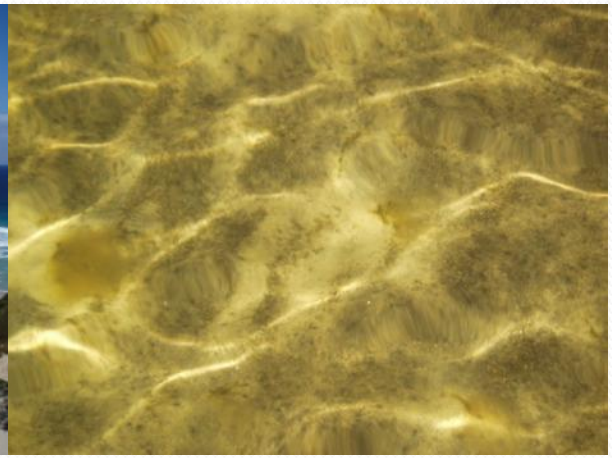
Enduring Environmental Variables (EEVs)

Location
- Latitude
- Longitude

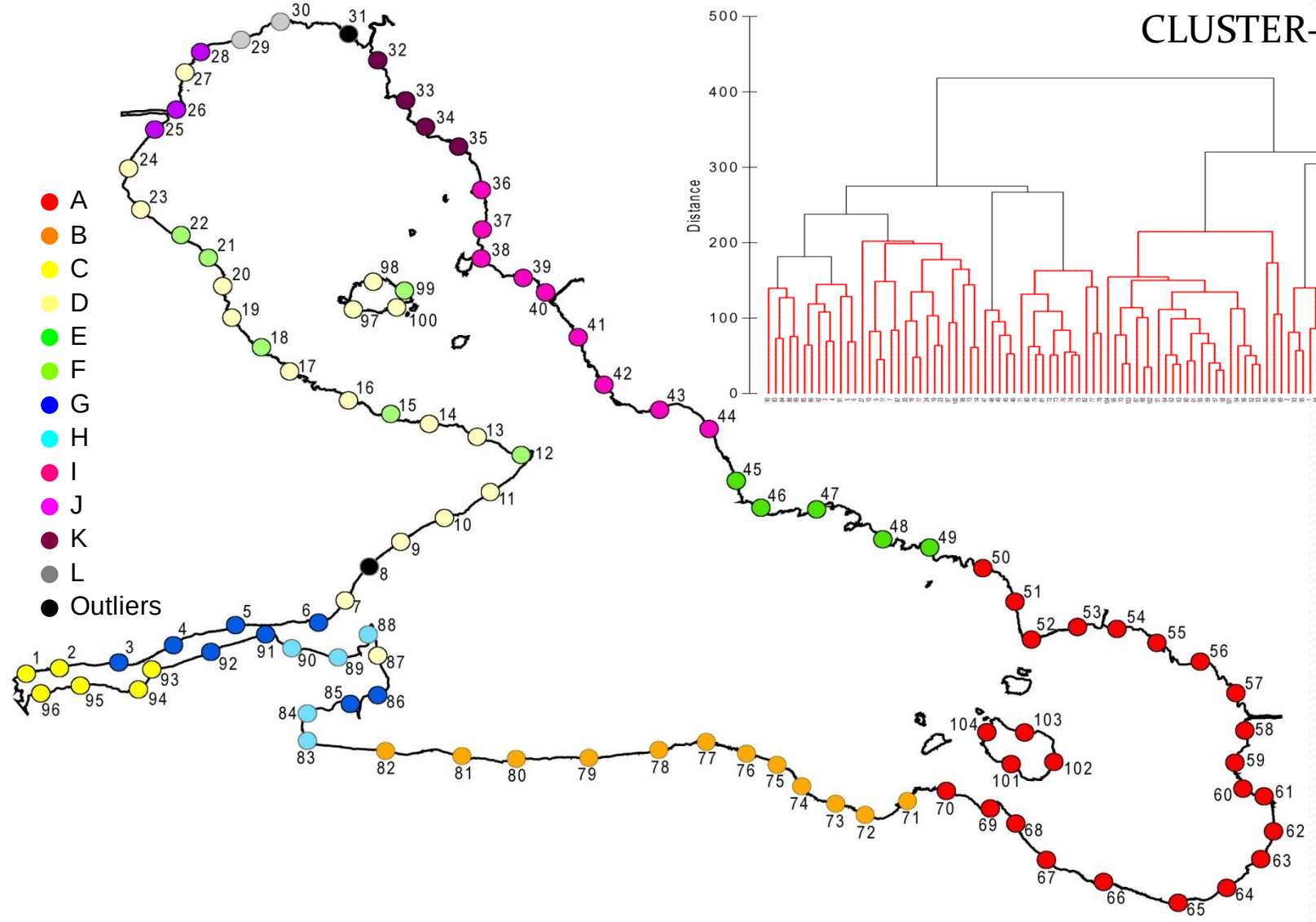
Exposure
- Cardinal Fetches (N,E,S,W)
- Direct Fetch
- Direct Fetch to the wave shoaling margin
- Slope

Substrate
- % Vegetation
- % Rock
- % Sand





Habitat classification



Sampling regime

- Seasonally between spring 2007 and winter 2008
- 11 habitat types using a 21.5m seine net
- 4 sites per habitat type
- 2 replicates per site

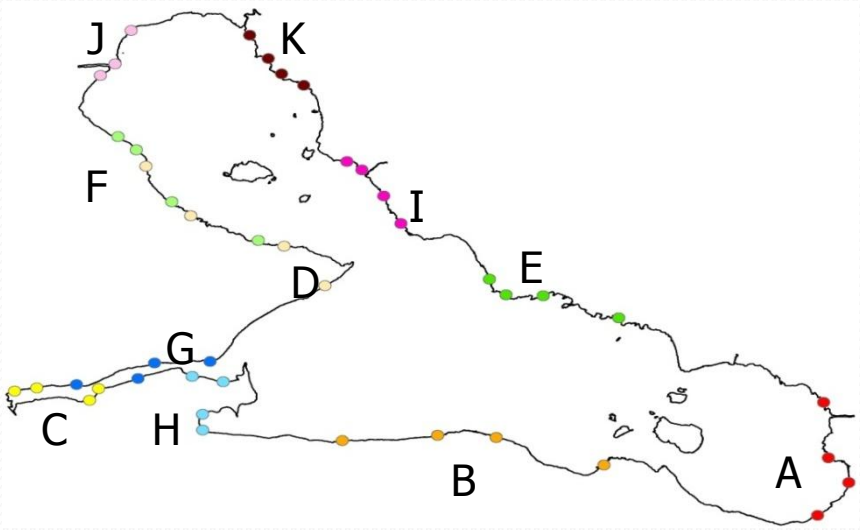
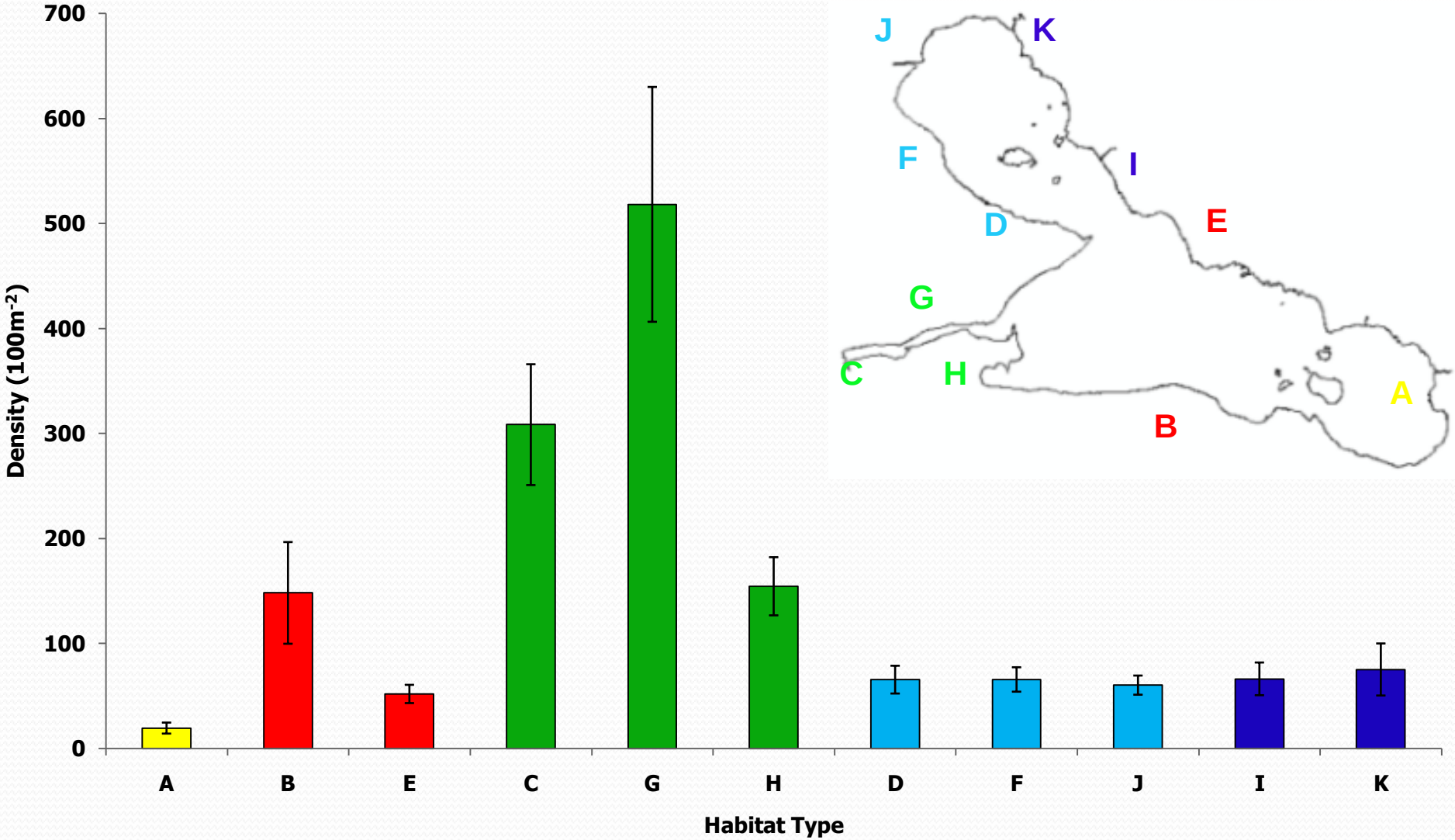
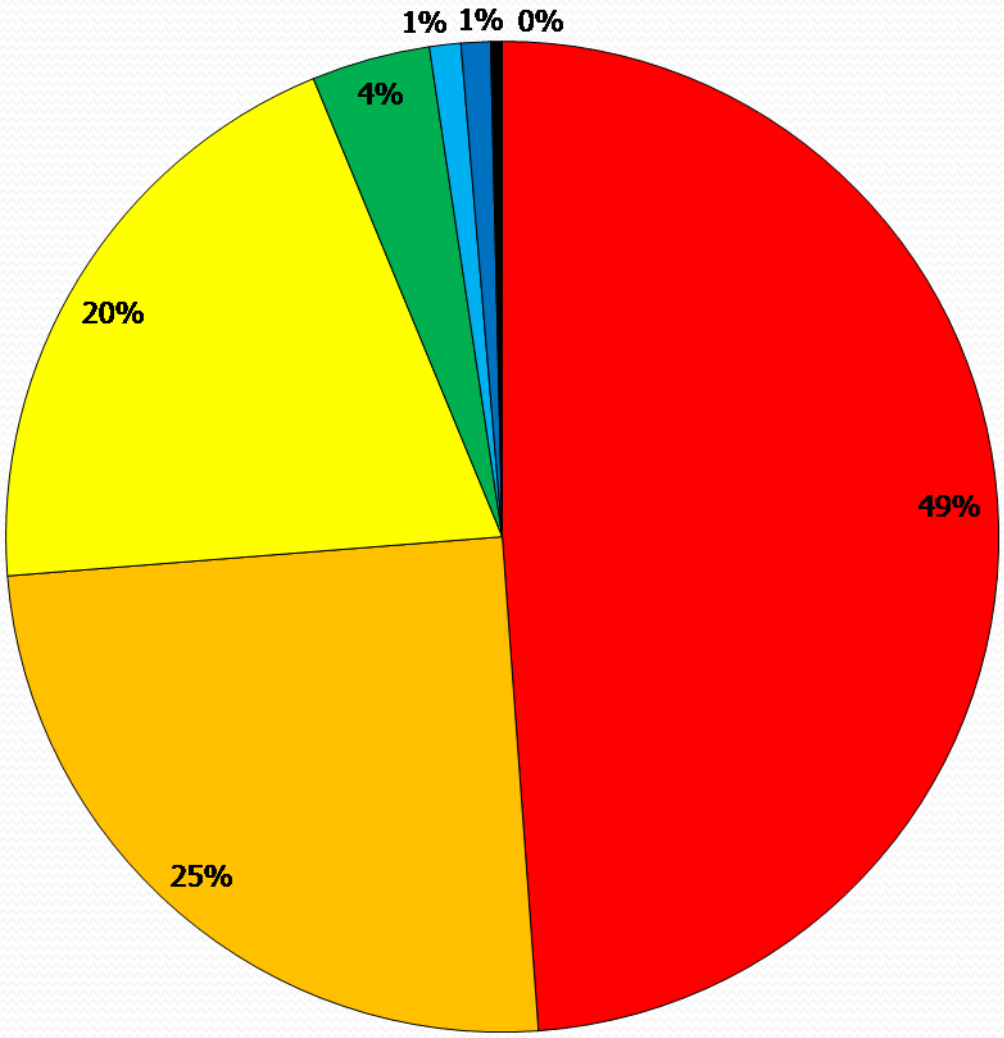



Photo: Ben Chuwen

Fish density



Species composition

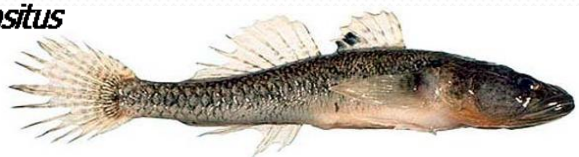


Atherinosoma elongata

Leptatherina presbyteroides

Leptatherina wallacei

Afurcagobius suppositus



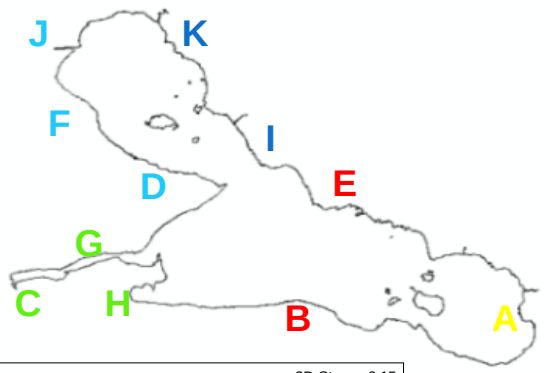
Pseudogobius olorum

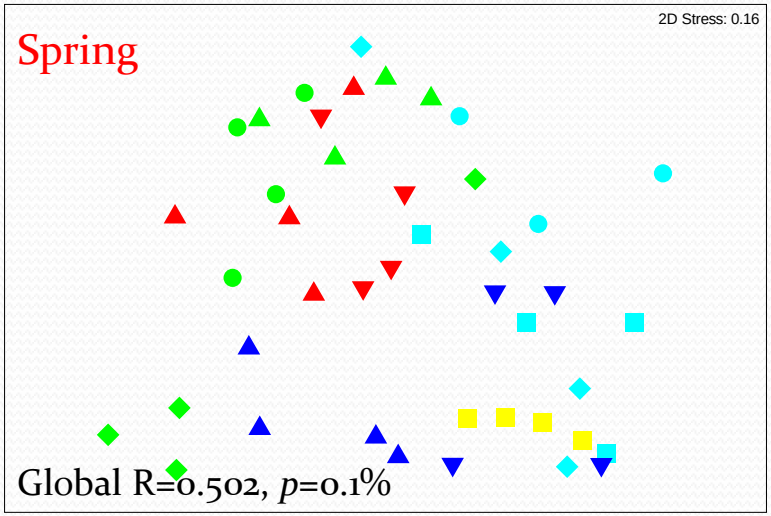
Favonigobius lateralis

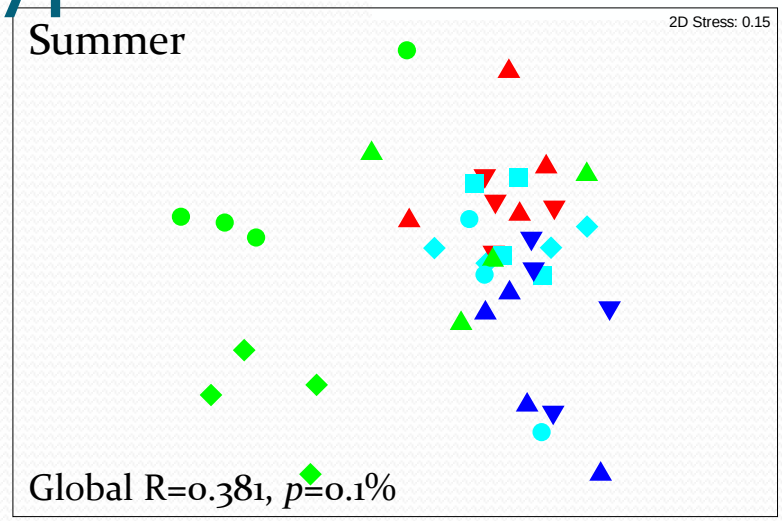
Other

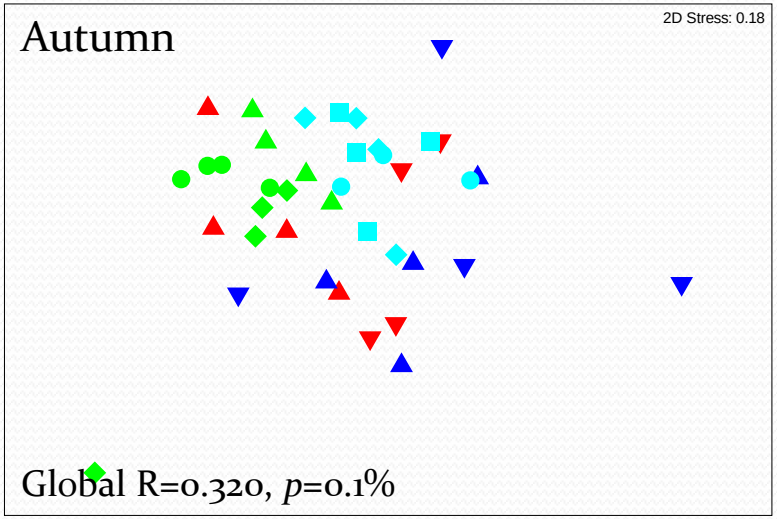
Photos: Phil Good

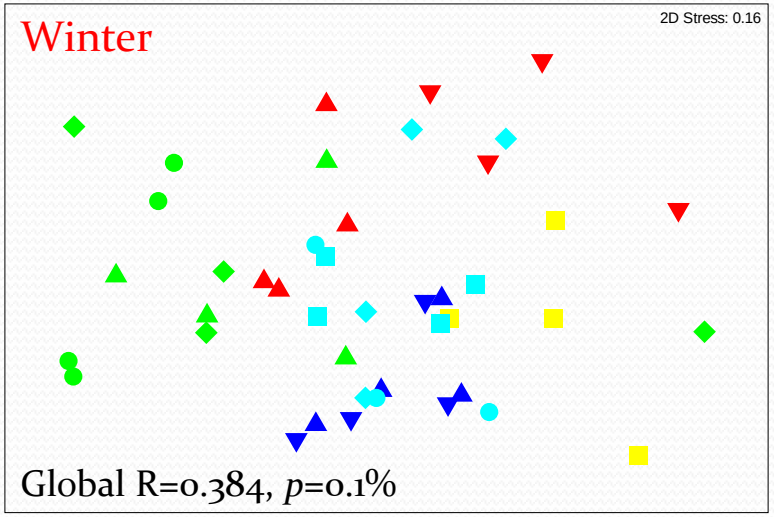
Relationships between fish faunas and habitat types



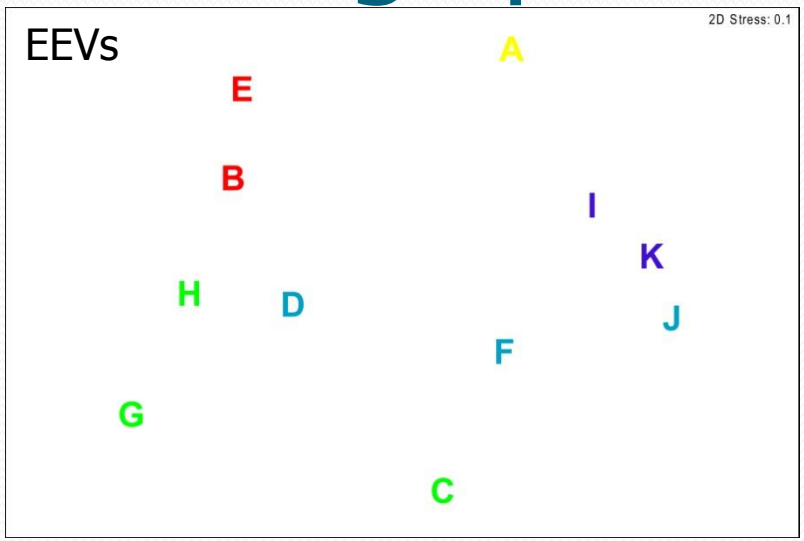


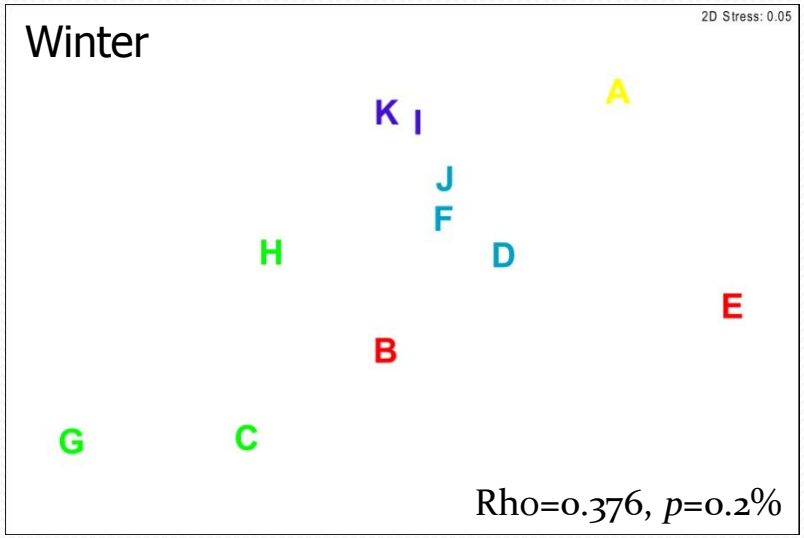






Matching spatial patterns





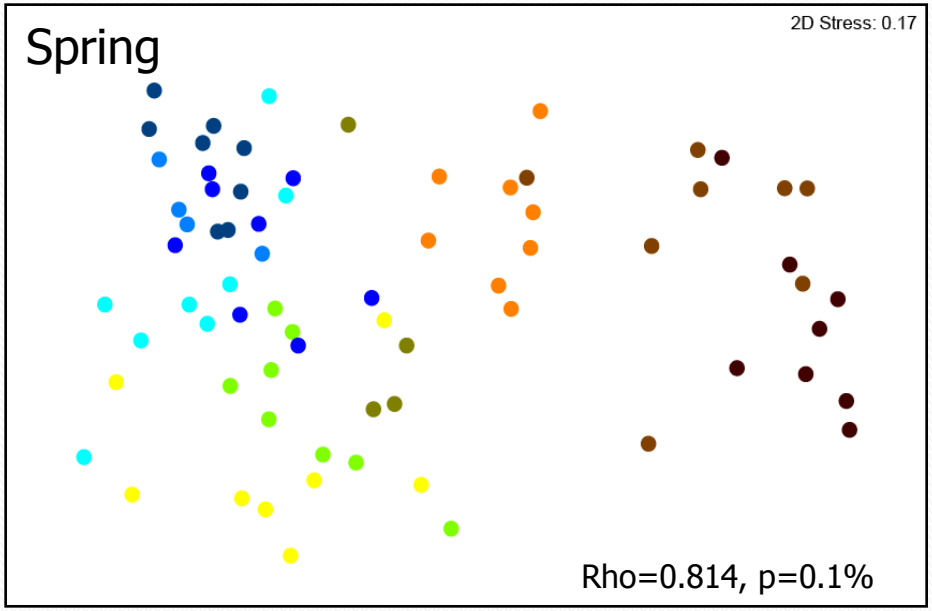
EEVs vs. Fish Fauna

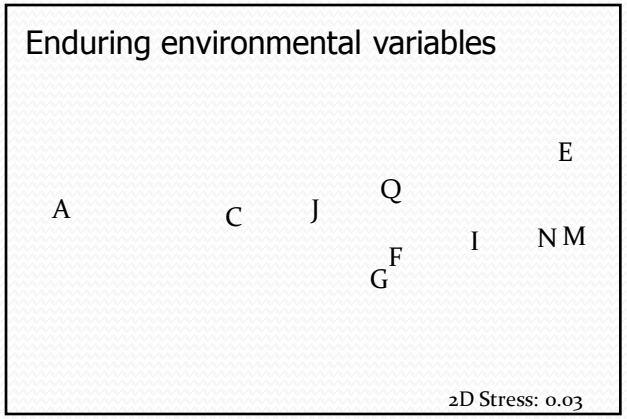
Spring: Rho=0.285, *p*=2.9%
Summer: Rho=0.282, *p*=1.0%
Autumn: Rho=0.338, *p*=1.6%
Winter: Rho=0.376, *p*=0.2%

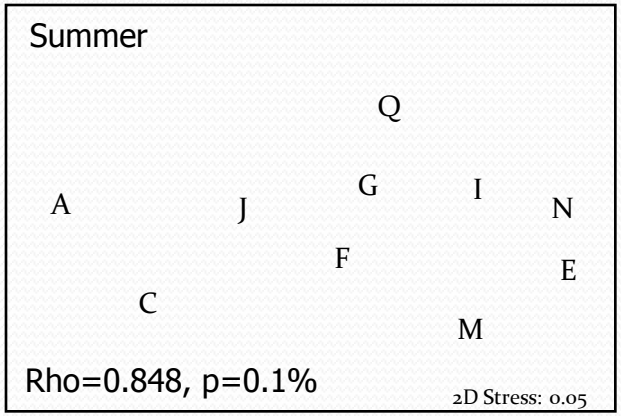
Water Quality vs. Fish Fauna

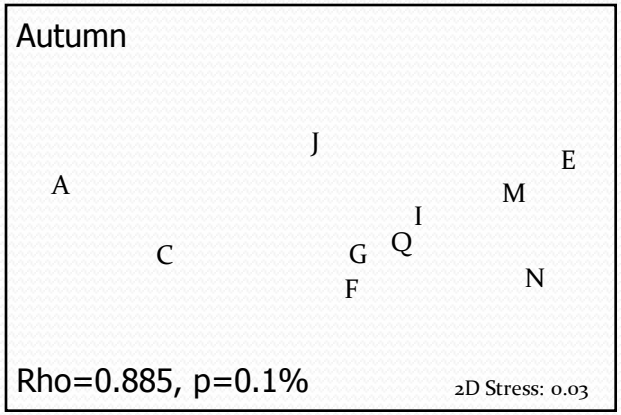
Spring: Rho=0.484, *p*=0.3%
Summer: ***Non-significant!***
Autumn: ***Non-significant!***
Winter: Rho=0.453, *p*=0.5%

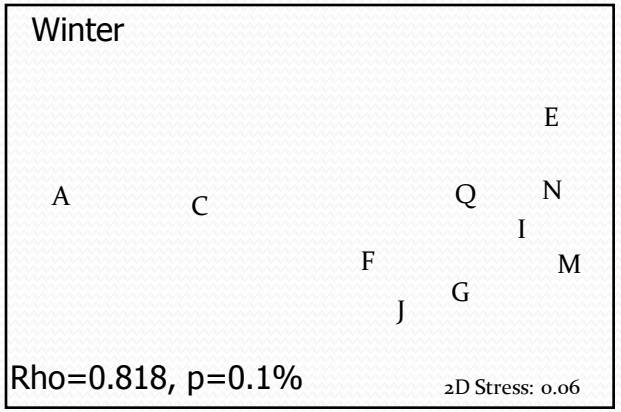
Swan Estuary example











Conclusions!

- Habitat classification logical and intuitive
- **Fish fauna**
  - Significant differences between habitat types in each season
  - Significant match between the EEVs and the fish fauna in each season
    - Reduced faunal match compared to a permanently-open system
    - Lack of recruitment from nearshore marine waters
    - Small number of estuarine species dominate the system
    - However, these species are euryhaline and therefore present throughout the estuary in each season.

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Fisheries Research & Development Corporation

Department of Environment and Conservation

Any questions?