Workshop on Applications for the Fisheries Community: Summary Report

Town & Country Conference Center Charleston, SC

October 2-3, 2003

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Dr. John Mark Dean

Table of Contents

Workshop Summary

A two-day workshop, sponsored by the partner organizations for the Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS), was held on October 2-3, 2003 in Charleston, S.C. to brief the Carolinas fisheries community (including recreational, commercial and environmental interests) on the kinds of information and data that will be available from Caro-COOPS, and to solicit their recommendations on potential data and data products. Information needs identified by the workshop participants generally fell within two categories: 1) reliable and consistent oceanographic and meteorological data that support maritime operations; and 2) information concerning fish distributions and movements to enhance both fishing efficiency and fisheries management. Recommendations included within the first category are considered near-term, achievable goals for the Caro-COOPS array; while recommendations falling into the second category are considered longer-term needs that require additional planning and research. Participants also identified a number of avenues through which Caro-COOPS information and data products should be delivered to the fisheries community. It is the intent of the Caro-COOPS principal investigators to maintain continuing interactions with the fisheries community in order to enhance the value of the Caro-COOPS information products.

Introduction

The Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) initiative is based upon an instrumented array of coastal and offshore moorings, which have been deployed off of the coast of South Carolina. The information from this observing system is being used to monitor and model estuarine and coastal ocean conditions, as well as develop predictive tools and ultimately forecasts for coastal managers. The initial product of Caro-COOPS is an advanced, integrated storm surge model, based on real-time monitoring of hydrologic and meteorological conditions and processed by state-of-the-art computer models. Future applications of Caro-COOPS information will address water quality and the transport of pollutants, sediment transport and shoreline stability, and the provision of real time physical oceanographic data that is fundamental to applications for fisheries research and management. Caro-COOPS also includes a sophisticated data management infrastructure that is designed to process and deliver information to a variety of public users, as well as for model applications.

Caro-COOPS was developed through a partnership among the University of South Carolina, North Carolina State University, and the University of North Carolina at Wilmington, and more information on the program can be found at the website www.carocoops.org . The program is funded by the National Oceanic and Atmospheric Administration in the U.S. Department of Commerce.

Developing Applications for the Fisheries Community

As part of the effort to take the information being derived from the Caro-COOPS array and create useful information products for the fisheries community, Caro-COOPS hosted a workshop on October 2-3, 2003, at the Town and Country Conference Center in Charleston, S.C. (see Appendix A for agenda). Attending the workshop were a wide variety of representatives from the fisheries industry, fisheries experts, and resource managers from the South Atlantic area (Appendix B). Attending also were the principals and scientific and technical staff from the Caro-COOPS project and collaborators with expertise particularly relevant to fisheries (Appendix C). In addition to those attending, some additional interviews have been scheduled to meet with segments of the fisheries industry which could not send participants to the workshop.

Purpose of the Think-Tank

The purpose of the meeting was to brief the fisheries community participants (including recreational, commercial and environmental interests) regarding the kinds of information and data available from the Caro-COOPS array, and to hear directly from them specific recommendations as to: (l) information of importance to their community, whether currently available from the Caro-COOPS array or potentially available in the future; (2) formats that are most useful to provide such information; and (3) the communication means that should be used to make the information or data available. The meeting was designed to be an informal but highly focused think-tank exercise and was facilitated by Deborah J. Stirling and Dr. John Mark Dean, with additional support from Dr. Earle Buckley.

The meeting began with introductions and a welcome from Dr. Madilyn Fletcher, the Principal Investigator on the project. That was followed by a detailed presentation by Dr. Len Pietrafesa, the Caro-COOPS principal from NCSU, describing the array, the information and data being developed from the array, and recent applications that might be of interest to the fisheries community. The presentation included information regarding the Caro- COOPS website and the kinds of information and data that are

currently, or soon to be, available at that site. In addition, the presentation detailed the kinds of sensors in the array and whether or not the data coming from those sensors were real-time.

This was followed by a focused discussion among the professional fishing industry representatives of the kinds of data and information currently originating from the array, how they relate to the needs of the various industry members; what the most important data and information needs are, and ultimately, how to communicate the information to the users.

After the discussion was concluded and an initial set of needs was identified by the fisheries community, both the members of the fisheries community and the scientific and technical experts, independently of one another, conducted an exercise to develop a comprehensive list of those needs and reach a consensus within each group. Those discussions were carried out over the course of the afternoon of October 2nd, and the morning of October 3rd. The information and data needs of the fisheries community were organized around three central topics: 1) The physical characteristics of the ocean environment; 2) The biosystem components and processes and; 3) How to communicate the outcomes to the user groups.

What follows are the recommendations made by the participants, both from the fisheries community as well as the scientific and technical experts. These are presented as comprehensive lists of needs, with little prioritization. It is useful to note that there is considerable overlap between the interests of both the fisheries and scientific groups, although the language used to express those interests differs. By reviewing the recommendations described below, it is apparent that the meeting was successful in both directions - briefing the fisheries community on the potential value of Caro-COOPS to their enterprises, and enlightening the scientific/technical team to the needs of the fisheries community. A fresh understanding and appreciation was obtained by both groups.

Results of the Discussions

1. What measures of the physical characteristics of the ocean environment do you want Caro-COOPS to provide?

Fisheries Community and Resource Managers

1. Wave height and period, real time

2. Fog forecasts (and severe storms/lightning forecasts, especially thunderstorms since in our region they are fast developing, fast moving, and dissipate quickly)

3. Lunar phases included in the web site (the lunar phases affect fish behavior)

4. Identification of eddies & gyres within array deployment area

5. Identification of vessels by acoustics (homeland security implications)

6. Long-term current patterns (affects fish recruitment and prospects for setting)

7. Currents over all or part of the array region

8. Bioluminescence (for shrimp trawling and swordfish)

9. Gulf Stream Forecasting (the industry uses a private vendor now) - make TOPEX data available daily if possible but no less than every 18 days

10. Turbidity

- Surface
- Midpoint depth
- Bottom

11. [Long term] storm damage assessment on fisheries resources (including infrastructure as well as populations), similar to what the Department of Agriculture provides for crop damage assessment after storms

12. Representative habitat types within arrays

13. Shallow water coverage, at or less than 30 ft.

14. Incorporation of C-buoys within array, e.g. to provide information for models for simulation and prediction of larval transport

15. For all buoys provision of radar signal identity so the fishermen can identify which buoy and location for navigational purposes

16. Budgeting of sufficient funds for real time maintenance of the array and Caro-COOPS system to maintain essential continuity of data and information

17. Checking potential for the Coast Guard to support system maintenance (Homeland Security implications].

18. Provision of all information on web site in English units in addition to metric.

Scientific/Technical Experts

1. Incident radiation (It will be useful and necessary for the non-scientists for the technical participants to provide a non-technical explanation of the meaning of terms like this)

2. Navigational information - visibility & fog.

3. Latitude and longitude and Loran C coordinates and GPS locations of each buoy illustrated on web site.

4. Co-location of meteorological & oceanographic buoys and provision better compilation of data and common formatting for data reporting

5. Turbidity - 30m & 200m systems - fluorometry at surface - chlorophyll & turbidity (convert) - offshore stations only - inshore need transmissometry standardized - or standardized intervals

6. Light attenuation

7. Water column - what intervals for physical characteristics?

8. Thermocline depths needed - position vertical, intermediate, cm

9. Fluorometer (pam) - (post amplitude)

10. Finer spatial scales of observations, e.g. spawning aggregation areas & MPAs 10. 02 sensors measurements

11. More inshore arrays to develop information to support state agencies/resource managers and estimate reserves

12. Simulation models for "what if" scenarios

13. Vessels to deploy and maintain the array

2. What measures of the biosystem components and processes do you want Caro-COOPS to provide?

Fisheries Community and Resource Managers

1. Identification of site and periodicity of spawning aggregations and long-term physical eddies & gyres within array areas

2. Productivity/larval transport

3. Acoustic tracking of fish and tagging

4. C-buoys - cell phones/ user ill/weather connection~ tracking of larva/fish

5. Tracking of red tide events and algal blooms

6. Compilation of all data from any outputs in system and make available

Scientific/Technical Experts

1. Secondary productivity and community biomass: acoustic measurements~ size and abundance of plankton, phosphorescence observations

2. Fish Cam to help determine abundance

3. Passive acoustic arrays for fish spawning aggregation size projections

4. Laser or optical plankton counters

5. Plankton cams / digital counters to help determine productivity levels

6. Physical characteristics of spawning areas and plankton species

7. Acoustic transmitters on turtles and for fish migration, to help determine reproduction levels

8. Arrays for passive detection of acoustically tagged fish

9. Video cams above surface/on buoys to monitor birds, clouds, vessels

10. Roving cameras/videos or acoustic units to assess if buoys are attracting biomass

11. Partnership with NURP + use of other NOAA activities to ground truth the data

12. Cameras to assess fishing and boating activities

3. How should information and data products be communicated to the fisheries community?

Fisheries Community and Resource Managers

1. Need for formatting that is consistent with other uses and with Palm Pilots

2. Graphics for Palm Pilot downloads

3. Black Box - for larger boats, or in port for downloads

4. NOAA weather radio = main info source at sea; want surface and bottom measurements, plus water temperature, salinity; currents, turbidity, wave height and period; wind velocity and direction; and fog as well as weather forecast for each buoy in area

5. Access to information for ARC GIS systems; ongoing ARCIS and coral reef mapping systems; couple with habitat systems

6. Information from array to be retrievable by cell phones (Note: maximum range of cell phones from shore is 25-35miles, with some cell phones having only an 8 mile range offshore]

7. Website display of data in feet (instead of, or in addition to, meters), and current data in knots

8. Coast Guard – how to refocus so CG can provide maintenance support and absorb some cost

9. One-stop shopping for information and graphics

10. Graphic for currents over area

11. Provision of data and information through NOAA weather radio and The Weather Channel

12. Model run operationally at 6:00 a.m.-6 pm daily intervals - or 4-6 a.m. - 6 hr forecasts? – similar to the wind projection models on line now

13. Vessels of opportunity - outfit like commercial aircraft sensor packages. Cited the UNH/WHOI Gulf of Maine project where seven commercial vessels - "Fleetlink"- are outfitted with sensors on trawls to record bottom temperatures, although the system output is not yet real time.

14. Standardization of sensor packages, and inclusion of head boats, which have reliable destinations and schedules, and pilot boats. Pilot boats formerly provided weather information every two hours and that activity should be brought back.

Scientific/Technical Experts

1. Black box free to fishermen in exchange for catch data

2. Data loggers and sensors provided to fishermen to overlay GPS on navigation maps

3. Real time & predictive models - how important to fishermen?

4. Operational Forecasts to fishermen

5. Model runs more often/operationally

6. Integration of data with other program output

7. Public education - classroom downloads

8. URL displayed on buoys

9. Use of other output for models

10. Metadata - need simplicity

11. Simulation models to answer "what if' questions - oil spills, how rains affect spawning, etc.

Follow-up and Next Steps

This report is now being circulated to the workshop participants to ensure accuracy of the recommendations and enable them to insert any additional items that should be included.

This report will be used as a planning document. It will remain in a form that can be circulated and modified as the program evolves and can provide the PIs with a means of assessment. Caro-COOPS investigators plan to solicit continued advice by forming a fisheries stakeholder advisory panel to meet at least once per year, and will query workshop participants and the advisory panel periodically to gain perspectives on various issues that may arise.

The Caro-COOPS team will review these recommendations and develop a specific set of responses to the fisheries community's needs reflecting what Caro-COOPS can provide presently, what is feasible in the near future, and what will require more time and funding to produce. The technical experts should do this in terms of Years 1, 3, and 5 and a final heading of Future Development. The latter category will identify those items that do not have an existing technology and will require substantive development.

This response set will be reviewed by the participants for interaction and input, and will be used for planning purposes for development of data and information products from the Caro-COOPS project.

It is the intent of the Caro-COOPS principals to maintain continuing interaction with the different user groups of the fisheries community in order to enhance the value of the Caro-COOPS information products. In addition, the PIs will brief the South Atlantic Fisheries Management Council and the leadership of NOAA Fisheries on a biannual basis.

Appendix A. Workshop Agenda

October 2-3, 2003
Charleston, SC

Deb Stirling, Convenor and Chair
John Mark Dean, Recorder

1:30 pm:	Welcome, Introductions, and Workshop Purpose Madilyn Fletcher
2:00 pm:	What is Caro-COOPS, and why should I care? Len Pietrafesa
2:45 pm:	Short question and answer period
3:00 pm:	Break
3:30 pm:	Development of topics for development – there are no bad ideas
4:30 pm:	Identification of priorities and small groups for topic development
5:45 pm:	Adjourn
6:00 pm:	Social

Oct. 3

8:30 am:	Small groups continue discussions and develop a report
9:45 am:	Break
10:15 am:	Convene all groups and begin reports – Each group has 15 minutes for explanation of the topic, approaches, expected benefits, user groups, and priorities; followed by 15-20 minutes of discussion.
11:45 am:	Lunch
1:00 pm:	Continue reports
2:45 pm:	Develop priority ranking of topics (Use the dot method; this will also constitute a break)
3:15 pm:	Report on priorities recommended and revise with discussion
4:00 pm:	Adjourn

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Appendix C. Buoy Info Chart (October 2003)

SUN1 - Sunset Beach Pier

Station Location (Lat/Long)	Decimal Degrees: 33.86 N, 78.51 W Degrees, Min., Sec.: 33º 51' 36" N, 78º 30' 36" W
Observations	Water level, meteorological, currents
Data Collection Platforms	**NOS G3 Water Level Station with Backup Gauge**

Sensor	Data Type
(1) Submersible Pressure Transducer (2) Aquatrak Assembly (3) Accububble Bubbler	Water level
Water Temperature Sensor	Water Temp

Sutron Automated Weather Station

Sensor	Data Type
Accubar Barometric Pressure Sensor	Barometric pressure
AT/RH Sensor	Air temperature, relative humidity
Wind Sensor Prop Vane	Wind speed, direction
Ultrasonic Wind Sensor	Wind speed, direction

Transmission and Receiving	GOES
Approximate Water Depth	NA

SUN2 - Sunset Nearshore

Station Location (Lat/Long)	Decimal Degrees: 33.78 N, 78.48 W Degrees, Min., Sec.: 33° 46' 48" N, 78° 28’ 48" W
Observations	Sea state
Data Collection Platform	**Bottom mounted inductively coupled to taut-wire mooring**

Sensor	Data Type
ADCP	Current speed and direction; Wave height, period, direction
Seacat + P (Paroscientific	Water level, Temperature,

	Digiquartz sensors)	Salinity
Data Format	Binary	
Interval of Data Measurements and Updates	15 min. sampling	
Transmission and Receiving	Iridium, 4 hr. interval	
Approximate Water Depth	10m	

SUN3 - Sunset Mid-shelf

Station Location (Lat/Long)	Decimal Degrees: 33.34 N, 78.17 W Degrees, Min., Sec.: 33° 20' 24" N, 78° 10' 12" W	
Observations	Sea state, biological	
Data Collection Platform	**Bottom mounted inductively coupled to taut-wire mooring**	
	Sensor	**Data Type**
	ADCP	Current speed and direction; Wave height, period, direction
	Seacat + P (Paroscientific Digiquartz sensors)	Water level, Temperature, Salinity
	Seacat + FL (Chelsea Instruments Aquatracka III Fluorometer)	Temperature, Salinity, Chlorophyll
Data Format	Binary	
Interval of Data Measurements and Updates	15 min. sampling	
Transmission and Receiving	Iridium, 4 hr. interval	
Approximate Water Depth	30m	

SUN4 - Sunset Outer Shelf

Station Location (Lat/Long)	Decimal Degrees: 33.78 N, 77.83 W Degrees, Min., Sec.: 32° 51' N, 77° 50' W	
Observations	Sea state, biological	
Data Collection Platform	**Inductively coupled to taut-wire mooring**	
	Sensor	**Data Type**
	ADCP	Current speed and direction; Wave height, period, direction
	Microcat	Temperature, Salinity

	Seacat + FL	Temperature, Salinity, Chlorophyll
Interval of Data Measurements and Updates	15 min. sampling	
Transmission and Receiving	Iridium, 4 hr. interval	
Approximate Water Depth	200+m	

MET1 - N. Charleston Met

Station Location (Lat/Long)	Decimal Degrees: 32.87 N, 77.83 W Degrees, Min., Sec.: 32° 52' N, 77° 50' W	
Observations	Meteorological, sea state	
Data Collection Platform	**Aanderaa Coastal Monitoring Buoy CMB4280**	
	Sensor	**Data Type**
	Wind Speed Sensor 2740	Average &maximum (gusts) wind speed
	Wind Direction Sensor 3590	Wind direction
	Air Pressure Sensor 2810	Barometric pressure
	Relative Humidity Sensor 3445	Relative humidity
	Air Temperature Sensor 3455A	Air temperature
	Solar Radiation Sensor 2770	Solar and sky radiation
	Water temperature (2)	Water temp
Interval of Data Measurements and Updates	15 min. sampling	
Transmission and Receiving	Orbcomm, 1 hr. interval	
Approximate Water Depth	200m	

CAP1 - Capers Island

Station Location (Lat/Long)	Decimal Degrees: 32.68 N, 79.68 W Degrees, Min., Sec.: 32º 41' N, 79º 42' W	
Observations	Water level, meteorological, currents	
Data Collection Platforms	**NOS G3 Water Level Station with Backup Gauge**	
	Sensor	**Data Type**
	(1) Submersible Pressure Transducer	Water level

	(2) Aquatrak Assembly (3) Accububble Bubbler
	Water Temperature Sensor — Water Temp

Sutron Automated Weather Station

Sensor	Data Type
Accubar Barometric Pressure Sensor	Barometric pressure
AT/RH Sensor	Air temperature, relative humidity
Wind Sensor Prop Vane	Wind speed, direction
Ultrasonic Wind Sensor	Wind speed, direction

Transmission and Receiving	GOES
Approximate Water Depth	NA

CAP2 - Capers Nearshore

Station Location (Lat/Long)	Decimal Degrees: 32.81 N, 79.63 W Degrees, Min., Sec.: 32° 48' 36" N, 79° 37' 48" W
Observations	Sea state
Data Collection Platform	**Bottom mounted inductively coupled to taunt-wire mooring**

Sensor	Data Type
ADCP	Current speed and direction; Wave height, period, direction
Seacat + P	Water level, temperature, salinity

Data Format	Binary
Interval of Data Measurements and Updates	15 min. sampling
Transmission and Receiving	Iridium, 4 hr. interval
Approximate Water Depth	10m

CAP3 - Capers Mid-shelf

Station Location (Lat/Long)	Decimal Degrees: 32.52 N, 79.34 W Degrees, Min., Sec.: 32° 31' 12" N, 79° 20' 24" W

Observations	Sea state
Data Collection Platform	**Bottom mounted inductively coupled to taut-wire mooring** **Sensor** / **Data Type** ADCP — Current speed and direction; Wave height, period, direction Seacat + P — Water level, temperature, salinity Seacat + FL — Temperature, Salinity, Chlorophyll
Data Format	Binary
Interval of Data Measurements and Updates	15 min. sampling
Transmission and Receiving	Iridium, 4 hr. interval
Approximate Water Depth	30m

MET2 - S. Charleston Met

Station Location (Lat/Long)	Decimal Degrees: 32.2 N, 79.67 W Degrees, Min., Sec.: 32° 12' N, 79° 40' 12" W
Observations	Meteorological, sea state
Data Collection Platform	**Aanderaa Coastal Monitoring Buoy CMB4280** **Sensor** / **Data Type** Wind Speed Sensor 2740 — Average and maximum (gusts) wind speed Relative Humidity Sensor 3445 — Relative humidity Air Temperature Sensor 3455A — Air temperature Solar Radiation Sensor 2770 — Solar and sky radiation Water temperature Sensors (2) — Water temp.
Interval of Data Measurements and Updates	15 min. sampling
Transmission and Receiving	Orbcomm, 1 hr. interval
Approximate Water Depth	30m

FRP1 - Fripp Inlet

Station Location (Lat/Long)	Decimal Degrees: 32.45 N, 80.45 W Degrees, Min., Sec.: 32° 20' 24" N, 80° 27' 36" W

<table>
<tr><td>Observations</td><td>Water level, meteorological, currents</td></tr>
<tr><td>Data Collection Platforms</td><td>
<table>
<tr><th colspan="2">NOS G3 Water Level Station with Backup Gauge</th></tr>
<tr><th>Sensor</th><th>Data Type</th></tr>
<tr><td>(1) Submersible Pressure Transducer
(2) Aquatrak Assembly
(3) Accububble Bubbler</td><td>Water level</td></tr>
<tr><td>Water Temperature Sensor</td><td>Water Temp</td></tr>
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<table>
<tr><th colspan="2">Sutron Automated Weather Station</th></tr>
<tr><th>Sensor</th><th>Data Type</th></tr>
<tr><td>Accubar Barometric Pressure Sensor</td><td>Barometric pressure</td></tr>
<tr><td>AT/RH Sensor</td><td>Air temperature, relative humidity</td></tr>
<tr><td>Wind Sensor Prop Vane</td><td>Wind speed, direction</td></tr>
<tr><td>Ultrasonic Wind Sensor</td><td>Wind speed, direction</td></tr>
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</td></tr>
<tr><td>Approximate Water Depth</td><td>NA</td></tr>
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FRP2 - Fripp Nearshore

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<tr><td>Station Location (Lat/Long)</td><td>Decimal Degrees: 32.28 N, 80.41 W
Degrees, Min., Sec.: 32° 16' 48" N, 80° 24' 36" W</td></tr>
<tr><td>Observations</td><td>Sea state</td></tr>
<tr><td>Data Collection Platform</td><td>
<table>
<tr><th colspan="2">Bottom mounted inductively coupled to taut-wire mooring</th></tr>
<tr><th>Sensor</th><th>Data Type</th></tr>
<tr><td>ADCP</td><td>Current speed and direction; Wave height, period, direction</td></tr>
<tr><td>Seacat + P</td><td>Water level, temperature, salinity</td></tr>
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</td></tr>
<tr><td>Data Format</td><td>Binary</td></tr>
<tr><td>Interval of Data Measurements and Updates</td><td>15 min. sampling</td></tr>
<tr><td>Transmission and Receiving</td><td>Iridium, 4 hr. interval</td></tr>
<tr><td>Approximate Water Depth</td><td>10m</td></tr>
</table>

FRP3 - Fripp Mid-shelf

Station Location (Lat/Long)	Decimal Degrees: 31.91 N, 80.03 W Degrees, Min., Sec.: 31° 54' 36" N, 80° 01' 48" W
Observations	Sea state, biological
Data Collection Platform	**Bottom mounted inductively coupled to taut-wire mooring**

Sensor	Data Type
ADCP	Current speed and direction; Wave height, period, direction
Seacat + P	Water level, Temperature, Salinity
Seacat + FL	Temperature, Salinity, Chlorophyll

Data Format	Binary
Interval of Data Measurements and Updates	15 min. sampling
Transmission and Receiving	Iridium, 4 hr. interval
Approximate Water Depth	30m