**Effects of Maternal Growth on Fecundity and Egg Quality of Wild and Captive Atka Mackerel (Pleurogrammus monopterygius):**

**Big Fat Female Fish are More Fecund**

S.F. McDermott1, D.W. Cooper1, J.L. Guthridge2, T.B. Spies1, M.F. Canino1, P. Woods1, N. Hillgruber2


**Objective**

Examine how growth and condition affect realized fecundity and egg energy:

1. Estimate total fecundity, batch fecundity, and atresia from three populations with different growth patterns: Amchitka Island, Seguam Pass, and fish held in captivity.
2. Estimate the egg energy content from wild fish and compare to fish held in captivity.

**Methods**

**Wild fish collection**

Atka mackerel were collected during NMFS research cruises on trawl vessels. Five females were randomly collected during each trawl haul. Females were length, weighed, and the atrichs and ovaries were extracted. For each, one ovary was processed into histological slides with H&E stain for every stage determination. The other ovary was subsampled for fecundity analysis using the gravimetric method.

**Captive fish collection**

The 5 captive females were collected from various locations in the Aleutian Islands during a NMFS cruise using bottom trawl gear. The fish were held in zooplankton tanks until arrival in Dutch Harbor from where they were transported in oxygenated coolers to the Alaska SeaLife Center in Seward. They were transferred into live tanks and fed to satiation three times a week for the remainder of the study.

**Fecundity estimation for wild fish**

Total fecundity, batch fecundity, and atresia were determined with the gravimetric method as described in McDermott 2005.

**Total potential fecundity**: all oocytes in vitellogenetic stage and above were counted from pre-spawning females.

**Batch fecundity**: oocytes in late hydration stage were counted.

**Atresia**: atretic oocytes in post-spawning specimens were counted.

**Realized fecundity**: estimates of atresia at length were subtracted from estimates of potential fecundity at length.

**Fecundity estimation for captive fish**

In 2005 the five captive females spawned a total of 37 fertilized batches. Egg masses were collected shortly after spawning by divers. Parentage of egg masses were successfully determined with genetic analysis.

**Batch fecundity**: the number of eggs in each egg mass was determined with the gravimetric method.

**Realized fecundity**: the number of eggs from all egg masses per female per season were summed.

**Conclusions**

Atka mackerel fecundity is best predicted by weight not length. Fecundity differed significantly for areas with different growth patterns. Egg quality was significantly higher for large captive fish than for smaller wild fish. In order to correctly estimate the reproductive output of Atka mackerel populations, it is important to track fish growth and condition on a local scale.

Fat big fish produce more and higher quality eggs.

**References**


Fork Length (cm)

<table>
<thead>
<tr>
<th>Age</th>
<th>Batch Fecundity</th>
<th>Potential Fecundity</th>
<th>Realized Fecundity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>74 kg</td>
<td>150 kg</td>
<td>70 kg</td>
</tr>
<tr>
<td>4</td>
<td>140 kg</td>
<td>300 kg</td>
<td>100 kg</td>
</tr>
<tr>
<td>6</td>
<td>210 kg</td>
<td>450 kg</td>
<td>150 kg</td>
</tr>
</tbody>
</table>

**Figure 1: Sampling locations**

**Figure 2: Atka mackerel length by age**

**Figure 3: Fecundity by length**

**Figure 4: Fecundity by weight**

**Figure 5: Fecundity by age**

**Fat big fish produce more and higher quality eggs.**