Chapter 6
Summary and Recommendations

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6.0 Introduction

This study was undertaken to help determine an optimum number of limited entry permits, as defined in AS 16.43.290, for the Bristol Bay salmon drift gillnet fishery. Chapters 1 through 5 present background information and discuss the results of the study. This chapter contains recommendations for an optimum number for the fishery.

Previous chapters have reviewed the three optimum number standards in AS 16.43.290. The chapters have discussed understandings of those standards and reviewed previous CFEC work on optimum numbers. Background information on the history of the Bristol Bay salmon fishery was provided, as well as an outline of the regulations and management of the fishery. Also provided were estimates of historical average economic returns in the fishery, and forecasts of future average economic returns in the fishery for different permit levels.

Each standard under AS 16.43.290, if considered alone, could result in a different number of permits, or a different range of numbers.[1] However, by law, the optimum number must represent a reasonable balance of the three standards. This chapter reviews the findings of the previous chapters and makes a recommendation on an optimum number of permits for the Bristol Bay salmon drift gillnet fishery.

6.1 Review of Optimum Number Standard One

The first optimum number standard in Alaska's limited entry law (AS 16.43.290(1)) seeks the number of entry permits sufficient to maintain an economically healthy fishery. The standard reads as follows:

> *(1) the number of entry permits sufficient to maintain an economically healthy fishery that will result in a reasonable average rate of economic return to the fishermen participating in that fishery, considering time fished and necessary investments in vessel and gear.*

"Economically healthy fishery" is defined in AS 16.43.990(2) as follows:

> *(2) "Economically healthy fishery" means a fishery that yields a sufficient rate of economic return to the fishermen participating in it to provide for, among other things, the following:*

[1] As discussed earlier in the report, AS 16.43.990 (6) now explicitly states that the term optimum number "includes an optimum range of numbers." This change in the law occurred in 2002 with other changes to the optimum number and buyback portions of Alaska's limited entry law. See Chapter 135 SLA 2002.

(A) maintenance of vessels and gear in satisfactory and safe operating condition; and

(B) ability and opportunity to improve vessels, gear and fishing techniques, including, when permissible, experimentation with new vessels, new gear, and new techniques.

At the beginning of the limited entry program, CFEC researchers called optimum number Standard One the "economic optimum number standard." Chapter 1 briefly reviewed the commission's understanding of the standard and the commission's earlier efforts to estimate an appropriate number of permits under this standard. Chapter 3 provided time series data on average harvests per permit and estimates of ex-vessel prices. There were also tables providing estimates of average gross earnings per permit and average net economic returns per permit in both nominal and real 2003 dollars.

Average net economic returns per permit were estimated over the 1983-2003 time period. One measure of net economic returns is "returns to labor, management, and investment." The measure subtracted fixed and variable costs from gross earnings and included a deduction for depreciation of vessel and gear. Returns to labor, management, and investment did not include deductions for interest on loans to purchase fishing capital. Nor did it include costs associated with the opportunity cost of the investment in fishing capital, or costs associated with the operator's labor and management.

Estimated average returns to labor, management, and investment for permits fished were positive throughout the 1983 through 2003 time period. In general, this measure tended to parallel estimates of average gross earnings per permit fished. This was true whether the measures were in nominal dollars or real 2003 dollars.

For example, the estimated nominal average returns to labor, management, and investment reached its peak in 1990 at $59,551 per permit fished, which was the same year that average gross earnings per permit fished peaked in nominal terms at $99,564. This economic return measure tended to decline from the mid-1990's, paralleling the decline in gross earnings resulting from lower harvests and declines in ex-vessel prices.[2] The measure hit a low in 2001 of $929 per permit fished, measured in nominal dollars.

The second economic return measure used in Chapter 3 is "economic profits." This is the measure the authors believe is most appropriate under optimum number Standard One because it explicitly takes into consideration "time fished and necessary investments in vessel and gear" that are required by the standard. To accomplish this, the economic profit measure subtracts two additional costs from gross earnings: an estimate of the opportunity cost of the investment in the vessel and gear, and an estimate of the opportunity cost of the skipper's time.[3]

[2] The size of the Bristol Bay sockeye harvest has historically impacted sockeye ex-vessel prices. Normally, smaller harvests have tended to mean higher prices, while larger harvests have tended to mean lower prices. However, the decline in sockeye ex-vessel prices in recent years has come with smaller harvests. One reason for this is the decline in the price of farmed substitutes for sockeye salmon due to the dramatic growth of farmed salmon and trout production.

[3] As noted in Chapter 3, this measure is not the same as accounting profits for taxation purposes.

Estimated average economic profits per permit also tended to follow gross earnings in both nominal and real terms. Estimated average economic profits peaked in 1990 at $47,300 per permit in nominal dollars. The profits fluctuated in the 1990's, but tended to decline over the 1994 through 2003 time period.

Estimated average economic profits per permit fished in nominal dollars were negative for the first time in 1997, at -$6,662. Over the 1997 through 2003 time period, the estimated average profits continued to be negative in all years except 1999. Permit participation rates began to fall in 1997, when 1,875 permits were fished. In 2001, the number declined to 1,566, and in 2002 only 1,184 permits were fished. Even with the reductions in numbers of permits fished, estimated average profits per permit fished remained negative in those years.[4] Nominal estimated average profits were lowest in 2001 at -$7,832 per permit fished.

Estimated permit values, which theoretically represent the present value of future expected profits in the fishery to a marginal fisherman, also tended to rise and fall with the economic profit measure. Estimated permit values in nominal dollars fell to a low of $19,700 in 2002 and still remain at levels that are low relative to the peak of $248,802 in 1989.

Thus, the estimates in Chapter 3 suggest that average economic profits per permit fished were positive for much of the 1983 through 2003 time period, but declined significantly during the 1990's and turned negative beginning 1997. With the exception of 1999, average profits per permit fished remained negative, despite the fact that many permit holders opted not to participate.

Nevertheless, if future economic returns in the fishery were expected to continue as they did over the entire 1983-2003 time period, the economic optimum number of permits would likely remain near current permit levels. However, the decline in ex-vessel prices, coinciding with a dramatic growth in farmed salmon and trout production and a concomitant decline in the price of farmed substitutes for wild salmon, suggests that economic returns will be lower in the future, reflecting more recent experience. The sharp decline in the market value of entry permits for the fishery suggests that fishermen have also revised their expectations about future net returns drastically downward.

Forecasting future economic returns is fraught with uncertainties, yet some reasonable forecast was needed to help determine the optimum numbers of permits. Chapter 4 of the report provides estimates of how future profits in the fishery will vary depending upon the number of permits.

An economic simulation model was developed to study different future scenarios for the Bristol Bay salmon drift gillnet fishery. The model was used to generate estimates for a "baseline scenario," a "high ex-vessel price scenario," and a "low ex-vessel price scenario." The results of these simulations are shown in Chapter 4 in real 2003 "constant-value" dollars.

[4] The decline in permits fished also suggests that the fishery was viewed as not profitable by some permit holders. The reader should note that while the estimate of average economic profits per permit fished were negative in these recent years, many permit holders who participated in these years were still earning positive profits.

All scenarios assume that harvests will continue to vary in the same fashion as harvests varied over the 1978 through 2003 time period. However, the assumptions about future ex-vessel prices reflect the reality of the growth of the salmon farming industry; therefore, the forecasts tend to be much lower, on average, than average ex-vessel prices observed during the 1980's and early 1990's.

Ex-vessel prices are a critical part of forecasts of future net economic returns. If harvests are held constant, changes in ex-vessel prices lead to equal percentage changes in total gross earnings. Also, if levels of harvests are constant and the number of permits is held the same, changes in ex-vessel prices lead directly to changes in average gross earnings per permit and average profits per permit. Thus, forecasts of future economic returns are very sensitive to forecasts of future ex-vessel prices.

Because ex-vessel prices have recently declined to new lows, and future ex-vessel prices are of critical importance in an optimum number determination, CFEC contracted with Dr. Gunnar Knapp to help with forecasts of future ex-vessel prices. Dr. Knapp is an economist at the University of Alaska-Anchorage and is a recognized expert on world salmon markets. Dr. Knapp's recommendation for a sockeye ex-vessel price forecasting equation was used in the economic simulation model. Ex-vessel prices for the other Bristol Bay salmon species were related to the sockeye ex-vessel price forecast. [5]

The baseline simulation follows directly from Dr. Knapp's equation, as well as from the other ex-vessel price equations and the assumptions about future harvest levels. The results of 100 simulations of the baseline scenario suggest that future average sockeye ex-vessel prices will be somewhat lower in real terms than any observed over the 1975-2003 time period. The overall mean of the sockeye ex-vessel price from the 100 simulations was $0.41 per pound, measured in real 2003 dollars. The prices for the other salmon species were also forecast near historic lows. The results, coupled with forecasts of average costs per permit, suggest that a reduction to around 900 permits would be needed to achieve positive average economic profits in the future. Even at 900 permits, some of the simulations 25 years into the future suggest that average profits may still be negative. [6]

Two other scenarios were run to put boundaries around the economic optimum number. The scenarios reflect that there is great uncertainty about future ex-vessel prices and future economic profits. One can come up with many hypotheses suggesting why future ex-vessel prices could be higher or lower than the baseline case. Some of these theories are mentioned in Chapter 4 and are discussed in more detail in Dr. Knapp's report to the commission. The results from the economic simulation model are highly sensitive to future ex-vessel price assumptions; the two scenarios highlight that sensitivity.

The "high ex-vessel price scenario" simply increased sockeye ex-vessel price forecasts by 30%, which also increased the forecast for the other salmon species. The overall mean of the

[5] The results of Dr. Knapp's research for CFEC can be found in his forthcoming report titled *Projections of Future Bristol Bay Salmon Prices.* An electronic copy of the report will be placed on the commission's website at www.cfec.state.ak.us.

[6] Again, this assumes that all permits are fished. Average profits per permit fished may be higher to the extent that a larger percentage of permits are not fished in poor years. Some persons would minimize their costs by not fishing; those who continue to fish would benefit from there being fewer participants.

sockeye ex-vessel price from 100 simulations of this high price scenario was $0.54 per pound. Simulations under this scenario suggest that positive average economic profits per permit in the future could be achieved with a reduction to around 1,200 permits.

The "low ex-vessel price scenario" simply decreased the sockeye ex-vessel price forecast by 30%, which also decreased the forecast for the other salmon species. The overall mean of the sockeye ex-vessel price from 100 simulations of this low price scenario was $0.29 per pound. Simulations under this scenario suggest that positive average economic profits per permit in the future would be achieved only with a reduction to around 600 permits.

Again, results from the economic simulation model are highly sensitive to the assumptions about future ex-vessel prices. Modifications of other elements of the model, such as the cost function, could also lead to significant changes.[7] Given the uncertainties about the future, the broad range of 600 to 1,200 permits was selected for the "economic optimum number" under Standard One. Even the upper bound of this range would require a substantial decrease in the number of permits from current levels.

6.2 Review of Optimum Number Standard Two

The second optimum number standard, found in AS 16.43.290(2), reads as follows:

> *(2) the number of entry permits necessary to harvest the allowable commercial take of the fishery resource during all years in an orderly, efficient manner, and consistent with sound fishery management techniques*

This standard brings the concepts of manageability, orderliness, and efficiency into the optimum number determination. "Sound fishery management techniques" are necessarily interconnected with the need to manage for resource conservation. This is the optimum number standard that most closely addresses the resource conservation purpose of the limited entry amendment to Alaska's constitution.[8]

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[7] As noted previously, the cost model predicts that as the fleet size is reduced, the remaining permit holders will have some increased costs. These are costs generally associated with fishing for longer periods of time, harvesting a greater amount of fish, and having greater gross earnings. Costs such as fuel, crew shares, repairs, maintenance, web for gill nets, and other costs could increase with greater effort by an individual fishing operation. While the overall cost of the entire Bristol Bay harvest will decrease substantially with a reduction in fleet size, the harvesting cost of the average operation that continues to participate will likely be higher. However, it is not known how well the cost equation captures cost increases associated with higher harvests per permit. It may be that with a reduction in congestion and a reduction in the race for the fish, the cost of a fishing operation will not increase as much as the forecast predicts. Alternatively, should substantial profits appear with fleet reductions, costs may be driven up more than forecast due to additional investments in greater fishing capacity.

[8] The purpose of the Limited Entry Act is stated in AS 16.43.010(a) as follows:

> *"It is the purpose of this chapter to promote the conservation and the sustained yield management of Alaska's fishery resource and the economic health and stability of commercial fishing in Alaska by regulating and controlling entry of participants and vessels into the commercial fisheries in the public interest and without unjust discrimination."*

It is clear that the law serves the reasons for limited entry allowed under the amendment to Article VIII, Section 15 of Alaska's constitution. This constitutional amendment reads as follows:

> *"This section does not restrict the power of the State to limit entry into any fishery for purposes of resource conservation, preventing economic distress among fishermen and those dependent upon them for a livelihood, and to promote efficient development of aquaculture in the State."*

Previous commission understandings of this standard were briefly discussed in Chapter 1. As noted above, Martin reported that the commission considered Standard Two as the "management optimum number." The management optimum number was defined as a range of values.

Martin described the commission's understanding of this standard in 1979.[9] He indicated the management optimum number of permits was determined to be: "a range bounded by: (1) the minimum number of units of gear adequate to harvest the highest runs anticipated in the next ten years; and (2) the maximum number of units of gear that can be effectively managed during low run years."

The Bristol Bay salmon fishery is very complex, with five principal management districts and nine major river systems. Some of the complexities of the fisheries and the regulatory framework were described in Chapter 2. There are multiple species to manage, two commercial gear types, sport fisheries, and subsistence fisheries.

Despite the many sub-fisheries in the various districts of Bristol Bay, a CFEC entry permit for the Bristol Bay salmon drift gillnet fishery is a use-privilege for the entire fishery. To determine management optimum numbers, these complexities must be reduced to something that makes sense under most conditions for the fishery as a whole.

Chapter 5 provides an analysis of management optimum numbers under Standard Two. To derive values under this standard, CFEC staff relied heavily upon the advice and expertise of the Department of Fish and Game and its fishery managers. The commission believes that those charged with the responsibility of successfully managing a safe and orderly commercial fishery for resource conservation would best be able to outline the nature of the management problems they face.

Chapter 5 provides a discussion of the meaning of "sound fishery management techniques" and "orderly and efficient harvesting." Sound fishery management techniques, as applied to Bristol Bay, include concepts such as managing for sustained yields, attaining escapement goals, maintaining the genetic diversity and the overall health of the escapement, providing for an orderly fishery, harvesting fish in accordance with regulatory management plans, and helping to obtain a high-quality fishery product.

Harvesting in an orderly and efficient manner is consistent with the notion of resource conservation, as understood by the framers of the constitution and the legislators who drafted the constitutional amendment allowing limited entry in Alaska's fisheries. In discussing Article VIII, Section 2 of Alaska's constitution, Harrison indicates the framers understood conservation in the traditional sense of "wise use".[10] Daugherty, writing for Attorney General Bruce M. Bothelo, cited the legislative history of the limited entry amendment to Alaska's constitution to show that the legislature altered the wording of the amendment, intending to

[9] See Martin: *Optimum Numbers*.
[10] See Harrison: *Alaska's Constitution: A Citizen's Guide.*

broaden the grounds for restricting entry "to include conservation not only of the fisheries themselves but of the capital and labor resources which are expended in harvesting them."[11]

The Alaska Supreme Court's decision in *Johns* raises questions about how far the concept of conserving capital and labor resources could be taken as part of the directive to harvest in an "orderly, efficient manner" under Standard Two.[12] Nevertheless a congested and overly intense fishery can lead to many forms of resource waste. Thus, a definition of harvesting in an orderly, efficient manner that includes the concept of avoiding high accident rates on the fishing grounds, avoiding damage to vessels and gear due to accidents, avoiding widespread disregard for fishery regulations, and avoiding high rates of fish wastage seems appropriate under both optimum number Standard Two and Alaska's constitution.

The Department of Fish and Game was asked many questions about the impact of the number of fishing operations on management of the fishery.[13] Since the fishery is so complex, in many cases they could not provide definitive answers. The one area where the Department indicated the number of units of gear had an impact was on their ability to maintain an orderly fishery. The Department discussed some of the ways they try to maintain an orderly fishery, and noted that fisheries tend to be less orderly with more fishing operations, and more orderly with less fishing operations.

The Department was asked to answer two questions that were similar to those Martin used to help bound the management optimum number of permits under Standard Two. The Department noted that their answers were estimates, and were not based upon a systematic analysis, but were based upon the best professional judgment of the persons who had been managing the fishery in recent years. The Department characterized the estimates as subjective and qualitative.

The Department indicated that approximately 800 to 900 drift gillnet fishing operations could be effectively managed, in an orderly and efficient manner and consistent with sound fishery management techniques, during years with the *lowest* expected harvests over the next 20 to 30 years.

Similarly, the Department indicated that approximately 1,400 to 1,500 drift gillnet fishing operations would actually be needed (the minimum required) to harvest, in an orderly and efficient manner and consistent with sound fishery management techniques, the allowable Bristol Bay salmon drift gillnet harvest from all districts during years with the *highest* expected returns over the next 20 to 30 years. Note that his number of fishing units could represent considerable excess capacity in other years.

Based upon the Department's answers, the authors estimate management optimum numbers for the Bristol Bay salmon drift gillnet fishery under Standard Two to be in the range of 800 to 1,500 permits. This is roughly comparable to the range that Martin reported in 1979.[14]

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[11] See: *Legality and Constitutionality of IFQ Programs*, A.G. file 223-95-0472, Alaska Department of Law, Attorney General's Office.
[12] See *Johns*, p. 1266
[13] See Commissioner Duffy's July 9, 2003 memorandum.
[14] See Chapter 1 discussion and Martin: *Optimum Numbers*

The Department's answers were contingent upon a number of assumptions including the assumptions that current Board of Fisheries regulations would remain unchanged. However, the Board of Fisheries does change regulations frequently in response to changes in conditions in a fishery, and it is possible the Board could adjust regulations as the fleet size is reduced to help the fleet harvest the available surplus in an orderly manner.[15] Moreover, the Department's response to the commission's question suggested that, even under current regulations, they can usually control the harvest and stay within their escapement goals simply by increasing the number or duration of the openings as the fleet size is reduced.[16]

For these reasons, it is possible that the upper bound of this management optimum number range under Standard Two could be lower than suggested by these rough estimates.

6.3 Review of Optimum Number Standard Three

AS 16.43.290(3) contains the third optimum number standard under Alaska's limited entry law. The standard reads as follows:

> *(3) the number of entry permits sufficient to avoid serious economic hardship to those currently engaged in the fishery, considering other economic opportunities reasonably available to them.*

Martin indicated the commission believed that: "*The third criteria [sic] outlined in the statute was to be utilized to adjust the economic and management optimum numbers as required by local employment conditions.*"[17] As noted in Chapter 1, the authors believe the standard exists to temper changes suggested by the other two standards. Moreover, the standard is probably most applicable when fleet reductions are being contemplated.

Under Alaska's limited entry law, if the optimum number is greater than the number of permits outstanding, then the commission is required to put additional permits into the fishery.[18] Any optimum number must be consistent with *Johns v. State*,[19] in which our Alaska Supreme Court declared:

> *[T]here is a tension between the limited entry clause of the state constitution and the clauses of the constitution which guarantee open fisheries. We suggested that to be constitutional, a limited entry system should impinge as little as possible on the open fishery clauses consistent with the constitutional purposes of limited entry, namely, prevention of economic distress to fishermen and resource conservation . . . . The optimum number provision of the Limited Entry Act is the mechanism by which limited entry is meant to be restricted to its constitutional purposes. Without this mechanism, limited*

[15] Note that harvesting the allowable commercial take in all years is a condition of standard two. However, it may not always be the best thing to do from an economic return standpoint.
[16] See Commissioner Duffy's July 9, 2003 memorandum, pages 5 and 6.
[17] See Martin: *Optimum Numbers.*
[18] See AS 16.43.330.
[19] See *Johns*, p. 1266 [citation and footnote omitted].

entry has the potential to be a system which has the effect of creating an exclusive fishery to ensure the wealth of permit holders and permit values, while exceeding the constitutional purposes of limited entry.[20]

In contrast, when the optimum number is less than the maximum, the commission may establish a fisherman-funded buyback program to reduce the number of permits to the optimum number. Imposition of a buyback assessment might force some fishermen to exit the fishery who cannot continue to fish profitably and pay the tax and who have few other occupational alternatives. Such individuals would arguably have low opportunity costs, and in some cases it might be better if they stayed in the fishery. Under such conditions, using Standard Three to achieve a reasonable balance might lead to a somewhat higher optimum number than implied by the first two standards in order to avoid disenfranchising persons with few other alternatives. More persons would stay in the fishery, since fishermen would be taxed less and fewer permits would be removed from the fishery.

Thus, the commission believes that the third optimum number standard should be used when the results from the first two standards need to be moderated to avoid serious economic hardship to those currently engaged in the fishery.

6.4 Optimum Number Recommendations

The authors recommend that the commission adopt an optimum number for the Bristol Bay salmon drift gillnet fishery as a range from 800 to 1,200 permits. The authors believe that this range provides a reasonable balance of the three optimum number standards.

As noted in Chapter 1, the commission's early work on optimum numbers bracketed the first two optimum number standards into bounded ranges.[21] Given the large uncertainties about the future, many believe that defining the optimum number for a fishery as a bounded range of numbers rather than as a single number would make the optimum number determination more meaningful. In a sense, a bounded range acknowledges that the future has many uncertainties, and even if there were no uncertainties, future economic returns from a fishery would still vary considerably on an annual basis. Recent changes in Alaska's limited entry law have made it clear that the optimum number can be an optimum range of numbers.[22]

Choosing an optimum range of numbers should also provide more flexibility with respect to buyback options. The law allows the commission to establish a buyback program with the object of reducing the number of permits to the optimum. An optimum range of permits provides more choices for a target in a buyback program. With an optimum number that is well below the current number of entry permits outstanding, any reduction in the number of permits toward the optimum would be a movement in the right direction. However, whether or not a particular reduction would make financial sense to the remaining permit holders would ultimately depend upon the prices at which individual permit holders would be willing

[20] See *Johns*, p. 1266.
[21] Range, as defined herein, refers to a group of sequential numbers with a lower and upper bound.
[22] See AS 16.43.990(6).

to sell their permits to the buyback program.[23] The wider range of potential targets should increase the likelihood that a target number beneficial to everyone could be found.[24] Those who must pay for the program must benefit from the program.

The recommended range of 800 to 1,200 is within the estimated bounded ranges for optimum number Standards One and Two. Since it is a range, the authors believe that there is ample room to accommodate any concerns under optimum number Standard Three. A target that is closer to the upper bound of the range should accommodate any such concerns. In short, the range allows for some flexibility in choosing a fleet reduction target and provides a reasonable balance among the three standards.

The "economic optimum number" range under Standard One was estimated to be 600 to 1,200 permits. The results of the simulations under the baseline case scenario, which is the scenario the authors believe is most likely, showed the overall average future profits from 100 simulations were positive when there were about 900 permits in the fishery and negative at higher permit levels. With 800 permits fished under the baseline case, average profits were positive in all 100 simulations.

Under the "low ex-vessel price scenario", overall average future profits per permit from 100 simulations were positive at 600 permits, but negative at higher permit levels. Under the "high ex-vessel price scenario," overall average profits per permit were positive at 1,200 permits, but negative at higher permit levels. However, if the "high ex-vessel price scenario" would eventually prove to accurately reflect the future and the number of permits is reduced to 600, then average profits per permit and permit values at 600 permits might be high enough to put at risk a portion of the fleet reduction if a court challenge emerges on the degree of exclusivity of the fishery.

Using 800 as a lower bound for the optimum number range should reduce the risk that the optimum number determination would face a legal challenge that the fishery is too exclusive after a permit reduction has occurred. The warnings of Alaska's Supreme Court in *Johns* should not be taken lightly. The commission would not want to be ordered to put more permits back into the fishery after permit holders have invested in a buyback program and permit reduction.

The "management optimum number" under optimum number Standard Two also had 800 permits as a lower bound. As such, it represented the Department of Fish and Game's rough estimate of the maximum number of permits that they could manage effectively in an orderly and efficient manner while achieving other management objectives during years of the lowest expected run sizes.

Resource conservation is one of the stated reasons for allowing limited entry under the limited entry amendment to Alaska's constitution. The available evidence suggests that "wise use of resources" was the intended definition of resource conservation. Permit levels

[23] Of course, it is possible that buyback funding could come from some other source than the remaining participants.
[24] The authors think that the language of AS 16.43.290 – AS 16.43.330 would allow the commission to pick any target within the optimum number range for buyback purposes. However, if this is unclear, the statute may need to be clarified.

above 800 permits will make it more difficult for managers to run an orderly fishery and achieve their other objectives in some years. Thus it would be difficult to argue that 800 permits is "too exclusive" from a resource conservation perspective if it is the maximum number of permits that can be effectively managed in an orderly manner during low run years.

Should the "low ex-vessel price" scenario eventually prove to be true, the lower bound of the optimum number range could be revised downward in the future under the authority provided in AS 16.43.300. A conservative approach to fleet reduction should help discourage a legal challenge if future ex-vessel prices and profits prove to be better than the baseline forecast. If future ex-vessel prices and profits prove to be worse than the baseline case, then the optimum number range can be revised downward in the future.

The recommended upper bound of the optimum number range is 1,200 permits. Based upon 100 simulations of the "high ex-vessel price scenario," overall average profits per permit were positive at 1,200 permits, but negative at higher permit levels. The high ex-vessel price scenario is the most optimistic future scenario in this report; therefore, the recommended upper bound of the "economic optimum number range" is 1,200 permits under the law's optimum number Standard One.

Twelve hundred permits also falls within the "management optimum number range" under optimum number Standard Two in the law. This number of permits may represent considerable excess capacity in some years, and may make it difficult to manage the harvest in an orderly, efficient manner in some years. However, it is also below the upper bound of the management optimum number range of 1,500 permits.

As noted previously, the Department of Fish and Game's memorandum suggested that it might take up to 1,400 to 1,500 permits to harvest the available surplus in an orderly and efficient manner and consistent with sound fishery management techniques in years of the highest expected returns. The answer assumed that current regulations would continue unchanged and processing capacity would be adequate enough to not influence management decisions.

Optimum number Standard Two is definitely asking for the number necessary to harvest the available surplus, so the Department's answer raises the concern that a lower number may be inadequate to harvest the available surplus in an orderly and efficient manner in years of the highest expected returns.[25] Nevertheless, the Department's answers to other questions suggest that the available surplus itself could usually be taken by adjusting the number of openings and/or the length of openings depending upon fleet size. Moreover, the Alaska Board of Fisheries changes regulations frequently and may be able to alter regulations to help a smaller fleet harvest any available surplus in an orderly and efficient manner.

For these reasons, the authors believe that an optimum number range with a lower bound of 800 permits and an upper bound of 1,200 permits would best achieve a reasonable balance of

[25] Note this is an objective of Standard Two in the law. However, under some conditions, it might make better economic sense to leave part of the available surplus unharvested.

the three optimum number standards. These bounds would also serve the constitutional purposes of preventing economic distress to fishermen and promoting resource conservation. Therefore, the authors recommend that the commission adopt an optimum number range of 800 to 1,200 permits.

6.5 Other Considerations

An optimum number determination is an important step in the development of a fleet reduction plan. An optimum number determination should help groups pursue sources of funding or financing for a buyback program by establishing a defendable optimum number in accordance with the limited entry law and Alaska's constitution.

Under recent changes in the limited entry law, establishment of an optimum number that is less than the number of permits outstanding no longer automatically triggers a fisherman-funded buyback program.[26] Thus, care should be taken to make sure that any fisherman-funded buyback proposal has adequate support among permit holders and the fishing industry.

The commission could work with stakeholders to develop a state-managed buyback program under AS 16.43.310. For a buyback of use-privileges to occur entirely at one point in time, a source for the requisite funds would be needed. If the buyback funds are in the form of a "loan" with a required loan payback, then the commission would need to establish regulations for buyback assessments under AS 16.43.310(b). Other agencies, such as the Department of Revenue, would also need to be involved.

Alternatively, implementing an optimum number regulation might help establish some of the preconditions whereby a buyback program could be possible under Section 312 of the Magnuson-Stevens Fishery Conservation and Management Act.[27] In this latter case, the buyback program would be run by the federal government, and great care would be needed to assure that the program comports with both state and federal law. Funding for such a program would also be in the form of a "loan" that would be paid back by assessments on the remaining permit holders. However, it is not clear this law would apply to the fishery.

A third alternative would be for permit holders to form a qualified salmon fishery association and conduct fleet reductions by private initiative. In 2002, the legislature passed a bill providing for this.[28] Once the qualified salmon fishery association is formed, fishermen can vote to assess themselves up to 5% of the value of the salmon sold in the fishery. The legislature can then appropriate the money collected from the assessment to the Department of Fish and Game for funding the association. The fishery association must develop an annual operating plan to expend the funds, and consolidation of the fishing fleet must be a valid purpose of the plan. Presumably, the association could contract with persons to retire their permits from the fishery.

[26] These changes occurred with Chapter 135 SLA 2002 (*CSHB 288 (FIN) am*), and are now embodied in AS 16.43.290-AS 16.43.330.
[27] See 16 U.S.C. 1861-1861a.
[28] Chapter 134 SLA 2002. The bill was codified as AS 16.30.250, AS 16.43.140(c)(5), AS 37.05.146(b)(4)(AA), and AS 43.76.220 - 43.76.380.

Development of any buyback plan will take time, and may require more statutory changes, as well as regulatory changes. In the interim, an optimum number determination in the recommended range will signal to the Alaska Board of Fisheries and to the fishery participants that the commission believes a fleet reduction makes sense under the limited entry law, and would be defendable under Alaska's constitution.

The Alaska Board of Fisheries could consider regulatory proposals that would encourage fleet consolidation. Some ideas for such regulations do not require an actual reduction in the number of entry permits or changes to laws.[29] Indeed, the Board has already experimented with a fleet consolidation regulation for the Bristol Bay salmon drift gillnet fishery for the 2004 season.[30] Such efforts by the Board may reduce harvesting costs and increase profitability for permit holders, even at existing permit levels. The commission can support the efforts of the Board and the public to search for alternative ways to encourage fleet consolidations, even if those alternatives are viewed only as interim measures.

In recent years, several efforts have been initiated to search for ways to change regulations and/or statutes to improve the economic conditions in the salmon industry. Alaska's Joint Legislative Salmon Industry Task Force evaluated ideas for change over the 2002 through 2004 time period. The task force asked the Alaska Board of Fisheries to continue the process of looking for possible restructuring solutions.

One recent study for restructuring the Bristol Bay salmon fishery was commissioned by the Bristol Bay Economic Development Corporation (BBEDC) and funded by both BBEDC and the Alaska's Joint Legislative Salmon Task Force. The chairman of CFEC served on the advisory panel for the study. The results of the study suggested that a buyback program could produce an increase in wealth.[31] This was true if the program was fisherman-funded or funded entirely by some other source.

However, the report also suggested that much greater wealth gains could be achieved if the "derby fishery" could be eliminated and an alternative way to harvest the resource in a more cooperative fashion could be found. The report did not provide any specific proposal on how to do this, but urged participants in the fishery to discuss and debate the topic of how to restructure the fishery.[32]

The Bristol Bay salmon fisheries are very complicated to manage and it is unclear if a way to manage the fisheries in a cooperative fashion could be found. However, if a practical solution for a cooperative fishery could be found, then the economic profits per permit might be much higher than forecasted in this report. The forecasts in this report assume that the

[29] An earlier commission effort to outline possible options can be found in *Outline of Options for Fleet Consolidation in Alaska's Salmon Fisheries* (December 1998).
[30] See 5 AAC 06.333. The regulation allows vessels to increase the amount of gear they may operate from 150 fathoms to 200 fathoms of gillnet, provided that two permit holders are onboard. This is a special regulation passed on an experimental basis. Unless the regulation is revisited it will expire at the end of the 2004.
[31] See Michael Link, et. al. *An Analysis of Options to Restructure the Bristol Bay Salmon Fishery.* Bristol Bay Salmon Fishery Restructuring Study, funded by the Bristol Bay Economic Development Corporation. Feb., 2003.
[32] The report does suggest the possibility of assigning shares of the harvest to individual permit holders, but does not discuss the practicalities of how to achieve this in a non-quota salmon fishery where forecasted returns can vary widely from actual returns, and where run sizes, harvests, and escapements must be tracked on a continuous basis.

"derby fishery" will continue. However, reducing the number of permits in the fishery might also help the search to find alternative ways to make the fishery more profitable.