

**Meeting Notes
Western Association of Marine Laboratories
July 27-29, 2015**

The Portofino Hotel
60 Portofino Way
Redondo Beach, CA 90277
Meeting Room: The Ocean Room

Monday July 27 – Development of a WAML Ocean Acidification Measurement Network

11:45 Convene in Ocean Room

12:00 Lunch on site – Ocean Room, Portofino Hotel

1:00 **Welcome, Introductions, Agenda for the WAML OA monitoring network meeting**
Roberta Marinelli

What are the existing infrastructure and monitoring programs at marine labs and field stations already in place? This was funded by a planning grant proposal.

1:20 **Agree on purpose(s) of an integrated WAML OA monitoring**
Steve Weisberg

NRC report on marine labs and field stations and what NSF is getting for it's investments. Marine Labs are a great opportunity for making a network of instrumentation.

Measurements of OA biochemistry coupled with biological observations.

Costs to Instrumentation:

Training, Buying new instrumentation

Other networks – Genomics Networks – Neil Davies has a planning grant

1:30 **Overview of IOOS and GOA-ON**
Tools and Guidance for OA Observing: Global to Local
Jan Newton

Topics to include:

- a. Core chemical measurements – synopsis of prior community discussions
- b. Core biological measurements – synopsis of prior community discussions
- c. OA impacts on biological processes

OA is a Global Condition with Local Effects – Need to study and monitor both levels

Nearshore – upwellings, anthropogenic sources, regional differences, rivers give fresh water input. East Coast is not the same as the West Coast for coastal processes.

GOA-ON – Global Ocean Acidification – Observation Network

Climate Data – sufficient and defined quality to assess long terms trends Data is high enough quality to define trends.

Weather Data – If alk, pH are your measurement pair, then pH must be good to 0.05 for perfect alkalinity.

Nested System Design – pH and pCO₂ are the easiest to measure!

Lab tests frequently measure Total Alkalinity (TA) and dissolved inorganic carbon (DIC)

Open Ocean

Coasts & Shelf Seas

Coral Reefs

Goal 1 – OA Conditions

Goal 2 – How does this effect the ecosystem?

IOOS – Integrated Ocean Observatory System - Regional Associations – Consistent National Capabilities for Data Collection

NANOOS, CeNOOS, SCOOS,

West Coast IOOS – IOOS Pacific Region

- a. NOAA Buoys
- b. Shellfish Hatcheries
- c. Sanctuaries
- d. NSF NERES

C-CAN – also has protocols up for

Washington OA Center (WOAC) – Jan Newton & Terry Klinger are Directors – Comparing pteropod shells and OA Conditions – This is one way of linking biological and oceanographic data.

2:50 Determining the parameters to be measured – pCO₂ and total CO₂ – OA is a multi stressor problem. E.g. The Mediterranean is very well buffered, but the Bering Sea is not.

- a. **4 measurable conditions** – Alk, TCO₂ (DIC), PCO₂, pH
- b. **The desired level of precision** – You can have low precision, low accuracy data as long as you know and define what you have. Don't start with Alk, TCO₂. Temperature and salinity really affect the pH.
- c. **What is your situation?** Do you have a mooring? Do you have live sea water? Should you monitor every 2 hours? Continuously? Sensing technologies are capable of this and some autonomous analyzers as well. In settings without estuaries or tidal exchanges, 4X per day is probably enough.
- d. Desired measurement frequency (including continuous vs. discrete measurements)
- e. **Where to send your water samples?** At Burke's lab, \$25 per sample. \$200 per CCCC analysis set. Run reference material - Use CRMs (Carbon Reference Material) – Get a set of moorings to monitor live sea water. Even for moorings, you have to collect and monitor with sampling of water samples. Biofouling is a big problem with these instruments.
- f. **Example** – Shoreside facilities associated with the aquaculture industry are able to gather water samples and monitor conditions.
- g. **What else to measure?** This may be site specific! There is no “easy” choice. What do you think the vulnerability in your system is?
- h. **Accuracy is difficult to get.** Accuracy is best addressed by the use of reference materials.
SIO CRMs for Alk and TCO₂.

Buffers for pH.

PCO₂ can only be verified with RMs directly. But it is easy!

- i. **Training!** Resources are available. There is a best practices on-line. Dickson's lab recently had a workshop to learn these techniques.
- j. **Carbon Camps** – Previous efforts to establish regional “blue ribbon facilities have failed.
- k. Marine Labs may not be the best place to be suited for the SIO style training as science labs.
- l. **Facility/academic partnerships NANOOS/OSU/UW/UAF/UCD/SIO**
- m. There is a proxy relationship of temperature and oxygen that can be modeled and will work if there is not a lot of fresh water in their samples. Compare these to the pH measurements.

4:00 Current state of data availability and at WAML laboratories

Each participating WAML group would have ten minutes to describe their OA related research at three levels:

- a. What is their existing OA water quality monitoring system (and what do they see as the likelihood of participation in a WAML network)
- b. What are the long-term biological monitoring programs they maintain that might be relevant to enhanced OA monitoring
- c. What other OA research are they conducting that they would like others to know about?

5:00 Conclude Discussions

6:30 Dinner at *Hostaria Piave* 6:30 p.m., 231 Pacific Coast Highway, Redondo Beach CA

Tuesday July 28 - Development of a WAML Ocean Acidification Measurement Network, continued

8:00 Breakfast in the Ocean Room

9:00 Continuation of “Current state of Data availability at WAML Labs”

11:00 Integration with other OA monitoring networks (with a series of five minute talks)

- a. LTER – Mark Ohman - pCO₂, TCO₂, Point Conception, Del Mar mooring, spray gliders, SIO Pier – manual measurements, TA and DIC in Andrew Dickson's program, phytoplankton, flow cytometry. A few plankton counters – zooplankton and
- b. They have been monitoring for many years. Records of ships transects – using the proxy relationship of temperature and oxygen will work if there is not a lot of fresh water. Compare these to the pH measurements. Undersaturation events – combining space and time measurements to look at what is happening during certain events, such as upwellings.

Development of a WAML Ocean Acidification Measurement Network

11:00AM Gretchen Hofmann – 1. SBC LTER & sensor network 2. Practicalities 3.

2010 – Seafet to take to the Antarctic

2013 – SeaFets added to new sites

2015 – All added.

- a. **Assets in the Santa Barbara Channel – Kelp forest sites**
- b. **Carbonate Chemistry** – low pH events coincide with cold water, high pH are normally associated with warm water – there are community level signatures that change seasonality.
- c. **Investments: time, people, money** – 15% time of a technician to take care of the Seafet. Each instrument will need about \$3,000/year to keep them going.
- d. **Many partnerships were established through this monitoring program.**

11:15AM George Waldbusser - West Coast OAH (Ocean Acidification and Hypoxia Panel)

<http://westcoastoah.org>

Other monitoring programs as inspiration!

SOAMAN – “Larvae are carbon”

Persistence pays off – juvenile oysters – IOOS is funding the monitoring of shellfish farms now.

11:30AM Marie Bundy - NERRS - Estuarine Monitoring – BIG DATA – These have 500-600K/year

Ex. Padilla Bay seagrass beds

- a. Water quality and Weather – sensors are calibrated each week – nutrients are collected once a month.
- b. Telemetered data and standard protocols and instrumentation plus research programs aimed at understanding ecological drivers of change at each reserve.
- c. Swamp Rats site!

12:00 Lunch at the Baleen Café (Portofino Hotel)

1:00PM Burke Hales - Costs of participation (instrumentation and staffing)

Equipment – Moored instrument - \$5K-10K; Flow-through instrumentation \$2-4K

OA Network – pH and pCO₂ – moorings

SAMI CO₂ – Many moving parts – Burke’s works about 75% of the time.

Sunburst – winners of the X prize - \$50,000 just for the system

Durafet - \$400 – specialized power supply

Operational (Instrumentation and Staff)

“Cheap option” CRMs \$60/bottle Add replacement electrodes

Flow through sensing? ¼ time of a full-time technician.

Participation in an OA Network – clean the system once a week.

OSU systems operate mostly on undergraduate and graduate student involvement.

X-prize for OA

Sunburst was the clear winner – Durafet was the second prize.
SAMIs are the state of the art now.

Carbon Camp!! – 20-30 techs each year for 3-4 days training for once a year

CAU – Calcification Accretion Unit

10:45 Data availability: Where will the data reside and how will it be shared?
Jan Newton

WAML Meeting – continuation of OA discussion

3:00 Break

3:30 Steve Palumbi - Review of WAML meeting agenda – The value of marine labs as a research network

- a. Developing funding opportunities to support OA monitoring at the WAML labs
- b. Supplemental monitoring parameters (e.g. biological process measurements)
- c. Involve PIs that are doing OA research.
- d. Questions that can be answered with a WAML-OA network –research opportunities that an OA network within WAML may provide.
- e. Kelp forests, sea grass beds, oyster recruitment, coral reefs, marine microbes
- f. Observational, Use existing data to answer questions, Push into new hypotheses.

1:30 Preparing the workshop report – Synopsis of the plan identified during the last day,
items for further discussion
Roberta Marinelli

6:00 Dinner at Roberta Marinelli and Phil Taylor’s house: 6424 via Colinita, Rancho Palos
Verdes, CA

Wednesday July 29 - Regular WAML meeting

8:00 Continental Breakfast in the Ocean Room

8:30 Background about the host laboratory (Wrigley Institute of Environmental Studies)
Great place to hold small meetings, etc. 50th year Anniversary – August 8, 2015
20th Anniversary celebration for the Environmental Studies
Roberta Marinelli

9:00 Cumulative Ecological Impact Assessment for Scientific Research in MPAs
New approaches to granting scientific collecting permits (SCP) that is scientific and
transparent. What are the Cumulative Ecological Impacts?

Karina Nielsen – Director of Tiburon
Brian Owens (CA Dept of Fish and Wildlife)

Top 10 MPAs by Authorized Projects (3 year projects)

Dana Point SMR 22

Elkhorn Slough 22

SMR (State Marine Reserve) No take at all.

Assessing the Cumulative Ecological Impact

Identify potential conflicts between collecting activities and MPA goals

- a. MPA relevance – Why do research in an MPA? Research to inform management, Academic research about the MPA
- b. Ecological impact – Target (population) Assemblage (community) Habitat
- c. Impact tolerance – High impact, Medium impact, Low impact
- d. Cumulative impact

Lots of equations – etc. etc. 34 meetings so far. PDF was sent to everyone!

9:30 Courses, curricula and enrollment trends at WAML labs.

U of Oregon has a Marine Biology major. There are 100 majors there.

22 students in invertebrate Zoology.

Humboldt State offered an Oceanography course, but they need 15 students to offer the course. They only had 8 students the past few years.

400 Marine Biology majors

Bodega Marine Lab – Spring courses were cancelled, but summer courses were full. Marine Invertebrates and Biomechanics in the fall with the new Marine Biology major. Undergraduates from U.C. Davis.

USC – Environmental Studies – Study abroad for 20 students who also dive and spend 4 months at Wrigley.

SFU – Biology – No Marine Biology major – Earth and Space Sciences has Oceanography embedded in it.

OSU is Hatfield Marine Lab – Marine Biology program in the spring – 22 students that fit into 2 - 11 person vans. Summer program has increased recently. The housing can support 100 students.

Moss Landing – San Hose State – (CSUMB) – 75-90 graduate students at any given time. No summer program, no summer housing. 450 Marine Biology majors

U.C. Berkeley Gump Station – Cultural center, other universities giving courses there.

**11:30 Other network opportunities: Developing WAML as a genomic observatory network
Neil Davies / Jon Geller**

MBON – NOPP – Monterey Bay National Marine Sanctuaries – NASA & NOAA funded \$17 million

eDNA – environmental DNA

12:00 Lunch at the Baleen Café, Portofino Hotel

1:00 Alta Sea – A New Marine Laboratory in Los Angeles Harbor

City Dock #1 – The architects have converted an old historic building into a new aquarium and marine lab.

Peter Barsuk, Gensler; Steve Dangermond, Dangermond Keane

1:30 NAML Education Committee Report

List of 70 people who are on the NAML Educational Committee.
Impact of education at field stations and marine labs.
Matt Gilligan has written a small proposal to NSF to attend the LSAMP meetings to promote the REUs in Ocean Sciences
SEPAL – Student from Moorea studying the
Jan Hodder

2:00 Challenges in implementing STEM at a marine laboratory
New “Mountains to Sea” major
Tide pool trailers
Erika McPhee-Shaw

2:30 Financial Report – WAML has \$30,000
Bob Richmond

2:30 Other WAML activities – student research, travel and cross disciplinary engagement
Steve Weisberg is the WAML President-Elect
Steve Palumbi

2:45 Report from the National meeting – status and activities of NAML
Steve Weisberg

WAML Business meeting

3:45 Two kinds of membership in WAML, with and without NAML.
Steve Palumbi

4:00 Election of Officers for WAML, Nomination of NAML President-Elect, Bob Cowan
Steve Palumbi

4:15 Planning for future WAML meetings
2016 September in S
Steve Palumbi

4:30 Adjourn

Thursday 29 July

Optional Field Trip to the Wrigley Institute on Catalina Island – Roberta will make arrangements for boat travel to the island