THE SURVIVAL OF RAJIDS DISCARDED IN THE NEW ENGLAND SCALLOP DREDGE FISHERIES

Project Update 4-9-2014
Fisheries Management/Discards

- U.S. Northwest Atlantic Ocean
- New England scallop dredge fishery

(NOAA Bycatch Report, 2011)
Management of Skates

- **Life history (K-selected)**
  - Long life
  - Slow growth
  - Late maturation
  - Low fecundity

**Northeast Skate Complex FMP**

- Winter skate (*Leucoraja ocellata*)
- Little skate (*Leucoraja erinacea*)
- Barndoor skate (*Dipturus laevis*)
- Thorny skate (*Amblyraja radiata*)

**Study**

- Sulikowski et al. 2003
- Waring 1984
Skate Discard P-R Mortality

- Required for effective fisheries management
- Gulf of Maine – otter trawl fishery
  - Physical trauma
  - Species-specific differences

(Mandelman et al. 2013)
Materials and Methods

- Normal fishing operations
  - Tow times: 10-90 min
  - Fishing conditions/practices
    - Time of day
    - Depth
    - Air temperature
    - % Cloud cover
    - Sea state
    - Volume of catch
    - Catch composition

- Timed sample period
  - Aerial exposure
  - 30 minutes
Materials and Methods

- **Health evaluation**
  - **Vitality index (0 to 1)**
    - 5 reflexes
    - Absent/Present
  - **Condition index (1 to 3)**
    - Physical trauma

\[
\text{Vitality} = 1 - \left( \frac{X \text{present reflexes}}{5} \right)
\]
Materials and Methods

- Health evaluation
- External measurements
- Dart tag

Release Mortality Trial
- Fisheries dependent

Re-evaluate health mortality predictors
Materials and Methods

- Net pen mortality trials
  - 48-hour soak time
  - Not successful
    - Tides and currents
    - Fog and visibility
    - Fishing pressure
    - Sea lice and isopod infestation
Materials and Methods

- Holding tank mortality trials
  - Refrigerated seawater system
  - Flow-through
  - 72-hour holding time
Preliminary Results

P-R mortality and fishing conditions/practices
## Specimens Sampled

<table>
<thead>
<tr>
<th>Release</th>
<th>Mortality Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specimens collected</strong></td>
<td><strong>Specimens collected</strong></td>
</tr>
<tr>
<td>Little: 2,454</td>
<td>Little: 136</td>
</tr>
<tr>
<td>Winter: 1,163</td>
<td>Winter: 100</td>
</tr>
<tr>
<td>Barndoor: 228</td>
<td>Barndoor: 31</td>
</tr>
<tr>
<td>TBD: 333</td>
<td>TBD: 23</td>
</tr>
<tr>
<td><strong>Tows: 295</strong></td>
<td><strong>Tows: 115</strong></td>
</tr>
</tbody>
</table>
P-R Mortality Trials

- Using the **condition index** to predict mortality

![Graph showing percentage mortality vs. initial condition score for different types of skate](image-url)
P-R Mortality Trials

- Using the vitality index to predict mortality

0.00 (no impairment)
1.00 (completely impaired)
Fishing Conditions/Practices

- **Tow duration**
  - 4 to 97 min

### Condition

![Condition Score vs Tow Duration Graph]

- Little skate
- Winter skate
- Barndoor skate

### Vitality

![Vitality Score vs Tow Duration Graph]

- Little skate
- Winter skate
- Barndoor skate
Fishing Conditions/Practices

- **Bottom-surface temperature gradient**
  - 0.41 to 11.52°C
Fishing Conditions/Practices

- Species-specific size classes (cm)

<table>
<thead>
<tr>
<th>Species</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little skate</td>
<td>36-42</td>
<td>43-49</td>
<td>&gt; 50</td>
</tr>
<tr>
<td>Winter skate</td>
<td>36-45</td>
<td>46-70</td>
<td>&gt; 71</td>
</tr>
<tr>
<td>Barndoor skate</td>
<td>30-60</td>
<td>61-90</td>
<td>&gt; 91</td>
</tr>
</tbody>
</table>

**Condition**

**Vitality**
What’s next?

- Trip for Moncton, Canada to meet with Dr. Hugues Benoit
  - Extensive analyses of data
    - Survival analysis
    - Analysis of the multinomial data of condition and vitality scores
    - Analysis of the multinomial data of fishing conditions/practices
- RSW tank system (in prep) for Journal of Fisheries Research
- Conferences:
  - 2014 Northeast Fish and Wildlife Annual Conference
  - 2014 American Elasmobranch Society Annual Meeting
  - 2014 American Fisheries Society Annual Meeting
Methodology

- Drawing board
RSW Tank System

- **Bottom Temperature and Efficiency**:
  - **May**: 8.29°C (92.63%)
  - **June**: 11.04°C (95.91%)
  - **July**: 11.80°C (86.14%)
  - **August**: 12.99°C (96.37%)

- **Tank Temperature and Efficiency**:
  - **May**: 8.45°C
  - **June**: 10.73°C
  - **July**: 12.20°C
  - **August**: 12.96°C

- **Graphs**:
  - May: Temperatures over the week
  - June: Temperatures over the week
  - July: Temperatures over the week
  - August: Temperatures over the week
## RSW Tank System

<table>
<thead>
<tr>
<th></th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System capacity (°C)</strong></td>
<td>Mean: 1.43 ± 1.40 Max: 3.01</td>
<td>Mean: 4.07 ± 2.01 Max: 7.50</td>
<td>Mean: 7.90 ± 2.92 Max: 11.27</td>
<td>Mean: 8.49 ± 1.45 Max: 10.49</td>
</tr>
<tr>
<td><strong>System efficiency (%)</strong></td>
<td>92.63</td>
<td>95.91</td>
<td>86.14</td>
<td>96.37</td>
</tr>
</tbody>
</table>
Reflex Impairment

- Reflex action mortality predictors (RAMP testing)
  - Neurological response to external stimuli
  - “reflexes are whole-animal indicators of a compromised physiological state” (Raby et al., 2012)
  - Based on presence/absence of reflex
  - RAMP curve
    - 0.00 (no impairment) to 1.00 (completely impaired)

(Davis, 2010)
## Status of Fishery

### Northeast Skate Complex Wing Fishery Weekly Report

<table>
<thead>
<tr>
<th>Previously Reported Landings (Whole Pounds)</th>
<th>Previous Weeks’ Updates (Whole Pounds)</th>
<th>Current Week’s Landings (Whole Pounds)</th>
<th>Cumulative Landings (Whole Pounds)</th>
<th>Quota (Whole Pounds)</th>
<th>Percent of Quota (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16,212,511</td>
<td>371,435</td>
<td>183,474</td>
<td>16,767,420</td>
<td>31,609,884</td>
<td>53</td>
</tr>
</tbody>
</table>

Notice: Effective May 1, 2013, the possession limit is 2,600 lb wing weight (5,902 lb whole weight) per trip for Season 1 (May 1 to August 31) for vessels fishing on a Northeast Multispecies, Monkfish, or Scallop Day-at-Sea (DAS). The Northeast Multispecies Category-B DAS possession limit remains 220 lb wing weight per trip, and the non-DAS incidental possession limit remains at 500 lb wing weight per trip.

For week ending: March 29, 2014
For data reported through: April 2, 2014
Quota Period: FY 2013
Quota Period Dates: 05/01/13 to 04/30/14
**Status of Fishery**

**Northeast Skate Complex**  
**Bait Fishery**  
**Weekly Report**

<table>
<thead>
<tr>
<th>Previously Reported Landings (Pounds)</th>
<th>Previous Weeks’ Updates (Pounds)</th>
<th>Current Week’s Landings (Pounds)</th>
<th>Cumulative Landings (Pounds)</th>
<th>Quota (Pounds)</th>
<th>Percent of Quota (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,488,647</td>
<td>1,900</td>
<td>158,880</td>
<td>11,649,427</td>
<td>15,923,992</td>
<td>73</td>
</tr>
</tbody>
</table>

For week ending:  
For data reported through:  
**Quota Period:**  
**Quota Period Dates:**

- March 29, 2014  
- April 2, 2014  
Bait Season 3, FY2013  
05/01/13 to 04/30/14

Notice: Period 3 for the skate bait fishery began November 1, 2013, through April 30, 2014. The quota for this period is the remainder of the quota for the 2013 fishing year. The possession limit remains the same and will only be adjusted when 90% of the skate bait quota is harvested.
Skate Regulations

### Possession Limits and Fish Size Requirements

***Prohibition*** Possession or landing of barndoor and thorny skates is prohibited throughout the Skate Management Unit. In addition, possession or landing of smooth skates from the Gulf of Maine Regulated Mesh Area is prohibited. Here are two skate identification guides to help you identify each species of skate: Skate ID Guide 1 and Skate ID Guide 2.

#### Possession Limits

<table>
<thead>
<tr>
<th></th>
<th>Trip Limit (lb)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Skate Wings</td>
<td>Whole Skates</td>
<td>Whole Skate Bait w/ Letter of Authorization (LOA)</td>
</tr>
<tr>
<td><strong>Northeast (NE) Multispecies, Scallop, or Monkfish DAS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 1 - August 31</td>
<td>2,600</td>
<td>5,902</td>
<td>25,000*</td>
</tr>
<tr>
<td>September 1 - April 30</td>
<td>4,100</td>
<td>9,307</td>
<td></td>
</tr>
<tr>
<td><strong>NE Multispecies B DAS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 1 - April 30</td>
<td>220</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td><strong>Non-DAS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 1 - April 30</td>
<td>500</td>
<td>1,135</td>
<td>1,135</td>
</tr>
</tbody>
</table>

*These limits also apply to vessels fishing in an approved Skate Fishery Exemption Area defined in the NE multispecies regulations at § 648.80.*

### Fish Size Limits:

**Minimum Fish Size:** None

**Maximum Fish Size:** 23 inches if fishing with a skate bait LOA

### Allowable Forms:

Vessels may possess and land skate wings, skate carcasses, and/or whole skates. The weight of skate carcasses may not exceed 1.27 times the weight of skate wings, and vessels may not possess skate carcasses without retaining the associated wings. Any combination of landed skate products must adhere to the trip limits described above.

## Skate Information

### Table 1: Overfishing Information

<table>
<thead>
<tr>
<th>Stock</th>
<th>Barndoor</th>
<th>Little</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overfishing?</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Overfishing Definition*</td>
<td>Autumn, 30%</td>
<td>Spring, 20%</td>
</tr>
<tr>
<td>Overfished?</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Overfished Definition</td>
<td>When the 3-year moving average of the autumn survey mean weight per tow is less than one-half of the mean weight per tow observed in the autumn trawl survey from 1963-1966 (currently 0.81 kg/tow).</td>
<td>When the 3-year moving average of the spring survey mean weight per tow is less than one-half of the 75th percentile of the mean weight per tow observed in the spring trawl survey from the selected reference time series.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rebuilding Program</th>
<th>Yes, year 9 of plan</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>F/F&lt;sub&gt;MSY&lt;/sub&gt;</td>
<td>Undefined</td>
<td>Undefined</td>
</tr>
<tr>
<td>Fishing Mortality Rate</td>
<td>Undefined</td>
<td>Undefined</td>
</tr>
<tr>
<td>B/B&lt;sub&gt;MSY&lt;/sub&gt; or B/B&lt;sub&gt;MSY&lt;/sub&gt; Proxy</td>
<td>0.69</td>
<td>1.16</td>
</tr>
<tr>
<td>Biomass (2010)</td>
<td>1.08 kg/tow</td>
<td>8.04 kg/tow</td>
</tr>
</tbody>
</table>

### Table 2: Overfishing Information

<table>
<thead>
<tr>
<th>Stock</th>
<th>Thorny</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overfishing?</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Overfishing Definition*</td>
<td>Autumn, 20%</td>
<td>Autumn, 20%</td>
</tr>
<tr>
<td>Overfished?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Overfished Definition</td>
<td>Average of the autumn survey mean weight per tow of the 75th percentile of the mean weight per tow observed in the autumn trawl survey from the selected reference time series.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rebuilding Program</th>
<th>Yes, year 9 of 25 year plan</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>F/F&lt;sub&gt;MSY&lt;/sub&gt;</td>
<td>Undefined</td>
<td>Undefined</td>
</tr>
<tr>
<td>Fishing Mortality Rate</td>
<td>Undefined</td>
<td>Undefined</td>
</tr>
<tr>
<td>B/B&lt;sub&gt;MSY&lt;/sub&gt; or B/B&lt;sub&gt;MSY&lt;/sub&gt; Proxy</td>
<td>0.06</td>
<td>1.72</td>
</tr>
<tr>
<td>Biomass (2010)</td>
<td>0.24 kg/tow</td>
<td>8.69 kg/tow</td>
</tr>
</tbody>
</table>