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Monitoring the movements of a critical marine resource: tracking a forage fish in Puget Sound

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Monitoring the movements of a critical marine resource: tracking a forage fish in the Salish Sea

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Columbia River Research Laboratory

U.S. Department of the Interior
U.S. Geological Survey
Background

- Forage fish guild: Important marine resource
- WDFW 30 year dataset on spawning
  - Spawning beaches
  - Seasonal timing
- Large data gaps
  - Movement and distribution
  - Site fidelity
  - Feeding ecology
Acoustic Telemetry

Powerful tool
- Monitor individual animals
- Fine-scale movement information

But.....
- Requires a big assumption: limited tag effects
- Best to have some baseline info to design monitoring

Our effort was a pilot study designed to:
1) Test fish handling & tag implantation procedures
2) Collect baseline data to inform future efforts
**Methods**

- **Vemco 69 kHz**
  - V7 tags (73 d life)
  - Compatible with other deployed receivers

- **Ross Pt in Sinclair Inlet**
  - Well document spawning beach
  - Popular recreational fishing site
  - Dip netting with local fishers

- **Tagged 12 males in Nov 2012**
  - Mean size: 167 mm FL and 43 g
  - Mean tag burden 3.8%
Also did limited mobile tracking in Sinclair Inlet

13 monitoring locations
> 90 d deployment

5 receivers
Bremerton
Port Washington Narrows

2 receivers
Port Orchard
Eagle Harbor

1 receiver
West Seattle
Ballard
Agate Passage
Liberty Bay
Port Orchard
Bainbridge Island
Ross Pt
Port Washington Narrows
ATTENTION: SURF SMELT ANGLERS

TAG REWARD

○ Made fish visually distinct
  ▪ Dorsal beads & ventral stitches
○ Signs at all fishing access points
○ Word of mouth
Results

All fish detected within a few days of release

Detections restricted to:
- Ross Pt: all individuals
- Port Washington Narrows: 1 individual

Port Washington Narrows
- Good detection across channel
- Ross Pt for 6 d after release
- Not detected again
Ross Pt

- Station positioned to monitor the spawning beach
- Spawning beach across the Inlet
  - Not within range of Ross Pt station

Spawning beach
Ross Pt Results

- Average of 6 visits to the site (max 17)
- Residence time: 2.2 h (max 8 h)
- Lag time: 2.3 h (max 5 d)
Where did they all go?

No longer at Ross Pt
Not detected elsewhere

Possibilities:
- Fish died
- Left Sinclair Inlet without being detected
- Within Sinclair Inlet but outside of detection range
  - Detections at spawning beach on opposite shoreline (mobile)
- Captured by recreational or commercial fishers

1 reward issued
Large commercial effort
Ross Pt Detections

**Bar Chart:**
- X-axis: Hour (0, 6, 12, 18, 24)
- Y-axis: Detections

**Pie Chart:**
- N=1481 Total Detections
- 81% of detections occurred during daylight
- 17% of detections occurred during the crepuscular period
- Less than 1% of detections occurred during the dark period

**Bar Graph:**
- X-axis: Tide Classification (Low, Highest)
- Y-axis: # of Detections
- Highest tide classification had more detections than the low tide classification.
Next Steps

Full-scale effort in fall-winter of 2014-2015
- Tag fish earlier in the season
- Mix of males and females

Focused monitoring in Sinclair Inlet
- Head of the Inlet
- Alternate spawning beach
- Detailed movements around Ross Pt
Study Context

- Part of a larger USGS program
  - Coastal Habitats in Puget Sound (CHIPS)
  - Interdisciplinary approach
- Address some of the forage fish data gaps
  - Focus on habitat
- Current research topics include:
  - Sand lance burrowing habitats
  - Habitat use & food habits of juvenile sand lance & surf smelt
Study Relevance

Movement & phenology information useful for:

- Modeling efforts
  - Climate impacts
  - Contaminant exposure risk
  - Trophic dynamics
    - Predator-prey interactions
    - Seabirds, salmon, marine mammals
- Habitat protection & restoration
- Resource management
  - Stock monitoring
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WDFW Port Orchard office
Questions?
November 7, 2012

Hour Tide Height (ft)

Dark 16
Dark 8
Dark 4
Daylight 12
Daylight 8
Daylight 4
Dark 16

Tide Height (ft)
Transmitter selection

V7-2x-A69-1303

- 73 day tag life
- 45 second nominal pulse rate
- 30-60 sec pulse rate range
- 1.6g in air