Biscayne Bay: Nearshore Continuous Salinity Monitoring

Greg Graves, RECOVER Division, SFWMD
Sarah Bellmund, Biscayne National Park
BBCW “Alt O” Phase I Restoration Plan
Biscayne Bay Continuous Salinity Monitoring Network
Phenomenon of “fresher on bottom”

Aug 2006
Difference 35 – 34 (top – bottom) Salinity

Avg top = 31.3

Avg bottom = 30.3

Daily Canal Discharge Volume
Phenomenon of “fresher on bottom” occurs elsewhere in Bay
Phenomenon of “fresher on bottom” occurs elsewhere in Bay Aug 2006
Biscayne Bay Salinity Monitoring Transect
Biscayne Bay Salinity Monitoring Transect
Hypersalinity Events – Top to Bottom

Paired Sites 35 (top) and 34 (bottom)

Salinity

May4-Sept15  Mar3-June10  May2-July6

Variable

- 34
- 35

Hypersalinity Events – Top to Bottom
Hypersalinity Events – Top to Bottom

Paired Sites 19 (top) and 18 (bottom)

Mar4-Oct17  Feb24-June12  May3-Aug25
Mar22-May21

Variable

- 19
- 18

Salinity

01/01/2004  01/01/2005  01/01/2006  01/01/2007

Hypersalinity Events – Top to Bottom
Error in Predicting 32 from Distance to 30 and 34

Accuracy of Predicted Salinity from Salinity at Bracketing Sites along Transect
Accuracy of Predicted Salinity from Salinity at Bracketing Sites along Transect
Salinity along 30-32-34-36 transect as function of Canal Discharge
Salinity along 30-32-34-36 transect as function of Canal Discharge

BISC30
LogTotFlow = 3.254 - 0.04333 30
S 0.44059
R-Sq 34.7%
R-Sq(adj) 34.6%

BISC32
LogTotFlow = 3.814 - 0.05762 32
S 0.407259
R-Sq 32.4%
R-Sq(adj) 32.2%

BISC34
LogTotFlow = 4.359 - 0.06648 bisc34
S 0.486433
R-Sq 21.4%
R-Sq(adj) 21.3%

BISC36
LogTotFlow = 5.548 - 0.09394 BISC36
S 0.517856
R-Sq 17.9%
R-Sq(adj) 17.7%

"Hanging chad" denotes higher salinity "events" during low flow

384 m from shore
3066 m from shore

1453 m from shore
6122 m from shore
Salinity along 30-32-34-36 transect as function of Canal Discharge

**BISC30**
LogTotFlow = 3.254 - 0.04333 30

S = 0.440-60
R-Sq = 34.7%
R-Sq(adj) = 34.6%

**BISC32**
LogTotFlow = 3.814 - 0.05762 32

S = 0.407269
R-Sq = 32.4%
R-Sq(adj) = 32.2%

**BISC34**
LogTotFlow = 4.359 - 0.06648 bisc34

b = 3.3

384 m from shore

**BISC36**
LogTotFlow = 5.548 - 0.09394 BISC36

S = 0.517856
R-Sq = 17.9%
R-Sq(adj) = 17.7%

b = 5.5

1453 m from shore

**BISC30**
LogTotFlow = 4.359 - 0.06648 bisc34

b = 3.3

3066 m from shore

**BISC36**
LogTotFlow = 5.548 - 0.09394 BISC36

b = 5.5

6122 m from shore
Salinity in Bay can be to large extent “explained” by canal discharge volumes.
PCA BBay Salinity Regime 2004-2006

2 psi bins, standardized, 65% variance "explained"

increasing uniformity in 4-24 salinity range
increased incidence 26-32 salinity range

Nearer to Shore    Farther from Shore
PCA BBay Salinity Regime 2004-2006

2 psi bins, standardized, 65% variance "explained"

increasing uniformity in 4-24 salinity range
increased incidence 26-32 salinity range

Nearer to Shore
Farther from Shore
Very near-shore sites
Very near-shore sites (<150m)
Very near-shore sites

Site 14 adjacent C-103 canal
Salinity at 4 Nearshore sites, by year, by month
Linking Salinity Data to Ecological Response
Mangrove Fishes

\[ y = 0.0014e^{0.1363x} \]
\[ R^2 = 0.8395 \]

\[ y = -0.0237 \ln(x) + 0.0958 \]
\[ R^2 = 0.4698 \]

Courtesy J. Serafy 2008
Juvenile Seatrout Occurrence as a function of Salinity
Difference in Seatrout Frequency - Site 40 minus 56

- Week 2005
- Difference in Observed Frequency
Fig. 6 Probability of occurrence of SAV taxa in relation to mean salinity during the wet season fitted with logistic regression. The low abundance of *Ruppia* precluded this species from being included in this analysis.

**Salinity – SAV relationships also being developed**
### Sample Station Salinity Statistics from Model

<table>
<thead>
<tr>
<th>Station ID</th>
<th>Station Name</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Depth (m)</th>
<th>Temperature (°C)</th>
<th>Salinity (psu)</th>
<th>Density (kg/m³)</th>
<th>Oxygen (mg/L)</th>
<th>Conductivity (μS/cm)</th>
<th>TSS (mg/L)</th>
<th>Turbidity (NTU)</th>
<th>Dissolved Oxygen (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Station A</td>
<td>34.56</td>
<td>-123.45</td>
<td>10</td>
<td>12</td>
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<td>10.567</td>
<td>123.456</td>
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<tr>
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<td>Station B</td>
<td>34.57</td>
<td>-123.46</td>
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<td>13</td>
<td>34.565</td>
<td>10.567</td>
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<tr>
<td>2</td>
<td>Station C</td>
<td>34.58</td>
<td>-123.47</td>
<td>12</td>
<td>14</td>
<td>34.565</td>
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<td>123.456</td>
<td>123.456</td>
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</tr>
</tbody>
</table>

**Salinity Histogram plots by Stations**

- **ID = 15**
- **ID = 38**

### Additional Information

- **Customizing Histogram**: Select min salinity, select max salinity, select 1st plot, select 2nd plot, select histogram bin width, etc.
Optimized network
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