

Ocean and Plume Science and Management Forum
October 26, 2017
Northwest Power and Conservation Council
Ocean Forum meeting notes (*draft, December 20, 2017*)

Attendees: Guy Norman (Forum chair), Patty O’Toole, Erik Merrill, Nancy Leonard, Karl Weist, John Harrison, Kerry Berg, Kendall Farley, Stacy Horton, (NPCC), Brian Burke, Laurie Weitkamp, Kym Jacobson, Des Maynard, Regan McNatt, Cheryl Morgan, Elizabeth Daly, Jennifer Fisher, Kenneth Haimes, Mary Beth Rew (NWFSC), Brian Wells (SWFSC), Tim Copeland (IDFG), Erick Van Dyke, Art Martin (ODFW), Nicole Czarnomski, Mara Zimmerman, Todd Hilson, (WDFW), Michael Clark (USFWS), Lynne Krasnow, Paul Wagner, Ritchie Graves (NMFS), Anne Creason (BPA), Catherine Corbett (LCEP), Bill Bosch, Tom Iverson (Yakama Tribe), Joe Needoba (OHSU-PSU School of Public Health), Kate Myers (ISAB), Mike O’Bryant (Columbia Basin Bulletin), (NWFSC contractor), Bill Hall (Parametrix).

1. Chair Guy Norman welcomed everyone to the meeting and led a round of introductions.
2. Council staff reminded everyone about Forum’s [charter](#) and purpose. The charter expires at the end of 2017. The Forum discussed the benefits of continuing to meet and the benefits of having a charter for the Forum. Staff reminded the Forum that the 2014 Fish and Wildlife Program supports the efforts of the Forum to encourage coordination and communication between researchers and managers. Forum members expressed strong interest in continuing the Forum in the future, but did not believe that a charter was necessary in order to continue to meet. The group discussed and was in favor of meeting one to two times per year. The group discussed the biennial Columbia River Estuary Conference (CREC), held every-other May in Astoria. Beginning in 2014 the Conference has incorporated plume and nearshore ocean presentations and has served in a capacity to promote additional sharing of ocean and estuary information between researchers, managers and restoration practitioners. The next CREC is scheduled for May of 2018.
3. Council staff provided a summary of the last Ocean Forum meeting, held January 19, 2017. The theme of the meeting was “*Coupling between estuary and early ocean survival of salmonids – significance, mechanisms and opportunities*”. The meeting notes from the January meeting were reviewed and [approved](#) at today’s meeting.
4. Council staff updated Forum members on Fish and Wildlife Program activities. The Council’s 2017 Research Plan was finalized in June of this year and a review of research conducted under the Program will be initiated in the next year. Staff in the early stages of planning for the review.

The Council is due to begin a process to amend its Columbia River Fish and Wildlife Program in 2018. Staff noted that the Council follows specific steps outlined in the Northwest Power Act to amend the Program. This usually takes around 18 months start to finish and could begin as early as April, or in the following months. The basin's fish and wildlife managers have a key role in the amendment of the Council's Program, but there is broad participation by many entities and individuals.

The Forum, led by chair Guy Norman, spent a few minutes remembering the lives and contributions of [Bill Peterson and Bob Emmett](#), former researchers with the NOAA Northwest Fisheries Science Center who passed away recently after battles with cancer. Bill's contributions of improving our understanding of lower trophic levels in the California Current and the development of a stoplight chart of ocean conditions were highlighted and were referenced many times throughout the day. Bob's passionate work with sardines, anchovies, tuna and salmon was remembered. Bob was a force behind the Salmon Ocean Ecology meeting that remains at the core of coordination between ocean researchers from California, Oregon, Washington, Alaska and Canada. It was noted that this year's meeting will be held in Newport, Oregon at the end of February and is open to all.

5. Presentations for today's meetings:
 - a. Density dependence:
 - i. [Status of Habitat Availability, Reserve System in the Lower Columbia River](#), Catherine Corbett (LCEP)

Catherine began by describing the National Estuary Program, projects completed to date, habitat lost since 1870s and quantifiable conservation targets. She then compared historic and present acreages for land cover types and identified where the most habitat has been lost and what land use looks like today. Using this information, they determined priority reaches for restoration and protection. For all geomorphic reaches, achieving the targets will recover an average of 60% of historic habitat.

Catherine also described a related question under evaluation, are juvenile salmon in the lower Columbia food-limited? They are not finding that this is an issue in subyearling Chinook in emergent marsh habitat. Stomach contents consistently show active feeding. Catherine noted they are also trying to determine if some sites are better for feeding than others. This would help prioritize restoration efforts as well. One site (Franz Lake) is showing more empty stomachs. One question to consider: is this where fish get off the barge and have empty stomachs? Some work by PNNL is showing that that fish sampled at the John Day bypass system are showing emptier stomachs, also raising questions about food availability in the middle- Columbia where riparian habitat may be limited and there are a lot of hardened surfaces.

Paul Wagner observed that the Bill Muir study found full stomachs in the fish in the middle Columbia. Perhaps fish may lose their food in the bypass. They may have eaten, but not retained it. Also fish in the bypass system may not represent fish population overall.

Laurie Weitcamp commented that they sample surface plankton in the mainstem at Rooster Rock State Park and a few other sites, and she noted that the Rooster Rock site has twice as many organisms in it than the other sites. This seems different than the data from the emergent marsh habitat. Interesting that 80% are zooplankton, however juvenile salmon are not eating the zooplankton. They are swimming through it. Either they are not hungry or are looking for bigger prey.

Guy Norman asked for clarification on the progress towards the 60% goal for restored acres of habitat. Is that a steep hill to climb? Catherine reported that it will require an increase in rate of implementation over what has been historically done.

From 2000-2009 they restored about 60,000 acres (protection and restoration). The goal is no net loss of habitat and recover 220,000 acres to get to 60%. About 7000 acres from 2009 to now (not sure how much is protection vs restoration). Protection is key (no net loss) but also need restoration. These are aggressive targets.

Karl Weist asked, are the target areas recoverable for those types of habitats? Catherine noted that in some areas, they have a clear prescriptions for what is needed, but not for all, and the targets are within the current hydrological regime. An underlying complicating issue with climate change and sea level rise, some of these habitats will be converted to open water at some point, so also looking at habitat behind these areas that will be converted to marsh.

Art Martin asked have they seen any variability of life history being expressed, different than what you have seen in the past. Catherine indicated that they do see some different behaviors from time to time. Regan added that they don't see a lot of yearling life histories, mostly subyearling. Pit tags showing that larger fish from interior areas may go into their sampling areas at high tide, when they are not sampling. There may be a great diversity of life histories using these areas, but the arrays only catch fish that have a pit tag.

- ii. [Density Dependence, a data \(and thought\) exploration](#), Brian Burke (NWFSC) Brian noted that density dependence in the estuary was discussed at the last Forum meeting. Brian's presentation at today's meeting outlined considerations for thinking about density dependence in the estuary.

Brian outlined what depends on density: feeding/growth, movement/behavior/habitat use and survival. Brian also described a model for looking at these variables. The results of the model were inconclusive as it was not set up specifically to look at this issue. Differences in productivity, prey availability, predator density could be attributed to inter-annual differences. An independent estimate of food availability is needed to account for these effects directly.

Also, hatchery fish had less food in their stomach and were found in higher density, but could be due to differences in migration timing. Independent estimates of prey availability would be needed.

- iii. [Practical considerations for detecting density dependence in the Columbia River estuary](#), Laurie Weitkamp (NWFSC)

Laurie indicated that density dependence is not just about hatchery and wild salmon. Diet overlap, and limited prey availability leads to competition. Challenges exist when trying to determine diet overlap and prey availability, such as researchers need to know the diets of other fish, need to know where to sample prey and prey don't stay still. In addition, juvenile salmon are few compared to other fish species.

Another key question is where to sample prey when fish are actively migrating downstream. They move quickly and their diets and prey may change. Other fish species share the same prey as salmon. Shad also consume similar prey as salmon. Laurie noted that 4 million shad passed Bonneville Dam last year. That's a lot of fish using the estuary.

Laurie presented some ideas for better understanding the potential for density dependence in the estuary. It would be helpful to better understand prey dynamics in lower estuary including the diets of juvenile salmon migrating to the mouth of the river and looking at consumption rates in wetland habitats.

Modeling would be helpful to determine size of potential effects. Considerations include: estimated prey consumption by different groups of fish that eat common prey, biomass, environmental factors influencing prey availability and consumption, diets and abundance of likely non-salmonid competitors. Putting all of this together may be able to identify if bottlenecks exist.

Laurie indicated that at least two years of data would be needed, five would improve the confidence in the findings.

Brian reminded the group that there can be a lot of variability year to year or even in multiple years. He noted that the last 3 years the ocean has been completely different. He recommended more than three.

Guy Norman asked about salmon and shad. Do we understand the overlap in habitat? Laurie noted that they see four different ages of shad (younger) that reside in the estuary. They stay for at least 1 year. Their size is similar to salmon. Laurie indicated they don't know a lot about their diet, but there is a huge number in the estuary. Catherine Corbett made a similar observation about stickleback. She noted that Bob Emmett reported that they used to never catch stickleback years ago, but now they catch a huge number. It appears stickleback numbers have exploded. Limited information is showing they may be indirect competitors for food.

Nicole noted that diet and competition studies are really hard to do and suggested a look at how important this is in the range of all the things to look at. Laurie agreed and said that bioenergetic and life cycle models can be very helpful for this. If there are functions that can look at size and survival, it could help. Brian Burke noted that models can be helpful by putting bounds on what is considered related to density dependence.

[LUNCH BREAK]

- b. [Gone, but not forgotten: The blob and the ocean environment off of Washington and Oregon](#), Brian Burke (NWFSC)

Brian Burke presented information that shows that while the physical attributes of the blob have dissipated, the biological consequences lag behind and these are still present. Brian reviewed the ocean surveys that were conducted in the summer months, the physical processes in the coastal ocean, and salmon growth and survival.

Brian noted that there are a lot of dynamics happening in the ocean at different temporal scales. Often people only think about PDO, but that is just one metric. It is important to keep in mind all the various metrics – decadal, annual, sub-annual, and the 3-7 year trends.

In terms of the biological responses to ocean dynamics, copepod anomalies can tell us a lot about salmon survival. They represent the base of food chain and can tell us about the quality and quantity of food in the ocean. When the blob came on-shore in the fall of 2014, there was a dramatic shift in the copepod community. Changes in krill biomass was also observed and the pyrosome population exploded. He noted that they don't yet know the ecological impact of this shift.

In terms of salmon growth and survival, IGF sampling is showing some growth. When food is available, it appears the salmon are growing well.

Spring Chinook outmigrants were a little early in spring of 2017 (Bonneville) and the abundance in estuary was average. Food nearshore indicate ok conditions but in June sampling, researchers did not find the juvenile fish. 2017 was one of three lowest catches on record. The researchers hypothesize that there may have been a large predation event that took a lot of juvenile salmon after they left the estuary. Predators are not sampled. This was a shock and spurred the science center to notify the Regional Office of NMFS of the unusually low presence of juvenile salmon in the plume and nearshore ocean. In addition, stock composition was also different compared with more typical sampling.

Brian presented a modeler's view of how the ocean indicators could be expanded to include stock-specific analyses and to identify a subset of model variables for which there is data and which seem important to survival. This info will help improve forecasts. So far, when this has been tried in a few cases, the data fits the models really well, and resulted improved forecast accuracy in recent years.

Erick Van Dyke asked if the model is using only ecological factors. Can socio-economic factors be worked in? Examples might be spill operations, some water supply metric, or a flood control metric that could influence survival. Brian commented that they are working with pit tag data to insert this information into the life cycle model. Other influences such as what Erick described could be factored in, that's one of the benefits of the life cycle model.

Council staff asked for clarification in regards to the 2017 out-migrant survival concerns. Was it possible that the sampling just missed the fish? Brian indicated that usually there is a very regular migration pattern for yearling Chinook; they come out of the river and very quickly turn north, arriving in Alaska in June, July and August. Even if they were early, they would have been found there eventually. Laurie noted that there is also sampling in Alaska. So they were missed off the Columbia River, they still would be seen in off Alaska but researchers report that they did not see yearlings from the Columbia as well.

Brian concluded his presentation with a check of the stoplight chart for ocean indicators. Most are red for the last three years.

- c. [Potential indicators of habitat and water quality in the lower Columbia River, Joe Needoba](#) (OHSU-PSU School of Public Health)

Joe Needoba presented information noting anomalous ocean and watershed conditions in recent years. He compared 2014/15 to past years, looking at three similar years- 1997, 2001, 2005. Joe described sampling locations that included biogeochemical and physical habitat monitoring sites. Joe considered several variables including salinity, dissolved oxygen, temperature, upwelling, discharge. Joe reported an increase in hours of low DO in recent years. Brian suggested that it might be useful to take a look at PIT tag data. PIT tag data allows us to know exactly when the fish are at Bonneville dam. Modeling studies show that earlier migration seems better for fish. The more data that can correlate with fish data the better.

Bill Bosch asked is it possible that this year's low juvenile abundance could be related to an anoxic event? Do you have that data? Catherine observed that there has been low dissolved oxygen (DO) off the shelf. There has been a big hypoxic event off the coast. Joe indicated that low DO from upwelling does enter the estuary. Brian added that they don't have the spatial or temporal sampling to determine exactly what happened.

Catherine asked if Laurie's sampling in the estuary is going to continue. She noted that this sampling was key to catching this possible mortality event (low survival between estuary and ocean). Without that we would not know if or where there could be a problem.

Laurie replied that the challenge is funding. The Corps funding for this estuary work is gone.

- d. Use of status and trend information:

i. [Forecasting Natural Coho Run Size for the Lower Columbia River Tributaries, Washington State](#), Mara Zimmerman (WDFW)

Mara Zimmerman described the approach to wild coho forecasts for Washington state and the lower Columbia River component. Coho salmon forecasts are generally based on the Oregon Production Index (OPI) and based on California, Oregon and Washington populations but heavily influenced on survival of hatchery coho in Columbia River populations. The annual coho forecast, prepared by the Oregon production index technical team is based on jack returns.

Recovery of natural coho pop increasingly focused on lower Columbia River, more than it was historically. The OPI is heavily hatchery influenced as hatchery fish outnumber natural fish in the lower Columbia River, 20:1. Models that focus on hatchery fish swamp out natural fish in the lower river and do not perform as well for natural coho. The jack-adult return relationship varies widely over time.

Forecasts for natural coho utilize an abundance estimate for smolts and factor in marine survival. Annual smolt production is calculated for some streams using either complete counts or mark-recapture estimates and are expanded to others streams.

Jack prediction not proven helpful for natural coho forecasts. Ocean ecosystem indicators from the NWFSC have been enormously valuable and helpful for putting together forecasts for the state of Washington. These indicators are also used to forecast wild coho on Washington coast.

Eleven individual variables are correlated with marine survival and considered during forecasting. Length of upwelling and sea surface temperature appear to be key predictors for coho.

ii. [Preliminary efforts to forecast Lower Columbia River Chum Salmon, Todd Hilson](#) (WDFW)

Todd presented information regarding forecasting for lower river chum. Todd noted that these forecasts are not harvest based, as all fisheries are closed for chum. The objective for the forecast is for conservation actions. The forecasts are utilized to make annual adjustments to the type and magnitude of supplementation, enhancement or captive broodstock programs. They are also used for status and trend monitoring to meet NOAA guidelines on a fixed budget.

For chum, the current working hypothesis is that early marine survival explains most of the variability in ocean survival.

WDFW is interested in whether ecosystem indicators could be used to forecast adult chum salmon returns. Preliminary analysis suggests that lower Columbia River chum salmon SRS are correlated with ocean ecosystem indicators. More work is needed to explore if specific ocean ecosystem indicators can improve prediction of hatchery and

natural origin chum salmon SARS. Todd noted that WDFW will explore adding Columbia River estuary ecosystem indicators to the analysis. Todd noted that the 2014-15 brood year survival for chum looks very poor.

Brian Burke noted that the data fit to survival looks good, and asked if Todd has tried to predict any years to see if it holds up? Todd replied not yet, but they intend to. They are just starting to work with this information. Todd also noted that they are working on a life cycle model for Columbia River chum. Laurie Weitkamp noted they do catch some chum in their sampling in the estuary.

Brian Burke posed a question to the group. When they consider updating the stop light chart they are aware that people are using it, so they are reluctant to change it. How would changes affect what you do? Brian noted they have other indicators that are not included in the chart. Initially these did not seem related to survival, but now they are seeing some indication that they might be related. They could maintain as it is, but there is additional information they could provide.

Mara indicated that she looks at multiple indicators. Two seem really important but she considers many. Mara said she would appreciate any that you think are relevant. Brian also noted that there may some current indicators on the chart that are less relevant, but they are reluctant to remove them, in case someone is using them. The group pondered the question. From the short discussion, everyone seemed to indicate that the most important thing is making the information as good as possible.

iii. [IDFG Public and Policy Communication](#), Tim Copeland (IDFG)

Tim Copeland presented some policy perspectives on how he uses the ocean ecosystem indicators information.

This year fish (and in particular, steelhead) returns were lower than expected and came in under the forecasted size. Tim noted that he needed an explanation for both the public and for policy boards. Based on the low returns, he needed to explain in-season management changes. They looked at three basic things: 1) outmigration survival, 2) outmigration conditions and 3) ocean conditions. The first two were unremarkable so Tim focused on the third – ocean conditions. He noted that for the non-technical audience, the stoplight chart was very valuable. He told the public, to not focus too much on the detail, but to look at the simple colors. The public could see very easily that ocean conditions were poor for the last couple of year. Tim also considered and utilized the copepod data to tell the story of what conditions the fish faced in the ocean. Without connection to this information, it would have been much tougher to tell the story. A big part of his work is to set expectations and the ocean indicator information helps in that task.

Tim noted that it is important that this info be timely. He said that by May it was apparent that fish were not showing up as expected, so they were looking for

explanations. In terms of taking any particular management action, uncertainty is a concern. What if it is wrong? Why were fall Chinook not as bad?

Council staff asked how people responded. Was the information convincing? Tim noted that it works great as an overall message. He noted that it is easy for the non-technical people to get mixed up in the details.

Brian Burke reminded the group that the stoplight chart represents different things for different fish. Until those differences are understood better, a general look is probably best. Steelhead are different from Chinook. The stoplight chart represents coastal conditions. Steelhead don't stay in these areas, they head out farther off so these may not be the best indicators for steelhead. But the chart can generally give a sense of what's going on in the ocean.

Laurie Weitkamp thought that a primer of life history of various fish might help. They could include basic information on the website that explains the difference in what various salmon eat and where they go.

Ritchie Graves commented that there is a tendency for the public to think the ocean is just one big homogenous pasture. The more we can explain the dynamics, the better. Brian Wells agreed. Digging into mechanisms will allow better communications. It will also explain variations over time in an understandable framework.

Council staff asked how quickly managers can adjust their actions based on information. Since there is a lot of red on the chart, and there are concerns about possibly poor outmigrant survival this year, are there responsive actions being considered for next year? Does this information trigger any management changes?

Paul Wagner commented that it's good to have this information, but it would also be nice to know its right. Uncertainty, as mentioned earlier, remains a concern. For example, jack counts look ok. Might be bad, but not so bad. Paul stated that we should not lean too heavily on any one piece of information.

Ritchie Graves added that NMFS considers four year running abundance and the rate of decline in the adaptive management plan for the 2008 Biological Opinion. They check this annually, based on information from Idaho, Washington and Yakima. If the 4-year mean were to fall below 10%, it would trigger additional discussion about further protective measures.

Guy Norman noted that it seems like one of the benefits of the ocean ecosystem indicators is early warning. It allows more time to work through the issues and look at protective actions. Ritchie agreed. It can get these conversations going earlier.

Ritchie added that it is really good to be improving our understanding of this information. Even though we don't fully understand everything, understanding the mechanics is very important. A lot of progress has been made in the last 10-15 years.

Guy commented that when you look at investments for salmon survival, a better understanding of what we are trying to evaluate, better understanding of what is going on in ocean portion of life cycle is very important. These discussion and information exchanges are very important.

In concluding discussion, the group indicated interest in continuing to meet. Staff reminded the group that the Columbia River Estuary Conference will be in May of 2018. NWFSC staff suggested that the conference be held at a time when ocean and estuary researchers can attend. There tends to be conflicts with sampling and low tides. Catherine said she would consider those issues when the conference date is finalized.

One idea for a future forum meeting would be to have an update from the Southwest Fisheries Science Center to compare and contrast with what the NWFSC is doing. Brian Wells indicated he would be happy to participate.

Lynne Krasnow asked if the forum might consider the topic of prey-switching. Brian indicated that avian predation is one area where that may be occurring.

Catherine noted that it would be great to have more participation from inland fish managers in the estuary conference. The information presented could be valuable to those managers as well. The idea was raised of having a meeting further upriver. Staff concluded by saying all of these ideas will be considered.

Guy thanked everyone and closed the meeting.

[end]

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