Supplemental Trawl Rationalization Analysis

The following pages constitute additional analysis of trawl rationalization. These analyses are largely in response to the outcome of the October 2008 meeting of the Groundfish Allocation Committee (GAC). The analyses contained in this document include:

A. The GAC request to analyze an alternative approach for processor linkage provisions in the mothership sector cooperative alternative
B. An analysis of the GAC recommendation to hold the at sea fishery responsible for the same set of species as the shoreside sector
C. An assessment of control limits based on utilization of the Herfindahl index
D. Metric ton and exvessel revenue equivalents for accumulation limits
E. Whiting sector and aggregate accumulation limits

Analysis of Groundfish Allocation Committee Recommendation for an Alternative Treatment of Processor Linkages in a Cooperative-Based Fishery for the Mothership Sector

At the October meeting of the Groundfish Allocation Committee (GAC), the GAC requested that additional analysis be done that examines the effect of substantially relaxing and/or eliminating the processor linkage provision in the mothership cooperative alternative. This request came about after discussion with NOAA General Counsel indicated that the processor linkage provisions in the mothership sector may raise antitrust concerns. Members of industry presented an additional proposal which appears to have been intended to create a cooperative structure that could be implemented without raising antitrust issues. The GAC recommended that this proposal be analyzed prior to the November 2008 Council meeting.

Following the GAC meeting and the distribution of the draft GAC report, members of industry indicated that their intention was to recommend an alternative cooperative structure that was different than the structure several GAC members and Council staff understood as the proposal. Industry members articulated that their intention was to have a cooperative alternative analyzed that had no processor linkage requirements – meaning that a vessel could switch motherships at any time during the course of the season and deliver to more than one mothership in a year. This was different than the structure described in the GAC report that would require a vessel to declare the mothership to which he would deliver to during the course of the year and be required to deliver to that mothership for the entire season. This document assesses the implications of both the approach described in the GAC report, and the approach that members of industry later clarified was their intention. We assess the effects of these approaches against an alternative with processor linkages and against the status quo.

Summarization of New Alternatives for Mothership Processor Linkages

Option A (Described in GAC Report)

A catcher vessel must declare whether it will be part of a cooperative or participate in the non-cooperative portion of the fishery.

i. Catcher vessels electing to participate in the cooperative fishery would be required to identify annually (at a date TBD) the mothership to which they will deliver to in the coming season.
ii. Catcher vessels would be able to switch motherships by simply declaring their linkage to another mothership in a subsequent year

A catcher vessel in the non-cooperative fishery may deliver to any mothership

Option B (Industry Clarified Intention)

Vessel declares a cooperative or non-cooperative each year. Not required to deliver to any particular mothership

The Non-Cooperative Fishery and its Role in a Fishery without Processor Linkages

In both options the non-cooperative fishery remains. Some rationale for the presence of a non-cooperative fishery in a cooperative structure is that it A) provides incentives for harvesters to maintain a linkage with a processor (if processor linkages exist and harvesters must fish in the non-cooperative fishery to break them), and B) that it provides a mechanism for protecting the cooperative if one or more vessels in a cooperative cannot agree to catch sharing arrangements with other cooperative members. In such an event, the members that can agree will most likely form a cooperative among themselves and the members that cannot agree will move to the non-cooperative fishery. In both A and B, the non-cooperative fishery can be viewed as a type of penalty mechanism that encourages harvesters to maintain linkages with processors and also agree to terms with other cooperative members.

The need for a penalty to exist in the form of a non-cooperative fishery depends on several different factors and elements of a cooperative program.

- If processor linkages are used as a tool to help ensure that processors benefit from rationalization, then the presence of the non-cooperative fishery may be more necessary to ensure that this occurs (assuming catcher vessels must fish in the non-cooperative fishery to break a processor linkage).
- If a cooperative structure is created based on the notion that it will tend to require less administrative workload of agencies (compared to an IFQ program), then a non-cooperative fishery may encourage catcher vessels to remain in cooperatives and work at minimizing the cost agencies must bear in order to rationalize the fishery.
- If no other mechanism exists for dealing with potential disagreements over catch sharing among fishery participants, having a non-cooperative fishery provides incentives for fishery participants to agree to catch sharing arrangements. In the event some members don't agree, they can participate in the non-cooperative fishery but this fishery is considered to be less beneficial. This effectively protects the cooperatives by ensuring they are formed by parties that can agree to terms, while allowing those that cannot agree to participate in the non-cooperative fishery.

If none of the above examples are the case, it is not clear that the presence of the non-cooperative fishery is necessary. If the above examples do not exist, it may be more appropriate to consider allowing those catcher vessels not in a cooperative to fish under a structure that is more like an IFQ-based fishery. One simple approach could be to allow harvesters not in a cooperative to fish their catch history independently (like an IFQ) while simultaneously establishing bycatch limits for the non-cooperative portion of the fishery. This may help ensure that harvesters not participating in a cooperative will continue to fish in a rationalized manner while also spreading the risk of bycatch events across several fishery participants. If the intention is to encourage a cooperative-based structure rather than an IFQ-based structure, making catch history percentages non-divisible may increase the chances of cooperatives forming and remaining intact.

Each of the alternative proposals for dealing with mothership sector ties described above solve catch sharing arrangements among cooperative members. This is because the proposals do not change the “golden rule” provision of the cooperative alternative and this golden rule provision solves resource sharing disputes that may arise among cooperative members. This means that the presence of a non-cooperative fishery may not be necessary as an outlet for those that cannot agree to terms with other potential cooperative members. This is because catch sharing arrangements will have been solved ahead of time.

The administrative workload associated with cooperatives may theoretically be less than the administrative workload associated with an IFQ-based fishery. If keeping participants in cooperatives tends to reduce workload, then having a non-cooperative fishery may help encourage harvesters to remain in cooperatives, and in turn keep administrative burden relatively low.

The lack of a processor linkage provision means that a non-cooperative fishery is not necessary to protect the interests of processors. This is because the non-cooperative fishery is intended to act as a deterrent to those considering the switching of processors. Under the new GAC option, it is understood that, if a catcher vessel wants to participate in a cooperative, they would need to declare a mothership to which they would deliver for the year. If they do not declare a mothership, they would not be able to join a cooperative and would be required to participate in the non-cooperative fishery. Since this GAC recommended option has some limitations on the mothership to which a catcher vessel could deliver to, the presence of a non-cooperative fishery may be necessary to encourage cooperative membership, and therefore, a mothership declaration. Under the option that some members of industry had clarified as their intent, the need for a non-cooperative fishery to help processors may not be necessary. Under this option it is understood that a catcher vessel could freely deliver to any mothership during the course of a season. Since there are no tools used for protecting processors under this option, there is no need for a non-cooperative fishery designed to stabilize mothership and catcher vessel relationships.

Reasons for non-cooperative fishery	**Appropriateness to new processor tie alternatives**
Provide an outlet for participants that cannot agree to catch sharing arrangements with others	Not Applicable. The presence of a "golden rule" provision means the non-coop fishery is not necessary in cases involving resource sharing disputes
Provide incentives for harvesters to form and remain in co-ops. This may decrease agency workload	May be applicable if cooperatives do in fact reduce agency workload compared to an IFQ-based fishery
Provide incentives to maintain linkages with processors (if a CV must fish in the non-cooperative fishery to break a linkage)	Processor tie option A) May be applicable because catcher vessels will need to declare a mothership in order to fish in the cooperative fishery
	Processor tie option B) Not applicable because no linkages exist

Rationalization's Effect on Harvester and Processor Relationships under the New Mothership Tie Alternatives

Rationalization has the potential to alter the relationships that exist between harvesters and processors over things like profit sharing and fishing timing. Under the status quo fishery with a common quota, both harvesters and processors must engage in a relatively intense amount of effort over a relatively short period of time, otherwise they may risk losing harvest and delivery volume. This makes it difficult for harvesters and processors to hold out for more favorable prices once the season has started because doing so means potentially foregoing harvest volume. Rationalization has the potential to change this relationship by granting defensible harvest privileges (either in the form of IFQ or catch history). The presence of a defensible harvest privilege makes it possible for many of the benefits of rationalization to occur, such as slower paced harvesting, consolidation in an over-capitalized industry, and higher quality products among other things. However, it also has the potential to change the relationships that exist between harvesters and processors because fishery participants no longer compete for that catch. This conceptually allows those in the fishery that hold harvest privileges to negotiate more successfully for more favorable prices because they do not risk losing that catch to someone else.

The ability of harvesters and processors to negotiate for prices that are favorable to them depends on several factors including, but not necessarily limited to, whether they hold quota or catch history and whether they have few or many competitors. Assuming that there are no motherships that own permits, and that there is substantial competition between motherships for catcher vessel deliveries, then harvesters holding the catch history will tend to assume the majority, or all, of the profits associated with both the harvesting and the processing activities in the whiting fishery. This is because those harvesters can force motherships to bid among one another for deliveries and this bidding will essentially involve bidding away profits that may have been attributed to processing in order to attract catcher vessels. This concept is discussed in more detail in Appendix E. However, the assumption of high degrees of competition that approach "perfect competition" among motherships is most likely not accurate because of the limited number of mothership companies engaged in the fishery. Furthermore, several permits are owned wholly, or partially, by mothership companies. This means those companies may realize profits from the harvest activities of those vessels and from processing the catch of their own catcher vessels. Alternatively, if mothership companies do not receive deliveries from partially owned catcher vessels, they are bound to realize some of the profits associated with that catcher vessel activity through their partial ownership even if it delivers to another mothership. This concept is discussed in more detail in a subsequent subsection.

The difference in price negotiations between the alternative specified in the October 2008 GAC recommendations and the industry-clarified intent alternative is very little. Indeed, there may be no difference at all.

- Under the alternative specified in the GAC recommendations, the negotiations over exvessel prices and other matters is likely to occur during the time period prior to the mothership declaration. This means that such negotiations will occur in an environment where no processor tie exists and the negotiation power of the harvester and the processor will resemble the negotiations that take place in a fishery without processor linkages.
- Under the alternative representing the industry intent, negotiations may be ongoing to some degree as the season progresses. This could occur if harvesters are consistently looking to find the most favorable market. This may mean that exvessel prices paid to harvesters may be more variable throughout the course of the year under the industry intent alternative, but the end result may be the same as the alternative in the GAC recommendation. They could be the same if the result of the alternative in the GAC recommendation includes retro-payments to catcher vessels from motherships based on changes in the market for whiting that have occurred throughout the course of the season and thereafter.

Because of the similarities in the effect over exvessel price negotiations between both alternatives, there is no further elaboration on the effect of each alternative on exvessel prices.

Rationalizations Effect on Relationships between Motherships and Independent Catcher Vessels
Independent catcher vessels have the ability to form marketing cooperatives under the Fishermen's Collective Marketing Act (FCMA). This allows independent harvesters the ability to form a type of union that acts collectively, and as a single entity, to negotiate with processors over things like favorable exvessel prices. This can result in a much greater degree of negotiation power than if fishermen attempted to negotiate exvessel prices independently. Since rationalization creates a system where the actions of one harvester cannot impact another, the ability for harvesters to form and maintain such unions is enhanced relative to a derby fishery where the catch of one harvester directly affects the amount of catch available to other harvesters. Under the derby fishery scenario, there is a strong incentive for harvesters in a FCMA cooperative trying to negotiate higher prices to "cheat" by breaking ranks and going fishing because that harvester will have the potential to catch more fish than other harvesters. This makes it difficult to sustain FCMA cooperatives under a derby system. A rationalized fishery makes it much easier to sustain FCMA cooperative actions and negotiations.

The number of mothership entities that would stand to receive mothership licenses is six and this relatively small number of companies may mean that mothership companies are able to exert some negotiation power over exvessel price negotiations with harvesters. The fact that six motherships would be licensed for the fishery is not a substantially different number than the total number of motherships that have participated in the fishery since 1997. In most years fewer than six motherships are active in the fishery. This means that the licensing of those six motherships is not expected to change the negotiation power of mothership entities.

The result of a rationalization program without processor ties on relationships between motherships and independent catcher vessels is likely to mean an increase in the negotiation power of those independent catcher vessels. Although it is likely to mean an increase in harvester profits, the magnitude of this change is not clear.

Partial Vertical Integration and the Effect on Mothership and Catcher Vessel Relationships

The degree to which a mothership company's partial ownership stake in a catcher vessel represents a controlling interest or not is a large factor determining the benefit that mothership company will receive from that partial interest. If the partial ownership stake is a controlling interest, that mothership company will essentially realize profits from processing of that catcher vessel's delivery while also realizing a portion of any profits generated from that catcher vessel's fishing activity. If that partial ownership stake is not a controlling stake, then that mothership company may not receive deliveries from that catcher vessel. However, the mothership company will see profits from the partial ownership stake in the catcher vessel, but the profits based on a controlling interest in a catcher vessel will be greater than the profits from a non-controlling partial interest. This is illustrated in the following simple examples:

<u>Example A: Controlling partial interest in a catcher vessel</u>

- Assume profits from processing a quantity of X is equal to $50 and profits from harvesting a quantity of X equal $50 in a scenario where negotiations are balanced.
- Assume the mothership company owns 25% of the catcher vessel.
- If the catcher vessel delivers to the mothership because of the controlling interest, then the mothership company generates profits of $50 + $50*25%, or $62.5 from the catch of that catcher vessel.

<u>Example B: Non-controlling partial interest in a catcher vessel</u>

- Assume profits from processing a quantity of X is equal to $50 and profits from harvesting a quantity of X equal $50 in a scenario where negotiations are balanced.
- Assume the mothership company owns 25% of the catcher vessel.
- If the mothership company does not receive deliveries from that catcher vessel because it does not have a controlling interest, then the mothership company generates profits of $0 + $50*25%, or $12.5 from the catch of that catcher vessel.

The examples above can be compared to a scenario where processor linkages are established. As stated in Chapter 4 of the EIS and in Appendix B, a processor linkage provision has the potential to result in the sharing of profits between the harvester and processor. This occurs because it creates a structure similar to a vertically integrated firm. While it is not clear whether those profits will be divided equally, it is reasonable to assume that a processor linkage provision will result in more profits being realized by processing entities than in a case without linkages. This is because the tie assures the processor of receiving a quantity of fish and it also assures that the processor has some leverage over price negotiations with the harvester.

When comparing the processor tie to vertical integration, the tie likely does not result in any difference between a catcher vessel and a processor if both are fully integrated. However, if partial integration exists, the tie effectively acts as a controlling interest in the current year, meaning example A above may be more reflective of a processor tie than example B. In cases where vertical integration does not exist (either full or partial), the effect of a processor tie assures the processor of a given volume of fish while also assuring negotiation power exists for both the harvester and processor. This effect was described in more detail in Chapter 4 and Appendix B.

The discussion above and in Chapter 4 and Appendix B shows that there may be no effect of the processor tie on fully integrated catcher vessel and mothership operations, but that there is an effect on the relationships between independent catcher vessels and motherships. The question then is how the processor tie potentially affects the relationships between partially owned catcher vessels and motherships. While information exists on partial ownership in the mothership sector, it is difficult to untangle the relationship between partial ownership and how that ownership affects delivery patterns of that catcher vessel.

Available information indicates that 6 of the 31 catcher vessel permits that have recently participated in the fishery may have some degree of partial ownership, or have an ownership stake in, a company that operates a mothership. If partial ownership leads to a controlling interest, the effect of a processor tie on relationships between partially owned catcher vessels and motherships will be less than in a case where partial ownership does not lead to controlling interest. This means that a processor tie that is relatively difficult to break may have an effect where partial ownership exists but does not lead to a controlling interest.

The type of processor tie described in the new GAC alternative establishes a type of processor tie while the industry clarified intent alternative does not establish one at all. Since the new GAC alternative establishes a tie that can be broken easily, it is not clear that this type of tie would have much of an effect on cases where a partial, non-controlling, ownership exists between a mothership and catcher vessel.

Effect of Option A and B on Business Planning
The GAC recommended alternative establishes a relationship between a mothership and a catcher vessel for the duration of a season. This relationship should be expected to result in better business planning than if no relationship is established. Alternatively, the industry intent alternative does not establish a tie between a mothership and a catcher vessel, and this may mean that it is more difficult to establish business plans because there is a greater degree of unknown. However, in many cases processors and harvesters may engage in negotiations to establish a relationship between the catcher vessel and the processor prior to the season starting. This would tend to occur because the catcher vessel wants to make sure he has a market for harvested fish, while the processor would work to establish this relationship in order to develop a relatively certain estimate of fish volume for the coming year. Therefore, while Option A may result in greater potential for business planning compared to a case where no tie is established, that improvement may be slight.

Summary
In summary, the presence of the non-cooperative fishery may or may not be necessary under the two alternatives considered here. The need for that fishery depends on the reasons for having that fishery in the first place and these may include A) an incentive to discourage the switching of processors, B) as a means to protect cooperatives if some members cannot agree to catch

sharing, and C) as a means to reduce agency costs by encouraging the formation of cooperatives. Alternative A (the GAC report alternative) appears to necessitate the existence of the non-cooperative fishery as a means to ensure that some degree of processor declaration occurs, while the alternative that appears to be what some industry members intended does not necessitate the existence of a non-cooperative fishery because there are no processor ties. It does not appear necessary to have the non-cooperative fishery in either alternative to address issues of catch sharing disagreements because both alternatives retain the "golden rule" provision.

Processor ties will have differing effects on the relationships between motherships and catcher vessels depending on the degree of vertical integration and whether partial ownership of a catcher vessel means there is a controlling interest. In relationships between motherships and independent catcher vessels the effect of a processor tie is likely to be relatively large, while in cases where the catcher vessel and mothership are owned by the same company the effect should be small, if any. In cases where a catcher vessel is partially owned by the mothership company, the effect of the processor tie will depend on whether that partial interest results in a controlling interest of that catcher vessel. If it does, then the processor tie may do very little, but if it that partial interest is not a controlling interest, then the processor tie may have a relatively large effect that may be similar to the effect that occurs between motherships and independent catcher vessels. Since both of the new alternatives establish mechanisms that make it easy for catcher vessels to switch motherships, the effect of both options is likely to be more similar to (or in the case of alternative B, exactly like) a case where a tie does not exist at all.

The two alternatives differ in their effect on the ability to conduct business planning. The first alternative (which was recommended for consideration by the GAC) effectively establishes a tie for a year and makes the quantity of deliveries for motherships relatively more certain. However, in many instances catcher vessels and motherships may engage in negotiations to secure relationships prior to the start of the season and this may occur because catcher vessels want some assurance that they have a market for their catch, while motherships want some better expectation about delivery volume. This may occur in alternative B. Therefore, the degree of business planning may be enhanced to some degree by alternative A, but that enhancement may be slight relative to a case where no ties exist.

Analysis of GAC Recommendation on Species Coverage in the At Sea Fishery

At the October meeting of the Groundfish Allocation Committee (GAC), a recommendation was developed for which set of species the at sea sectors of the whiting fishery would be accountable and responsible for. The Council's preliminary preferred alternative selected in June specified two possible options: 1) holding the at sea sectors responsible for canary, darkblotched, and widow and 2) holding the at sea sectors responsible for additional species including sablefish, slope rockfish, shelf rockfish, lingcod, POP, and yellowtail. After some discussion of the matter, the GAC recommended that the at sea sectors be held responsible for the same set of species that the shoreside sector would be responsible for. This document addresses the effects of using the same list of species for both the at sea sectors and the shoreside sector.

Executive Summary

Discussion and analysis since early 2007 has involved the implications of holding trawl fishery participants responsible for species encountered on a relatively infrequent basis. Analysis suggests that holding trawl fishery participants responsible for species which are infrequently encountered may result in some adverse economic impacts as a result of several factors including quota hoarding and risk aversion behavior, but with little or no benefit to fish conservation and management.

Based partially on this finding, nearshore species were preliminarily removed from the rationalization program because of the relatively infrequent degree which trawl participants encounter those stocks. Analysis contained in this document suggests that, if this logic is applied to the non-whiting sector, a distinct list of species is developed for inclusion or exclusion from the program, but if that logic is applied to the whiting fisheries a different set of species is included and excluded from the program. Specifically, applying this logic to the at sea sectors suggests that the at sea sectors should be held responsible for a much different list of species than the shoreside sector. If four trawl sectors are established, then the appropriate species for the shoreside whiting sector is the same as the at sea sectors.

Analysis suggests that it may be appropriate to hold the whiting sectors responsible for the catch of widow, canary, and one or more of either darkblotched, POP, or slope rockfish. If the whiting fisheries are held responsible for the same set of species as the non-whiting fishery, the probability that the whiting fishery will attain the whiting OY is substantially reduced.

Sector Allocation Amounts and the Responsibility for Harvested Species

Establishing allocations between trawl sectors means that different allocations will need to be specified for each of the sectors. The existing alternatives contained within the intersector allocation process vary the amounts of species allocated to each sector to some degree, but all alternatives are similar to status quo catches by sector. The result is that the shoreside sector will be allocated a much different volume of species such as Dover sole than the at sea sectors because the catch of those species in each sector has been substantially different. The following table shows one possible set of intersector allocation amounts by sector for a select set of species. Since this information is based on catch that has occurred in each sector over the 1995 to 2005 time period, this information is reflective of both historical catch amounts and also potential allocation amounts. This information illustrates that many species are caught in very small amounts in the whiting sectors and this would turn into relatively small allocations. A substantial difference exists between the non-whiting fishery and the whiting sectors in almost all species in the table. In every instance aside from whiting, the whiting sectors would stand to be allocated substantially less than the non-whiting sectors.

Table 1 Select Species from Intersector Allocation Alternative 3

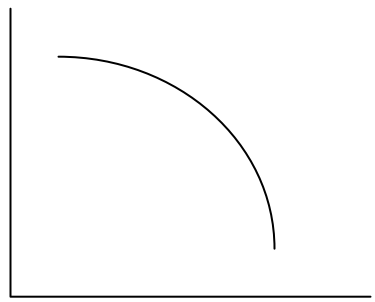
Intersector Allocation Alternative 3: Based on 1995-2005 Landed Catch shares (15% set aside, high canary OY)

	CP	MS	SW	SN	TWL Total	Non TWL
Lingcod Columbia and US-Vanc. areas						
N of 42º (OR & WA)	1	3	10	2,250	2,264	1,620
S of 42º (CA)	-	-	0	97	97	355
Pacific Cod	0	0	1	739	740	7
Pacific Whiting (U.S.)	70,751	49,942	87,398	1,559	209,650	241
Sablefish						
N of 36º (Monterey north)	16	2	47	2,642	2,707	2,444
S of 36º (Conception area)	-	-	-	73	73	81
Yellowtail Rockfish	138	214	282	1,896	2,530	98
Shortspine Thornyhead - N of 34º27'	14	0	1	1,157	1,172	25
Shortspine Thornyhead - S of 34º27'	-	-	-	246	246	66
Longspine Thornyhead - N of 34º27'	0	0	0	1,622	1,622	19
Longspine Thornyhead - S of 34º27'	-	-	-	1	1	355
Slope Rockfish N	55	10	9	653	728	104
Slope Rockfish S	-	-	-	326	326	140
Dover Sole	0	0	1	11,926	11,927	5
English Sole	0	0	3	4,479	4,482	2
Petrale Sole (coastwide)	0	0	0	1,763	1,764	2
Arrowtooth Flounder	2	1	2	4,155	4,160	3
Starry Flounder	-	-	0	318	318	333
Other Flatfish	9	1	2	3,430	3,442	94

For many of those species with substantially low allocations made to the at sea sectors (such as lingcod, arrowtooth flounder, Dover sole, English sole, petrale sole, starry flounder, and Other Flatfish, among others), the same type of impacts to whiting fishery participants may occur as those that were described for nearshore species in Chapter 4 of the EIS. These impacts were primarily the result of factors which would tend to result in markets where individuals have the ability to exert some form of market power and/or participants may engage in behavior to mitigate against risk. Examples include trading quota in "thin markets" and quota hoarding to hedge against catch uncertainty.

Empirical examples exist of risk aversion behavior by harvesters that may occur for species with fairly small allocations relative to the likely catch. In 2007 the whiting fisheries harvested less than the bycatch limit of darkblotched rockfish, however it appears that participants in the whiting fishery became consciously aware and worried about their catch of darkblotched in the late May time period and held several discussions about managing darkblotched bycatch. The outcome of those meetings was a change in fishing behavior in order to avoid that species. Data indicates that this change in behavior reduced the catch rate of darkblotched, but that it subsequently increased the catch rate of widow rockfish and it was the catch of widow that ultimately closed the fishery (see Agenda Item F.3.b. Supplemental GMT Report, March 2007).

It is not unreasonable to expect this type of behavior to occur for other species if an allocation is specified that is low relative to the potential to catch that species. When examining the potential allocations to the at sea sectors in the above table, several species would be allocated in small amounts to the at sea sectors and it is reasonable to expect that some – if not all – would result in the same behavioral response among industry members as occurred over darkblotched in 2007. As the number of species with this potential constraint increases, the probability that the whiting allocations will be realized decreases. This type of behavior may have adverse economic impacts while having little benefit to the stock or to management. For example, holding the at sea sectors to three tons of arrowtooth flounder (which is one alternative in the ISA process) is likely to create some adverse effects on industry. However, when compared to the OY of 5,800 the benefit to management (achieving harvest targets) is little to negligible.



By combining the shoreside whiting and non-whiting sectors into a single sector, the pool of catch available to shoreside participants appears to be large enough to avoid these types of occurrences, except perhaps in the case of nearshore species and perhaps a couple of others (discussed in more detail in Chapter 4 of the EIS). However, by separating the at sea sectors from the shoreside sector and implementing one of the intersector allocation alternatives currently under consideration, the pool of catch available to the at sea fishery for the majority of groundfish species would likely be small enough to result in some market manipulation and/or risk hedging behavior among other things – reasons that originally led to the exclusion of nearshore species from the program[1]. This could be overcome by allocating a greater quantity to the at sea sectors than currently exists in the alternatives for intersector allocation. However, in many instances that may mean reducing the amount of target species available to the shoreside trawl fishery and resulting in less economic activity than may otherwise be the case. Another option is to establish an allocation of those stocks between the shoreside trawl sector and all other sectors in the ISA process, effectively combining the catch of the at sea sectors, the recreational sectors, and the non-trawl sectors into one.

Consideration of a Different Set of Species for Coverage in the At Sea Sectors

Implicit in the idea that not all species will require coverage is the concept that the catch of uncovered species is indirectly controlled by the catch of covered species. For example, under status quo conditions the whiting fishery is responsible for the catch of canary rockfish (a shelf species), darkblotched rockfish (a slope species), and widow rockfish (a pelagic species). The avoidance of these species by whiting harvesters means that species caught along side of them

[1] If the shoreside whiting fishery is separated from the non-whiting fishery through the establishment of four sectors, the shoreside whiting fishery would have the same issues with species coverage as the at sea sectors, meaning it would be appropriate to have the shoreside whiting fishery responsible for same set of species as the at sea sectors if a four sector split is established.

are also avoided to some degree. Avoidance of darkblotched rockfish may equate to avoidance of POP or DTS species to some degree, avoidance of canary may equate to avoidance of yelloweye and shelf flatfish to some degree, and avoidance of widow may result in avoidance of yellowtail. While the coverage of some species indirectly controls the catch of uncovered species, there is still some variability in the catch of uncovered species. In some instances that variability is slight, while in other instances it may be larger. The importance of that variability should be viewed alongside of harvest targets and the implications for other sectors. If catch of a particular species varies from 1 to 10 tons, but the OY for that species is several thousand tons, then that variability is probably not very meaningful. However, if the OY for that species is 50 tons, that catch variability can be very important and have implications to management, conservation, and other fishery sectors.

To help inform the above concept, Table 2 was constructed. This table only includes those species that were caught in excess of one metric ton over the four year period and this was based on the idea that species with less than one metric ton over the period do not appear to have a substantial enough catch potential to pose much uncertainty to management, conservation, or other fishery sectors. The one species for which this might not be true is yelloweye rockfish. Based on available data, yelloweye were encountered in the at sea fishery in three of the four examined years and this catch amount was 0.004 mt in 2004, 0.03 mt in 2006, and 0.01 mt in 2007. The Groundfish Management Team's Bycatch Scorecard considers these to be "trace" amounts.

Table 2 At Sea Sector Catch of Select Species or Species Groups from 2004 - 2007 (includes species where catch exceeds 1 mt over the time period)

	Year							
Species	2003	2004	2005	2006	2007	OY/ Allocation	Average portion of OY	Substantially Caught in Non-trawl Sectors
LONGNOSE SKATE		0	1	0	1			No
OTHER FLATFISH		2	3	-	-	4,884	0%	No
PACIFIC HALIBUT	3	1	2	1	1			Yes
CANARY ROCKFISH	1	5	1	1	2	44	5%	Yes
LINGCOD	1	1	3	3	6	5,558	0%	Yes
PACIFIC OCEAN PERCH	6	1	2	3	4	150	2%	No
ARROWTOOTH FLOUNDER	4	3	4	3	3	5,800	0%	No
SHELF ROCKFISH (N)		5	7	4	2	958	0%	Yes
SHORTSPINE THORNYHEAD	16	5	7	1	3	1,634	0%	No
DARKBLOTCHED ROCKFISH	4	7	11	11	12	330	3%	No
SABLEFISH	17	29	15	2	3	2,651	1%	NA
SLOPE ROCKFISH (N)		24	51	8	32	1,160	2%	No
YELLOWTAIL ROCKFISH	36	47	112	110	79	4,548	2%	No
WIDOW ROCKFISH	14	21	80	142	146	368	22%	No
SPINY DOGFISH	269	615	355	61	155			Yes

Source: NPAC4900 table. October 2008. PacFIN database

The species shown in Table 2 tend to be caught in volumes of less than 10 metric tons in any given year in both at sea sectors combined. For some species, like canary, the OY is relatively small, so catch amounts of only a handful of tons can be important for conservation and management goals and to other sectors that may have fishing opportunities affected by the amount of catch occurring in the at sea sectors. The metric most appropriate in this table for examining the catch of the at sea sectors relative to the OY is the second to last column. This column shows that there are three species where the at sea sectors catch more than 2 percent of the OY on average. For other species such as any of the flatfish species in the table, the catch amount is low relative to the OY and appears to be consistently low. Since these flatfish species are not directly managed under status quo conditions (and catch is low under such conditions), this suggests that direct management of those species in a rationalization program may have little or no benefit to management and conservation goals. The three species which are caught in the largest quantities are spiny dogfish, widow rockfish, and yellowtail rockfish. Given the life history characteristics of these species and the fact that whiting vessels use midwater gear, this is not surprising. On a percentage of the OY basis, widow, canary, darkblotched, slope rockfish, POP, and yellowtail are the largest respectively.

The final column in the table provides an indication of the importance of the at sea catch to other sectors of the fishery. This column identifies stocks as whether they are substantially caught in other (non-trawl) sectors of the fishery. The implication is that those species that are substantially caught by other sectors of the fishery are divided up among several different user groups and the percentage of the OY taken by the at sea sectors may be more important in cases where the species is taken by more sectors. When comparing the final two columns, there is only one species for which the at sea sector takes more than 2 percent and which is substantially caught by other sectors. That species is canary.

Species caught in the at sea fishery at levels greater than 2 percent of the OY, but that are not substantially caught by non-trawl sectors may still have an inter-trawl sector affect. Darkblotched and POP are relatively important species for the non-whiting portion of the trawl fishery, meaning that the at sea sector catch of these species will affect the opportunities in the non-whiting fishery. Given that darkblotched and POP are caught in conjunction with DTS species and petrale, these stocks have a large influence on the value of the non-whiting fishery. Slope rockfish plays a similar role. However, given that these three types of species are caught in similar areas, the coverage of just one may indirectly control the catch of the other two.

Widow rockfish is caught in the largest amounts in the whiting fisheries and in recent years the whiting fishery has approached or met the bycatch limit for that species. This means that the metric in the second to final column should be qualified because it compares average catch over the five year period with the existing OY, but the catch rate of widow has been increasing as the stock population increases. In recent years the percentage has been much higher. This also means that the direct management of widow in the whiting sectors may be necessary to achieve management and conservation goals, especially as the stock is under a rebuilding plan. Yellowtail rockfish may be important to the non-whiting trawl sector, especially when widow rockfish become rebuilt and a midwater fishery for widow and yellowtail can be re-established. However, given that canary and yellowtail are correlated, the amount of canary will continue to restrict access to yellowtail, meaning it may not be likely that the full yellowtail OY could be achieved. This means that the amount of catch in the at sea fishery may not have any effect on the non-whiting fishery unless conditions are such that it is likely that the full yellowtail OY could be attained. Finally, sablefish was caught in higher volumes in 2003 and 2004 than in 2005 and 2006. This appears to have been the result of the large 1999 year class moving through the fishery, meaning that the future catch of sablefish (and the at sea percentage of the trawl allocation) will depend on the number of successful recruitment events in the future. However, if 2004 is a guide, the catch amount during these events may still be on the order of 1 percent of the trawl allocation.

Based on the above analysis, several species appear to have a higher degree of priority for direct coverage than others. This prioritization appears to be (in addition to whiting):

1. Widow rockfish
2. Canary rockfish
3. Darkblotched/Slope rockfish/POP
   (Selecting one of these species may indirectly control the catch of the other two)

Finally, spiny dogfish is the species caught in most abundance in the at sea whiting fisheries aside from whiting. Since no management targets exist for spiny dogfish, it is impossible to determine the importance of that catch relative to conservation goals. However, in the event that a spiny dogfish management target is established, the catch of spiny dogfish in the at sea sectors, and the need to directly managed spiny dogfish catch in those sectors, may need to be considered.

Using the Herfindahl Index to Assess Appropriate Control Limits

Executive Summary

Measuring the degree of market concentration can be used to estimate the degree of competition among firms in an industry. Lower degrees of competition generally mean that each firm in the industry has more influence over price. Competition is substantially related to several aspects of the trawl rationalization program, including limits on the control of quota share, to whom quota share should be allocated (permit holders and processors), and to what degree. In this document we utilize a widely used tool called the Herfindahl index for examining the amount of concentration that exists in the processing and harvesting portions of the fishery and for assessing the effect of various control limits.

Results of this analysis indicate that (not surprisingly) the processing industry is more concentrated than the harvesting industry. Using thresholds utilized by the Department of Justice and the Federal Trade Commission, the processing industry for the non-whiting, shoreside whiting, and mothership portions of the west coast groundfish industry can be considered relatively concentrated, meaning processors may have some influence over exvessel price. The finding that the processing industry is relatively concentrated is not surprising given the economies to scale that appear to exist in seafood processing which would tend to lead to relatively few processing entities. While the harvesting portion of the fishery can be considered unconcentrated, the Fishermen's Collective Marketing Act allows harvesters to form bargaining unions which have the effect of increasing concentration in the harvesting portion of the fishery, if such unions are created and are active. It is expected that rationalization will make it easier for such unions to be created and remain together, potentially leading to greater concentration in the harvesting portion of the fishery than compared to status quo.

The fact that both the harvesting and processing segments of the fishery appear concentrated – or have the potential to act in a concentrated manner – may argue for control limits on quota share that do not allow for concentration to occur in that market. We use DOJ thresholds and the Herfindahl index to bracket a reasonable range of control limits for the fishery that may be expected to result in unconcentrated holdings of quota share.

The result is that a 10 percent limit on aggregate non-whiting quota share will assure an unconcentrated outcome. Higher limits may also result in an unconcentrated outcome, but it will depend on whether each entity in the fishery owns the maximum allowable share. It is possible that limits over 18 percent will achieve a concentrated outcome. Except for a few cases, the species-specific limits have little bearing due to the easy substitutability of one species for another. In the whiting fishery, the results depend on whether one considers each sector a different market. If the sectors can be treated as the same market, then the sector specific whiting limits will have little bearing, and the combined whiting sector limit is the appropriate measure. Like the aggregate non-whiting limit, a combined whiting sector limit of 10 percent will assure an unconcentrated outcome, while it is possible that limits above 18 percent will result in a concentrated outcome.

Background

The Herfindahl index is a standard measure of industry concentration. This index is used by the U.S. government and the European Union for measuring the market share of firms in an industry. This concept is often used in the field of competition economics and law and in dealing with antitrust issues. The U.S. Antitrust Division has established thresholds which define a market as relatively un-concentrated, moderately concentrated, and relatively concentrated.

The Herfindahl index measures the degree of market concentration by estimating the sum of squares of market shares of each individual firm in an industry. Large values indicate a relatively high degree of market concentration, while low values indicate a relatively small degree of market concentration. The intuition behind this index is that an industry with a relatively small number of firms will have a relatively high index value, while an industry with a relatively large number of firms will have a relatively low index value. The distribution of market shares is also an important factor in determining index values. If an industry has a relatively large number of firms, but one dominant player with a high degree of market share, it is possible that industry could have a higher index value than an industry with a smaller number of firms with relatively similar market shares. To illustrate this latter point we show the following example[2]:

- Assume Example 1 has 5 firms, all with equal market share.

- Assume Example 2 has 6 firms. One firm controls 75 percent of the market share and the remaining 5 firms equally share the remaining 25 percent (each remaining firm has 5 percent).

- In Example 1, the Herfindahl index would return a value of 0.2
  H1 = (5*20^2)/10,000

- In Example 2, the Herfindahl index would return a value of 0.575
  H2 = (75^2 + 5*(5^2))/10,000

To put the above example results in context, the Antitrust Division of the Department of Justice considers an index between 0 and 0.1 to be unconcentrated, between 0.1 and 0.l8 to be moderately concentrated, and results greater than 0.18 are considered concentrated. Both above examples would be considered concentrated markets (meaning firms could exert some form of market power), but the second example is far more concentrated than the first, even though there is a larger number of firms.

[2] Typically Herfindahl index values are calculated on a scale of 0 to 10,000. We estimate this index in fractions to make the application to control limits more readily apparent.

Application of the Herfindahl Index to the Existing Harvesting and Processing Segments of the Fishery

The definition of a market is important in the utilization of the Herfindahl index. If we were attempting to measure the degree to which segments of the west coast groundfish fishery could affect the final price paid by consumers, then the appropriate scope of the market would include operations in other fisheries that compete in the final consumer market with west coast groundfish species. These other fisheries may include the British Columbia groundfish fisheries and the Alaska Pollock fishery, among others. Given the relatively small volume (on a global scale) of fish harvested on the west coast and easy substitutability of other bottomfish species with west coast groundfish, it appears highly unlikely that changes in the west coast groundfish fishery will affect the prices seen by consumers. Therefore, the effect of relative concentration that exists among processing and harvesting of groundfish along the west coast may be limited to the interactions among harvesters and processors, interactions among harvesters with other harvesters, and interactions between processors and other processors.

In this analysis we examine each of the fishery sectors as if they are an independent market. We assess each sector independently because of regulations that separate each sector to some degree and because many companies that participate in whiting do not participate in non-whiting and vice versa.

Information exists showing the relative degree of market share each harvesting entity and processing entity has over the harvesting and buying of fish. This information consists of fish purchases and sales by permit and buyer code. We augment this information with business identifiers to indicate market shares of actual harvesting and processing firms rather than fishing vessels and buying stations. Taking the average sales and purchases of groundfish by entities in each sector over the 2004 to 2006 time period and dividing by the total weight of groundfish landed in that sector gives the average market share for each entity from 2004 to 2006. We can apply the Herfindahl index to this data to show the relative degree of market power that exists in the harvesting portion of the fishery and the buying portion of the fishery. The implication is that firms in a market with less concentration would tend to have lower leverage over prices than firms in a market with higher degrees of concentration. Although we examine the market shares of harvesters independently, we also examine the concentration possible under market cooperatives formed under the Fishermen's Collective Marketing Act. In this latter measure we assume approximately 50 percent of the fleet harvest is engaged in a FMA cooperative – a number on the same order of magnitude as one existing west coast FMA cooperative. The appropriateness of using either the "Harvester" value or the "FCMA Harvester" value depends on one's belief as to whether FCMA cooperatives can be formed and sustained. Including both harvester estimates illustrates the potential degrees of harvester concentration depending on whether FCMA cooperatives are formed and sustained or not.

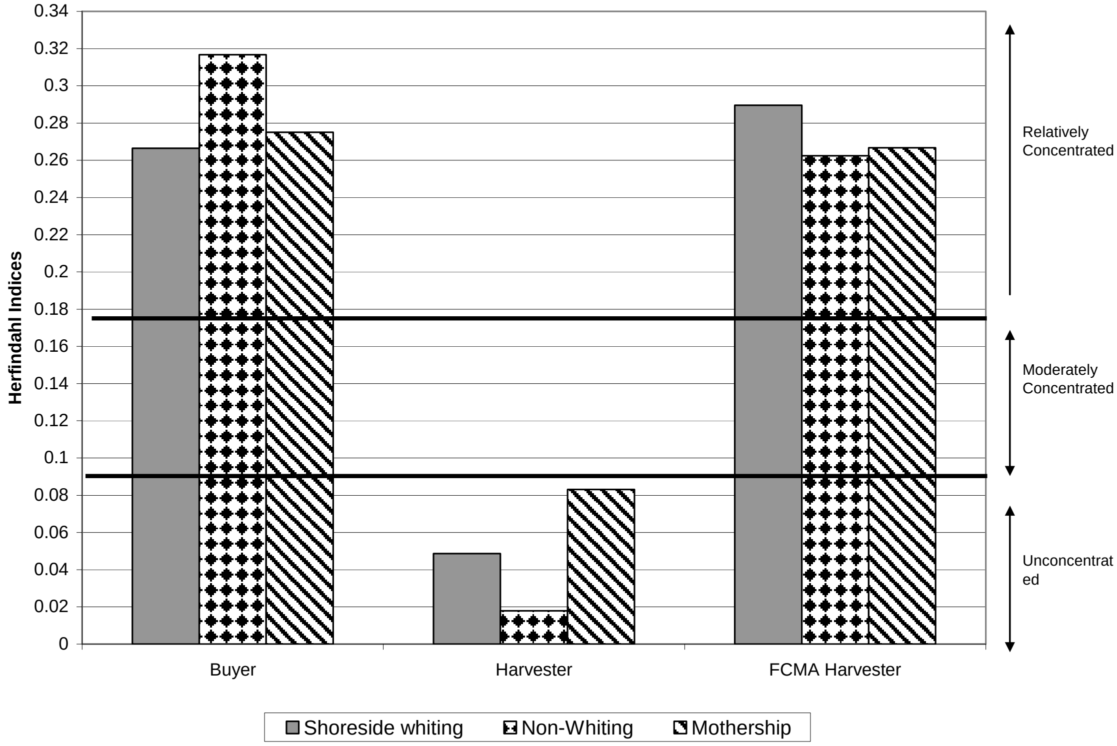


Figure 1 Herfindahl Index Results for Harvesting and Processing Segments of the Trawl Fishery

Figure 1 shows the result of the Herfindahl index approach applied to processing and harvesting entities. These results indicate that the shoreside whiting processing industry is the least concentrated of the three sectors, while the non-whiting processing industry appears to be the most concentrated. While there are many more non-whiting processing entities than shoreside whiting processing entities, purchases of fish are much more concentrated into fewer entities in the non-whiting fishery than in the whiting fishery. This distribution of fish purchasing drives the measure of non-whiting processing industry concentration higher than in the shoreside whiting and mothership processing industries.

On the harvesting side, the non-whiting portion of the fishery is the least concentrated, while the mothership portion of the fishery is the most concentrated under a scenario without FCMA cooperatives. This appears to be directly related to the number of participants in each fishery and amount of catch of each vessel in each sector. The number of harvesting entities in the non-whiting fishery is far greater than the number of harvesting entities in the shoreside whiting and mothership portions of the fishery. The estimated concentration among harvesting entities in the mothership portion of the fishery is further enhanced by the relatively high volume of catch made by a relatively small percentage of the harvesting entities in that sector.

The effect of a sustained FCMA cooperative has the potential to concentrate the harvesting sector at a level similar to that of processors (if the assumptions made regarding the construction of these values are correct). This means that both harvesters and processors would have the potential to leverage some form of market power in the exchange of fish between fishermen and buyers. This conclusion is dependent on whether harvesters can sustain such cooperatives – and use those cooperatives in negotiations over prices – over a long enough time period to exert some market power.

While this information attempts to separate fishery participants into two separate groups (processing entities and harvesting entities), this distinction is often not clear. Vertical integration exists in all sectors of the groundfish fishery and it is reasonable to expect this vertical integration to play more into the hands of processing entities than harvesting entities. In general, vertical integration appears largest in the mothership fishery, followed by the non-whiting fishery and the shoreside whiting fishery, respectively. It is not immediately clear how this affects the index results shown in Figure 1, but should be kept in mind nonetheless. The reader is referred to Chapter 4 of the EIS for further information on vertical integration.

Application of the Herfindahl Index to the Initial Distribution of Quota Share

The initial distribution of quota share has the potential to result in some varying degrees of market concentration depending on the allocation formula. In particular, the amount of quota allocated to harvesters and processors appears to affect the amount of quota concentration.

We can develop Herfindahl indices by using estimates of quota share distribution to entities under several alternatives for initial assignment of quota. We assume the same general formula will be used (equal sharing of buyback history, assignment of overfished species on a bycatch rate) but vary the percentage allocated to harvesters and the percentage allocated to processors. We plot Herfindahl index values against the percentage of quota share allocated to harvesters and processors and find that under each allocation scenario, results are within the range considered "unconcentrated", but the relationship between the Herfindahl index and the percentage to harvesters/processors is non-linear for every sector.

The information below shows aggregate non-whiting quota distributions and whiting distributions to the whiting sectors. This shows that, in general, an increasing allocation to processors increases the degree of concentration. However, for the entire range assessed, the degree of concentration is within the unconcentrated range. The concentration in shoreside whiting actually decreases to some degree if less than 20 percent of the quota is allocated to processors, but begins increasing as the amount increases above 20 percent. This is because the allocation to processors increases the number of entities receiving quota share, and when the amount allocated to processors is less than 20 percent, the allocation to those additional entities reduces concentration. However, as the allocation to processors is increased, relatively large processing firms acquire increasing percentages of quota, driving the concentration measure up.

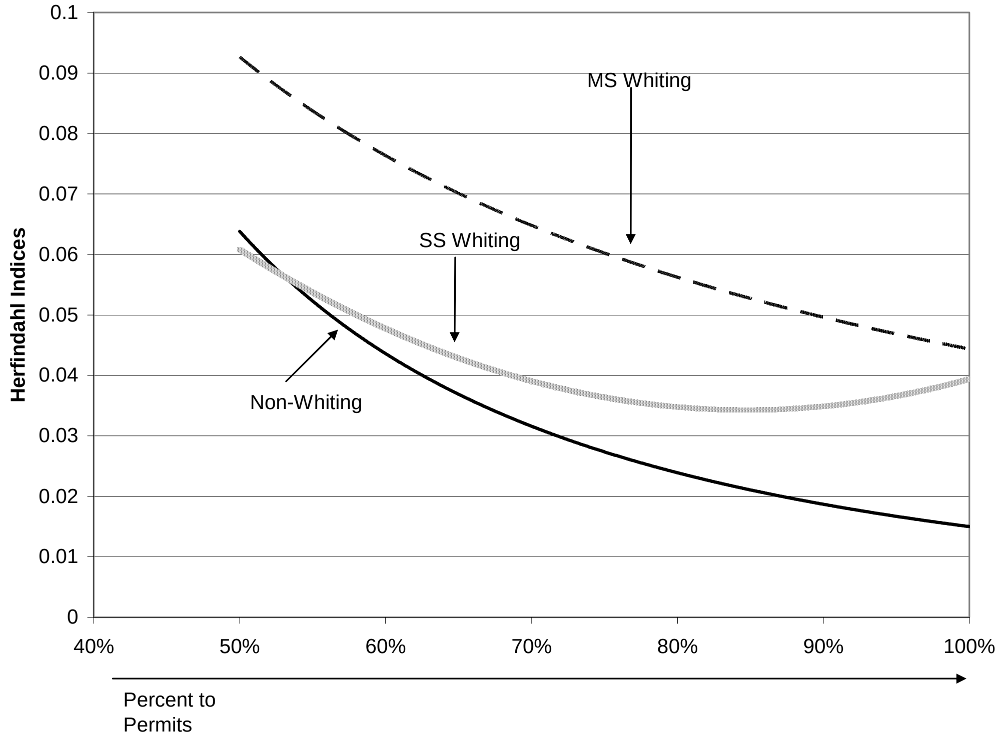


Figure 2 Herfindahl Index Results for Initial Distribution of Quota Share

Application of the Herfindahl Index Concept to Limits on Control of Quota

Limits on the control of quota are important for several reasons. The Herfindahl index provides a framework for considering limits on the control of quota from the perspective of market power. If it is assumed that entities will accumulate quota up to the maximum amount allowed by the control limit, then the Herfindahl index value is the control limit (if a control limit is set at 18%, then the Herfindahl index result would be 0.18 if all entities that hold quota share own the maximum allowed by the limit). However, this is most likely not a correct assumption. It seems more likely that some entities may acquire quota up to the control limit, but that most entities will fall below the limit. Unfortunately developing estimates of this distribution of quota ownership over the longer term is not possible, so the application of the Herfindahl index to control limits is – at this point – conceptual.

The moderately concentrated and relatively concentrated ranges of the Herfindahl index are areas where market power could be exerted. These areas are above index results of 0.10.

Index Value	Degree of Concentration
0 – 0.10	Unconcentrated
0.10 – 0.18	Moderately Concentrated
0.18 to 1	Concentrated

Currently, the Council's alternatives for control of aggregate non-whiting quota range from 1.5 to 3 percent, meaning that in all cases index results would fall within the "un-concentrated range" for the non-whiting fishery. Control limits on aggregate non-whiting of up to 10 percent would continue to fall within the "un-concentrated" range, but limits above 10 percent could be above or within the un-concentrated range. The result would depend on the distribution of ownership and the number of entities that hold up to the control limits and those that are below the control limit.

Aggregate Non-Whiting Control Limit	Effect on Concentration
1.5% to 3%	Unconcentrated
3% to 10%	Unconcentrated
10% to 18%	Unconcentrated or moderately concentrated (will depend on distribution of ownership and number of entities at the control limit)
> 18%	Unconcentrated, moderately concentrated, or concentrated (will depend on distribution of ownership and number of entities at the control limit)

The alternatives for control over shoreside whiting and mothership whiting are 10 to 25 percent. At the 10 percent level, index results would fall within the "un-concentrated" range. Values above 10 percent could fall above the un-concentrated range, but it would depend on the distribution of quota share ownership and the number of entities that are at the high and low end of the ownership spectrum.

Shoreside and Mothership Whiting Control Limit	Effect on Concentration
10%	Unconcentrated
10% to 18%	Unconcentrated or moderately concentrated (will depend on distribution of ownership and number of entities at the control limit)
> 18%	Unconcentrated, moderately concentrated, or concentrated (will depend on distribution of ownership and number of entities at the control limit)

If all three whiting sectors are held to an aggregate, three sector whiting limit, then the effect will vary based on one's ownership of quota in one particular sector and the percentage allocation of that sector. To illustrate the effect of an entity attaining the maximum shares in all three sectors, the following table was constructed. This illustrates that, under option 1, an entity could control 23.6% of the total non-tribal whiting quota if that entity acquired quota in an amount equal to the control limit in each sector. This means that entities could acquire enough quota to fall into the concentrated range if all three whiting sectors are viewed as being in the same market.

An issue that arises with the combined limit is that, if the CP sector is managed as a limited entry fishery without assignment of catch history or quota share, an overall limit may not be possible. One way an overall limit could be developed in this case is to establish a useage limit in the CP sector and use that usage limit in conjunction with quota share and/or catch history in the other two sectors as a means to estimating total control.

	Control Limit Option		
	Option 1	Option 2	Option 3
Shoreside Whiting	10	15	25
MS	10	15	25
CP	50	55	60
SS Contribution to Total	4.2	6.3	10.5
MS Contribution to Total	2.4	3.6	6
CP Contribution to Total	17	18.7	20.4
Total Control	23.6	28.6	36.9

The Council's alternatives for control limits for individual species vary widely depending on the species and the sector. Each of the whiting sectors may have bycatch species allocated on a pro-rata basis to the amount of whiting quota each entity holds, so bycatch species allocations in the whiting fishery are covered under the section describing whiting limits.

Given the substitutability of individual species for others in the market, it appears highly unlikely that the individual species control limits will affect market power, except perhaps in a couple of cases. This is because the ability to exert market power depends on there being limited substitutability of one product for another. Put in simpler terms, if an entity was attempting to exert market power over the Dover sole market, harvesters and/or processors may simply switch to English sole, sand sole, and other types of similar flatfish, neutralizing any potential market power effects attempting to be exerted by that one entity.

The species for which some limited substitutability may exist appear to be (in the case of target species) sablefish and petrale sole, though there may be others. Constraining overfished species may have limited substitutability in another regard, such as in their constraint on target species access. In such cases, it may be appropriate to implement a control limit that results in an unconcentrated level of ownership. Control limits less than 10 percent will result in this level of concentration, while larger control limits may result in unconcentrated or concentrated quota holdings depending on the distribution of ownership and the number of entities at the limit.

Metric Ton and Dollar Equivalents for Accumulation Limits

An assumed trawl allocation was derived based on 2004-2006 OYs and typical trawl harvest percentages. That allocation and the metric tons and exvessel revenue that might be generated by someone with one percent of the QS are displayed in Table 3. The accumulation limits are provided in Table 4 and those limits are translated into a metric ton equivalents (Table 5) and exvessel revenue equivalents (Table 6) based on the values in Table 3. The actual average landings for 2004-2006 are provided in Table 7. In some cases these values are substantially lower than those provided in Table 3 because of the amount of harvest that is not accessed due to regulatory or other constraints.

Table 3. Metric tons and exvessel value represented by a 1% quota share, assuming recent prices and estimated trawl allocations based on recent OYs.

Species Category	Assumed Trawl Allocation (mt)	1% share mt	1% share $
All nonwhiting groundfish (in aggregate)		441.9	465,997.8
Lingcod - coastwide	855.0	8.6	$9,706
N. of 42° (OR & WA)	684.0	6.8	$7,720
S. of 42° (CA)	171.0	1.7	$1,985
Pacific Cod	1,200.0	12.0	$15,132
Pacific whiting (shoreside)	100,000.0	1,000.0	$113,283
Sablefish (Coastwide)	2,600.0	26.0	$65,511
N. of 36° (Monterey north)	2,550.0	25.5	$64,879
S. of 36° (Conception area)	50.0	0.5	$632
PACIFIC OCEAN PERCH	84.8	0.8	$869
Shortbelly Rockfish	0.0	0.0	$0
WIDOW ROCKFISH	150.0	1.5	$1,419
CANARY ROCKFISH	9.5	0.1	$106
Chilipepper Rockfish	2,000.0	20.0	$19,509
BOCACCIO	3.5	0.0	$46
Splitnose Rockfish	350.0	3.5	$2,977
Yellowtail Rockfish	3,500.0	35.0	$31,026
Shortspine Thornyhead - coastwide	1,700.0	17.0	$22,448
N. of 34°27'	1,536.0	15.4	$20,451
S. of 34°27'	164.0	1.6	$1,998
Longspine Thornyhead - coastwide	2,071.0	20.7	$24,073
N. of 34°27'	2,071.0	20.7	$24,073
S. of 34°27'	0.0	0.0	$0
COWCOD	0.0	0.0	$0
DARKBLOTCHED	200.0	2.0	$2,008
YELLOWEYE	0.4	0.0	$4
Black Rockfish - coastwide	1.8	0.0	$15
Black Rockfish (WA)	0.0	0.0	$0
Black Rockfish (OR-CA)	1.8	0.0	$15
Minor Rockfish North	758.6	7.6	$9,236
Nearshore Species	0.7	0.0	$6
Shelf Species	10.9	0.1	$91
Slope Species	747.0	7.5	$9,139
Minor Rockfish South	377.2	3.8	$4,505
Nearshore Species	0.1	0.0	$1
Shelf Species	4.2	0.0	$38
Slope Species	373.0	3.7	$4,466
California scorpionfish	0.0	0.0	$0
Cabezon (off CA only)	0.0	0.0	$0
Dover sole (total)	15,000.0	150.0	$123,641
English Sole	883.1	8.8	$6,895
Petrale Sole (coastwide)	2,421.6	24.2	$52,241
Arrowtooth Flounder (total)	4,943.0	49.4	$27,556
Starry Flounder	65.9	0.7	$834
Other Flatfish	4,800.0	48.0	$44,759
Other Fish	210.6	2.1	$1,481
Sum (value if 1% of each species)		1,442	579,281

Table 4. Accumulation limit options.

Stock	Option 1		Option 2		Option 3	
	Control Limit (%)	Vessel Limit (%)	Control Limit (%)	Vessel Limit (%)	Control Limit (%)	Vessel Limit (%)
All nonwhiting groundfish (in aggregate)	1.5	3	2.2	4.4	3	6
Lingcod - coastwide c/	5	10	7.5	15		
N. of 42° N (OR & WA)	5	10	7.5	15		
S. of 42° N (CA)	5	10	7.5	15		
Pacific Cod	5	10	7.5	15		
Pacific Whiting	10	15	15	22.5	25	37.5
Sablefish (Coastwide)	1.9	3.8	2.9	5.7		
N. of 36° N (Monterey north)	2	4	3	6		
S. of 36° N (Conception area)	5	10	7.5	15		
PACIFIC OCEAN PERCH	5	10	7.5	15		
Shortbelly Rockfish	5	10	7.5	15		
WIDOW ROCKFISH	3.4	6.8	5.1	10.2		
CANARY ROCKFISH	5	10	7.5	15		
Chilipepper Rockfish	5	10	7.5	15		
BOCACCIO	5	10	7.5	15		
Splitnose Rockfish	5	10	7.5	15		
Yellowtail Rockfish	5	10	7.5	15		
Shortspine Thornyhead - coastwide	3.1	6.2	4.7	9.3		
N. of 34°27'	4.8	9.6	7.2	14.4		
S. of 34°27'	4.7	9.4	7.1	14.1		
Longspine Thornyhead - coastwide	2	4	3	6		
N. of 34°27'	2	4	3	6		
S. of 34°27'	5	10	7.5	15		
COWCOD - Conception and Monterey	5	10	7.5	15		
DARKBLOTCHED	5	10	7.5	15		
YELLOWEYE g/	5	10	7.5	15		
Black Rockfish	5	10	7.5	15		
Black Rockfish (WA)	5	10	7.5	15		
Black Rockfish (OR-CA)	5	10	7.5	15		
Minor Rockfish North	5	10	7.5	15		
Nearshore Species	5	10	7.5	15		
Shelf Species	4	8	6	12		
Slope Species	5	10	7.5	15		
Minor Rockfish South	5	10	7.5	15		
Nearshore Species	5	10	7.5	15		
Shelf Species	5	10	7.5	15		
Slope Species	5	10	7.5	15		
California scorpionfish	5	10	7.5	15		
Cabezon (off CA only)	5	10	7.5	15		
Dover Sole	1.8	3.6	2.7	5.4		
English Sole	10	20	15	30		
Petrale Sole (coastwide) c/	2.9	5.8	4.4	8.7		
Arrowtooth Flounder	5	10	7.5	15		
Starry Flounder	5	10	7.5	15		
Other Flatfish	10	20	15	30		
Other Fish	5	10	7.5	15		

Table 5. Accumulation limits translated to MT, assuming recent prices and estimated trawl allocations based on recent OYs (aggregate assumes QS held is equally distributed among all species).

Stock	Option 1		Option 2		Option 3	
	Control Limit (mt)	Vessel Limit (mt)	Control Limit (mt)	Vessel Limit (mt)	Control Limit (mt)	Vessel Limit (mt)
All nonwhiting groundfish (in aggregate)	663	1,326	972	1,944	1,326	2,651
Lingcod - coastwide c/	43	86	64	128		
N. of 42° N (OR & WA)	34	68	51	103		
S. of 42° N (CA)	9	17	13	26		
Pacific Cod	60	120	90	180		
Pacific Whiting	10,000	15,000	15,000	22,500	25,000	37,500
Sablefish (Coastwide)	49	99	75	148		
N. of 36° N (Monterey north)	51	102	77	153		
S. of 36° N (Conception area)	3	5	4	8		
PACIFIC OCEAN PERCH	4	8	6	13		
Shortbelly Rockfish	0	0	0	0		
WIDOW ROCKFISH	5	10	8	15		
CANARY ROCKFISH	0	1	1	1		
Chilipepper Rockfish	100	200	150	300		
BOCACCIO	0	0	0	1		
Splitnose Rockfish	18	35	26	53		
Yellowtail Rockfish	175	350	263	525		
Shortspine Thornyhead - coastwide	53	105	80	158		
N. of 34°27'	74	147	111	221		
S. of 34°27'	8	15	12	23		
Longspine Thornyhead - coastwide	41	83	62	124		
N. of 34°27'	41	83	62	124		
S. of 34°27'	0	0	0	0		
COWCOD - Conception and Monterey	0	0	0	0		
DARKBLOTCHED	10	20	15	30		
YELLOWEYE g/	0	0	0	0		
Black Rockfish	0	0	0	0		
Black Rockfish (WA)	0	0	0	0		
Black Rockfish (OR-CA)	0	0	0	0		
Minor Rockfish North	38	76	57	114		
Nearshore Species	0	0	0	0		
Shelf Species	0	1	1	1		
Slope Species	37	75	56	112		
Minor Rockfish South	19	38	28	57		
Nearshore Species	0	0	0	0		
Shelf Species	0	0	0	1		
Slope Species	19	37	28	56		
California scorpionfish	0	0	0	0		
Cabezon (off CA only)	0	0	0	0		
Dover Sole	270	540	405	810		
English Sole	88	177	132	265		
Petrale Sole (coastwide) c/	70	140	107	211		
Arrowtooth Flounder	247	494	371	741		
Starry Flounder	3	7	5	10		
Other Flatfish	480	960	720	1,440		
Other Fish	11	21	16	32		
Sum of value if at limit for each species	11,818	18,636	17,728	27,954	25,000	37,500
Sum of nonwhiting and whiting accum lim	10,663	16,326	15,972	24,444	26,326	40,151

Table 6. Accumulation limits translated to MT, assuming recent prices and estimated trawl allocations based on recent OYs (aggregate assumes QS held is equally distributed among all species).

Stock	Option 1		Option 2		Option 3	
	Control Limit ($)	Vessel Limit ($)	Control Limit ($)	Vessel Limit ($)	Control Limit ($)	Vessel Limit ($)
All nonwhiting groundfish (in aggregate)	698,997	1,397,993	1,025,195	2,050,390	1,397,993	2,795,987
Lingcod - coastwide c/	48,529	97,057	72,793	145,586		
N. of 42° N (OR & WA)	38,602	77,204	57,903	115,806		
S. of 42° N (CA)	9,926	19,853	14,890	29,779		
Pacific Cod	75,658	151,315	113,486	226,973		
Pacific Whiting	1,132,833	1,699,249	1,699,249	2,548,874	2,832,082	4,248,124
Sablefish (Coastwide)	124,470	248,941	189,981	373,411		
N. of 36° N (Monterey north)	129,758	259,517	194,638	389,275		
S. of 36° N (Conception area)	3,158	6,315	4,737	9,473		
PACIFIC OCEAN PERCH	4,343	8,687	6,515	13,030		
Shortbelly Rockfish	1	3	2	4		
WIDOW ROCKFISH	4,826	9,651	7,238	14,477		
CANARY ROCKFISH	530	1,059	794	1,589		
Chilipepper Rockfish	97,547	195,095	146,321	292,642		
BOCACCIO	230	460	345	690		
Splitnose Rockfish	14,886	29,773	22,329	44,659		
Yellowtail Rockfish	155,128	310,255	232,691	465,383		
Shortspine Thornyhead - coastwide	69,590	139,180	105,508	208,770		
Shortspine Thornyhead - N. of 34°27' N	98,164	196,329	147,246	294,493		
Shortspine Thornyhead - S. of 34°27' N	9,388	18,777	14,182	28,165		
Longspine Thornyhead - coastwide	48,146	96,292	72,219	144,438		
Longspine Thornyhead - N. of 34°27' N	48,146	96,292	72,219	144,438		
Longspine Thornyhead - S. of 34°27' N	0	0	0	0		
COWCOD - Conception and Monterey	0	0	0	0		
DARKBLOTCHED	10,041	20,081	15,061	30,122		
YELLOWEYE g/	22	44	33	65		
Black Rockfish	77	154	116	232		
Black Rockfish (WA)	1	3	2	4		
Black Rockfish (OR-CA)	76	152	114	227		
Minor Rockfish North	46,182	92,364	69,273	138,546		
Nearshore Species	31	61	46	92		
Shelf Species	365	730	548	1,095		
Slope Species	45,695	91,390	68,543	137,085		
Minor Rockfish South	22,525	45,049	33,787	67,574		
Nearshore Species	4	7	5	11		
Shelf Species	190	380	285	570		
Slope Species	22,331	44,662	33,496	66,993		
California scorpionfish	0	0	0	0		
Cabezon (off CA only)	0	0	0	0		
Dover Sole	222,553	445,106	333,830	667,660		
English Sole	68,949	137,897	103,423	206,846		
Petrale Sole (coastwide) c/	151,499	302,997	229,860	454,496		
Arrowtooth Flounder	137,780	275,560	206,670	413,340		
Starry Flounder	4,168	8,336	6,252	12,504		
Other Flatfish	447,592	895,185	671,388	1,342,777		
Other Fish	7,407	14,814	11,110	22,221		
Sum of value if at limit for each species	2,941,828	5,317,239	4,415,454	7,975,859	5,548,287	9,675,108
Sum of nonwhiting and whiting accum lim	1,831,830	3,097,243	2,724,444	4,599,264	4,230,076	7,044,110

Table 7

Landings and Ex-vessel Revenue for Groundfish Species Delivered to Shoreside Buyers by West Coast Trawl Vessels in 2004-2006

	Roundweight (mt)			Ex-vessel Revenue ($,000)		
Species Category	**2004**	**2005**	**2006**	**2004**	**2005**	**2006**
Lingcod - coastwide	62.1	83.5	126.9	91.0	116.3	179.6
N. of 42° (OR & WA)	46.4	63.1	100.2	62.3	84.1	137.0
S. of 42° (CA)	15.7	20.4	26.7	28.7	32.2	42.6
Pacific Cod	1,103.1	731.0	338.7	1,163.3	754.0	377.5
Pacific whiting (shoreside)	92,893.9	97,569.1	97,268.7	7,525.2	11,351.5	13,719.1
Sablefish (Coastwide)	2,571.0	2,385.3	2,621.7	5,793.0	5,821.8	7,588.3
N. of 36° (Monterey north)	2,490.9	2,330.4	2,608.6	5,627.6	5,734.1	7,560.3
S. of 36° (Conception area)	80.2	54.9	13.1	165.4	87.7	27.9
PACIFIC OCEAN PERCH	131.2	58.7	66.1	132.8	60.5	68.9
Shortbelly Rockfish	0.1	0.0	0.3	0.1	0.0	0.4
WIDOW ROCKFISH	43.1	80.2	55.5	40.3	75.8	54.1
CANARY ROCKFISH	7.7	7.6	11.9	8.4	8.7	13.5
Chilipepper Rockfish	39.2	30.6	23.6	45.0	37.5	32.0
BOCACCIO	6.1	3.8	0.8	7.5	5.3	1.0
Splitnose Rockfish	163.7	86.3	105.5	119.9	61.7	69.2
Yellowtail Rockfish	220.4	202.9	183.3	211.7	189.2	171.7
Shortspine Thornyhead - coastwide	664.4	506.3	564.1	1,088.1	925.1	1,111.8
N. of 34°27'	439.1	361.2	442.5	660.0	594.2	822.8
S. of 34°27'	225.3	145.0	121.6	428.1	330.9	289.0
Longspine Thornyhead - coastwide	722.0	629.4	733.2	767.9	629.3	948.0
N. of 34°27'	722.0	629.4	733.2	767.9	629.3	948.0
S. of 34°27'	0.0	0.0	0.0	0.0	0.0	0.0
COWCOD	0.0	0.0	0.0	0.0	0.0	0.0
DARKBLOTCHED	188.4	82.7	91.1	192.5	79.2	91.7
YELLOWEYE	0.3	0.3	0.5	0.4	0.3	0.7
Black Rockfish - coastwide	2.4	0.5	2.6	2.5	0.6	2.8
Black Rockfish (WA)	0.0	0.0	0.1	0.0	0.0	0.1
Black Rockfish (OR-CA)	2.4	0.5	2.5	2.5	0.6	2.7
Minor Rockfish North	242.2	140.0	116.1	244.7	137.5	120.2
Nearshore Species	1.2	0.2	0.9	1.3	0.2	0.9
Shelf Species	34.0	36.5	25.0	28.8	30.1	24.9
Slope Species	207.0	103.3	90.3	214.6	107.1	94.4
Minor Rockfish South	239.9	116.7	103.2	274.5	119.4	126.8
Nearshore Species	0.1	0.0	0.1	0.9	0.0	0.3
Shelf Species	1.8	5.8	5.0	3.4	7.3	7.2
Slope Species	238.0	110.9	98.1	270.1	112.1	119.3
California scorpionfish	0.0	0.0	0.0	0.0	0.0	0.0
Cabezon (off CA only)	0.0	0.0	0.0	0.0	0.0	0.0
Dover sole (total)	7,128.6	6,925.8	6,002.9	5,838.5	5,697.1	4,996.9
English Sole	887.3	870.6	890.6	691.8	642.3	646.6
Petrale Sole (coastwide)	1,904.3	2,745.5	2,606.3	4,264.8	5,571.5	5,810.2
Arrowtooth Flounder (total)	2,386.9	2,119.7	1,817.5	585.8	496.1	441.5
Starry Flounder	118.3	23.4	56.2	103.7	21.1	49.9
Other Flatfish	1,269.7	1,105.4	1,092.0	1,174.0	1,032.6	982.5
Other Fish	259.2	320.6	214.1	97.0	122.0	74.7
Total Non-whiting Groundfish	20,361.5	19,256.6	17,824.9	22,939.0	22,605.0	23,960.4
Total Groundfish	113,255.4	116,825.6	115,093.5	30,464.2	33,956.5	37,679.5

Whiting Sector and Aggregate Accumulation Limits

The sector accumulation limit options were transformed (the first two columns of numbers in Table 8) were transformed to a combined whiting sector equivalent (the second two columns in Table 8). On this basis, it can be seen that the option 3 individual sector control Limits (grey cell) total to less than the Option 3 all whiting sector combined limit. Therefore, the option 3 control limit of 40% will not be limiting but rather the combined control limit will be limited by the individual sector control limits.

Table 8. Pacific Whiting accumulation limit and limits as a proportion of the trawl allocation.

	Sector Limit Options		Sector Limits as a Proportion of Total Non-tribal Trawl Whiting Allocation	
	Control Limit (%)	Vessel Limit (%)	Control Limit (%)	Vessel Limit (%)
Option 1				
Shoreside Sector	10	15	4.2	6.3
Mothership Sector	10	25	2.4	6
Catcher Processors	50	65	17	22.1
All Whiting Sectors Combined	15	25	23.6	34.4
Option 2				
Shoreside Sector	15	22.5	6.3	9.45
Mothership Sector	15	37.5	3.6	9
Catcher Processors	55	70	18.7	23.8
All Whiting Sectors Combined	22.5	37.5	28.6	42.25
Option 3				
Shoreside Sector	25	37.5	10.5	15.75
Mothership Sector	25	50	6	12
Catcher Processors	60	75	20.4	25.5
All Whiting Sectors Combined	40	50	36.9	53.25

Option 3 combined control limit is less constraining than the individual sector control Limits combined.

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