Jameal Samhouri - NOAA Federal <jameal.samhouri@noaa.gov>

Re: OCNMS otter-invert-kelp manuscript

1 message

Jameal Samhouri - NOAA Federal <jameal.samhouri@noaa.gov> Thu, Feb 1, 2018 at 3:10 PM
To: "BERRY, HELEN (DNR)" <HELEN.BERRY@dnr.wa.gov>
Cc: Ole Shelton <ole.shelton@noaa.gov>

Hi Helen,
Just catching up here, but I echo Ole's thank you for your very thoughtful responses.

As Ole said we are very interested in the interplay between understory and canopy-forming kelps. My sense is that we have enough here for a first manuscript in terms of analysis, but that it will be really important to follow up with a second paper that digs into the spatial patterning and ecological interactions within the benthic community as well. For now, I would suggest we add some text to the Discussion about the potential importance of the canopy-understory kelp interactions.

We'd be happy to share the understory data we have with you at any point, so just let us know if you'd like a peek. We count stipes >30cm for Nereo and Pterygophora, and >1m for Macro. We count all plants for the other browns (Alaria, Costaria, C. triplicata, Desmerastias, Pleurophycus, Saccharina, etc). We also conduct uniform point contact surveys (1 data point per m per 30m transect), and record any algae that happens to fall on the transects (in broad tax. groups) as well.

I am super appreciative of the context you have provided regarding sea urchin dynamics, drivers of kelp variability, and thoughts about potential sea otter thresholds. All of these topics will really enrich the paper.

I hope we can connect when I come down to give a seminar at WDFW on Feb 12th. Will you be around?

Best,
Jameal

On Wed, Jan 24, 2018 at 12:37 PM, BERRY, HELEN (DNR) <HELEN.BERRY@dnr.wa.gov> wrote:

> Hi Ole,
>
> Sorry for the delayed response, I was out of town. Meanwhile, you may have been ‘shut down’, sorry about that mess.
>
> I’m excited to hear that you could potentially add some data/discussion of the urchin fishery and understory algae. That would really enrich the ms for those who are familiar with local history and/or otter-urchin-algae literature. I’ve added more comments below.
>
> Again, it’s great to see the DNR kelp data used,
>
> Helen
>
> **From:** Ole Shelton [mailto:ole.shelton@noaa.gov]
> **Sent:** Friday, January 19, 2018 1:12 PM
> **To:** BERRY, HELEN (DNR) <HELEN.BERRY@dnr.wa.gov>
> **Cc:** Jameal Samhouri <jameal.samhouri@noaa.gov>
> **Subject:** Re: OCNMS otter-invert-kelp manuscript
>
> Hi Helen. Thanks much for taking the time to look through it and give such thoughtful comments.
>
> On the interactions with urchin fisheries. I suspect urchin fisheries may be contributing some to the pattern for Neah Bay, but I don't think it's driving the patterns. Like you, I have never seen the urchin harvest data broken down by area.

I do know that urchin harvest closed in district 5 in 1995 and hasn't reopened, so the question is if fisheries had a large effect before 1995. Tatoosh had pretty substantial densities of urchins in the Kvitek 1995 surveys (in fact that's the only spot urchins were really abundant that year) so I don't think the declines there were driven by divers. The Kvitek densities from 1987 do contrast two areas in Neah Bay - one in a harvested area and one in an unharvested area. The difference between the two spots is about a 50% decline in density. If we assume that is due entirely to sea otter driven differences, that's a substantial decline, but not anywhere near the rate of decline for some of the outer coast sites. I suspect that urchin divers just aren't as efficient as otters and they give up diving when urchins fall below a certain density. But it certainly is an interesting idea for thinking about drivers of kelp and synchrony among different areas of the coast.

These are really interesting observations. For the many local people who are aware of the fishery history, adding this discussion would address a potential contributing factor and make it more complete. Perhaps no additional figures would be needed - is the difference in urchin densities at the northern sites visible in fig 7a? (I couldn't differentiate the lines because no legend). Basic summary harvest data from your current references seems sufficient - Laidre and Jameson 2006 mentioned a peak of 1.6 million pounds in 1987-88, referenced to Kvitek et al 1989. Fishery was closed in 1995.

The Northern region stands out due to the really low otter abundance throughout the study period (visible in figure 5) and stable kelp cv. In addition to the potential fishery driver, there is a broader question about whether the western strait doesn't support otters for some other reason – habitat limitations? Prey limitations? Lower exposure? Human disturbance? I think this is worth noting, although more discussion is beyond the scope of this ms. You discuss the potential relationship between exposure and CV at Neah Bay (line 438). Cavanaugh found that, in more protected areas, temp drove kelp abundance more than wave energy. Neah Bay is a unique place in that it is somewhat protected from exposure extremes and the temp is relatively stable due to oceanographic factors (mixing). That might explain low cv.

On the role of other environmental drivers of kelp and spatial similarities. We thought about exploring this some but felt like the Pfister et al. 2017 paper had worked on that and we didn't really feel like we had much to add on that front. The other main problem we had was that the otter-kelp correlation occurs among sites within the outer coast and we didn't really have reasonable covariates (beyond exposure) that varied among our sites; PDO and other ocean indices are all annual and identical among the sites. I do agree that in most places urchins are below densities needed to suppress kelp.... though in our surveys in 2015 and 2016 we did find some places with substantial urchin densities in the north. So maybe that is changing.

I'm not sure I'm following all of your points, but I'm wondering if it's reasonable to increase the focus on the distinct local trends on the coast in otters and kelp (rather than consider broad similarities in kelp abundance over time in the eastern strait, I understand the complexity of factoring in a completely different area). For example, the unique pattern of steady otter increase in Southern in the second time period corresponds to substantially higher kelp abundance relative to the OCNMS-wide average during that period (fig 2c). Could the increasing otter population in Southern have decreased the influence of other drivers that led to lower relative kelp abundance in other regions during that period?

Also, are there thresholds in total numbers of otters that could be related to kelp abundance patterns? Looking at average number of otters in alt. fig 5, the number of otters was higher at all Central sites (vs Southern) in the first time period and then flat in the second time period, while Southern abundances were all lower then all increased markedly.

I would like to compare these different Southern/Central otter/kelp patterns with inverts but I can't get much detail from fig 6 (differences between regions swamped by years) and fig. 7 (missing legend).

I have wondered a little bit about trying to do some more fine-grained spatial analysis on the kelp data to see if the data supports breaking three big areas (coastal, western strait, eastern strait) into some larger number of smaller areas. Maybe a finer grain would provide more insight in the drivers of patterns?

Yes, I think there are many distinct drivers in distinct areas over distinct time periods (so many analysis opportunities). We're looking at one of the obvious ones now: Elwha dam removal. The canopy nearby disappeared when dam removal started, then recovered.

We've chatted amongst ourselves about the effects of annual Nereo vs. perennial Macro. The mix of species must matter with respect to long-term growth and variability, but I don't have any guess for how big a deal this would be.

Finally, other algae - We do have other algae information from 2015-2017. The best information is from 2015 (we changed our surveys a bit in the last two years - moving from 10 sites to 5) but we have info on % benthic cover and the undercanopy browns (namely Pterogophera). We thought about including it in the paper but haven't really looked at it closely yet. It's on the list to try and work up in the near-ish future. We'd be happy to share that info whenever.

I'm thrilled to hear that you have understory algae data from the same survey year as the invert data! What does it look like? Might you include it in a format similar to figure 7 for a few general categories, such as in Kvitek? I think this is a important piece to include in order to account for known interannual variation in algal species. It wouldn't need to be a major portion of the analysis. I'm betting it will show an overall pattern and a lot of variation, which would support Watson and Estes. Or if it disrupts the flow of the ms, perhaps as supplementary information.

Best

Ole

On Fri, Jan 19, 2018 at 7:02 AM, BERRY, HELEN (DNR) <HELEN.BERRY@dnr.wa.gov> wrote:

> Hi Ole and Jameal,
>
> I thoroughly enjoyed reading your ms, it's fascinating. I'm happy to help in an way. Being a co-author would be great – to acknowledge the role DNR played in producing the kelp data.
>
> I've attached the ms with a few specific comments. I also have three general comments, which I will try to keep short:
>
> The urchin fishery played an important role in the Northern region in the 80s and early 90s. The timing of peak urchin fishery landings overlap with otter expansion (for example, figure below from Andrew et al 2002 https://eprints.utas.edu.au/1255/1/Andrew_et_al_2002.pdf). I've never seen landings broken down by district, but I have heard that the District 5 landings were high. Laidre and Jameson 2006 mention a peak of 1.6 million pounds in 1987-88 (referenced to Kvitek et al 1989). Could some of the patterns for North in figs 2,4,5 be related to this factor?

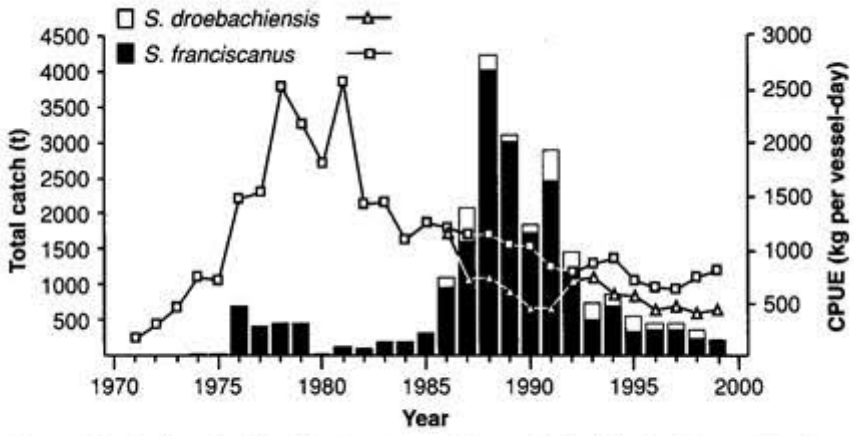

Figure 24 Total catch (t, bars) and catch rate (kg vessel-day^{-1}, lines) of sea urchins from Washington (USA).

The ms thoroughly presents the evidence that otters have transformed the outer coast nearshore and concludes that otters and kelp were coupled in the first time period then decoupled. Yet, the pattern of kelp canopy abundance over time is similar along the eastern strait where there have never been otters (easy to see in fig 2 in Pfister et al 2017). This brings into question what's driving the correlation between otter increases and kelp increases through 2000. (It's also similar along the western strait, which may be attributed to otters to some degree.) I've been wondering about this paradox for 20 years, and I attribute it to: 1) climate (especially the peaks and troughs occur during climate extremes); and 2) the urchin fishery along the strait. Urchin densities continue to be quite low along the strait (based on my conversations with Hank Carson, WDFW). I wonder if the densities there are comparable to the densities on the outer coast and/ or are below a threshold of 'urchin dominated' (they seem to be, in rough comparison to Watson and Estes). The ultimate shift could be toward 'algae dominated' despite the difference between predators (otters on coast vs humans on strait, with overlap in western strait). And 3) perhaps, the dynamics of the annual species (Nereo) plays a role because it drives the large swings in abundance throughout the study area and is the only canopy-forming species in the eastern strait (also visualized in fig 2 of Pfister et al 2017).

For me, the major limitation of the kelp canopy data is that it only tells part of the story wrt algal abundance. Watson and Estes (2011) documented the interaction among algal species thoroughly (and also showed that there can be little algae in some years during 'algae abundant' phase states, which is helpful to interpreting our data.) The Kvitek reports seem to be basically similar, in that the algae data is messy and there's a general shift from corallines to fleshy reds and browns. Did you record algae information in 2015? I'm hoping that understory algae information from benthic surveys can provide insight into abundance of non-floating canopy algae (the rest of the story).

I'm happy to talk about any-and-all of this more. Thanks again,

Helen

From: Ole Shelton [mailto:ole.shelton@noaa.gov]
Sent: Thursday, January 11, 2018 1:22 PM
To: BERRY, HELEN (DNR) <HELEN.BERRY@dnr.wa.gov>
Cc: Jameal Samhouri <jameal.samhouri@noaa.gov>
Subject: OCNMS otter-invert-kelp manuscript

Hi Helen. I know you've emailed over the past month or so with Jameal Samhouri and Blake Feist here at the NWFSC about the kelp database DNR maintains. We have been working on a manuscript

linking the available DNR kelp data, sea otter data, and invertebrate data from Kvitek's surveys and our own SCUBA surveys in recent years (a mostly complete draft of the manuscript is attached). We use the data extensively in the attached manuscript and, if you have interest and time, would appreciate any comments you might have on it. I know that it takes a lot of effort and time to produce the data and maintain the kelp database, and we would like to acknowledge that - so if you think it would be appropriate we'd be happy to have you consider being a co-author.

We're hoping to get this manuscript submitted within the next month or so but we understand you are busy, so if you won't have time to get comments back in the next few weeks, just let me know.

Additionally, I wanted to say that the kelp monitoring data set is an amazing resource and to say thanks for all your work on it.

Finally, I also know that you've worked recently with Cathy Pfister on that Journal of Ecology paper that came our recently. Cathy was my PhD advisor and I'm really happy to see that kelp information come out in an interesting paper.

Thanks and please let me know if you have any questions.

Ole Shelton

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