

ECOSYSTEM WORKGROUP REPORT ON POTENTIAL FISHERY ECOSYSTEM PLAN
INITIATIVES: CLIMATE SHIFT INITIATIVE AND FISHING COMMUNITIES INITIATIVE

1.0 Introduction..... 1
2.0 Cross-FMP Climate Shift Initiative (A.2.8)..... 2
 2.1 *Background*..... 2
 2.2 *Scope and Workload* 4
3.0 Effects of Fisheries Management on Fishing Communities Initiative (A.2.7) 6
 3.1 *Background*..... 7
 3.2 *Scope and Workload* 8
4.0 Human Recruitment to the Fisheries Initiative (A.2.6)..... 9
 4.1 *Background*..... 10
 4.2 *Scope and Workload* 10
5.0 References..... 11

1.0 Introduction

The Council’s Fishery Ecosystem Plan (FEP) appendix provides a series of potential ecosystem-based fishery management initiatives exploring how the Council could address issues that affect two or more Council FMPs, or coordinate major Council policies across the fishery management plans (FMPs) to fulfill identified FEP needs. At this September 2017 meeting, the Council will consider future workload and timing for a third ecosystem initiative. After reviewing the potential initiatives in its FEP appendix in March 2017, the Council asked for further background on and discussion of potential workload for:

- A cross-FMP climate initiative to help the Council better understand and plan for the potential effects of near-term climate shift and long-term climate change on Council-managed fish stocks and fisheries, and on West Coast fishing communities;
- A cross-FMP fishing communities initiative to look at the combined effects of different fisheries management programs on West Coast fishing communities, and at the continuity of those communities into the future through the support of young and new fisheries participants.

In March 2017, the EWG had suggested that the Council consider combining the community initiatives from the [FEP Appendix](#) (A.2.6 *Human Recruitment to the Fisheries Initiative* and A.2.7 *Cross-FMP Socio-Economic Effects of Fisheries Management Initiative*) into one broad initiative on the effects of fisheries management on fishing communities, including looking at whether there are barriers for younger fishermen to join West Coast fisheries. While developing this report for September 2017, the Ecosystem Workgroup (EWG) realized that combining the two communities-related initiatives could diminish the potential effectiveness of both initiatives. The human

recruitment initiative is a bit different from the A.2.7 and A.2.8 in the specificity of the problem addressed. The Council may wish to consider the degree to which this problem exists before launching into the initiative in full. To ensure that we could clearly explain how these initiatives might work, we have separated the specific question of aging human participants in fisheries (Initiative A.2.6) from the more general questions about the effects of fisheries management on fishing communities (Initiative A.2.7).

Section 2.0 of this report describes the potential workload for initiative A.2.8, *Cross-FMP Climate Shift Initiative*. Section 3.0 describes the potential workload for initiative A.2.7, *Cross-FMP Socio-Economic Effects of Fisheries Management Initiative*. Section 4.0 describes the potential workload for initiative A.2.6, *Human Recruitment to the Fisheries Initiative*. The EWG cautions the Council and the public that the concepts behind these initiatives are bigger and wider-ranging than the ideas we worked with under [FEP Initiative 1](#) on protecting unfished forage fish, or [FEP Initiative 2](#) on reviewing the indicators within the annual ecosystem status report. To better understand what might be possible under these initiatives and to articulate those possibilities for the Council and the public, this report includes draft goal statements for each potential initiative.

2.0 Cross-FMP Climate Shift Initiative (A.2.8)

The goal of a cross-FMP climate shift initiative is to first build understanding of what the best available science forecasts are for change in the California Current Ecosystem (CCE) over the near- and long-term. Once the Council family has a baseline understanding of the potential future effects of the changing climate on managed stocks and fishing communities, the Council could develop strategies for improving the flexibility and responsiveness of our management actions to near-term climate shift and long-term climate change, and strategies for increasing the resiliency of our managed stocks and fisheries to those changes. This initiative would evaluate the connections between fish stock vulnerability and fishing community vulnerability to climate shift and change. This initiative could also improve our understanding of the combined effects of state, tribal, and Federal fisheries regulations, to assess how they might be better coordinated to promote coastwide fisheries management policies that address the vulnerabilities of fish stocks and fishing communities to climate shift and change.

2.1 Background

The Council first considered FEP Initiative A.2.8, *Cross-FMP Climate Shift Initiative* in 2015, but deferred work on the initiative to await the implementation of the National Marine Fisheries Service's (NMFS) then-new national [Climate Science Strategy](#) (Link et al. (eds.) 2015). By November 2016, the Northwest and Southwest Fisheries Science Centers had developed a [Western Regional Action Plan \(WRAP\)](#) on climate and fisheries science specific to the California Current Ecosystem (NOAA Fisheries 2016). Some of the WRAP's proposed work will be implemented through the Centers' California Current Integrated Ecosystem Assessment. The Council has seen some results of that work in the [annual March ecosystem status reports](#), with the 2017 report particularly responding to Council requests for information on the effects of short-term climate events and biological indicators within our ecosystem.

The species managed under the Council's four FMPs are significantly different from each other in their life histories and in their roles within the ecosystem. The FMPs also vary considerably in how much and what strategies, if any, they have already developed to adapt to large-scale climate fluctuations. Similarly, the Council's management strategies for and authorities over these species differs between FMPs. For long-lived species, like groundfish, a resilient fisheries management process may mean using regulatory measures to build more diverse age structures into groundfish populations, or build in a greater response capability within some sectors of the fishery. For more migratory species, like salmonids and highly migratory species (HMS,) a resilient management process may include strategies for dealing with shifting stock distribution within multi-national fisheries management processes. Distribution of managed stocks may also vary along the U.S. West Coast and FMPs should be evaluated for whether they provide flexibility for fishermen to pursue stocks as those stocks migrate.

Recent publications have recommended a variety of fisheries management ideas for building fish stock resiliency to climate change ([Campbell 2013](#), [Morrison and Termini 2016](#), [Chavez et al 2017](#)). The Council already uses several management measures that, although not their stated objectives, build in resiliency to climate change, including:

- FEP Initiative 1 included restrictions on the fisheries and gear authorized for use in the West Coast Exclusive Economic Zone (EEZ) and prohibited the targeting of unfished forage fish, which will constrain fisheries from commencing for species expanding their ranges or abundance, or which are newly migrating into the EEZ without management oversight;
- The Coastal Pelagic Species (CPS) FMP sardine harvest control rule scales harvest rates to environmental conditions, as indicated by sea surface temperature;
- The Groundfish FMP multi-year successful efforts to rebuild overfished and depleted groundfish populations, which depend on episodic recruitment;
- The Groundfish FMP 40-10 policy sets more conservative harvest rates for species with populations below B_{40} to prevent those species from becoming overfished;
- Management under the HMS FMP includes the Pacific loggerhead conservation area, which is triggered by El Niño occurrences or forecasts, to minimize sea turtle bycatch during periods when their ranges are known to shift;
- The Salmon FMP requires flexible management both inseason and from year-to-year, with its adaptive inseason management program and its geographic zones that may be open or closed from year to year depending on forecasts;
- The Council has begun considering the status of snow cover index as an indicator of future returns in setting salmon regulations for the coming year.

Beyond management measures, NMFS's Northwest and Southwest Fisheries Science Centers have briefed the Council and its advisory bodies about an ongoing management strategy evaluation (MSE) for sablefish, climate vulnerability assessments for major Council-managed species, and about NMFS's national climate science strategy and the WRAP. The Council's practice of receiving regular updates on the state of fisheries and climate science via the annual California Current Ecosystem Status Report helps educate Council process participants about the future potential ecosystem effects of climate change and the scope of scientific knowledge on the interactions between the CCE's physical, biological, and socio-economic systems.

2.2 Scope and Workload

This initiative could build on the Council’s past efforts with a more systematic and cross-FMP look at building resiliency to climate variability in as many of our managed fish stocks as possible, such as through measures like adjusting harvest limits, revisions to the timing of management cycles, or support for exempted fishing permits (EFPs) to experiment with new gear or fisheries. This initiative could also assess Council management processes for whether and how those processes provide flexibility to fisheries participants and fishing communities, so that they can adapt to climate change and to changes in stock productivity and distribution. The initiative might examine: the vulnerability of different coastal communities to both the physical and economic effects of climate change; whether Council management includes flexibility in fisheries permitting that will allow fishermen to transition between fisheries or gear types; the responsiveness of NMFS and Council management processes to the effects of climate anomalies or interannual shifts on target stock availability; and the responsiveness of NMFS and Council management processes to radical changes in stock status or availability that may result in disaster declarations based on environmental factors. This information could also be useful in developing the fishing communities initiative A.2.7.

Finally, this initiative could include a close review of Chapter 5 of the FEP, *PFMC Policy Priorities for Ocean Resource Management*. Chapter 5 of the FEP is intended “to provide non-Council entities with information on some of the Council’s highest priority concerns for non-fishing activities within the West Coast EEZ.” Modifications to Chapter 5 could take into account how non-fishing activities may affect the ocean ecosystem in ways that mitigate for or exacerbate the effects of climate change on fish stocks and fishing communities. By reviewing these effects of non-fishing activities on the ecosystem, the Council could help to inform and coordinate coastwide policies on adaptive ocean management in the face of climate change and jump start the upcoming FEP review process.

Depending on how the Council defines the scope of this initiative and assuming the Council supplements the EWG with additional members who are climate scientists, ecologists, biologists, and social scientists, and on the availability of scientists from Council-participating agencies, this initiative could take several years to develop and finalize. If the Council chooses this initiative, it could pursue three major and interacting themes: 1) educating the Council family so that we have a better collective understanding of the potential effects of climate change on fish stocks and fishing communities; 2) investigating methods or means to incorporate climate information into management of fish stocks or complexes to increase our stocks’ resiliency to the negative effects of climate variability and change; 3) identifying fishing communities that may be more vulnerable to the physical effects of climate variability and change and which are also dependent on income from those fish stocks that are vulnerable to climate variability and change and 4) providing information for non-Council entities on the impact of their actions on Council-managed resources and fisheries.

This initiative could begin with a webinar series presenting current scientific information about the potential effects of climate shift and change on: productivity in the CCE, managed fish stock productivity, managed fish stock distribution, fisheries’ landings quantities and landings diversity in coastal communities, and physical impacts on fishing communities that could affect their ability

to prosecute fisheries. Like the [webinar series that kicked off FEP Initiative 2](#) on ecosystem indicators, this webinar series would be open to the public and recorded for later viewing.

To address the second theme, we recommend a scientific workshop to provide a more detailed discussion of the state of science on the effects of climate variability and change on the productivity and distribution of Council-managed West Coast fish stocks, and needed science going forward as well as how management can respond. The workshop should focus on whether or how we can adjust harvest parameters to better account for the effects of the changing climate on our Council-managed stocks. Different groups of FMP species may need different broad-scale harvest policies to support future population resiliency to the effects of climate change. In addition, the workshop could highlight key additions for the next iteration of the Research and Data Needs document. Issues and ideas that the workshop might consider include:

- Direct (physical) effects of near-term climate shift and long-term climate change from
 - ocean temperature
 - pH
 - water movement (currents, upwelling)
- Indirect (biological) system effects of near-term climate shift and long-term climate change on
 - System productivity (including from shifting pH)
 - Trophic structure, both over the long-term and as shifting with interannual changes
 - Broad-scale range shifts of ocean species
- Indirect (biological) and stock-specific effects of near-term climate shift and long-term climate change on
 - Vulnerability of stocks to effects of oceanographic conditions
 - Productivity of Council-managed species
 - Distribution of Council-managed species

The EWG understands that we have suggested a broad and complex array of topics that may have been addressed in other venues, or which may be unanswerable in a single workshop. Our intent is to help the Council, its advisory bodies, and the public think about the potential scope of this initiative. We welcome suggestions for narrowing the scope of the workshop and references to scientific work that may have already addressed some of the above topics.

Workshop participants could include: stock assessment analysts, fresh water life stage biologists, state water resource managers, climate and ecosystem scientists, as well as representatives from the EWG, Ecosystem Advisory Subpanel (EAS), and Scientific and Statistical Committee Ecosystem Subcommittee (SSCES). A report of the workshop would be presented to the Council at a March or September meeting. The EWG anticipates that the results of this workshop could help the Council sort out the potential cross-FMP effects of climate change on our fisheries from the future FMP-specific effects of climate variability and change. Future FMP-specific tasks could range from reporting out to international fisheries management entities to developing long-term harvest policies to increase age- and size-diversity in managed populations.

The third major theme of this initiative is to identify fishing communities that may be vulnerable to the physical effects of climate variability and change and also depend on income from those fish

stocks that are vulnerable to climate variability and change. This information is important to developing future Council responses to climate shifts. Some of this work is already underway as the states consider sea-level rise (e.g. [Griggs et al. 2017](#)) and in NOAA Fisheries' work to [identify fishing-dependent communities](#). The EWG could work with Center scientists to develop an initial white paper to summarize existing and forthcoming work, to be followed up by a second initiative workshop that would focus more on the potential combined physical and socio-economic effects of climate variability and change on fishing communities. The scope of the second workshop could be set once the Council has had an opportunity to consider the results of the first workshop and the white paper on existing work. Broadly, the EWG anticipates that a second, community-focused workshop could address topics like:

- Direct effects of near-term climate shift and long-term climate change on coastal communities
 - Sea-level rise
 - Changes in drought, storm, or flooding frequency or intensity
- Indirect effects of near-term climate shift and long-term climate change on coastal communities from changes in fish stock distribution and productivity, such as
 - Change in the mix of species landed in each port (due to range shifts)
 - Change in ex-vessel revenue (due to range shifts and stock productivity or fishing ability)
 - Vessel level responses
 - Will they “follow the fish” but keep the same home port – longer trip distance?
 - Will they shift to a different port?
 - Will they shift to a different fishery/target?
- Potential policy constraints and responses that might address
 - Embedded geographic barriers (spatial allocations)
 - Optimum yield management
 - Bycatch management (including protected species)

The Council is scheduled to begin its five-year review of the FEP in 2018. As part of this process, the results of these two workshops could be used to update Chapters 4 & 5 of the FEP. We might also expect the workshops to stimulate future analyses of the effects of fisheries management actions on the environment.

3.0 Effects of Fisheries Management on Fishing Communities Initiative (A.2.7)

The goal of a fishing communities initiative is to assess how different Federal, state, and tribal fisheries regulations and management systems – including Council FMPs – interact with each other to affect how fishing fleets operate in different coastal communities. This assessment would help identify potential changes to our regulations that the Council could consider to help increase operational flexibility for fisheries participants, bring more stability across fisheries for fishery participants, improve the safety of fishing operations, better support fishing-related community infrastructure, and benefit West Coast fisheries' access to markets.

3.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) describes a “fishing community” as a community that is “substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and U.S. fish processors that are based in such community” (16 U.S. C. §1802). National Standard 8 of the MSA states: *Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meets the requirements of paragraph (2) [National Standard 2 requiring the use of best available science], in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.* While Federal regulations at 50 CFR 600.345 provide guidance on examining the importance of fisheries to fishing communities, neither the Act nor its implementing regulations provide much guidance on how best to sustain the participation of fishing communities in U.S. fisheries. This initiative would look at the long-term potential effects of fisheries management on fishing communities, to assess whether there are Council actions that could help sustain fishing community participation in our fisheries.

West Coast fishing communities range from a few commercial vessel docks within large urban areas with diverse income opportunities, to small coastal towns with few economic opportunities beyond natural resource extraction or tourism industries. These communities have their own governance structures and planning efforts for their futures that may or may not include considerations for the ongoing presence of the fishing industry within their communities.

Section 3.4 of the FEP discusses historic and recent West Coast fisheries across FMPs and across jurisdictions, including cumulative summaries of landings portfolios by state and by port. [NMFS's annual ecosystem status report](#) includes reporting on fisheries-dependent communities and coastal community vulnerability indicators. The FEP also cites the Groundfish FMP at Section 4.6.3.2, which describes fishing communities as needing “a sustainable fishery that: is safe, well-managed, and profitable; provides jobs and incomes; contributes to the local social fabric, culture, and image of the community; and helps market the community and its services and products.” Except for the Salmon FMP, which focuses on conservation objectives, the Council’s FMPs also include communities-focused objectives, many with overlapping themes that could help frame this initiative, such as:

- Promote year-round availability of quality seafood to the consumer; promote recreational fishing opportunities; provide a long-term stable supply of high-quality, locally-caught fish to the public; provide for the sustained participation of fishing communities in the fisheries (Groundfish, HMS).
- Provide viable and diverse commercial fisheries and recreational fishing opportunity based in West Coast ports; achieve harvest capacity that results in a fishery that is diverse, stable and profitable; promote efficiency and profitability, including stability of catch (CPS, Groundfish, HMS).
- Minimize gear conflicts (CPS, Groundfish, HMS).

- Accommodate existing fishery segments, resolve management issues with the least disruption of current domestic fishing practices and marketing procedures (CPS, Groundfish).
- Achieve a level of harvest capacity that is appropriate for a sustainable harvest and low discard rates; control the growth rate of fisheries and encourage management by limited access (Groundfish and HMS).
- Develop management measures that will affect users equitably; allocate harvest fairly and equitably among commercial, recreational, and charter fisheries if allocation becomes necessary (Groundfish, HMS).

Both the Groundfish and HMS FMPs address additional potential social benefits from fisheries management:

- Attempt to achieve the greatest possible net benefit to the nation from the managed fisheries (Groundfish).
- Avoid unnecessary impacts on small entities and minimize adverse economic impacts on fishing communities to the extent practicable (Groundfish).
- Promote the safety of human life at sea (Groundfish).
- Promote outreach and education efforts to inform the general public about how West Coast fisheries are managed and the importance of these fisheries to fishers, local fishing communities, and consumers (HMS).
- Establish procedures to facilitate rapid implementation of future management actions (HMS).

3.2 Scope and Workload

Initiative A.2.7, which broadly addresses the effects of fisheries management on fishing communities, could assess whether the Council's fishery management programs are meeting the combined communities-focused goals of the FMPs, such as providing for year-round fisheries, accommodating existing fishing practices and minimizing gear conflicts. Background work for the initiative could build on recent analyses like the [five-year review of the West Coast groundfish trawl catch share program](#) and the [HMS Management Team report on North Pacific albacore fisheries](#).

This initiative could look at whether and how Federal fisheries management policies may have unintended or unmeasured effects on fishing communities over time, and could help us better understand how communities may be affected by management actions across the FMPs. The Council would need to know how current and ongoing indices of fishing community vulnerability to changes in availability of fishery resources might be used to support fisheries management. The Council would also need a cross-FMP review to know which fishing communities are most closely tied to which fisheries (state, tribal, Federal) and whether those communities undergo cyclical within-year effects from shifts in fishery management programs or due to climate shifts.

To begin Initiative A.2.7, the Council could review the communities-related goals and objectives of its FMPs, listed in Section 3.1, and provide guidance on which of those goals and objectives should frame the analysis of the effects of fisheries management on fishing communities. The

EWG, if aided by agency social scientists, could then report back to the Council at a March or September meeting with a white paper on whether and how well Council fisheries management may be meeting those objectives across FMP fisheries. Similar to the climate initiative, putting together the white paper for this initiative may require a workshop that includes: social scientists, a geographically diverse set of fisheries representatives, fisheries managers, and should include representatives from the EWG, EAS, and SSCES. The workshop and resulting white paper might consider:

- How communities may be affected by cumulative fishery management actions across the FMPs
- Temporal-spatial landings compositions and seasonality of fishing operations
- Vessel displacement and mobility
- Operational tradeoffs when management decisions made under different FMPs affect the same communities
- Linkages among fisheries in an area based on gear
- Which fishing communities are most closely tied to which fisheries
- Cyclical within-year changes in landings composition and the role of fishery management programs in these changes
- The role of different (state and federally managed) West Coast fisheries in the economies of West Coast ports
- The amount of economic activity generated by fish harvesters and processors operating within particular West Coast ports
- The types of seafood exported from and imported to the U.S. West Coast
- The net benefit of our fisheries to West Coast fishing communities and the nation
- The effects of declared fishery disasters for recent tribe, state, and Federal disasters
- Which ports are more vulnerable to climate change
- Updates to social impact assessment methodologies to specifically look at well-being in and the effects of fisheries management programs on fishing communities

Ultimately, this cross-FMP review of the effects of fisheries management on fishing communities could help the Council to consider: whether year-round fisheries are still a Council priority; whether there are fisheries management fixes that would improve safety in our fisheries; if there are ways for the Council to address fisheries disasters so that fewer disasters occur; and whether Council fisheries management meshes well with state and treaty tribe fisheries management to maintain relatively stable long-term benefits to the economies of fishing communities.

4.0 Human Recruitment to the Fisheries Initiative (A.2.6)

The goal of a human recruitment initiative would be to evaluate whether West Coast Federal fisheries regulations and management systems inadvertently create disincentives for new people to join or advance in fishing professions. This initiative would develop strategies, building on examples from elsewhere, to support young or new fisheries participants becoming established members of fishing communities. These strategies may include programs to support equipment or license leasing or purchases, or landings diversification. This initiative could develop, for Council

consideration, regulatory and management incentives for trained and interested people to join our West Coast fisheries.

4.1 Background

Initiative A.2.6 is intended as a more focused review of the effects of fisheries management on the participation of young and new fishermen in West Coast fisheries. This initiative could work from existing and ongoing analyses in support of the 5-year review of the trawl rationalization program, which includes some analyses of the age distribution of groundfish trawl fleet participants. A cross-FMP look at both the ages of participants and the flexibility of movement between fleets could give the Council better information about the long-term viability of West Coast fleets. If there are longer-term financial and regulatory barriers to entry into and advancement within the fisheries, Council attention to long-term human recruitment to West Coast fisheries could help fishery participants and fishing communities better prepare for the future of the fishery itself.

The question of how to support and encourage young or new participants to join U.S. fisheries has gotten more attention in Alaska than off the U.S. West Coast, although it may also be a concern for West Coast fishing communities. Since 2007, Alaska Sea Grant has been hosting [*Young Fishermen's Summits*](#), intended to provide younger fishermen with opportunities to meet with each other, to learn about fisheries business management, and about the fisheries management process. The British Columbia fishing fleet is facing similar challenges and in January 2017 held a [*Young Fishermen's Gathering*](#) in Victoria, concurrent with the annual International Pacific Halibut Commission (IPHC) meeting, so that young fishermen could be introduced to the IPHC process. U.S. Congressional representative Don Young (R-AK) has supported Alaska efforts to consider and address the graying of the fleet through his recent introduction of H.R. 2079, the Young Fishermen's Development Act of 2017. That bill is intended to "preserve United States fishing heritage through a national program dedicated to training and assisting the next generation of commercial fishermen." Even if the Council does not choose to take up this initiative as a near-term priority, it might consider working with Sea Grant offices in Washington, Oregon, and California to develop summits for young West Coast fishermen, possibly held at times and in places where summit attendees might also attend PFMC meetings.

4.2 Scope and Workload

This initiative could provide a cross-FMP look at the ages of fisheries participants and the flexibility of movement between fleets to give the Council better information about the long-term viability of West Coast fleets. If there are longer-term financial and regulatory barriers to entry into and advancement within the fisheries, Council attention to long-term human recruitment to West Coast fisheries could help fishery participants and fishing communities better prepare for the future of the fishery itself. Council process participants may also benefit from a review of programs from the West Coast and elsewhere that may facilitate the entry of new professionals into fishing fleets.

To implement this initiative, the Council could assemble an ad hoc advisory committee to assess: mobility within and among fisheries, barriers to entry in Council-managed fisheries, and efforts within the U.S. and elsewhere to facilitate the upward mobility of skilled crewmen to positions

within the fishing fleet. This committee would need economists, anthropologists, sociologists, a geographically diverse set of fisheries representatives, fisheries managers, and others the Council deems appropriate to the task. The committee would report to the Council on potential management programs to improve human recruitment to West Coast fisheries over time, addressing both programs the Council could implement through its FMPs and recommendations the Council could make to government agencies for work outside of the Council's authority. Questions the committee might consider include:

- What does “sustained participation” of fishing communities in fisheries mean? Are there any studies of fishing communities on the U.S. West Coast or elsewhere of what sustained participation in fisheries means to members of fishing communities?
- Do any West Coast fisheries management programs include provisions to support the sustained participation of fishermen or our fishing communities in fisheries? Do we know what factors prevent or minimize the sustained participation of individuals in certain fisheries or of fishing communities in fisheries? Are any of those factors affected by Council actions?
- Are Federal and state license limitation and limited access privilege programs positively or negatively affecting employment in fishing dependent communities? Are these programs concentrating effort and fishing profits in some parts of the coast, and have they left fishing revenues in some parts of the coast in decline?
- What data are available to help gauge whether there is a “graying” of West Coast fishing fleets – the steady increase in average ages of boat owners and skippers – of concern to West Coast fishing communities?
- Do we have any management programs that either encourage or discourage fisheries participation and fishing or boating skill development by younger community members? What are the financial and regulatory barriers to entering into and advancing within West Coast fisheries?
- Do we know what factors prevent or minimize the sustained participation of individuals in certain fisheries or of fishing communities in fisheries? Are any of those factors affected by Council actions? Are there actions the Council could consider to better facilitate participation?
- Do fishermen's retirement financing concerns affect the prices of permits? Is there, or should there be, a quasi-government fishery cooperative plan that requires or allows limited entry permit holders to contribute to a retirement savings program that would ensure that fishermen could retire at a reasonable age and not be dependent on the sale of their permit as retirement “nest eggs”?

5.0 References

- Campbell, C. 2013. Implications of changing ecosystems for fisheries managers. Pages 160-167 in *Managing our Nations Fisheries 3: Advancing Sustainability*. Proceedings of a Conference on Fisheries Management in the United States. Portland Oregon. Available: http://www.managingfisheries.org/2013_documents/Proceedings_session2.pdf. (October 2015).
- Chavez, F.P., Costello, C., Aseltine-Neilson, D., Doremus, H., Field, J.C., Gaines, S.D., Hall-Arber, M., Mantua, N.J., McCovey, B., Pomeroy, C., Sievanen, L., Sydeman, W., and Wheeler,

- S.A. (California Ocean Protection Council Science Advisory Team Working Group). 2017. *Readying California Fisheries for Climate Change*. California Ocean Science Trust, Oakland, California, USA.
- Griggs, G, Árvai, J, Cayan, D, DeConto, R, Fox, J, Fricker, HA, Kopp, RE, Tebaldi, C, Whiteman, EA (California Ocean Protection Council Science Advisory Team Working Group). *Rising Seas in California: An Update on Sea-Level Rise Science*. California Ocean Science Trust, April 2017.
- Link, J.S., R. Griffis, S. Busch (Editors). 2015. *NOAA Fisheries Climate Science Strategy*. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-F/SPO-155, 70p.
- Morrison, W.E., and V. Termini. 2016. *A Review of Potential Approaches for Managing Marine Fisheries in a Changing Climate*. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-OSF-6, 35 p.
- NOAA NW/SW Fisheries Science Centers. 2016. *Western Regional Action Plan (WRAP)*, NOAA Fisheries Climate Science Strategy. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-565. 75 p.

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