COMMERCIAL FISHERIES
RESEARCH FOUNDATION
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Project Title: "Pioneer Array Workshops – Exploration of Issues and Concerns Connected with the Planned OOI Pioneer Array Project"

Workshop #3 – Nov. 8, 2011, 12:00 PM – 3:30 PM, Meeting Room above Superior Trawl, 55 State Street, Narragansett, RI (Pt. Judith)

Draft Workshop Summary

Opening Remarks: Group began with another round of introductions. P. Parker reviewed the planned agenda.

List of participants in attendance:

- Al Plueddemann, Senior Scientist, Woods Hole Oceanographic Institution
- Norbert Stamps, commercial fisherman, fished in the area since 1980
- David Spencer, offshore commercial lobsterman, Spencer Fish & Lobster, Inc.
- Fred Mattera, offshore commercial trawler, based in Pt. Judith
- Bonnie Spinazzola, Executive Director, Atlantic Offshore Lobstermen's Association
- Bonnie Brady, Executive Director, Long Island Commercial Fishing Association
- Kevin MacGuire, commercial fishermen and restaurant owner, based in eastern Long Island
- Glen Gawarkiewicz, Senior Scientist, Woods Hole Oceanographic Institution
- Dan Farnham, commercial fisherman (long liner), based in Montauk, NY
- Oscar Schofield, Professor, Bio-Optical Oceanography-Rutgers University
- Wendell Brown, Professor of Oceanography, University of Massachusetts, Dartmouth, SMAST

CFRF Staff:

- Peg Parker, Executive Director, CFRF
- Jane Dickinson, Administrative Assistant, CFRF

Pioneer Array – Discussion on siting options, potential gear conflicts, safety concerns

Mooring details:

Group returned to the discussion on the mooring part of the Pioneer Array Project, working through the following topics:

- Review of proposed mooring arrangement discussed at last workshop
- Guard buoys
- Submerged buoys
- Description of profiler moorings

Review of proposed mooring arrangement: Group reviewed the site arrangement that has been proposed at the last workshop, and no new site arrangements were proposed. However, it was requested that time be spent going over the type of moorings planned for each site, and the plans for navigational aids such as guard buoys. The type of moorings planned for each site was added to the sketch of the new proposed arrangement. (See attachment to meeting summary.)

Major Points made:

- Buffer zone for each mooring arrangement is intended to be ½ mile radius from site center.
- Fishermen suggestion: If mooring site is to be on a hang or wreck, that mooring should be as close as possible to that wreck or hang- otherwise fishermen will have two obstacles to avoid.
- Response to this request was that how close they can get to a wreck or hang is dependent on the nature of that spot – they don't want to get tangled with it and if there is archeological significance to the wreck, there may be guidelines that will have to be followed.
- Fishermen would like to have the coordinates for both the site center (that helps if they are steaming towards the general area) and the actual moorings. The latter is the most important for avoiding gear conflicts.
- Scope of mooring line is generally 50% of the water depth.
- Site centers will remain constant over duration of the project but the position of the moorings within that 1 mile diameter encompassing the site center could change. Current plans for deployment are for the moorings to be as close to the site center as possible.
- No one wants to get involved in hitting buoys – they need to be very clearly marked and as close together as possible.
- Fishermen have their own buffers they follow around these hangs to avoid lost or damaged nets – especially in severe winter conditions.
- Need some way to make profiler moorings more visible – possibility would be raising their profiler higher above the surface of the water and using radar or pinger on top.
- Use of the phrase "buffer zone" around each site center may be problematic in terms of liability issues. Fishermen raised this point – group will return to this subject next workshop.
- Guard buoys –Guard buoy would look like top of surface mooring (with a tower and a radar reflector).
- The non guard buoy option would have the site center with the surface mooring and the WFP or the Winched Profiler up to ½ mile apart.
- The added guard buoy option would put the winched profiler in the center and have the surface mooring and the guard buoy straddling the winched profiler.
- There may be a problem with sports fishermen tying up to these moorings. Point was made that the interests and concerns of commercial fishermen in this area should come first – they are out there to make a livelihood, not recreationally fishing.
- Fishermen made point that guard buoys are not guard buoys if they are up to ½ mile away from a mooring.
- Captains may not always be at the wheel – crew members need to be able to easily know what it is in the area.
- Current plan was to line up double moorings as follows: surface mooring------1/2 mile ----- winch profiler---300 Feet-----Guard buoy

- Fishermen noted this was too far apart – scientists agreed to look into how close together surface mooring and winch profiler can be next to each other.
- Fishermen need to have the exact locations of all the moorings so they can enter them into their onboard computers. Computers essentially drive the vessel.
- Need to raise profiler moorings up to 10 feet – could be done by increasing the height of the central tubing- a radar reflector and pinger should be on the top. [Note: Fishermen typically see 15 foot waves out there in the winter.] Other note: Power could be a limiting factor.
- Fishermen state that the fewer buoys the better but they are needed as close to the winch profiler as possible.

Questions/Answers:

- How close together can surface moorings and profiler moorings be? Note: Scientists agreed to check on this.
- How does the winched profiler mooring work? It sits on the bottom and goes up and down from a cradle at the bottom of the mooring. It takes measurements creating a vertical profile of the water column – designed to go up and down 4 times/day. These are controllable by sending commands through satellite communication.
- How is this project managed? The Pioneer Array infrastructure is being controlled by one institution. Other scientists apply or submit proposals to do studies using this array.

Conclusions:

- Once things are set up out there, need to establish a committee or some vehicle to communicate to fishing industry about intended changes to the science equipment.
- It would be helpful for the fishing community to be involved at some stage of project approval (maybe as a final step once it is decided what science projects will receive awards to do work using the Pioneer Array infrastructure) in order to know what it is going to be worked on and the logistics of that work.
- Scientists will be meeting this coming spring/summer to discuss fixed sampling protocols. It might be helpful to have fishing industry input involved in this planning.
- In general it might be helpful to have some standing group that can serve as a vehicle for fishermen input throughout the project on a variety of subject areas.
- Major safety concern is the winch profiler part of the mooring system. This is not visible even at the surface and it will be coming up and down in the water column. After much discussion on how to alert fishermen and help them avoid contact with this equipment, fishermen suggested that part should have a buoy directly on top of it.

Gliders and AUVs

Group then proceeded to discuss the mobile parts of the Pioneer Array Project including the Gliders and AUVs, working through the details of how each piece of equipment is constructed, what it is intended to measure, and planned operations.

Gliders:

Major Points made:

- Gliders can be out for up to a year. For the Pioneer Array, the planned deployment interval is 2-3 months. Gliders will be operating within the white box (pg. 3 of Pioneer Array Brochure).

- Gliders always go up and down. They can be programmed to go within a certain distance from the water surface and the bottom.
- Gliders are about 6 feet long, weigh about 100 lbs, and travel at about ¼ to ½ knot speed. They are neutrally buoyant in the water. The tube is held together by a vacuum. If it hits something the seal breaks and it sinks to the bottom immediately.
- Gliders are not fast moving – there is flexibility in how they are used.
- Being used to sample bottom temperature, depth of upper mixed layer (to improve hurricane forecasting, etc). They provide a slice of data through the water column – testing water properties.
- Gliders measure temperature, salinity, pressure, dissolved oxygen, currents, optical properties, chlorophyll and organic matter.
- Planned Glider mission (takes 5-7 days to get out to a certain point and 5-7 days to get back-slow moving):
- 6 Gliders are part of project

Questions/Answers:

- Have there been contacts with Gliders? There have been about 300 missions and there have been 2 contacts. Contacts show the glider being brought onboard a vessel – scientists can track it – they know it has been placed on a vessel if they see it going faster.
- How do Gliders recharge? They will be carrying their own battery pack – will be out for a few months at a time

Conclusions:

- Scientists need to coordinate Glider mission with fishermen to avoid conflicts as much as possible.
- Need to program Gliders to avoid coming above 30 feet from the surface to avoid hitting the bottoms of fishing vessels and to not go below 30 feet up from the bottom to avoid gillnets.
- Scientists will consult the gear restrictions already established for this area. Copies were made available to the group.
- Scientists will come back to the group with more specific ideas/plans for how the Gliders will operate.

AUVs

Major Points made:

- AUVs go faster – up to 4 knots – have a 1500 rpm propeller (right now this is unprotected – could be a problem if it is pulled up on deck and it is still running) = can make sharp turns
- AUVs can operate in three ways:
    - Triangle mode – surface to a certain depth
    - Run at a constant depth
    - Run at constant altitude off the bottom
    - Pioneer Array scientists likely to use a triangle mode on a weekly sampling basis-not concrete
- More expensive piece of equipment – weighs 500 lbs.
- 2 AUVs will be covering the space the size of Delaware
- Can go down to 1800 feet.

- Scientists want to use these to understand the frontal zone; they will be deployed in a T fashion – one going a depth contour and along a mooring line (Repeat lines once a week up north of 50 fathom tracking high nutrient waters from the slope to the shelf and one running along the mooring lines so they can see the cross shelf distribution there-this particular location could be problematic).
- They will be deployed once per week – they have a 48 hour battery life – will go back to mooring to recharge.
- Measures the same things as the Gliders but can also measure nutrients- can measure the fluxes between the continental slope and shelf.

Questions/Answers:

- How do AUVs recharge? They have to recharge after 48 hours – they return to the bottom of the mooring to recharge.

Conclusions:

- These will be deployed in areas heavily fished and will be traveling at much greater speed - need to address how to avoid conflicts
- Draft of typical fishing vessel is about 14-15 feet but they also have outriggers – these are flopper stoppers – stabilize boats – In fishing grounds should stay below 30 feet from the surface.
- Having predictable schedule and path could help avoid conflicts – want to minimize risks while meeting science goals.
- Avoidance of shipping lanes needs to be considered.
- Antennas need to be protected – should also consider a rounding type of bumper on the AUV or some way to avoid entanglements with the antennae.
- A possible solution to deflect would be a new design off the back fins involving a thin wire from the body to the fin.
- Should consider a court nozzle or prop shroud around the propeller for protection purposes.
- Not much trawling goes on from May through November but heavy trawling in this area after that – scientists should consider that when planning missions.

Array Maintenance

The group then proceeded to discuss the maintenance of the science equipment, including the planned schedule for retrieval and re-deployment.

Major points made:

- There will be two sets of all the science equipment so when one set is taken out for maintenance, another set will immediately be deployed (this turnaround happens two times per year).
- More algae growth will occur on the equipment in winter – fish likely to keep them clean in the summer months.
- A Research Vessel such as the R/V Knorr out of Woods Hole (approx.. 279 ft) would go out for about 5 days to pick up and replace gear.
- 4 trips will go out and tend to gliders and AUVs in small boats (i.e. R/V Connecticut – approx.. 75 ft)
- 6 trips total
- Guard buoys are likely to remain for 1-2 years.

Question:

- What happens when one gets moved by a storm? Scientists will know this, and can report position changes to the fishing community. However, they will not have the vessel lined up to go out and put it back on station until one of the preprogrammed intervals. Homework – Scientists had been asked to look back at what sea state would result in a mooring "hopping".
    - Fishermen noted that a combination of winds and tides together could change when a mooring moves. Three factors need to be considered: wind speed, wave height, and tidal current. The duration of these factors also is a consideration.
    - Fishermen relayed that they could get a maximum current of 3 knots out in this area.
    - Scientists relayed that the conditions that may result in a mooring hopping or submerging would be 2 knots current, 60 knots wind, and 40 foot waves and under these conditions 10% of the time submerging or hopping could occur.
    - Fishermen relayed that those conditions could occur once or twice a year out there.

Conclusions:

- The planned months for replacing moorings are April and September. Note: It was suggested that the scientists consider changing this schedule – hurricanes likely occur in Sept. – would be better to wait until October.
- When fishermen discover that a mooring has moved, they have to have a means of communicating this information. Scientists might know if guard buoys are moved if they have a GPS on the buoy.

<u>Communication between scientists and fishing community – options</u>

- Scientists relayed that they will be working on a project website to communicate information. They would like input from fishermen on how this website should be set up. This could be a working group to work with programmers/website designers.
- Scientists also looking for input on how data products can be used in fishery science.
- Other communication options discussed:
    - NOAA system – use this system to send notices to the fishing community
    - Form an online social network
    - Physical mailing to all permit holders effected letting them know about this project
    - Communicate through fishermen associations
    - Put the information on the VHS weather channel
    - Develop a brochure to be mailed to fishermen depicting what the science equipment looks like, navigational information, what to do if fishermen encounter a gear conflict, what the equipment does, what to do if you have an interaction, etc. Something fishermen can keep on their vessels.
    - Might consider offering a $100 reward for fishermen returning the equipment.
- Also need to consider ongoing communication with fishing industry representatives – need to decide how fishing community interacts with operational center for this project throughout its duration.
    - May consider some type of standing committee that is part of the OOs system
    - This type of fishing industry advisory committee should be set up this coming spring

<u>Liability and mitigation – Briefing</u>

P. Parker reported that she had been briefed on the work Anna-Marie Laura is doing on this subject. A.M. Laura has agreed to come to the next workshop to report to the group directly. She has been in conversations with the Coast Guard about navigational aid options, and has been working with the NSF on the subject of liability. She suggested that this workshop group focus on providing input on the following:

1. Fishing industry representatives: Should consider what they would like to have in place concerning liability. What would they like to see happen if an interaction occurs and there is damage done to a fishing vessel or its gear, or to the scientific equipment? Are there examples from other regions of this country or from other countries that might serve as a template to use for this situation?
2. Science representatives – Should consider their role when an incident occurs. How do they think things should proceed when there is an interaction? What part of that process will they be willing to be involved in?

Group agreed to return to this subject area in Workshop #4.

<u>Summary of major points made – P. Parker</u>

- Over the last two workshops, the group has been focusing on the topic of how to best avoid conflicts and co-exist. This has resulted in:
    - A proposed alternative site arrangement for the moorings part of the Pioneer Array (just one alternative has emerged that appears to be acceptable or a preferred arrangement to most if not all of the participants).
    - Navigational aids have been discussed. Fishing industry representatives are asking for direct buoy placement over the mooring arrangement being marked, communication to the fishing community on the type and exact location of scientific equipment being placed out there, and steps to increase the visibility of the moorings in high seas.
    - Fishermen are asking that a means be established to monitor science equipment so if it becomes displaced due to storms there is notification and possible replacement, as soon as possible.
    - Fishermen are also asking for adjustments to the engineering design of the mobile science equipment to avoid entanglements, and offer protection from moving parts such as the propeller on the AUV.
    - Strategically planned and predictable missions for the Gliders and AUVs could help quite a bit in reducing the possibility of interactions.
    - Communication is a critical component to a safe and successful implementation of this project. Communication has been talked about in terms of mass communication to the commercial fishing industry so members know about this project and understand its components and location clearly. It has also been talked about in terms of providing a means for ongoing communication with the fishing industry so fishermen can continue to offer advice and suggestions to scientists on a number of topics throughout the project.
    - Group needs to address how to handle the situation of something going wrong out there.
    - Group needs to begin initial discussion on two topics that may have to be worked on further outside of these 4 workshops. These include the topic of liability issues and the application of the data collected during this project to fisheries science.

Discussion on agenda for next workshop

Group agreed to address the following at its last workshop in this series:

1. Moorings –
    a. Can pingers be placed on them?
    b. How close together can they be?
    c. Does the group recommend the use of guard buoys? If so, how should they be placed?
2. Gliders/AUVs = possible changes to the designs to help avoid entanglements
3. AUV and Glider missions – scientists agreed to come back with more detailed plans.
4. Liability issues – How to address? What type of process should be established when incidents occur?
5. Ongoing communication – what does this group recommend? Should this process continue or some other type of process be established?
6. Project science – possible connections to fisheries science needs.

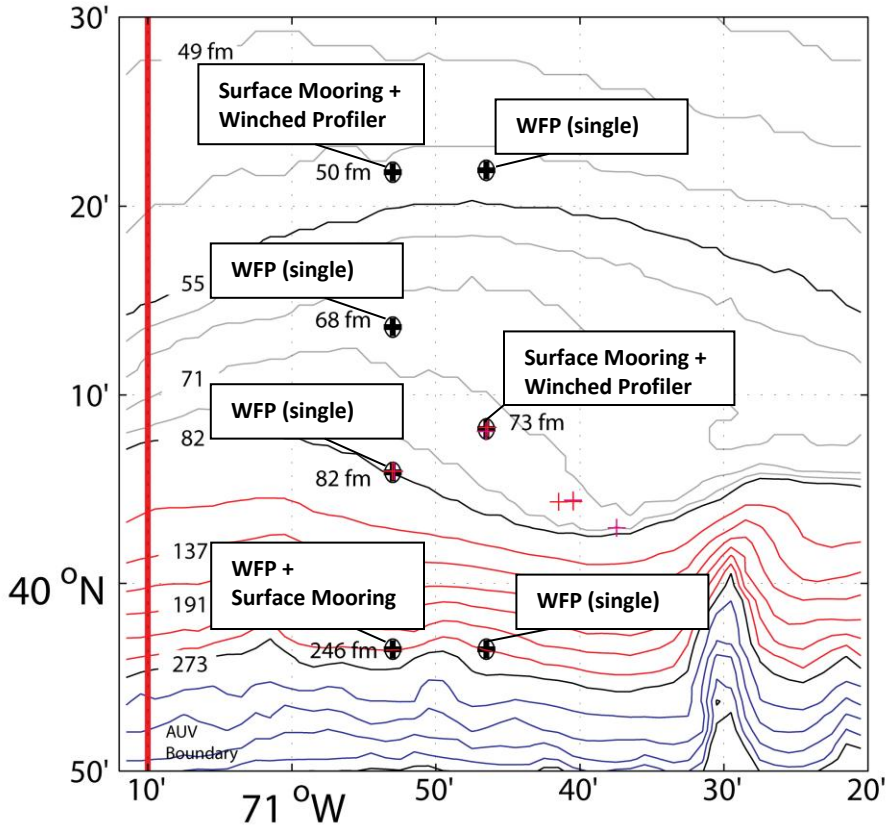
Workshop was adjourned at 3:35 PM. Next Workshop is scheduled for Wednesday, December 14, 2011, 12:00 PM – 3:30 PM, Conference Meeting Room above Superior Trawl, Narragansett, RI (Pt. Judith).

Group members agreed to work on the following in preparation for the workshop on Dec. 14th:

"Homework Assignments"

1. Scientists will look into how close together paired moorings can be placed (surface moorings and winched profilers). Industry is asking for as tight an arrangement as possible with a guard buoy on top of the winched profiler mooring.
2. Scientists will also consult with project engineers to determine what can be done to raise the profile of the profiler moorings – the group talked about extending the central tubing area to a height of 10 feet or so with a radar reflector and pinger on top so these can be seen in high seas. Note: Power could be a limiting factor –scientists will also look into this.
3. Scientists will be working on providing more specific information on mission schedules for the mobile part of the scientific gear. It was noted that information on gear restricted areas (forwarded to everyone by Jane) and the fishing activity information provided could be helpful in determining these schedules in such a way as to reduce potential conflicts.
4. Scientists will also consult with engineers on possible ways to modify the exterior of the mobile equipment in order to avoid entanglements with vertical end lines of fishing gear and to provide some protection around the moving propellers.
5. Scientists may also want to review the planned maintenance schedule and make changes to better accommodate seasonal storm events.
6. Scientists may also need to consider what happens when a sea state is such that a mooring "hops". How can it be put back to where it was?
7. Fishing industry representatives will work on gathering background information on the liability issue and begin to develop options for dealing with various scenarios if something goes wrong. They will be preparing to respond to the question of what process do they want to see in place to handle such situations. Note: Al agreed to forward to Fred background information on this subject – west coast example.
8. Scientists will be prepared to share what role they envision they will play in situations of gear conflicts, accidents, etc.

9. All participants should be thinking about how the information/data to be gathered from the Pioneer Array project might be applied to fisheries science needs.



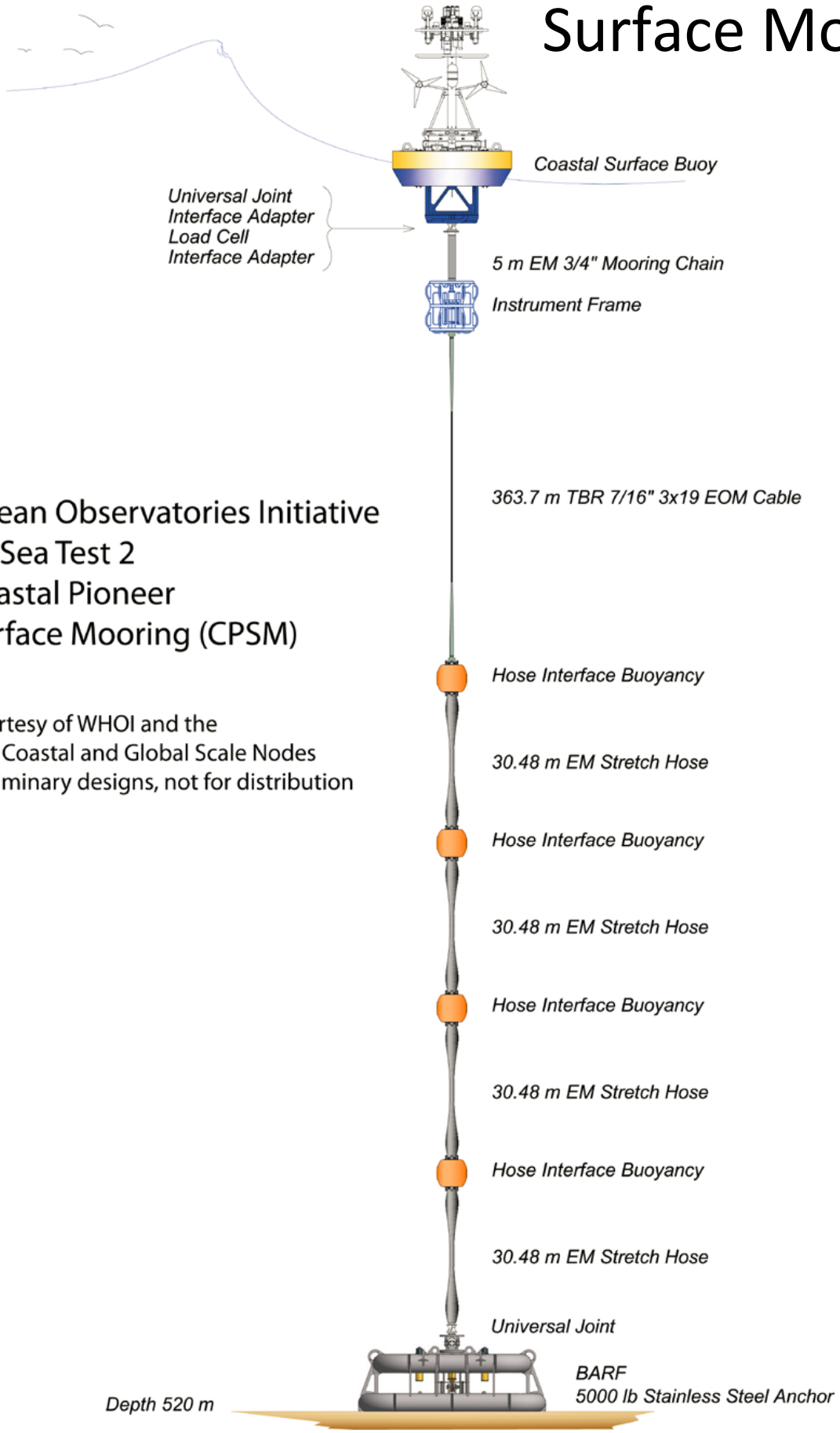
Surface moorings have relatively large buoys with 15-foot towers supporting scientific instrumentation and multiple navigation aids. The buoys are always on the surface and serve as flotation for an instrumented mooring line and anchor below.

Moored profilers have smaller buoys with 6-foot towers supporting telemetry equipment. These smaller telemetry buoys could be partially submerged in rough weather, and are not as easily visible as the surface mooring buoys. The mooring line below the buoy supports a wire-following profiler (**WFP**) equipped with scientific instrumentation.

Winched profilers have intermittent surface expressions. These moorings support profilers containing scientific instrumentation; the profilers are “parked” at a seafloor node and winched from the seafloor to the surface and back to make measurements. This is considered a bottom frame with two pieces and one can detach from the other. When you release the winch on the bottom frame the buoyant piece rises up towards the surface and that creates the profile. When it is done with the profile the winch is turned in the opposite direction and it is pulled back to the bottom frame.

Guard buoys have towers large enough to support multiple navigation aids, and are proposed as a means to increase the visibility of moored profilers and winched profilers at sites shallower than 250 fathoms. There would be no scientific instruments on the mooring line below a guard buoy.

Surface Mooring

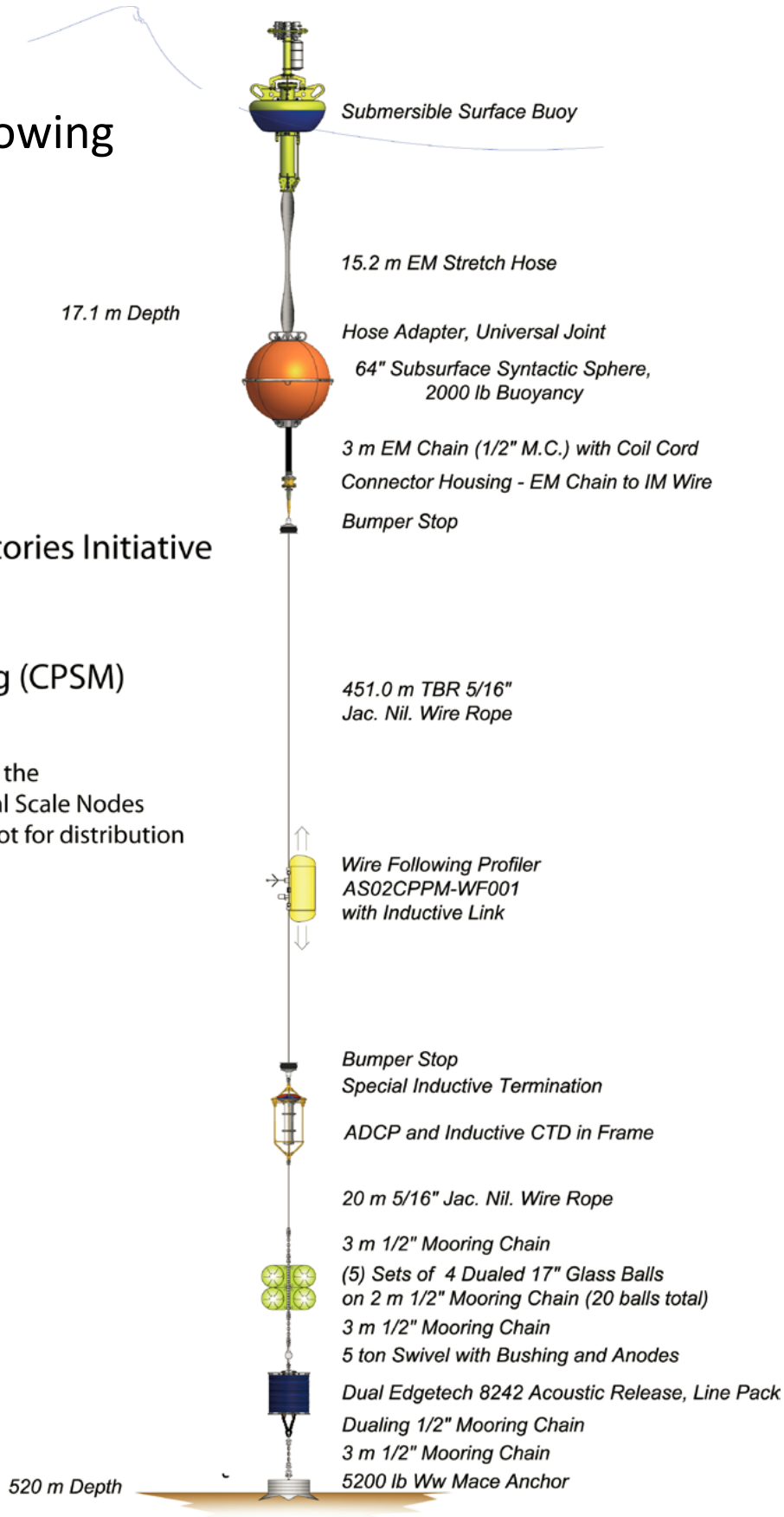


Ocean Observatories Initiative
At-Sea Test 2
Coastal Pioneer
Surface Mooring (CPSM)

Courtesy of WHOI and the
OOI Coastal and Global Scale Nodes
Preliminary designs, not for distribution

Surface Mooring buoy at sea

WFP- Wire Following Profiler



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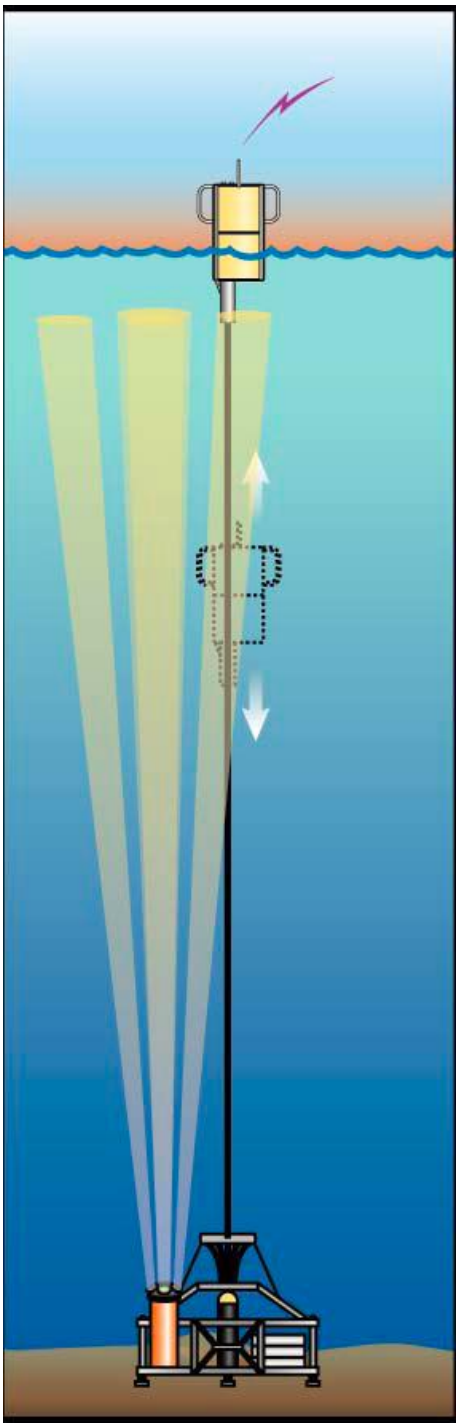
Profiler Mooring buoy at sea



Winched (surface-piercing) Profiler

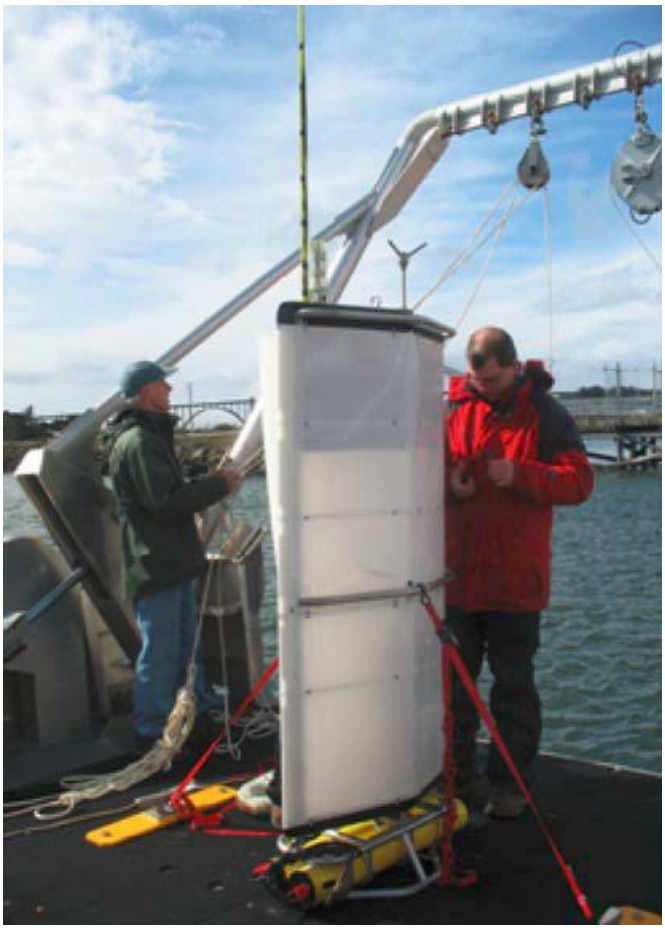
Profiling Body

- Telemetry to shore
- Temperature and salinity
- Dissolved oxygen
- Dissolved carbon dioxide
- Currents
- Optical properties
- Chlorophyll, organic matter
- Nitrate

Bottom frame

- Water column currents

Winched Profiler



Representative Glider

Representative AUV

Example of possible Glider missions