# How can stable isotopes inform fisheries science?

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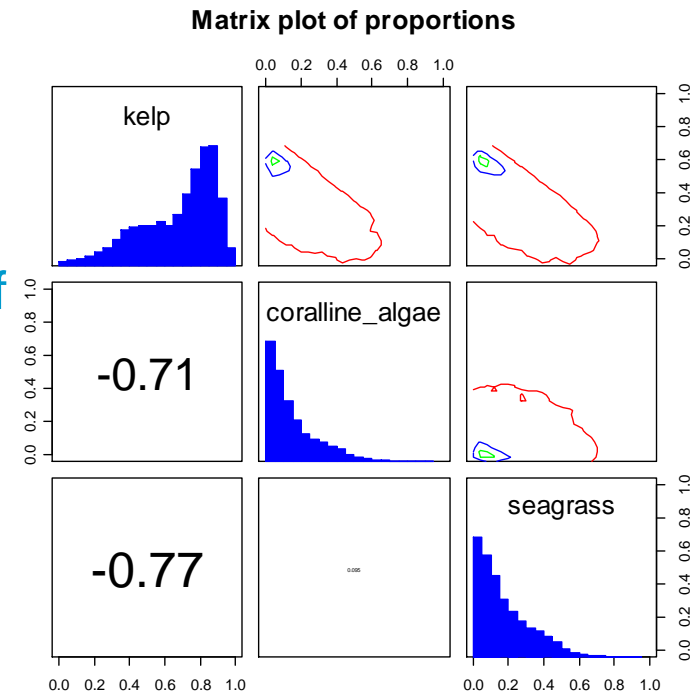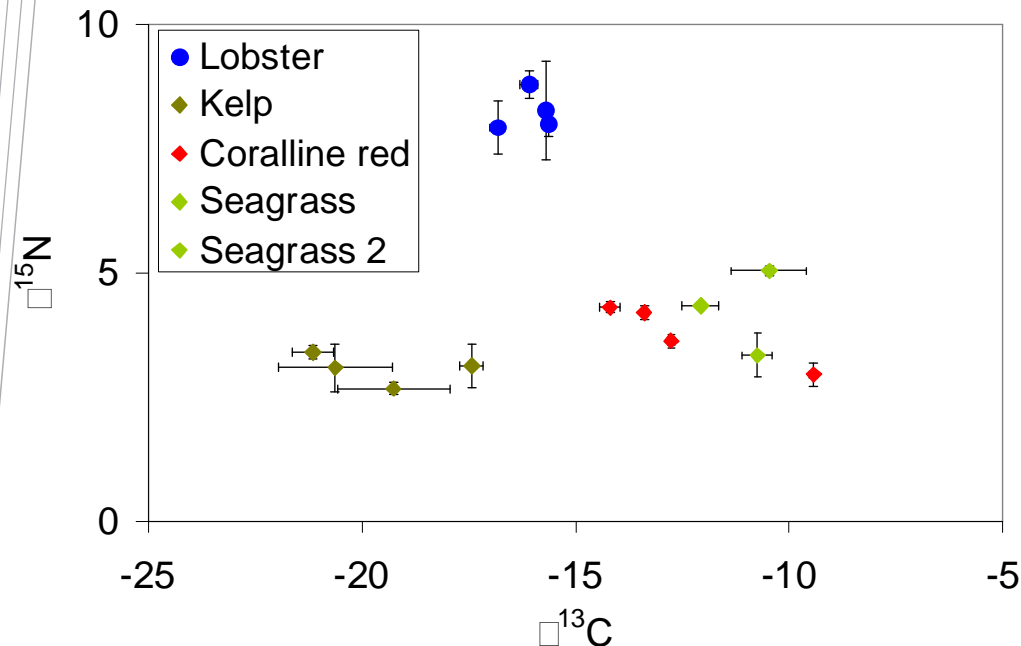National Research
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# Information needed by EBFM

- **What sustains fisheries production?**
  - Identify  key producers
- **What are the trophic interactions among species?**
  - Characterise food webs
  - Define trophic levels
- **What are the temporal scales of change?**
  - Inert tissues reflect change over time
- **How has the ecosystem changed?**
  - Characterise nature of changes
- **What is a sensible spatial unit?**
  - Characterise food webs in space
  - Define spatial extent of movement
- **Could fishing influence the ecosystem?**
  - Dietary specialisation, trophic interactions

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# What sustains fishery production?

SIA can identify ultimate sources of production

Example: modelling ultimate sources of production for lobster at Jurien Bay



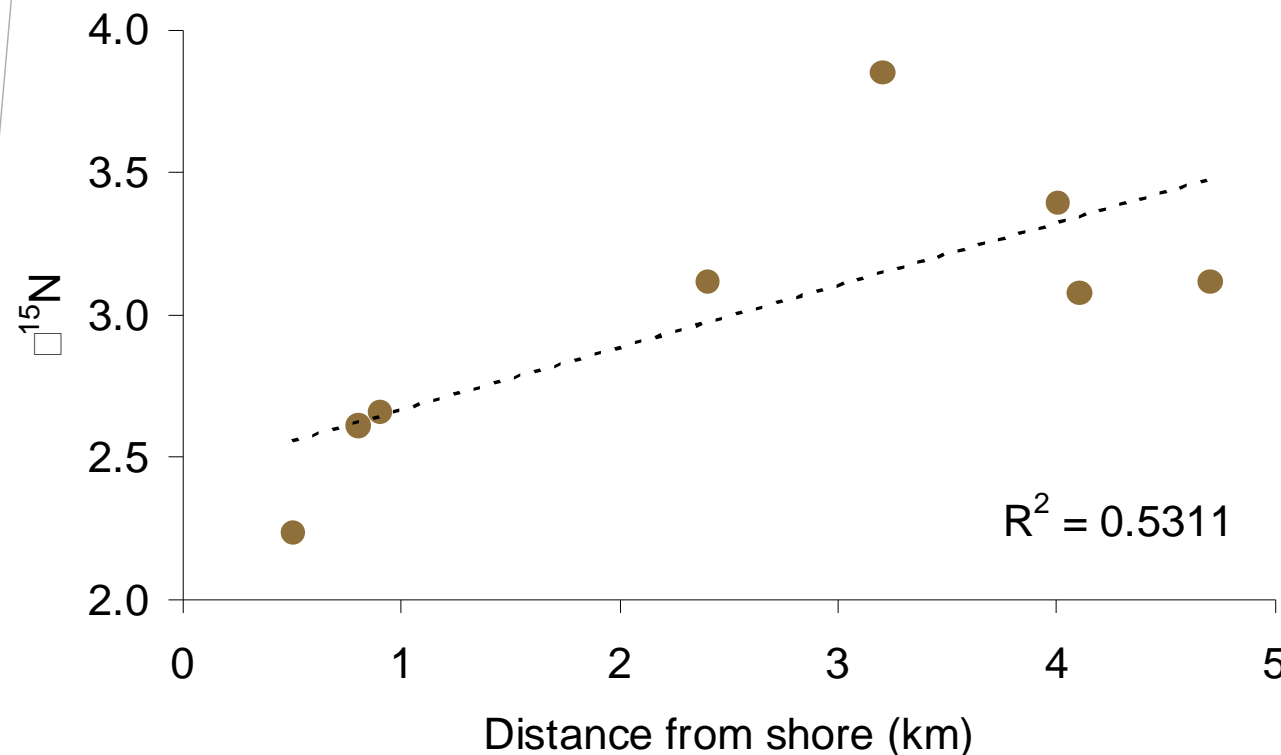**Matrix plot of proportions**



Data from ECU collaborative project
Hyndes, Hanson, MacArthur

# What sustains fishery production?

Fisheries questions are large scale in nature

SIA can be adapted to ask geographical questions

Example 1: Cross-shelf patterns in production of kelp at Jurien Bay
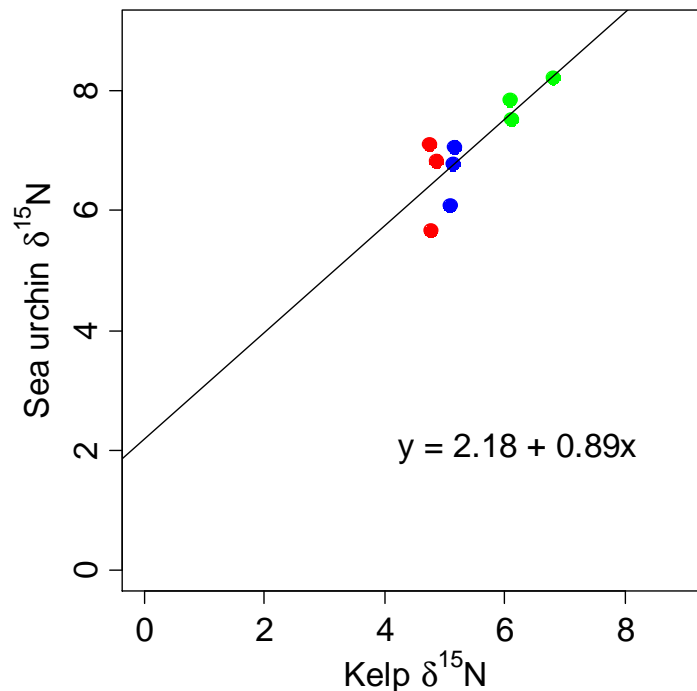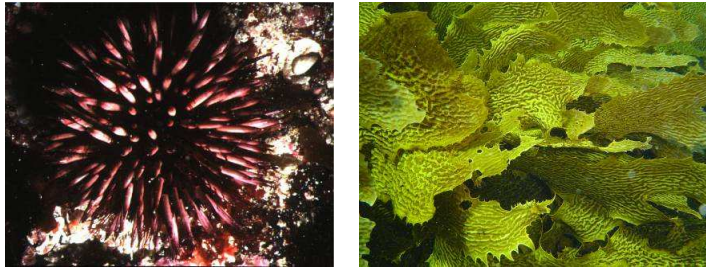


$R^2 = 0.5311$

Y-axis: $^{15}N$

X-axis: Distance from shore (km)

Data from ECU collaborative project

Hyndes, Hanson, MacArthur

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# What are the trophic interactions among species?



Example 2: Large-scale geographical correspondence (over hundreds of kilometres) in the $\delta^{15}$N of a consumer and its diet

→ consumer-diet relationships can be highly consistent over vast geographical extents



$$y = 2.18 + 0.89x$$

Data from Vanderklift & Wernberg (in prep)

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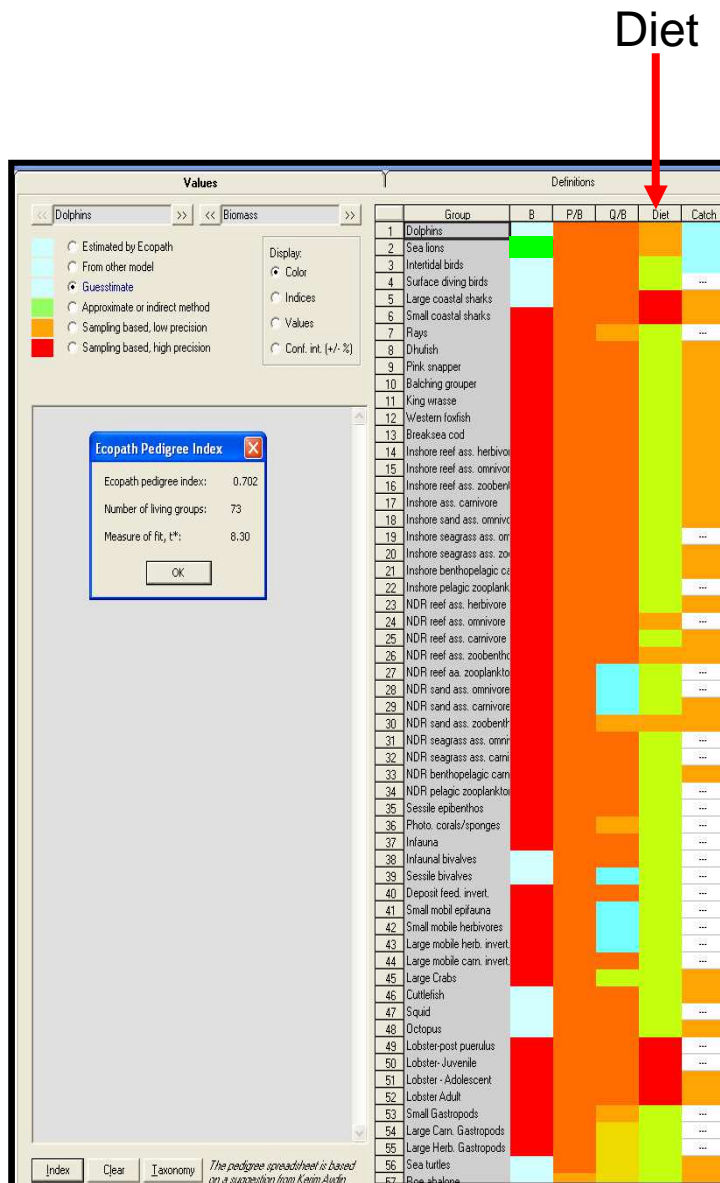**FLAGSHIPS**
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# What are the trophic interactions among species?

To interpret field data we need lab experiments

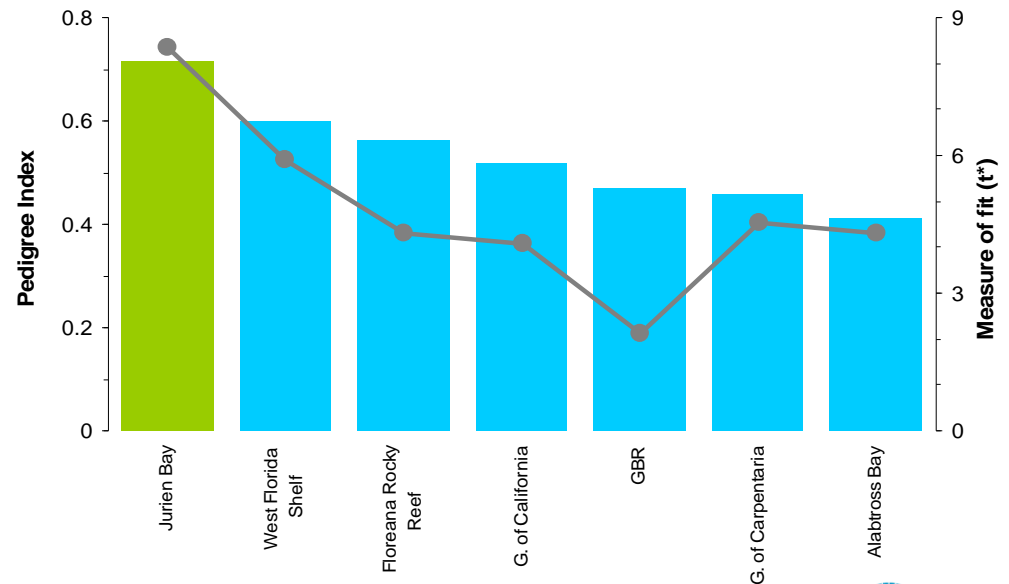Example: Testing patterns of consumer-diet stable isotope discrimination with marine herbivores

# What are the trophic interactions among species? Could fishing influence the ecosystem?

Diet



Diet data needed by ecosystem models

e.g. Jurien Bay Ecopath Model:
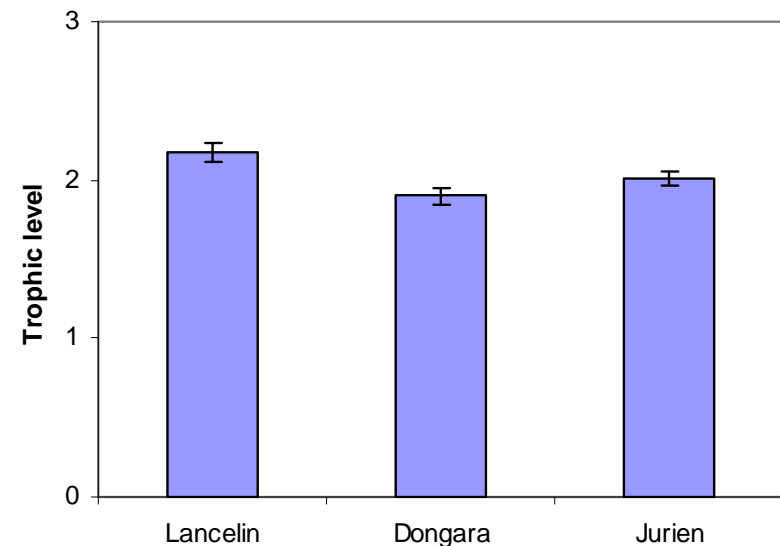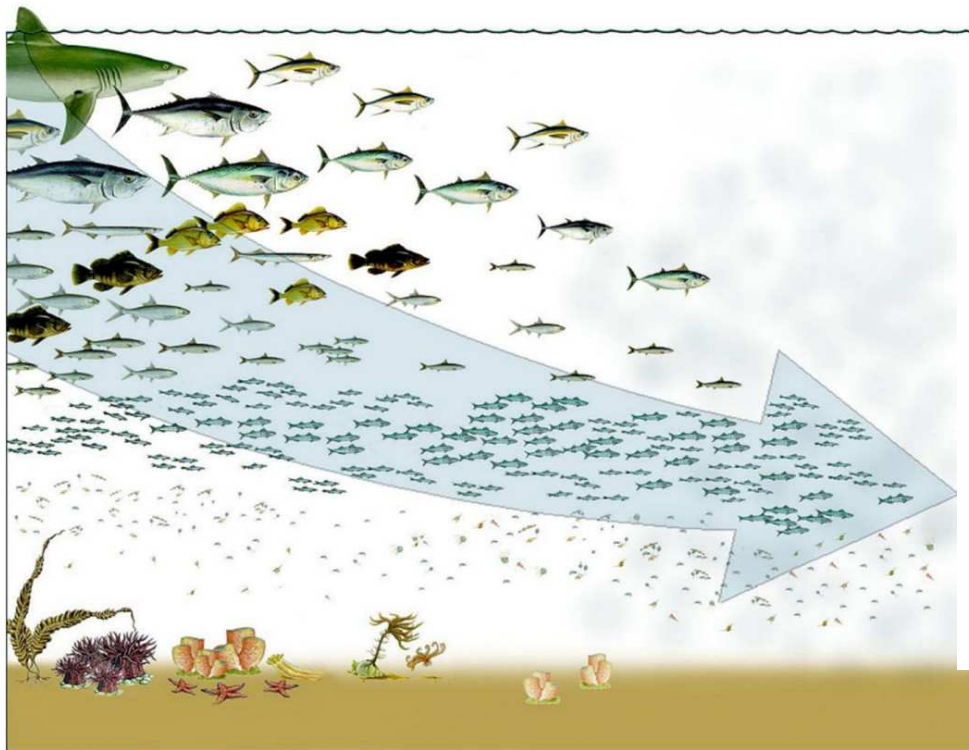Pedigree = 0.702 (this is good!)
…. but diet data weak



Data from Hector Lozano-Montes

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# Is fishing influencing the ecosystem?

Mean trophic level of species in ecosystem can change

$\delta^{15}N$ provides a measure of trophic level

Example: trophic level of deepwater western rock lobsters



Data from Waddington PhD