May 16th, 9:00 AM - 12:00 PM

Feeding success of harbor seals in relation to hunting technique at Whatcom Creek

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Feeding success of harbor seals consuming adult salmonids in relation to hunting technique

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MacKenna Newmarch

Introduction
- Foraging behavior in carnivorous marine mammals is poorly understood despite its ecological significance.
- Studying patterns in individual foraging success may provide (1) predictive models and (2) insight to changes in ecosystem structure and function.
- Individual variability has been recorded in marine predators.
- Harbor seals frequent an estuary in Bellingham, WA, hunt primarily for hatchery Pacific salmon during the annual run.
- Are there certain hunting techniques and environmental variables that allow seals to have higher feeding success?
- Does feeding success of hunting technique vary at an individual level?

Methods
- Tied field behavioral data to photos from fall 2015 to winter 2017 using time lapse cameras.
- Analyzed events that mentioned hunting behavior in one of three exclusive categories: rapid chase, scanning the shallow bankside, and scanning the shallow bankside.
- Up to 2015, catalog used to tie hunting events to numbered individual by manually matching unique spotting patterns.
- GLM used to determine if hunting event lead to successful catch.
- GLM used to test for the prediction of success by year, active hatchery chum salmon run, and location in creek.

Results
- Average success rate of chase hunting technique across all years: 15.6% ±36.3% SD.
- Average success rate of bank hunting technique across all years: 20.1% ±40.6% SD.
- Average success rate of upside down hunting technique across all years: 7.8% ±26.9% SD.
- Three-way interactive effect of technique, whether hatchery chum are running, and year is most influential on feeding success (Table 1).

Discussion
- Technique type does not reveal major patterns of success across years (Figure 1).
- Hatchery had ~90% less salmon returns in 2017, no obvious effect on success (Figure 1).
- No successful bank behavior in 2016 possibly due to high success of chase; dominating behavior in each year (Figure 1).
- Technique plays a role in predicting feeding success (Table 1).
- Variation evident in feeding success for 2015 at individual level both in success of technique used and range of technique (Figure 3).
- Individuals 17, 56 and 105 have high success in one behavior, possibility of specialization or ‘mastering’ technique where other seals not as skilled (Figure 3).
- 5 & 6 are right-reduced seals, upside down may help with vision (Figure 3).
- Future research will investigate the significance on individual specialization.

Table 1. Generalized linear model examining variables most effective at predicting feeding success. Better predicted models have comparatively lower AIC values. Likelihood describes probability of model being the best of those tested.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>AIC</th>
<th>Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>technique<em>salmon running</em>year</td>
<td>189.12</td>
<td>0.86</td>
</tr>
<tr>
<td>technique+salmon running*year</td>
<td>192.72</td>
<td>0.14</td>
</tr>
<tr>
<td>salmon running</td>
<td>200.01</td>
<td>0.004</td>
</tr>
<tr>
<td>technique</td>
<td>221.34</td>
<td>8.6193E-08</td>
</tr>
<tr>
<td>year</td>
<td>227.75</td>
<td>3.4959E-09</td>
</tr>
</tbody>
</table>

Figure 1. Percent feeding success for all harbor seals at Whatcom creek according to chase (n=64), bank (n=67) and upside down (n=166) hunting techniques by year.

Figure 2. Heat map representing lower success rate (light) and higher success rate (dark) for three hunting techniques: chase (n=10), bank (n=9), and upside down (n=10) in 2015. X axis represents designated ID according to current catalog.

References

Acknowledgements