

Q & A – Kelping the Sea Webinar
May 16, 2018

- 1 What is the average depth of kelp farm site? How did you choose 3m depth for the kelp long lines? (Brittney Honisch; bhonisch@bigelow.org) Answered during broadcast - at the shallow (shore) side of the site the depth is about 35' and the deep side about 70', relative to MLLW. We picked 3M depth based on prior research for optimal depth for growing sugar kelp. In fact, I believe we will need to be able to move the lines higher in the water column to take advantage of more light as we see phytoplankton blooms restricting light to depth after about April 1.
- 2 How long were your spools in nursery conditions (Brittney Honisch; bhonisch@bigelow.org) In this design, there are 17 lines in each half of the hectare - each line is about 250' long (per half) - so a total of 68 spools were deployed to fill out the hectare (2.47 acre).
- 3 How did you decide on sugar kelp as your crop of choice? (Tom Mumford; tom@marineagronomics.com) Sugar kelp is the most popular species grown for human consumption here in the US - so this is an economic decision, though growing reds like dulse or porphyra along with sugar kelp would be feasible and enable year round crop rotations. Bull kelp (another brown) could also be grown in association with sugar kelp as it would likely occupy a different part of the water column, though shading of the sugar kelp could become a factor if there was a bull kelp canopy growing above it.
- 4 In the area you're using (1 hect.), what is the annual yield of sugar kelp (wet weight)? (Diane Kim; dianekim@usc.edu) This is actually a good question that we have not completely answered as of yet. We estimated that up to 19.4 mt (wet) was present at maximal biomass in 2017 before it began to erode. Ideally we will harvest kelp for food as it reaches optimal quality - but this would occur before it reached maximal biomass because of fouling and other quality focused issues.
- 5 What models did you use to approximate storm information, the maximum fetch, wave height and period? Are they publicly available or did you create them? (Rae Fuhrman; rfuhrman@bren.ucsb.edu). We used the Puget Sound Atlas for information on storm wind fetch and direction, mainly. I have also worked on Hood Canal for the last 25 years and have a pretty good sense of what is needed in terms of gear - though with CC, perhaps all bets are off for the future. If you wish to delve further into this question, please email me!
- 6 Are there any limitations in scaling up? (Nina Bednarsek; nina.bednarsek@noaa.gov). Great question. The major impediment to scaling up will be permitting and social license for creating larger kelp farms. What effects we see associated with

carbonate chemistry changes in seawater passing through the farm is the primary question we are trying to answer - along with developing the model that can hopefully be predictive and help estimate what effects we might see elsewhere.

- 7 What is a rough off-the-shelf coast of oceanographic monitoring buoys? (Brian Delay; brian.delay@gmail.com). This is a great question for UW/PMEL partners. Perhaps John Mickett (UW-APL) can best answer this.
- 8 Are there any major diseases that kelp farmers worry about? (Karl Owen; everetowen@gmail.com). None that I am aware of. Tom Mumford would be a good person to ask about this.
- 9 Would it be beneficial to the kelp farm to border the fields with other species of kelp that would not be harvested? Much like how some farms leave a strip of native grasses between fields? (Karl Owen; everetowen@gmail.com). This is a great question. In my view, yes as long as the overall flux of seston in seawater through the farm is not impacted (if you are trying to also grow shellfish). In my view, the optimal design would have a perimeter zone of kelp that would not be harvested and simply serve as habitat and mechanism for connectivity to the nearshore (if the farm was located just offshore). In this case, the perimeter kelp would grow in the winter and spring and then die off naturally in the summer - releasing the accumulated carbon and nitrogen, etc. in the process.
- 10 With wild kelp populations increasingly diminishing, do you anticipate climate change affecting productivity of kelp farms? (Tari Gunstone; tarigunstone@gmail.com) I don't know as the evidence is a little mixed on CC and seaweed productivity. The kelp we plant out does really well at this site. The lack of recruitment of kelp, especially bull kelp in many PS locations is likely related to other issues.
- 11 What salinity was the water at the kelp farm? What is the minimum salinity? (Franchesca Perez; fperez@stillaguamish.com) The salinity at the Hood Head site is pretty stable at about 28-30 PSI
- 12 Is there an energy or other reason to focus on kelp rather than other macroalgae (e.g. Sargassum)? (Alyson Myers; alysonmyers1@gmail.com). We are focusing on sugar kelp as the most obvious species to grow for economic reasons. Tom Mumford (see email above) would be a great person to consult on that question as well.
- 13 How do you limit bycatch? (Alyson Myers; alysonmyers1@gmail.com) We have harvested so little kelp at this point (other than for the research effort to estimate productivity and biomass) that I cannot

answer this question as of yet.

- 14 Per RCW 79.135.410, "commercial harvesting of seaweed from state-owned aquatic lands, and all privately owned tidelands is prohibited: in the state of Washington. I'd like to start a kelp farm in WA and sell it as food. How do we go about legalizing it? (Joe Stephanson; digits@uw.edu) The prohibition of harvest pertains to wild (e.g. naturally occurring) seaweeds - what we are growing was produced in a lab - from wild kelp sorus -and grown on a DNR leased farm, so the prohibition does not seem to apply here.
- 15 Are there any potential environmental impacts that kelp might pose? For example, does frequently removing the kelp forests for harvest influence habitat fragmentation? (Tari Gunstone; tarigunstone@gmail.com) I have thought a lot about this question. I think site selection will be very important to reduce the potential for habitat fragmentation. At the site we are working, there is some native kelp and we have seen some natural recruitment of kelp as well.
- 16 How have marine mammal entanglement concerns been addressed in Puget Sound? (Brian Delay; brian.delay@gmail.com). To my knowledge, these potential impacts have not been addressed but are very important of course to consider. Design of growlines to avoid entanglement will be very important.

How does one deal with biofouling, both on the lines and the kelp itself, on a commercial kelp operations? (Alex Mitchell-Morton; alexmm93@gmail.com). Biofouling is a serious consideration and a driver for how we will manage the kelp for commercial harvest down the road. I believe that at this site we will want to have the sporophytes in the water no later than December 1 and have the harvest completed by the end of April - at the latest for best quality