Summary Notes

SOAR Science Steering Committee Workshop
1-3 November 2011
Watertown Hotel, Seattle, WA

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1 November (DAY 1)

Participants: Dee Williams, Vera Metcalf, Heather Crowley, Robert Suydam, Taqulik Hepa, Tom Weingartner, Chris Clark, Robyn Angliss, Craig George, Jackie Grebmeier, Chad Jay, Sue Moore, Phyllis Stabeno, Lisa Guy

At 0900, Moore and Stabeno welcomed the SOAR Science Steering Committee (SSC) to the 3-day workshop and reviewed the overarching Objectives and Approach to the project, w/ reference to the Project Summary sent to the SSC on 27 June 2011. Members of the SSC and representatives of the Bureau of Ocean Energy Management (BOEM) then provided brief self-introductions. Moore noted that the primary tasks for the SSC workshop were to: (1) agree on DRAFT Science Themes and associated questions, as a foundation for (2) a plan and list of invitees for a 3-day SOAR Science Workshop sometime during the last two weeks in March 2012, in Anchorage, AK. It was agreed that the spatial and temporal 'footprint' for the SOAR project is broad, to include the northern Bering, Chukchi and Beaufort Seas

As background for this work, Guy noted that the SOAR website is now up at: http://www.arctic.noaa.gov/soar/ and will serve as a link among the SSC members, NOAA and BOEM as planning and actions undertaken in support of the SOAR project move forward. During the morning session, it was agreed that while the topics on the Draft Agenda (Appendix 1) would be addressed, the order of topics was considered fluid. To that end, a discussion of the relationship of SOAR to other studies and synthesis efforts was initiated, to provide workshop participants a broader sense of how the SOAR might contribute to advancing marine science in the Pacific Arctic region.

After lunch, draft science themes and related questions (Appendix 2) were reviewed and revised by the SSC. Participants were reminded that the over-arching goal of each question was the development of an analytical approach based upon available data that might lead to a peer-reviewed publication. It was agreed that SSC members will participate directly in at least one, but possibly two science themes.

Dates and a provisional structure for the SOAR Science workshop were discussed, with 14-16 March 2012 agreed as the 'best' period for SSC involvement. It was agreed that 'theme talks' on six disciplines would best set the foundation for the workshop during the first morning (14 March). Discipline theme talks will be concise summaries (10-15 minutes) followed by a question & discussion (10-15 minutes, as listed below.

► Six Disciplines (SSC member)

1. Atmospherics & sea ice (Overland/Stabeno)
2. Physical & chemical oceanography (Weingartner)
3. Primary production/nutrients (Frey/Arrigo/Grebmeier)
4. Lower-Trophic Species (zooplankton/benthos) (Grebmeier/Ashjian)
5. Higher-Trophic Species (marine fish, birds and mammals, subsistence) (Moore/Suydam/Angliss/George/Hepa)
6. Acoustic Ecology (Clark/Moore)

► What does each discipline need to address?

- Discipline history and milestones
- State of knowledge and key datasets (time frame)
- Examples of change
- Identify stressors
- Capability to forecast

SSC members will be responsible for either giving the talk, or working with a workshop participant to give the presentation. It was noted that Discipline #5 (Higher Trophics) may need a bit more time to adequately address the subsistence theme. PRIOR to the Workshop, each Discipline Lead will email with workshop participants to ask for 2-3 important topics or questions related to that persons field. The goal here is to engage Science Workshop participants in the discipline overview and to set the stage for identification of science questions and data sets relevant to synthesis.

A very provisional DRAFT Agenda for the March Workshop was discussed:

DRAFT Science Workshop Agenda
Welcome and Intro – 30 min
Disciplinary groups 1-3 leads give plenary presentations – 1.5 hrs
Break – 30 min
Disciplinary groups 4-6 leads give plenary presentations – 1.5 hrs
Break into three theme groups – 3 hrs
Theme groups come back and Theme Lead gives plenary presentation to all – 1.5 hrs

The meeting adjourned at 1730.

2 November (DAY 2)

Participants: Dee Williams, Vera Metcalf, Heather Crowley, Robert Suydam, Taqulik Hepa, Tom Weingartner, Chris Clark, Robyn Angliss, Craig George, Jackie Grebmeier, Chad Jay, Sue Moore, Phyllis Stabeno, Lisa Guy

The SSC Workshop re-convened at 0900. Chris Clark gave a presentation to the group on some of his recent work on acoustic ecology to provide the SSC background on this topic. The SSC then resumed work on the DRAFT Science Themes and questions, this time also formulating a draft list of science contributors for each question.

Near the end of the morning session, the discussion of how SOAR relates to other synthesis efforts was re-addressed, noting a need to inform research program managers from other agencies and industry about the SOAR effort. Discussion on this topic continued through lunch, with the suggested outcome being a two-step process including (1) a town hall-style meeting convened by Moore and Stabeno at the Alaska Marine Science Symposium (AMSS) in Anchorage next January and (2) an invitation to interested program managers and agency representatives to attend the last afternoon of the SOAR Science Workshop.

The SSC spent the afternoon further refining Theme #1 Science questions and formulating a list of invitees.

The meeting adjourned at 1730 and was followed by a group dinner at Ivar's.

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3 November (DAY 3)

Participants: Vera Metcalf, Heather Crowley, Robert Suydam, Tom Weingartner, Craig George, Jackie Grebmeier, Chad Jay, Sue Moore, Phyllis Stabeno, Lisa Guy

The SSC reconvened at 0900 and completed the draft Science Themes and science questions (Appendix 3). A list of potential SOAR Science Workshop participants was reviewed and completed. The SSC then turned its attention to finalizing an invitation for workshop participants. Wording for the invitation (Appendix 4) was completed by 12:30, and Moore and Stabeno thanked the SSC for their hard work, noting that they would send out the invitations the next day, Friday, November 4th.

Appendix 1
DRAFT AGENDA

1 November

0900 Welcome & Introductions (Moore, Stabeno & Guy/ introduce SOAR logo & website)

SSC – self introductions

0930 Objectives & Scope of SOAR

BOEM Overview (Williams & Crowley)

Project Overview & SSC Responsibilities (Moore & Stabeno)

1000 Q&A – full SSC

1030 BREAK

1100 Develop Science Themes (Appendix 1) & Associated List of Scientists (Appendix 2)

Overview of DRAFT Science Themes (Moore & Stabeno)

Q&A – full SSC: Are the DRAFT Science Themes the 'right' foundation for synthesis?

1200 LUNCH (box lunches onsite; time informal discussion, email, etc.)

1330 Getting Down to Business – Science Theme Refinement & Hypotheses Formulation

Theme 1: Bottom-up

1500 BREAK

1530 Theme 2: Top-down

1700 Summary of Progress on Themes 1 & 2

1730 Meeting adjourns - dinner on your own; hotel van available for local transport

2 November

0900 Resume Science Theme Refinement & Hypotheses Formulation

Themes 1 + 2: Review Hypotheses and Identify Analytical Team Members

1030 BREAK

1100 Theme 3: Ecosystems Sentinels

1230 LUNCH (box lunches onsite; time for informal discussion, email, etc.)

1400 Theme 4: Acoustic Ecology

1530 BREAK

1600 Themes 3 + 4: Review Hypotheses and Identify Analytical Team Members

1730 Meeting adjourns – Group Dinner @ Ivars, depart hotel @ 1800

3 November

0900 Review of Science Themes & Invited Scientist List

1030 BREAK

1100 Development of Workshop I Invitation – determine process for delivery

1200 LUNCH – on your own

1330 Relationship of SOAR to other studies & Synthesis efforts

NPRB-lead Synthesis (Moore)
NSB-Shell Baseline Studies (Suydam, George, Hepa)
IARPC – anticipated NSF-IERP in Chukchi/Beaufort (Grebmeier)

1500 BREAK

1530 Meeting Wrap-up
Final Drafting of Science Themes & Invitation to SOAR Workshop I
Timeline of Milestones Leading to Workshop I
Scheduling of 'routine' teleconference (e.g. 2nd Tuesday each month)

1630 Meeting Adjourns

Appendix 2
ORIGINAL SOAR DRAFT SCIENCE THEMES

EXAMPLE Over-Arching Themes to Initiate SSC Discussion; note that SSC members will be encouraged to join at least one (or multiple) Analytical Teams that will be formed under each theme

1. **Bottom-up Theme – Physics to Marine Mammals[1]:** Seasonal sea ice – Primary Production – Zooplankton/Forage Fishes - Pelagic/Benthic coupling – Marine Mammals: step changes from the 1970s-2010?

   1.a Link Sea ice and 1°production indices @ regional – to- local scales

   1.b Do 1° production hotspots correspond to zooplankton, forage fish & marine mammal hotspots?

   1.c Importance of advection, upwelling and eddies to lower trophic level (nutrients, zooplankton, etc.) and to pelagic predators (e.g., bowheads, beluga, ringed seals)

   1.d Tracking benthic production hotspots from the Northern Bering to Amundsen Gulf: importance to benthic predators (e.g., walrus, bearded seal & gray whales)? a framework to assess ecosystem heterogeneity and change?

[1] Marine Mammals are used here as the primary apex predators for consideration (as in proposal to BOEM); could include marine birds and possibly fishes where data are available – open for discussion

2. **Top-down Theme – Marine Mammals to Physics:** Whales-Zooplankton/Forage Fishes- Hydrography -Wind-Currents: investigating marine mammal 'hotspots', as predators that require aggregated prey

   2.a Pressure by marine mammal predators on 'historic' benthic hotspots; impact of walrus late-summer shift to central-place foragers in the Chukchi Sea?

   2.b Marine mammal distribution & relative abundance – a tool to identify and assess variability in benthic and pelagic hotspots?

   2.c Can we estimate marine mammal prey removal rates at regional/seasonal scales?

3. **Marine Mammals as Ecosystem Sentinels: coupling distribution, relative abundance, movements, stomach contents and body condition indices to oceanography**

   3.a Create 'combined track' maps from satellite-tagged marine mammals in the Pacific Arctic: assessment of seasonal movements & habitat use (e.g. Block et al. 2011).

3.b Link cetacean habitat density models (from NOAA/CetMap) to marine ecosystem patterns

3.c Correlate BCB bowhead whale stomach contents and body condition to sea ice cover at regional scales, from the 1980s onward

3.d Seal & walrus diets and body condition from the 1970s onward, linkages to changes in sea ice, physical oceanography and patterns of productivity

4. Acoustic Ecology Theme

4.a Develop seasonal 'acoustic scenes' for the Chukchi & Beaufort shelf, slope & basin, from the cumulative sound field generated by natural & anthropogenic sources; how are autumn sound fields changing with extension of open-water season?

4.b Overlay movements of tagged marine mammals with acoustic scenes, especially with reference to seismic surveys and ship transits – focus on close spatial/temporal 'fits' between available data

4.c Evaluate sampling capability and identify gaps from existing arrays of long-term recorders in the Chukchi and Beaufort Sea

4.d Use results of NOAA/CetMap–Sound-Field/Map working groups to identify 'hotspots' of marine mammal exposure to anthropogenic sound, and recommend local to fine-scale behavioral studies to evaluate effects

4.e Is there some follow-on project from the BP-sound on-going effort (Clark, Suydam, Angliss)?

Appendix 3
REVISED DRAFT SOAR SCIENCE THEMES AND SAMPLE QUESTIONS

GOAL of SOAR = Cross-disciplinary science synthesis to support understanding of the marine ecosystem and forecasting of future states. Below are three over-arching science themes and potential science questions.

1. Ecosystem Response to Bottom-up and/or Top-down Forcing

- How are spatial (regional and local) and temporal (seasonal and inter-annual) variations in sea ice linked to primary production?
- How do primary production hotspots correspond to zooplankton, benthic, forage fish, and marine bird and mammal hotspots?
- What is the importance of advection, upwelling and eddies to lower trophic level (e.g. nutrients, primary production, zooplankton) and to pelagic predators (e.g. seabirds, bowheads, beluga, ringed seals)?
- How do benthic production hotspots correspond to benthic predators (e.g., eiders, walruses, bearded seals & gray whales) and can these benthic hotspots provide a framework to assess ecosystem heterogeneity and change?
- What is the importance of Arctic and saffron cod, and other forage fishes, in the system?
- How does pressure by top marine predators affect historic benthic hotspots?
- How can marine bird and mammal bioenergetics help inform population and ecosystem models and what data sets are required?
- How are stressors such as ocean acidification, contaminants, anthropogenic activity (transportation, oil and gas, commercial fishing, etc.), and habitat alteration (loss of sea ice, weather patterns, temperature, erosion) affecting the biological components of the marine ecosystem?
- How are changes in the marine ecosystem affecting subsistence resources and access to them?

2. Marine Birds, Mammals, and Fish as Ecosystem Sentinels

- How can combined track maps from satellite-tagged marine birds and mammals be used to identify hotspots and evaluate habitat partitioning among species?
- What can marine bird and mammal diet, body condition, health status, and abundance inform us about environmental change and variability?
- How do vital rates of marine birds and mammals change (age at first reproduction, growth rates, etc.) relative to environmental conditions?

- How can marine mammal distribution and relative abundance be used as a tool to identify and assess variability in benthic, pelagic, and subsistence hotspots?

- How can we link variability in relative abundance, distribution, species composition, and growth of fish to environmental conditions?

3. Acoustic Ecology

- What are the relative contributions of natural and anthropogenic sound sources to the cumulative sound field?

- How are sound fields changing with loss of sea ice, change in weather patterns, and extension of the open-water season?

- What are the temporal and spatial relationships between the distribution, behavior, and abundance of marine mammals and seismic surveys, drilling operations, and ship transits?

- What are the sampling capabilities and limitations from the existing grid of long-term recorders for describing and tracking change in the acoustic environment?

- What are the effects of shipping, drilling operations, and seismic activity on marine mammal and bird prey and the availability of subsistence resources to local communities?

Appendix 4
March SOAR Workshop Invitation

4 November 2011
Name
Affiliation

Dear XXX
We are pleased to invite you to a Science Workshop, to be held in **Anchorage, Alaska from 14-16 March 2012**, in support of the Synthesis of Arctic Research (SOAR) project, funded by the Bureau of Ocean Energy Management. The SOAR has the overarching goal of using available data, analytical and modeling approaches to identify and test hypotheses that cross scientific disciplines (http://www.arctic.noaa.gov/soar/). The geographic area is the Pacific Arctic, including the northern Bering, Chukchi and Beaufort seas, with time frames extending from days to decades. The three primary objectives of the project are to: (1) increase scientific understanding of the biophysical environment; (2) enhance capability to predict future conditions; and (3) effectively transmit findings of the synthesis to local residents, resource managers, science societies, and the general public.
A Science Steering Committee organized the workshop around three themes: (1) Ecosystem Response to Bottom-up and/or Top-down Forcing; (2) Marine Mammals as Ecosystem Sentinels; and (3) Acoustic Ecology. After plenary overview talks, we will break into working groups to identify analytical approaches and relevant data sets to address questions within each theme (see attached sample questions). We extend this invitation to you because of your expertise in (fill in as appropriate). With this in mind, we request that you bring examples of relevant information and be ready to join an Analytical Team. The goal for each team is to participate in an inter-disciplinary synthesis (or modeling) effort, with results finalized as a manuscript suitable for submission to a peer-reviewed journal. Some financial support will be available to each Analytical Team.
We are excited by this opportunity to bring together individuals to work toward a more coherent understanding of the Pacific Arctic marine ecosystem. We hope that you will join us in Anchorage next March. Travel support is available. **Please respond to this invitation by 11 November 2011 (1-week)**. If you would like additional information on the intended activities at the workshop, please contact either of us, or consult the web site for background on the SOAR project.
Thank you for considering this invitation and we hope to hear from you soon.

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