Escapes and “Human Failure"

The Atlantic Canadian Perspective

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General Causes of Escape

- Structural Failure of farm infrastructure.
- Operational / Management Failure during routine operations.
- Biological Failure that includes predator attacks and vandalism.

Acute losses - most often a combination of weather and equipment / structural failure.
Ice may cause significant damage to the operation leading to an escape opportunity.
HDPE Collar Elongation & Collapse

Elongation of the HDPE collar to failure

Single storm damage
HDPE Pipe Damage

Permanent kinking of the HDPE pipe

HDPE surface pipe broken
Operational “Human” Failure

• Saltwater Operations

*Critical operational points for the potential of Atlantic salmon escape.*

<table>
<thead>
<tr>
<th>Broad Operational Categories</th>
<th>Specific Potential Escape Vectors</th>
<th>Possible Frequency of Occurrence</th>
<th>Chronic or Acute Escape</th>
<th>Possible Number of Net Pen Escapes per Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish Handling</td>
<td>Hatchery Smolt Transfers</td>
<td>Once</td>
<td>Chronic → Acute</td>
<td>Up to Entire Truck Load (0-40,000)</td>
</tr>
<tr>
<td>Weight Sampling &amp; Sea Lice Counts</td>
<td>Monthly / Weekly</td>
<td>Chronic</td>
<td>Up to Entire Sample (0-30)</td>
<td></td>
</tr>
<tr>
<td>Grading &amp; Splitting Populations</td>
<td>Once</td>
<td>Chronic → Acute</td>
<td>Up to Entire Stock (0-120,000)</td>
<td></td>
</tr>
<tr>
<td>Fish Health Treatments</td>
<td>Monthly</td>
<td>Chronic → Acute</td>
<td>Up to Entire Well Boat Load (0-40,000)</td>
<td></td>
</tr>
<tr>
<td>Harvesting Stock</td>
<td>Once</td>
<td>Chronic → Acute</td>
<td>Up to Entire Harvest Number (0-50,000)</td>
<td></td>
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Operational “Human” Failure

- **Saltwater Operations**

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<td><strong>Farm Procedures</strong></td>
<td>Net Changes</td>
<td>0-3 Times</td>
<td>Chronic → Acute</td>
<td>Up to 50% of Stock (0-60,000)</td>
</tr>
<tr>
<td>Securing Vessels to Net Pens</td>
<td>Daily</td>
<td>Acute</td>
<td>Up to Entire Stock (0-120,000)</td>
<td></td>
</tr>
<tr>
<td>Towing of Net Pens with Stock</td>
<td>0-2 Times</td>
<td>Chronic → Acute</td>
<td>Up to Entire Stock (0-120,000)</td>
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<tr>
<td>Diver Entry for Mort Removal or Stock Inspections</td>
<td>Weekly to 3x/wk</td>
<td>Chronic</td>
<td>Low Likelihood for Large Escape (0-1,000)</td>
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Reducing the Human Factor

• The causes for farmed fish escape are complex and varied

• “human error” not always on the part of site crew
  ➢ QA/QC at net loft when seam let go on new net
  ➢ Fishermen on “auto-pilot”
Reducing the Human Factor

Can it really be eliminated?! No

- Training in procedures / equipment use
- Written SOPs
- 3rd party certifications
- Codes of Containment
- Daily operations planned to minimize the possibility for escape – tide, weather
- Work with service providers – net loft, divers

Daily attention to detail – hard to maintain / ensure
Questions
Thank you