Plenary: Regional Impacts of Fortune and Favor

*What aspects of this scenario are particularly relevant for **Washington**?*

*What parts of fishing or specific communities in **Washington** might be most affected by developments in this scenario?*

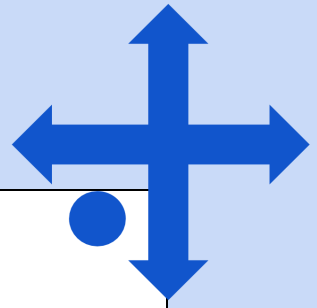
*What specific storylines could you imagine happening in this scenario in **Washington**?*

- WA will benefit from increased access/opportunities from tuna fisheries
- Fishermen are flexible (business operations, target species); as long as there's something to fish for out there fishermen will take advantage of it. Fishermen will move around as needed.
- There may be some fishermen that will be able to pursue fish, others that won't.
- More localized markets, whiting focused on international markets will have to shift product forms to adapt to local markets (e.g., shift from surimi to more fillet product forms); shoreside does a lot of h&g, interesting to think about what changes would be needed in those product forms
- Impact on Idaho related to salmon, these fish can't move further north because they are evolved for migration to Idaho. People will shift to other recreational fisheries but may be looser connection to PFMC managed stocks for Idaho.
- Salmon stocks are a cultural icon for Tribal communities and may be maintained in this scenario, a positive. It will allow Tribes to maintain an important part of their economic base. But Tribes will have to adapt within the constraints of their usual and accustomed fishing areas.
- With harsh economic conditions, it will be difficult to mobilize a workforce for processing. Also, it can be difficult to find workers if there is competition from other sectors for employment.
- Even now WA is struggling with HABs and under this scenario that could get worse.
- Some species will have a hard time thriving so we won't be able to depend on them for harvest; how will fisheries adapt?
- With northerly distribution shifts, recreational fishing (and commercial) opportunity off the WA coast will contend even more with mixed stock management. This will make adaptation more difficult.
- Under this scenario stock status will be similar to today but we will see changes in human behavior/aspirations as we've seen during this pandemic. For example, recreational boat sales were huge in 2020. With a shift to local and

DIY we could see a lot more involvement in recreational fisheries, with a focus on fishing for food. This could put more pressure on a resource that may not increase abundance significantly.

- More favorable conditions could ease conflicts between fisheries and protected species (like recent Council action on SRKW).
- There may be salmon fisheries under this scenario but given we're struggling to maintain Puget Sound fisheries we might expect serious problems under other scenarios.
- Greater collaboration could make us more effective in managing/conserving natural resources.

Plenary: Regional Impacts of Blue Revolution



*What aspects of this scenario are particularly relevant for **Washington**?*

*What parts of fishing or specific communities in **Washington** might be most affected by developments in this scenario?*

*What specific storylines could you imagine happening in this scenario in **Washington**?*

- Growing interest in mariculture. seaweed production in Washington. Unclear if it will result in marine space conflicts
- Saw a situation like this in the late 70s/80s. The attitude was fishermen could switch over to servicing other offshore operations, which runs counter to the ethos of most fishermen. It's likely these attitudes will arise again in this scenario -- fishermen are unlikely to transition to a role servicing offshore facilities.
- Tribes have limited areas to exercise treaty rights in the ocean (U&As) so that imposes a big constraint on adaptation in the face of increased competition for ocean space.
- Like Fortune and Favor, wild salmon populations are likely to decline and all fishery sectors are likely to become more dependent on hatchery production. So their fate will rest in the hands of those who set hatchery policy.
- Shellfish aquaculture is a big source of revenue in Washington; with OA success will depend on shellfish hatchery technology.
- Siting decisions for offshore facilities could differentially affect fishery sectors. [Potential for legal/regulatory processes affecting siting and relationship between marine use sectors. Conflict and hostility possible.] Adding that on top of climate change could be a make or break for a lot of fishery operations.
- Certain conservation interests might value offshore energy platforms as de facto MPAs where fishing would be prohibited; a positive could be due to spillover effects.
- [Spatial data crucial to decisionmaking in this scenario.]
- Marine uses could affect survey designs and related indexing in stock assessments.
- From SAS, we hear concern about offshore wind conflicting with fishing operations; aquaculture competing with wild caught fish. Salmon migrate up and down the coast, targeting them would be complicated if areas are taken up by other uses.

- A plus would be employment in coastal communities in support roles for offshore facilities (even if ownership is distant), which could offset potential employment losses in fisheries.
- We don't have the policy framework for managing these potential spatial conflicts nationally or regionally. This creates uncertainty about policy and will likely be addressed nationally/federally with risk of poor fit to local conditions.
- Specific to Washington, treaty U&As and national marine sanctuaries are mechanism for resource protection; in conjunction with strengthing of marine spatial plan, that will mitigate potential conflicts with energy development and similar uses.
- Potential impact on bycatch/bycatch avoidance due to range compression. The more spatially constrained fishermen are, the harder to avoid bycatch species (from whales to overfished stocks).
- Commercial fishery adaptation with local/niche marketing/markets, are there particular challenges in Washington to doing this?
- CSAs in collaboration with Tribes could be a benefit.

Plenary: Regional Impacts of Hollowed Out

*What aspects of this scenario are particularly relevant for **Washington**?*

*What parts of fishing or specific communities in **Washington** might be most affected by developments in this scenario?*

*What specific storylines could you imagine happening in this scenario in **Washington**?*

- Stocks that do okay such as small pelagics or squid are also important forage for top level predators; concern about the effects could further constrain harvest on these species, especially during periods of low abundance.
- This scenario would be the death of many fishing communities
- Anybody fishing on mixed stocks will face serious challenges and there will be a need for improved bycatch mitigation technologies when trying to focus on abundant stocks
- PFMC uses weak stock management for salmon; you will see more and more weak stocks, to the point it won't be possible to fish for salmon without impacting weak stocks. Do you stop fishing? Figure out main sources of man made mortality (other than fishing) that can be addressed?
- We should be concerned about the long lasting impacts on important species; we will have to focus on mitigating impacts within our control/authority (we can't directly influence global GhG emissions policy).
- Will large fishery firms be able to continue to operate (per scenario description)? Seems unlikely.
- May have more conflict with Canada in management of transboundary stocks, especially those where distribution is not primarily in US waters.
- State managed stocks (e.g. D. crab) will be seriously challenged resulting in less of a safety net for PFMC/federal management. On the other hand some of those impacts are predictable so we can prepare for them.
- HAB events could make beaches inhospitable. [Impact on coastal communities, tourism.]
- Safety of sea concerns when harvesters try to capitalize on sporadic availability during severe weather (more common off Washington coast).

Plenary: Regional Impacts of Box of Chocolates

*What aspects of this scenario are particularly relevant for **Washington**?*

*What parts of fishing or specific communities in **Washington** might be most affected by developments in this scenario?*

*What specific storylines could you imagine happening in this scenario in **Washington**?*

- HABs and warm water events impact D. crab fishery.
- Range compression of whales during warm water events and D. crab fishery conflicts
- Mitigation opportunities relative to reducing buoy lines on fixed gear.
- Profound impacts on salmon stocks such that only the strongest stocks will survive. Highly variable conditions are the “death of thousand cuts” for many salmon stocks.
- Bycatch will be the biggest issue during boom and bust cycles; a current example is the recent year class of sablefish impacting other groundfish fisheries.
- More economic considerations in setting catch limits such as to avoid flooding the market and depressing prices. Do we have the information to make decisions this way? Stock assessment methods can forecast but considering economic effects may take new approaches.
- Example of 1982 El Nino, when salmon fishing didn’t see any feed and the salmon were emaciated.. But just a couple years we saw one of the biggest biomasses of silver salmon seen in years. It was a similar situation with crab in 1983 in terms of experiencing boom and bust. From a management perspective we have to be careful not to overreact and recognize that fishermen are prepared to adapt to changing conditions.
- Opportunities may present themselves due to failures elsewhere. This may require more coordination between fisherman and processors to quickly shift between products and markets.
- The variability in this scenario will necessitate managers being more flexible both inseason and between years.
- Research in gear technology/bycatch mitigation will be important and needs adequate funding.
- Bycatch technology (eg, avoidance) and management measures (innovations like risk pools) will be important to deal with high variability in this scenario.

Breakout 1: Implications for communities in Washington

Facilitator: Rich Lincoln
Notetaker: Jameal Samhouri
Date: 20 January 2021
Participants: Rich, Jameal, Yvonne dR, Dan H, Sunny J, Jenny W, Richard S, Karma N

- It's ok if our conversation raises unanswered questions, as we are not a full cross-section of WA fishing communities

For each scenario:

1. *What will communities in Washington be most concerned about?*
2. *What's happening that provides a potential upside for communities in Washington?*

Fortune and Favor

Question 1: *What will communities in Washington be most concerned about? (immediate challenges and opportunities)*

- Balance between people historically engaged in fishing / maritime efforts and whether that will shift to include people who want to be near the coast but may hold different value sets and do not necessarily participate in fisheries
- Potential for completely different oceanside community (from fishermen to people with fortunes)? Turnover to folks with less concern for fisheries.
- Fewest changes from marine system and in terms of fisheries in this scenario, things that will concern communities may not originate from marine environments but rather from larger social/political/economic conditions (eg, gentrification, demographic change within industry [greying of the fleet])

Hollowed Out (bleakest)

- WA may have fewer impacts than other states under this scenario save for salmon.
- Some salmon runs may disappear entirely, unclear whether hatchery production can even succeed under this scenario. Will lead to more conflict between State and Tribes, and also with protected species that depend on salmon and are themselves recovering
- fundamental questions for WA communities wrt portfolio of economic activities that support them → significant policy challenge.
- analogy with timber industry, we could look for lessons learned there. need for communities to reinvent themselves

- Loss in processing capacity. Jessie's Ilwaco closing last year, will continue to be a concern.
- Greying of the fleet X gentrification: avg age of vessel owners is 60, younger people that come in may find it hard to buy property and integrate into communities
- New fish stocks coming in X gentrification could open up new markets interested in local fish (higher-end), could cause seafood prices to rise and lead to inequities in access to fisheries
- Fewest changes implies that some coastal WA communities may continue to desire innovative approaches to making more vibrant fishing communities (reducing poverty, drug use, etc)
- Tribal communities traditionally rely on local seafood, increased interested in local seafood from markets more broadly could put pressure on tribal fisheries
- Razor clams especially important to tribal communities ("school close dig" along 23mi of WA coast), also impt recreationally and culturally and for hospitality industry -- challenged by HABs, potentially microplastics
- with stocks shifting north, will fishery participants have access to these opportunities (permits, quota, etc)?
- if this scenario is most similar to present, we run the risk of doing nothing (no "sense of crisis") but WA coast may need infusion of infrastructure $. frog in boiling water, no incentive for innovation
- what happens with major int'l markets for fisheries continues to be a concern for Washingtonians

- Gentrification may happen more rapidly in this scenario than others, and communities could make an active choice in this direction
- Gone vs public display of demise. The pathway that gets us to Hollowed Out could influence societal response. Slow moving disaster vs acute shock a la a pandemic? 2017 hypoxia event made halibut impossible to catch in WA (fish were just gone), very different than the spectacle of seabirds and whales washing up dead on beaches
- Salmon also coping with climate impacts in FW habitat (doubles risk)
- What does it mean if we know salmon are not coming back? does habitat restoration $ get invested elsewhere, reconceptualized, etc?
- suggestions that policies and preparation may look very different if we know this scenario is what is coming. but will we know it is coming?
- salmon: fish passage center studies show high mortality from hydro system, others that show most mortality occurs in ocean, currently under review by independent science advisory board
- will Hollowed Out look very different in WA communities than in OR/CA? is Hollowed Out

Question 2: *What's happening that provides a potential upside for communities in Washington?*

- New fish stocks coming in X gentrification could open up new markets interested in local fish (higher-end)
- Gentrification could lead to benefits such as sportfishing charters
- Currently there are seasonal pulses of vibrant (sport- and commercial-) fishing along WA coast, also some years are better than others (eg, when tuna is more available)
- Limitations in port facilities (processing, access to markets) could be remedied to help stabilize and potentially diversify catch. solutions include technology, marketing, etc
- Variability but a bit more stability than other scenarios
- Whale migrations remain late in the year, avoiding major conflict with crab fishery compared to other west coast states
- WA maritime heritage area (includes all of puget sound as well as coast north of grays harbor): opportunity as our past grounds us

more different from today's WA communities than in OR/CA?

  - WA may experience less dramatic shifts in physical env, more vulnerable in social env on outer coast
  - Bigger contrast between outer WA coast and Puget Sound/Salish Sea communities (which are already urbanized and gentrified).

- how do we account for the fact that much of the Alaska fleet is operated out of Seattle/WA?

Question 1:

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Question 2:

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Blue Revolution

Question 1: *What will communities in Washington be most concerned about? (immediate challenges and opportunities)*

- Not especially rosy for traditional harvest fisheries, but implies opportunities for other industries. presents communities with a choice: embrace or push away? risk that big corporations or non-residents gain big without local benefits if the latter.
- inequity in that southern WA coast has fewer protections from offshore development than northern WA coast
- Scale of blue revolution activities -- more appetite for smaller scale efforts
- Blue Revolution may also include alternative industries and activities like recreation, tourism, research (and associated technologies), etc, which also can have strong impacts
- Zoomtown component → gentrification concerns
- offshore aquaculture could degrade marine habitats, with negative impacts on fisheries
- installation of offshore energy and aquaculture infrastructure will affect Dungeness crab habitat and habitat for other benthic-associated species

Question 2: *What's happening that provides a potential upside for communities in Washington?*

- gaining traction for non-fishing offshore uses in WA may be more difficult than in other states, between

Box of Chocolates (boom/bust)

- processing capacity in WA coastal communities may be even more challenging to maintain in this scenario.
  - possibility of mobile processing facilities that could be repositioned as booms and busts occur. could include refrigerated land based operations
  - leveraging other food processing facilities outside of the fishing industry and/or in remote locations
- connecting harvesters and marketers more directly
- prices go down when booms occur and when there is a lot of variability (lack of steady supply), but consumer attitudes/preferences may be malleable and open to flexible 'catch-of-the-day' marketing
- if boom/bust extends to other regions, it may create opportunities if WA booms occur when other regions bust and seafood can be exported to bust regions
- add'l monitoring capacity and technology may imply better forecasting of boom/bust conditions, which could enhance predictability

legal challenges (OCNMS, tribal U&As), physical challenges given at-sea conditions, and the fact that we have so much hydropower on land and less need for energy from offshore sources (viz a viz Nationally Determined Commitments in other nations to mitigate carbon emissions)

- aquaculture potential high. how might this intersect with greying of the fleet? depends on returns from labor-- are aquaculture jobs high or low paying?
- tribes have rights when it comes to use of ocean space. all U&As extend beyond OCNMS boundaries in all directions, entitled to 50% of allowable catch in those areas. [see WA MSP reports?]
- seafloor disturbance and/or discharges have to be permitted by OCNMS and State, treaty rights interact here wrt habitat degradation

for markets and supply chains. could buffer impacts of boom/bust conditions

- better monitoring and forecasting may facilitate more flexible mgmt that capitalizes on booms but dials back during busts
- in WA we are starting from a sound basis of science infrastructure for ocean and fisheries forecasting (JSCOPE, etc)
- if booms and busts have spatial component, transboundary issues (eg, allocation) may be strongest in WA compared to other states (or at least OR)
- spatial allocation will be very important under this scenario, require more sophisticated intercoastal planning and increased collaboration to optimize opportunities and mitigate impacts
- wild caught vs aquaculture based seafood. will offshore aquaculture experience booms/busts or have an advantage over wild caught fisheries?
- How do booms/busts for fisheries species interact with recoveries of protected species like marine mammals (including sea otters)? impacts on crabs, razor clams? competition between people and mammals for food

- HABs impacts on crabs may continue and become more frequent, is it possible to build infrastructure to allow crabs to depurate (impoundment facilities a la lobsters on east coast)?
- importance of D crab in terms of cross-fishery participation (portfolio stability) and for coastal communities, and impacts of env change on D crab, may imply need for increased fed-state collaboration on preparing for this future
- Sea lions may suffer during busts along with the rest of us, but will also affect the amount of fish available for fishermen

Question 1:

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Question 2:

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Breakout 1: Implications for Harvesters in Washington

For each scenario:

1. *What will Washington Harvesters be most concerned about?*
2. *What's happening that provides a potential upside for Washington Harvesters?*

Concerns:

- Changing conditions will cause a change in the mix of species; if everything stayed the same as today we would be okay. But in this scenario some species will disappear and it will be hard to bring them back.
- Will we be able to access healthy species if bycatch of weak stocks constrains us?
- While some pelagic species may be more abundant less mobile benthic species may suffer.
- Continued climate creep: with small incremental changes are harder it's harder to perceive impacts and manage accordingly. Current OA conditions are a good example.
- Transboundary/straddling stocks: what sort of management problems will we see? Maybe managers from both countries can begin collaborating now to anticipate effects of range shifts. The US-Canada whiting treaty is a potential model.
- What species are we thinking will shift northward?
    - P. whiting
    - albacore
    - other tuna species?
- Harvest of albacore is basically unrestricted right now, they are wide ranging so big environmental changes

Concerns:

- Can fishermen, communities plan their fisheries with so much variability?
- We will need the markets that are responsive/receptive to highly variable supply; so there will be a stronger partnership between harvesters and processors.
- Data from harvesters may not be accepted by scientists. Need successful dialogue for this type of data provision to be successful.
- Larger vessels may have less versatility than small vessels, unable to switch/adapt
- Challenges catching abundant stocks, avoid bycatch of depleted stocks.
- Examples of tribal harvesters trying to enter new fisheries is cautionary as to whether fishermen can adapt to boom and bust.

Upsides:

- Fishermen are well positioned to pick out the fisheries they can capitalize on, especially if they can participate in multiple fisheries.
- With new monitoring technology there will be more opportunities for collaboration between harvesters and scientists/managers.

needed to affect long term abundance. However, they could shift further into Canada

- Do we have the management flexibility to respond to these changes? (And fishermen and processors)
- Federal guidelines and rules are not set up to deal with the problems we foresee. Need to identify changes to the Magnuson Act.
- We've rationalized west coast fisheries, but they are not as flexible because of allocations to sectors. How do we ensure flexibility under this management approach?
- Does it make sense for harvesters to market directly? Time and skills are necessary which take away from primary occupation of fishing. Also, scale issues (volume doesn't justify time investment)
- Need for sufficient lead time to develop new market opportunities, especially with other environmental and economic uncertainties.

Potential upsides:

- There is a lot of opportunity from stocks that shift north into waters off WA assuming harvesters can take advantage of them.
- Slower more steady change will allow evolution of more flexible approaches for managers, harvesters, processors, etc.
- Will subtropical/tropical tunas (or other HMS) appear off Washington presenting new opportunities?
- Development of new markets a potential upside but will management allow that to happen? i.e., as new species - opportunities emerge will management allow those to be taken advantage of?

- Increased investment in innovation from big tech companies?

- If stocks are more abundant maybe there is possibility to change management approaches?
- Positively Groundfish a potential model

Concerns:

- Loss of access to fishing grounds.
- Huge interest in mariculture development (specifically kelp and other seawards).
- Offshore energy companies are powerful - well funded with legal political clout. So there is a risk they could steamroll the harvester sector.
- Risk of leases occurring without sufficient attention from harvesters or in fishery management forums.

Upsides:

- Sanctuaries are protected from offshore wind
- Within the Quinault U&A the Tribe would have some say over any development.
- But the area south to the Columbia River could be developed.
- Opportunities for positive management frameworks to reduce ocean use conflicts including forging partnerships and spatio-temportal approaches. (Example of kelp growing season in winter months when less conflict with fisheries, other uses)
- Small scale mariculture could be more compatible and likely not sited in offshore areas.
- Washington coast probably not suitable for alt energy development due to severe weather conditions. But the technology could evolve to make it feasible.
- Fishermen will still have the ability to take advantage of opportunities arising from periodic high abundance.

Concerns:

- Shortbelly rockfish is a great example of the effects of boom and busts (or some species becoming much more abundant).
- "Nuisance species" such as tunicates become much more abundant. Interferes with fishing operations.
- We will have to "triage" what species can be saved and harvested.
- It's very hard to sign up long term customers if supply is highly variable. Boom and bust cycles will make it very hard to market fishery products. Example from recent history is rockfish that became overfished and now it's hard to rebuild a market.
- How will sustainability certification (e.g., MSC) work in a world of low abundance/high variability? (Current MSC work on "yo-yo fisheries" to avoid constant decertification/recertification.)
- Will science be current? (Relates to above point)

Upsides:

- If land based aquaculture production ramps up, what does that look like? Can it be complementary to wild harvest in some way?
- Could a premium be placed on wild caught seafood if there is limited supply? Higher prices could offset decline in volume somewhat. "Artisanal fisheries"?

They are used to approaching business operations this way.	• Consumer awareness of seafood sustainability keep rising - the “blue aspirationals”. This could present new opportunities

Breakout 1: Implications for fishery fishery managers in Washington

For each scenario:

1. *What will fishery managers be most concerned about?*
2. *What's happening that provides a potential upside for fishery managers?*

Question 1 (FF threats):

- Mixed stock salmon fisheries; weak stocks will continue to be weak into the future
- HABS frequency/intensity will increase; shellfish fishery problem; HABs worsening is assc with more extreme weather events
- Crab fishery closures (climate-induced reasons) and management needs assc with related fishery effort shifts
- Salmon int'l cooperation/treaties on management with BC/AK has increasing importance; lower 48 cannot directly impact salmon management in the north.
- Salmon fishery/population success reliant on EBM and nexus with pinniped populations and management
- Trans-boundary fisheries effects for many FMP species (salmon, hake, etc.)
- Species range shifts; those at edge of their range in the CC will be of particular concern/opportunity (depending on the species).
- Species ranges affect Tribal U & A's particularly, since those are defined/bounded.
- OA will be of concern, even if it is less in this scenario than in others.
- Allocation between sport/commercial/Tribal will become

Question 1 (BoC threats):

- We'll see more fisheries (economic) disasters. E.g. 2015 salmon/crab disaster from the Blob. Species north of the U & A, for example.
- Species reference points, scientific uncertainties. Impacts management of catch; need to be more comfortable with uncertainty, managing risk.
- In-season management difficult (time-lag between when decisions are made, and when harvest occurs). FMPs decisions are made well-ahead of a season. In-season management needs to get more attention/investment. Particularly with mixed stock fisheries.
- Need to find a way of both taking advantage of increasing abundance species, while being robust to managing declines.
- Mixed stock vs. single stock fisheries: shift to terminal fisheries (e.g. around hatcheries).
- Differential response by species - economically valuable species (now) may not be available in future.

Question 2 (BoC opportunities):

- Boom years may allow us to withstand the bust years (get us through - Fricke's 7-years economic resilience).
- Transition to science/research:

Question 2 (FF opportunities):

- Predictability of lesser changes/extremes makes reacting to this scenario easier.
- Society may focus on more local product, more local fisheries. Lead to greater community stability, even as ocean changes.
- Transition to science opportunities:
- range shifts will affect research survey design - how do we re-tool the survey approach? collaborate more with AK?
- May lead to a different type of science - how might this change?
- International markets will be challenging, but international scientific collaboration may (need to) increase to assess stocks.
- Decreased globalization of fisheries (more local) - steady environmental conditions; public may have a stronger connection to/understanding of the importance of local resources.
- Managers need to be able to respond to shifting markets, wider variety of species (e.g. bycatch species).
- CA workshop - fisheries impacts from pandemic has been to see increased boat-consumer sales. This may be similar to changes from ocean change?

- building models, testing models - we are good at this! BoC management may be more successful because of our success at modeling (in uncertain times).
- Variability in the system - it will challenge us to better understand variability and how to predict futures. (through modeling, etc.).
- BoC may be the most difficult for science - the probability that science is “wrong” may be high, in the face of extreme variability. Fisheries could invest in “wrong” predictions and get frustrated by mistakes (this is a risk for science).
- Models can be used to screen alternatives/predictions (rather than give “the” answer). Climate-robust management actions through simulation modeling.

Question 1 (BR threats):

- Decreasing resources ($$) for management, research, monitoring may occur as a result of species declines; compounding the problem.
- NOAA budget likely to be stable; allocations within NOAA budget may change (e.g. shift to aquaculture away from fisheries investments).
- New species appearing would require new funding to manage/understand those
- Spatial uses conflict and competition (wind vs. crab, etc.); fisheries managers will be in the cross-hairs.
- Subsistence harvest, native species are key. Species shifts will impact "first foods" choices and harvest opportunities.
- Spatial use conflict - habitat/wild species vs. industrial uses (aquaculture, wind). Does the policy framework exist to arbitrate this? Treaty tribe co-management framework exists (still a work in progress to achieve 50:50). But, trading species (through ocean change) does not have precedent. And then the policy to intersect with sport/comm harvesters is not clear.
- PFMC/RMC's managing aquaculture will fragment the bandwidth of managers; problematic both for fisheries and aquaculture management.
- Transition to science/research:
- Capacity (people, funding) is always the challenge. If scientists are asked to evaluate new uses, without the capacity to do so, it will be a challenge (managing in uncertainty).

Question 2 (BR opportunities):

- More funding for new spatial uses?

Question 1 (HO threats):

- Bycatch as stocks decline (mixed stock fisheries) will be increasingly difficult; challenge to harvesting the fewer species that remain healthy/harvestable.
- Working at the extremes of our predictive models, and appropriate levels of harvest; we will often (always?) be managing beyond/outside the range of the models, which increases risk (decision-making with too little information; requires making more precautionary decisions as managers).
- If there is little to manage (species), then there is no need for fisheries management (capacity). Societal focus is elsewhere. Communities need to be supported by other endeavors.
- Management challenge - which phase do we manage for? Transition (decreasing fisheries) vs. future state of few fisheries (given up).
- Reactive vs. Proactive management considerations (as we approach thresholds). HO scenario is more about conservation.

Question 2 (HO opportunities):

- Fisheries management will be more simple. Fewer fisheries, fewer inter-sector conflicts.
- Transition to science/research:
- Reimagining the roles of the FSC's. Originally, designed to serve the commercial fisheries. Maybe it becomes focused on conservation/protected species.
- HO disrupts all the models, based on equilibrium and how we define harvest levels. Challenges our assumptions, need to fill/reimagine how ecosystems/species work.

- creative ways to fund new science - new uses may help answer science questions (provide funding).
- Trans-boundary science need/opportunity, could be beneficial.
- Likely to see new monitoring platforms (to support the new uses/users) could be useful in general for understanding ocean/change/species assessments.
- Markets for new species; new ways of marketing and selling species.
- BR may lead to more int'l markets - what markets should we be reaching out to? Shellfish is now being shipped across oceans (but expensive). Cheaper to sell locally.

- Will drive industrial solutions to recovery. This will be outside of what we might consider now. Carbon removal included.

Breakout 2: Potential actions for communities in Washington

For each scenario:
*If you knew this scenario was going to be the future, what should communities do <u>now</u>? (i.e. identify **actions** to prepare for this situation, to ensure it happens, or to avoid it happening)*

Fortune and Favor

- Focus on terrestrial habitat projects that improve habitat for our strongest salmon stocks, so that those stocks make it to 2040.
- Strategize on and improve our communication efforts so that communities understand the difference between natural variability and variability that may result from climate change.
- Preparing fishing communities for anticipating change, species/stocks predicted to shift and change. Give communities some picture of what changes are coming so that they can develop responses instead of being surprised.
- What changes do we need to make in fishery monitoring to ensure that we can get useable information to communities -- do we track infrastructure? -- how many people are involved in fishing outside of vessel owners? -- better social and economic data?
- Community lobbying for infrastructure would be important under this scenario if they're going to drive their futures in one direction or another -- continued fishing presence vs. gentrification.

Box of Chocolates

- Processing capacity and flexibility will be important. Can processors become more flexible -- different product types in different years, different species -- to account for the shifting species availability and abundance.
- More ocean/beach monitoring needed to deal with more frequent HABs.

- If there are species that were not present before and that are moving into the area, WA will need receiving/processing infrastructure for those new species.

Blue Revolution

- Planning for aquaculture out on coast, potentially sablefish aquaculture? What might the communities want to have or not have, particularly in Puget Sound? What opportunities for shellfish mariculture are there on the coast? Biggest thing that stops aquaculture in the U.S. is regulatory planning/zoning.
- Will populations in Puget Sound support higher end markets for seafood? How do we make more connections between the coast and the Sound?
- Thinking more about CSAs that are direct to consumers, need consumers to understand that seasonal abundance is variable (maybe this works better under F&F?) With declining abundance, looking for flexibility on the consumer end, rather than supply end?
- Work with area community/technical colleges and high schools to provide training opportunities for new industries. How can communities smooth out the transition, rather than just being dumped from one world into another?
- Are coastal communities ready for or interested in gentrification? Are they interested in becoming locations for e-commuters? Shoreline Master Plan of potential use? What is the tipping point where local fisheries no longer sustaining community economies in

Hollowed Out

- Gentrification challenges likely to be highest under this scenario. How do we get a planning process started that maybe understands that we're in F&F now, but think about actions that might mitigate the potential for this future?
- This scenario will likely require some very hard policy discussions on what we do and don't protect in terms of salmon populations and habitat. Would certainly need to make decisions on whether we're going to preserve our hydropower priorities and the economies that rely on dams and associated transportation, or if we're going to try to preserve fishing and wildlife economies.
- The approach where you put your time, efforts, funds into supporting the strongest salmon populations and habitats now would have the biggest payoff under this scenario. Would this approach even work with our needs to meet Treaty trust obligations?
- Can we add significant infrastructure investment under this scenario to prepare communities for this future, or is that a failed use of funds if we're ultimately moving away from fishing communities to gentrified communities with limited resource-extraction? The communities themselves will be under more pressure to think about reinventing themselves -- more work

a viable way, where maybe offshore development is the best option for ensuring that communities have year-round populations and income?	outside the Council process than inside. Maybe there are some lessons learned from logging communities, how some of those communities reinvented themselves.

Breakout 2: Potential actions for Harvesters in Washington

For each scenario:
*If you knew this scenario was going to be the future, what should harvesters do now? (i.e. identify **actions** to prepare for this situation, to ensure it happens, or to avoid it happening)*

- [answer fortune and favor]
- Groups like Positively Groundfish, Genuine Alaska Pollock Producers are needed to build more local demand and awareness of sustainability with More local marketing.
- Washington seems to be jumping in with local marketing efforts.
- NOAA Fisheries used to be involved with seafood marketing with recipe cards and trade shows. Increased government funding/involvement would be needed.
- USDA has provided trade relief for products where the US has a deficit. There is a lot of government funding of agricultural production and that should be increased to fishing.
- Increased USDA seafood purchase: species like pollock are purchased in large quantities by the gov (USDA) and sold at discounted prices to schools, nursing homes etc. - getting young kids to eat seafood from an early age is a big focus of GAPP because that's where food preferences are formed, so getting seafood safely in schools is a huge benefit for long-term domestic seafood demand. Also the use of different product forms such as “seafood noodles.”

- [answer box of chocolates]
- A lot of marketing flexibility will be needed.
- We are unprepared for situations where species actually go extinct due to climate change.
- Don’t think the Council has the tools it needs under this scenario. Mandates under the MSA prevent needed flexibility. Thinking out of the box, set allowable catch in range rather than a point value. Can’t do that now under MSA constraints.
- With different species interactions the need for real time data on encounters with constraining species to better understand how to avoid catching them.
- Some species range will move north and we need good data on that so we don’t mistake a range shift with steady abundance for stock depletion.
- A shift towards cooperative management akin to what the whiting MS co-ops are doing.
- Washington needs a long term ecological research (LTER) site like the Newport Line. Call it the Westport Line. The Council should support finding the funds to implement this.
- Increased harvester participation in research enterprise. Takes cooperation from both sides.

- During Coved sale of seafood in bespoke ways and through pop up enterprises occurred offering examples of innovation avenues.
- MAFAC recommendation to revive national seafood council as national forum to advocate consumption of US seafood.
- More promotion of small scale and local harvesters. Perhaps a focus on multi species harvesters?
- State agricultural production boards are another example of a mechanism to promote local/regional marketing; CA sustainable seafood initiative had a number of elements in terms of certifications, etc. but it died due lack of funding.
- Oregon seafood commodity boards are an example of government support for seafood marketing. Washington may be moving in this direction. BUT downside include cost to harvesters and resistance from fishermen and sometimes the processors has frustrated the development of these types of efforts.
- Better data acquisition, surveys, and infrastructure needs to be better funded on a continuous basis. This is needed to better forecast conditions.
- Continued strong of advocacy for GhG emission reductions.
- Government marketing support tends to focus more on large scale fisheries; how do we get a focus on small scale fisheries?
- eNGO marketing collaboration/support is possible through trust building with harvesters
- The Council may have the tools to address bycatch concerns that would arise in this scenario.

- With variability in abundance, build a system for fishing vessels to gather data on every trip including environmental parameters. If the government paid for it, it would provide some supplemental income to buffer boom and bust conditions.
- We need to implement systemic improvements to address changes in stock distribution and management system responses. Right now we are not good at dealing with that or catching up with rapidly changing conditions. Example of northward range shift means we will be managing the tail end of the distribution without regard to overall stock status.
- Vessel crew could rotate among multiple vessels. Same with processors to allow employees to work for multiple firms. This would be a way to address boom and bust cycles.
- Allocation in rationalized fisheries reduces flexibility. The ability for industry to develop cooperative structures will be important. And the management system will have to facilitate this by allowing the shift of quotas/allocations among sectors/vessels.
- Examine the reasons for permits to figure out how to increase flexibility. This goes for allocations as well (since they are often associated with permits).
- Will the Council have to change its governance structures to become more nimble, responsive, and flexible?

- [answer blue revolution]
- Renew and reinvigorate marine planning efforts to reduce conflict
- Evaluation of the geographic distribution of fisheries shows they occur everywhere. This emphasizes the need for concerted spatial planning.
- Bigger companies have good representation; under all scenarios there will be increased reliance on communication and collaboration. Small vessel fisheries will need to further develop mechanisms to speak with a common voice. (There are some ongoing efforts in this regard.)
- All encompassing workshops on wind energy are occurring but they can be very hard for fishermen to keep track of. Improved ways of communication will be critical in this scenario. Necessary for fishermen's views to be heard.
- With more offshore development there will be a need for alternative data collection methods. For example, survey locations may be closed due to facility installations so alternatives will have to be found.
- Responsible Offshore Development Alliance (RODA) is an effective forum for the fishing industry to push back on rapid expansion of offshore wind. WA equivalent needed?
- Research on compatibility among ocean uses is needed to feed into siting decisions. Who are the best neighbors?

- [answer hollowed out]
- With salmon management, when abundance falls below a threshold then the fishery is closed. This also impacts the groundfish trawl fishery with respect to salmon bycatch. If this is caused by ocean conditions do we shut down a fishery? What should the Council do in these situations?
- The Council should advocate for retraining programs for the fishing industry. Give the small boat fleet the opportunity to exit fisheries without being bankrupted.
- NMFS disaster funding and buyout programs will need to be expanded. Recognize the historical role of fishermen in providing protein to the nation.
- Leverage land based aquaculture to sustain a limited wild harvest fishery.
- Recognize that fishery institutions are facing a major challenge across the board.
- Develop markets for non traditional species like jellyfish and other invertebrates.

- With the appearance of new species, we will need to understand stock status and have a management system that can flexibly respond so they can actually be harvested.

Breakout 2: Potential actions for fishery managers in Washington

For each scenario:
*If you knew this scenario was going to be the future, what should fishery managers do now? What should they consider doing in this scenario in future? (i.e. identify **actions** to prepare for this situation, to ensure it happens, or to avoid it happening)*

- [answer fortune and favor] **(ADAPT)**
- invest in forecasting tools to manage fisheries in-season. Salmon and other species. HABs too.
    - HABs will increasingly impact fisheries, lead to effort shift (e.g. CA events evaluated in recent Holland manuscript).
        - Managers will need to anticipate fishermen behavior (choice of participating in one fishery or another). What are needs here?
- monitor/research any changing in timing of reproduction (life cycle timing) - apply to all scenarios or FF? Applies to most/all but FF in particular because it is a rosy fisheries scenario.
- Range shifts - do we need to rethink treaties timeframes for trans-boundary stocks? (e.g. is our knowledge robust enough to enter an agreement for 2 decades?)
    - balancing/addressing needs of 3 governance areas (AK, BC, lower 48)
- wild stock/hatchery fish prioritization - what role do hatcheries have in future fisheries? Will it grow or

- [answer box of chocolates] **(MANAGE RISK)**
- Build flexibility into management, but manage risk
    - take advantage of surplus, constrain harvest when not
- Regulatory barriers to flexibility in management
    - e.g. federal process is not flexible (review timelines, etc.)
    - ESA/MSA/NEPA are rigid to improve sustainability.
    - limited entry is a barrier to flexibility but is also helpful in improving sustainability by controlling effort.
    - Question: are flexibility and sustainability mutually exclusive?
- Information needs to support flexibility:
    - in-season data (e.g. from observer program) - is this useful in providing flexibility in-season to managers?
    - yes. already used for in-season attainment of quotas or harvest caps.
    - in-season data for many weak stocks is not currently available. This would be helpful, if

decrease? Salmon but also other species. Hatchery infrastructure takes a lot of time and $$ to build.
    - Still disagreement on what role hatcheries should play in our future.

spatially explicit, to direct harvesting away from weak stocks.
    - GMT uses in-season data. e.g. increase in short-belly rockfish bycatch in whiting fishery (probably from range shift and/or recruitment boom).
    - PSC Fraser River salmon - test fishery is genetically evaluated; structure fisheries accordingly. Costly ($$ and workload) but effective. Could be applied to other fisheries.
- Extreme/variable events will help us learn, vet & test models (may give us better ideas about cause/effect on ecosystem change and biological response).
    - Action is to be prepared to respond to swings.
    - Action is to invest in modeling/research to understand

- [Managers answer blue revolution] **(TOUGH CHOICES)**
- Prepare fisheries for new markets:
    - international markets may require/prefer certain types of fisheries management.
    - E.G. sustainability certification requirements - this is a need/opportunity for US managers to prepare US fisheries. Species/product preferences.
- New uses, new management challenges:
    - e.g. aquaculture-transmission of disease and/or invasive species.
    - Managers will need to better coordinate and prepare for this (across agencies within states,

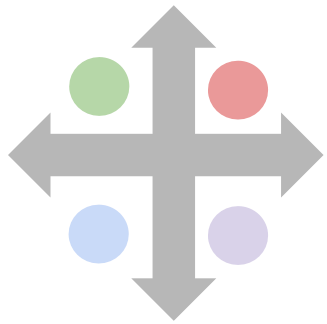
- [Managers answer hollowed out] **(REINVENT)**
- Give up some biodiversity for maintaining some stocks
    - Prioritization of stocks (actions, conservation) becomes more important. Some weak stocks may not have a chance. Give up some biodiversity, to maintain some more robust species/stocks. Barriers?
    - ESA policy framework needs to be relaxed/reimagined. Other federal legislation: MSA, MMPA, etc.
- Aid for fishery disasters:

between states, between states-feds-Tribes). Room for improvement here.

- <u>Mitigate spatial conflict as spatial uses increase</u>
  - spatial users relationships/planning - managers need to engage more.
  - Promote co-location of uses (e.g. energy and aquaculture), to minimize space conflicts; do this early in the process.
  - Are managers well-positioned to engage?
  - Yes, and, managers need more information to be better-prepared to engage early, meaningfully. Invest in information.

  - Expecting more federal disasters; need to improve delivery of aid (timeliness). Also relevant to BoC, but maybe most relevant in HO.
- <u>Reduce fishing capacity</u>
  - MSA NS1 (optimum yield) and NS9 (minimizing bycatch) - fishing capacity is over-capitalized. Further reduction of fishing capacity (limited entry, buy-back, etc.). Recent example - groundfish fishery.
  - pay attention to all parts of the fishery system, when adjust capacity (not just harvester, or just buyers…).
  - “Trailing actions” in implementation of ITQ for groundfish - should avoid this piecemeal approach in future actions.
  - Atlantic cod example - was over-capitalized. Could provide additional lessons learned.

Breakout 3: Looking Across Scenarios - Communities Priority Actions



Review your suggested actions across all 4 scenarios. What does this tell you about the priorities for Washington communities to prepare for these futures?

Some synthesis highlights from community 'action space':

- **Flexible local/niche marketing and processing capacity as part of creative infrastructure development**
- **Informed community planning leading to explicit decisions about adaptation and intentional design in a changing environment - related to gentrification, changing demographics, sources of economic opportunity etc**
    - **Monitoring and collecting key (multi-dimensional) information needed to understand importance of fishing and fishing support businesses in relation to other socio-economic factors**
    - **Providing communities information about potential climate driven factors to support local discussions about implications - defining infrastructure needs across dimensions from fishery support to basic community physical/safety needs (sea level, etc)**
    - **Thinking about possible trigger conditions that could be partial likelihood indicators 'scenario states'**
    - **Support thinking/planning across a range of possible needs from adaption (best case) to reinvention**
    - **Possible actions to position communities optimally, in logical ways**
- **Salmon landscape -> not exactly discussed this way but do local communities have an opportunity to create a watershed based component of community environmental-social-economic fabric and knowledge that could contribute an improved capacity to influencing informed thinking around tough policy decisions and potential; trade-offs that could lead to constructive community evolution rather than reactive change**
- **Better linkage of Council process elements of fishery/stock assessment and planning (including needed for more predictive capacity) that would assist communities better anticipate changing conditions for support businesses (including recreational fishery tourism)**
- **Salmon and habitat was particularly important- and making sure lifecycle and habitat was aligned**
- **Alignment between future status quo and policy framework; International treaty timelines are a potential mismatch between policy framework and SQ**

- **Regulatory inflexibility is built into system and need to build more flexibility is a bit of a quandary**
- **Winding down activities (fishing capacity, reliance on moving species/inaccessibility of some species, gears that won't be possible)- will have to figure out how to do that**

Which suggested actions seem to work across all or most scenarios?

- The individuals, people who are entrenched in the coastal communities, if we were to express all of this to them, some would go with the flow and some would see the sky is falling. Will have to begin and let the public know what direction we may be going- frame the situation.
    - We have a need to motivate change, communicate things that are scary. But research shows that communicating scary scenarios shuts people down. Need to turn a scary situation into a positive product at the end- here is as bad as it may get, here are the things we can do to make it better, here are the things we can do to move us away from the worst scenario.
    - Show solutions and highlight how communities can re-envision their future along with information about expected changes and guiding people to thinking about the switches that may be needed.
- Investments in marketing infrastructure that could benefit WA communities in all scenarios. Understand where products are going and how market orders are set up. Could bring more technology to this information problem and re-envision seafood marketing, such as meal delivery services.
    - Who are the likely actors to start these discussions? Marketing coops, producers associations. Hard because it is a competitive industry. Could be some benefits to collectively organize to be able to afford needed improvements/technology.
    - Could put together a workshop of processors, marketers, and others to brainstorm solutions and engage the communities.
- Monitoring: make sure we have real time monitoring for better decision making- from a boat captain determining whether to fish that day to managers
    - Seems more meaningful and relevant. People engage more immediately and deeply. Cultivates a culture of awareness of ocean conditions and harvest attainment

    - Can roll out more cost effective equipment and engage fishers in data collection and interpretation. Through collaboration we can build trust and lead to stronger partnerships
    - Data products (eg predictive models) that build off real time data may be more valuable to the end users.
    - Increasing monitoring and preparedness- need to see the data in understandable ways, especially with the health risk of HABs
    - To collect good data, it needs to be systematic or random- NOT haphazard. Need a good data collection plan in place.
    - Could use the fishermen and science group as a model for project/data collection project development- use science/fishermen working groups to look at common interests and design projects (Caren's Newport example)
        - What ingredients are needed to get folks together in this way? It is really community dependent. Newport is already a hub of science. The fishing community across the coast is more understanding of what science can and cannot do and what they can get from science.
    - Quinault fishers are collecting data
    - New technology is coming that could provide some insight- ferry data, NANOOS visual data service, HAB Bulletin, Marine Conditions Bulletin (NWIFC)
- Infrastructure: improvements that help protect water quality (pump out facilities, access points like boat ramps, etc). Do things that benefit communities that may not be fishing. Infrastructure needs and capacities that benefit all scenarios.
- Reduce lost gear-
- Make fishing something that everyone wants to go to bat for.
- Training in aquaculture- protein consumption is not going to decline under any scenario. May provide transitioning activities.

What actions are important to do because they prevent the worst-case situation?

- Hard to distinguish between various questions in this form.
- WA send $M to replace culverts, but no set amount for tribes. No forum for conversation for the tribes to intersect and get funds for restoration. The tribes may be better suited to plan and conduct the restoration.
    - Tribal trust responsibility
    - What investment of resources will maintain important values for individual communities?
    - At least 4 tribes (Col River tribes) and on the north coast
        - But also need to look at what stocks can feasibly make it and what stocks can't

- Need to prioritize resources where it makes the most sense. Hard to do with the science available- using our best sense. Don't put all eggs in one basket
    - By not prioritizing, you decrease your ability to save anything
- How can you influence fish in the ocean?
    - Regulatory flexibility for changing ocean conditions

What actions are important because it enables a good future?

- See monitoring discussion above

What actions help build flexibility to cope with the future?

- We are at the stage of acknowledging that we need to build in flexibility while ensuring sustainability
    - Key ingredient to future success
    - No ideas… yet
    - Need to invest more time into regulatory flexibility (piloting fisheries, permits, changing allocations, etc).
    - Need to put some ideas on the table soon to achieve an outcome in 20 years
- People may need to feel a risk to existing schemes before they are ready to move to another model
- May need to dial back existing harvest to give space- special allowance for something that doesn't fit within current regulatory scheme. Need provisional approaches to create incentives.

What should you stop doing given these scenarios?

- Making investments in areas that don't make sense- things we have done by practice and design that will not be adaptable in the future
- Don't continue to invest disaster relief funds to fisheries- incentive to stay in a business that may not make sense in the future. Invest in transition plans (job transition) that make more sense (e.g., derelict gear removal)

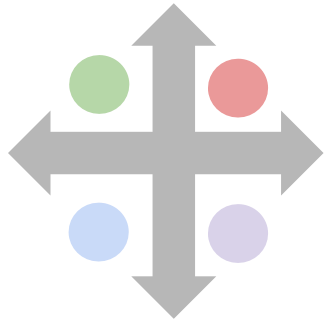
Opportunity to make connections to communities that have been previously challenging, outside of the Council process. There are community planning needs that go beyond the Council process. There are community choices to be made- how will they invest their resources (offshore energy, fishing, aquaculture, tourism, etc).

Discussion:

- previous group talked about putting more emphasis on providing disaster relief and this group talked about reducing disaster relief.

- There may be funder fatigue by those that are responsible for allocating funds and allocation would need to shift to look at better ways to help support fishermen in communities
- The current disaster relief program is ludicrous. If it continues, it need to be corrected (just got 2016 relief 3 months ago). There are better ways to support the communities

Breakout 3: Looking Across Scenarios - Harvester/Manager/... Priority Actions



Review your suggested actions across all scenarios. What does this tell you about the priorities for Washington harvesters to prepare for these futures?

Which suggested actions seem to work across all or most scenarios?

-

What actions are important to do because they prevent the worst-case situation?

-

What actions are important because it enables a good future?

-

What actions help build flexibility to cope with the future?

-

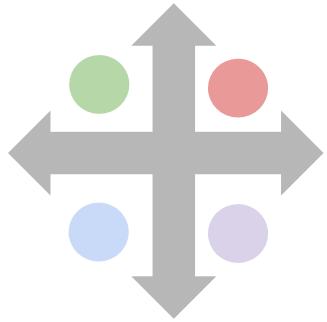
What should you stop doing given these scenarios?

- Grow the science and data enterprise to support management flexibility.
- Promote more flexibility in management decision making framework in the MSA, especially in periodic management cycles, e.g., annual harvest specifications. Hopefully PFMC comes out of covid thinking about how they can use online meeting tools to make inseason management more flexible for both participants and managers. Less “clunky” than the 5 meeting process.
- Management flexibility has to come with increased data and analysis. Need for better inseason data tools.
- The harvester community has to be adaptable as range shifts bring new stocks
- The market side is critically important for harvesters / processors to provide protein sources.
- New markets and marketing approaches will be necessary to support a good and sustainable future

- It is important to not lose sight of the key role of advocacy for GhG emission reduction measures. Agencies have a role to play in terms of educating the public about information on climate change and effects.
- Agencies also need to energetically plan for climate change and identify mitigation measures
- There is a need for more international engagement, especially with Canada as stock distribution shifts north. This would involve inter-agency collaboration e.g., interagency collaboration on sablefish stock assessment going on now (looking at the stock distribution across its range from west coast, Canada, to Alaska...).
- International arrangements (RFMOs) to address transboundary issues need to be further developed proactively (before distribution changes happen). There are species/stock specific examples now (whiting, P. halibut, salmon, etc.)
- We really can't afford to create a new commission for each species. Maybe a near-term action (2022-ish) is some kind of bilateral science meeting to discuss vulnerabilities of different stocks to climate change?
- Currently there are almost no arrangements to allow vessels from Canada and the US to fish in the other country's waters. (Albacore is the exception.) Do we need to negotiate these types of agreements for more stocks?
- To deal with the worst case scenario,
    - develop retraining programs to move people out of fisheries to sector.
    - Prepare for a future where disaster funding will be necessary on a regular basis. Also, the timeline from when a disaster is declared and the funding is distributed is currently too long. The process needs to be compressed.
    - Does the disaster funding model need to be shifted to an insurance model to support food security? [Mitigate boom and busts]
    - International lending institutions are starting to look at the status of stocks relative to loan risk. [Triple bottom line?]
- We need to give higher priority to (terrestrial) habitat restoration to mitigate climate change impacts. More broadly, more consideration needs to be given to growth management. This includes continued focus on priority habitat protection for anadromous species. (Look to examples in coastal Washington.)
- We need to take a hard look at fishing capacity (both commercial and recreational) and over capitalization taking into account avenues to facilitate entry to replace those aging out. The primary focus is on the west coast but there is an international dimension to this.
- We need flexibility in permitting programs while ensuring it doesn't contribute to over capitalization.

- Capital costs are outstripping potential returns, i.e., the cost of a new boat (and permits) can't be made up by what you can catch.
- Is there a role for government subsidizing capital investments, especially if it leads to GhG reductions (e.g. new power systems for vessels)? Is there an opportunity for shoreside infrastructure such as processing plants to shift to carbon neutral energy sources? And transportation.
- In considering zero carbon/carbon neutral energy sources we will have to consider the full range of impacts. For example, dams produce "green energy" but have adverse impacts on salmon, habitat, etc.

Breakout 3: Looking Across Scenarios - Fishery Science Priority Actions



Review your suggested actions across all scenarios. What does this tell you about the priorities for Washington fishery scientists to prepare for these futures?

Which suggested actions seem to work across all or most scenarios?

- **Increase our monitoring and the amount of data we have from within communities and participation**. Without sufficient data it is hard to evaluate the situation
- Preparing fishing communities for coming change. Good **monitoring of ocean conditions, modeling and forecasting**. What can fishing communities and managers expect? Scientists might need to reach out to communities, make sure data and information is accessible.
- Socio-economic and demographic change independent of CC, **need to better understand linkages between climate and communities**.
- The data that is available tends to be focused on vessel captains and permit owners, **need data targeted at the broader communities**. Data products need to be tailored to broad groups.
- Greater investment in surveys and other community data gathering tools. Ex. Alaska crew information database, could allow for more monitoring of folks who are involved in the industry.
- We expect to see gradual or sudden changes in species, key thing is **science that enables us to change and adjust reference points**. Don't want to be stuck in a situation where we are trying to rebuild a species that can't be rebuilt or constrained by bycatch of species that can't recover. Reference points are set in terms of mortality rates, harvest rates, biomass levels based on historical data that assumes that we are still in equilibrium (or that the baseline hasn't shifted. Baselines assume static, unfished biomass). Spatial analysis, distribution - movement of species ranges over time. Important for species that are moving out of the US West Coast range (or new species moving in).
- Need data on hand as more challenges arise (multiple uses such as aquaculture, offshore energy).
- Steady movement with change vs highly variable time periods, requires different approaches.

- Good monitoring of ocean conditions, models and forecasts - challenges of bycatch. **Need to improve models of bycatch and species overlap**.
- Importance of sharing data and collaborative science with Canada/AK (and Mexico)

What actions are important to do because they prevent the worst-case situation?

- Could ecosystem modeling be useful in generating a bigger picture/holistic view of the ecosystem? If a particular stock crashes how does that impact the broader food web? Could be used to prioritized stocks for protection.
- If we assume some species are not going to survive should we move into triage mode and prioritize those that can be saved. Do we have sufficient information to do this? Risk of putting all your eggs in one basket. Ex. Salmon - trade off between protecting stronger components of a population vs more widespread protection.
- **Ecosystem level modeling**

What actions are important because it enables a good future?

-

What actions help build flexibility to cope with the future?

- As there is more movement and mixing of different stocks/species - **weak stock management will require avoiding encounters with them. Need realtime information on stock locations.** More could be done in analyzing associations pre-season.
- New technologies - autonomous gliders, new genetic tools for faster stock ID. **How can these new data sources improve our understanding of fisheries and ecosystems?** Challenges of incorporating new data types? Ex. Antarctica Living Marine Resources program - has moved to using autonomous drones and data from fishery boats. Used new data while maintaining continuity.
- In social sciences - ability to monitor vessels at sea. Has led to new ways of looking at communities. Communities on shore and communities at sea using similar gear, etc. Will there be new monitoring systems from different groups?
- **Council may need to broaden the family of managers, scientists and stakeholders that are involved.** Focus is on federally managed species, many issues that are coming up involve a broader group of managers and stakeholders. With communities, NMFS is not well positioned to gather data at the local level, other agencies such as SeaGrant might be better able to. Need to involve scientists and others that are involved in research and fisheries that aren't managed by Council (such as state level fisheries such as crab). Scientists working on these issues are not necessarily involved in the Council process.

What should you stop doing given these scenarios?

- **Data collection - is there any that aren't that useful? Given scarce resources should we re-prioritize.** Do we have an assumption that more is better? What criteria should we consider? Investment in some areas (such as biophysical) can be quite expensive while some social data can be quite cheap.
- On the West Coast we have moved away from using the White Ships (NOAA), this offers some flexibility. **Should we build more large research vessel or invest in smaller, cooperative platforms**. Smaller platforms can access more nearshore areas that are data poor.
- Indicators of ecosystem change - Ex stoplight chart of salmon return. Have been using the same indicators for 20 years, some have broken down. **We shouldn't hold onto indicators/relationships that aren't functional anymore**. Be aware that they can change over time.

Discussion

- **Ecosystem evaluations that we currently have - a lot is based on the Newport Line. Does WA need something similar or will Newport suffice? Saildrones don't have the same type/quality as the Newport Line, but could be an opportunity. Use new autonomous technologies to cut costs. And partnerships with tribes, etc.**
-

Other

-What is this telling us in terms of the science needs?