Impacts of Student Research:

What I gained from my work at NOAA

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4. Summary

Background

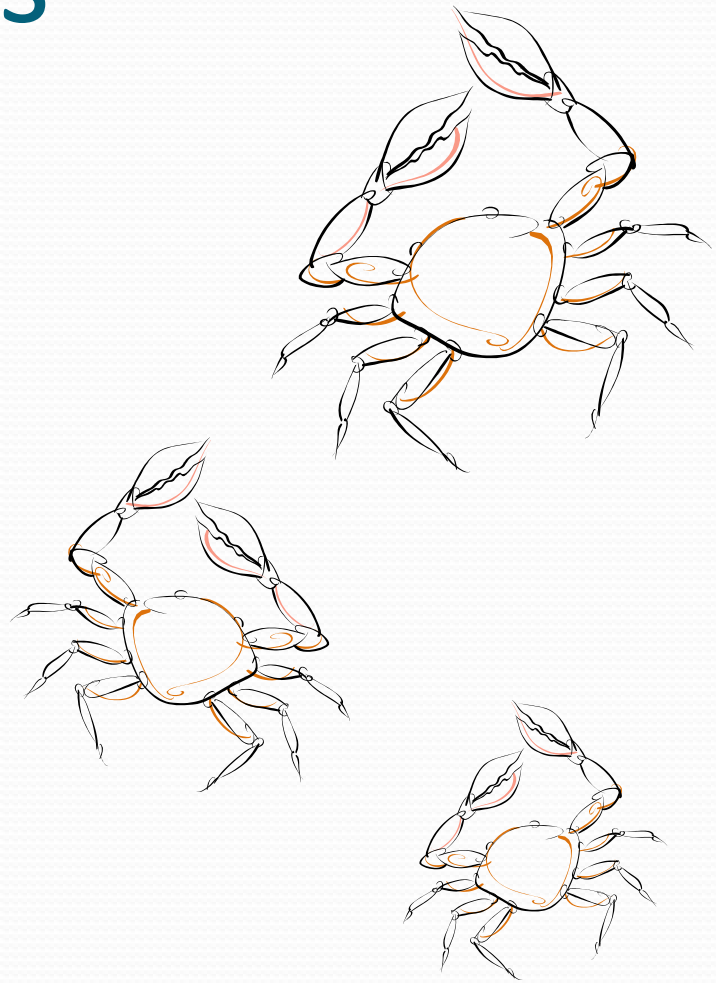
- University of Washington – Seattle
- Major: Human Centered Design & Engineering and/or Mechanical Engineering
- Minor: Oceanography and/or Statistics
- Prior research experience:
  - Marine Chemistry Program
  - UW's Mechanical Engineering Department

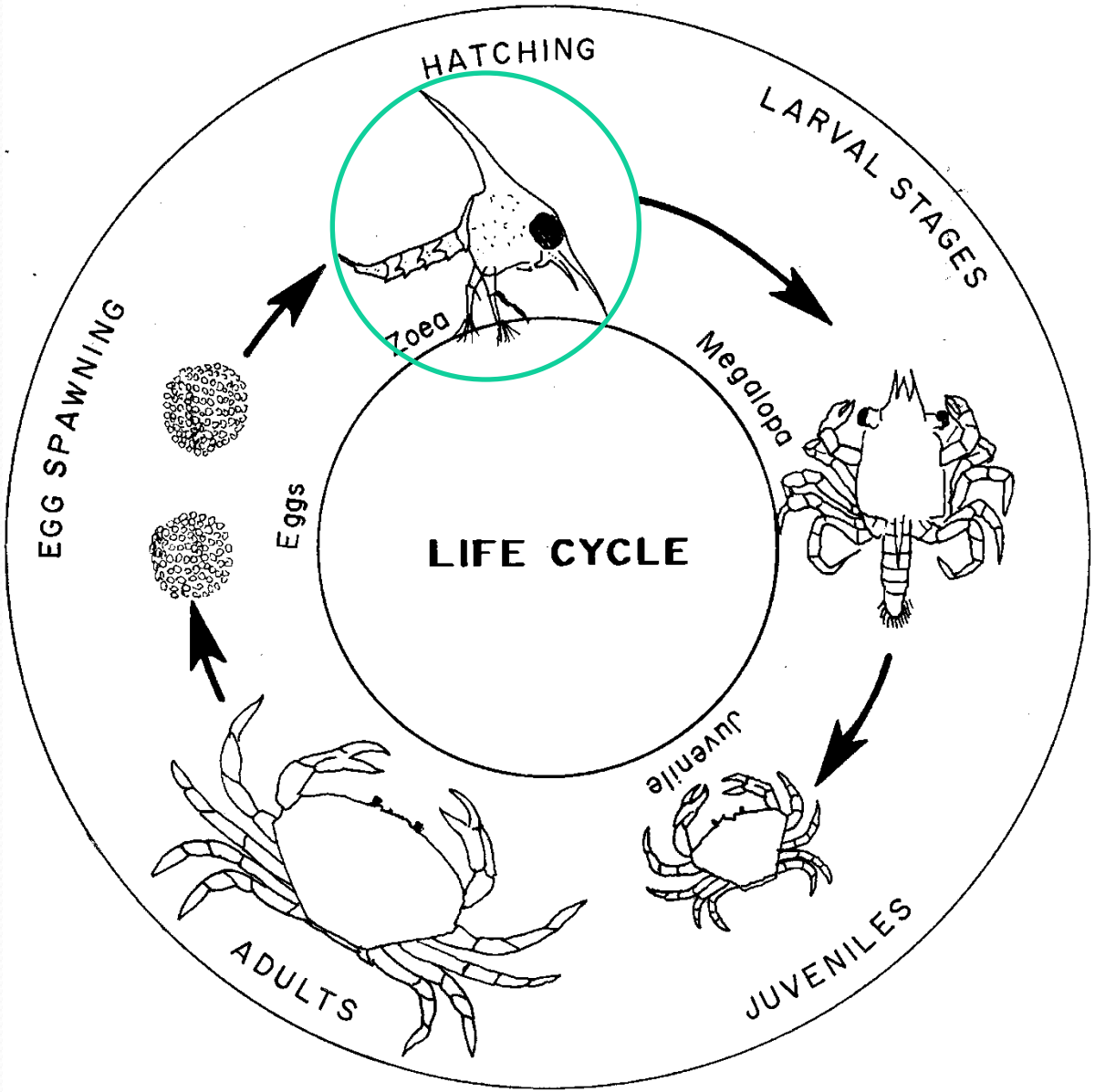
Intel ISEF Research

Design and Development of a Portable Light Trap for Sampling Brachyuran Crab Larvae

Importance of Crabs

- Key to population connectivity
- Indicators of the health of the marine ecosystem
- Part of the fishing industry




HATCHING
LARVAL STAGES
Zoea
Megalopa
EGG SPAWNING
Eggs
LIFE CYCLE
Juvenile
ADULTS
JUVENILES

Problem

1. To design and construct a portable light trap for capturing crab larvae

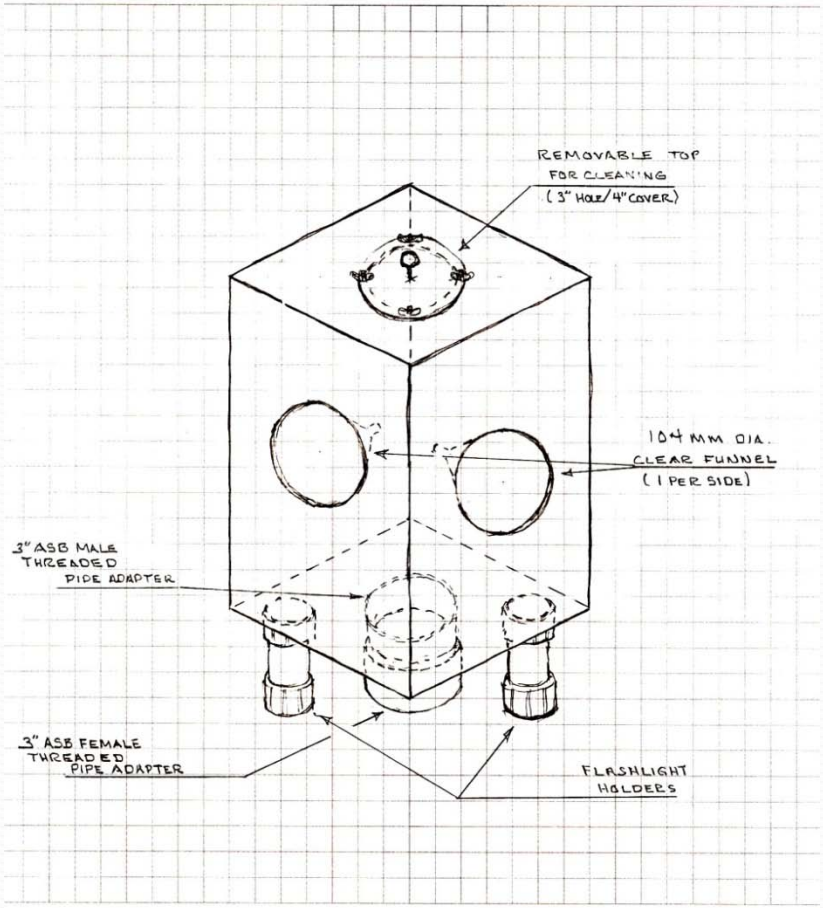
2. Determine whether light is effective in the capture of larvae

Why switch?

- Plankton tows
  - Inconsistent sampling
  - Data at a single instant
  - Subjective

- Light traps
  - Collect over a 24 hour period
  - Can be used at different depths/locations

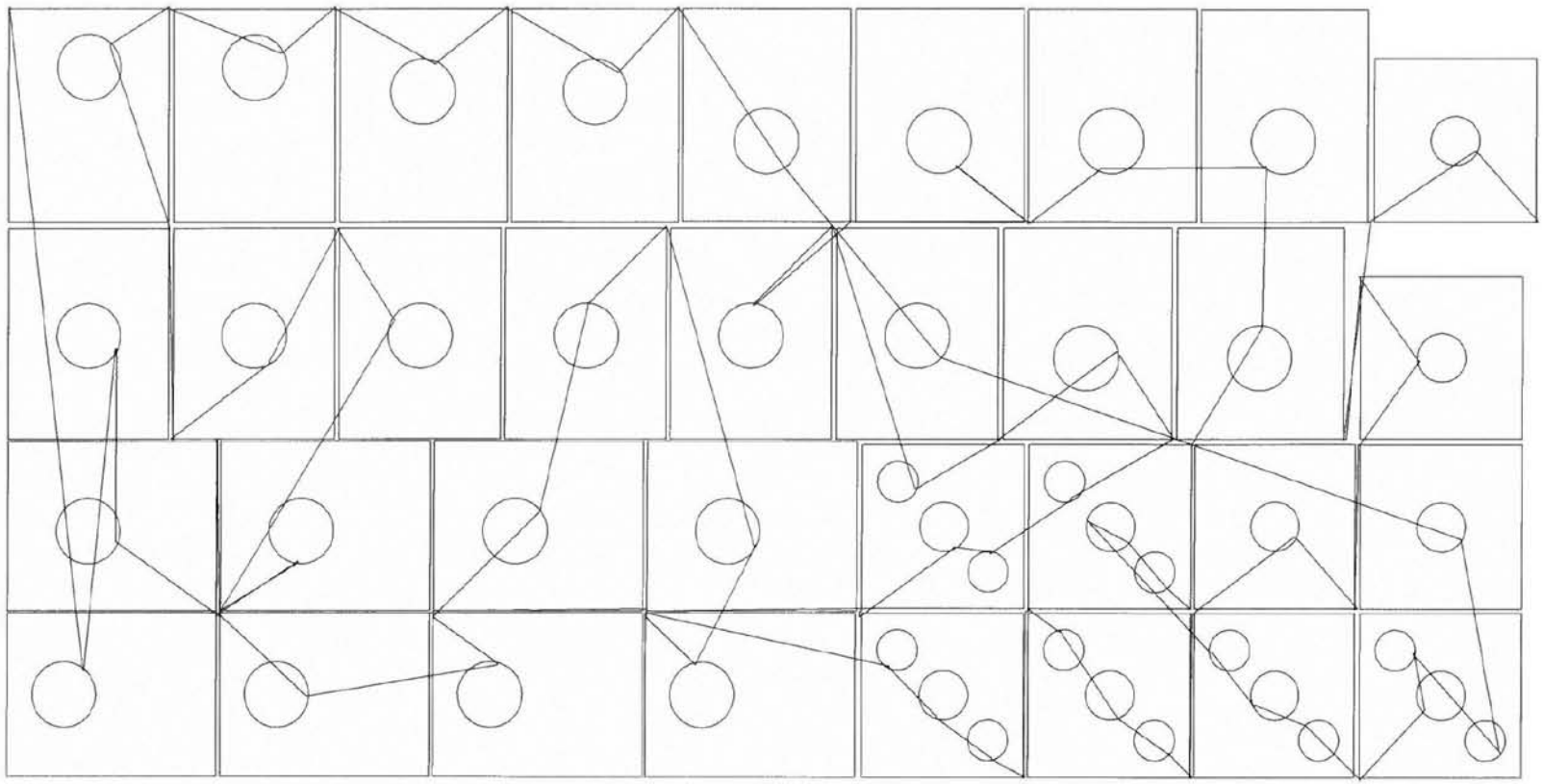
Key Features



- Detachable collection piece at the base of the trap
- Offset funnels
- Removable top
- Realistic size of the trap body
- Internal power source
- Two lights at the base of the trap

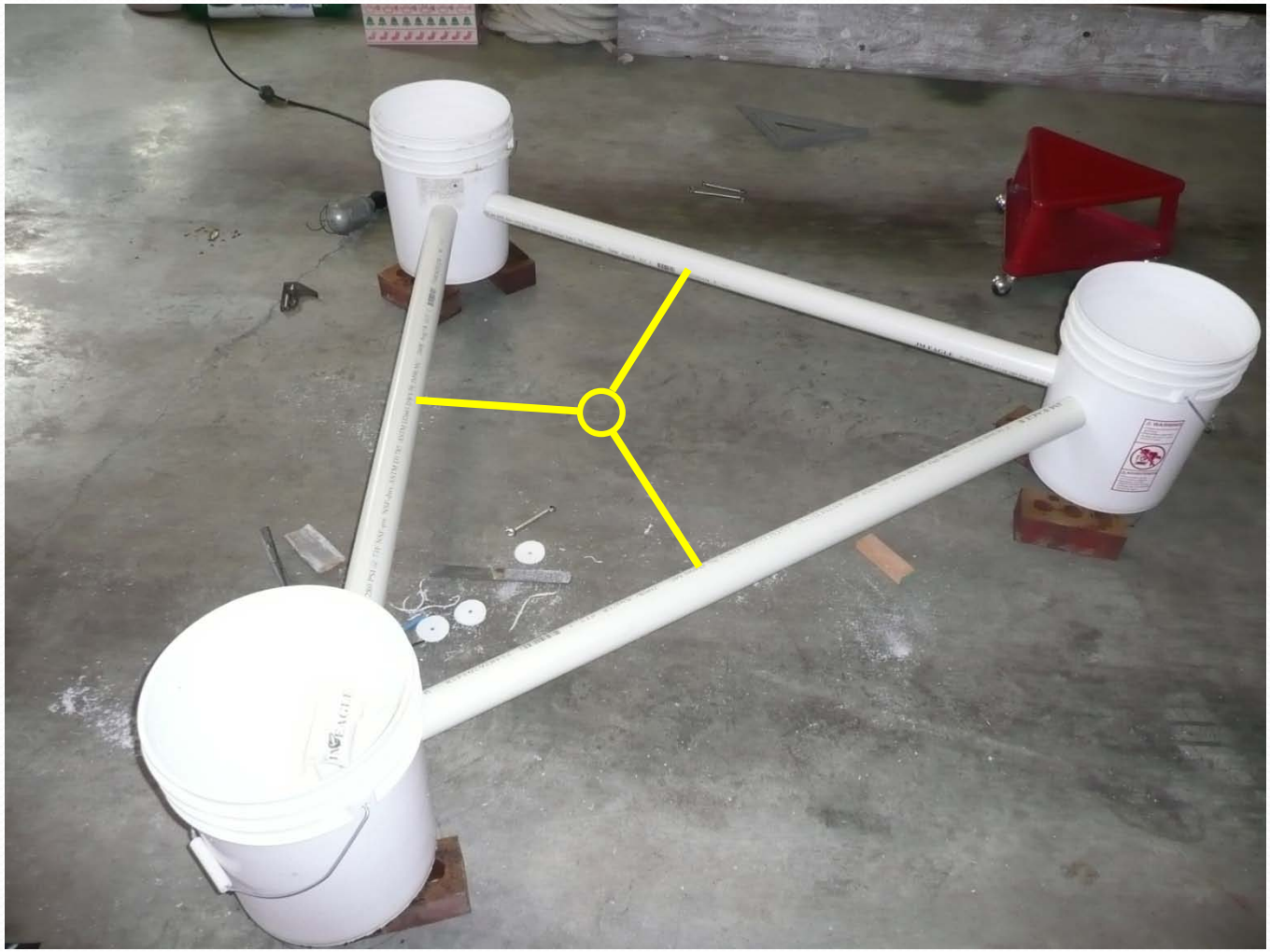
Building the Traps

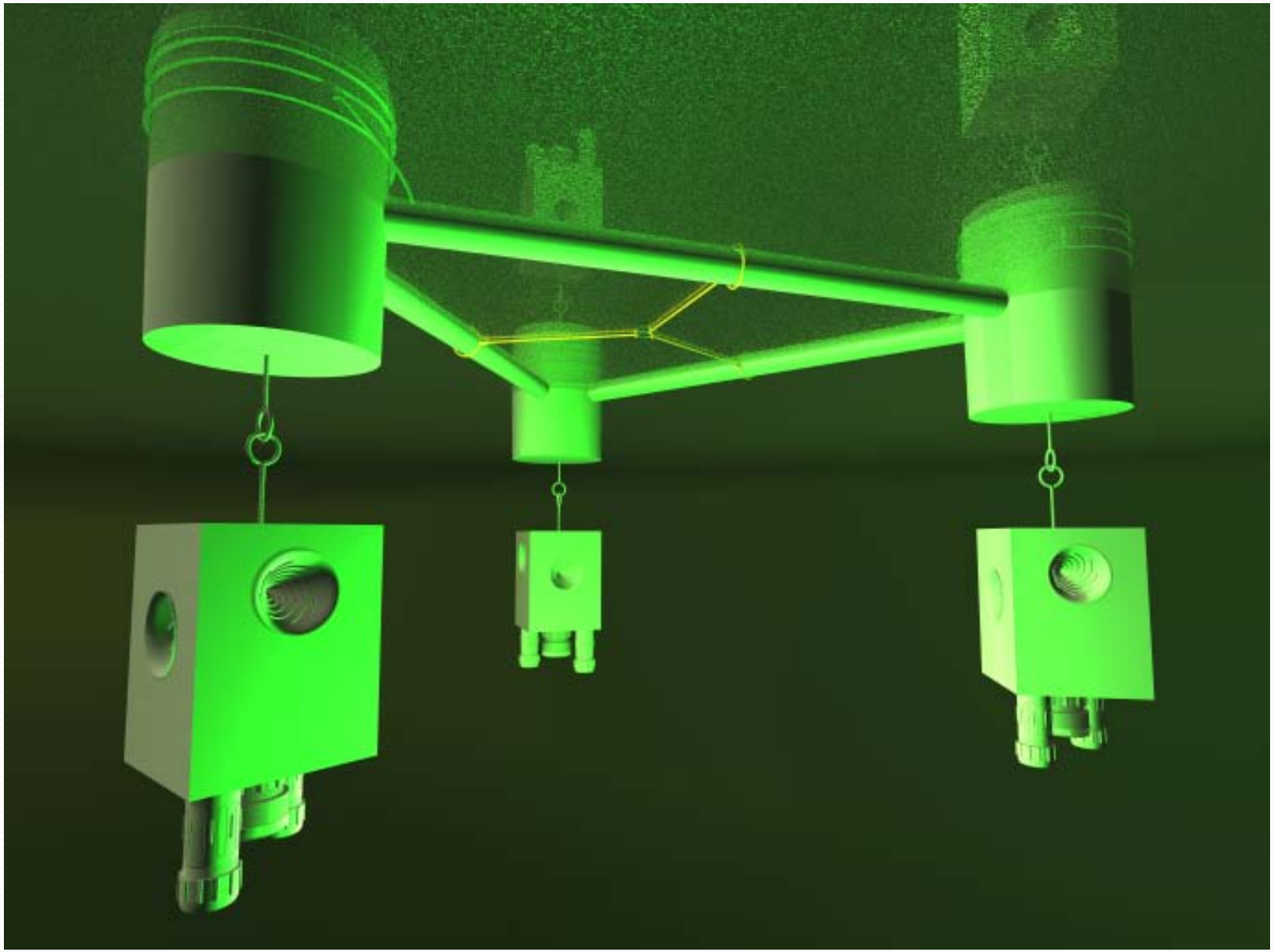
Building the Traps



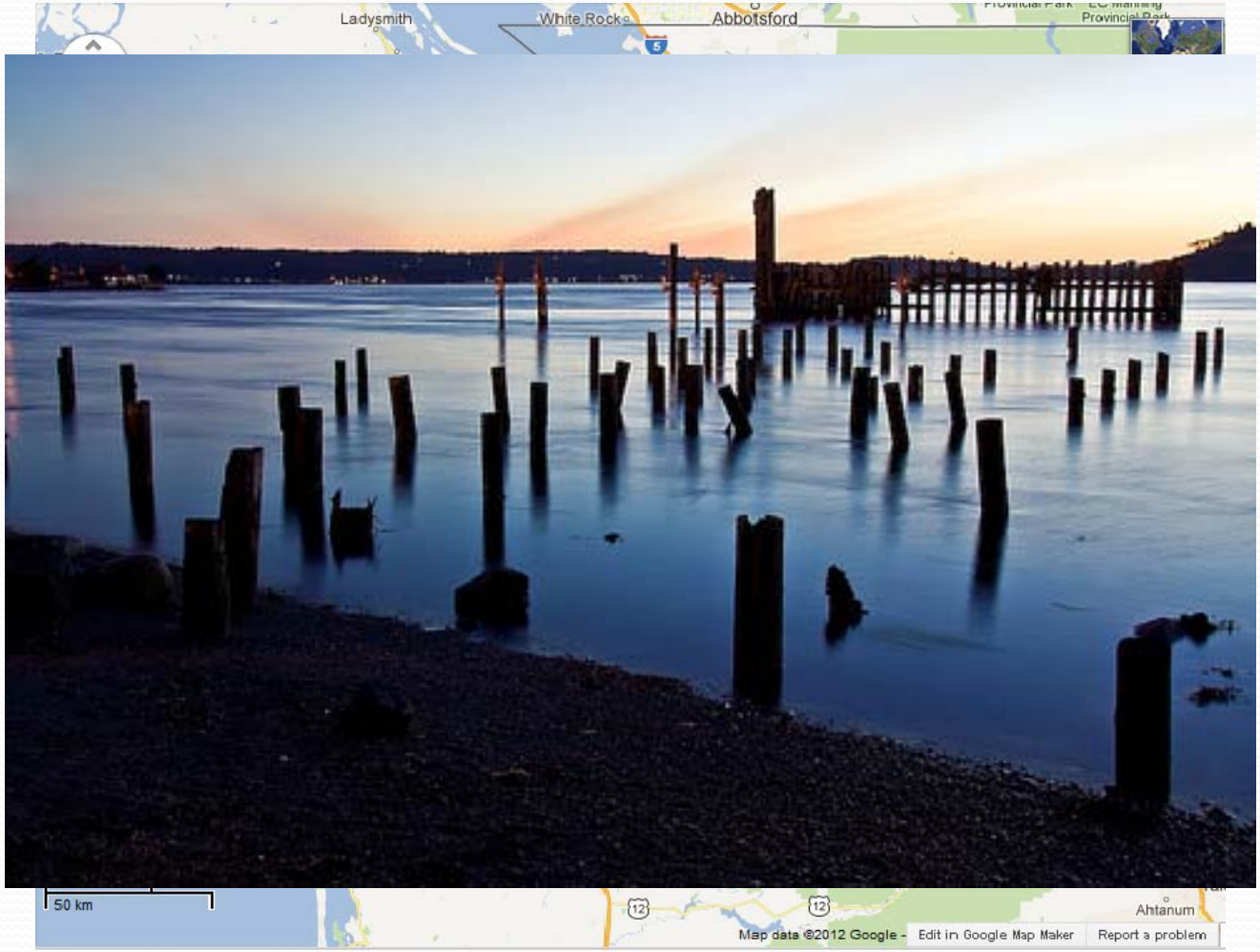
Building the Traps

Building the Float System

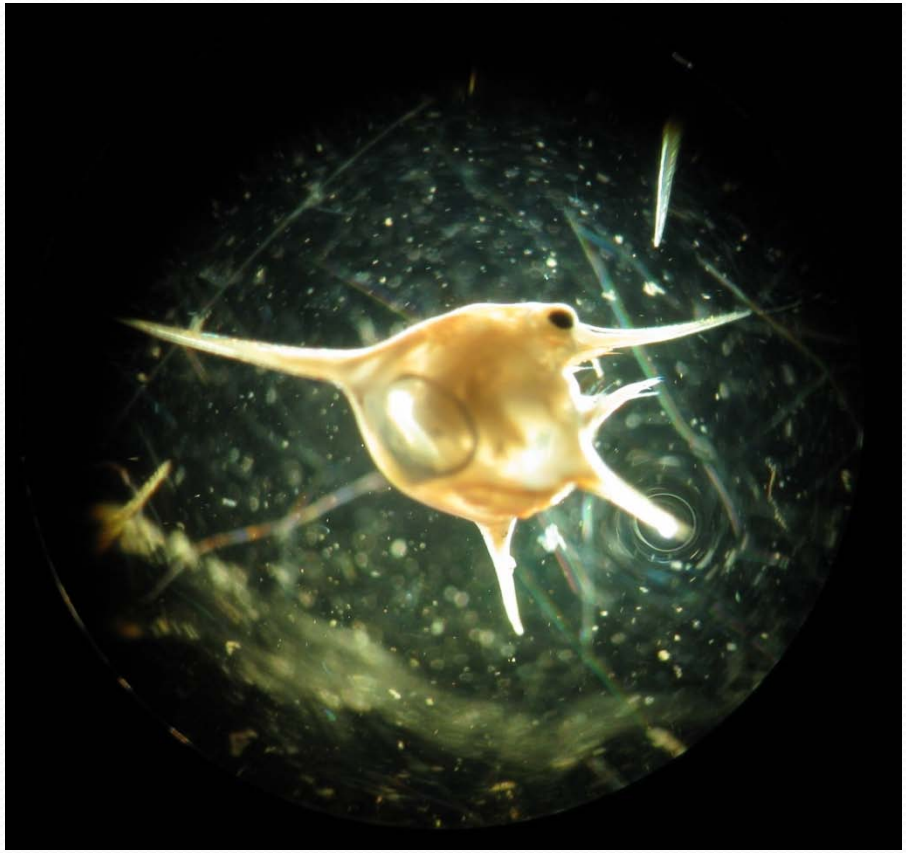


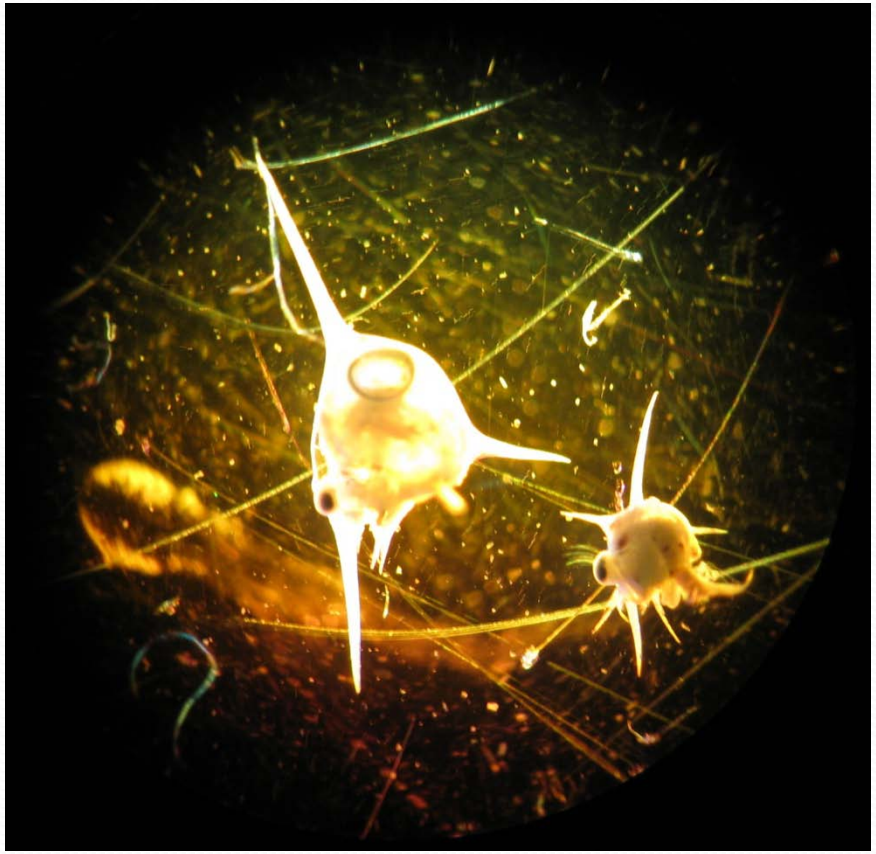


Titlow Beach Marine Preserve



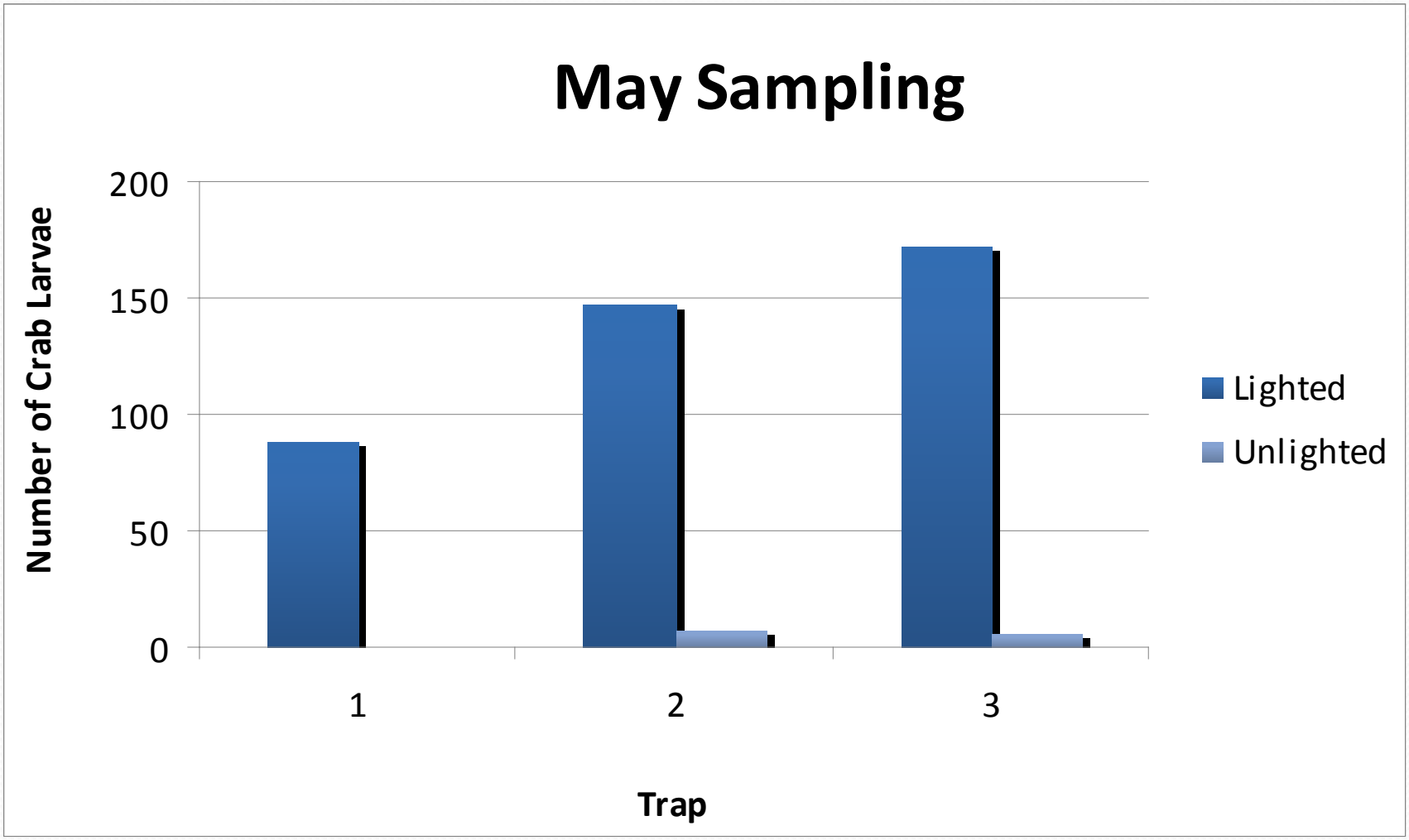
Deploying the Traps



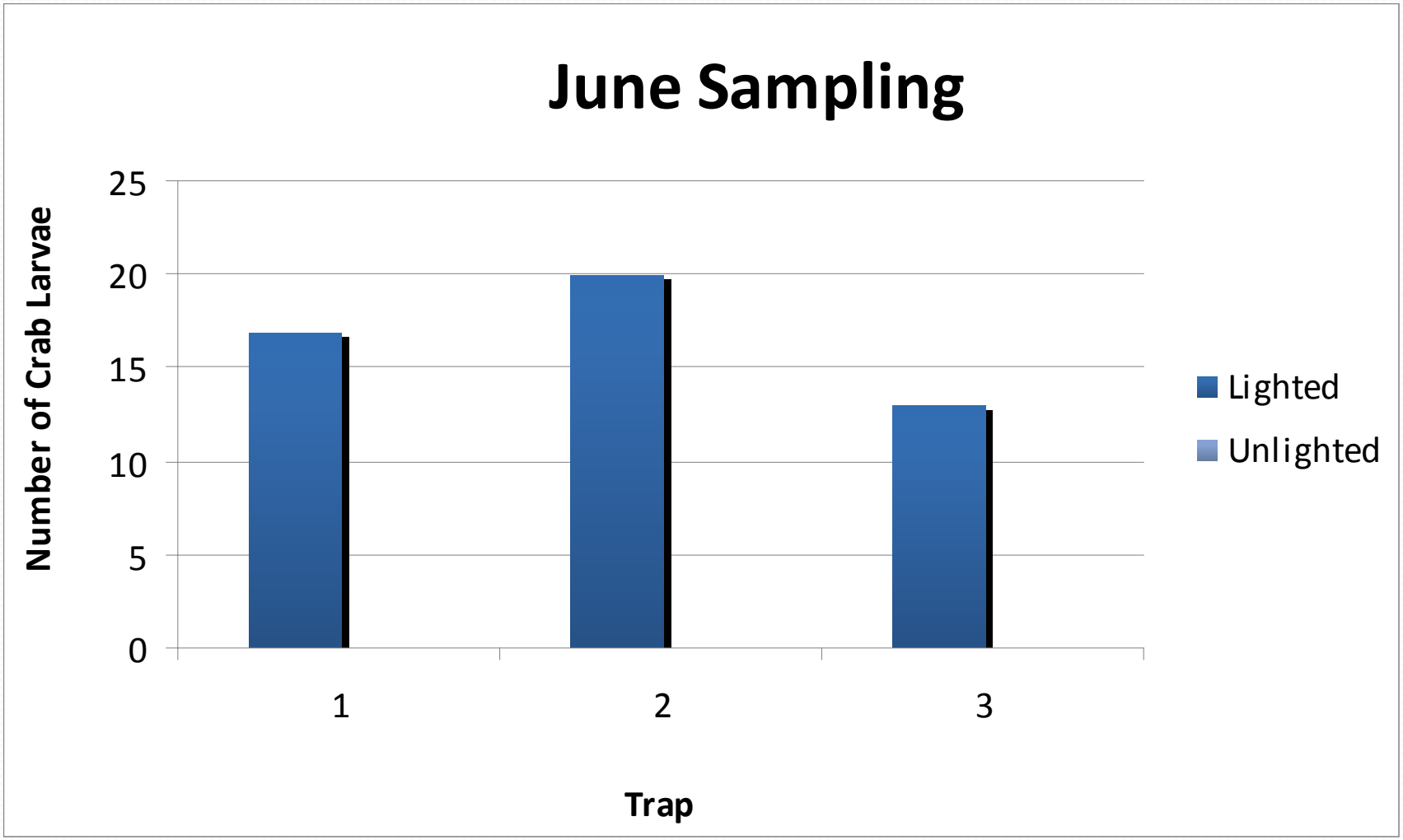


Pinnotherid crab Tunicotheres moseri, commonly known as the pea crab

Results: Trial 1



Results: Trial 2



Further Research

- Increased number of samplings
- Sampling at different depths
  - Dungeness crab research in Quartermaster Harbor
- Sampling over a greater time span
- Testing the effectiveness of different frequencies of light on the capture of larvae

NOAA Internship Research

Background – NOAA/NOS/CO-OPS

- NOAA/NOS Center for Operational Oceanographic Products and Services (CO-OPS)
  - Monitor and assess the U.S. coastal environment
  - Distribute real-time ocean/met observations and various forecast

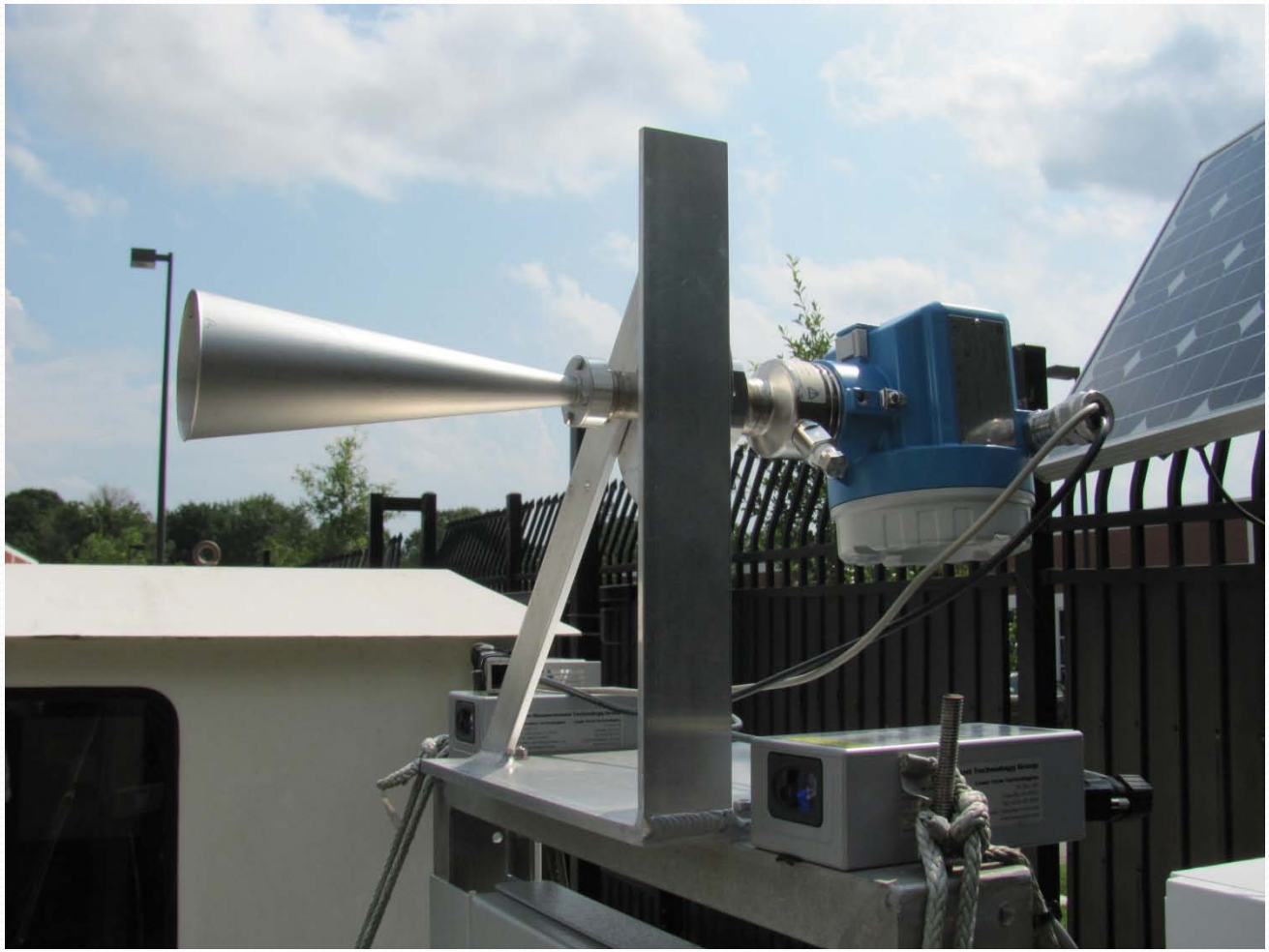
CO-OPS Maintains two Major Observatory Networks:

- National Water Level Observation Network (NWLON)
  - >200 stations with continuous WL observations
  - Acoustic and pressure sensors, float/shaft angle encoders
- Physical Oceanographic Real-Time Systems (PORTS®)
  - Integrating various real-time ocean/met obs across a port region
  - Distribution of info via phone & web, nowcast and forecast products
  - 20 operational PORTS® systems throughout the U.S.

Current OSTEP Projects

- Microwave Radar Water Level Sensor - trans. to operations
- Sutron Accubar Bubbler
- New Waterlog Air Gap Sensor
- Visibility Measurement System – cont. field testing
- Ultrasonic Anemometer Test
- Greenspan Conductivity-Temperature Sensor
- Water Quality Measurement System
- Current Measurement Technology
  - ADCP & Xpert DCP Integration
  - Bow Tow Test Capability
  - Nortex ZCell
- Improved Communications – GOES/LRIT, Iridium

Microwave Radar WL Sensor



The Target

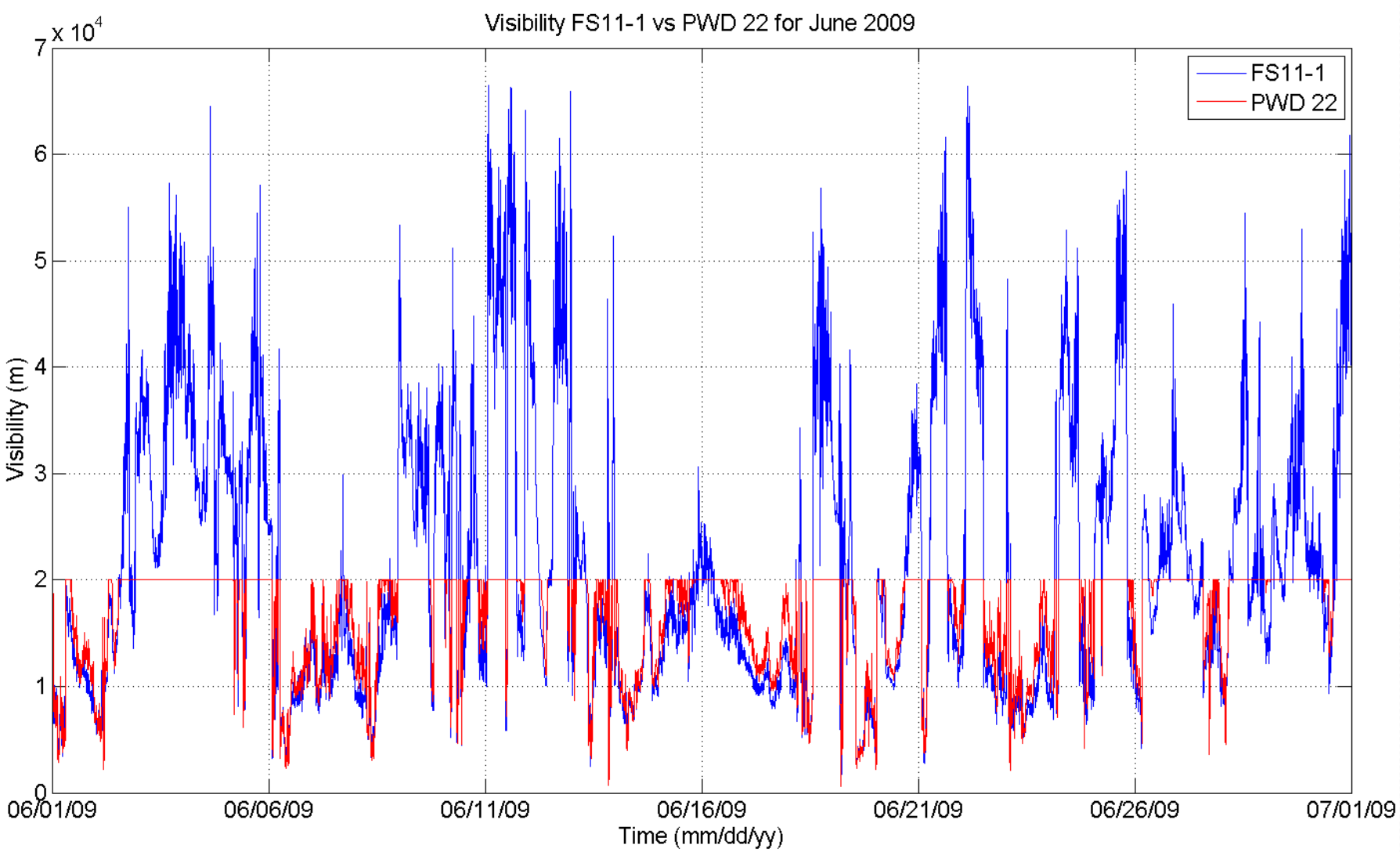
What I Learned

- Be adaptable – solutions can be found anywhere
- Pay attention to the weather

Visibility Measurement System

PWD 22

FS11-1


Visibility FS11-1 vs PWD 22 for June 2009
x 10^4
7
6
5
4
3
2
1
0
Visibility (m)
FS11-1
PWD 22
06/01/09
06/06/09
06/11/09
06/16/09
06/21/09
06/26/09
07/01/09
Time (mm/dd/yy)

What I Learned

- Appreciate the people who keep websites running
- Ask questions – it's better than being confused

Ultrasonic Anemometer Test

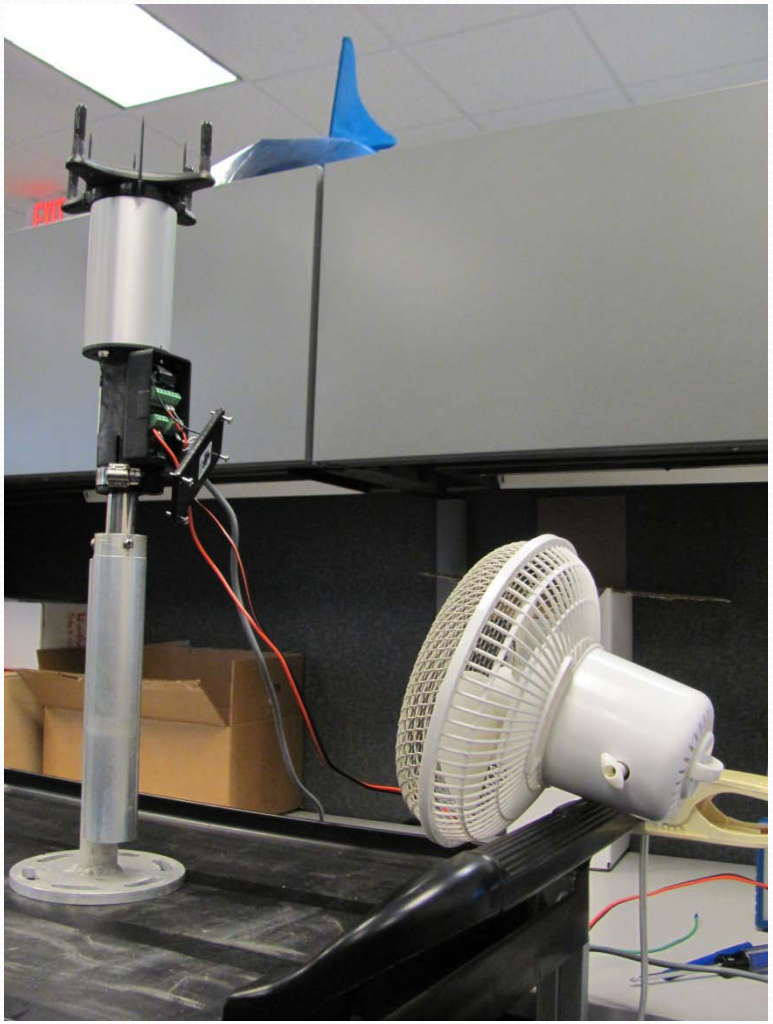
RM Young Ultrasonic

AirMar

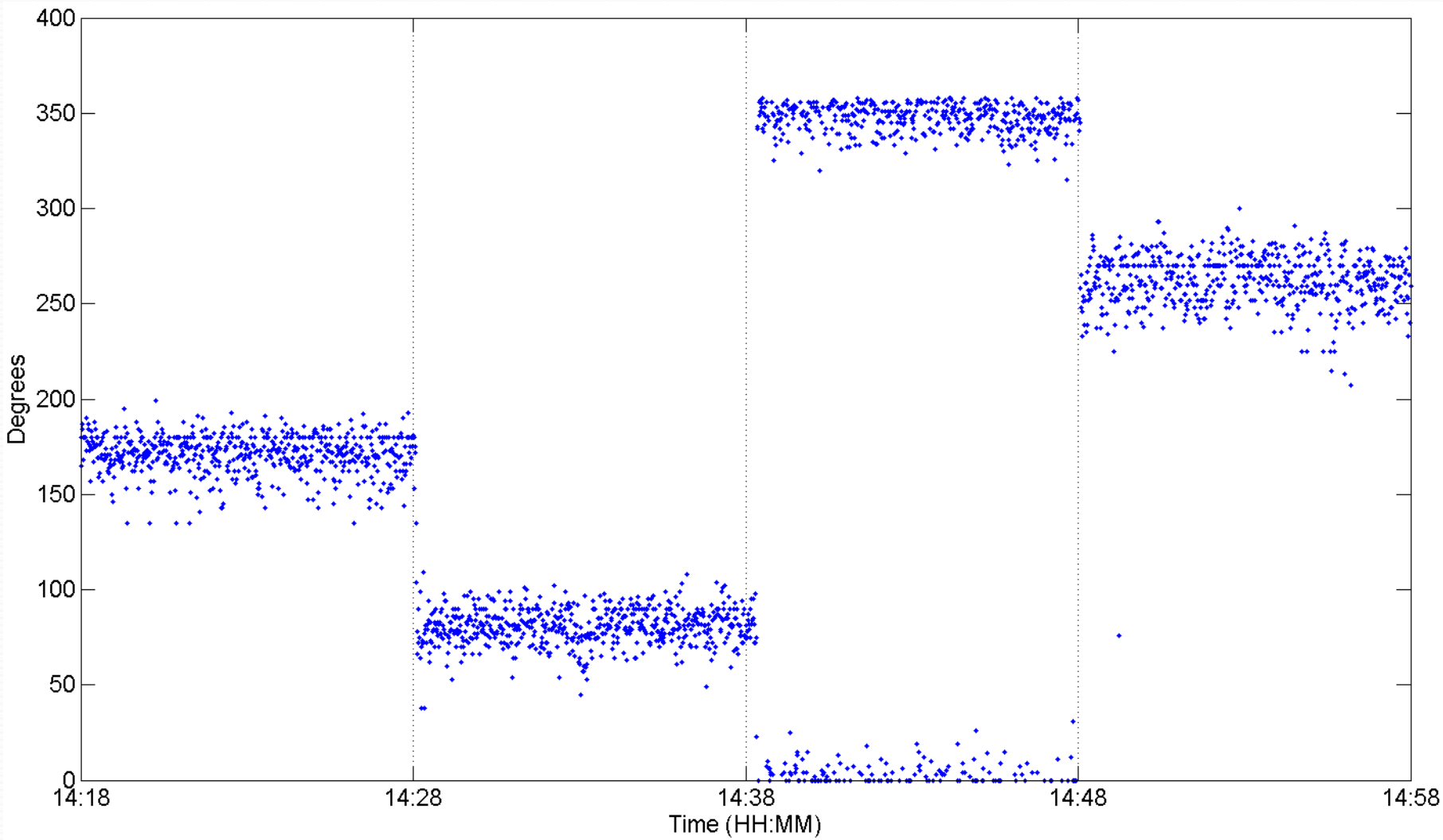
RM Young Mechanical

Lab Test

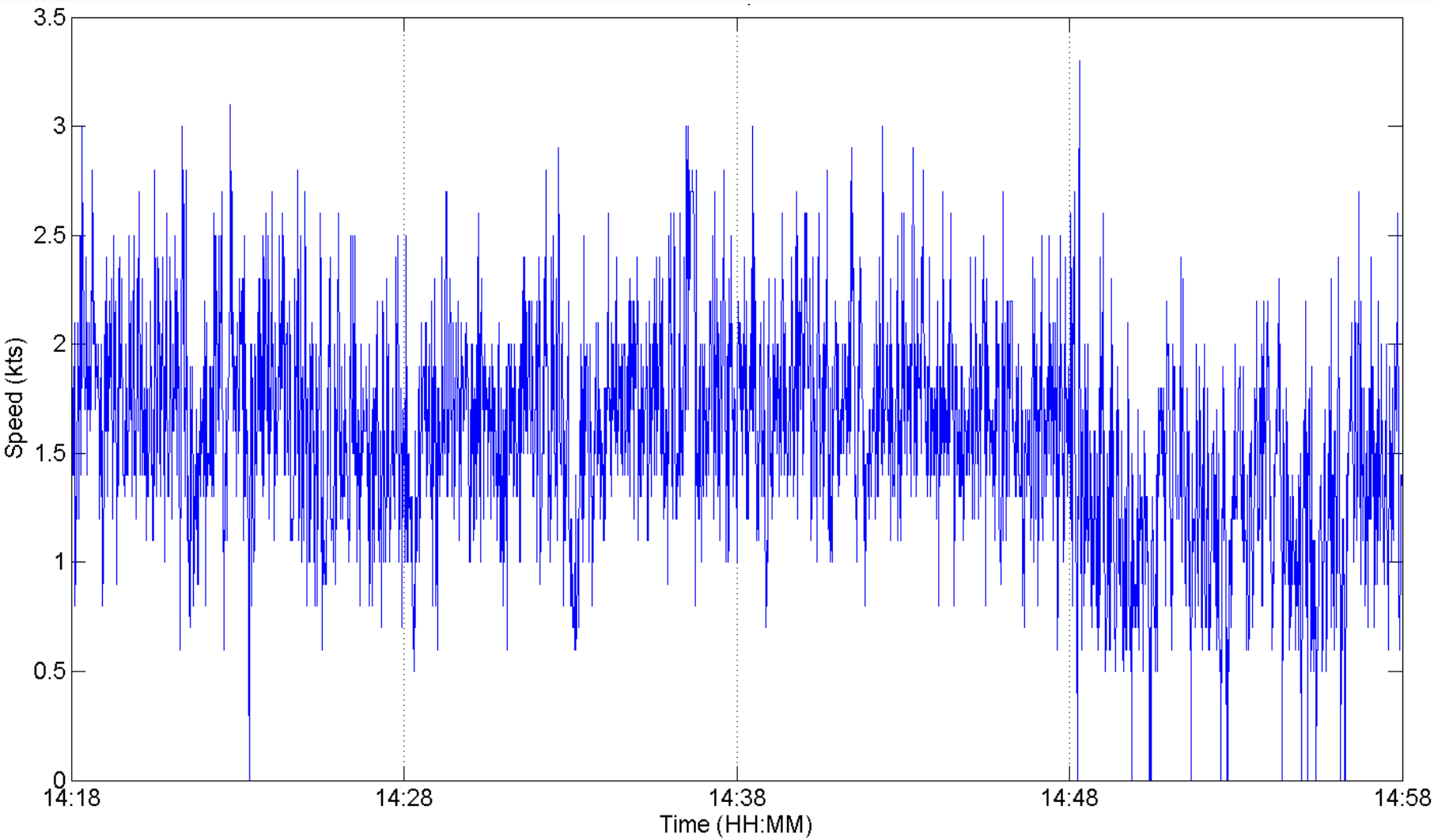
Sensor Position	Start Time	Stop Time
0°	14:18:00	14:28:00
90°	14:28:00	14:38:00
180°	14:38:00	14:48:00
270°	14:48:00	14:58:00



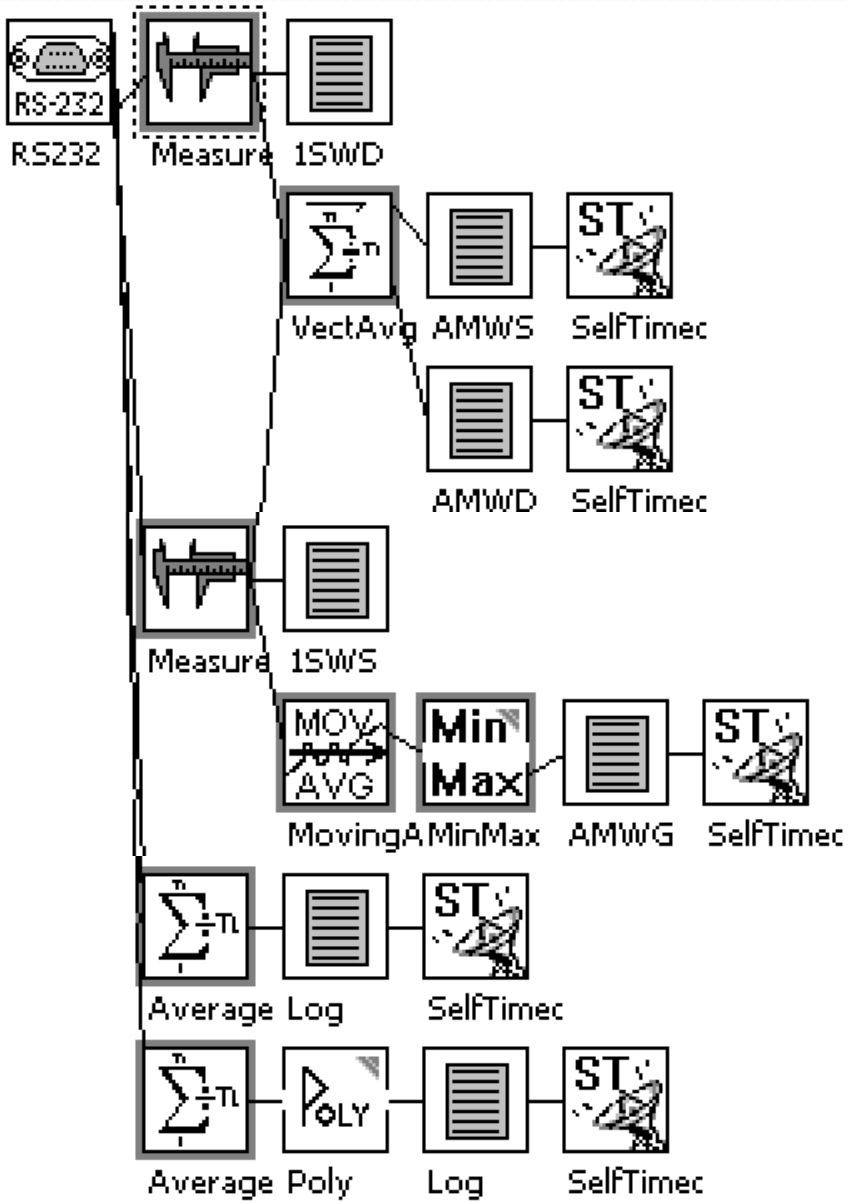
Wind Direction



Wind Speed



Graphical Setup

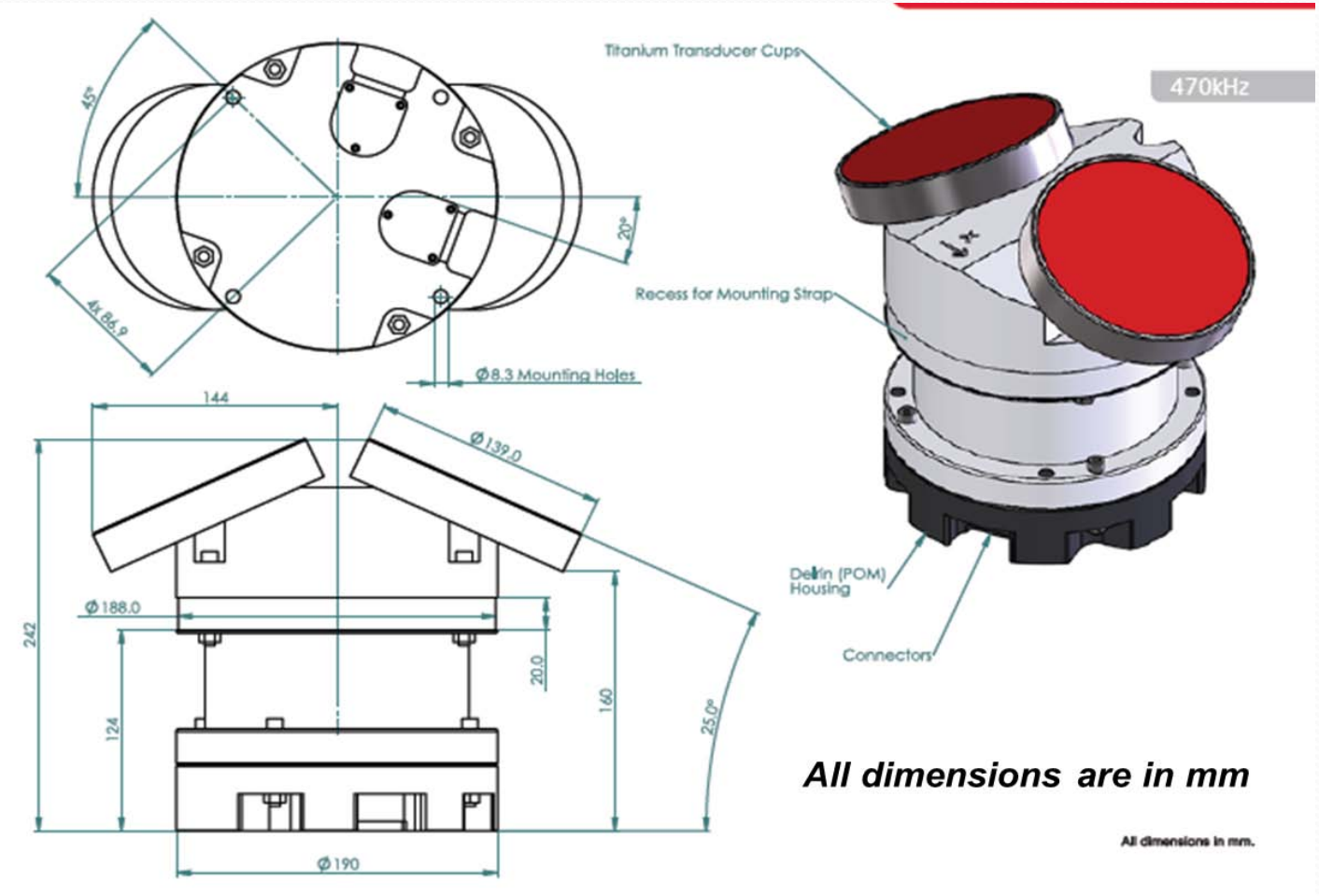


Test Platform

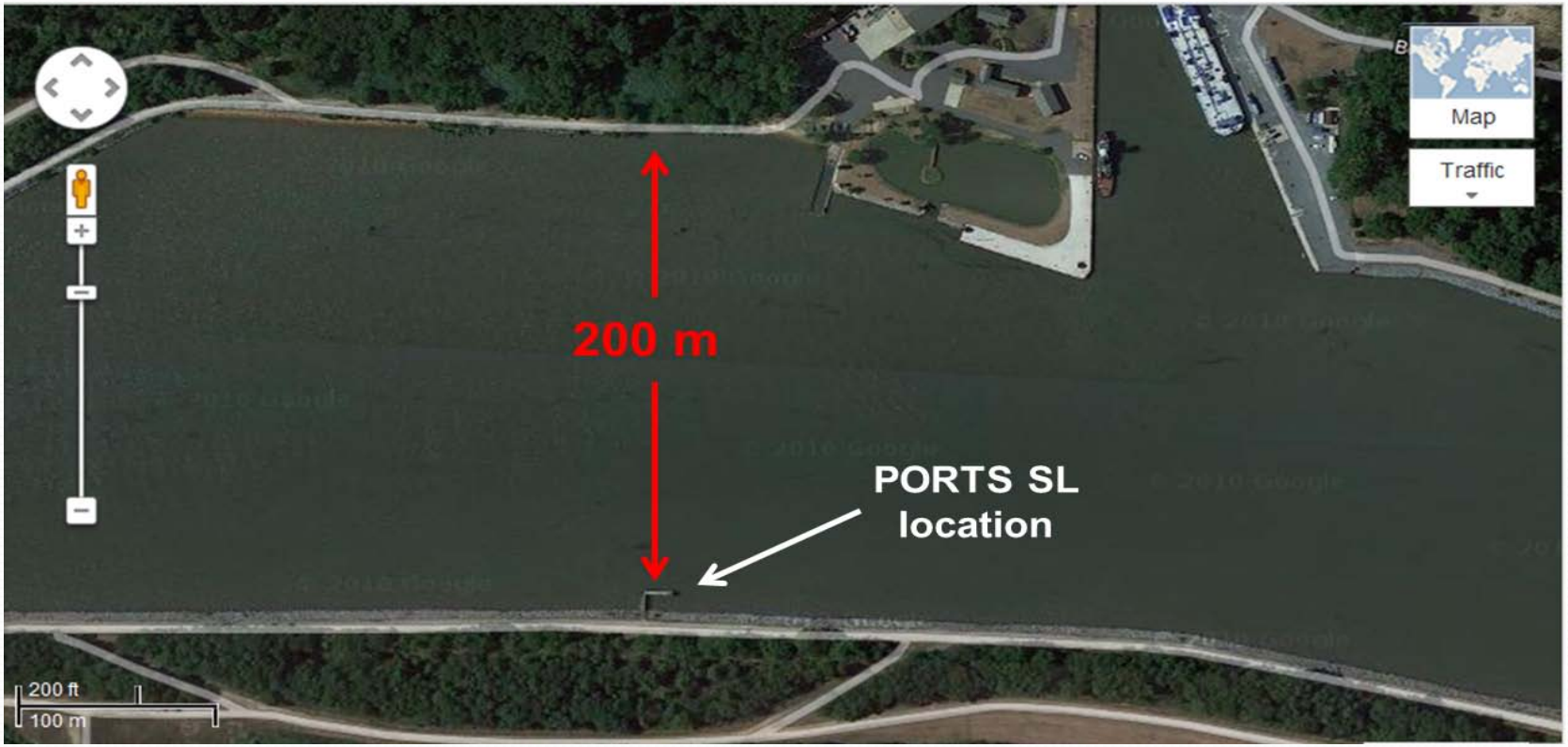
What I Learned

- Keep your lab/shop organized – seriously
- Patience is, unfortunately, necessary

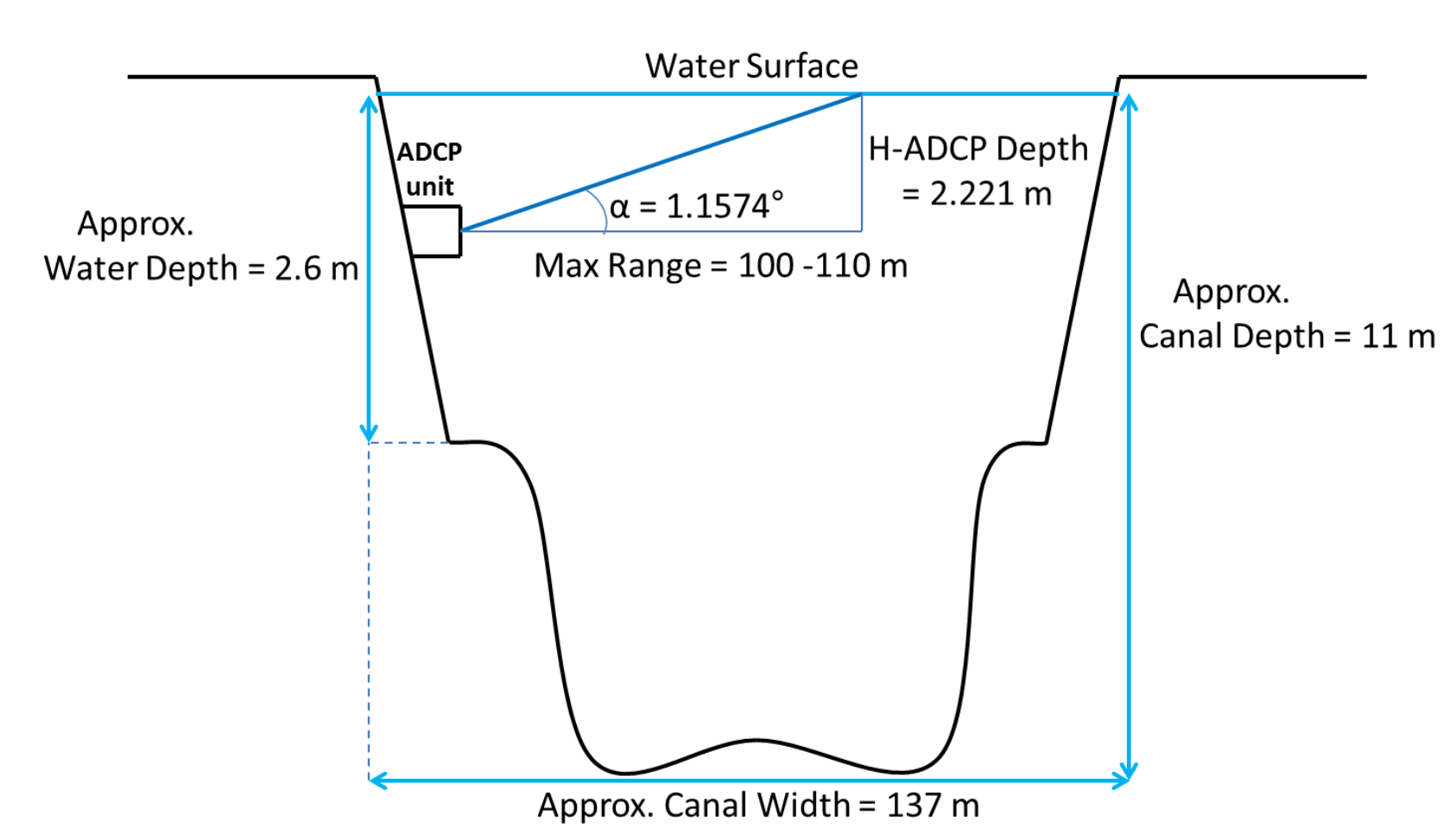
Current Measurement – ADCP

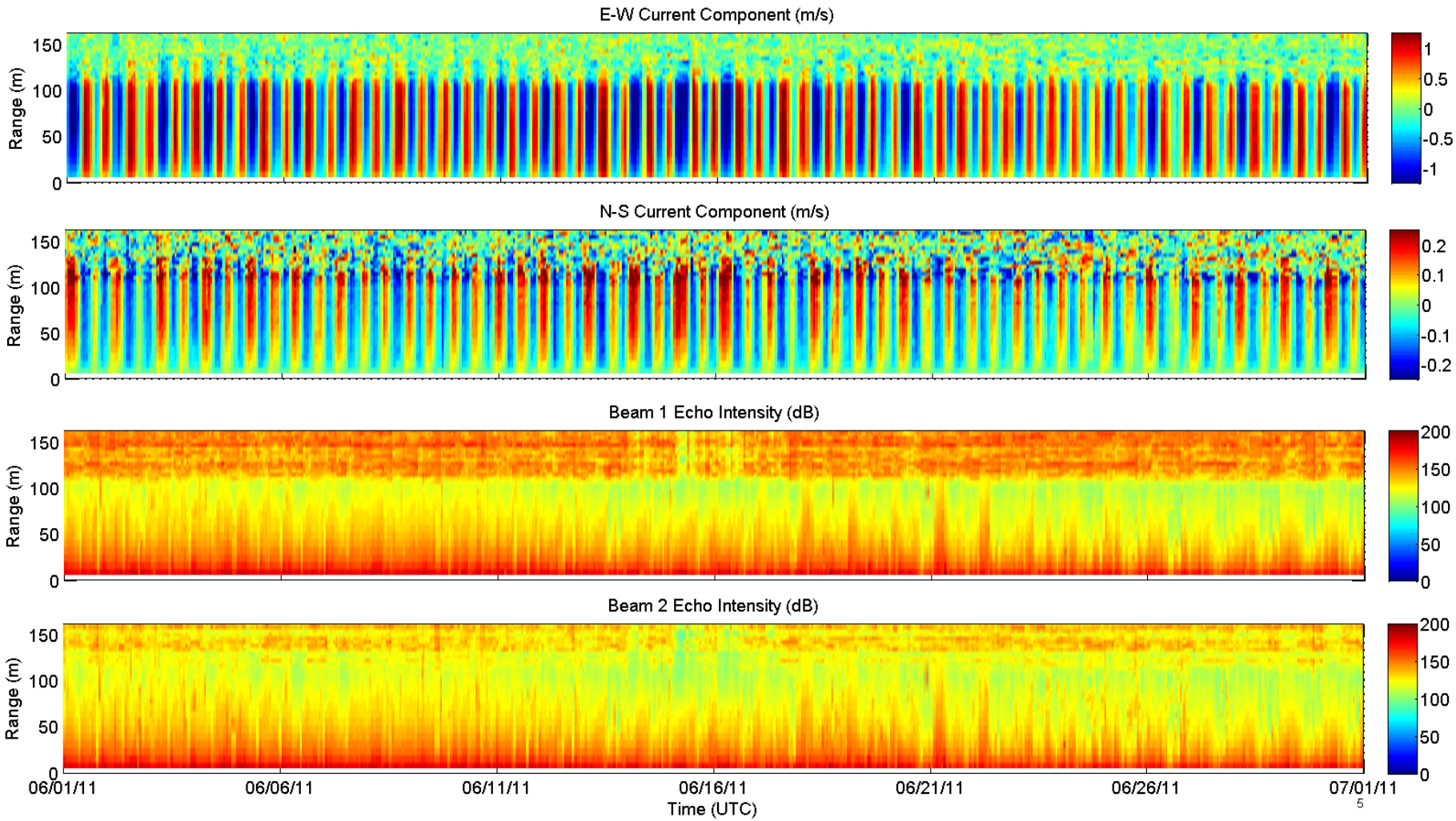


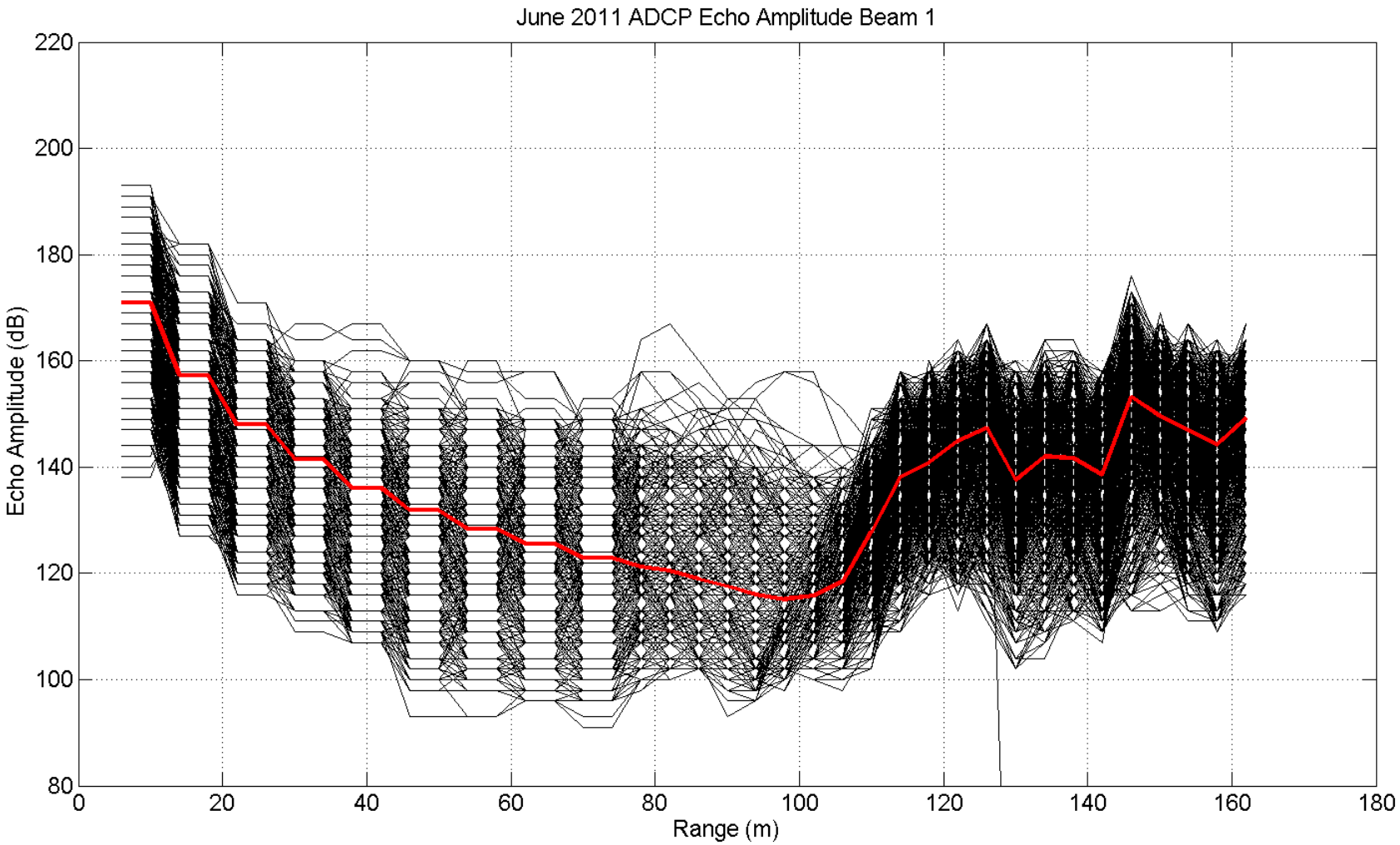
Location: Chesapeake City

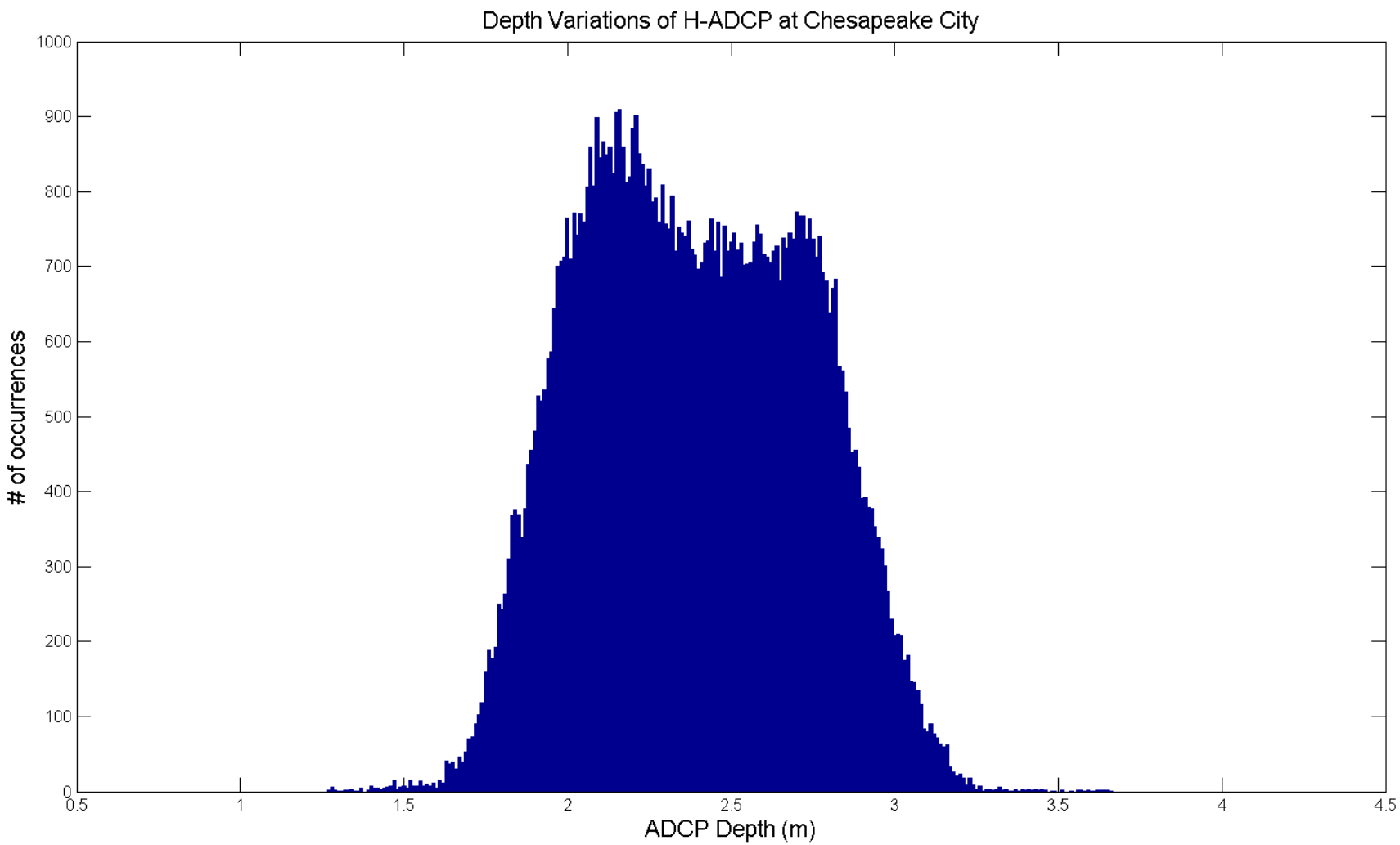


Cross Channel View



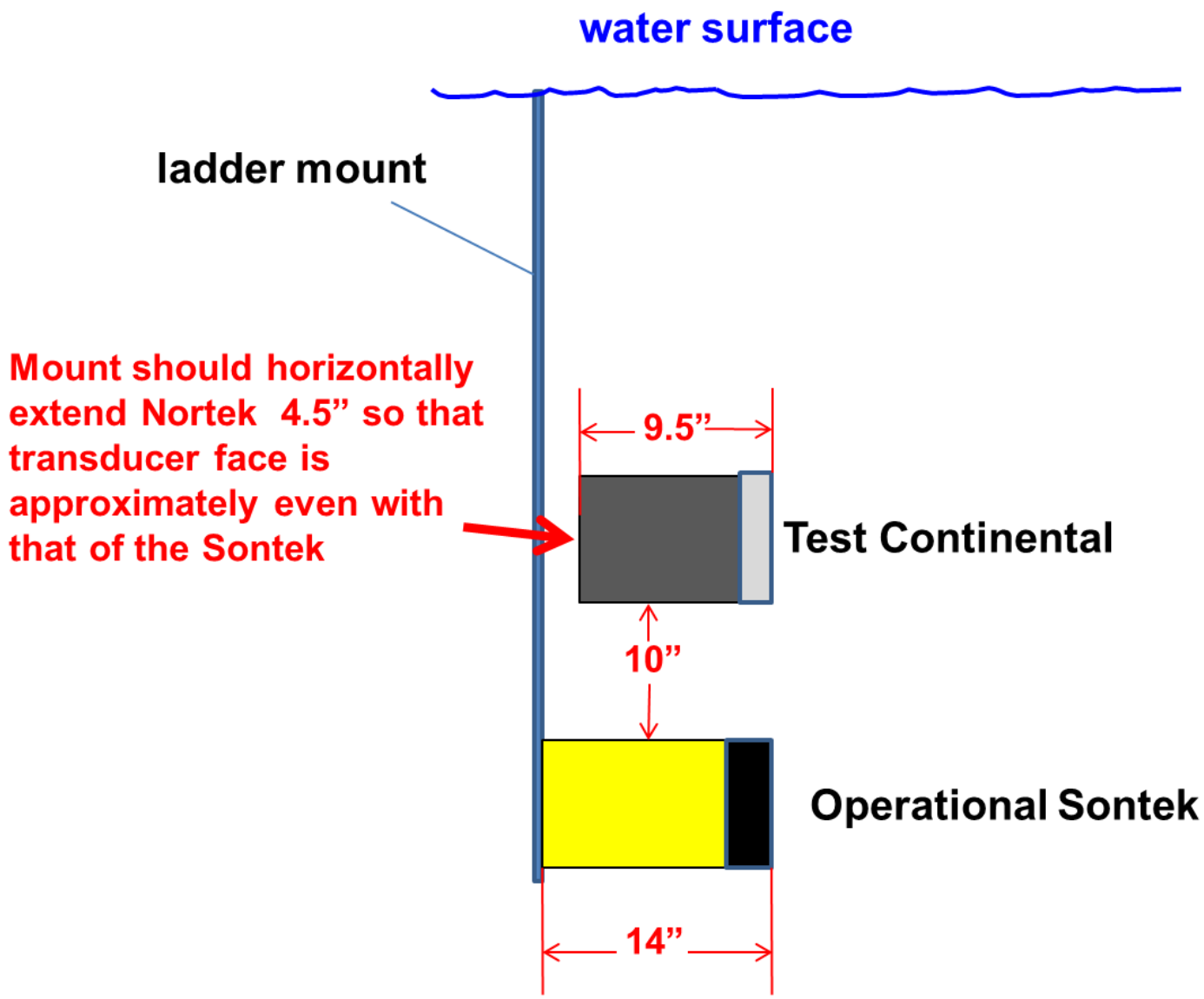

E-W Current Component (m/s)
Range (m)
150
100
50
0
1
0.5
0
-0.5
-1
N-S Current Component (m/s)
Range (m)
150
100
50
0
0.2
0.1
0
-0.1
-0.2
Beam 1 Echo Intensity (dB)
Range (m)
150
100
50
0
200
150
100
50
0
Beam 2 Echo Intensity (dB)
Range (m)
150
100
50
0
200
150
100
50
0
06/01/11
06/06/11
06/11/11
06/16/11
06/21/11
06/26/11
07/01/11
Time (UTC)


June 2011 ADCP Echo Amplitude Beam 1
Echo Amplitude (dB)
Range (m)
220
200
180
160
140
120
100
80
0
20
40
60
80
100
120
140
160
180


Depth Variations of H-ADCP at Chesapeake City
# of occurrences
ADCP Depth (m)
0
100
200
300
400
500
600
700
800
900
1000
0.5
1
1.5
2
2.5
3
3.5
4
4.5

Sensor Comparison

Nortek Continental will be mounted to the ladder right above the operational sensor


water surface
ladder mount
Mount should horizontally extend Nortek 4.5” so that transducer face is approximately even with that of the Sontek
9.5”
Test Continental
10”
Operational Sontek
14”

What I Learned

- Make sure you're downloading the right data
- Take the time to organize files on your computer

Impacts on my Future

- Matlab/programming skills
- Algorithmic thinking
- Future educational and research endeavors

Thank
You