APPROACH AND METHODS FOR ANALYSIS

This document includes selected text from draft sections of the trawl rationalization EIS that describe the approach and analytical tools that will be used in assessing the impacts of rationalizing the West Coast trawl fishery. In this document we describe the analytical framework, which includes a description of an additive approach for estimating cumulative effects, the timeline that is assumed for the process and implementation of a trawl IQ program, and the analytical scenarios that are used to determine impacts of rationalizing the West Coast trawl fishery.

The analytical scenarios will serve as the basis for determining the effect of a rationalization program as a whole, and as such, members of the Council family are encouraged to pay particular attention to this section. These scenarios are intended to illustrate the effect of key decision points and trade-offs that exist in the suite of alternatives and to illustrate a more programmatic-level effect of rationalization. In other words, the perspective taken in constructing the analytical scenarios is to create a handful of example rationalization programs. These example rationalization programs concentrate on the key decision points and the elements of the program that are under consideration which can have a "big picture" impact on the affected environment. Individuals are encouraged to consider whether there are other elements that exist within the alternatives that should be considered "key elements" or that otherwise may have a "big picture" impact that are not included within the analytical scenarios.

Following the section describing the analytical framework is a section describing the principal models and methods that are being developed and that will be used to illustrate the impact of rationalization. This section describes assessment tools that are generally predictive in nature. Aspects of the alternatives that do not principally rely on a predictive assessment tool or are still undergoing research (such as program costs) are not included here. The Council family is encouraged to review these models and their outputs and consider whether there are other aspects of the program that deserve more focus and should be assessed by the construction of an assessment tool. In particular, individuals are encouraged to consider whether there are additional factors that should be measured, and tools that should be developed, that would facilitate a more informed decision on the part of the Council.

4.1 Analytical Framework

4.1.1 Additive Model for Analyzing Effects, Including Cumulative Effects

CEQ regulations at 40 CFR 1508.25 identify three types of impacts that must be considered in an environmental impact statement: direct, indirect, and cumulative effects. Direct and indirect effects are causally related to the proposed action: they are directly related to the action (occurring at the same time and place) or are indirect in that there is some intermediate cause-and-effect between the proposed action and the actual effect being evaluated in the analysis (occurring at a distance in time and/or place). The regulations also define a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such actions." Although the regulations and

guidance identify cumulative effects as a separate, third class of impacts, all effects can be viewed as cumulative to the extent they are part of some causal chain that results in an ultimate effect on an environmental component. Using this concept of cumulative effects, this EIS frames the analysis in terms of an additive model. To arrive at the final, cumulative effect on an environmental component, the effects in a causal chain are traced out and measured qualitatively or quantitatively, in terms of the metrics that have been identified in this EIS. The components in this additive model include baseline conditions, reasonably foreseeable future actions, the effect of the proposed action, and any mitigation that is proposed separately from the alternatives. Baseline conditions describe the past and present status of environmental components as well as the future status of those environmental components under status quo regulations; reasonably foreseeable future actions are actions that are anticipated to occur in the future and generally include proposals that are in the planning and development stage; the effect of the alternatives is the predicted impact of the alternatives being considered; and mitigation includes proposals that are separate from the alternatives that are designed to mitigate the effects of the alternatives.

Table 1 Components included within the Additive Model for Determining Cumulative Effects

Components of Additive Model	Description
Baseline Conditions	The past and present status of environmental components and the future status of those components under status quo management measures
Reasonably Foreseeable Future Actions	Actions that are anticipated to occur in the future and generally include proposals that are in the planning and development stage
Effect of the Alternatives	The predicted impact of the alternatives being considered
Mitigation	Proposals separate from the alternatives that are designed to mitigate the effects of the alternatives. These are added to – or subtracted from – the baseline to arrive at the cumulative effect

Based on this evaluation a determination of whether the proposed action will result in significant impacts to the human environment will be made by the responsible program manager (Regional Administrator, NWR) and described in the record of decision (ROD), based on the information provided in this EIS. To determine the potential for significant effects, the impacts described in this EIS may be compared to a threshold, if one exists in Federal, State, or local law (1508.27(b)(10)); or in land use plans, policies or controls for the area (1502.16(c)); or can be defined in terms of an inconsistency with such laws, policies or plans (1506.2(d)). If no such threshold can be identified, then the alternatives are evaluated comparatively to identify which one has the least effect, in terms of the metric concerned. (Although this is an additive model, it should be noted that component effects can be "subtractive" to the degree that they are in fact mitigative; conceptually this can be likened to adding a negative number.)

This additive model is applied within the framework of the EIS by describing in Chapter 3 actions other than those of the alternatives under consideration and their effects; this serves as the description of the "affected environment." The affected environment is thus a summary of current conditions, which results from the interaction between past and present actions and underlying natural phenomena, and is described in terms of the same metrics used in Chapter 4.

In addition, Chapter 4.1.3 catalogues those factors likely to alter the condition of evaluated environmental components in the future—reasonably foreseeable future actions—in terms of the metrics. This projects the affected environment, or environmental baseline, forward in time by considering the interaction of these foreseeable actions with the natural phenomena.

Chapter 4 evaluates the impacts of the alternatives. This includes a description of how these alternatives affect the evaluated environmental components, in terms of the metrics, and a summation of these effects in combination with projected environmental conditions; this represents the cumulative impact assessment. The alternatives are also compared to the no action alternative, which represents baseline conditions if the current management program remains in place. The following sections describe the components of the additive model that are not discussed in chapter 3. These components include the baseline conditions, reasonably foreseeable future actions, and the effect of the alternatives. Also discussed is the analytical timeline which shows the assumed timeline for various aspects of groundfish fishery management and policy implementation from the present date through 2016.

4.1.1.1 Baseline Conditions

4.1.1.2 Catalogue of Reasonably Foreseeable Future Actions

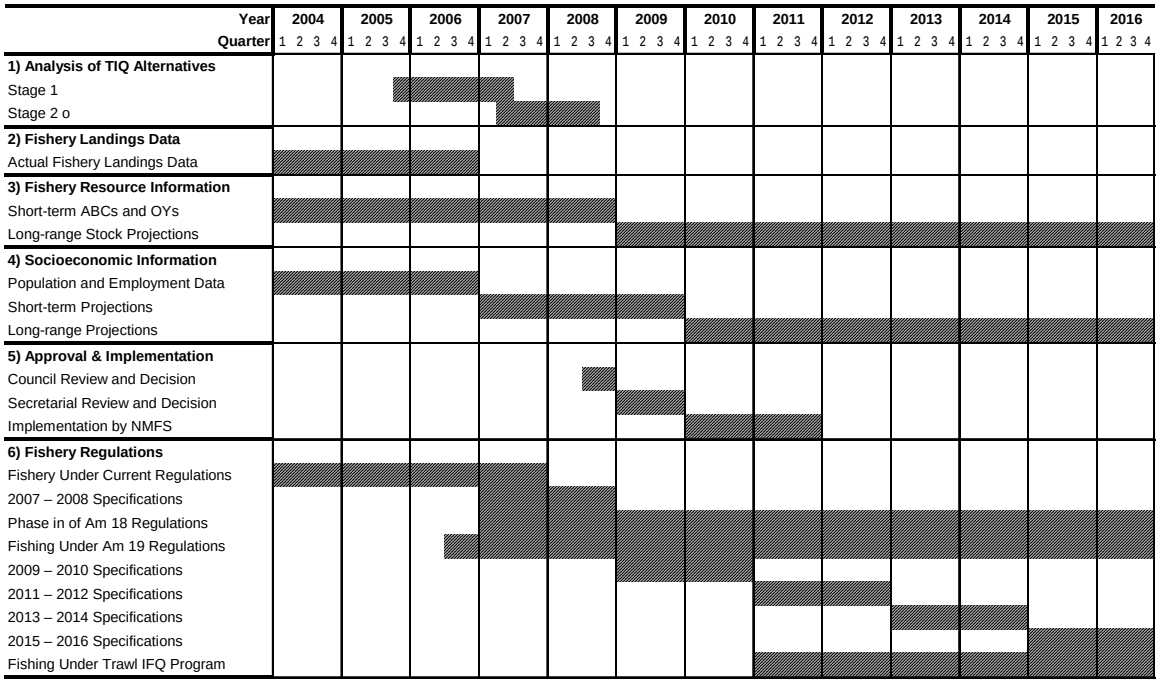
4.1.1.3 Analytical Timeline

As in any analysis that tries to predict the effects of future actions, it is critical to examine the time periods covered by the available historic and current data, the period in which the analysis will occur, and the period over which the analysts must make projections. In general, there is a substantial time lag between the period during which the analysis is undertaken and the period in which the effects of a proposed action will occur. Specifically, the DEIS is scheduled to be released in the fall of 2008.[1] The effects of the proposed action are not expect to occur until 2012 because of the time needed for Secretarial approval and the development of necessary infrastructure and personnel. Those effect will most likely will not be fully realized until some years later because of the time necessary for the fishery participants to adjust and adapt to the new regime.

Figure 1 provides a quarterly timeline for analysis and implementation of the trawl IFQ program from 2004 through 2016. The first section of the figure, labeled “Analysis of TIQ Alternatives,” indicates the time frame over which the analysis of the trawl IFQ program takes place. Sections 2 through 4 show the availability of key data sets that will be necessary for the analysis. Section 5, Approval & Implementation, shows the timeframe for the Council and Secretarial decision process and implementation of the approved program by NMFS. The last section of the figure, Fishery Regulations, indicates the timing of regulatory changes that are projected to occur during the first years of fishing under the program.

[1] The reauthorized Magnuson-Stevens Fishery Conservation and Management Act states that the Council shall submit a plan for rationalization of the West Coast groundfish trawl fishery within two years of reenactment of the act. The release of the DEIS in the fall of 2008 is scheduled to facilitate the development of that rationalization plan by the end of 2008, which will meet the congressionally mandated deadline.

Figure 1 Trawl IFQ Program Analytical and Implementation Timeline



Note: The fact that the timeline begins in 2004 does not mean that data from earlier periods will not be used in the analysis.

As seen in the first section of Figure 1, Stage 1 of the analysis (development of the analytical framework and outline) runs approximately one and a half years. The second stage of the trawl IFQ program analysis begins in the second quarter of 2007 and run through the third quarter of 2008.

Section 2 of the figure shows the period over which actual fishery landings data will be available. By the time the Stage 2 analysis is underway, fishery data for 2006 should be available. Information for earlier years will also be available and used to describe historical conditions of potentially affected resource and stakeholder groups, but it is not shown in the figure.

The figure's third section describes the availability of stock assessment information. Under the current management regime, the groundfish stock specifications cover two-year periods, and Council recommendations are made at the end of the second quarter each even-numbered year. Therefore, actual ABC and OY specifications for the 2009 and 2010 fishery will not be available early enough to inform the trawl rationalization analysis. Harvest specifications for 2007 and 2008 provide an indication of the stock levels and OYs for the near term and also provide longer range projections. As indicated in the figure, these long-range projections of stock sizes are likely to be generally available through 2016 for most species.

The fourth section of the figure deals with available socioeconomic information. In general, population and employment estimates through 2006 will be available at the community or county level by the time Stage 2 of the analysis is underway. Reliable population and employment projections through 2009 should also be available, but projections beyond 2009 are likely to be less certain, primarily because population estimates are recalibrated every 10 years to the decennial US census.

Assuming that the analysis of the trawl IFQ program proceeds as currently scheduled, the Council should receive a preliminary draft analysis at the end of the second quarter in 2008 (June Council meeting), and is presumed to make its final recommendations by the end of that year (November Council meeting). Following the Council decision, it is presumed that development of a draft analysis for Secretarial review will be required. Drafting of plan amendment language, implementation plans, proposed changes to the regulation, and the Secretarial review and decision process will require at least a full year (2009). Assuming the Secretary approves the program, it is anticipated that implementation of the program by NMFS will require an additional two years (2010 and 2011).

The sixth and final section of the figure shows the major regulatory regimes under which the fishery will operate between 2004 and 2016. The current regulations are expected to remain in effect through 2008. By then it is anticipated that new groundfish stock and harvest specifications would be in place, and that some additional regulations such as Amendment 10 will have been put into place. It is assumed that fishing would continue under those regulations through 2011. In 2012, it is anticipated that fishing under the trawl IFQ program would begin.

The end of 2016 is used as the "end point" for the analysis. The time horizon of the analysis is more than a few years after implementation of an alternative management regime in order to include fleet consolidation and other possible effects.

4.1.1.4 Analytical Scenarios

The existing suite of alternatives specify two alternatives in addition to status quo. Within each of these alternatives are several sub-options that may have different impacts on the affected environment when examined in whole or in part. Each of the sub-options may have noticeable impacts on the affected environment if one is chosen over the other, but equally important is the combined suite of a series of sub-options that are potentially chosen and the overall impact of the combined suite of sub-options. Given the number of sub-options that exist in the suite of alternatives, there are a large number of potential combinations of sub-options that would make the analysis of the alternatives unfeasible if every potential combination was analyzed. Since the potential number of sub-option combinations is large, a suite of "analytical scenarios" were developed that serve as the focal point of the analysis. These analytical scenarios strategically combine a series of potential sub-options with the intention of illustrating the trade-offs that exist within the alternatives while keeping the analysis and consideration of options within a refined and feasible set.

One objective of the concept of analytical scenarios is the illustration of how different decision points can impact the outcome of a trawl rationalization program. These scenarios were developed so that each suite of sub-options making up the analytical scenario results in noticeable differences in the impact on the affected environment. Some sub-options are not illustrated in the analytical scenarios because the decision to choose one option or the other is not expected to have a noticeable impact on the program or the environment as a whole. It should be noted however that such options are considered in the components analyses that are included as appendices.

Four analytical scenarios are illustrated below and these scenarios are referred to throughout chapter 4 in illustrating the impact of a trawl rationalization program on the affected environment. It should be noted that status quo is not shown in the table but is considered in the analysis and referred to as Scenario 1.

ELEMENT	ANALYTICAL SCENARIOS FOR ILLUSTRATING IMPACTS			
	Scenario 2.a	Scenario 2.b	Scenario 3	Scenario 4
Catch Control Tool	• IFQ for all Trawl Sectors	• IFQ for all trawl sectors	• IFQ for Non-Whiting Trawl • Coops for Whiting Trawl	• IFQ for Shorebased Trawl • Coops for At-Sea Trawl
Initial Allocation	• Based on catch history (no buyback sharing)		• Equal sharing of buyback history in Non-whiting • Whiting sectors: placeholder	• Equal sharing of buyback history in Non-whiting • Whiting sectors: placeholder
Processor Initial Ownership / Coop Affiliations	• None	• 25% of groundfish • 50% whiting to shoreside and motherships	• Processor affiliations in mothership and SB whiting sectors. • 25% SB processor ownership of SB groundfish	• Processor affiliation in Mothership sector • 50% SB processor ownership of SB whiting • No processor ownership of SB groundfish
Species Covered	• All grndfish and Pacific halibut	• All grndfish and Pacific halibut	• All groundfish in non-whiting sector • Whiting in whiting sectors with bycatch pools that are common across all whiting sectors	• All groundfish in shorebased sector • Whiting is covered at sea. At sea sector bycatch is covered through sector-specific pools
Number of Trawl Sectors	• Three	• Four	• Four	• Three
Adaptive Management[1]	• No adaptive mgmt	• No adaptive mgmt	• Adaptive mgmt for non-whiting	• Adaptive mgmt for shorebased
Roll-over	• Roll-over exists	• Roll-over exists	• No roll-over	• Roll-over exists
Overfished Species Provisions	• none	• none	• placeholder	• placeholder
Accumulation Limits	• SB non-whiting grnd: 5% • SB whiting: 25% ctrl & 12% per vessel • Mothership: 25% ctrl & 50% per vessel • CP: 60% ctrl & 75% per vessel		• SB grnd: 1.5% • SB whiting: 15% • Mothershp: 20% • CV(MS): 10% • CP: none	• SB grnd: 3% • SB whiting: 10% • Mothershp: 30% • CV(MS): 15% • CP: none
Tracking and Monitoring Options	• Placehol der	• Placeholder	• Placeholder	• Placeholder

Note: Adaptive management provisions are assumed to be used to A) provide protection to communities and processors that may be adversely affected by rationalization by directing QP to LE permits based in particular communities, and B) to encourage bycatch reduction measures and/or gear conversion by directing QP to particular vessels

The above analytical scenarios serve as the basis for analyzing impacts to the affected environment. These scenarios were constructed to illustrate the trade-offs that exist in the existing suite of alternatives and to focus on elements of the alternatives that may have a significant impact, and therefore should be considered under NEPA. Some elements of the alternatives are not considered in these analytical scenarios for several reasons. Some of the

elements or sub-options not included are simply specified as part of the program if a rationalization program is implemented so there is no contrast available. Other elements or sub-options are not considered because they are not expected to have a noticeable impact.

The approach for specifying the analytical alternatives was to construct alternatives in addition to status quo that show outcomes based on a range of market flexibility in the program and a range of processor influence over harvest privileges or harvest activities:

- Scenario 1 is Status Quo

- Scenario 2.a is constructed with the intention of being market-centric with a high level of individuality, individual accountability, and a focus on vessel-ownership of harvest privileges. The individuality perspective is accomplished by issuing IFQ (versus coops) for all sectors of the fishery. This creates a more individualistic perspective based on the notion that IQ tends to make participants focus on their personal perspective, whereas participants in a harvest cooperative acts within a type of community and take into account the perspective of other participants in that cooperative as well as their own perspective. The focus on vessel-ownership of harvest privileges is accomplished by not making an initial allocation of quota to processors. A focus on market outcomes is achieved by issuing IFQ, but also by requiring that all groundfish species and Pacific halibut be covered with IQ, that three trawl sectors be established (versus four), that no adaptive management exists which may otherwise skew the outcome driven by a market, allowing for a roll-over to occur, and not building in any specific requirements for managing overfished species.

- Scenario 2.b is constructed with the intention of being market-centric, with a high level of individuality and individual accountability, but with an initial distribution of quota shares being made to processors. This scenario is the same as 2.a, except that there is an initial allocation of IQ to processors, and the fishery is separated into four trawl sectors in order to support the processor allocation rules specified in the scenario.

- Scenario 3 imposes harvest cooperatives for the whiting sectors of the fishery and places constraints and controls on market outcomes through sector divisions, adaptive management mechanisms, and overfished species provisions. This scenario also has a relatively large degree of processor influence or ownership of harvest privileges. Imposing harvest cooperatives on three sectors of the fishery is expected to result in some different outcomes than IQ for all sectors. This is because the perspective of individual harvesters in a system of harvest cooperatives includes the perspective of other participants in the cooperative as well as the perspective of the individual. A limitation on market outcomes is achieved through a limitation in the species covered in the whiting fishery, the establishment of four trawl sectors, establishing an adaptive management mechanism, not allowing roll-overs to occur, and establishing special provisions to manage overfished species. Market outcomes are also restricted by establishing relatively small accumulation limits.

- Scenario 4 is intended to be moderate to scenarios 2 and 3 by allowing for more market-driven outcomes than scenario 3 through roll-over provisions, allowing for three trawl sectors, and higher accumulation limits than scenario 3. This scenario imposes harvest coops for the at-sea portion of the trawl fishery and also imposes special overfished species management provisions.

4.1.1.5 Uncertainty in Predicting Outcomes

4.2 Analytical Tools for Assessing the Impacts of Trawl

Rationalization

The rationalization of the West Coast trawl fishery is expected to result in impacts to the social and economic status of fishery participants, processors, and West Coast fishing communities. In addition, shifts in the location of fishing effort and changes in the amount of fishing-induced groundfish mortality is expected that will have impacts to the status of West Coast groundfish stocks and the marine ecosystem. In this section we describe the principal analytical approaches that are being proposed to address the impacts of trawl rationalization.

Preliminary analysis and public scoping has indicated that the rationalization of the West Coast trawl fishery could result in economic impacts to various aspects of the socioeconomic environment. Substantial impacts may be realized on the harvesting side via changes to economic status of trawl catcher vessels, permit holders, captains, and crewmembers. Substantial impacts may also be realized on the processing side via changes in the utilization of processing plants, processor access to groundfish landings, changes in the demand for processing labor, and impacts to the processing companies as a whole. These changes occur as a result of changes in the quantity of catch, the type and quality of fish retained, and negotiations that occur between harvesters and processors amongst other things. Impacts to harvesters and processors have a secondary effect to West Coast fishing communities because of changes in the economic status of harvesters and processors, as well as the level, type, and location of employment in both sectors.

The individual accountability and market-based trading aspects of rationalization are expected to result in shifts in harvesting activity that will alter the quantity of fish caught and the location of fishing effort. These changes could impact the status of fish stocks as harvest rates change and there is a resulting change in the removals of some species. Changes in fishing effort and fishing-induced mortality may also alter the ecosystem because of trophic interactions and the location and intensity of fishing effort that occurs on marine habitat.

Several efforts are being undertaken in order to address the impacts of trawl rationalization. These efforts can be categorized as A) economic theory, B) data and information collection, and C) model development. Economic theoretical approaches are being utilized to describe the outcomes of negotiation that occur between harvesters and processors and the outcomes that occur as a result of potential changes in the negotiating power of the two groups. Information collection is occurring in order to support model development, but also to provide analytical support for tracing impacts through aspects of the socioeconomic environment and to document lessons that have been learned from other rationalization programs. Model development is occurring to support the analysis of several issues. These issues include;

1) The impact of the initial allocation of IFQ,

2) The amount of fleet consolidation expected to occur,

3) The potential for shifts in the location of fishing effort,

4) The potential for changes in revenue and catch as a result of changes in bycatch rates,

5) The comparative advantage of ports and regions in a rationalized fishery,

6) The effect on the California current ecosystem resulting from changes in trawl activity,

7) The regional economic impacts of trawl fishing activity

4.2.1 Tools for Estimating Impacts

4.2.1.1 Theory for Illustrating Negotiation Outcomes

Game theoretical approaches for illustrating the concept of negotiation and bargaining power will be utilized to illustrate the negotiation that takes place between harvesters and processors. This information is useful for showing how the negotiation stance of each player changes as the initial allocation of quota is divided between harvesters and processors. This concept shows the linearity/non-linearity of bargaining power between two players engaged in a negotiation.

4.2.1.2 Information Collection

4.2.1.2.1 Lessons Learned from Other Rationalization Programs

The rationalization of the West Coast Trawl fishery can benefit from experience in other rationalization programs around the world. An in-depth literature review has been ongoing since 2004 in an attempt at documenting some of the intended and unintended consequences of rationalization programs that have been put in place. This information has demonstrated impacts to communities, catcher vessels, fishery resources, and processors and can be used to show an empirical example of how various policies have impacted portions of the affected environment.

4.2.1.2.2 Identification of Community Vulnerability and Resilience

As part of the 2007/2008 Annual Specifications and Amendment 16-4 Groundfish Rebuilding Plan Environmental Impact Statement, an analysis of community vulnerability and resilience was conducted. This information was created by estimating dependence of West Coast fishing communities on fishing activity and the relative resilience those communities have to dealing with change. This information is useful for considering impacts to communities in cases where changes in fishing activity have a different degree of impact to a community. In such cases, a moderate change in fishing activity occurring in a vulnerable community may be considered a substantial impact, while a moderate change in fishing activity in a less vulnerable community may be considered relatively inconsequential.

4.2.1.2.3 NWFSC cost-earnings survey

4.2.1.2.4 Documentation of processor ownership, plant location, and port-to-plant product flow

This data collection exercise is intended to document the location of trawl groundfish processing plants, the company of ownership, and the ports that those plants receive their groundfish from. This information will display the number of trawl groundfish plants owned by seafood processing companies, the regional location of those plants, whether those plants process whiting and/or non-whiting groundfish, and the port or ports that those plants derive their fish inputs from. The method for collecting this information is through data available in the PacFIN database, information provided by state port samplers and fisheries information specialists, and information provided by members of industry. This information can be used to show the geographic location of plants and product flow which is useful for illustrating impacts on processors from a change in

the location of landing for example. This information also has repercussions for regions and communities.

The following table illustrates a hypothetical example of the information being collected in this exercise. This table shows the name of a plant, the city of that hypothetical plant, the company that owns that plant, the ports of landing that plant derives its catch from, and whether that plant processes whiting and/or non-whiting groundfish.

Table 2 Hypothetical Example of Processor Plant Information Being Collected

Plant name	Location	Company	Source ports	Whiting port	Groundfish port
A groundfish plant	Astoria, OR	A groundfish company	Astoria	Yes	Yes
			Westport	Yes	Yes
			Neah Bay	No	Yes

By documenting this information, it is possible to illustrate the relationships between processing plants and regional patterns of landings; between processing plants and individual seafood companies; and between whiting and non-whiting harvest levels and individual processing plants. By documenting this information, second and third order effects can be further developed and described that illustrate the effect on regions and communities that result from an impact on processing plants.

4.2.1.2.5 Documentation of Fishing Infrastructure and Support Business

The Northwest Fisheries Science Center is updating the community profiles that were published in 2006. As part of this update, information that is being collected will show the presence of fishing infrastructure and the presence of fishing support business, such as net manufacturing and vessel fabrication. This information is useful for showing the level of involvement the various fishing communities have in West Coast fisheries. Documenting the amount of infrastructure and support business is also useful for analysis that relies on the concept of "agglomeration economies" where a greater presence of similar business creates economic efficiencies through information sharing and a decrease in the amount of "transfer costs" or the cost of conducting day to day operations. In this case, a greater presence of fishing business would tend to illustrate the presence of agglomeration and provide an indicator of economic efficiencies that are present or not present in fishing communities along the West Coast.

4.2.1.2.6 Tracking and Monitoring Program and Cost Development

As part of this EIS development, NMFS is constructing options for a tracking and monitoring system that would meet the needs of a rationalized fishery. As part of this information development, options are being researched to determine the level of costs that can be borne by industry and the level of costs that need to be borne by agencies. This information has implications for the profitability of participants in the rationalized fishery and implications for management agencies that currently lack adequate resources for enhanced management systems.

4.2.1.3 Models

This subsection provides an overview of models being developed for predicting how portions of the affected environment will respond under each alternative. The choice of models depends upon the amount and quality of information available. The following bullets describe some of the data issues complicating model development for this analysis:

- Cost and earnings data for individual harvesters are available only for a single year.
- Cost and earnings data for individual processors are unavailable
- Comprehensive primary data on processed products and product prices are unavailable.
- Final market demand for groundfish products is not well known.
- Data showing the total catch (landings plus discard) of groundfish by individual vessels are unavailable.

Given these data shortcomings a comprehensive predictive model would not be feasible for development and use in the effects analysis. Instead, a set of models designed to focus on specific issues can be developed. These include:

- A model showing the effects of the initial allocation of IFQs in a trawl IFQ program.
- A model assessing the expected amount of fleet consolidation.
- A model illustrating the potential for geographic shifts in fishery patterns.
- A model illustrating the potential to reduce the catch rate of overfished species and the associated potential for increased target species catch and revenue.
- A qualitative comparative advantage model illustrating the potential for regions to be negatively or positively impacted by rationalization
- An ecosystem-based model describing the impact on the biological and ecosystem components of the environment resulting from changes in fishing behaviour and catch
- A regional input-output model that measures the regional economic impact of changes in catch and revenue occurring in a rationalized fishery

In addition to these models, available literature and theory is useful for articulating additional impacts that may not be able to be predicted, but can be assessed in a qualitative fashion. Such issues include impacts on fishing safety, and changes in bargaining power. Issues like these that cannot be readily assessed via the construction of a model are assessed in a qualitative fashion that is based on the expertise of analysts and a review of available literature.

4.2.1.3.1 Model to Assist in Assessing the Effects of the Initial Allocation of IFQ

The initial allocation of IFQs may have a large impact on the way in which trawl groundfish harvesters and processors prosecute the fishery, especially in the first few years under an IFQ program. An examination of how quota recipients fare under the initial allocation options relative to current participation levels will provide an indication of socioeconomic impacts resulting from the initial allocations. The initial allocation model will be designed to calculate allocations under alternative formula options, and to compare the value of those allocations with recent experience of both permits and processors. Key components of the model include:

- PacFIN fish ticket-level data on LE trawl landings by permit, year and species from 1994 - 2006. The model will also include data indicating the ex-vessel purchase of trawl groundfish by buyers or processors. Each trip will be categorized as to in which IFQ “sector” it belongs.

Compared with the original PacFIN file, the data is also "transposed" so that each species category is represented by two numeric data fields, one for round weight of the landing and one for ex-vessel revenue.

- Specific allocation rules included in the alternatives (e.g., relative lbs. calculated annually for years 1994-2003, dropping a certain number of years, and recent participation requirements). Allocation options currently on the table for permits include: no recent participation requirement, dropping the three worst years from the calculation for non-whiting fishery permits' quota shares, and dropping two years from the whiting fisheries permits' quota share calculation.

- Rules on alternative treatment of the buyback vessels' portion of total quota share. Current options include allocating the buyback portion equally among all permits receiving quota share, or allocating it in the same proportion as the permits' catch history-based quota share.

Results will be generated for each permit and processor who is eligible to receive quota share under each allocation option. Results will be rolled up to the business entity level in cases where owners control multiple buyer/processor codes and/or LE trawl permits. It will also be possible to combine processor and permit allocations to show total quota share amounts that would be allocated to entities with eligible history from both buying/processing activities and landings.

These results will be used to assess quota share concentration implications of the initial allocation, and to compare the annual catch value of allocated quota shares with the value of harvest and/or buying activity exhibited in recent years. Average ex-vessel revenue during 2004-2006 will most likely be used for this comparison.

4.2.1.3.2 Model to Assist in Assessing the Expected Amount of Fleet Consolidation

Consolidation under the alternatives will be a key impact mechanism. A model is being developed that provides projections of consolidation in the fishery and the effects of that consolidation. This model is based on work published by Weninger and Waters in the Journal of Environmental Economics and Management 46 (2003) 207-230.

Ex ante benefit estimates will be obtained using a two-step methodology. The first step predicts the harvesting practices expected to prevail under an ITQ system. This first step will predict post-ITQ equilibrium harvesting practices including:

- Groundfish harvest per vessel
- Number of vessels needed to harvest limited entry trawl groundfish catch
- Which vessels remain in the groundfish fishery and which vessels exit
- Non-groundfish harvest per vessel

A directional distance function model of a multiple output harvest technology is being used for analysis. The directional distance function is well-suited for characterizing fishing practices under alternative regulatory systems. The model is being estimated using data collected in the recently completed West Coast Limited Entry Cost Earnings Survey.

In the second step, estimates of potential economic benefits are generated conditional on the predicted harvesting practices from the first step analysis. Because the West Coast groundfish fishery is not a derby fishery, it is expected that economic benefits will come through cost reductions and increased access to target species that arise from modifications in fishing behavior (overfished species avoidance). The key output of the second step analysis is an estimate of post-ITQ equilibrium harvesting cost.

Changes in harvesting costs can arise from three sources. First, the total fixed costs incurred by the groundfish trawl fleet change as the size of the fleet changes. Since many limited entry trawlers incur annual fixed costs of at least $100,000, reductions in fleet size can result in substantial cost savings. Second, costs may change as vessels change decisions regarding fishery participation, and no longer incur diseconomies of scope (such as the costs of frequently switching gear for participating in multiple fisheries). Third, costs may change as vessels are able to buy and sell quota to take advantage of economies of scale and operate at the minimum point on their long run average cost curve.

Using the model developed through this project, it will be possible to compare:

- Harvesting costs under the current regulatory system
- Harvesting costs under an "unconstrained" ITQ system
- Harvesting costs under an ITQ system where fleet rationalization is constrained through program design features such as quota accumulation caps.

This information can be used to help determine community impacts, revenue associated with fishing opportunities under a rationalization program, and the number of boats engaged in the fishery. A prediction of the number of vessels engaged in the fishery has repercussions for estimating the cost of monitoring the fishery.

4.2.1.3.3 A Model Illustrating the Potential for Geographic Shifts in Fishery Patterns

Individual accountability in a rationalization program is likely to result in cleaner fishing practices. In particular, the individual accountability associated with constraining overfished species will encourage vessels to modify gears as well as fish in areas where overfished species are less abundant. In addition, the rationalization program will tend to slow the pace of Olympic style fisheries that exist in the shorebased and mothership sectors of the whiting fishery. Both of these measures will tend to adjust fishing patterns at a geographic level. Cleaner fishing practices are likely to result in some pressure to move away from areas where there are relatively high encounters of constraining species like canary, yelloweye, and cowcod. A rationalized whiting fishery will tend to slow the pace of harvesting and given that the whiting stock tends to migrate north over the course of the year, this is likely to result in more midwater trawl effort occurring further to the north than under an Olympic style fishery.

The model indicating geographic shifts in fishing effort in the non-whiting trawl fishery will be constructed to show areas and regions that are more likely to see less fishing effort and areas that are likely to see more fishing effort. This index will be based on a regional analysis of bycatch rates of constraining overfished species with the hypothesis being that areas with high bycatch rates will tend to see less trawl effort. This ranking of bycatch rates by area is intended to be illustrative of the type of effect that may occur in a rationalized fishery and should not be considered predictive.

The geographic shift in fishing effort in the mothership and shorebased sectors of the whiting fishery will be informed by catch patterns that have been exhibited in the catcher-processor sector of the whiting fishery. The catcher-processor sector of the whiting fishery voluntarily formed the Pacific Whiting Conservation Cooperative. This association acts like a rationalized fishery, and clear differences in fishing patterns occurred after the cooperative was formed. It is anticipated that similar fishing practices will occur in the mothership and shorebased sectors of the whiting fishery.

The outputs created by this model will show areas of the coast that are likely to see decreases or increases in trawl effort. The coast will be broken into ?9? distinct areas and increases or decreases in trawl effort will be identified based on the relative bycatch rate of overfished species that exist in each of those areas.

4.2.1.3.4 A Model Illustrating the Potential to Reduce the Catch Rate of Overfished Species and the Associated Potential for Increased Target Species Catch and Revenue

The reduction in the bycatch rate of overfished species is envisioned as one of the principal outcomes of a trawl rationalization plan. One large implication of reductions in the bycatch rate of overfished species is the ability to access more target species and generate higher levels of revenue than under status quo. Under status quo management, fishing opportunities have been reduced to protect overfished species. In some cases, opportunities to catch species that have historically been large targets of the trawl sector have been eliminated because of their relatively high degree of correlation with overfished species (yellowtail and chilipepper rockfish for example). In many cases, those species that are not highly correlated with overfished species have also seen target opportunities reduced. For example, the catch of sablefish (one of the primary targets for the trawl sector) has been less than the total trawl allocation by several hundred tons in recent years and this represents a substantial economic loss in exvessel revenue. It is envisioned that a rationalization program will encourage fishers to operate in a manner that avoids overfished species better than under the command and control type of management that exists in the status quo regime. This expected change in behavior is directly related to the individual accountability aspect of a rationalization program.

Several sources of information exist that can be used to show how the bycatch rate of overfished species can change in a rationalized fishery and the implications of that bycatch rate reduction. This information can be used to modify the NMFS/GMT trawl bycatch model[2] which predicts overfished species catch, target species catch, and exvessel revenue given an estimated overfished species bycatch rate and a set of assumed exvessel prices. By modifying the bycatch rate the model can be used to simulate potential changes in harvest outcomes that will occur in a rationalized fishery.

Information that exists to estimate changes in the bycatch rate of overfished species in a rationalized fishery include EFP fisheries have been conducted with requirements that are nearly identical to what would likely be required under a rationalized fishery. In addition, bycatch performance in the catcher-processor sector after that sector formed a voluntary harvest

[2] The Trawl Bycatch Model was originally developed by staff at the Northwest Fisheries Science Center for use in setting regulations that manage the non-whiting trawl fishery. This model was reviewed and endorsed by the SSC in 2003.

cooperative is illustrative of the potential bycatch reductions that exist in a rationalized West Coast trawl fishery.

The Washington Arrowtooth Flounder EFP was a project that occurred over 4 years with requirements nearly identical to what would be expected under a rationalized fishery. In this EFP, vessels carried observers and were given an overall cap on the amount of overfished species. Vessels were also given individual vessel limits on overfished species. Vessels that could avoid overfished species and stay within their limits had access to arrowtooth flounder and petrale sole in excess of the normal two-month limits that were in place as well as access to areas within the trawl Rockfish Conservation Area. When a vessel reached or exceeded the individual cap, that vessel was no longer allowed to participate in the EFP and was required to fish under normal two-month limits and RCA restrictions while still carrying an EFP observer. In other words, observations were collected while fishing under the EFP and while the vessel was fishing under status quo regulations (the latter serves as the control on the experiment). In addition to information collected on overfished species and target species catch, information on non-marketable discards was collected during the first year of the program. This information can be used to show order of magnitude estimates regarding the amount of regulatory discard occurring under stats quo management and the increased amount of revenue that can be attributed to the fishery via an elimination of regulatory discards.

The information collected when vessels fished outside the EFP is directly comparable to bycatch information collected from the West Coast Groundfish Observer Program in a fishery that is not rationalized, while information collected in the EFP is illustrative of the bycatch rates that would be expected in a rationalized fishery. While the actual bycatch rates collected in this area cannot be used on a coastwide basis (the EFP occurred off northern Washington which has different overfished species interactions than other areas of the coast), the percentage difference between EFP-based observations, and non-EFP observations using the same observers can be used to show the reduction in bycatch rates that can be expected, and to estimate how coastwide bycatch rates collected through the WCGOP should be modified to reflect bycatch under a rationalized fishery.

The figure below illustrates the recorded canary bycatch rates for vessels participating in the EFP by year. The information below shows the bycatch rate when those vessels were participating in the EFP and the bycatch rate when those vessels were fishing under normal (non-EFP) fishing conditions. As is shown from the figure, in 2001 and 2002 the difference in EFP and non-EFP bycatch rates was substantial, while in 2003 and 2004 the difference was less, though still very noticeable. The explanation for this change is indicated in the figure. In 2003 gear modifications were required of vessels participating in the EFP and those gears (which had demonstrably lower bycatch rates) were used outside the EFP as well. In 2004 those vessels became more accustomed to using those gears and only gears that had demonstrated “satisfactory” results were used (which further reduced bycatch rates). In 2003 and 2004 the Rockfish Conservation Areas were in place during the months when observations were recorded, thus the bycatch rate for non-EFP observations fell because vessels were no longer fishing in areas with high canary bycatch.

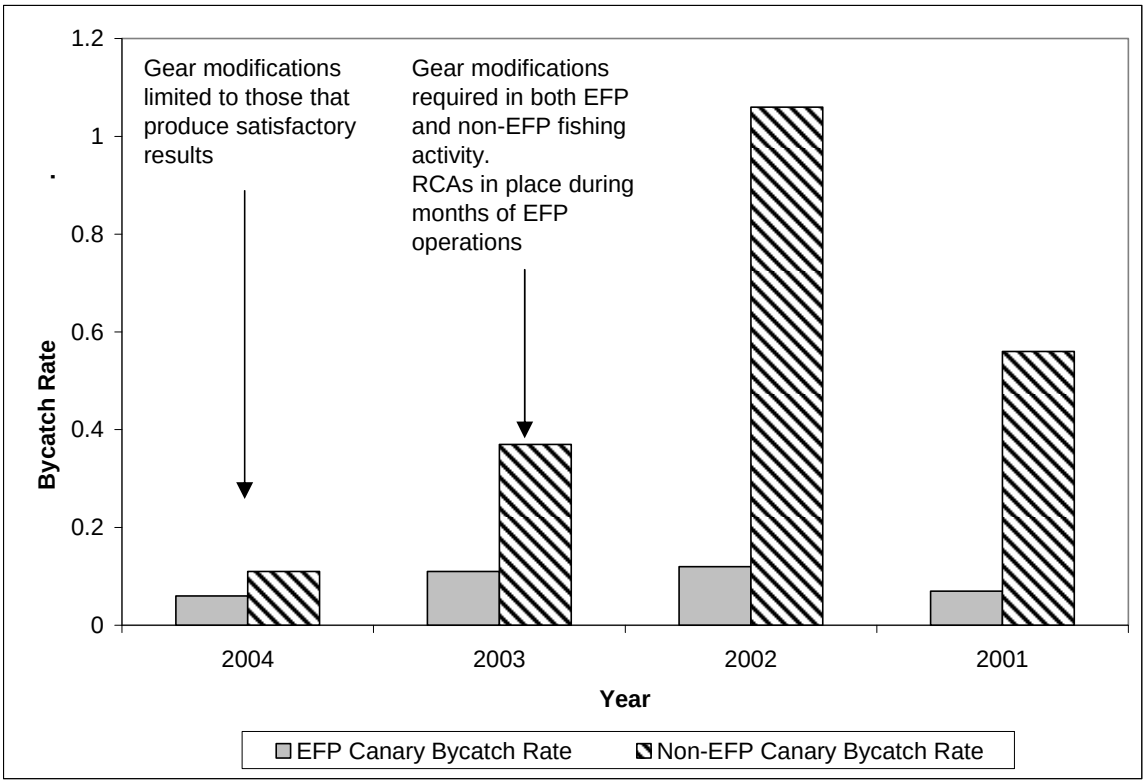
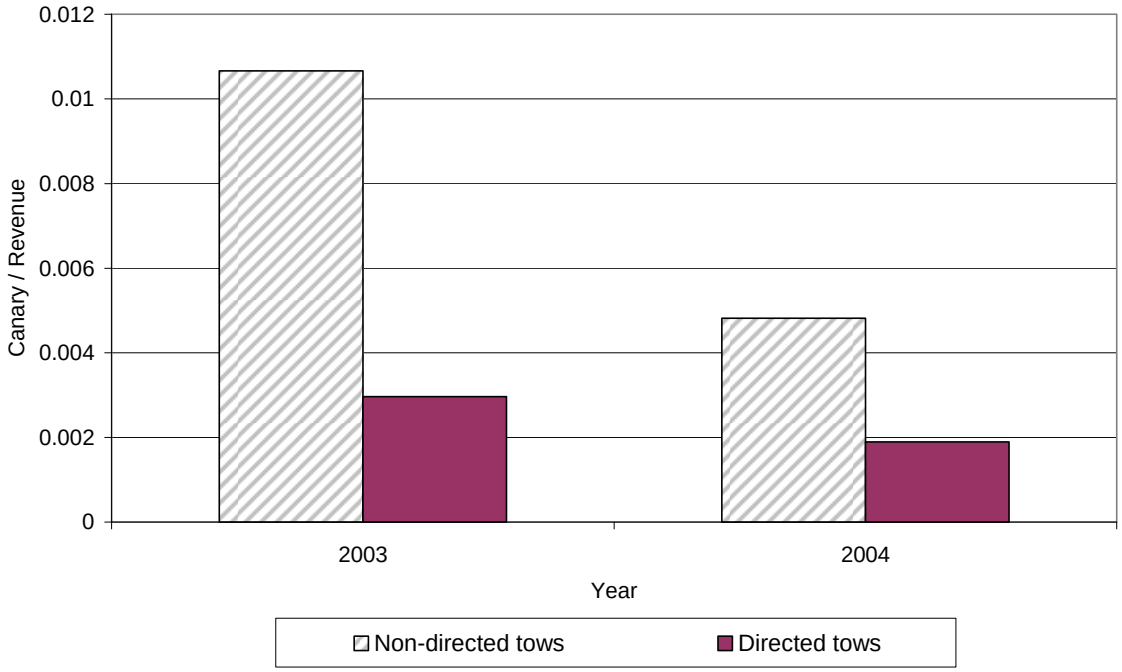
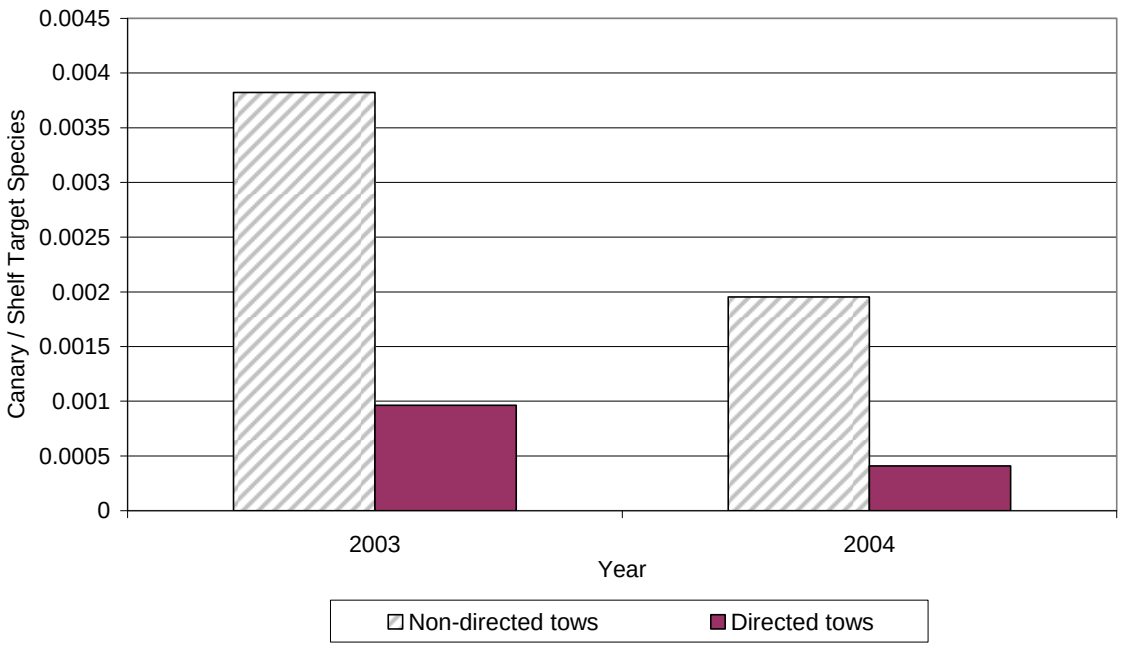
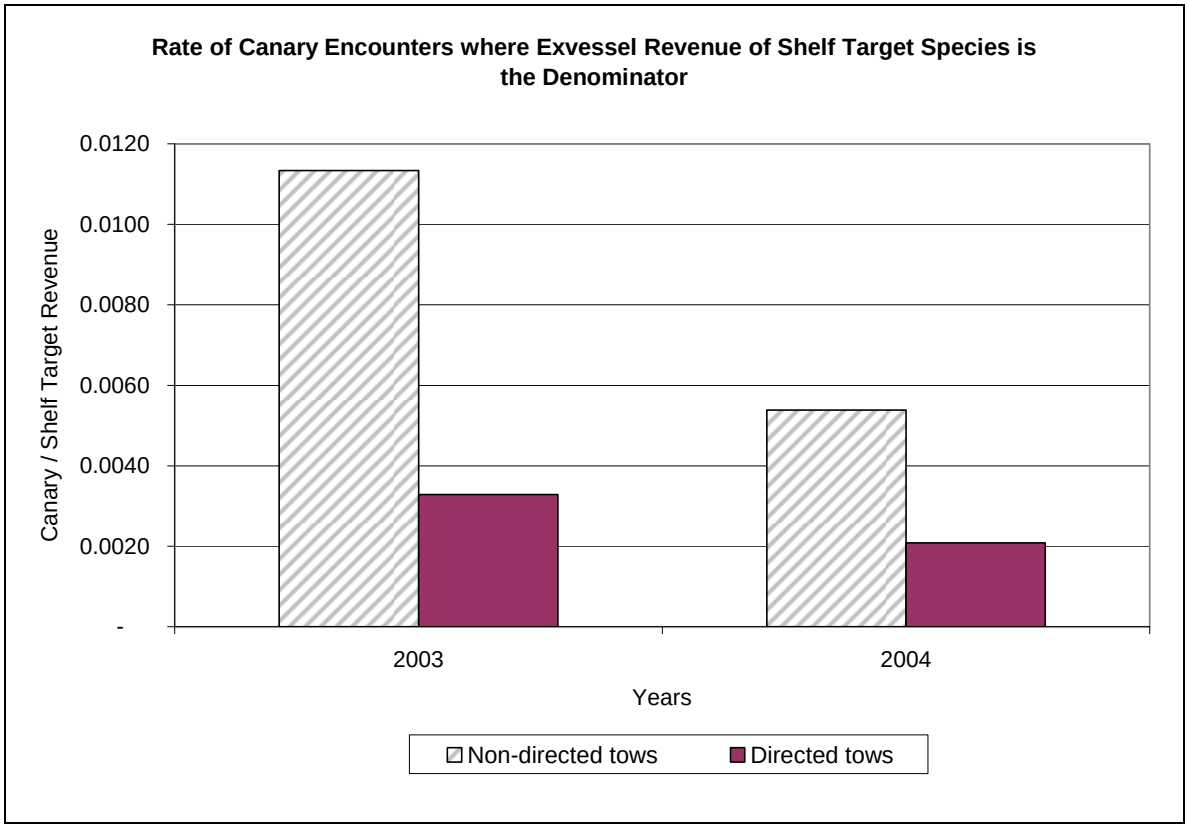


Figure 2 Observed Canary Bycatch Rates in the Washington Arrowtooth EFP

Comments received during the review of proposed methodology questioned whether the bycatch rates in the arrowtooth EFP changed because overfished species were being avoided, or whether they were changing because the denominator, or set of target species, were changing between EFP and non-EFP fishing activity. If the denominator, or set of target species, differs between EFP and non-EFP activity, then the results shown above may not be indicative of what could occur under a rationalization program. To examine this question, bycatch rates were estimated in several additional ways: the first method examined canary bycatch relative to the amount of revenue generated by fishing activity; the second method examined canary bycatch relative to the amount of shelf target species; and the third method examined canary relative to the amount of shelf target revenue. All three additional approaches show substantial differences in the bycatch of canary rockfish in directed EFP activity compared to non-EFP activity. Canary rockfish is examined in this case because it was the most constraining species to target fishing activity during the 4 years of the EFP (because of the individual accountability measures of the program). Along other portions of the coast other species such as darkblotched rockfish would likely to be more constraining, and therefore substantial reductions in darkblotched would be expected instead.


Rate of Canary Encounters where Exvessel Revenue is the Denominator
0.012
0.01
0.008
0.006
0.004
0.002
0
Canary / Revenue
2003
2004
Year
Non-directed tows
Directed tows


Rate of Canary Encounters where Retained Pounds of Shelf Target Species is the Denominator
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Canary / Shelf Target Species
2003
2004
Year
Non-directed tows
Directed tows



The data used from the Arrowtooth EFP project will be a comparison of observed bycatch rates that occurred in depths that are outside (deeper or shallower than) the trawl Rockfish Conservation Area. Including observations outside the RCA is consistent with the expectation that RCAs will remain in place under a rationalization program and also provides a more direct comparison between a rationalized fishery and status quo management (which relies on RCAs). This involves eliminating observations from 2001 – 2004 that occurred in depths within the trawl RCA. After this filtering exercise is completed, the percentage difference between EFP and non-EFP rates will be applied to coastwide bycatch rates estimated from the West Coast Groundfish Observer Program. These modified rates will be used in the NMFS/GMT bycatch model for estimating the change in target species catch and exvessel revenue that would be expected in a rationalized fishery given the expected reduction in the encounters of constraining overfished species.

It is likely that overfished species bycatch rates will also decrease in the mothership and shorebased sectors of the whiting fishery because those fisheries are operating as an Olympic fishery under status quo management. The whiting fishery operates under sector-wide bycatch limits that can close all sectors of the fishery if reached. Each sector has demonstrated a reduction in bycatch rates since bycatch limits were put in place, however the catcher-processor sector has demonstrated a lower rate of canary rockfish bycatch (the species that was most constraining from 2004-2006). By examining the bycatch rates in the catcher-processor sector, we can infer changes in the bycatch rates in the mothership and shorebased sectors of the whiting fishery if those sectors of the fishery are rationalized, however it is not appropriate to assume the mothership and shorebased sectors of the whiting fishery would have the same bycatch rates as the catcher processor sector.

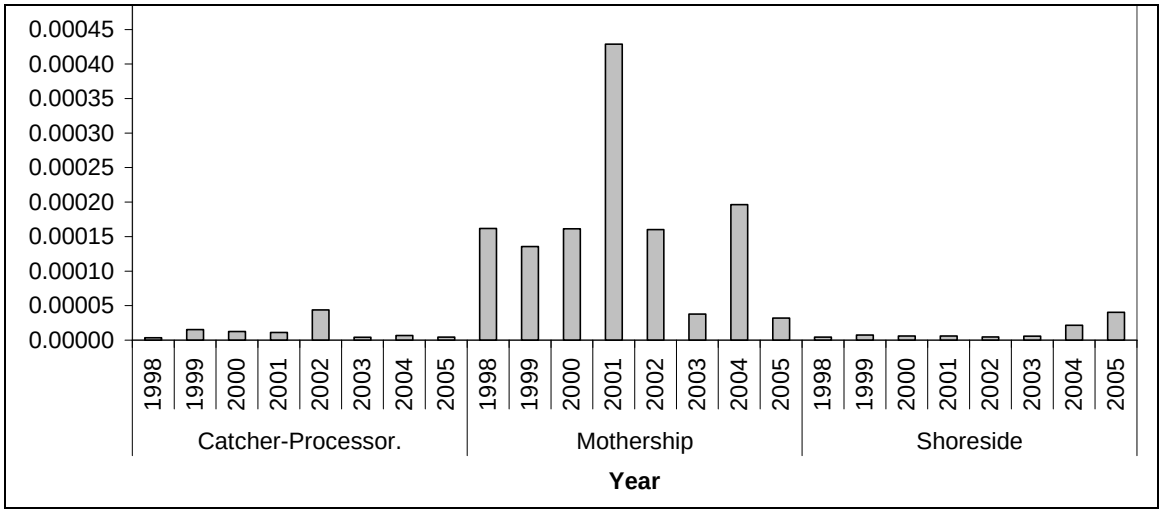


Figure 3 Canary Bycatch Rate by Year and Whiting Sector

The outputs created by this model will be a range of likely results of changes in catch and exvessel revenue that occur under a rationalized fishery. One bound can be described as being optimistic and the other bound can be described as being relatively pessimistic. This information will show the total exvessel revenue that can potentially be created by a rationalized trawl fleet and the associated quantity of retained catch.

4.2.1.3.5 A Comparative Advantage Model Illustrating the Potential for Regions to be Made Better or Worse Off by Rationalization

Several variables determine the amount of fishing activity occurring in different ports, including access to fishing grounds, port infrastructure, and fish purchasing and processing amongst other things. In a rationalized fishery, the incentives created by market-based management may impose additional forces that will alter the decision that vessel operators make regarding the location of fishing activity, the delivery location, and home-port location for a given vessel. Assuming profit is the motivating factor for fishers engaged in commercial fisheries then the decision framework created by a rationalized fishery will tend to shift the location of fishing and delivery activity.

Under status quo management vessels are not held individually responsible for the amount of fish they catch, provided their landings are within their cumulative landing limit. In addition, operators cannot choose to grant their cumulative limit to another, potentially more profitable, operator. Under a rationalized fishery, both scenarios change and fishers are held individually accountable and can transfer their fishing privilege to another vessel. The aspect of individual accountability will tend to put pressure on operators to fish in areas with lower encounter rates of overfished species and the ability for transferring catch privileges allows the fleet to consolidate to fewer, but more profitable vessels as the market directs quota in a manner that is more economically efficient.

In a rationalization program, more economically efficient vessels are expected to remain in the fishery, while less efficient vessels are expected to drop out of the fishery. Economic efficiency is determined by several variables including the ability of the operator to generate gross revenues and the vessels cost structure. Cost structure is determined by variable costs such as fuel, by fixed costs and also by “transfer costs” and the cost of doing day to day operations. Ports that have a higher degree of fishing support business (agglomeration) tend to make it easier and more

efficient for operators to conduct day-to-day activities and this makes the cost of running a fishing business, acquiring parts, and negotiating work relationships lower than other ports.

Given these arguments, it is reasonable to expect ports with vessels that have a relatively long travel time to fishing grounds, have relatively unsuccessful operators, relatively costly vessels, and are in ports with relatively few support businesses to be at a disadvantage when compared to other regions. In addition, ports that are adjacent to fishing grounds with high constraining overfished species abundance would also tend to be at a disadvantage as the presence of overfished species would encourage operators to move to areas with lower abundance. Given enough disadvantaging (or advantaging) factors in a port, that port may find itself losing (or gaining) trawl groundfish activity after rationalization, absent some mitigation tool that the Council may wish to implement as part of the program.

Information is available to illustrate these relationships and provide information indicating which ports or areas may be at a relative advantage or disadvantage. Available information includes:

- Logbook data can be used to show the preferred fishing grounds of trawl vessels categorized by home port (e.g. we can identify the preferred grounds for Astoria-based trawlers). This information can be combined with West Coast groundfish observer program data to show whether preferred fishing grounds of some ports are in areas with relatively high bycatch rates of constraining overfished species. Those ports with vessels fishing in areas with relatively lower bycatch rates may be at an advantage in a rationalized fishery.

- West Coast fishing community profiles provide information about community business and infrastructure. In addition, industry members, extension agents, and extension publications are sources of this information. Using the theory of agglomeration, those communities with larger amounts of support business and infrastructure may be at an advantage in a rationalized fishery.

- The fleet consolidation model can be used to identify the geographic effects of consolidation based on the most likely vessels to drop out of the fishery and the most likely vessels to stay in the fishery.

- The initial distribution of quota can be used to show which ports will receive more or less quota relative to status quo and relative to the initial distribution made to other ports.

The output created by this model will illustrate 4 variables and the relative advantage or disadvantage each port has with respect to each of those variables. These variables include 1) bycatch rates in preferred fishing grounds of various ports, 2) relative economic efficiency of vessels in that port, 3) the relative amount of fishing business that exists in that port, and 4) the initial distribution of quota shares to those ports relative to status quo and relative to the distribution made to other ports.

Table 3 Hypothetical Example of Relative Comparative Advantage Information

Hypothetical Port	Relative Bycatch Rate	Fishing Infrastructure	Economic Efficiency of Local Fleet	Initial Distribution of Quota shares
Hypothetical Washington port	–	–	+	+
Hypothetical Oregon port	+	–	+	–
Hypothetical California port	+	–	–	+

4.2.1.3.6 An Model Describing the Impact on the California Current Ecosystem Resulting from Changes in Fishing Behaviour and Catch

Certain behavioural changes on the part of fishers can be anticipated after a rationalization program goes into place. These behavioural changes can have biological and ecosystem effects and these effects can be identified based on known relationships in the ecosystem. In a rationalized fishery it is anticipated that there will be geographic shifts in effort and greater utilization of currently under-utilized species will occur. Geographic shifts in effort have the potential to alter impacts on habitat and greater removals of some groundfish can have secondary impacts on other groundfish depending on the trophic level of that species. For example, if arrowtooth flounder is a predator of a certain rockfish and arrowtooth removals increase under rationalization, we would expect the abundance of that prey rockfish species to increase.

This model identifies the anticipated changes in fishing behaviour that will occur after a rationalized fishery goes into place. These changes are traced through known trophic and habitat relationships to identify the type of impacts that occur in the California ecosystem.

4.2.1.3.7 A Regional Input-Output Model that Measures the Regional Economic Impact of Changes in Catch and Revenue Occurring in a Rationalized Fishery

Attachment

4.2.2 Utilization of Analytical Methods in Assessing the Effects of the Analytical Scenarios

Each of the proposed methods is used to illustrate the impact of the analytical scenarios on portions of the affected environment. In some instances these methods can provide quantitative outputs that differ between each of the analytical scenarios, while at other times the proposed models may provide a range of likely outputs that are not necessarily tied to a specific analytical scenario. In this case, the relationship of the outputs to the analytical scenarios is characterized based on a qualitative likelihood of where each scenario may fall within that range.

Several analytical methods described are closely related to one another. Some of these analytical methods are related because one measures the direct effect of trawl rationalization while another

measures the indirect effect and therefore relies on the outputs of the model estimating the direct effect. One example of where this occurs is when rationalization changes the way catcher vessels prosecute the fishery and this has a indirect, or second-order impact, on the biological status of fish stocks and on the state of the California current ecosystem.

The following table illustrates the relationship of the proposed analytical methods to the analytical scenarios and their utilization in determining their respective impact on each of the environmental components.

Data Collection / Model	Env Component Informed by Data/Model	Utilization of Information in the Assessment of Analytical Scenarios
4.2.1.2.4 Processor Plant and Company Info	• Processors • Communities	This data collection is primarily used as descriptive information and as supporting information within various analyses.
4.2.1.2.5 Community Infrastructure	• Communities • Catcher vessels	This data collection is primarily used as descriptive information and as information within various analyses.
4.2.1.2.1 Lessons Learned	• All environmental components	This information is used to show empirical examples of impacts where alternatives under consideration have been implemented in other areas
4.2.1.2.2 Community Vulnerability	• Communities	This information identifies communities that are vulnerable and dependent on fishing. Analytical scenarios are assessed based on the likelihood of impacting communities and whether those communities are vulnerable or not vulnerable.
4.2.1.2.3 NWFSC Cost-Earnings Survey	• Catcher-vessels	This information is primarily used as descriptive information and as inputs to the fleet consolidation model
4.2.1.2.6 Tracking and monitoring program and cost	• Agencies • Catcher Vessels	Analytical scenarios are assessed based on the amount of consolidation allowed or expected to occur and the associated cost of monitoring that fleet size
4.2.1.3.1 Initial Allocation of IQ	• Communities • Processors • Catcher Vessels	This information illustrates the distribution of initial allocation and the implications of doing so at the vessel, processor, and community level. Analytical scenarios are assessed based on the initial allocation rules specified in those scenarios.
4.2.1.3.2 Fleet Consolidation	• Communities • Processors • Catcher Vessels • Agencies • Captain & Crew • Input Suppliers	Fleet consolidation is illustrated based on model projections and the amount of accumulation limits that are specified as part of each scenario.
4.2.1.3.3 Geographic Fishing Patterns	• Groundfish resources • Non-trawl harvesters • Ecosystem • Groundfish	Identification of geographic shifts in fishing patterns is assessed based on the incentives within each analytical scenario for doing so.
4.2.1.3.4Change in Bycatch Rate, Catch, and Revenue	• Catcher Vessels • Processors & labor • Captain and Crew • Groundfish resources • California Current Ecosystem	Changes in catch and revenue are portrayed as a likely range. Analytical scenarios are analyzed based on the likelihood of whether each scenario would tend toward the lower or upper bound. The impact on components of the environment are estimated through the impact of the upper and lower bound.
4.2.1.3.5 Regional Comparative Advantage	• Communities • Processors • Ecosystem	Elements within the alternatives may mitigate the comparative advantage of some regions. The amount of mitigating factors in each analytical scenario are used to characterize the outputs of this model in terms of the likelihood that comparative advantage will make a region better or worse off under rationalization.
4.2.1.3.7 NWFSC Input-Output Model	• Communities	Outputs from the change in catch and revenue model will be used as inputs in this model. The output of the I-O model will be used to show the regional economic impact of the scenarios.

4.3 General Effects of Trawl Rationalization

4.3.1 Overview

4.3.1.1 A Review of Impacts in Other Rationalization Programs

4.3.1.2 Expected Effects in the West Coast Trawl Fishery

4.3.1.3 General Effects on West Coast Fisheries

4.3.1.4 General Effects on West Coast Communities, Including Processors

4.3.1.5 General Effects on Biological Resources

4.3.2 General Effects on Environmental Components Where There is a Low Potential for Significant Impacts

4.3.2.1 Buyers and Processors That Do Not Purchase Trawl Groundfish

4.3.2.2 Recreational Harvesters

4.3.2.3 Consumers of Groundfish Products

4.3.2.4 General Public

4.3.2.5 Other Fish Resources

4.3.2.6 Protected Species Other than ESA-Listed Salmon (includes seabirds, marine mammals, other ESA-listed species)

4.4 Limited Entry Trawl Groundfish Catcher Vessels and Permit Owners

4.5 Non-Trawl Commercial Harvesters

4.6 Captain and Crew

4.7 Trawl Catcher Processors

4.8 Processors of Trawl Groundfish

4.8.1 Information Collection

4.8.2 Potential Impacts, Mechanisms, and Metrics

4.9 Processor and Other Labor

4.10 Wholesalers and Retailers

4.11 Input Suppliers

4.12 Communities

4.13 Tribes

4.14 Management Agencies

4.15 Groundfish Resources

4.16 ESA Listed Salmon

4.17 California Current Ecosystem (incl. Habitat and Trophic Relationships)