Survey Methodology and Results for Collection of Economic Data Used in the Analysis of Long-Term Allocation Options for the Pacific Sardine Harvest Guideline

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Introduction

The Pacific Fishery Management Council is considering long-term changes to the framework for allocating the coastwide Pacific sardine harvest guideline between the northern and southern subareas of the fishery (currently the Pacific Northwest and California respectively). At the outset, the Council requested the industry to assemble and develop options for allocating the harvest guideline between geographic sectors of the fishery -- Pacific Northwest (PNW, Washington and Oregon), Northern California (Monterey area) and Southern California (San Pedro area). The rationale being, that given the annual harvest guideline, which is established to insure the ecological well being of the resource, and no market based mechanism to allocate the harvest guideline, the way in which the harvest guideline was to be directly allocated was a decision best left up to industry. The hope was that the fishery sectors would negotiate among themselves and reach an allocation agreement that would be satisfactory to all in terms of economic and community impact concerns. Industry did meet several times in attempt to reach an agreement on allocation. Industry failed to come up with a means that was preferred by all, and instead developed seven alternatives that would allocate the harvest guideline either on a seasonal, regional or combination seasonal-regional basis. The Council was then faced with selecting among these alternatives, as well as an alternative that represented the status quo and an alternative that represented no action. It turned to the CPS Management Team to provide an analysis of each alternative relative to the status quo.

An analysis of proposed changes in the harvest guideline allocation framework would primarily focus on the net economic benefits associated with alternative allocation options being considered. Consequently, an effort was undertaken to assemble detailed cost and earnings (C-E) data from west coast sardine processors in each sector of the fishery which would enable

[1] This document has been revised in response to a review by the Economics Subcommittee of the Scientific and Statistical Committee (SSC Economics Subcommittee May 24, 2005).

estimates of producer surplus and private profits in the fishery under each allocation option being proposed. The analysis focused on sardine processors since differences in net economic values and private profits between the two subareas are mainly determined at the exprocessor level. The data collection procedures and results are described and discussed below, followed by some concluding remarks.

Methodology

Shortcomings in the procedures used in developing the economic data for the current (2003-2005) interim Pacific sardine harvest guideline allocation arrangement weighed heavily in designing a survey methodology to assemble the economic data for evaluating the long-term allocation framework alternatives. In the interim allocation case, analysts were dealing with an exceedingly short time frame in which to assemble the necessary economic data, conduct the appropriate analyses and present the results to the Council at its April, 2003 meeting. In this case the data collection procedure was to solicit voluntary C-E data through a detailed questionnaire that was made available to all industry members in each fishery sector during January, 2003. This resulted in a non-random sample of processors replying to the solicitation, who responded with a wide range of values for the specific C-E data being sought. The returned questionnaires were not consistently and completely filled out across, and within, all fishery sectors, because the C-E items specified in the questionnaire did not universally apply to all processing operations. This required less than fully successful follow up to ensure that to the extent possible the values used in the analyses were realistic.

While every attempt was made to insure that the economic data would be representative of each fishery sector's sardine processing operations, the possibility of inherent biases in the data that were provided could not be ruled out. This mainly had to do with the contentiousness of the issue at hand strategically influencing the information provided by participants in the data collection exercise; i.e., strategic bias. Although there was no specific evidence, incentives for skewing the data in order to gain some strategic advantage were undeniably present in the sardine harvest guideline allocation case.

To validate the economic data, the cost-benefit/private profit analyses and the data used therein were subsequently reviewed by the CPS Advisory Subpanel (AP) and other industry members during the week of the April 2003 Council meeting. During this review there was considerable debate and disagreement over the C-E values used in the analyses. At the time there was no resolution to the disagreements over appropriate amounts for the C-E measures subject to dispute. Despite these concerns the data were used to conduct cost-benefit/private profit analyses of the interim allocation alternatives. The analyses were then presented to the Council with the stern warning that the data used in the analyses might not be representative of the economics of sardine processing in each of the fishery sectors.

Based upon the experience in collecting the economic data for the analyses of the interim allocation alternatives, a Delphi-like process was developed to obtain representative, unbiased economic data for evaluation of the long-term allocation alternatives. The basic protocol was to follow up on the interim allocation experience by convening sardine processors -- a panel of

experts -- from each fishery sector and to have them develop a reliable consensus opinion on representative values for the C-E variables of interest.[2]

The process was coordinated by representatives of fishing industry associations in California and the Pacific Northwest.[3] These coordinators were very knowledgeable of the fishery and had the trust of the sardine process in their respective sectors. They were able to interact with all of the processors in their respective sectors to get a full participation in fashioning a consensus on the C-E measures.

The course of action was to: (1) assembling regional panels of expert processors for the development of representative sardine processed product C-E data; (2) preparing a form to guide the process and to record values for the C-E data elements; (3) initial development of C-E profiles for processed sardine products in each sector; (4) review and assessment of the initial C-E profiles; (5) feedback; (6) opportunity for participants to revise their original responses; and, 7) final validation of data.

The data collection effort, steps (1)- (6) above, extended over the period December, 2004 through December, 2005. There were a number of consultations between the contractors and the principal investigator over this time to deal with problematic issues regarding the data collection, and to ensure consistency in the data collection protocol across fishery sectors. Most of these issues were resolved in a timely manner and C-E data were obtained independently for each geographic sector of the west coast sardine fishery. Step (7) was scheduled to occur during an AP and industry review of preliminary analytical results at an AP meeting scheduled for early March, 2005.

Results

The Delphi-like process achieved the following for each fishery sector:

1. Identification of the specific sardine processed products produced by each geographic sector's processors.

2. Estimates of the average annual expenditure on each of the fixed inputs that are required in the production of each sector's sardine products which included:[4]

    a. Insured value of plant;
    b. Lease expense for plant;
    c. Lease expense for equipment;
    d. Repair and maintenance expenses for plant;
    e. Repair and maintenance expenses for processing equipment;
    f. Insurance (plant insurance and other insurance associated with the operation of this plant, excluding insurance reported under variable costs);

[2] A feature of the conventional Delphi process is anonymity for all participants. This was not a strict requirement in this case, if it was deemed that a consensus could be amiably reached through a group roundtable.
[3] The coordinators were under contract to NMFS, SWFSC, La Jolla, with Sam Herrick as principle investigator.
[4] Elements of the fixed cost data were provided for all sectors except Northern California.

g. General and administrative expenses (including professional services and management fees);
h. Interest payments;
i. Depreciation and amortization;
j. All other fixed expenses (those that are independent of the level of production).

3. Estimates of the average expenditure on each of the variable inputs that are required to produce one full container load (FCL)[5] of each processed sardine product. These included:

   a. Raw fish;
   b. Processing labor;
   c. Processing labor benefits;
   d. Supervisory and technical support;
   e. Energy
   f. Product additives;
   g. Packaging;
   h. Waste disposal/treatment;
   i. Freight;
   j. Storage;
   k. Broker fees;
   l. Other sales costs;
   m. Any other variable input.

4. Estimates of the wholesale price, free on board, of each processed product.

5. Compile the economic data and create a C-E profile for a FCL of each processed product.

Survey coverage and the variable cost and earnings data obtained from each fishery sector are summarized below.

Pacific Northwest

For the Pacific northwest, there were 13 sardine processors who received sardine landings in 2004. Twelve of these processors took part in developing representative C-E data for the Pacific northwest for 2004 (Table 1). Together, these 12 processors accounted for over 98.0 percent of the Pacific northwest sardine landings in 2004. Of the 12 processors eight were considered large processors (> 500 mt of sardine receipts in 2004), and 4 were considered medium processors (> 50, but <= 500 mt of sardine receipts in 2004). Of the eight large processors, five process sardine exclusively.

Northern California

There are three sardine processors in northern California, and all three participated in developing representative C-E data for 2004 (Table 2). These three processors each received in excess of

[5] A full container load equals 22.7 metric tons.

500 mt of sardine in 2004, and accounted for 100.0 percent of the northern California landings in 2004.

Southern California

For the southern California sector there were six processors with sardine receipts in excess of 500 mt and one with receipts less than 500 mt in 2003, who were involved in developing the southern California C-E data for 2003 (Table 3). Together these processors accounted for 98.3 percent of the total southern California sardine landings in 2003.

Discussion

Methodology

Based on previous experience with the collection of these data for analysis of the current interim sardine allocation framework, the Delphi-like process was perceived as the preferred means of obtaining the desired information for analysis of the long-term allocation issue. When compared to administering a standardized survey instrument to individual processors (as was done for the interim framework), the Delphi-like process had several advantages. Assembling a voluntary panel of experts, and having them develop an acceptable format for enumerating the desired economic data greatly facilitated development of the data. Moreover, this approach provided a built in review of the data by virtue of the process.

In the case of the interim allocation analysis, industry review of the economic data used therein took place at the joint CPS Management Team - Advisory Subpanel meeting just prior to its presentation to the Council at the April, 2003 Council meeting. At that time there was vigorous debate amongst industry members present regarding the representativeness of those data. Consequently, the analytical results were subject to a number of caveats in that regard. With this in mind, and as part of the Delphi-like process, a final industry review of the data used in the economic evaluation of long-term allocation alternatives was to occur at joint CPS Management Team - Advisory Subpanel meeting planned for March 2003. This review would provide an opportunity for cross examination of the data provided by each fishery sector. Unfortunately, this meeting was not held, so, a final vetting of the economic data did not occur until the joint CPS Management Team - AP meeting on April 6, 2005. As in the prior case, and as expected this time around, there was rigorous debate amongst industry counterparts -- those it would seem most qualified to review the economic data provided by corresponding sectors of the fishery -- regarding the validity of the data used in the analysis.

Indeed, this review uncovered a major discrepancy in the data from the southern California sector. As it turned out, the wholesale prices for southern California processed sardine products included overseas freight costs, and were not FOB prices. The effect of this was to inflate the weighted average estimate of per unit producer surplus for southern California by the amount of the overseas freight charge. Adjustments were made accordingly to the southern California data (these revisions are incorporated in Tables 3), and the analysis was rerun using the revised dataset (Table 4) in time for presentation to the Council the following day, April 7, 2005. In this instance, the data collection protocol performed as anticipated.

While not exactly a peer review,[6] this appraisal did result in a consensus dataset for use in the analyses. To the extent that the industry review could be construed as a guise for negotiating a tacit resolution to the allocation issue then, in the sense that allocation is the province of industry, the consensus dataset may reflect what industry considers in their best interest. This seems to be consistent with the notion that given the harvest guideline (resource biological and ecological concerns having been addressed), industry should be allowed to determine how the harvest guideline is best allocated. It would follow then that an industry review of the data, and its use, would not be that unreasonable in this case.

Data Limitations

There are a number of other restrictions that using only processor variable cost and earnings data impose on the economic analyses of the proposed allocation alternatives. The data only allow estimates of producer surplus/short-run profits at the exprocessor level; any economic profits at the exvessel level are not included in estimates of processor producer surplus. In other words, if exvessel revenues -- which are variable costs to processors and therefore reduce processor producer surplus -- exceed harvesting costs, then true producer surplus for the sector is underestimated by this amount of producer surplus accruing to sardine harvesters. The lack of cost data at the harvesting level precludes estimation of exvessel producer surplus. However, there are several possible situations that may lessen this concern. First, economic theory of the fishery proposes that in the long run the average cost of harvesting sardines will be equal to the average revenue or exvessel price; producer surplus at the exvessel level will be zero.[7] If this is the case for sardine harvesters then there is no exvessel producer surplus to be concerned about, but without the cost data this can not be confirmed empirically. The second, concerns the degree of vertical integration within the fishery. If vessels are owned by processors, processor producer surplus will capture the total producer surplus for the sector. Thirdly, there may be exclusive exvessel supply arrangements between privately owned vessels and processors that result in the processor producer surplus being all-inclusive. Under these conditions it may be that supply of raw sardines is perfectly price-elastic; i.e., any amount will be supplied at the prevailing exvessel price. In this situation the marginal, and therefore average, cost of harvesting sardines would be constant and equal to exvessel price for any level of sardine harvest. Consequently, exvessel producer surplus is zero. Without conclusive evidence to support any of these circumstances, and to at least partially address potential changes in producer surplus at the exvessel level, exvessel revenue for each fishery sector was projected under each allocation alternative as a proxy for exvessel producer surplus (Table 5).

Another concern involves the fact that the economic data only represent sardine processing activity for the most recent year. However, they are intended to reflect, aggregate, average economic conditions in the long term in a very dynamic industry subject to numerous

[6] As pointed out by the Economics Subcommittee, the industry review of the data may not constitute a true peer review which requires that the reviewers not have a vested interest in the outcome, and that they be as interested in the methodology (i.e. technical aspects of the data collection process) as in the results of the work being reviewed.

[7] This is not to say that some individual vessel owners may be realizing a profit as a result of superior fishing skills (intra-marginal rents). But, for the limited entry fishery as a whole economic profits will be completely dissipated as authorized vessels increase their individual harvesting capability in the anticipation of such rents (Herrick et al. 1994).

uncertainties including, the environment, resource availability locally and globally and international market demand. Therefore it is virtually impossible to predict with any degree of certainty the volume, mix and economic value of sardine products that might be produced at any time in the future. Consequently estimates of producer surplus based on a constant per metric ton estimate of producer surplus from the data in hand should be considered realistic only as local approximations in the short run. This is because these estimates of producer surplus assume that revenues and variable costs are constant per unit output across allocation alternatives and that certain of the productive resources (capital stock) used to process raw sardines are fixed in amount over the time horizon being considered. In particular that plant processing capacity is fixed and capable of accommodating the expected growth in sardine landings in each fishery sector over the time horizon, and that there will be no need to invest in additional processing capacity (Table 6). To the extent that processing capacity is near full utilization in all fishery sectors one might expect per unit processing costs to increase as the processing capacity is more fully utilized; i.e., the marginal cost of producing each successive unit of output increases for the fixed capital stock as the variable resources used for production become relatively less efficient (i.e. diminishing returns to the variable resources).[8]

Changes in the prices of variable inputs (e.g. raw sardines)or prices of processed sardine products are also potential sources of variation among alternatives that would affect unit estimates of producer surplus in each fishery sector. Differences among alternatives in the type of processed sardine products available to markets would presumably affect demand, and therefore, market prices may respond differentially among alternatives. Similarly, substantial changes in demand for, or the availability of raw sardines could affect ex-vessel prices in each fishery sector, which would require adjustments to the unit estimates of producer surplus.

The SSC's Economics Subcommittee points out that While these economic effects on prices are indirect, and usually ignored in short-run analyses, markets would surely adjust to the proposed allocation of the sardine harvest guideline in the long run. Therefore, a long run analysis should be consider the possibility of differential effects on prices. An important simplifying case in this regard is the possibility of a perfectly elastic demand curve, in which case changes in landings among alternatives would not affect market prices for processed sardine products. Given that the market for sardines is global, and that there are a number of readily available close substitutes for processed sardine products, a perfectly elastic demand for processed sardine products might be a reasonable simplifying assumption.

The remarks above about the supply elasticity of raw sardines would apply here with regard to changes in demand for, or the availability of raw sardines and their affect on ex-vessel prices in each fishery sector. If the exvessel supply of sardines is perfectly price elastic then producer surplus is only realized at the exprocessor level. Given that there is sufficient harvesting capacity in the limited entry CPS finfish fishery south of 39° north latitude, this could be the case in the California fishery sectors. Maximum harvesting capacity estimates for the limited entry CPS finfish fleet south of 39° north latitude were 282,121 mt per year based on the average number of landings per year (PFMC 2002). In the Pacific Northwest fishery sector harvesting capacity is

[8] Over the long run the capital stock may be adjusted which shifts and or rotates the marginal cost or short-run supply curves. This in turn will affect the short-run producer surplus. The change in net economic benefits is given by the sum of the changes in short-run producer surplus minus the investment costs.

unknown, and hence an assumption of constant marginal costs among alternatives may not be plausible for Pacific Northwest sardine harvesters in the long run.

Lastly, the analysis of alternatives only considers the variable inputs and the associated variable costs of processing sardines in each fishery sector; i.e., those costs that are directly proportional to the amount of sardines processed. The per unit measure of producer surplus used in the analysis of alternatives is calculated as the market equilibrium price for processed sardine products net of per-unit variable costs such as expenditures on raw sardines, ice and storage, and transportation. Other costs including facilities, equipment, insurance, etc. are treated as fixed in the analysis. Therefore, part of the calculated producer surplus embodies the fixed costs associated with processing sardines, which technically should be deducted from the estimates of producer surplus to obtain a more precise measure. However, this fixed cost residual will cancel out and not affect estimates of change in producer surplus if the fixed costs are the same under the status quo and the proposed alternatives. This assumption may not be that unreasonable given the estimates of processing and harvesting capacity in the fishery.

There are a couple of complications that precluded a more inclusive treatment of the costs associated with sardine processing in this analysis. First, data on fixed processing costs were available for only two of the three fishery sectors addressed in the analysis. Second, even if the data were available for all three sectors, there are some theoretical issues related to how fixed costs are allocated among different processing activities when processing plants deal with more than one species (Terry et al. 1996). In most cases the companies that process sardines also process other species (Table 7). Therefore the problem is one of determining what share of the total fixed costs should be allocated to sardine processing. One possibility would to be allocate total fixed costs by the species revenue share.

Concluding Remarks

Fisheries economic data is not easy to get. Except for landings and exvessel prices it is generally not routinely collected for west coast fisheries. Consequently economic analyses of west coast fisheries will typically require special data collections. For a federal agency this entails identifying the population, or sub-population, designing a survey, a survey instrument, obtaining Paperwork Reduction Act clearance, finding someone capable of conducting the survey, and a lot of follow up, after which you may end up with some usable data.

The data collection effort described herein provided somewhat of an opportunity to streamline this process. The population of sardine processors on the west coast is relatively small and concentrated in three geographic areas. So, it seemed reasonable and feasible to survey the entire population. To avoid the difficulties of administering a questionnaire bring the processors together voluntarily, as panels of experts, and have them identify the relevant costs and earnings items associated with sardine processing in their geographic fishery sector and reach a consensus regarding the values of these items. Repeat the process as necessary to obtain sardine processing economic data that are representative of each fishery sector. Finally have a cross section of processors evaluate these data in order to get a dataset that is acceptable and useable for the analysis. Granted this process may leave much to be desired in terms of providing statistical properties for the data as would be derived from a full-blown survey. However it did offer,

compared to an earlier effort, an expedient and to a large degree, a defensible means of obtaining representative cost and earnings measures.

Although the use of these data in the analysis of alternatives was subject to a number of simplifying assumptions, some of these may be quite rational in the near term. Nonetheless, many of the issues surrounding the measures of producer surplus that led to these assumptions might be addressable through the development of quantifiable economic model. For analyses that focus on economic efficiency a priority for future work would be the formulation of a tractable and transparent bioeconomic model of the pacific sardine industry for use in evaluating the impacts of various policy alternatives on producer and consumer surplus.

Finally, there are a number of environmental, biological and other socioeconomic factors that effect patterns of landings in the fishery that are not quantitatively accounted for in the analysis. Variation in one or more of these could bring about crucial changes in the availability or demand for sardines across the fishery sectors within a relatively short period. Given the high degree of uncertainty, and the fact that the economic analysis of alternatives is essentially a short-term analysis, it is imperative that the long-term sardine harvest guideline allocation framework readily provide for review and revision should conditions in the fishery change significantly. Useful in this regard would be the bioeconomic model referred to above.

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Tables

TABLE 1. Average earnings and variable cost data per full container load (FCL) for Pacific northwest processed sardine products, 2004.

Item	Product Frozen 10 - 18 Kilo Pack
Share of Total Production	96.0%
Sales Revenues	
Av. Sales Price per FCL	$15,758.00
Pounds per FCL	50,000
Variable Production Costs	
Raw fish cost per FCL	$3,403.00
Fish landing tax per FCL	$46.00
Processing labor - total man hours per FCL	139
Wage rate per HR	$10.08
# employees required per FCL	78
Benefits	$1.83
Supervis-Tech - # HRS per FCL	6
Supervis.wage rate per HR	$43.50
Energy cost per FCL	$544.00
Energy requirement per FCL	5,280
Packaging cost per FCL	$1,202.50
Waste disposal per FCL	$220.00
Shipping-trucking per FCL	$637.50
Airfreight per FCL	$0.00
Storage cost per FCL	$295.50
Broker Fees	$510.00
Other variable costs (list)	n/a
Salt	$76.00
Unloading	$400.00
Ice	$369.50

TABLE 2. Average earnings and variable cost data per full container load (FCL) for northern California processed sardine products, 2004.

Item	Product					
	Fresh	Frozen IQF	Frozen 2 Kilo	Frozen 10 Kilo	15 Kilo Nude Block w/ Liner	Frozen 50 lb Block
Share of Total Production	1.0%	2.6%	0.5%	32.0%	11.4%	52.7%
Sales Revenues						
Sales Price per FCL	$23,500.00	$22,500.00	$16,500.00	$16,000.00	$12,500.00	$8,000.00
# lbs in FCL	50,000	50,000	50,000	50,000	50,000	50,000
Variable Production Costs						
Raw fish cost per FCL	$2,500.00	$2,500.00	$2,000.00	$2,500.00	$2,000.00	$2,500.00
DFG fish landing tax per FCL	$315.00	$315.00	$315.00	$315.00	$315.00	$315.00
Processing labor - total man hours	48	96	240	70	45	42
Wage rate per HR	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00
# employees required	12	12	30	20	15	14
Benefits	n/a	n/a	n/a	n/a	n/a	n/a
Supervis-Tech - # HRS	4	8	8	3.5	3	3
Supervis.wage rate per HR	$17.00	$17.00	$17.00	$17.00	$17.00	$17.00
Energy cost per FCL (see storage below)	n/a	n/a	n/a	n/a	n/a	n/a
Energy requirement per FCL	n/a	n/a	n/a	n/a	n/a	n/a
Packaging cost per FCL	$2,500.00	$2,500.00	$2,500.00	$1,025.00	$110.00	$0.00
Waste disposal per FCL	n/a	n/a	n/a	n/a	n/a	n/a
Shipping-trucking per FCL	$3,000.00	$1,000.00	$2,300.00	$2,000.00	$1,000.00	$1,000.00
Airfreight per FCL	n/a	n/a	n/a	n/a	n/a	n/a
Storage/freezing per FCL (includes energy)	$500.00	$1,000.00	$1,000.00	$1,650.00	$1,700.00	$1,500.00
Broker Fees	n/a	n/a	n/a	n/a	n/a	n/a
Other variable costs (list)	n/a	n/a	n/a	n/a	n/a	n/a
Unloading+trucking to plant per FCL	$450.00	$450.00	$450.00	$450.00	$450.00	$450.00
Ice (averaged) per FCL	$365.00	$365.00	$365.00	$365.00	$365.00	$365.00

TABLE 3. Average earnings and variable cost data per full container load (FCL) for southern California processed sardine products, 2003.

	Product						
Item	**Fresh**	**H&G**	**Frozen IQF**	**Frozen 2 Kilo**	**Frozen 10 Kilo**	**15 Kilo Nude Block w/ Liner**	**Frozen 50 lb Block**
Share of Total Production	3.2%	11.4%	6.3%	0.0%	40.2%	10.2%	27.7%
Sales Revenues							
Sales Price per FCL	$18,500.00	$20,300.00	$22,500.00	$15,500.00	$14,000.00	$11,000.00	$6,300.00
# lbs in FCL	50,000	52,910	50,000	50,000	50,000	50,000	40,000
Variable Production Costs							
Raw fish cost per FCL	$2,500.00	$4,373.00	$2,500.00	$2,500.00	$2,500.00	$2,500.00	$1,600.00
DFG fish landing tax per FCL	$315.00	$551.00	$315.00	$315.00	$315.00	$315.00	$252.00
Processing labor - total man hours	48	424	240	240	30	24.0	22.5
Wage rate per HR	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00	$10.00
# employees required	12	61	30	30	15	15	15
Benefits	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Supervis-Tech - # HRS	4	8	8	8	2	1.6	1.5
Supervis.wage rate per HR	$25.00	$25.00	$25.00	$25.00	$25.00	$25.00	$25.00
Energy cost per FCL	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00
Energy requirement per FCL	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Packaging cost per FCL	$2,500.00	$176.00	$1,000.00	$2,250.00	$850.00	$176.00	$60.00
Waste disposal per FCL	$5.00	$8.00	$5.00	$5.00	$5.00	$5.00	$5.00
Shipping-trucking per FCL	$1,000.00	$2,050.00	$2,500.00	$2,500.00	$2,500.00	$2,100.00	$2,100.00
Airfreight per FCL	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Storage/freezing per FCL (includes energy)	n/a	$1,150.00	$1,150.00	$1,150.00	$1,150.00	$1,150.00	$920.00
Broker Fees	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Other variable costs (list)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Unloading+trucking to plant per FCL	$375.00	$375.00	$375.00	$375.00	$375.00	$375.00	$375.00
Ice per FCL	$625.00	$630.00	$800.00	$250.00	$250.00	$250.00	$250.00

Table 4. Itemized weighted average costs and revenues per metric ton of sardine product for each fishery sector.

	SCA	NCA	PNW
	Weighted Average	**Weighted Average**	**Weighted Average**
Rev	$557.80	$514.27	$694.80
Raw Fish[1]	$82.02	$77.82	$135.75
Processing Labor	$36.63	$23.74	$61.53
Supervisory	$3.17	$2.50	$11.51
Energy	$0.65	$0.00	$23.99
Packaging	$23.73	$19.53	$53.02
Waste	$0.23	$0.00	$9.70
Shipping Trucking	$97.50	$59.46	$28.11
Storage/Freezing	$45.77	$68.27	$13.03
Salt	$0.00	$0.00	$3.35
Unloading	$16.27	$19.88	$17.64
Ice	$14.71	$16.13	$16.29
Total Variable Cost	$320.67	$287.32	$373.91
Producer Surplus	$237.13	$226.94	$320.89

[1]Based on weighted exvessel revnues derived from the PacFIN management database.

Table 5. Present value of estimated exvessel revenue and it distribution by fishery sector under 10% growth in exvessel landings and base (136,000 mt), low (72,000 mt) and high (200,000 mt) harvest guidelines, 2005-2009

Base case scenario		Share of Regional Exvessel Revenue (Present Value)				
	Present Value of Regional Exvessel Revenue, 2005-2009	Southern California	Northern California	Pacific Northwest	Southern Subarea	Northern Subarea
No Action	$52,387,292	35.5%	13.2%	51.2%	35.5%	64.5%
Status Quo	$58,153,984	32.0%	12.9%	55.1%	44.9%	55.1%
Alternative 1	$60,808,683	29.5%	11.5%	59.0%	41.0%	59.0%
Alternative 2 (3)	$60,613,749	29.6%	12.0%	58.4%	41.6%	58.4%
Alternative 3a (4a)	$60,808,683	29.5%	11.5%	59.0%	41.0%	59.0%
Alternative 4 (6)	$60,808,683	29.5%	11.5%	59.0%	41.0%	59.0%
Alternative 5 (7)	$60,452,081	30.2%	12.1%	57.8%	42.2%	57.8%
Low HG scenario		Share of Regional Exvessel Revenue (Present Value)				
	Present Value of Regional Exvessel Revenue, 2005-2009	Southern California	Northern California	Pacific Northwest	Southern Subarea	Northern Subarea
No Action	$33,722,805	50.6%	8.3%	41.1%	50.6%	49.4%
Status Quo	$34,420,617	43.0%	11.0%	45.9%	54.1%	45.9%
Alternative 1	$36,613,034	32.3%	6.0%	61.7%	38.3%	61.7%
Alternative 2 (3)	$35,181,246	35.1%	10.9%	53.9%	46.1%	53.9%
Alternative 3a (4b)	$34,210,988	43.2%	10.9%	45.9%	54.1%	45.9%
Alternative 4 (6)	$36,136,552	34.7%	6.7%	58.6%	41.4%	58.6%
Alternative 5 (7)	$34,966,020	40.3%	8.9%	50.8%	49.2%	50.8%
High HG scenario		Share of Regional Exvessel Revenue (Present Value)				
	Present Value of Regional Exvessel Revenue, 2005-2009	Southern California	Northern California	Pacific Northwest	Southern Subarea	Northern Subarea
No Action	$61,048,755	30.5%	12.2%	57.3%	30.5%	69.5%
Status Quo	$62,159,636	30.0%	12.1%	58.0%	42.0%	58.0%
Alternative 1	$62,159,636	30.0%	12.1%	58.0%	42.0%	58.0%
Alternative 2 (3)	$62,159,636	30.0%	12.1%	58.0%	42.0%	58.0%
Alternative 3a (4a)	$62,159,636	30.0%	12.1%	58.0%	42.0%	58.0%
Alternative 4 (6)	$62,159,636	30.0%	12.1%	58.0%	42.0%	58.0%
Alternative 5 (7)	$62,159,636	30.0%	12.1%	58.0%	42.0%	58.0%

Table 6. Processing capacity estimates by fishery sector, 2005-2009.

Sector	Capacity MT per Day	Expected Landings	Number of Days to Process Expected Landings
PNW			
2005	1,190	49,339	41
2006	1,725	54,273	31
2007	1,725	59,701	35
2008	1,725	65,671	38
2009	1,725	72,238	42
NCA			
2005	1,100	17,815	16
2006	1,100	19,596	18
2007	1,100	21,556	20
2008	1,100	23,711	22
2009	1,100	26,082	24
SCA			
2005	1,950	36,619	19
2006	1,950	40,281	21
2007	1,950	44,309	23
2008	1,950	48,740	25
2009	1,950	53,614	27

Table 7. Distribution of raw fish expenditures by species for sardine processors in each sardine fishery sector, 2004.

	Percent of Total Expenditure											
Sector	**Anchovy**	**Crab**	**Ground-fish**	**Jack Mackerel**	**Other**	**Pacific Mackerel**	**Salmon**	**Sardine**	**Shrimp**	**Squid**	**Tuna**	**Grand Total**
Pacific Northwest												
CPS Only (3)[1]	0.0%	0.0%	0.0%	0.0%	0.1%	0.3%	0.0%	99.6%	0.0%	0.0%	0.0%	$2,783,386
CPS and Other (13)	0.2%	18.4%	25.6%	0.0%	3.2%	0.0%	4.7%	8.3%	7.3%	0.0%	32.2%	$40,163,585
Northern California												
CPS Only (3)	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	38.1%	0.0%	59.7%	0.0%	$449,469
CPS and Other (12)	5.3%	0.9%	14.4%	0.0%	1.9%	1.0%	8.0%	20.1%	0.0%	47.0%	1.3%	$5,310,557
Southern California												
CPS Only (15)	9.0%	0.0%	0.0%	0.6%	0.5%	2.3%	0.0%	17.7%	0.0%	69.9%	0.0%	$4,764,856
CPS and Other (19)	0.1%	0.2%	0.8%	2.0%	26.9%	3.5%	0.0%	16.7%	0.0%	44.3%	5.5%	$11,190,620

[1]Number of processors in each category in parentheses.