# Ocean Acidification: Monitoring and Mitigation at the Taylor Shellfish Hatchery

Benoit Eudeline
Taylor Shellfish Hatchery
Quilcene, WA

Taylor Shellfish Farms

C-CAN Workshop
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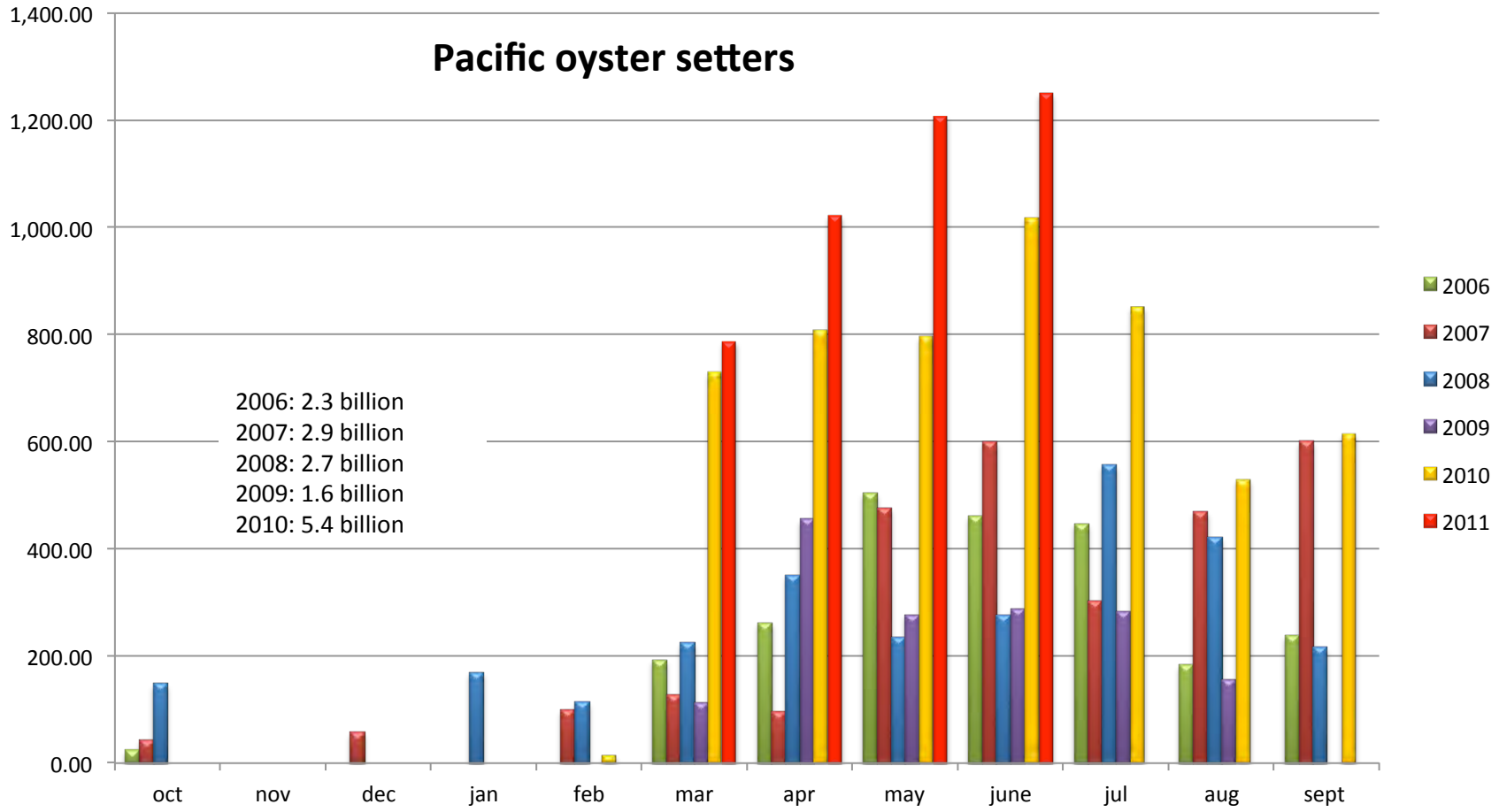
# Dabob Bay Hatchery



# Pacific Oyster Larvae Production

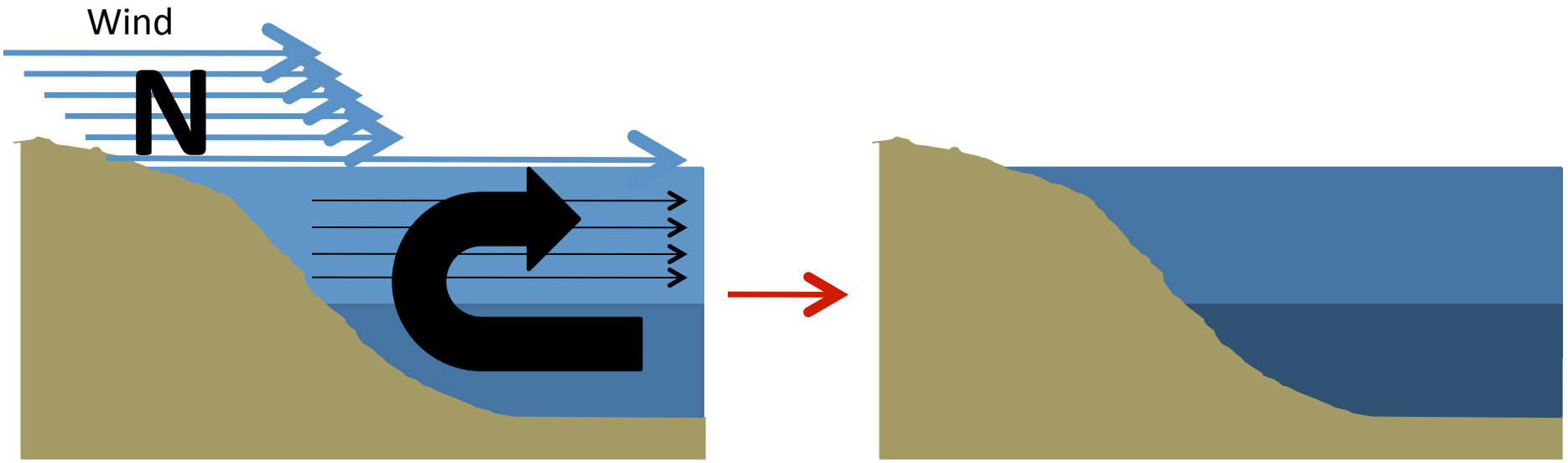



- Production capacity increased from 2006 to 2009 but production decreased
- 2010: Record setting year for oyster larvae production

# What is our problem?

(We think…)

# Upwelling in Dabob Bay




Combination of 3 low pH/High $PCO_2$ sources

- Upwelling in Dabob Bay
- Upwelled ocean water
- Estuarian/ run-off water

Shallow Water

Deep Water

Deeper Water

# Hatchery water supply

- Shallow intake: 5 to 15 feet deep, floating
  Shallow water used to raise oyster larvae

- Deep intake: 100 feet deep, 4 feet from bottom
  Deep water used for algae production and geoducks

# Shallow and Deep water

# PCO2 Deep/Shallow water

# Deep Water Characteristics

- High $PCO_2$
- Low aragonite saturation
- Low pH
- High Salinity
- Low Temperatures
- Reduced chemistry?
- What else?

# Monitoring

# Levels of Monitoring

- Water quality
  - Continuous (Probes, PCO2…)
  - Weekly (DIC, nutrients…)
- Larvae performance
- Bacteriology
- Weather

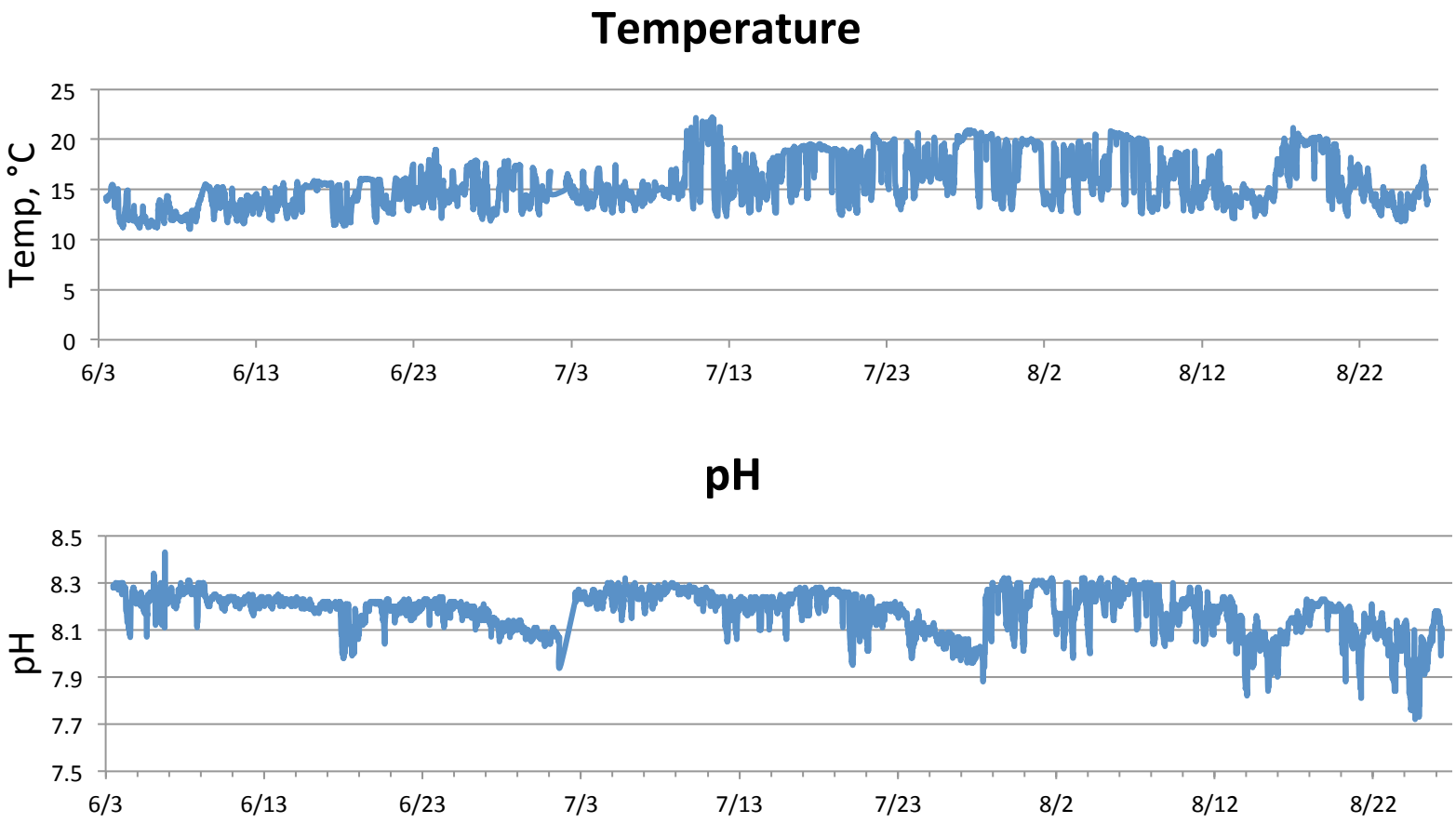
# Water Quality

- YSI 6600 (2) monitoring Shallow and Deep Intakes
  pH, Temperature, Salinity, Oxygen, ORP, Depth (Tide), Chlorophyll, Turbidity.

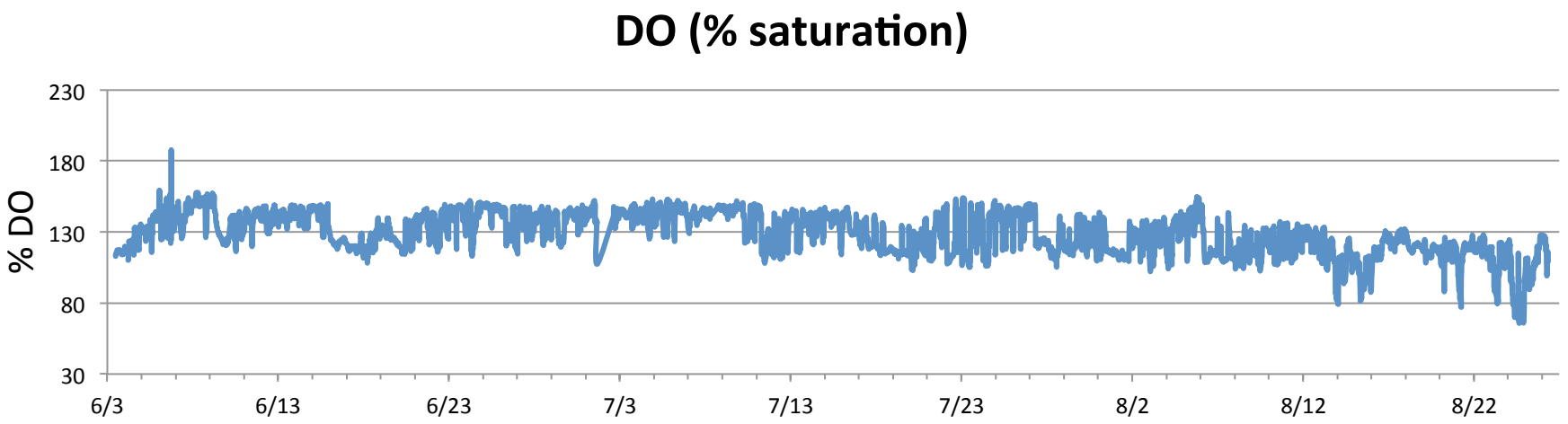
- YSI 5200A (4) monitoring intakes, water treatments and Bio-assays.
  pH, Temperature, Salinity, Oxygen, ORP

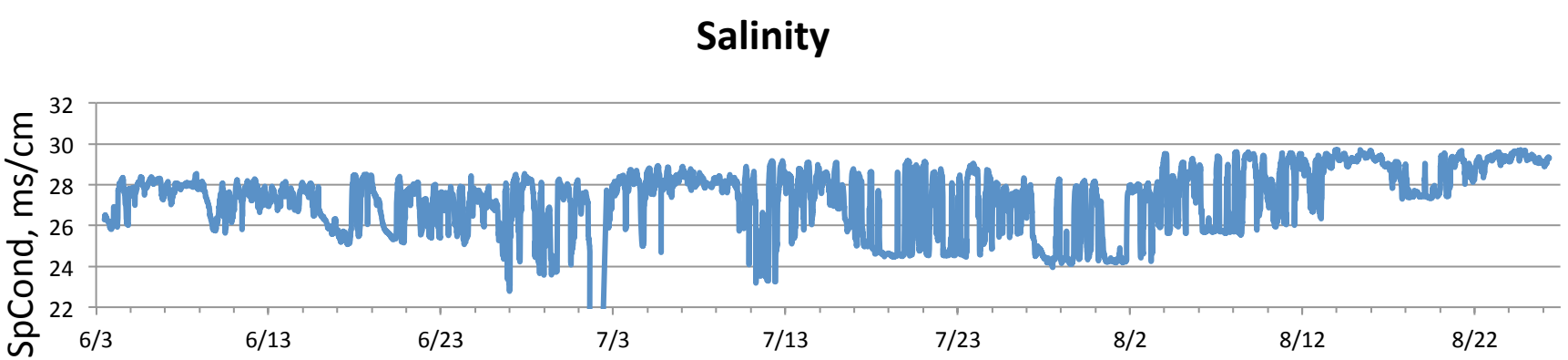
- $PCO_2$ Monitor (OSU,Burke Hales)
  Continuous monitoring of the PCO2 in the Shallow intake

# Continuous Monitoring

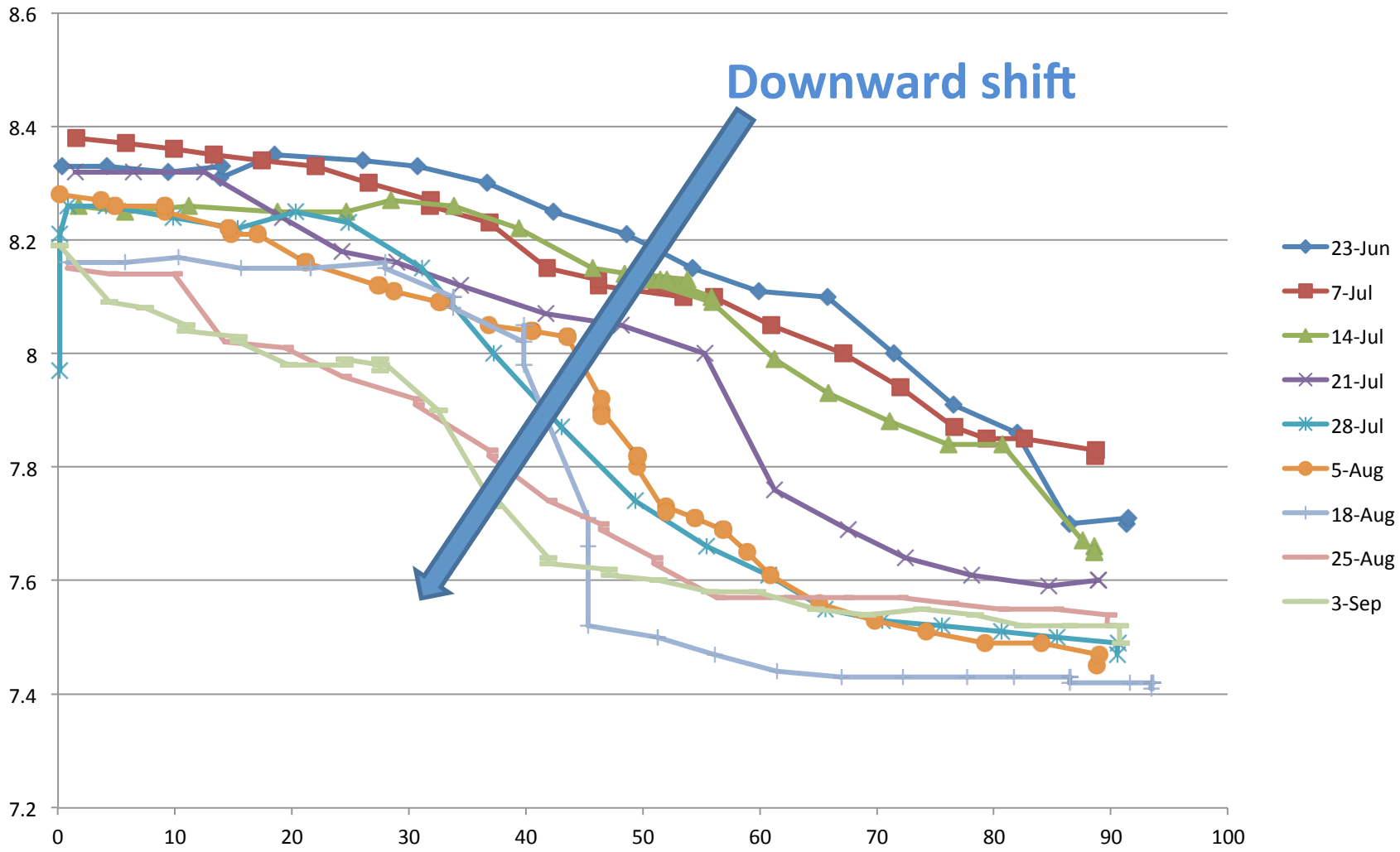


# Continuous Monitoring



# Dabob Bay pH Profiles



# Tracking Larvae Performance

## Taylor Shellfish Hatchery larvae spawning sheet

### Spawn information:

| | |
|---|---|
| Spawn ID | |
| Tracking number | |
| Spawn date | |
| Ploidy | |
| Spawn type | |
| Male family | |
| Female family | |
| Number of males | |
| Number of females | |
| Total number eggs | |
| Number of eggs kept | |
| fertilization rate | |
| Number Dlarvae(CC) | |
| Number D larvae(DW) | |
| Number D larvae kept | |

### Spawning Water Chemistry:

| | |
|---|---|
| pH | |
| O2 mg/l | |
| O2 (%) | |
| Temp | |
| ORP | |
| Salinity | |
| Cond. | |
| SPC | |
| Alkalinity | |
| pCO2 | |
| TCO2 | |
| NO2 | |
| NO3 | |
| NH3 | |

### Larvae information:

| First screening date: | |
|---|---|
| Number 140's | |
| Number 120's | |
| Number 100's | |
| Number 90's | |
| Number 80's | |

| Third harvest date: | |
|---|---|
| Number Setters 250's | |
| Number setters 236's | |
| Number Setters 224's | |
| Number Setters 200's | |

| First harvest date: | |
|---|---|
| Number Setters 250's | |
| Number setters 236's | |
| Number Setters 224's | |
| Number Setters 200's | |

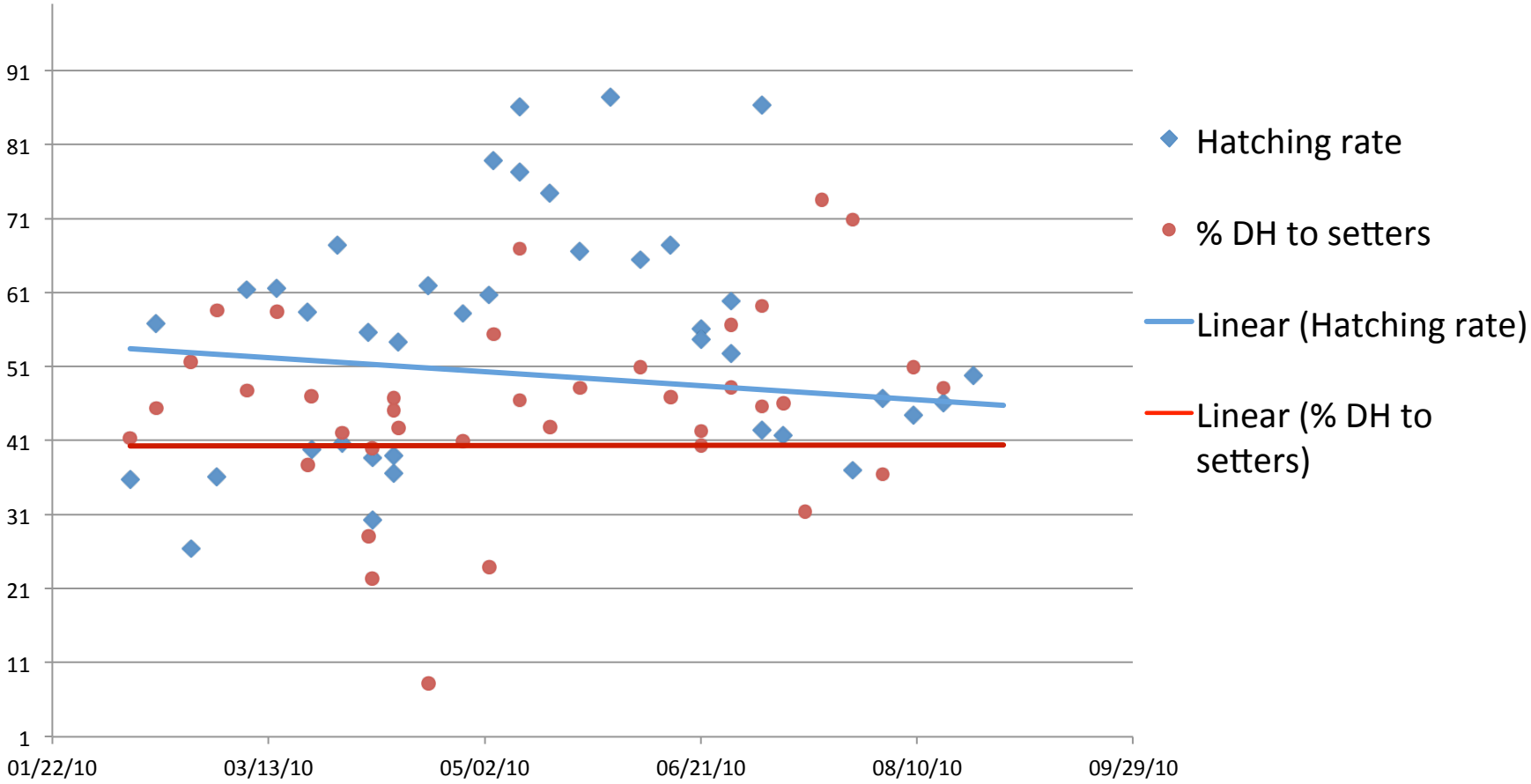
| Fourth harvest date: | |
|---|---|
| Number Setters 250's | |
| Number setters 236's | |
| Number Setters 224's | |
| Number Setters 200's | |

| Second harvest date: | |
|---|---|
| Number Setters 250's | |
| Number setters 236's | |
| Number Setters 224's | |
| Number Setters 200's | |

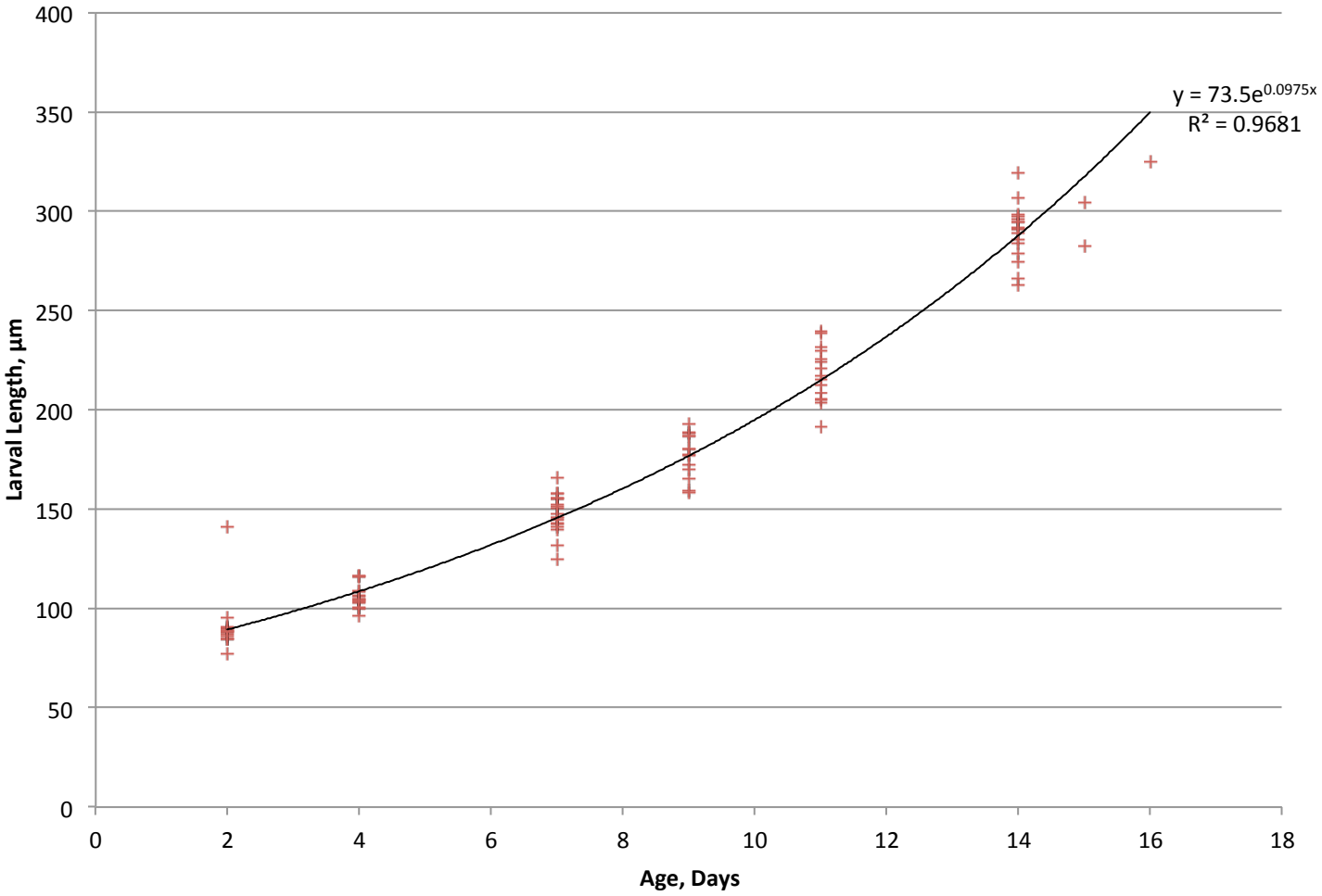
| Fifth harvest date: | |
|---|---|
| Number Setters 250's | |
| Number setters 236's | |
| Number Setters 224's | |
| Number Setters 200's | |

Comments:

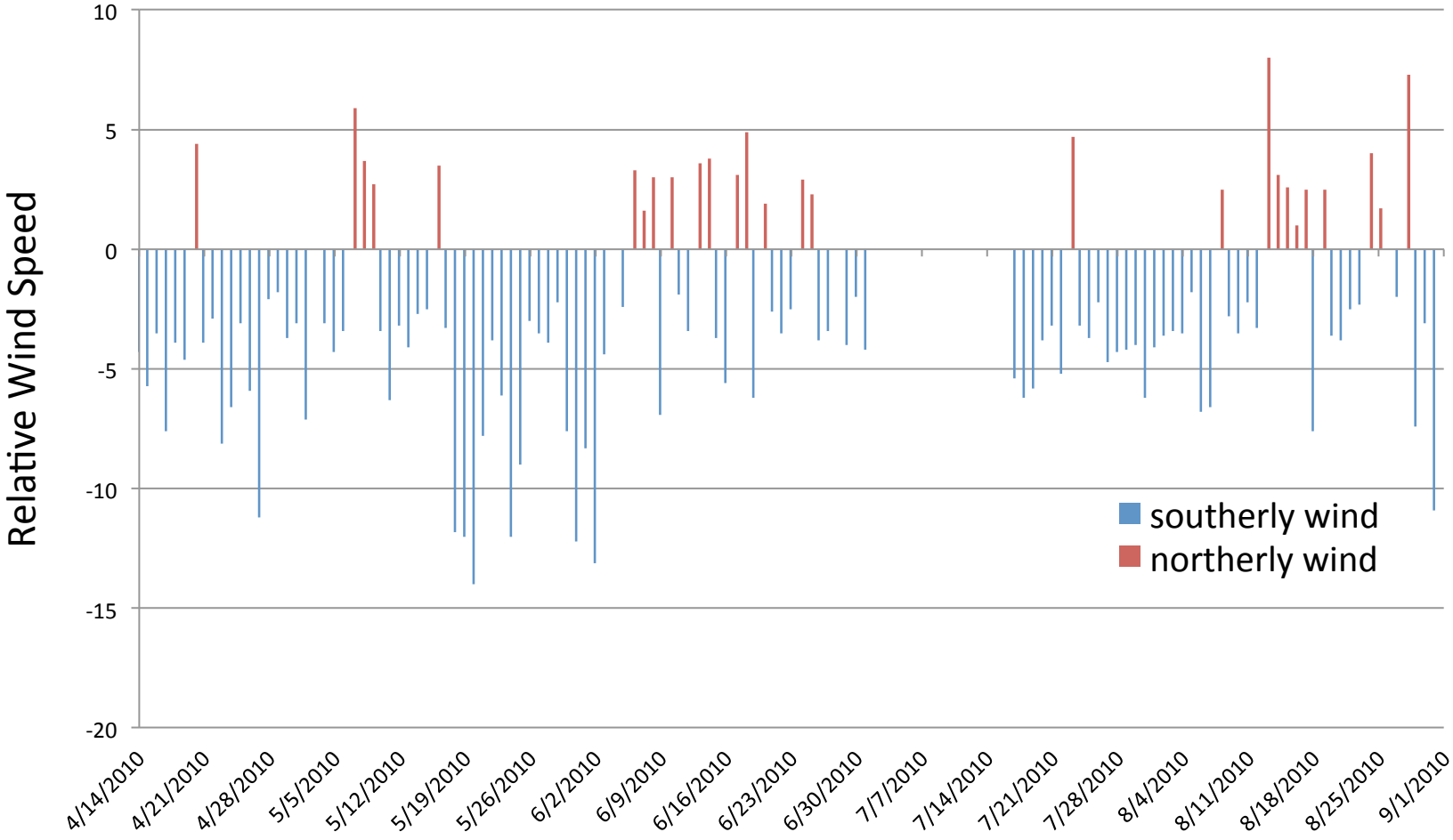
# Larvae Performance



# Larvae growth (16 spawns)



# Wind Direction



# Larvae Bioassays

# Larvae Bioassays

- Based on the comparison of Shallow and Deep water sources.
- Impact of egg hatching condition (0 to 48H PF)
- Impact of larvae rearing conditions
- Comparison of Shallow and Deep water treatments (Sodium carbonate, NaOH, degassing…)


Thank you
5200A
SHAL
5200A
DeeP
Airgas
Taylor
Shellfish
Farms