Urban-related distribution patterns of an iconic Salish Sea mesopredator, the giant Pacific octopus (Enteroctopus dofleini)

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Urban-related distribution patterns of an iconic Salish Sea mesopredator, the giant Pacific octopus (*Enteroctopus dofleini*)

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**Coauthors:** Eliza Heery (Nat. Univ. Singapore/UW), Blake Feist (Cons. Biol. Div., NWFSC), Ken Sebens (Friday Harbor Labs, UW)
Urbanization

• Particularly intense on coasts
• Modifies marine environments
• What are the ecological impacts on marine organisms?
Urban terrestrial ecology suggests...

• Rise of mesopredators

• In urban areas: ↑ shelter, food / ↓ predators
• “synanthropic”
Research questions

a) Is there a relationship between octopus occurrence and urbanization?
   • $H_A$: Octopus more common in urban centers

b) Is octopus abundance correlated with anthropogenic debris?
   • $H_A$: Positive correlation

c) Do octopus diets differ with urbanization intensity?
   • $H_A$: More prey and larger prey items in more urban areas
a) Octopus occurrence & urbanization

- Presence/Absence data
- Explanatory variables:
  - Urbanization metric (PC1)
  - From REEF:
    - Bottom Time and Visibility
    - Depth, Date, Habitat Type
  - Oceanographic conditions:
    - Pacific Decadal Oscillation (PDO)
- Mixed-effects logistic regression
a) Octopus occurrence & urbanization

- Parameter estimation
  - Bottom Time
  - Visibility
  - Depth: S-I
  - Depth: D-I
  - Depth: D
  - Month
  - Year
  - Habitat: Rocky
  - Habitat: Soft
  - PDO (50 month avg)
  - PC1

→ Depth × PC1 interaction
a) Octopus occurrence & urbanization

On deep dives (> 24m)…
b) Is octopus abundance correlated anthropogenic debris?

- Video transect surveys
- 4 sets of paired sites
  - Site pairs (a,b)
    - a: extensive debris
    - b: limited debris
- Lasers → Measure dimensions of debris
b) Is octopus abundance correlated anthropogenic debris?

- Mixed effects model
- Compared fit from:
  - # debris items
  - Horizontal area of debris
  - Maximum height of debris
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**Proportion by Number**

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinocardium spp.</td>
<td>0.75</td>
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<tr>
<td>Saxidomus gigantea</td>
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</tr>
<tr>
<td>Other Heterodonts</td>
<td>0.25</td>
</tr>
<tr>
<td>Cancer productus</td>
<td>0.75</td>
</tr>
<tr>
<td>Metacarcinus magister</td>
<td>0.5</td>
</tr>
<tr>
<td>Pugettia spp.</td>
<td>0.25</td>
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</tbody>
</table>

**Proportion by Estimated Tiss**

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<td>Cancer productus</td>
<td>0.75</td>
</tr>
<tr>
<td>Decapods</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Diet unrelated to urbanization intensity**
Conclusions

• Giant Pacific octopus may be synanthropic within specific habitats (deep, > 24m)
  • Caveats!

• Pattern appears to be unrelated to prey resources

• Importance of anthropogenic debris

• Depth distribution of debris?
Many to Thank:

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Thank YOU!
Questions?