GROUNDFISH MANAGEMENT TEAM REPORT ON RESTRUCTURING THE OTHER FISH COMPLEX

Introduction and Background

In September 2013, the Council recommended limiting further analysis for restructuring west coast groundfish stock complexes to the Other Fish complex. Analysis of the remaining stock complexes (Nearshore Rockfish, Slope rockfish, and Shelf Rockfish) was deferred until future cycles (e.g., 2017 and 2018). Reasons for deferring those analyses were provided in some of the references shown below (Appendix A), as well as in Council minutes.

This document provides a GMT-recommended process (thoroughly described under Agenda Item G.8.b, Supplemental GMT Report 7, September 2013) for reorganizing groundfish stock complexes, as well as alternatives for reorganizing the Other Fish complex that the Council may consider. The process described herein may be used by the Council to develop its own alternative(s) based on the Council's objectives. This statement provides alternatives for the Other Fish complex only. Alternatives, rationale, and the process for consideration of reorganizing the remaining complexes may be provided during future cycles.

Materials provided over the past 2 years clearly described analytical methods, alternatives, justifications, socio-economic impacts, and considerations for restructuring stock complexes. Rather than repeating much of that information, we provide a list of these previous reports beginning April, 2013, along with a brief description of contents and a link to access them (see Appendix A). Electronic versions of these reports can also be found at the following FTP site: (ftp://ftp.pcouncil.org/pub/Stock_Complex_Materials/). Note there were additional reports on this subject matter prior to April, 2013, however, those were omitted in the bullets and are not included on the FTP site. Omitted GMT statements include (1) Agenda Item E.4.b, Supplemental GMT Report, March 2010 and (2) Agenda Item G.5.b, Supplemental GMT Report, September 2011).

Objectives

There is a need to evaluate and consider changes to the current structure of stock complex groupings, to ensure that the species in each complex are sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that management impacts are similar.

The GMT notes that stock complexes may be reorganized for biological purposes (e.g., remove species from complexes to reduce the probability of overfishing a particular stock), for logically consistent purposes (e.g., match stocks with similar life histories, distributions, and vulnerabilities), or some combination of the two. There are consistency issues with some of the current stock complexes in the groundfish fishery management plan (FMP). For instance, the Other Fish stock complex includes species with dissimilar life histories and species that do not co-occur. Also, as shown below, only one species within the Other Fish complex has

experienced historical catches that have approached the component overfishing limit (OFL; i.e., dogfish shark), whereas the other species within that complex may be at much lower risk of overfishing (e.g., cabezon). Additionally, the Other Fish complex, similar to the other complexes, includes stocks that have very low OFLs (e.g., California skate) or very high OFLs (e.g., spotted ratfish). Disparate OFLs within a single complex may cause overfishing for susceptible stocks with relatively low OFLs. This provides an example of a "logical consistency" and biological purpose for reorganizing a complex. The ideal complex would be of stocks that co-occur in proportion to their component OFLs-allowable biological catches (ABCs).

The scientific and statistical committee (SSC) has noted that no two stocks are exactly alike, and in establishing stock complexes there will always be tradeoffs between management practicality and concerns about individual species (Agenda Item I.3.b, Supplemental SSC Report, April 2012) and

Process for Reorganizing Stock Complexes

A process and considerations for reorganizing stock complexes was developed and described in detail by the groundfish management team (GMT) in Agenda Item F.8.b, Supplemental GMT Report 2, June 2013 and Agenda Item G.8.b, Supplemental GMT Report 7, September 2013. A summary of that process follows. For all steps, considerations should include balancing biological need, management practicality, and socio-economic impacts. Other examples of considerations are shown after each step in the process.

(1) Should any species be added to the FMP, removed from the FMP, or designated an ecosystem component (EC) species? See Agenda Item H.4.b, GMT Report 2, November 2013.

a. What are the implications of adding new species to the FMP (and a particular complex) that have no calculated OFLs?
b. What are the implications of adding a new species to the FMP as an EC species?
c. What are the implications of removing species from the FMP (and a particular complex) that have OFLs, leaving a complex with only a few of the remaining species with contributing component OFLs?

(2) Consider removing species from the complex for individual management because it may be potentially at risk of overfishing.

a. For those species with component OFLs available, the ratio of catch to OFL/ABC should be used to evaluate the risk of overfishing. Furthermore, cumulative catch relative to cumulative OFL/ABC is most indicative of a potential problem.
b. Although individual management may be presumed for stocks that are potentially at risk of overfishing, that is not necessarily the best choice.
    i. Tradeoffs between management practicality and concerns about individual species need to be evaluated.
    ii. In some cases, individual species management may not be necessary for implementing management measures necessary to prevent the risk of biological overfishing (e.g., blue rockfish in CA where the component OFL has not been exceeded since the stock was assessed in 2008 and harvest guidelines were (HG) were implemented).

(3) Consider removing species from the complex for individual management because it may be an inflator species that may cause others within the complex to be potentially at risk of overfishing.

a. Considerations are similar to those described for species at risk of overfishing (above).

(4) Consider creating new complexes to better align stocks in terms of life history, appearance, and spatial overlap, and thereby decreasing the potential of overfishing any single stock within the complex.

a. Considerations are similar to many of those described above.

A worksheet is provided in Table 1 that may be useful for applying this process for reorganizing stock complexes. The most desirable complex is dependent on objectives.

Table 1. Worksheet for reorganizing stock complexes.

Stock Complex Worksheet
Species to add to FMP, delete from FMP, and/or designate as EC species: • See Agenda Item H.4.b, GMT Report 2, November 2013 for a complete list of species. • •
Select species for individual management that may be at risk of overfishing: • •
Select species for individual management that may be considered inflator species: • •
Create a new complex for stocks that may be at risk of overfishing, or for stocks that may be considered inflator species, or for any other reasons ,if a new complex is desired (e.g., shark-ratfish complex): • •

Overarching Considerations while Selecting Alternatives

Categorization and Management of Species Caught Primarily or Exclusively in State Waters

The Other Fish complex prioritized for revision includes some stocks that primarily or exclusively occur in state waters, and as such could be considered for removal from the fishery

management plan, and management by the states. Some of the species, if not most, are already managed individually by the states as part of recreational bag limits and other measures. One problem we have identified is that some of the alternatives shown below make changes that would leave some of these state-water species in complexes with others species that do not share much in common. This matter is addressed in more detail within our statement on the classification of stocks in the groundfish FMP (see Agenda Item H.4.b, GMT Report 2).

The Council's authority over state waters is a matter of legal jurisdiction. Our NMFS colleagues were not available at our October discussion to advise us, yet the matter has come up in other contexts at the Council and is addressed directly by the National Standard 1 Guidelines and accompanying background materials. While the Council should get more detailed advice from NMFS and NOAA General Counsel, the Council does not have direct authority to recommend conservation and management measures over the states. Section (f)(5)(iii) of the Guidelines describes dividing annual catch limits into state and federal portions based on the distribution of the stock between the areas. And Section (g)(5) states that Council management/accountability measures can only apply in federal waters. These issues are also addressed in the response to Comment 71 in the final publication of the revised Guidelines [1].

At the same time, the Guidelines also promote coordination and cooperation between state, federal, and tribal management jurisdictions and this is the spirit that has been followed at this Council for many species. The GMT as a whole recognizes the advantages of such collaboration, some of which we note below, and are not raising the need to change it. To be clear we are highlighting the state-federal jurisdiction in the context of this Other Fish stock complex.

Some of the species discussed here just do not group easily with other species in some of the alternatives proposed below. Leopard shark and spotted ratfish provide an example of such a mismatch. In this example, designating leopard shark as a state water species in the FMP might be preferential to grouping it with spotted ratfish.

The situation of each species may differ slightly. While some are occasionally caught within federal waters, their primary range is within three miles of shore, due to their association with nearshore habitats. Examples of such species include cabezon, kelp greenling and all other greenlings, California skate, and leopard shark. However, there are a number of considerations that provide support for their continued inclusion in the fishery management plan, or conversely, state based management. Inconsistencies would remain in either case relative to species that are currently in and out of the FMP.

An argument can be made that cabezon and greenlings primarily co-occur with nearshore species which are also primarily caught within three miles of shore in state waters and could also be managed by the state. State management could however be more complicated for some states because greater flexibility to take inseason action may exist through the Council process than is available with state management. Similarly, leopard shark is primarily caught in the California recreational fishery within state waters; they are encountered in the trawl fishery outside three miles of shore. Management of leopard shark within the Council process is more streamlined and allows routine management action in a single meeting rather than emergency action or a

[1] 74 Federal Register 3197 (January 16, 2009).

three meeting process within state management. For some states, there are greater efficiencies in managing these nearshore species within the Council process compared to state management in some cases.

Cabezon is closely monitored and managed by the state in Oregon and timely action to affect changes in the recreational and commercial fisheries is afforded within state management. In California, there is close state management of cabezon and kelp greenling in the commercial and recreational fisheries. While cabezon does not have a specified OFL in Washington waters, recent actions have been taken by the state to implement a length restriction and reduced bag limit to proactively conserve the stock. An additional consideration is that cabezon and kelp greenling are managed as components of the Rockfish, Cabezon, and Greenling (RCG) complex in California for which, recreational bag, season and depth restrictions are specified in state and federal regulations. Regulations are specified on the RCG complex basis to reflect the co-occurrence of cabezon and kelp greenling with rockfish, which may necessitate their inclusion in the FMP to facilitate fishery management.

"Risk" and the Stock Complex Evaluation

With this approach to evaluating the stock complexes, the GMT has aimed at helping the Council to prioritize changes by looking to the highest needs or risks first. All of the Groundfish FMP's stock complexes could certainly be better aligned with the National Standard 1 (NS1) Guidelines, and principles of good fisheries management. Yet with heavy workload again this management cycle, the GMT's risk-based approach was meant to highlight changes that might involve more urgency or benefit than others.

Importantly, however, in the Council's September discussion we noted some differences in how "risk" was being spoken of. We recognized those differences because they have also arisen many times in GMT discussions. We discuss some of these differences here because they can affect one's view of what should be done with the stock complexes.

Discussions on the stock complexes cover almost every aspect of harvest specifications and management measures and therefore can raise the full-range of viewpoints involved with fisheries management. It can be difficult to move through the discussions and issues stepwise. After considerable discussion in this and in past cycles, the GMT arrived at a specific, narrow type of risk in mind when formulating this analytical approach and suggesting it to the Council at the June meeting: the risk that catch might exceed the "component" OFLs and ABCs of each stock managed in a stock complex. When we have spoken of high or low risk, we have been referring to how likely it is that catch will go over an ABC or OFL if no management changes are made.

The analysis of this risk starts with the same question that the Council takes up each biennial management measure cycle: are new management measures needed to keep catch within annual catch limits (ACLs) and other harvest specifications for particular stocks? Although typically discussed as part of the harvest specifications, in this regard the stock complex evaluation is largely in the nature of a management measures analysis. The structure of a complex itself is the first-level management measure. Yet an ACL set at the level of a stock complex may result in a

wide variety of catches of the component stocks and result in the "risk" that catch exceeds the component OFL/ABCs for one or more stocks. To address the risk, the Council can restructure that first-level management measure or, as discussed in the harvest guideline discussion and elsewhere, employ other measures to bring catch into acceptable proportions. However, there are some unanswered questions remaining about how to assess risk to the sustainability of a stock given estimates of component OFL/ABCs that we also raise in this discussion. The difference in views about risk that we have observed arise from the next level question of what it means for catch to exceed component OFLs and ABCs. People may hold the same view on the likelihood of a component ABC or OFL overage but then can differ over views on the consequences of and the appropriate response to that overage. Some hold the view that it is not as consequential to exceed component OFLs and ABCs as it is to exceed the same for individually managed stocks. Others hold similar views about overages for stocks estimated to be above the B_{MSY} management targets, rougheye rockfish and spiny dogfish being two examples from this cycle. Our point here is that these differences on the need for new management measures have driven differences in GMT views on the relative need to restructure the stock complexes. We imagine similar dynamics may be at play at the Council level.

In addition, at the bottom of the stock complex discussion and the nature of the component OFL and ABCs is a view that harvest specifications should be more in the nature of a "target"—where overages of certain magnitude are expected and acceptable—than a "limit" where overages are to be avoided. The discussion, however, has not always been explicitly framed in this way. While "targets" have long been used in fisheries management, it is unclear to some why the more flexible targets should be allowed for stocks managed as part of a complex but not individually managed stocks. For one, the stock complexes include many of the stocks that we know least about, and on that same logic, a higher buffer for scientific uncertainty is used between their OFL and ABCs. It is not clear then why we would be less concerned about catch overages (or indeed what level of overage should trigger a concern) than for individually managed stocks for which, the consequences of an overage are, in theory, better known. However, most agree that chronic or very large overages warrant additional attention whether through additional management measures, prioritization for future assessments, or other appropriate means to ensure that the sustainability of the stock is not in jeopardy.

The view on component OFLs and ABCs is based in part on the SSC's advice to evaluate stock complexes using average/cumulative catch (i.e., overages in any one year are not cause for concern if catch on average has been under OFLs/ABCs). Others on the team have concerns about this view because it involves unresolved questions which lead to inconsistency in management. To that point, the SSC has given the same advice about average catch performance with rebuilding ACLs and the individual fishing quota (IFQ) carryover program, yet even small annual overages have been avoided in both.

These matters have certainly not been straightforward. The SSC's advice from September about the risk faced by tiger rockfish is illustrative (Agenda Item G.8.b, Supplemental SSC Report). The question about what it means to exceed a component OFL or ABC combines many issues ranging from the fundamental matter of identifying the appropriate stock unit/unit to conserve, the quality/legitimacy of a stock's OFL/ABC and the measures of scientific uncertainty used to arrive at them, the fairness of holding some areas to account for catch, and more. These matters

involve important questions but ones that are not the GMT's to resolve. Many of the questions are best addressed by the SSC guidance on the science and in Council discussions with the National Marine Fisheries Service (NMFS) and National Oceanic and Atmospheric Administration (NOAA) general counsel (GC) on what the law allows. The discussions are not simple and we do not expect that they could be fully worked out through this cycle.

We have included this discussion here also to highlight a key analytical purpose of our narrow definition of risk. In brief, our work goes smoothest when the policy objective that we are analyzing and the metrics and data for evaluating performance against the objective are clear. Treating the OFLs and ABCs of stocks differently based on a whole slew of reasons, reasons that potential differ among stocks, does not lend us that clarity and team discussions can easily become confused. As an example, some have argued that the need to address overages of shortraker rockfish's OFL or ABC is less than for other stocks because it is a data poor stock that is also more northerly distributed and only partially extends into the Council's management area. Others have not agreed to that reasoning and would argue that this type of question is more appropriately considered with the "in the fishery" analysis (i.e., should the stock even be in the FMP?), or the calculation of the OFL and ABC. Again, this is a type of question the GMT cannot resolve on its own.

So, to avoid the potential distractions created by treating the OFLs and ABCs of stocks as apples and oranges, we have tried to avoid the question altogether. In June, September, and here we have reported the best available estimates of catch for each component stock. We use the best estimates of each stock's OFL and ABC as the key points of reference/performance standards. From this foundation, the Council and others can have the policy discussion about the other levels of conservation risk that are related to the overages of component OFLs and ABCs and of OFLs and ABCs of stocks above their B_{MSY} management targets.

Lastly, the differences in views among GMT members are really matters of degree. All agree that that a stock complex that would allow large or regular overage of component OFLs and ABCs is undesirable and should be avoided or actions taken to respond to such overages. The disagreements really revolve around the question of how regular or how large overages could be and then what the appropriate response is. Others are simply troubled by the lack of clarity and potential inconsistencies mentioned above that have yet to be worked out.

Overview of Next Steps

It was just this year that we were able to comprehensively look at the past performance of the stock complexes by looking at total catch for each component stock separately. And to date, this look back at the "risk" discussed above has taken up most of the GMT's attention. The next step in the analysis is to look forward and consider what the catch risk might be in 2015-16 and beyond.

As mentioned above, the organization of a stock complex can be thought of as a "first-level" management measure. Management measure would ideally be set on the ACL for the complex as whole and achieve the desired level of catch risk with respect to each component stock. Where performance does not live up to this objective, then other management measures may be necessary to keep the catch risks to acceptable levels. Per the Council's direction in September,

we only consider the Other Fish complex in this report. For the other stock complexes, we consider the potential need for "second-level" management measures in the other stock complexes under Agenda Item H.10. These "second-level" measures have typically been targeted at component stocks using harvest guidelines to delineate the acceptable level of catch.

Before moving to the specific discussion of the Other Fish, we highlight one more overarching issue. As noted several times during this and past cycles, the groundfish stock complexes could be arranged more in line with the principles laid out in the NS1 Guidelines and elsewhere. In other words, we have identified many "logical problems" with the complexes. At the same time, we have recognized that these do not necessarily translate into immediate conservation problems, or more specifically, "risks" of the sort noted in the previous section. The Other Fish complex is a good example. Save for spiny dogfish and perhaps the new FMP candidates, we do not see the need for new management measures to address catch risk for the component stocks. At the same time, there are real questions about the rationale for grouping many of the Other Fish stocks together. The complex may be highly illogical yet the conservation risks are low.

To the point, depending on time and priorities, the Council could focus on just addressing the greatest catch risks—or on the other end of the spectrum—go full out and take on the matter of aligning the complexes with the logic of the NS1 Guidelines. The GMT approach was set up to allow the Council to address either end or something intermediate along this spectrum. Moreover, at the center of the GMT's approach was the idea that the greatest catch risks could be addressed by pulling individual stocks out of the complex while leaving the remainder intact (or, similarly, pulling the inflator stocks out and leaving the rest intact). We raise this again because we heard the opposite impression expressed during the Council's September discussion (i.e. that the GMT was suggesting that the Council fully attempt to address the "logical problems" this cycle). How much to take on this cycle is a policy choice the GMT does not speak to. Our main recommendation is that, if resources are limited, the Council could sensibly ration those resources by focusing on the highest risks first.

While only addressing the Other Fish complex here, we again think the Council has the flexibility with the Other Fish to focus on catch risks, on full alignment with the NS1 Guidelines, or something in between.

Other Fish Complex Alternatives

The species comprising the Other Fish complex have disparate life histories, ecological relationships, distributions, and vulnerabilities to overfishing. This complex consists of various roundfish and cartilaginous fish. The cartilaginous fish are comprised of elasmobranches species (e.g., sharks and skates) and chimaeras (e.g., ratfish). For this document, alternatives are provided as either (a) cartilaginous fish alternatives or (b) roundfish alternatives. This proposed division of the Other Fish complex was proposed and justified by Council staff (Agenda Item F.8.a, Attachment 1, June 2013) and by the GMT in June (Agenda Item F.8.b, Supplemental GMT Report 2, June 2013) and in September (Agenda Item G.8.b, Supplemental GMT Report 7, September 2013).

Alternatives provided below were brought forward from previous Council meetings (i.e., GMT and GAP alternatives) or developed by the GMT during our October meeting. Additional

alternatives may be brought forward in the supplemental briefing book. For example, the GMT discussed whether complexes with no calculated OFLs could be included as an alternative. This type of alternative requires further GMT discussion before it can be fully developed.

Tables and figures that may help in selecting alternatives are provided in Appendix B and Appendix C. Appendix B provides recent catch relative to OFLs and ABCs (i.e., "risk" analysis). Appendix C provides figures and tables that demonstrate the level of co-occurrence. Additional information that may inform the decision to add or remove species to or from the FMP, or designate EC species can be found in Agenda Item H.4.b, GMT Report 2, November 2013.

Status Quo Cartilaginous Fish

The cartilaginous fish stocks in the FMP, including those managed in the status quo Other Fish complex, are depicted in Table 2. Longnose skate, which was assessed in 2011, was removed from the Other Fish complex and managed individually beginning 2013. Longnose skate is not a quota species within the IFQ fishery, but rather is managed under trip limits. Note that a range of trip limits and Groundfish Conservation Areas (GCAs) were analyzed as potential management measures for both longnose skate and spiny dogfish for the 2013-2014 biennial harvest specifications and management measures final environmental impact statement (FEIS 2013). Species within the status quo Other Fish complex, along with their 2014 OFL contributions, include big skate (458 mt), California skate (86 mt), leopard shark (167.1 mt), spotted ratfish (1,441 mt), soupfin shark (61.6 mt), and spiny dogfish (2,950 mt).

Table 2. Status quo cartilaginous fish stocks and stock complex.

Cartilaginous Fish – Individually Managed Stocks	Cartilaginous Fish Complex
Longnose Skate	Big Skate California Skate Leopard Shark Spotted Ratfish Soupfin Shark Spiny Dogfish

Cartilaginous Fish Alternative 1

Alternative 1 creates a new complex described as cartilaginous fish complex (Table 3). This alternative was developed at the October GMT meeting. The only difference between this alternative and Status Quo is moving spiny dogfish out of the complex for individual management.

Similar to longnose skate, which is individually managed, spiny dogfish demonstrates a large OFL contribution relative to the other cartilaginous species (Appendix B). As such, this species

might inflate the OFL of a complex that included them. Another similarity between spiny dogfish and longnose skate is both have OFLs based on Category 1 stock assessments.

A dissimilarity between spiny dogfish and longnose skate is the potential "risk of overfishing" (see the discussion above; also see Appendix B). Although the maximum catches of dogfish shark during the years 2004-2012 (2,455 mt and 2,464 mt in 2005 and 2006, respectively) remained below the 2013 OFL, those levels of catches would have exceeded the 2013 ABC (2,044 mt) in 2005 (when catch was 2,455 mt) and in 2008 (when catch was 2,464 mt). The new spawning potential ratio (SPR) of $F_{SPR50\%}$ will produce a spiny dogfish OFL for 2015 of 2,523 mt, which is lower than the 2013 OFL (2,980 mt) that was calculated under the previous SPR of $F_{SPR45\%}$. Although maximum catches during 2004-2012 would not have exceeded the 2015 OFL, they approach it. Under the new SPR, using the status quo P-star (P*) of 0.30, the resulting 2015 ABC would be 1,731 mt. This ABC would have been exceeded during 3 of 9 years between 2004 and 2012. Note the most recent reported catch of spiny dogfish was 1,662 mt in 2011, below the ABC for 2015. Preliminary data suggest the 2012 catch for spiny dogfish may be much lower.

Although the 2015 OFL was exceeded for California Skate once in 9 years (Appendix B), this alternative recommends leaving the species within the complex because it is largely state managed, and the 2015 OFL (86 mt) was exceeded only by catches in 2005 which reached 89 mt. Catches of California skate have not exceeded 18 mt since 2007.

Table 3. Cartilaginous Fish Alternative 1. Italics represent a new addition to a column relative to Status Quo. Strike out represents a species that was removed from a column relative to Status Quo.

Cartilaginous Fish-- Individually Managed Stocks	Cartilaginous Fish in the Other Fish Complex
Longnose Skate *Spiny Dogfish*	Big Skate California Skate Leopard Shark Spotted Ratfish Soupfin Shark ~~Spiny Dogfish~~

Cartilaginous Fish Alternative 2

Alternative 2 creates a new complex (cartilaginous fish complex) and designates an EC species (Table 4). As shown and justified under Alternative 1, spiny dogfish would be moved out of the complex and join longnose skate for individual management, and California skate would remain in the complex. Ratfish, however, would be removed from the complex and designated an EC species. Ratfish may be considered an inflator species because it has a large OFL contribution relative to the other cartilaginous species, is never targeted or sold (as far as we know), and is largely protected by the trawl rockfish conservation area (RCA). Catch of spotted ratfish relative to the 2015 OFL (1,441 mt) averaged 12% from 2003-2012 and only 7% from 2009-2012. The

maximum catch of spotted ratfish during that time period was 304 mt in 2006 and the most recent reported catch was only 74 mt in 2011.

Table 4. Cartilaginous Fish Alternative 2. Italics represent a new addition to a column relative to Status Quo. Strike out represents a species that was removed from a column relative to Status Quo.

Cartilaginous Fish-- Individually Managed Stocks	Cartilaginous Fish Complex	Cartilaginous Fish EC Species
Longnose Skate *Spiny Dogfish*	Big Skate California Skate Leopard Shark ~~Spotted Ratfish~~ Soupfin Shark ~~Spiny Dogfish~~	Spotted Ratfish[a]

Cartilaginous Fish Alternative 3

Alternative 3 creates two new complexes: a shark-ratfish complex and a skate complex (Table 5). This alternative was developed by the GMT in June (Agenda Item F.8.b, Supplemental GMT Report 2, June 2013) and presented again in September (Agenda Item G.8.b, Supplemental GMT Report 7, September 2013); the Council recommended moving this alternative forward for further consideration during the September Council meeting.

As shown and justified under Alternative 1, spiny dogfish would be moved out of the complex and join longnose skate for individual management. California skate would remain in the skate complex. There are good reasons for separating cartilaginous species into a shark-ratfish complex and a skate complex. The species do not co-occur to a high degree, and they are easily differentiable from one another. At the same time, however, the conservation need for separation may not be high. In general, cartilaginous species have life histories that are more similar to each other than to bony fishes, making their vulnerability to overfishing somewhat similar.

This alternative adds five species (or species groups) to the FMP: brown cat shark, Bering/sandpaper skate, Aleutian skate, roughtail/black skate, and all other skates (see discussion and Table 2 in Agenda Item H.4.b, GMT Report 2, November 2013). It is uncertain whether OFLs can be calculated for "all other skates". If not, then adding this component to the complex may require further discussion. An alternative would be to designate "all other skates" as EC species, at least until OFLs can be calculated.

Leopard shark, which is largely caught inside of 3 miles off California, may be considered for removal from the FMP for management by the State. Some discussion of removing species from the FMP for State management was discussed above, and was provided as an alternative under Table 4 in Agenda Item H.4.b, GMT Report 2, November 2013.

Table 5. Cartilaginous Fish Alternative 3. This alternative was provided by the GMT under Agenda Item G.8.b, Supplemental GMT Report 7, September 2013. Italics represent a new addition to a column relative to Status Quo. Strike out represents a species that was removed from a column relative to Status Quo. Bold represents species that may be considered for removal from the complex for state management.

Cartilaginous Fish-- Individually Managed Stocks	Shark-Ratfish Complex	Skate Complex
Longnose Skate	Soupfin Shark	Big Skate
Spiny Dogfish	Brown Cat Shark[a]	California Skate
	Leopard Shark[b]	Bering/Sandpaper Skate[a]
	Spotted Ratfish	Aleutian Skate[a]
	~~Spiny Dogfish~~	Roughtail/Black Skate[a]
		All Other Skates[a]

[a]Add to the FMP
[b]Consider state management

Cartilaginous Fish Alternative 4 (GAP Alternative)

Alternative 4 creates two new complexes: a shark-ratfish complex and a skate complex (

Table 6). This alternative was developed by the Groundfish Advisory Subpanel (GAP) under Agenda Item G.8.b, Supplemental GAP Report, September 2013 and Agenda Item F.8.b, Supplemental GAP Report, June 2013. The GAP based this alternative on that shown in Table 13 of the Council Staff report shown under Agenda Item F.8.a, Attachment 1, June 2013.

Under this alternative, longnose skate would be moved from being individually managed to the skate complex, where it would become an indicator stock. Although the SSC supports the possibility that longnose skate could be used as an indicator stock for the skate complex (see Agenda Item F.8.b, Supplemental SSC Report, June 2013), they showed that it may not be necessary to become a member a complex to simply to function as an indicator stock. The SSC cautioned: "Adding a stock to a complex simply to have an indicator stock could lead to the indicator stock becoming an inflator stock." The GMT notes that further discussion is required on the concept and application of indicator stocks, and seeks further guidance from the SSC.

Alternative 4 adds non-FMP species to the FMP (Aleutian skate, Bering/sandpaper skate, black/roughtail skate, and all other endemic skates to the Skates complex), similar to what was done under Alternative 3. All endemic skates other than Aleutian skate, Bering/sandpaper skate, big skate, black/roughtail skate, California skate, and longnose skate would be designated EC species.

Soupfin shark would also be designated an EC species under this alternative. The catch of this species averaged 8 mt per year over 2007-2011, however, less than 1 mt on average was caught by Groundfish FMP sectors (see Agenda Item H.4.b, GMT Report 2, November 2013).

Table 6. Cartilaginous Fish Alternative 4. This alternative was presented by the Groundfish Advisory Panel (GAP) under Agenda Item G.8.b, Supplemental GAP Report, September 2013, and was based on the Council Staff report under Agenda Item F.8.a, Attachment 1, June 2013.

Cartilaginous Fish--Individually Managed Stocks	Shark-Ratfish Complex	Skate Complex	EC Species
~~Longnose Skate~~	Spiny Dogfish Spotted Ratfish ~~Soupfin Shark~~[a] ~~Leopard Shark~~[b]	*Longnose Skate* Big Skate California Skate *Bering/Sandpaper Skate*[c] *Aleutian Skate*[c] *Roughtail/Black Skate*[c] *All Other Skates*[c]	*Soupfin Shark*[a]

[a]Specify as EC species
[b]Remove from the FMP
[c]Add to the FMP

Roundfish Complex Alternatives

Status quo and two alternatives are shown below for the roundfish stock complex. Both alternatives create additional complexes based on depth. Roundfish Alternative 1 was developed by the GMT during the June and September Council meetings, whereas Alternative 2 was developed by the GAP during the same Council meetings.

Discussions at the October GMT meeting contemplated even further sub-division of the Roundfish complex and potential management of the shallower complex components by the states (i.e., remove from the FMP for state management). More GMT discussions are necessary, however, before this potential alternative can be fully developed. Results of that discussion may be brought forward to the Council in a supplemental GMT statement. Nonetheless, we provide some considerations here regarding these shallow-water roundfish.

The Shallow-Water Roundfish complex is composed of species that are primarily caught within three miles of shore, in state waters, making them candidates for removal from the FMP and subsequent management by each state. This possibility was discussed above as well as in Agenda Item H.4.b, GMT Report 2. Individual management of cabezon and kelp greenling stocks at the state level may be advantageous given the low connectivity expected between states and the biology of the stocks. Though the complex includes shallow reef dwelling species, some species occupy disparate latitudes (see Appendix C). It is important to note that at present, only cabezon in Washington are included in the complex, while others are individually managed (Table 7). Also note that kelp greenling have only been assessed in California, and are managed closely by regulation in all states. Although at first glance removing some of these shallow-water stocks from the FMP and managing them individually at a state level of geographic

stratification may seem logical. Conversely, retaining these stocks within the FMP may offer increased efficiencies, in some cases (see the discussion above).

Another important consideration when evaluating the shallow-water stocks is the OFL contribution for kelp greenling. Since kelp greenling has only been assessed in California waters, the "coastwide" OFL contribution for the complex does not include Washington and Oregon contributions. The only contribution to the aggregate OFL comes from the portion of the kelp greenling stock in California. As a result, the mortality from the other stocks (i.e., those in Washington and Oregon) are counted against the complex OFL that includes only the OFL contribution from the California-greenling assessment. This situation could be solved if OFLs are calculated for the remaining kelp greenling stocks using data poor methods.

The GMT notes, based on this discussion, kelp greenling in California could be pulled out of the complex and individually managed within the FMP, if desired. The remaining component stocks could be left within the complex without OFLs at this time. However, this brings up the question of how to address complexes with little or no OFL contributions. This question will be addressed more thoroughly in a supplemental GMT statement.

Status Quo Roundfish

The roundfish included in the status quo Other Fish complex include cabezon in Washington, finescale codling, kelp greenling and Pacific grenadier (Table 7). Species within this complex may occupy differential depths and latitudes (Appendix C). As noted above, the OFL contribution for kelp greenling is offered only by the California portion of the stock (2014 OFL = 118.0 mt). Finescale codling and Cabezon (WA) currently have no OFL contributions. Pacific grenadier may be considered an inflator species, with an OFL contribution of 1,519 mt for 2014.

Table 7. Status quo roundfish stocks and stock complex.

Roundfish – Individually Managed Stocks	Roundfish in the Other Fish Complex
Cabezon (CA)	Cabezon (WA)
Cabezon (OR)	Finescale codling
California scorpionfish	Kelp greenling
Lingcod N and S of 40º10'	Pacific grenadier
Pacific cod	
Pacific whiting	
Sablefish N and S of 36º	

Roundfish Alternative 1

Alternative 1, presented by the GMT at the September Council meeting (Agenda Item G.8.b, Supplemental GMT Report 7, September 2013), divides the Status Quo roundfish complex into shallower and deeper groupings (Table 8). In this case, Cabezon (WA) and kelp greenling are included in the shallow-water complex, whereas finescale codling and Pacific grenadier are included in the deep-water complex.

This alternative adds several species to the FMP (see See Agenda Item H.4.b, GMT Report 2, November 2013), including Giant grenadier, all other grenadiers, and California slickhead in the deep and all other greenlings in the shallow.

Under Alternative 1, non-FMP grenadier species (i.e., giant grenadier and all other grenadiers) are added to the deep water complex, joining Pacific grenadier which is already in the FMP. Evaluation of species composition in the Pacific Fisheries Information Network (PacFIN) databases indicates that the majority of the "all other grenadiers" is primarily composed of retained Pacific grenadier. In aggregate ~40 percent of the grenadier identified as Pacific grenadier is retained, while the majority of giant grenadier is discarded due to its inferior flesh quality. However, adding giant grenadier into the FMP may simplify sorting if it were included in a complex with all other grenadiers (e.g., a Grenadier complex).

Of the remaining species in the deep-water roundfish complex, Alternative 1 brings California slickhead into the FMP for EC species designation. This alternative also considers designating finescale codling as an EC species. Finescale codling and California slickhead, though encountered with some regularity, are not retained. These species are not marketable due to poor flesh quality. If designated as EC species, mortality could be monitored, while acknowledging that they are not targeted in the fishery. Should the Council choose to manage the shallow-water complex species as individual stocks at a state level discussed above and to designate finescale codling and California slickhead EC species, the only stocks remaining within the complex would be the Pacific grenadier, giant grenadier and all other grenadier, which could comprise a grenadier complex. Such action would effectively eliminate the other fish complex. More information on the "in the fishery" question can be found in H.4.b, GMT Report 2, November 2013

Table 8. Roundfish Alternative 1. This alternative was provided by the GMT under Agenda Item G.8.b, Supplemental GMT Report 7, September 2013. Italics represent a new addition to a column relative to Status Quo. Strike out represents a species that was removed from a column relative to Status Quo.

Roundfish – Individually Managed Stocks	Deep-water Roundfish Complex (coastwide)	Shallow-water Roundfish Complex (coastwide)
Cabezon (CA)	Finescale codling[b]	Cabezon (WA)
Cabezon (OR)	Pacific grenadier	Kelp greenling
California scorpionfish	*Giant grenadier*[a]	*All other greenlings*[a]
Lingcod N and S of 40°10'	*All other grenadiers*[a]	
Pacific cod	*California slickhead*[b]	
Pacific whiting		
Sablefish N and S of 36		

[a]Add to the FMP
[b]Consider specifying as an EC species

Roundfish Alternative 2 (GAP Alternative)

Roundfish Alternative 2 (Table 9) was presented by the GAP at the April and June Council meeting under (Agenda Item D.3.b, Supplemental GAP Report, April 2013 and

Agenda Item F.8.b, Supplemental GAP Report, June 2013. This alternative contemplated removing species from the FMP and making others EC species.

This alternative suggests removing Pacific grenadier from the Groundfish FMP, because it is not targeted and only a fraction of the biomass of any grenadier species is currently fished as they are distributed into far deeper depths than are currently accessed. The GAP also recommended designating finescale codling as an EC species. Finescale codling is encountered with some regularity but not retained since due to poor flesh quality. Under this scenario, there would be no deep-water roundfish complex for management purposes.

Finally, roundfish Alternative 2 suggests adding all other greenlings to the FMP, as was shown under Alternative 1.

Table 9. Roundfish Alternative 2. This alternative was presented by the Groundfish Advisory Panel (GAP) under Agenda Item D.3.b, Supplemental GAP Report, April 2013 and Agenda Item G.8.b, Supplemental GAP Report, September 2013. The alternative was initially based on the Council Staff report under Agenda Item F.8.a, Attachment 1, June 2013.

Roundfish – Individually Managed Stocks	Deep-water Roundfish Complex (coastwide)	Shallow-water Roundfish Complex (coastwide)
California scorpionfish	~~Pacific grenadier~~[c]	Cabezon (WA)
Spiny dogfish	Finescale codling[b]	Kelp greenling
Cabezon (OR)		*All other greenlings*[a]
Cabezon (CA)		
Lingcod N and S of 40°10’		
Pacific cod		
Pacific whiting		
Sablefish N and S of 36°		

[a]Add to the FMP
[b]Specify as an EC species
[c]Remove from the FMP

Summary

In this paper, we provide example alternatives for reorganizing the Other Fish complex. Decisions to bring species into the FMP or removing species from the FMP should be made using guidelines and considerations offered in Agenda Item H.4.b, GMT Report, November 2013. We point out that numerous alternatives could have been developed and provided by the GMT, however, we provide only a few as examples. The Council may consider information provided in both GMT reports to create alternatives that best fit Council objectives.

Socio-economic impacts were not provided herein. Most potential impacts associated with restructuring complexes were discussed in detail in many of the previous reports (see Appendix A).

The GMT expects to provide some additional information and alternatives in a supplemental statement.

Appendix A. Reports associated with stock complex reorganization created beginning April 2013. These statements are organized by source (e.g., Council staff, states, or advisory bodies), date, and statement number.

Council Staff Reports

- Initial Proposal (Proposed Action, Alternatives, and Considerations) for Restructuring Groundfish Stock Complexes (Agenda Item D.3.a, Attachment 1, April 2013)
    - Council staff white paper containing: (1) background and information regarding Magnuson-Stevens Act (MSA), National Standard 1 (NS1) guidelines, National Marine Fisheries Service guidance on how to meet the conservation objectives of the MSA; (2) description of methods used to evaluate alternatives; (3) description of alternatives for Nearshore Rockfish, Shelf Rockfish, Slope Rockfish, Other Flatfish, Roundfish, and Cartilaginous Fish complexes.

- Considerations for Restructuring Groundfish Stock Complexes (Agenda Item D.3.a, Supplemental Agenda Item Overview PowerPoint, April 2013
    - Council staff and GMT power point presentation describing methods and alternatives shown in the Council staff white paper (DeVore/Cope).

- Considerations for Restructuring West Coast Groundfish Stock Complexes: Preliminary Alternatives and Analyses (Agenda Item F.8.a, Attachment 1, June 2013)
    - Council staff white paper containing: (1) background and information regarding Magnuson-Stevens Act (MSA), National Standard 1 (NS1) guidelines, National Marine Fisheries Service guidance on how to meet the conservation objectives of the MSA; (2) description of alternatives for Nearshore Rockfish, Shelf Rockfish, Slope Rockfish, Other Flatfish, Roundfish, and Cartilaginous Fish complexes; (3) description of methods used to evaluate alternatives; (4) effects of alternatives including socioeconomic impacts to fisherman and processors, as well as management agencies.

State Reports

- Oregon Department of Fish and Wildlife Report on the Oregon Commercial Sampling Program and Potential Changes to Species Complexes (Agenda Item F.8.b, ODFW Report, June 2013)
    - ODFW report showing impacts such as (a) sampling procedures, (b) cost of increasing the number or configuration of species complexes, and (c) qualitative cost to the state commercial sampling program.

Groundfish Advisory Subpanel Reports

- Groundfish Advisory Subpanel Report on Stock Complex Assemblages (Agenda Item D.3.b, Supplemental GAP Report, April 2013
    - GAP provided concerns as well as recommendations for stock complex reorganization alternatives for Nearshore Rockfish, Shelf Rockfish, Slope

Rockfish, Other Flatfish, and Other Fish complexes. The GAP also provided comment on removing Pacific grenadier from the FMP.

- Groundfish Advisory Subpanel Report on Adopt Preliminary Stock Complex Aggregations (Agenda Item F.8.b, Supplemental GAP Report, June 2013)
    - GAP statement providing recommended alternatives for Slope Rockfish and Other Fish complexes (cartilaginous fish and roundfish), along with impacts of restructuring stock complexes.

- Groundfish Advisory Subpanel Report on Consider Stock Complex Aggregations (Agenda Item G.8.b, Supplemental GAP Report, September 2013)
    - GAP provided concerns and described impacts of stock complex reorganization, as well as recommendations regarding the reorganization of Slope Rockfish, Shelf Rockfish, Other Flatfish, and Other Fish complexes.

Scientific and Statistical Committee Reports

- Scientific and Statistical Committee Report on Stock Complex Assemblages (Agenda Item D.3.b, Supplemental SSC Report, April 2013)
    - SSC review of methods developed for analyzing stock complex alternatives.

- Scientific and Statistical Committee Report on Adopt Preliminary Stock Complex Aggregations (Agenda Item F.8.b, Supplemental SSC Report, June 2013)
    - SSC statement providing (1) a review of GMT methods/metrics used to evaluate stock complexes, (2) comment on complex components caught on either side of $40^{o}10'$ N. latitude, (3) approaches to determine stock status within complexes (e.g., indicator stocks and data-moderate assessments).

- Scientific and Statistical Committee Report on Consider Stock Complex Aggregations (Agenda Item G.8.b, Supplemental SSC Report, September 2013)
    - SSC review of risk analyses provided by the GMT; advice regarding recent catches of tiger rockfish relative to its component OFL/ABC; review and comment on use of PSA and other metrics for deciding which species should be "in the fishery"

Groundfish Management Team Reports

- Groundfish Management Report on Stock Complex Assemblages (Agenda Item D.3.b, Supplemental GMT Report, April 2013)
    - The GMT provided recommendations for (1) Council schedule pertaining to stock complex reorganization and (2) prioritization of complexes to consider for reorganizing based on Productivity and Susceptibility Assessment (PSA) and historical harvest levels.

- Groundfish Management Team Report on Methods and Results That May Be Used to Evaluate Alternatives for Stock Complex Reorganization (Agenda Item F.8.b, GMT Report, June 2013)
    - GMT description of five methods/analyses used to evaluate stock complex alternatives including spatial analysis, species co-occurrence tables, C-scores, cluster analysis, and a survey of port biologists and state fishery managers.

- Groundfish Management Team Report on Considerations for Restructuring West Coast Groundfish Stock Complexes (Agenda Item F.8.b, Supplemental GMT Report 2, June 2013)
    - The GMT (1) discussed use of indicator species, and the cost of reorganization, (2) adopted a four-step approach to evaluate stock complex alternatives, and (3) developed alternatives for Other Fish complex and Slope Rockfish. Relevant figures and tables showing co-occurrence were attached.
    - The full suite of figures and tables used to support this analysis was posted at the Council website: ftp://ftp.pcouncil.org/pub/Stock_Complex_Materials/GMT_June2013/

- Figures and Tables Depicting At-Sea Hake and Recreational Fishery Catch and Effort Data for Slope Rockfish, Cartilaginous Fish, and Roundfish complexes (Agenda Item F.8.a, Supplemental Attachment 2, June 2013).
    - GMT products used to evaluate co-occurrence of potential complex component species using catch and effort data.

- Groundfish Management Team Report on Additional Methods that May Be Used to Evaluate Alternatives for Stock Complex Reorganization (Agenda Item G.8.b, GMT Report 1, September 2013):
    - GMT description of methods used to evaluate stock complex alternatives, including metrics to evaluate risk of overfishing.

- Groundfish Management Team Report on the Classification of Stocks in the Groundfish Fishery Management Plan (Agenda Item G.8.b, GMT Report 2, September 2013)
    - GMT description of methods to evaluate whether stocks should be included in the FMP and in the fishery, or included in the FMP and designated EC species, or removed from the FMP.

- Groundfish Management Team Report on Port Sampling Surveys (Agenda Item G.8.b, GMT Report 3, September 2013)
    - GMT reported results of surveys provided to State Managers and Port Biologists. This report provided potential impacts of stock complex reorganization at the state level (data quality, sampling programs, etc.) and at the plant/vessel level (i.e., potential impacts to sorting requirements and space).

- GMT PowerPoint - Complex Reorganization, A Summary of Reports and Results by the Groundfish Management Team (Agenda Item G.8.b, Supplemental GMT Report 4, September 2013)
    - GMT PowerPoint presentation

- Groundfish Management Team Report on Restructuring West Coast Groundfish Stock Complexes (Agenda Item G.8.b, Supplemental GMT Report 5, September 2013)
    - GMT provided a process for reorganizing stock complexes
    - An alternative for reorganizing Slope Rockfish was provided as an example, along with justification for the alternative, and associated implications.
    - Tables and figures supporting stock complex alternatives for Slope Rockfish, Shelf Rockfish, Other Flatfish, and Other Fish complexes were provided in this report. These tools included information regarding risk analysis and co-occurrence.

- Groundfish Management Team Report – Proposed Alternatives for Classifying Stocks in the Groundfish Fishery Management Plan (Agenda Item G.8.b, Supplemental GMT Report 6, September 2013)
    - GMT narrows the candidates for potential classification as "in the fishery" or EC species in the FMP

- Groundfish Management Team Report on Consider Stock Complex Aggregations (Agenda Item G.8.b, Supplemental GMT Report 7, September 2013)
    - GMT provided alternatives for reorganizing the Other Fish complex and evaluated whether any species within Shelf Rockfish were at risk of overfishing.

Appendix B. Risk Analysis Tables.

Appendix B - Table 1. Metrics that may be used to evaluate the risk of overfishing for the Cartilaginous Fish Complex. Metrics include (1) average annual catch (2011-2012, 2009-2012, and 2004-2012) as a percent of the 2015 ABC and the 2015 OFL, and (2) percent of years (N =2, 4, or 9 years) that catch would have exceeded the 2015 OFL or the 2015 ABC.

Component Stock	2015 OFL	2015 ABC	Percent ABC 2011-2012	Percent ABC 2009-2012	Percent ABC 2004-2012	Percent Years Over ABC 2004-2012	Percent OFL 2012	Percent OFL 2009-2012	Percent OFL 2004-2012	Years Over OFL 2004-2012
Longnose skate - Fmsy = 50% SPR, P* = 0.3*	2449	2027	52%	61%	45%	0%	43%	50%	37%	0%
Longnose skate - Fmsy = 50% SPR, P* = 0.45*	2449	2341	45%	53%	39%	0%	43%	50%	37%	0%
Big skate	458	317.9	24%	23%	41%	0%	17%	16%	28%	0%
California skate	86	59.7	10%	16%	49%	11%	7%	11%	34%	11%
Leopard shark	167.1	116	26%	29%	35%	0%	18%	20%	25%	0%
Ratfish	1441	1000.1	8%	10%	17%	0%	6%	7%	12%	0%
Soupfin shark	61.6	42.8	9%	9%	34%	0%	6%	6%	23%	0%
Spiny dogfish - Fmsy = 50% SPR, P* = 0.3	2523	1731	72%	70%	93%	33%	49%	48%	64%	0%
Spiny dogfish - Fmsy = 50% SPR, P* = 0.45	2523	2303	54%	53%	70%	22%	49%	48%	64%	0%
Aleutian Skate***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Black Skate***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bering/Sandpaper skate***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
All other skates (not in the BB)***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Brown cat shark***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

*Managed outside of complex

**Trace amount caught; i.e., the average catch does not round to 0.1 mt.

***No estimate of OFL available

Appendix B - Table 2. Metrics that may be used to evaluate the risk of overfishing for the Roundfish Complex. Metrics include (1) average annual catch (2011-2012, 2009-2012, and 2004-2012) as a percent of the 2015 ABC and the 2015 OFL, and (2) percent of years (N =2, 4, or 9 years) that catch would have exceeded the 2015 OFL or the 2015 ABC.

Component Stock	2015 OFL	2015 ABC	Percent ABC 2011-2012	Percent ABC 2009-2012	Percent ABC 2004-2012	Percent Years Over ABC 2004-2012	Percent OFL 2012	Percent OFL 2009-2012	Percent OFL 2004-2012	Years Over OFL 2004-2012
Finescale codling/Pacific flatnose	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pacific rattail/grenadier**	1519	1054.2	9%	12%	10%	0%	6%	9%	7%	0%
Giant rattail/grenadier	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
All other rattails/grenadiers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cabezon (WA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cabezon (OR and CA)	214	201	54%	45%	41%	0%	51%	42%	39%	0%
California Scorpionfish*	119	114	99%	80%	68%	11%	94%	76%	65%	11%
Kelp Greenling	118.9	82.5	85%	66%	51%	0%	59%	46%	36%	0%
All other greenlings***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

*Managed outside of complex
**Trace amount caught; i.e., the average catch does not round to 0.1 mt.

***No estimate of OFL available

Appendix C. Tables and figures showing species co-occurrence and distribution for Other Fish alternatives.

Appendix C - Table 1. Cartilaginous Species occurrences (a), co-occurrences (b), and normalized C-scores (c) in the WCGOP bottom trawl data (2002-2011) coastwide. The shading in (c) is darkest for values less than 0.20 indicating the highest level of co-occurrence, and lighter for values between 0.20 and 0.70, indicating moderate levels of co-occurrence. Values greater than 0.70 are un-shaded indicating the lowest level of co-occurrence. Further explanation of these co-occurrence tables is provided in Agenda Item F.8.b, June 2013.

(a) Total occurrences of Cartilaginous Species coastwide

Longnose Skate	All Other Skates	Spiny Dogfish	Spotted Ratfish	Brown Cat Shark	Bering/ Sandpaper Skate	Big Skate	Black Skate	California Skate	Aleutian Skate	Leopard Shark	Soupfin Shark
19318	18043	16993	16959	15076	15040	6029	5279	2720	539	358	113

(b) Matrix of common occurrences of Cartilaginous Species coastwide

	All Other Skates	Spiny Dogfish Shark	Spotted Ratfish	Brown Cat Shark	Bering/ Sandpaper Skate	Big Skate	Black Skate	California Skate	Aleutian Skate	Leopard Shark	Soupfin Shark
Longnose Skate	7581	10163	10561	8501	11531	2460	2152	974	408	22	29
	All Other Skates	9115	9604	5313	6927	2764	918	875	304	133	52
		Spiny Dogfish	10426	4804	8391	2976	836	1190	294	186	57
			Spotted Ratfish	4059	8420	3113	543	744	288	41	42
				Brown Cat Shark	7448	159	4165	73	360	1	3
					Bering/ Sandpaper Skate	1596	1478	135	312	1	9
						Big Skate	24	1245	13	289	69
							Black Skate	19	115	1	0
								Cal. Skate	1	223	64
									Aleutian Skate	0	0
										Leopard Shark	25

(c) Matrix of normalized C-scores for Cartilaginous Species coastwide

	All Other Skates	Spiny Dogfish Shark	Spotted Ratfish	Brown Cat Shark	Bering/ Sandpaper Skate	Big Skate	Black Skate	California Skate	Aleutian Skate	Leopard Shark	Soupfin Shark
Longnose Skate	0.352	0.19	0.171	0.244	0.094	0.517	0.526	0.61	0.238	0.937	0.742
All Other Skates		0.229	0.203	0.457	0.332	0.459	0.784	0.645	0.429	0.624	0.538
Spiny Dogfish Shark			0.149	0.489	0.224	0.418	0.8	0.523	0.447	0.475	0.494
Spotted Ratfish				0.556	0.222	0.395	0.868	0.695	0.458	0.883	0.627
Brown Cat Shark					0.255	0.963	0.153	0.968	0.324	0.997	0.973
Bering/ Sandpaper Skate						0.657	0.649	0.942	0.412	0.997	0.92
Big Skate							0.991	0.43	0.974	0.183	0.385
Black Skate								0.989	0.77	0.997	1
California Skate									0.998	0.346	0.423
Aleutian Skate										1	1
Leopard Shark											0.724

Appendix C - Table 2. Other Roundfish occurrences (a), co-occurrences (b), and normalized C-scores (c) in the WCGOP bottom trawl data (2002-2011) coastwide. The shading in (c) is darkest for values less than 0.20 indicating the highest level of co-occurrence, and lighter for values between 0.20 and 0.70, indicating moderate levels of co-occurrence. Values greater than 0.70 are un-shaded indicating the lowest level of co-occurrence. Further explanation of these co-occurrence tables is provided in Agenda Item F.8.b, June 2013.

(a) Total occurrences of Other Roundfish coastwide

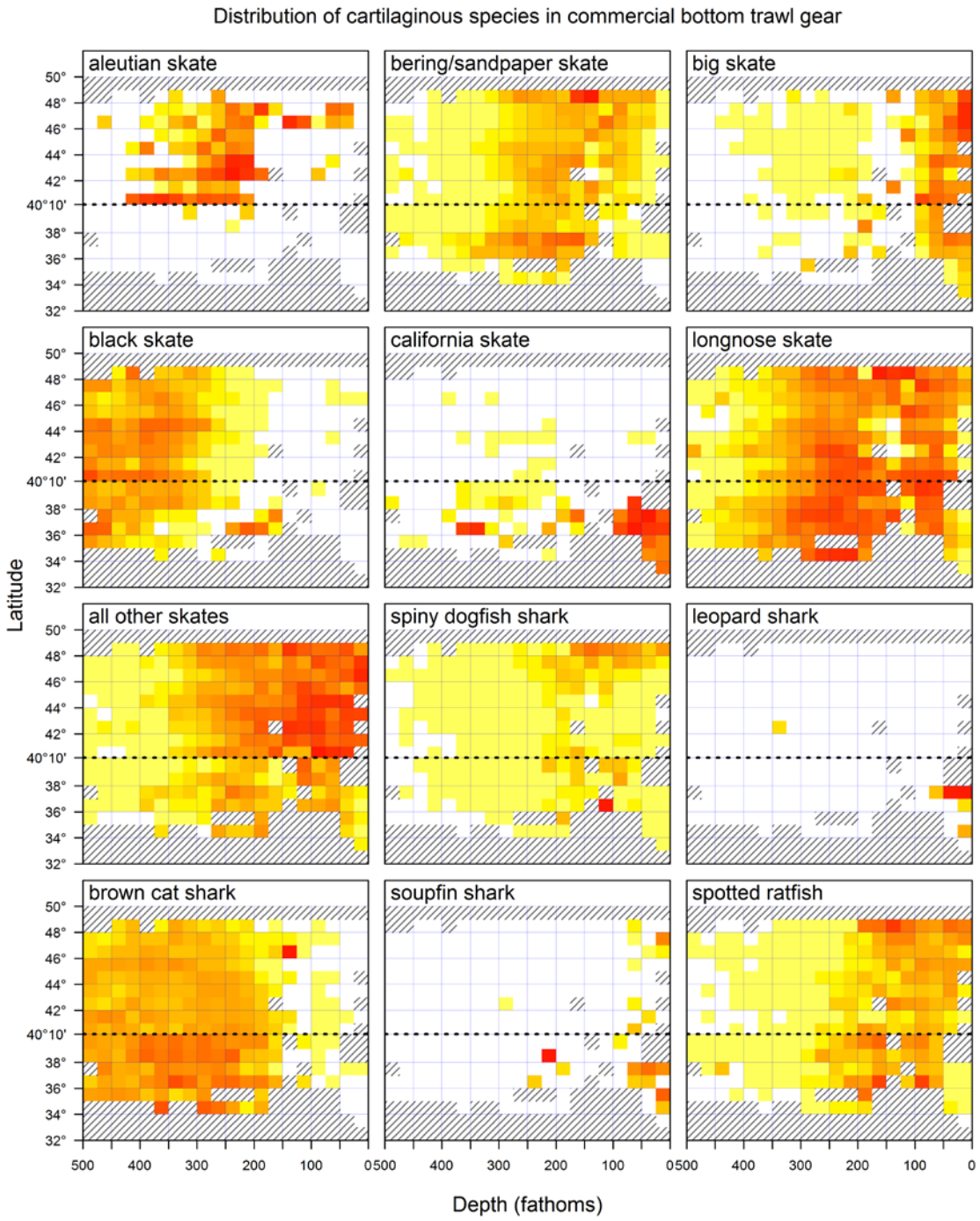
Giant Grenadier	Pacific Grenadier	California Slickhead	Pacific Flatnose	All Other Grenadiers	California Scorpionfish	Kelp Greenling	Cabezon	All Other Greenlings
7032	6433	4465	4120	3867	148	108	29	28

(b) Matrix of common occurrences of Other Roundfish coastwide

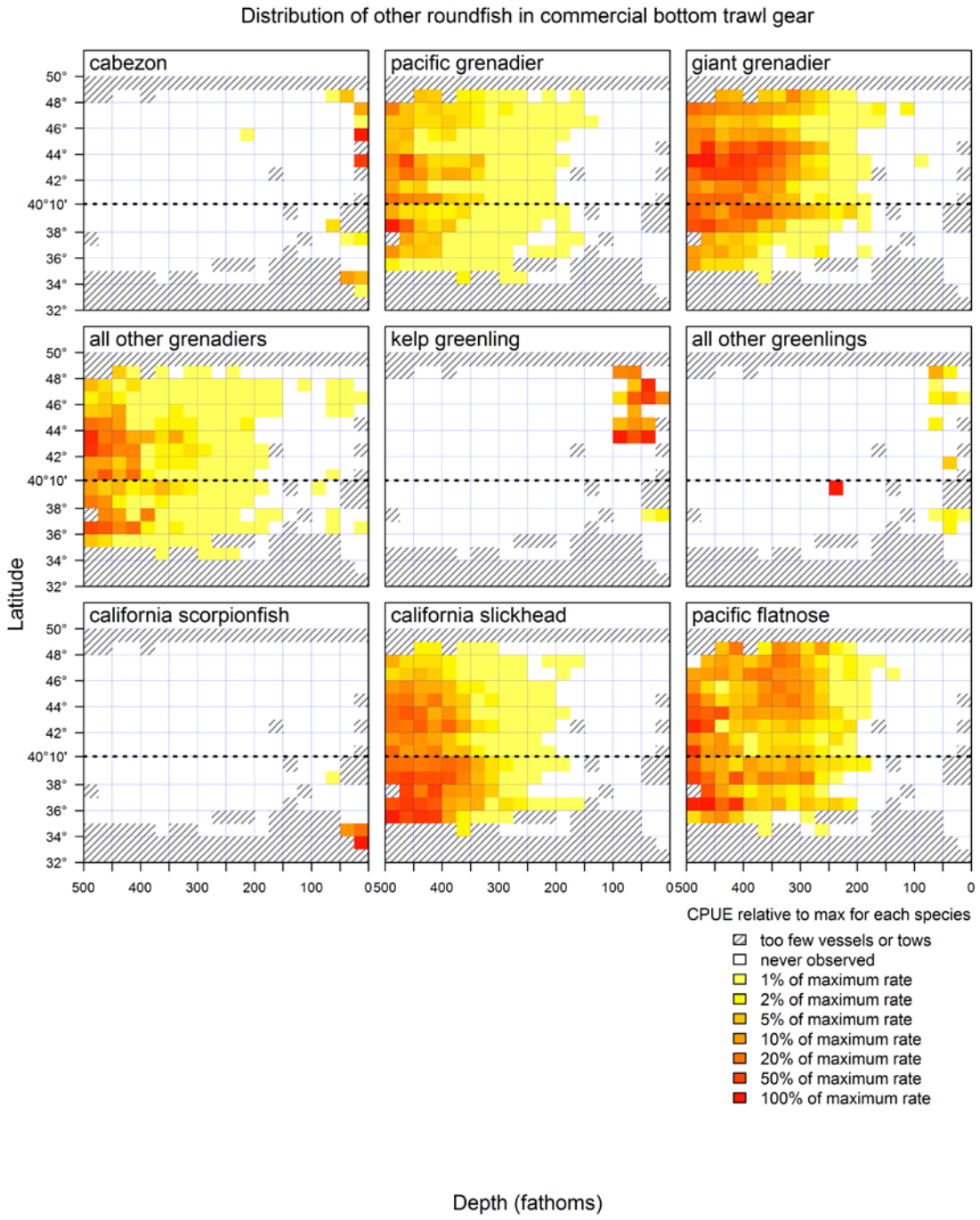
	Pacific Grenadier	California Slickhead	Pacific Flatnose	All Other Grenadiers	California Scorpionfish	Kelp Greenling	Cabezon	All Other Greenlings
Giant Grenadier	4241	3262	2628	1399	0	1	0	0
Pacific Grenadier		2944	2375	1077	0	1	0	0
California Slickhead			1929	1566	0	1	0	0
Pacific Flatnose				1516	0	1	0	0
All Other Grenadiers					0	2	0	0
California Scorpionfish						0	1	0
Kelp Greenling							0	0
Cabezon								0

(c) Matrix of normalized C-scores for Other Roundfish coastwide

	Pacific Grenadier	California Slickhead	Pacific Flatnose	All Other Grenadiers	California Scorpionfish	Kelp Greenling	Cabezon	All Other Greenlings
Giant Grenadier	0.135	0.144	0.227	0.511	1	0.991	1	1
Pacific Grenadier		0.185	0.267	0.601	1	0.991	1	1
California Slickhead			0.302	0.386	1	0.991	1	1
Pacific Flatnose				0.384	1	0.991	1	1
All Other Grenadiers					1	0.981	1	1
California Scorpionfish						1	0.959	1
Kelp Greenling							1	1
Cabezon								1



Appendix C - Figure 1. Spatial distribution of cartilaginous fish in WCGOP trawl data (2002 – 2011) for alternatives above. Colors represent CPUE relative to the maximum within each species (see the legend). Darkest red = highest CPUE; lightest yellow = lowest CPUE. Data for hatched boxes could not be displayed because of confidentiality (only 1 or 2 vessels carrying observers fished in the area) or because no vessels carrying observers fished in the area. White areas are places where 3 or more vessels fished and carried observers, but the species in question was not caught.



Appendix C - Figure 2. Spatial distribution of roundfish in WCGOP trawl data (2002 – 2011) for alternatives above. Colors represent CPUE relative to the maximum within each species (see the legend). Darkest red = highest CPUE; lightest yellow = lowest CPUE. Data for hatched boxes could not be displayed because of confidentiality (only 1 or 2 vessels carrying observers fished in the area) or because no vessels carrying observers fished in the area. White areas are places where 3 or more vessels fished and carried observers, but the species in question was not caught.