

# Chapter 5

## Management Optimum Number

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# CHAPTER 5

## Management Optimum Number

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### 5.0 Introduction

The second optimum number standard, 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.<sup>1</sup>

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

This report builds upon the earlier commission understandings of the standard to bracket the management optimum number within a range of values. Care has been taken to ensure that concepts used herein comport with the purposes of limited entry cited in the law and with the purposes of the limited entry amendment to Alaska's constitution.

As was outlined in Chapter 2, managing the Bristol Bay salmon fisheries is very complicated. There are five principal management districts and nine major river systems. There are multiple species to manage, with two commercial gear types, sport fisheries, and subsistence fisheries. There is also a body of regulations that managers must follow, and several management goals to attain.

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 management area. Therefore, the selection of a management optimum number under Standard Two does not succumb easily to a straight-forward standardized mathematical analysis. The persons

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<sup>1</sup> 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 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."*

who manage the fisheries are aware of the complexities and aware of the diverse situations and circumstances they must face from year-to-year during the course of the fishery. Under these circumstances, selection of management optimum numbers requires expert judgment.

To derive values under this standard, CFEC staff relied heavily upon the 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 which they face.

CFEC staff interviewed Department managers on several topics: strategies for managing the Bristol Bay salmon drift gillnet fishery; status of the Bristol Bay salmon stocks; conservation issues; safety and orderliness issues; and fishery regulations. Three members of CFEC's research staff visited Bristol Bay in 2002 to observe the fishery and to learn more about its management. CFEC also sent a formal set of questions about management of the fishery and management optimum numbers to Commissioner Kevin Duffy of the Alaska Department of Fish and Game. The memorandum containing CFEC's questions and the memorandum containing the Department's answers can be found in the Appendices of this report.<sup>2</sup>

It should be noted that some questions about the fishery were difficult to answer definitively due to the inherent uncertainties involved and the variety of circumstances that managers may face. Nevertheless, to address the optimum number question, CFEC needed the expert opinions of managers, even where scientific evidence was inadequate or lacking. Because of this, many of the answers received from ADFG should be viewed as the expert judgments of those charged with the management tasks.

The commission's task is to ultimately produce an optimum number that contains a reasonable balance among the three optimum number standards. This chapter reviews Standard Two and provides an estimated range for management optimum numbers.

## 5.1 Definitions Applied to Standard Two

Fundamental to the application of Standard Two in the determination of an optimum number is an understanding of the concepts of: "*harvesting the allowable commercial take...in an orderly, efficient manner,*" and "*consistent with sound fishery management techniques.*"

In Bristol Bay, ADFG attempts to manage sockeye salmon for maximum sustained yield through biological escapement goals (BEG's).<sup>3</sup> In doing so, they are fulfilling constitutional mandates for sustainable fisheries and the wise use of resources. They are also managing in a fashion that attempts to avoid waste, thereby helping to conform to more orderly fisheries. Orderly fisheries are important, and have meaning not only in the avoidance of wasted fish, but

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<sup>2</sup> The questions are contained in an April 16, 2003 memorandum from CFEC to Kevin Duffy, the commissioner of the Alaska Department of Fish and Game. The answers to the commission's questions are contained in a July 9, 2003 memorandum from Commissioner Duffy to CFEC. See the appendices for copies of the memos.

<sup>3</sup> Maximum sustained yield (MSY) and optimum economic yield (OEY) may not be the same. OEY may occur at a sustainable level that is less than MSY.

also in reducing the frequency of accidents and in prosecuting a fishery where the participants abide by the regulations. Orderly fisheries and the avoidance of waste are also linked to resource conservation, as understood by the framers of the Alaska constitution and by the legislators who drafted the limited entry amendment.

### 5.1.a Sound Fishery Management Techniques

To determine what “sound fishery management techniques” might mean under Standard Two of the state’s optimum number law, the authors considered parts of the Alaska state constitution and the state’s fishery management regulations. As was mentioned in Chapter 2, the constitution contains a clause expressly calling for managing the state’s fishery resources on the principals of sustained yield.<sup>4</sup> Direction for managing fisheries based upon sustained yield is also provided in state law,<sup>5</sup> the state’s Sustainable Salmon Fisheries Policy (SSFP),<sup>6</sup> and the state’s Policy for Statewide Salmon Escapement Goals (PSSEG).<sup>7</sup>

Sustained yield is defined in the SSFP. It is:

*“..average annual yield that results from a level of escapement that can be maintained on a continuing basis. A wide range of average annual yield levels is sustainable; likewise, a wide range of annual escapement levels can produce sustainable yields.”*

The notion that a wide range of harvests (yields) can be sustainable was addressed by the Alaska Supreme Court in *Native Village of Elim v. State of Alaska*.<sup>8</sup> In this decision, the Court provided guidance on the definition of sustained yield and how it should be applied to Alaska’s fisheries. The Court clarifies that the application of sustained yield does not mandate a predetermined formula or specific numerical yield. Instead, the Court viewed sustained yield as: “...a guiding principle rather than a concrete, predefined process.” In support, the Court cites discussion of sustained yield at the Alaska Constitutional Convention:

*“For fish, for wildlife, and for some other replenishable resources... it is difficult or even impossible to measure accurately the factors by which a calculated sustained yield could be determined. Yet the term “sustained yield principle” is used in connection with management of such resources. When so used it denotes conscious application insofar as practicable of principles of management intended to sustain the yield of the resource being managed. That broad meaning is the meaning of the term as used in the Article.”*<sup>9</sup>

Clearly, to apply the principles of sustained yield harvest in salmon fisheries, the most important aspect is conservation of the fishery resource. If the quality of the habitat is

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<sup>4</sup> See Article VIII, Section 4.

<sup>5</sup> See AS 16.05.730 (a).

<sup>6</sup> See 5 AAC 39.222.

<sup>7</sup> See 5 AAC 39.223.

<sup>8</sup> See *Native Village of Elim v. State of Alaska*; 990 P.2d 1 (Alaska 1999).

<sup>9</sup> See *Papers of the Alaska Constitutional Convention, 1955-1956, Folder 210, Terms.*

maintained, and spawning populations are sufficiently protected so they remain high enough to replenish themselves in the face of commercial harvests, then a sustained yield can be attained. In theory then, ADFG could conserve the Bristol Bay wild salmon resource and provide a sustained harvest by setting conservatively high escapement levels in each of the major river systems and keeping harvests at a low level.

Yet in the Bristol Bay salmon fisheries, sockeye harvests are managed to be above what are merely sustainable; instead, ADFG attempts to achieve “maximum” sustained yield. As was discussed in Chapter 2, maximum sustained yield (MSY) is the greatest average annual yield that one could expect from a stock of fish without harming the population. Therefore, harvests from maximum sustained yield are not only sustainable, they are also at the upper end of the theoretical yield that can be attained from the fishery.

The state’s Sustainable Salmon Fishery Policy directs ADFG to manage for maximum sustained yield if it is possible to do so.<sup>10</sup> In Bristol Bay, ADFG has collected the data and acquired the level of scientific knowledge necessary to attempt to manage sockeye salmon for MSY. With only two exceptions (Nushagak River chinook and coho), the other four species of salmon from various Bristol Bay river systems are not managed for MSY because ADFG lacks the information to do so. Instead, other salmon stocks are managed on a sustainable basis, which theoretically produces harvests that are somewhat less than those obtained through maximum sustained yield management.

All salmon escapement goals are established through scientific review and in collaboration with the Board of Fisheries. In this sense, attaining escapement goals in Bristol Bay should be considered an important component of “sound fishery management techniques,” as applied to Standard Two. The escapement goals are consistent not only with the constitutional mandate for sustained yield and conservation of the fisheries, they are also directed by the management goals set out in state law and in regulations adopted by the Board of Fisheries. Furthermore, successfully attaining BEG’s and SEG’s is consistent with the resource conservation purposes of limited entry, as defined in the state constitution and in state law.

While attaining escapement goals is one of the primary goals of ADFG’s management, the agency and the Board of Fisheries is also directed by regulation to achieve other management goals. These goals include: maintaining the genetic diversity and overall health of the escapement, attempting to provide an orderly fishery, helping to obtain a high-quality fishery product, and harvesting fish consistent with regulatory management plans.<sup>11</sup>

These other goals are also consistent with “sound fishery management techniques.” Board of Fisheries regulations clearly state that obtaining escapement goals and maintaining the genetic diversity of salmon escapement shall be considered the highest priorities of salmon management in Bristol Bay. Maintaining the genetic integrity of escapements is supported by science and is a commonly held goal of salmon fisheries management.

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<sup>10</sup> See 5 AAC 39.222 (3)(c)(2)(B).

<sup>11</sup> See 5 AAC 06.355.

Providing orderly fisheries and managing harvests to improve product quality are also consistent with “sound fishery management techniques.” These are important goals brought about through a public process with the Board of Fisheries. Together with obtaining genetically diverse escapements, these goals additionally fit within the notion of “resource conservation,” as understood by the both the framers of Alaska’s constitution and the legislators who drafted Alaska’s limited entry constitutional amendment. They are discussed in more detail below.

### **5.1.b Orderly and Efficient Harvesting**

Because the goal of orderly fisheries is explicitly stated in both the Board of Fisheries regulatory management goals and in Standard Two of the state’s limited entry law, this objective is especially important. Chapter 2 discusses an interpretation of “orderly” and how it can be applied to the Bristol Bay salmon drift gillnet fishery. “Orderly” may include the concepts of reducing the likelihood of accidents on the fishing grounds, adherence to fishery regulations by the fishing fleet with effective enforcement of the regulations, and avoiding the waste of fish.

The first two concepts of orderly fisheries are fairly clear; however, avoiding the waste of fish deserves more consideration. Fish may be “wasted” in several ways. Foremost, fish may be wasted if they are harvested in a manner where they are not fit for human consumption and have to be discarded. This can occur when processing and holding capacity are not adequate for the harvest. Avoiding this type of waste has been an ongoing issue in the Bristol Bay salmon fisheries; for example, in 1999 ADFG reduced fishing time to keep harvests within limits of the processors’ capacity.

Waste can also occur when biological escapement goals are not attained. If the lower end of escapement goals is not met, it may be possible to put the salmon resource at risk, and subsequent harvests or yields from those escapements can be impacted. Similarly, when escapements exceed the BEG, future yields may be negatively influenced. In this sense, escapements above the BEG, while perhaps not causing long-term damage to the fishery resource, are a source of waste. Not only could future yields be smaller if excess fish are put on the spawning grounds, but the excess fish are wasted in the sense that an available surplus is foregone. Again, this is the basis for the concept of maximum sustained yield.

There is evidence that the framers of the Alaska constitution favored full utilization and development of the state’s resources, supporting this concept of avoiding waste of fishery resources. In discussing the framers’ desire for development, Gordon Harrison, states:

*“The constitution clearly establishes a presumption in favor of the development and utilization of Alaska’s resources. That is, development is considered desirable except when it is wasteful, destroys the ability of living resources to regenerate, violates the rights of others, is narrowly selfish and exploitive, or*

*otherwise outrageous and offensive to the public interest. The constitution says, in effect, that there should be development but not development at any cost.”<sup>12</sup>*

In discussing Article VIII, Section 2, Harrison indicates that the authors of the section understood conservation in the traditional sense of “wise use”.<sup>13</sup> The wise use of resources adds yet more emphasis to the Department’s direction to manage for maximum sustained yield. To avoid putting excess escapement into a salmon system beyond that of a biological escapement goal constitutes wise use of the resource and is consistent with not only sound fishery management techniques, but also harvesting in an orderly (non-wasteful) and efficient manner.

Avoiding waste and harvesting in an orderly and efficient manner may also be consistent with the Alaska Legislature’s intent when they crafted the constitutional amendment to allow limited entry into Alaska’s fisheries. Moreover, there is evidence that the legislature took an even broader approach to waste as it applies to harvesting natural resources. Former Assistant Attorney General (AG) Steven A. Daugherty carefully examined background documents on the limited entry amendment to Alaska’s constitution. In 1995 Daugherty wrote a letter for Attorney General Bruce M. Bothelo to then-Representative Alan Austerman of the Alaska State Legislature, where he addressed the legality and constitutionality of individual fishing quota programs in Alaska.<sup>14</sup>

In the letter, Daugherty indicates that the final legislative history of the limited entry amendment suggests the legislature had a broad concept of resource conservation when it finalized the language of the amendment. Daugherty states:

*Legislative history indicates that the final language of the amendment was altered “to show that the state’s power to limit entry is a specific exception to the ‘exclusive right’ prohibition,” and to 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.”<sup>15</sup> . . .*

*However, as adopted, the limited entry amendment focuses on prevention of economic distress and on conservation of resources, including capital and labor as well as the fisheries themselves.<sup>16</sup>*

The Alaska Supreme Court decision in *Johns* (1988) predates this 1995 letter containing the Attorney General’s Opinion. It is unclear how the Alaska Supreme Court interpreted the term “resource conservation” when it considered the limited entry amendment in the decision. Nevertheless, given their decision in *Johns*, it might be difficult to defend a strong definition of resource conservation that includes the prevention of all waste associated with the use of excessive labor and capital. For example, from an economic efficiency perspective, the use of

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<sup>12</sup> See Gordon S. Harrison, *Alaska’s Constitution: A Citizen’s Guide*, 1986. Second Edition. Institute of Social and Economic Research, University of Alaska, Anchorage, page 69.

<sup>13</sup> *ibid.*, page 71.

<sup>14</sup> See: *Legality and Constitutionality of IFQ Programs*, A.G. file 223-95-0472, Alaska Department of Law, Attorney General’s Office.

<sup>15</sup> *ibid.*, page 10. The author Steven Daugherty cites the House Committee Substitute for Committee Substitute for S.J. Res. 10, 7<sup>th</sup> Legislature, 1<sup>st</sup> Session (1971).

<sup>16</sup> *ibid.*, page 11 in footnote 9.

labor and capital beyond what is needed to maximize the economic rents from the fishery would be considered as waste. In this study, the amount of labor and capital will be considered excessive and a contributor to waste and disorderly harvesting if the excessive number of fishing operations results in a disorderly fishery. Again, a disorderly fishery can mean one where accidents frequently occur and vessels or gear are damaged, or where fisheries infractions are inordinately high, or where fish are wasted, either directly when they become unfit for human consumption or by consistently failing to achieve escapement goals.

### **5.1.c Summary of Definitions**

The Alaska constitution contains provisions expressly calling for fisheries resources to be managed on a sustained yield basis. There is also evidence that the framers of the constitution defined resource conservation in the traditional sense of wise use, where resources are to be fully utilized and waste is avoided.

Limited entry in Alaska's fisheries was allowed under an amendment to Alaska's constitution. One of the expressed purposes of limited entry, as called for in the amendment, is resource conservation. The drafters of the amendment considered resource conservation to be more than just conservation of the fishery resource; they considered that conservation of capital and labor used to harvest the fishery resource should also be included.

State statutes provide direction on how the commission should determine an optimum number of permits in a fishery. The law states there are three standards the commission must consider. Standard Two, often referred to as the "management optimum number," must consider the number of entry permits necessary to harvest the allowable commercial take in an orderly and efficient manner and consistent with sound fishery management techniques.

ADFG manages for maximum sustained yield of the Bristol Bay sockeye salmon stocks, and for a long-term sustainable yield for other salmon stocks in Bristol Bay. Successfully attaining escapement goals is consistent with the constitutional mandate for resource conservation, and is also consistent with the limited entry constitutional amendment and "sound fishery management techniques" under Standard Two of the state limited entry law.

"Sound fishery management techniques" as interpreted under Standard Two should also include the other regulatory management goals of maintaining the genetic diversity and the overall health of the escapement, providing for orderly fisheries, helping to obtain a high-quality fishery product, and harvesting fish consistent with regulatory management plans.

Harvesting fish in an orderly manner is an important management goal and needs to be considered under optimum number Standard Two. Orderly harvests include the avoidance of accidents that occur during the fishery, and effective enforcement of fishery regulations. Orderly fisheries are also linked to resource conservation, as understood by the framers of the state constitution and by the legislature when they drafted the amendment allowing Alaska's limited entry program. The link to resource conservation includes not only avoiding the waste of fish and wise use of the fishery resource, it also includes the notion of containing excessive

labor and capital in the fishery, to the extent that the waste associated with a disorderly fishery can be avoided.

## **5.2 Conceptual Bounds for Standard Two Used in This Report**

Following earlier CFEC research efforts, two different concepts for Standard Two were used in this report to help bracket the management optimum number. These two concepts also bracket a range of likely readings of the statutory standard.

The appropriate management optimum number in any particular year could vary depending upon the overall Bristol Bay run size, the specific conditions related to a particular year, and the status of stocks in different sub-fisheries. A number of permits which might not pose a serious concern under one set of conditions might pose problems under another set of conditions. For this reason, the two concepts were used to create a bounded range for the management optimum number.

### **5.2.a Concept One**

The first concept is the number of fishing operations that would actually be needed to harvest the available surplus during years with the highest expected returns in an orderly, efficient manner, and consistent with sound fishery management techniques. This number would roughly reflect the number of fishing operations that would be economically efficient in years of high returns.<sup>17</sup>

This concept is comparable to a bound defined by Martin as "the minimum number of units of gear adequate to harvest the highest runs anticipated in the next ten years."<sup>18</sup> While this number of fishing operations might be appropriate for years of high returns, it could result in considerable excess capacity in years of lower returns. In other words, in years with smaller run sizes the minimum number of units of gear needed to harvest the resource in an orderly manner might be lower.

### **5.2.b Concept Two**

The second concept utilized herein is concerned with how many units of gear the Department could reasonably manage and control during years of low harvests, given available resources and their existing regulatory authority.

The concept is similar to the bound defined by Martin as "the maximum number of units of gear that can be effectively managed during the low run years." The question implicitly

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<sup>17</sup> The number would be efficient subject to existing statutory and regulatory constraints. There could be more efficient methods to harvest the resource and gain greater net value out of the harvest that are not allowed under current law and regulations. The regulations that the Board of Fisheries passes to control the effort of fishing operations are likely impacted by the number of permits available for the fishery.

<sup>18</sup> See Martin: *Optimum Numbers*.

assumes that the number of units of gear that can be effectively managed increases with the size of the runs and the available surplus.

### **5.3 The Department of Fish and Game's Answers to CFEC's Questions**

On April 16, 2003, CFEC sent a formal set of questions in a memorandum to the Commissioner of the Department of Fish and Game on management of the Bristol Bay salmon drift gillnet fishery and management optimum numbers under Standard Two. Commissioner Kevin Duffy responded to CFEC's questions in a July 9, 2003 memorandum. Both memoranda can be found in the Appendices.

The main purpose of the CFEC memo was to obtain information to help estimate management optimum numbers. The questions were also designed to learn how the number of units of gear in the fishery would impact management decisions, as well as the costs of management, the quality of the harvest and quality of the escapement, the Department's ability to achieve escapement and allocation goals, and the orderliness of the fishery. Some questions were about measures that might be taken in certain situations under the Alaska Board of Fisheries Sustainable Salmon Fisheries Policy (SSFP).

The following paragraphs briefly summarize the Department's answers to questions related to the number of units of gear and management optimum numbers. The text provides references to the Department's answers found in the memorandum.

### **5.4 Impacts of the Number of Units of Gear**

The Department's answers suggest they can make adjustments to achieve escapement goals as the number of units of gear changes. In general, if the number of fishing operations increases, they can decrease the number and/or the length of fishery periods ("openings"); as the number of fishing operations decreases, they can increase the number and/or length of openings. They did not think they would face a situation where, because of a concern about the number of fishing operations, they would have to keep a district entirely closed at a time when there was an available surplus of fish above the escapement needs.<sup>19</sup> Note that ADFG was asked to answer the memo's questions using the existing framework of regulations and current numbers of permits. Therefore, the highest number of permits they would face area-wide would be 1,857 (the current number of potentially active entry permits).

ADFG answered that consistently exceeding escapement goals could result in biological and conservation problems. Exceeding escapement goals could lower the productivity of the freshwater environment by cropping the food sources; the carrying capacity for juvenile salmon would then be reduced, which would in turn reduce future returns of adult fish. Ultimately though, with smaller runs of fish the freshwater food sources would likely rebound and once again support relatively large numbers of rearing salmon.<sup>20</sup>

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<sup>19</sup> See Commissioner Duffy's July 9, 2003 memorandum, page 5.

<sup>20</sup> *ibid*, page 8.

They indicate they currently prefer to avoid continuous fishing for a variety of biological and socioeconomic reasons. The likelihood of the need for continuous fishing to avoid exceeding the upper end of the BEG declines when there are more units of gear in an area. They indicate they have occasionally exceeded the upper end of the range of the BEG, even with continuous fishing. This occurred in the Togiak District in both 2000 and 2001.<sup>21</sup> Thus, there could be situations where there are too few units of gear from a management perspective.

The Department does not think their management costs are significantly impacted by changes in the number of fishing operations in the Bristol Bay salmon drift gillnet fishery. They said they did not expect to get additional resources to manage the fishery given the budgetary environment in the foreseeable future.<sup>22</sup>

The Department could not make a definitive statement on whether the number of units of gear in the Bristol Bay drift gillnet fishery had an impact on their ability to meet gear type allocation goals. They said that in some circumstances more units of gear in the fishery would make achieving allocation goals more difficult, while in other circumstances more units of gear might make achieving allocation goals easier.<sup>23</sup>

The Department said they attempt to maintain the genetic diversity and the quality of escapements by scheduling openings and closures that are spread throughout the entire run. This allows pulses of unharmed, healthy fish to go up the rivers throughout the run. The Department indicated that increasing the number of units of gear would not have a serious impact on using these measures. They noted that a substantial decrease in the units of gear might eliminate the need for the measures, since with a sufficiently small number of fishing operations there could be continuous escapements even when the fishery is open.<sup>24</sup>

The Department was also uncertain about how increasing or decreasing the number of fishing operations would impact product quality. They indicated that the most important factor that affects quality is the length of time from when a fish is harvested to when it is processed. The temperature at which fish are held during that time is also very important. The Department said that gentle handling to prevent bruising and gaping of the flesh is important, and activities such as using a boat to tow hard on the net reduces quality. They felt that an individual permit holder's efforts toward quality were more important than the number of fishing operations. In theory, they said that slower, more continuous fishing operations would allow fishermen to take better care of the fish, and measures to slow the fishery and spread out harvests over a longer period of time would tend to promote quality. However, they felt it would be speculative to say whether reducing the number of fishing operations would contribute to increased product quality.<sup>25</sup>

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<sup>21</sup> *ibid*, page 6. Note, however, regulatory restrictions that discourage the movement of fishing operations into the Togiak District (see 5 AAC 06.370 (k)(1) ) probably contributed to the relatively low number of vessels in Togiak in 2000 and 2001.

<sup>22</sup> *ibid*, pages 14 and 15.

<sup>23</sup> *ibid*, page 11.

<sup>24</sup> *ibid*, page 13. Personal communication with fishery managers indicate that the Department currently assumes that few fish, if any, escape during an opening.

<sup>25</sup> See Commissioner Duffy's July 9, 2003 memorandum, page 14.

The Department indicated that the orderliness of a fishery would tend to be impacted by the number of fishing operations. The background to CFEC's questions to the Department on orderliness contained the following definitions:

*We believe orderliness can be expressed several ways. One is through fewer accidents on the fishing grounds; another can be when fisheries regulations are closely adhered to and enforcement is effective. Avoiding waste of fish can also be part of an orderly fishery. . .*

*For example, regulations calling for the use of the Naknek river special in-river harvest area may help conserve weak salmon runs in the neighboring Kvichak river; however, doing so forces boats fishing on Naknek stocks into a smaller area. We have heard this congestion results in a more disorderly fishery, with higher accident rates, more damage to gear and vessels, and higher rates of fish wastage.<sup>26</sup>*

The Department indicated that several situations reduced the orderliness of a fishery: reduced fishing areas with large numbers of vessels; long openings resulting in line fisheries; lack of law enforcement presence and/or unenforceable regulations; high volumes of fish that exceed processing capacity; and high prices. The Department said that inriver or special harvest area fisheries are likely to promote disorderliness, as does continuous fishing that creates line fisheries at some district boundaries. The Department said it often tries to promote orderliness by having relatively short openings to prevent line fisheries; closed periods allow salmon to disperse throughout the district, allowing the fleet to spread out when the fishery re-opens. The Department indicated that fisheries tend to be less orderly with more drift fishing operations and more orderly with less drift fishing operations.<sup>27</sup>

While ADFG did not comment specifically on the number of accidents in the fishery, there is strong evidence that fishing in Bristol Bay is hazardous. In CFEC's survey of Bristol Bay salmon drift gillnet permit holders in 2002, permit holders were asked how often they experienced damage to their fishing gear or equipment as a result of congestion in the fishery. Nearly three-fourths of the respondents (73.2%) indicated this was a very frequent event: 38.4% said it occurred "nearly every year", while 34.8% indicated it happened "multiple times a year."<sup>28</sup>

## **5.5 Estimates of Management Optimum Numbers**

The Department was also asked questions to help estimate the management optimum numbers under Standard Two in the limited entry law. Again, the second optimum number standard, found in AS 16.43.290(2), reads as follows:

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<sup>26</sup> *ibid*, pages 11 and 12.

<sup>27</sup> *ibid*, page 12.

<sup>28</sup> See Carlson: *2002 Survey of Bristol Bay Salmon Drift Gillnet Permit Holders: Preliminary Summary of Responses*.

*(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;*

To bracket the management optimum number of permits, the Department was asked to answer two questions. These questions attempt to establish boundaries for management optimum numbers. The Department was asked to answer the questions assuming that existing regulations would remain unchanged, and that there will be at least enough processing capacity in Bristol Bay so that inseason management is not significantly affected. The commission asked for these assumptions to establish benchmarks that would help the Department form their answers. Although it is entirely possible that new regulations and changes in processing capacity could affect future management of the fishery, at this time it can only be speculative as to what those changes might be.

Under the first conceptual boundary for management optimum numbers, the Department was asked to answer the following question:

*Approximately how many fishing operations (drift gillnet permits) would actually be needed (the minimum required) to harvest, in an orderly and efficient manner, and consistent with sound 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?*

The Department's answer to the question was 1,400-1,500 drift net permits.<sup>29</sup> The Department noted that the estimate was not based on a systematic analysis but was based upon the best professional judgment of the persons who have been managing the fishery in recent years. They were also careful to note that their estimates were made using the assumptions of adequate processing capacity and unchanged regulations. However, they said that processing capacity could indeed affect inseason management decisions in the future, noting that capacity has declined significantly in the last 5 years. They indicated the likelihood is strong that processing capacity will affect management, particularly during years of large sockeye returns.

The Department came up with a roughly similar estimate to a similar question during the early years of limited entry. In 1978, the commission wanted to know the minimum number of units of gear adequate to harvest the highest runs anticipated during the next 10 years. The Department's estimate of 1,338 units of gear and the methodology that they used at the time can be seen in Martin's report.<sup>30</sup> The reader should note that the highest returns experienced to date in the fishery occurred after 1978. This may be consistent with the slightly higher estimate provided by the Department in 2003.

Note that the commission's question in 2003 includes the statutory language that the harvest should occur in an orderly and efficient manner and consistent with sound fishery

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<sup>29</sup> *ibid*, page 15.

<sup>30</sup> See Martin: *Optimum Numbers*.

management techniques. The question in the CFEC memorandum to the Department came after the discussion on “orderly” cited above.

The CFEC question asks for the *minimum* number of units of gear needed to harvest the highest expected returns in an orderly, efficient manner. The minimum number of permits needed in years of the highest expected runs could represent considerable excess harvesting capacity in other years with lower returns. Moreover, it is possible that large excess harvesting capacity in years with lower run sizes could make it difficult to manage the fishery in an orderly fashion.

Under the second conceptual boundary for management optimum numbers, the Department was asked to answer the following question:

*Approximately how many fishing operations (permits) could be effectively managed, in an orderly and efficient manner, and consistent with sound management techniques, in the Bristol Bay salmon drift gillnet fishery during years with the lowest expected harvests over the next 20 to 30 years?*

The Department’s answer to this question was 800 to 900. Again, the Department says that this represents the professional judgment based on the experience of those managing the fishery and they characterize the estimates as subjective and qualitative.<sup>31</sup>

Again, the Department came up with a roughly similar estimate to a similar question on this second conceptual boundary during the early years of limited entry. In 1978, the commission wanted to know the maximum number of units of gear that can be effectively managed during low run years. The Department’s estimate of 840 units of gear and the methodology that they used at the time can be seen in Martin’s report.<sup>32</sup>

## 5.6 Summary

This chapter reviewed optimum number Standard Two found in AS 16.43.290(2) and the amendment to Alaska’s constitution allowing for limited entry, found in Article VIII, Section 15. The chapter examined the concept of resource conservation and reviewed the understanding of resource conservation that was held by the framers of Alaska’s constitution and by the legislators who authored the limited entry amendment to Alaska’s constitution. The chapter also reviewed the Department’s answers to questions about how the number of units of gear could affect the Department’s ability to meet management objectives. Finally, the chapter provides the Department’s answers to two questions that help to bracket management optimum numbers.

For the most part, the Department felt they could make adjustments to achieve most of their objectives as the number of units of gear changes. To achieve escapement goals they can decrease the number and/or length of openings as the number of operations increases;

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<sup>31</sup> See Commissioner Duffy’s July 9, 2003 memorandum, page 16.

<sup>32</sup> See Martin: *Optimum Numbers*.

conversely, they can increase the number and/or length of openings as the number of units of gear decreases. Similarly, the Department did not think that the number of units of gear would impact their ability to maintain genetic diversity and the quality of the escapement by scheduling openings and closures that are spread throughout a run. The Department also did not think that their management costs would be significantly impacted by changes in the number of units of gear.

The Department could not reach a definitive conclusion on whether the number of units of gear in the fishery impacted the managers' ability to meet the Board's allocation goals among users. The Department was also uncertain on how changes in the number of units of gear would impact fish handling and product quality.

The area where the Department indicated that the number of units of gear had a definite impact was on their ability to maintain an orderly fishery, where the concept of orderly included avoiding high accident rates, avoiding damage to vessels and gear due to accidents, and avoiding high rates of fish wastage because of an intense and congested fishery. The Department briefly discussed some of the ways they try to maintain an orderly fishery, but noted that fisheries tend to be less orderly with more fishing operations, and more orderly with less fishing operations.

Harvests in an "orderly and efficient manner" is part of optimum number Standard Two and is part of the resource conservation definition used herein. Resource conservation is also one of the constitutional purposes of limited entry. An objective would be to pick a number of permits that would avoid the most acute types of wastage caused by a disorderly fishery.

Given this background, the Department was able to provide rough estimates for the two questions on the management optimum number of permits. The Department estimated that it would take a minimum of 1,400 to 1,500 permits to harvest the highest expected runs in an orderly and efficient manner and consistent with sound fishery management techniques. Note that while this might be an efficient number for the highest expected runs, it could represent considerable excess capacity for lower runs.<sup>33</sup> Similarly, the Department estimated they could effectively manage a maximum of 800 to 900 permits in an orderly and efficient manner and consistent with sound management techniques in years with the lowest expected harvests.

For purposes of this study, 800 to 1,500 permits will be used as the best estimate of the range of permits for the fishery under optimum number Standard Two.

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<sup>33</sup> Note again, these estimates assume all other current regulations and constraints impacting the fishery will remain constant.