Insights from the CFRF/WHOI Shelf Research Fleet and the June Salinity Intrusion Cruise

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Introductions

- Name
- Affiliation
- If in the fishing community please say: where you fish out of, and for what species, gear type
CFRF/WHOI Shelf Research Fleet

- **Project Goals:**
  - study the oceanographic conditions across the continental shelf off the coast of RI
  - Fishing vessels collect temperature, salinity, depth from six designated study zones
  - Each F/V samples 2 stations every other week
  - Currently funded through September 2021
Huge thank you to our fleet participants!

Brooke C, Erica Knight, Excalibur, Finast Kind II, Harvest Moon, Mister G
“Where'd the fish go? Where are they?” Well, it’s pretty much explained right there and it all has to do with the warm bottom temperatures, the salinity. The fish know that they can’t spawn in that area.” - Rob Walz

Photo credit: © Woods Hole Oceanographic Institution: Daniel Cojanu, Under Current Productions
Temperature Data by Month and Zone

CFRFWHOI monthly box averages, temperature [deg F]

http://science.whoi.edu/users/seasoar/crfwhoi/
Salinity Data by Month and Zone
Glen Gawarkiewicz, Physical Oceanographer, WHOI
Housekeeping for Google Meets

- You can enter questions in chat box. This will be seen by everyone

How to turn mic on:
When someone is presenting, please keep yourself muted (red), and then unmute to speak.

Turn video on and off

Raise hand

Hang up call
Profiles to Date

721 Profiles as of August 23, 2021

Sampling through time periods when Academic ships were not operating

Data shared with Office of Naval Research for April-June to assist in large experiment for Task Force Ocean

Used data in runup to passage of Hurricane Henri to assess subsurface temperatures
NDBC Buoy 44008
Nantucket Shoals

79 Deg. F
August 22

9 Deg. F warmer than 2000-2010 Ave.

Warmer than 2012 in August
Zone 2 (Near Block Island)

<table>
<thead>
<tr>
<th>May 15</th>
<th>June 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>44</td>
</tr>
<tr>
<td>Salinity</td>
<td>32.3</td>
</tr>
</tbody>
</table>

![May 15 Graph](image)
![June 15 Graph](image)
Zone 2 (Near Block Island)

Temperature

Salinity

August 8

Salinity Maximum Intrusion
Zone 4 (Outer Shelf)

Temperature

May 26: 45°C
July 27: 59°C

Salinity

May 26: 33.2 PSU
July 27: 35 PSU

Smax

July 27: 32.5 PSU
Rings!!! (from Avijit and Adrienne)

http://jcgulfstream.com
240-432-9570

Early June
SIRATES- Salinity Intrusions, Rings, AUVs, Turbulence, and Squid

Map Intrusion with multiple AUVs, Shipboard CTD, and turbulence Profiler

Determine linkage of intrusions to presence of Warm Core Rings

Measure mixing rates of an Intrusion

Determine if there is any connection to onshore pulses of squid

Two cruises- June 17-July 2 and September 16-23 2021
Salinity Profile with Smax

- ΔS > 0.2 PSU
- Thickness
- h_p
- z_m
- Smax
Frequency of Smax by Month of Year

Monthly Frequency - Red Shelf Fleet - Blue Lentz Climatology

Shelf Fleet 2015-2019

Climatology 2003
Finding an Smax

Red Bar
Initial CTD Line
Salinity Profiles First Cross-Shelf Transect
AUVs - REMUS 100 and Long Range AUV
Vertical Microstructure Profiler (Turbulence)
REMUS Mapping - June 26
LRAUV Frontal Tracking
VMP - Mixing
Larger Context
Jigging for Squid
New Ideas
Marine Heatwave 2016 (Perez et al. 2021)

• Two separate Marine Heatwaves in 2016- January-March and September-October
• Winter strongest over slope and caused by large Gulf Stream meanders south of Nova Scotia
• Fall caused by anomalous northern Jet Stream position affecting heat loss from ocean
New Ideas
Bottom Intrusion in January 2017
(Chen et al., 2021, submitted)

• Computer model successfully reproduces warm saline bottom intrusion in January 2017

• Two necessary conditions for formation - steady winds from the west for several days AND shallow cyclonic eddy next to Shelfbreak Front

• Bottom Intrusion is steered by bathymetry and points towards Block Island/Cox’s Ledge
New Ideas
Slope Productivity (Oliver et al. 2021)

• Survey in April 2019 showed diatom hot spot over upper continental slope
• Associated with cyclonic eddy near Warm Core Ring
• Presence of Gulf Stream water over slope increases upwelling over slope through more eddies
• Need only upwelling of 30 feet to get high nitrate waters into euphotic zone over slope
• Slope water productivity may have increased by 50% in past several years due to increased Gulf Stream influences
New Ideas
Storms and Ocean Stratification (Lobert et al. 2021, in prep.)

Storms and changes in ocean stratification from the Pioneer Array
Data is from 2019
Weather Systems Changing Stratification

Storms

Extended winds from east
Future Directions

• Obtain funding for Shelf Fleet!!!!!
• Pioneer Array moving to Cape Hatteras region, ends in New England in October 2022
• Analysis of year to year differences in seasonal transitions and stratification from Shelf Fleet data 2015-2020
• Develop Ocean Acidification sensors and tools for addition to Shelf Fleet (with Aleck Wang WHOI)
Thank you for joining us!

For Shelf Research Fleet data access and visualization please visit:

http://science.whoi.edu/users/seasoar/cfrfwhoi/