Southeast Alaska Enhanced Salmon Allocation
a
Twenty-Year Retrospective 1994 - 2015

Position Statement: Joint Regional Planning Team industry representatives believe the Southeast Salmon Enhancement program has benefitted all gear groups far beyond fishermen's expectations when the Enhanced Salmon Allocation Plan was adopted in 1994. Further, the Plan has been and continues to be an effective tool for measuring success and setting future goals.

This document was developed by the Joint NSRAA & SSRAA RPT members representing the interests of salmon limited entry permit holders. The JRPT consists of two elected representatives from each gear group – trollers, gillnetters, and seiners – the identical gear composition and representation of the original Allocation Task Force convened 1991 to 1994.

Goal: To document enhanced salmon allocation from 1994 to 2015 and the factors affecting gear allocation percentages, whether in terms of underperformance or over-performance. The report is intended to inform the Board of Fisheries and user groups with an examination of the Allocation Plan's assumptions and premises, including the Plan's strengths and weaknesses.

Road Map to the Goal: The objectives to meet these goals are accomplished through an examination of the assumptions which the allocation plan is based, a consideration of premises that are foundational to the Plan, and a review of the enhancement program outputs. To provide some context, in 1991 the enhanced salmon cumulative value was $8 million compared with 2013 when the enhanced value was $50 million. The paper reports enhanced salmon value and percentages, but also analyzes why current results are not what was envisioned in 1994. Therefore the report includes a discussion of exigencies thwarting expected outcomes. Finally, the report provides a description of our vision set in motion in 2014 to solve the allocation imbalance under current regulatory criteria.

Expectations beyond 2017: New production with predicted adult returns starting in 2017 and beyond are outlined; expected impacts on allocation percentages for future five and ten year periods are presented.

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Introduction

Allocation of enhanced fish in southeast Alaska has been considered and debated since the inception of the program in the late 1970s. The discussion was heated enough at the beginning of the nineties that the board of fisheries directed NSRAA and SSRAA (Southeast Alaska Allocation Task Force SATF) to negotiate a consensus agreement. An agreement in 1994 was promulgated by the Board of Fish in #94-02-FB, but later that year updated by including value data tables showing the base period years 1985 – 1991 (#94-148-FB, appendix A). It took many meetings over a period of three years to reach a consensus. Subsequent to 1994, the gear groups have worked together to reach enhanced allocation consensus agreements with reports to the board of fisheries in 2009, 2012, and 2015.

The #94 BoF findings laid out fourteen guiding principles. These principles are pertinent to allocation ranges, agency contribution goals (60% - 70%), protection of wildstocks, program evaluation, marking responsibilities, criteria for action, and types of management actions to be employed to influence value to a gear type out of their lower range. However, the plan did not provide the context in which the plan was written in the late 80s and early 90s, including consideration of traditional fisheries vis-à-vis enhancement plans, explicit acknowledgement of target species for seine and gillnet gear versus troll gear, or inherent gear efficiency differentials (although we posit there was a tacit understanding). In retrospect, there are good reasons for these oversights. This paper will provide that historical context with the advantage of twenty years of knowledge, discovery, and data analyses.

Base Period for Allocation Plan 1985 – 1991

The allocation plan percentage ranges for each gear are based on value of enhanced fish for the period 1985 to 1991. The cumulative value for all gear for all seven baseline years combined was $54 million. The value in 2012 for comparison, a single year, was $74 million and for 2013 it was $52 million. On average the overall value has tripled since 1994 due to increased production and price. During the baseline period trollers caught 71.7% of the enhanced coho and 86.6% of the enhanced Chinook, but only 2.0% of the chum, conversely the net groups caught 97% of the enhanced chum and pink salmon (Appendix A, #94-148-FB) . This is a clear indication of what the 1994 SATF expected in the future given the seven year period upon which the Allocation Plan was based. This is not to say the gear groups considered a prohibition on which gear group caught chum or Chinook, but it certainly supports the idea that based on history the net groups would likely harvest the chum production and trollers would catch the lion's share of coho/Chinook production.

Southeast Allocation Base Period 1985 - 1991 (#94-148-FB)				
Species		Total Value		Percent
Coho				
	Troll	$	10,775,635	71.7%
	Seine	$	1,626,678	10.8%
	Gillnet	$	2,616,161	17.4%
Chinook				
	Troll	$	4,559,573	87%
	Seine	$	260,671	5%
	Gillnet	$	446,040	8%
Chum				
	Troll	$	521,184	2%
	Seine	$	17,265,856	66%
	Gillnet	$	8,261,208	32%
Pinks				
	Troll	$	124,857	3%
	Seine	$	2,377,096	65%
	Gillnet	$	1,173,472	32%
Sockeye				
	Troll	$	119,287	3%
	Seine	$	1,856,903	44%
	Gillnet	$	2,220,614	53%
	Total	**$**	**54,205,235**	

Table 1. Summary portion of table from board of fish #94-148-FB showing 1985 – 1991 enhanced salmon cumulative total values by species, gear, and percentages for each species. The base period shows trollers catching 72% and 87% of coho and Chinook respectively. The net groups caught 98% of the chum salmon or 47% of the total cumulative value.

The 1995 RPT minutes state, "(Mr. Ken) Duckett added that if Snettisham (hatchery) were to come on line, it undoubtedly would throw the allocation numbers "out" (gillnet above target range) and the Joint RPT would have a significant job on their hands getting them back into compliance. (Mr. Scott) Marshall (regional commercial fish supervisor) commented that the "jury was out" for Snettisham until they could see how many fish they were getting back and how they were distributed; when it showed up in the data they would deal with it then." While the Snettisham Hatchery did not perform as feared/hoped as conveyed in this statement, another DIPAC program producing chum salmon did 'throw the allocation numbers out'. The outcome predicted in 1995 came to pass, but with a different species. This is an example of one unforeseen consequence; there are many more that will be examined.

It was clear to the SATF members that the future troll allocation was dependent on a high Chinook interception. Even with that presumption they predicted that trollers would be well below their allocation range. Specifically in the 1994 finding #94-148-FB SATF predicted at full production the trollers would attain 21.2% of the enhanced value, although in 1994 trollers were at 29.7%. The

document also considered future production that was in the works in 1994; this also predicted the trollers would be well below their range. In both of these scenarios (presented below) the total value of enhanced salmon was predicted to increase significantly with the gillnet proportion rising and the troll falling. Therefore, it appears the SATF, agreed upon the gear group ranges while at the same time predicting gear group values that would not attain the gear balances they envisioned.

		Southeast Allocation Base Period 1985 - 1991 (#94-148-FB)					
Species	**Gear**	**Annual Full Production Value**	**Annual Full Production Percent**	**Total**	**Value**	**Future Percent**	**Potential Total**
Coho				$ 4,201,270			$ 4,201,270
	Troll	$ 3,021,781	71.9%		$ 3,021,781	71.9%	
	Seine	$ 540,786	12.9%		$ 540,786	12.9%	
	Gillnet	$ 638,703	15.2%		$ 638,703	15.2%	
Chinook				$ 5,473,259			$ 9,433,951
	Troll	$ 4,773,109	87.2%		$ 7,400,573	78.4%	
	Seine	$ 359,042	6.6%		$ 944,601	10.0%	
	Gillnet	$ 341,108	6.2%		$ 1,088,777	11.5%	
Chum				$ 24,632,796			$ 24,632,796
	Troll	$ 293,658	1.2%		$ 293,658	1.2%	
	Seine	$ 16,010,792	65.0%		$ 16,010,792	65.0%	
	Gillnet	$ 8,328,346	33.8%		$ 8,328,346	33.8%	
Pinks				$ 2,197,761			$ 2,197,761
	Troll	$ 57,882	2.6%		$ 57,882	2.6%	
	Seine	$ 1,370,607	62.4%		$ 1,370,607	62.4%	
	Gillnet	$ 769,272	35.0%		$ 769,272	35.0%	
Sockeye				$ 2,150,892			$ 7,557,008
	Troll	$ 51,810	2.4%		$ 112,610	1.5%	
	Seine	$ 953,598	44.3%		$ 1,283,040	17.0%	
	Gillnet	$ 1,145,484	53.3%		$ 6,161,358	81.5%	
All Species				**$ 38,655,978**			**$ 48,022,786**
	Troll	$ 8,198,240	**21.2%**		$ 10,886,504	**22.7%**	
	Seine	$ 19,234,825	**49.8%**		$ 20,149,826	**42.0%**	
	Gillnet	$ 11,222,913	**29.0%**		$ 16,986,456	**35.4%**	
NOTES:							
1. Current annual production includes permited capacity on existing ongoing projects using assumed survival rates and average prices, weights							
2. Future production includes Deep Cove Chinook, Snettisham sockeye, and Chilkat Lake sockeye enhancement							
Chilkat will produce 264,000 sockeye: 250,800 to gillnet, 13,200 to seiners							
Snettisham will produce 320,000 sockeye: 288,000 gillnet, 32,000 seiners							
Beaver Falls and Klawock will produce 259,000 sockeye: 123,000 gillnet, 130,000 seine, 5,000 troller (current production)							
Deep Cove will produce 75,000 harvestable Chinook: 55,250 troll, 14,400 seine, 5,250 gillnet							
3. AAI (Alaska Aquaculture Inc) added November 1992: 300,000: gillnet 239,000, seine, 61,000 chum							
4. Future potential is a best guess of what might happen. It is not an allocation.							

Table 2. SATF table of full production and potential production enhanced values by gear, species and proportions. The table shows large increases in Chinook catch by trollers and large sockeye harvests, neither of which came to pass. Chum value was predicted to be strong which was correct although it was under forecasted.

Premises & Assumptions

A fundamental premise of the 1994 Plan was trollers would continue to catch high quality Chinook and coho at relatively high prices, and eventually at considerably higher abundances (Table 2). Contained in the board of fish finding was an expectation from the proposed program at Deep Cove, southwest Baranof Island: "Deep Cove will produce 75,000 harvestable Chinook: 55,250 troll, 14,400 seine, 5,250 gillnet". Net groups were expected to harvest lower priced pink and chum salmon for the most part, also eventually at greater abundances. The assumption that enhancement programs could produce 100,000 catchable chinook for the troll fleet was thought to be attainable. The net fleet side of the calculation depended on production increases of chum salmon at large volumes with prices in the thirty cents per pound range.

In the SATF report there are notes quantifying production of sockeye at Chilkat Lake, Snettisham Hatchery, and Beaver Lake Hatchery, none of which came to fruition. The report also states that 75,000 harvestable Chinook will be produced at Deep Cove on eastern Baranof Island. Of all these programs only Snettisham became reality, although with mediocre marine survivals and modest harvest rates for the gillnet fleet.

In the 1993 paper *Allocation of Enhanced Salmon* by Don Amend, SSRAA general manager and support staff for the SATF, noted "….forecasting the future, one makes certain assumptions which may or may not be true." This was a prescient observation, because in fact the premises were faulty, even if admirable. Coho and Chinook prices fell due to competition with farm fish while chum prices initially fell but ultimately rose to unprecedented and sustained high levels for years 2010 to 2014. Price was only one factor and perhaps not the most important.

An additional factor that compromised the outcome was moderate to low exploitation rates on coho and Chinook by the troll fleet. Salmon escaping the troll harvest end up in the terminal area where they exacerbate the allocation inequity due to terminal harvest by the net fleets which take advantage of a 'mop up' fishery. Terminal mop up generally does not work for the troll fleet because salmon are motivated to spawn rather than feed once close to their natal freshwater.

Marine survival of chum salmon varied greatly among facilities in the early 1990's. DIPAC (traditional gillnet area) in the 90's had 0.5% to 1% marine survivals while Hidden Falls (traditional seine) survival was 4% to 7%. Many assumed DIPAC production would not be much of a factor in the future. The current reality is DIPAC production since 2010 is double to triple that of Hidden Falls, resulting in rising gillnet catch and falling seine harvest.

Value Assumptions 1994

Dr. Amend cited in the 1993 report, "because the troll fleet harvests the higher value fish, they actually will receive more value than either of the two net groups." This statement discounts volume affects and assumed continued wide price disparity between troll and net caught salmon. Both assumptions were incorrect. In terms of total value, high volume chum harvest by gillnet and seine can and does overwhelm low volume and high value coho/Chinook harvest by the troll fleet.

Historical Context

U.S./Canada Pacific Salmon Treaty

The Pacific Salmon Treaty was signed in 1985. Alaska trollers in particular suffered major cuts in their traditional harvest. Commitment to the Pacific Salmon Treaty (PST) required the loss of fishing opportunity to the Alaska troll fleet. The historical chinook salmon catch at that time was reduced by 100,000 fish annually. The U.S. Congress originally intended that Alaskan enhanced production would mitigate this loss, but early enhancement programs fell short of this 100,000 goal by some sixty percent. Unfortunately, this continues to be true for enhanced Chinook through the two thousand ought's and teens.

The PST agreement negatively affected the harvests' of the net groups but not nearly to the extent of the troll fishery. Most troll Chinook originate as smolt from Washington, Oregon, and British Columbia rivers and hatchery programs but grow to adults in the North Pacific and Alaskan waters, whereas the majority of gillnet and seine harvest is produced from southeast Alaskan streams and enhancement programs. This reality is highly significant to the troller's attainment of their allocation.

Pacific Coastal Salmon Recovery Fund

Traditional Alaska troll fish were Chinook and coho. When the Alaska enhancement programs could not meet the PST Chinook obligation in the 1990's, the Pacific Coastal Salmon Recovery Initiative (1999) was put forward to fund enhancement programs targeting production of coho salmon, sometimes called 'Chinook equivalents'. PST and Pacific Coastal Salmon Recovery mitigation monies amounting to $30 million was primarily directed toward constructing Chinook and coho capital projects throughout southeast Alaska. The coho programs have demonstrated greater success for the trollers in the sense of harvest and exploitation rates, although when trollers cannot catch all the enhanced coho or chinook on the ocean or in mixed stock areas, the 'uncaught' coho filter through to the net fisheries and terminal harvest areas.

Magnuson-Stevens Act

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 was of less direct impact to trollers than the Pacific Salmon Treaty but it still had import, positive and negative. The two hundred

mile limit helped conserve Alaska stocks especially immature and adult Chinook salmon. In addition, the Act established federal area management zones to the twelve mile limit from Cape Suckling to Dixon Entrance. Foreign high seas gillnetting continued to vex enforcement into the 2000's although seems to be under control. However, trollers were forced off portions of federal waters for non-Alaska stock conservation, areas that were traditional fishing areas. Enhancement programs were expected to mitigate federal and state harvest strictures.

Farmed Salmon Industry

Alaska set the salmon market price for decades even into the early 1980's when Alaska controlled over sixty percent of the world harvest of salmon. During this period salmon farming in Norway and elsewhere had little effect on Alaska salmon prices. By 1994 that was beginning to change in a significant way; by 2000 farmed salmon usurped Alaska's market position and consequently prices plummeted for all salmon, especially coho. Trollers responded in a variety of ways, competing in high volume, round chum fisheries (neither gutted nor bled) was one alternative.

Commensurate with this period in the new century was a major marketing effort by Alaska Seafood Marketing Institute (ASMI) to differentiate Alaska salmon from farmed salmon by accentuating Alaska salmon's wildness, pristine waters, higher omega-3s, and natural life cycle. The negatives of farmed salmon were also featured to heighten the contrast. By 2010, world markets responded to this campaign and Alaska salmon was back on top in value terms, especially troll caught Chinook.

Southeast Alaska Comprehensive Salmon Enhancement Plan

The Comprehensive Salmon Plans (Phase I & II) were the chief salmon planning and production documents beginning in the late 1970's and continuing through the 1990's. A complete revision of the Comprehensive Salmon Plan (CSEP): Phase III was published and signed by the ADF&G commissioner in 2004. The CSEP continues to be the official umbrella document for enhanced salmon as delineated in AS 16.10.375. The CSEP and updates set production targets for Alaska's five Pacific salmon species, listed specific projects for future development, and delineated gear group target species. As production of chum surpassed the original CSEP goals and Chinook goals could not be attained, the Allocation Plan took center stage in the 2000's as the political and production driving force. Nevertheless, it is informative to review CSEP narrative for an understanding of gear group imperatives.

In the 1980 Comprehensive Salmon Plan (Phase I, pg 49), under the section *User Group Needs and Aspirations*, "Both NSRAA and SSRAA found that power trollers as well as hand trollers preferred Chinook and coho (production). NSRAA's gear group committee placed top priority on Chinook. The major reason was the severely depressed Alaskan chinook stocks and the importance of avoiding dependence on non-Alaskan stocks."

Phase II of the CSEP, December 1982, "…the northern and southern regions of Southeast present independent action plans to meet the common goals and harvest objectives." These action plans are derived by each of the five species and forecast future harvests by gear and species. Seine and gillnet forecasted sockeye, chum, and pink harvests, but no mention of coho or Chinook and conversely, trollers lay out harvest expectations for Chinook and coho and no other species.

The planning documents of the 80's and 90 set a direction for program development by species and harvest type. The momentum and support for them carry forward to the current day, although shifts in target species, prices, and allocation have altered expectations of these founding documents.

The Joint Regional Planning Team recognized as early as 1997 that what was predicted for trollers in 1994 was coming to be. The history was documented in the 2004 Phase III CSEP:

> "…..by 1997 the 5-year moving averages for seiners and trollers had been substantially out of the allocation range for two consecutive years, and the Joint RPT believed the imbalance was likely to continue. Rather than wait until the mandated trigger point for taking corrective measures, the Joint RPT held a workshop early in 1998 to explore ideas and proposals to alleviate the imbalance. The workshop helped to clarify the applicability, strengths, weaknesses, and limits of the allocation regulation……the following conclusions were drawn:
>
> - The current method used by CFEC to compute the price per pound value of enhanced fish, while resulting in imperfect data, is the best method available.
> - Changes in *marine survival and exvessel price of fish*, benefitting some species and harming others, had dramatically changed the distribution of benefits.
> - For *Chinook salmon, the troll fleet's primary target*, significant decreases in marine survival rate, number released, and price per pound resulted in decreased benefit the troll fleet
> - For *chum salmon, the seine fleet's primary target*, increased hatchery releases, amplified by an extraordinary increase in marine survival rate, overrode a decline in price per pound to provide the increased benefit to the seine fleet.
> - Marine survival and price of fish are factors outside the control of the enhanced fish producers, ADF&G, and the Board of Fisheries.
> - Remedies should focus on improving troll harvest. The troll representatives on the RPT expressed the opinion they were catching as many fish as they could, given the U.S./Canada treaty restrictions, and *were not interested in taking fish away from other gear groups*. The distribution of coho and Chinook catch between gear types has remained relatively constant."

Traditional Chinook and coho troll fisheries were low volume compared to net fisheries, and considered a higher quality product that brought more value. Chinook and coho were, and still are, marketed as individually caught, bled, iced, high fat content omega-3 oil salmon, and delivered to the dock as Alaska's best. Volume net fisheries were not expected to compete on a quality basis.

Analyses of Assumptions and Premises

Fundamental Premise of 1994 Allocation Plan

The fundamental belief and focus of enhancement in 1994 was new production of Chinook and coho salmon at Medvejie, Deep Cove, Hidden Falls, Whitman Lake, Neets Bay and Deer Lake program would be developed for trollers, and importantly they would catch a high proportion of that production. At the same time new production for the net groups would be comprised of chum salmon.

The 1997 RPT minutes (page 4) has a quote by Tom Fisher (SATF troll representative), "maybe the percent allocation for trollers was too high – that they might need a wider range to bounce around in". Ms Denton asked Fisher, as a troller, was he "not dissatisfied?" Fisher said he was not dissatisfied because trollers were not losing value, noting what was happening was that seiners were gaining more value because of more chums in the water.

Results versus Allocation Plan Assumptions

Contrary to expectations, trollers catch a low proportion of enhanced Chinook production (23% (2007-14 average; range 19%-30%)) and a moderate proportion of coho production (37% (2007-14 average; range 30%-51%)). Chinook and coho must bite to get caught by troll gear and in order to get high exploitation rates the majority of the fish need to be available for harvest far from the terminal area. Conversely, the net groups can catch 100% of the enhanced chum salmon production and any coho or Chinook that pass through a terminal or mix stock net fisheries. In fact, to avoid over harvest by seine and gillnet gear in terminal areas the SHA's must be managed carefully to control harvest. A salmon's lack of interest in biting once in the proximity of the terminal area is a biological and genetically driven behavior, and has a profound effect on troll exploitation rates as salmon near freshwater spawning grounds, while this biological behavior of salmon has no negative effect on net group harvest rates.

An example of a program designed for trollers is informative. The Neck Lake Coho program located near Sumner Strait, is a summer returning coho of exceptional quality. Due to timing conflict with the summer Chinook season or some inherent stock characteristic, few of these coho are taken by trollers but are highly exploited by the gill fleet in district 6. Rather than 'fix' the allocation imbalance the Neck Lake program exacerbated the problem.

Joint Regional Planning Team minutes from the 1997 (page 6) document: (Mr. Ken) Duckett (SATF gillnet representative) said when the Task Force developed allocations, they realized it would take at least 10 years to bring a gear group that was out (of their allocation) into balance; he said it was designed only to trigger solutions over the long term. Dr. Amend concurred with Mr. Duckett, noting the Task Force had been aware the net gear groups would be easier to deal with.

Gear Efficiency

Gear efficiency was not discussed in the development of the Allocation Plan for an obvious reason, and that is the net groups and troll group were targeting different species. It was assumed by simply increasing production of a group's target species the fix or desired result would follow. No one believed in 1994 nor does anyone belief in 2015 that if the three gear groups were expecting to compete for the same species that gear harvest efficiency would not be a fundamental discussion point.

That is not to say trollers cannot catch significant numbers of chum. Average catch rates for chum have been as high as 250 fish per day. A hundred boats could catch 25,000 fish in a single day. Chum salmon became an important troll species in 1993 in Eastern Channel, Sitka showing a catch that year of 450,000. It was the first location where fish behavior, abundance, weather, and the troll fleet merged in perfect harmony; it would not be until 2000 and 2013 for the second and third occurrences at this level, although catches ranged from 24,000 to 300,000 during this twenty year period. The largest total return on record for Medvejie/Eastern Channel chum was 3.6 million fish in 1999, a year when only 67,000 chum were caught by the troll fishery. Abundance is a factor but not the most important factor influencing troll harvest rates on chum salmon. Price plays a large role in a troller's decisions on where they put their effort. Chum prices in 1999 & 2000 were in the $0.18/lb range.

Terminal Area Clean-up Fisheries

In 1993 when trollers had their best year on record in Eastern Channel and could harvest twenty-four hours per day, seven days per week most of the fish still got past the troll fleet and into the terminal harvest area. Over 1.1 million chum were caught by the net groups and cost recovery in Deep Inlet in 1993. Seven years later, in 2000 when the next record troll catch (450,000) occurred, three million chum were caught by the net groups and cost recovery.

Value of Enhanced Salmon - Historical Perspective

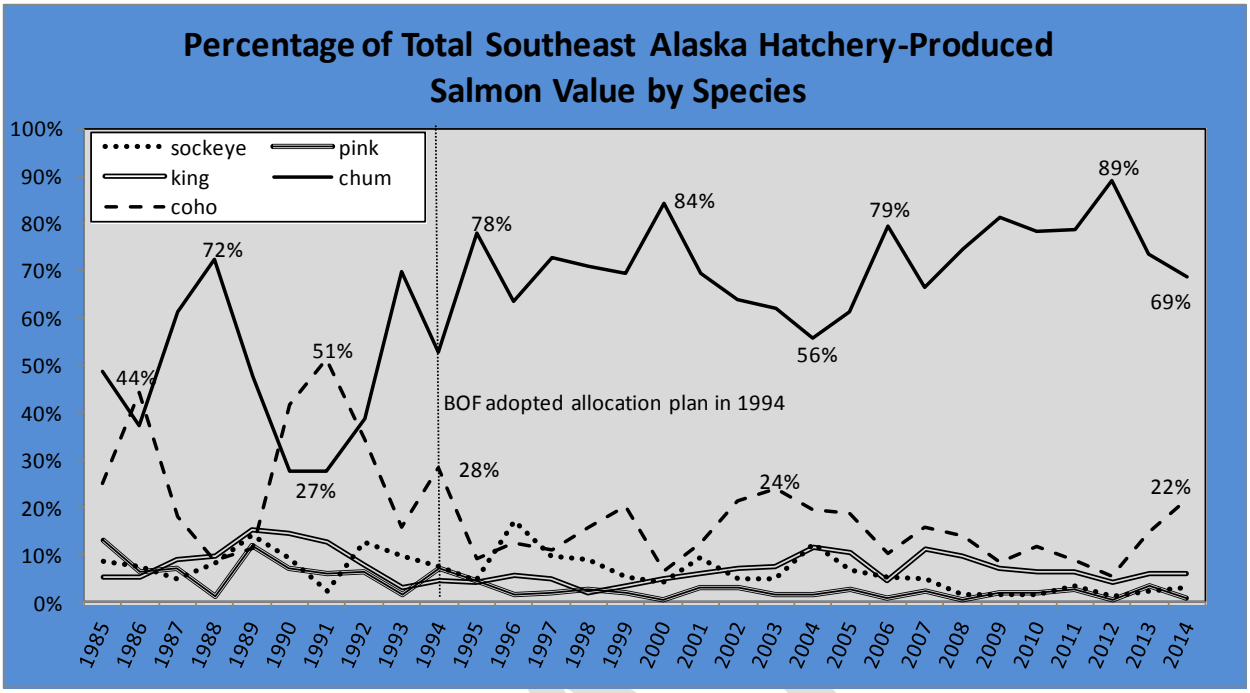


Figure 1. All gear total value for chum harvest represents about 80% in the past twenty years, whereas coho is 15% and Chinook is 5%.

In the 1997 RPT minutes (page 7), "(Mr. Tom) Fisher noted that one of their (SATF) basic faulty assumptions was that the prices for salmon increases and decreases across the board. There is a general trend in salmon prices going up and down, but chum roe can drive prices high when other salmon prices decline.

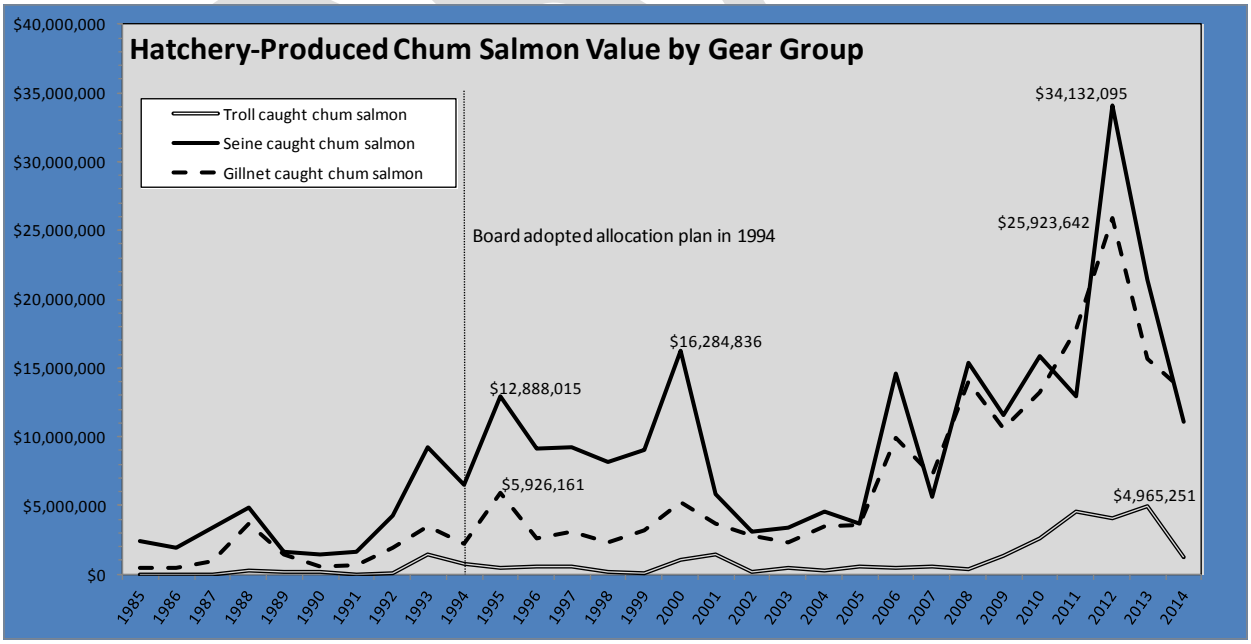


Figure 2. Chum value by gear for 1985 to 2014 shows a strong increasing trend.

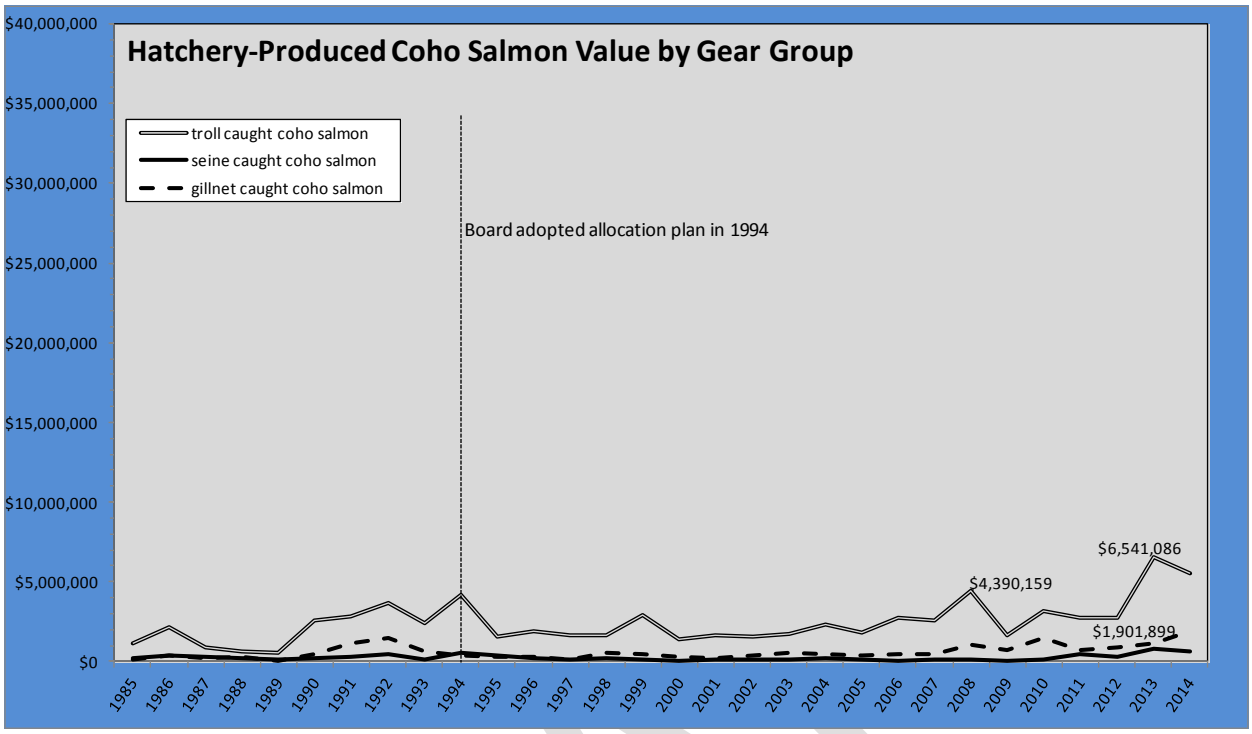


Figure 3. Coho value by gear showing high year value in 2013 for troll at $6.5 million. Note x-axis scale for graph is identical to figure 2 & 4. ADF&G data.

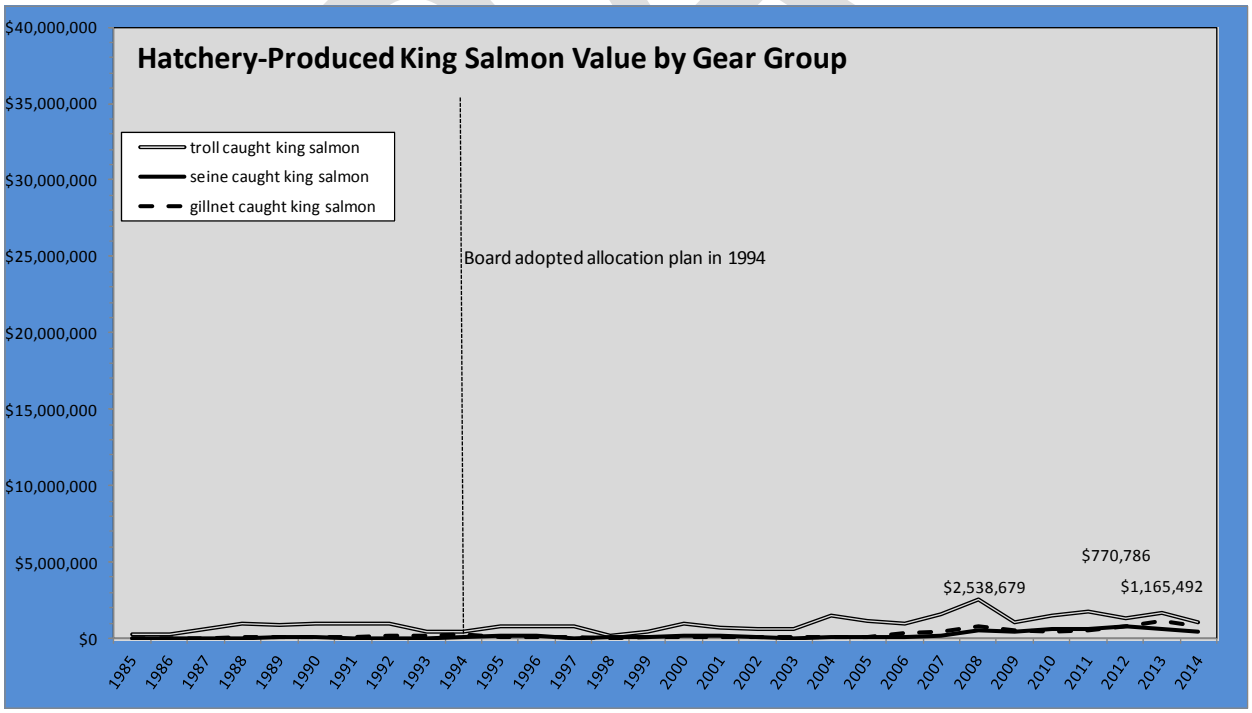


Figure 4. Chinook value by gear showing high value year for each gear group – troll $2.5 million in 2008, gillnet $1.1 million in 2013, and seine $770,000 in 2012. Note x-axis scale for graph is identical to figure 2 & 3. ADF&G data.

Exploitation Rates

Wildstock fisheries are managed for escapement, whether troll fisheries on the ocean or corridor troll, gillnet and seine fisheries. The greater the gear harvest efficiency and exploitation rate in a fishery, the more necessary time and area restrictions become. Troll fisheries occur most of the year and for much of southeast Alaska, whereas net fisheries are restricted primarily to the summer period with time and area protocols, often with one day or two days fishing per week in late June/July to four days per week in late July and August.

Enhanced fisheries are managed differently since they are located in special harvest areas isolated from most wildstocks. Unlike wildstocks, enhancement programs can sustain exploitation rates up to 95%. The result is terminal area fisheries often have seven day per week openings with the expectation that 100% of the fish will be harvested. Intense fishery management of this type also helps minimize straying.

Spring Access and Experimental Troll Fisheries

Spring Chinook fisheries, considered a mixed stock fishery, have been an important component of NSRAA and SSRAA programs. Management and fishing boundaries were developed by ADF&G managers, fishermen, and the regional associations. The spring fisheries have evolved considerably over the past twenty years to maximize Alaska hatchery catch of Chinook and at the same time minimize non-Alaska hatchery catch. Spring access Chinook troll fisheries not only increase catch but value due to low supply and high market demand in May and June. Price usually falls dramatically by the July summer opening for Chinook. These spring fisheries tend to favor local Alaskan fishermen.

The period 2005-2014, trollers harvested 385,200 Chinook in spring troll fisheries. Of this total, 138,500 (36%) were Alaska hatchery fish and 246,700 (64%) were non-Alaska hatchery fish. For each AK hatchery Chinook harvested, an additional 1.78 non-Alaska hatchery Chinook was caught – fish that may have not otherwise been harvested at the higher value. Production of Chinook even with these low Alaska Chinook exploitation rates allows for leverage to prosecute the spring fisheries. Without Alaska Chinook production the spring troll fisheries would not exist and therefore opportunity for the troll fleet during the spring time frame.

Terminal Fish are Genetically Programmed to Spawn, not Bite

The biological imperative of Pacific salmon to spawn limits catchibility for hook and line since the salmon needs to be an active participant in the ‘catch’. Salmon likely do not want to be caught in nets but are ill-equipped to avoid such gear. These factors may be obvious but help explain some of the difficulty of solving the imbalance in allocation.

Catchibility and exploitation rates were not topics considered during the three year long SATF. The expectation was to ‘produce 100,000 Chinook or one million coho and the troll fleet will catch them’. The average all gear harvest from 2005-14 has been 100,600 hatchery Chinook and 881,100 hatchery coho per year; troll harvest on these total has averaged 22,700 (23%) for Chinook and 332,800 (38%) for coho.

Enhancement: Review of the Past Twenty Years

In the past twenty years there has been very little new hatchery construction although major expansions have occurred at existing hatcheries. Program expansion has resulted from greater efficiencies and technological advances. Maximizing facility infrastructure and water use have been at the core of chum, coho, and Chinook expansions. Value to fishermen has increased steadily through the period commensurate with production increases. Infrequently, low price and poor marine survival has worked in concert to lower overall value. Nevertheless, in the past twenty years value has gone from $17.9 million in 1994 to $52.7 million in 2013. The all time record value was over $72 million in 2012.

Summary Table - Annual Value Estimates by Gear

ALL SPECIES	TROLL	SEINE	GILLNET	TOTAL	SOURCE	RANK
1994	$ 5,317,271	$ 8,876,576	$ 3,797,692	$ 17,991,540	ADFG	13
1995	$ 2,871,032	$ 14,789,338	$ 7,169,053	$ 24,829,423	ADFG	10
1996	$ 3,224,761	$ 12,061,185	$ 4,184,597	$ 19,470,543	ADFG	12
1997	$ 3,004,073	$ 10,752,998	$ 4,037,169	$ 17,794,241	ADFG	14
1998	$ 1,973,521	$ 9,277,676	$ 3,792,912	$ 15,044,109	ADFG	17
1999	$ 3,461,492	$ 10,061,642	$ 4,110,113	$ 17,633,247	ADFG	15
2000	$ 3,465,550	$ 17,113,326	$ 6,219,903	$ 26,798,778	ADFG	9
2001	$ 3,752,912	$ 7,170,159	$ 4,852,294	$ 15,775,364	ADFG	16
2002	$ 2,303,490	$ 3,645,488	$ 3,627,174	$ 9,576,152	ADFG	21
2003	$ 2,774,408	$ 3,744,188	$ 3,385,285	$ 9,903,881	ADFG	20
2004	$ 4,139,539	$ 5,498,187	$ 5,400,059	$ 15,037,785	ADFG	18
2005	$ 3,522,736	$ 4,405,236	$ 4,707,650	$ 12,635,622	ADFG	19
2006	$ 4,192,671	$ 15,109,033	$ 12,215,370	$ 31,517,075	ADFG	7
2007	$ 4,728,923	$ 6,531,971	$ 8,851,525	$ 20,112,418	ADFG	11
2008	$ 7,320,371	$ 16,158,998	$ 16,385,073	$ 39,864,442	ADFG	5
2009	$ 4,032,749	$ 12,746,563	$ 12,255,256	$ 29,034,568	ADFG	8
2010	$ 7,215,190	$ 17,451,677	$ 15,728,240	$ 40,395,107	ADFG	4
2011	$ 9,109,654	$ 15,430,492	$ 20,391,332	$ 44,931,479	ADFG	3
2012	$ 8,113,226	$ 35,570,351	$ 28,453,598	$ 72,137,175	ADFG	1
2013	$ 12,717,367	$ 20,863,723	$ 19,128,923	$ 52,710,013	ADFG prelim	2
2014	$ 7,863,185	$ 11,923,318	$ 16,772,454	$ 36,558,957	OPER prelim	6
1994-14 Total	$ 105,104,121	$ 259,182,125	$ 205,465,672	$ 569,751,918		
1994-14 Avg.	$ 5,004,958	$ 12,342,006	$ 9,784,080	$ 27,131,044		
1994-14 Percent	18%	45%	36%	100%		
2014 Percent	22%	33%	46%	100%		
Target	27-32%	44-49%	24-29%			

Table 1. All enhancement program value by gear (all species combined) for 1994 - 2014

The salmon enhancement program has contributed $570 million in exvessel value since 1994. During that period 18% of the value has gone to troll, 45% to seine, and 36% to gillnet. The 2014 estimate moves the troll fleet up a bit to 22% of the value for that year, while seine dropped to 33% and gillnet edged up to 46%.

ALL SPECIES 1994-2013	Troll	Gillnet	Seine	
NSRAA	20%	12%	68%	100%
SSRAA	22%	34%	44%	100%
DIPAC	5%	84%	11%	100%
All others AKI, Klawock, Gunnuk Cr.,	31%	20%	49%	100%
All Combined	18%	35%	47%	100%
Target	27-32%	24-29%	44-49%	

Table xxx. Allocation of salmon within NSRAA, SSRAA, DIPAC, and all others producers combined for each gear type. SSRAA comes the closest to the Allocation Plan ranges. In the 'other' grouping Klawock and Port Armstrong have large coho programs with relatively high troll exploitation rates.

Salmon enhancement organizations have developed under different circumstances and have different site selection opportunities, and therefore each produce a different mix of species and biomass. Port Armstrong for example was developed as a coho and pink salmon facility targeting their coho benefits to the troll fleet and using pink salmon returns to pay the bills. DIPAC was developed as a gillnet organization due to its location in the heart of districts 11 and 15, traditional gillnet areas and has been very effective in benefitting the gillnet fleet.

The regional associations by contrast were developed with boards of directors representing all gear groups and expected to create programs benefiting all common property fisheries. NSRAA has been successful with numerous coho and Chinook programs that benefit trollers, but far less successful getting benefits to the gillnet fleet. Deep Inlet in Sitka Sound, a traditional troll and seine area was opened to gillnetting in 1993 to provide some benefit that would not have occurred otherwise. Other than Deep Inlet and districts 11 and 15 there are no other gillnet areas within NSRAA's purview. Most of NSRAA's districts 9 through 15 are traditional seine and troll areas and the returns to each group reflect that reality.

SSRAA gear contribution proportions are close to the Allocation Plan ranges. The SSRAA programs are centrally located within both gillnet and seine districts. District 1, 6, and 8 mixed stock gillnet fisheries intercept Neets Bay, Carroll Inlet, Neck Lake, and Anita Bay returning fish. Seine fisheries in Clarence Strait, district 1, 2, and 4 also intercept the returns from the same programs. Somewhat by serendipity and partially through design the SSRAA programs attain a gear distribution balance closer to the ideal than any other individual organization.

DIPAC with a $117 million contribution to commercial fisheries is the third largest enhancement organization in southeast Alaska. Initially organized as a gillnet enhancement group it has expanded to produce a fair number of coho and Chinook for the troll fleet and now that its debt has been paid off, they have made large contributions to the seine fleet with openings at Amalga Harbor. Even so, 84% of DIPAC's value goes to the gillnet fleet.

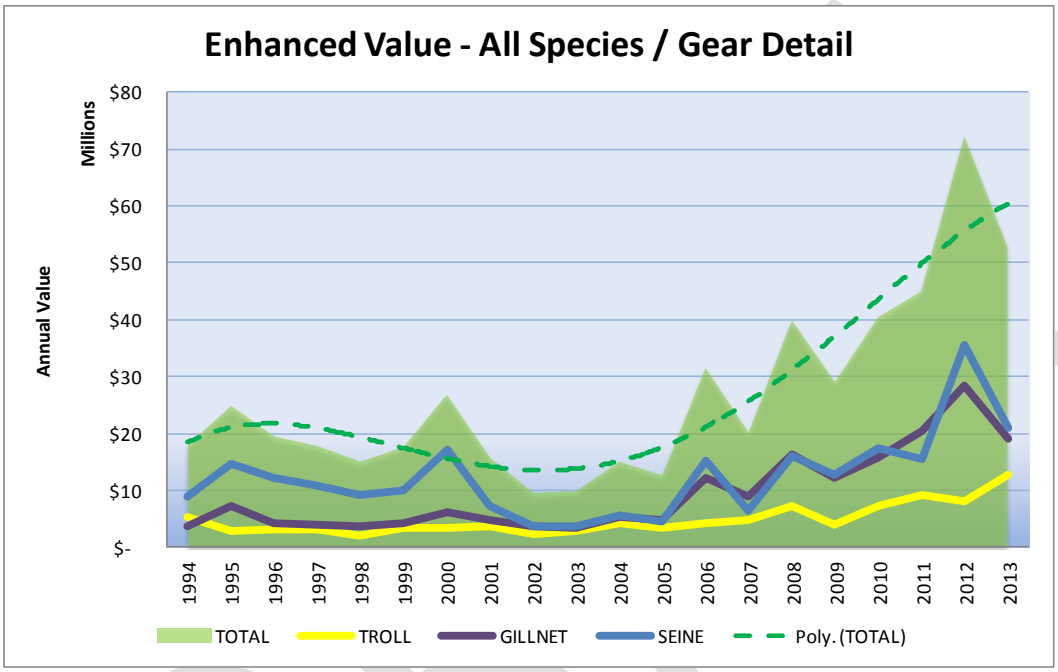


Chart xxx. Annual value for the three gear groups has gone up in aggregate and for each individual gear group. The aggregate trend line is expected to continue for the next decade and then level off by 2025.

ALL Years 1994-2013*				
	troll	gillnet	seine	Grand Total
NSRA	$ 39,611,496	$ 24,005,116	$ 137,976,704	$ 201,593,316
SSRA	$ 38,014,623	$ 57,963,518	$ 76,278,563	$ 172,256,703
DIPAC	$ 5,948,904	$ 98,062,716	$ 13,038,313	$ 117,049,933
REST	$ 13,711,132	$ 8,664,156	$ 21,861,920	$ 44,237,208
	$ 97,286,155	*$ 188,695,506*	*$ 249,155,500*	*$ 535,137,160*

Table xxx. Cumulative value by gear and by enhancement organization for years 1994 – 2013.

Southeast Allocation by Percentage, Five Year Rolling Averages

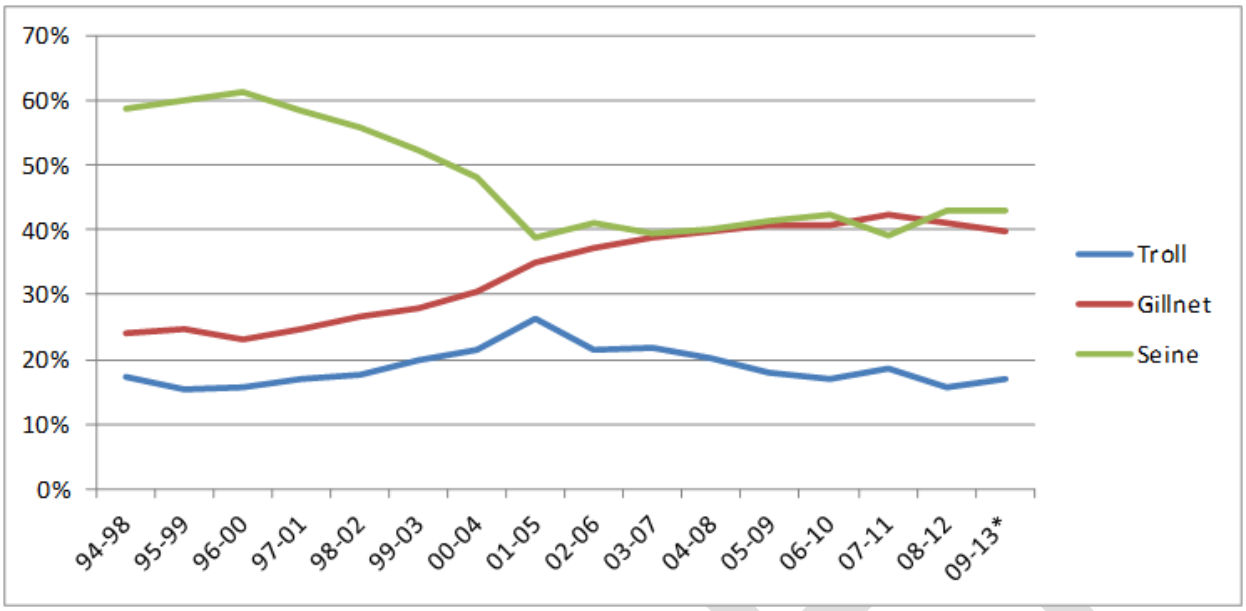


Chart xxx. Five year value rolling average as gear group percentage of total value.

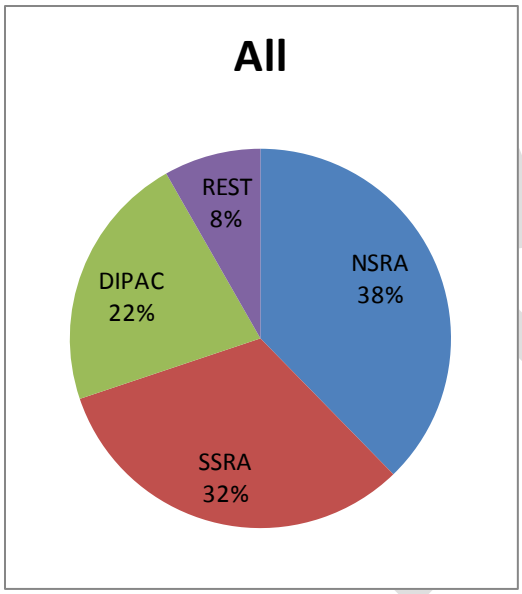


Chart xxx. Proportion of total enhanced value by organization. Rest is composed of Pt Armstrong, Klawock, and Gunnuk Creek hatcheries.

Programs & Management Strategies Implemented
to Address Troll Imbalance

Considerable planning and effort has gone into creating new coho, Chinook, and chum programs to improve troll opportunities, value, and harvest in the past twenty years. Many millions of dollars have been spent for new raceways, net pens, incubation space, and other infrastructure to support new salmon production specifically for the troll fleet. Beyond that there have been numerous management changes to increase troll access and opportunity. The following is a bulleted summary of program development, costs, and management structuring by agency to address the troll allocation imbalance.

Northern Southeast Regional Aquaculture Assoc Capital and Operational Changes

Capital Expenditures to Increase Troll Fish since 2000:

- Created new chum production at Crawfish Inlet in 2014 with troll priority, $1.9 million capital outlay
- Create new chum production at S.E. Cove, Kuiu Island in 2012 with troll access priority, $1.5 million outlay so far
- Construction of Sawmill Creek Hatchery for 2 million smolt capacity, $3.0 million construction
- Increase coho production at Hidden Falls from ~2 million to 3 million smolt, construction of new rearing and incubation building at HF to accomplish, $1.2 million capital investment
- Increase coho production at Deer Lake from 1 million smolt to 2.5 million smolt. Capital investment of $200,000 and $550,000 annually operating costs

Program Changes to Increase Troll Fish since 2000:

- Shift 400,000 Medvejie Chinook smolt production release to HPR at troller request
- Shift majority of 2.5 million Medvejie Chinook production to Green Lake where marine survival is highest
- Shift production at HF by decreasing chinook and increasing coho due to a tripling of benefit to cost
- Expansion of Deer Lake project from 1 million to 2 million, and then to 2.8 million fry stocking; consistent production of 2 million smolt, operational cost $200,000
- Stock surplus coho fry in Cliff Lake and Banner Lake
- Backfill shortfalls at Crystal Lake Chinook program with HF Chinook eggs, numerous years
- Obtain permit increases for chum release at Medvejie from 7m to 10m to the current 20m, operational costs $100,000

Management Changes to Increase Troll Fish since 2000:

- Shift line within Deep Inlet during May and June to provide greater area for Chinook troll drag
- Provide for trolling in Eastern Channel during coho troll closure (BoF ~2003)
- Extend troll season in Hidden Falls terminal harvest area every year ADFG extended troll season beyond September 20

- Allow additional coho troll area at Kasnyku and Mist Cove THAs

Southern Southeast Regional Aquaculture Assoc Capital and Operational Changes

- Assume the operation of Deer Mountain Hatchery, including retrofitting the building and fish culture equipment to produce 500,000 chinook a year. Historically KIC produced less than 100,000 fish a year, primarily summer coho. Annual operating budget of about $200,000 a year. Capital costs have been covered by several grants to date, but there will be some expenses on finishing the project. Hatchery will release 100K smolt from Whitman Lake this spring (2015) and accept between 400K and 500K juveniles from Whitman Lake later this spring (2015)

- Reestablish the Carroll Inlet SHA including releasing 400K to 600K Chinook smolt annually. The cost of running the site and tagging the fish will be about $30K to $40K a year, which would also include fish transport. The first release in Carroll Inlet, if all goes well, will take place in the spring of 2016. The first fishery in the SHA should occur in 2018 or 2019.

- Underwrite the POWHA program up to $500K a year through 2016 (2014 through 2016 for a total of $1.5 million). DIPAC has granted two $500K grants toward this program to be administered through SSRAA. In addition to the funding, SSRAA has assisted POWHA with administrative and technical support for the past 5 years or more. POWHA annually releases between 4 and 5 million fall coho smolt. SSRAA is entered in a long term deliberation as to whether to assume the operation of the Klawock Hatchery. If SSRAA takes this course it will involve resolving the $5 million debt owed by POWHA to the State as well as a $700K a year operating budget. If SSRAA does not either take over the facility or continue to underwrite the program, the hatchery association, POWHA, will be bankrupt within several months of that decision.

- Annually provide about 300K Chickamin stock chinook eggs to POWHA for the Port St. Nick hatchery. The fish are released at Port St. Nick and in Coffman Cove. This has been ongoing for the past 7 or 8 years. There is some cost to SSRAA as the required broodstock could have otherwise been sold for cost recovery or caught in common property fisheries.

- Increase fall coho production by 2 million smolt a year. These increases began with SSRAA's 5-year project in Bakewell Lake about 9 years ago. The project involved 500K to 1 million smolt a year that were reared and released in Bakewell Lake. It was a cooperative project with the USFS. With a change in local personnel that project fell out of favor when the 5-year contract was over – Bakewell Lake lies partly in Misty Fjords Wilderness and current USFS no longer support our presence there. The production was to be moved to Connell Lake near Ketchikan.

This was part of the fisherman's agreement preceding the BOF meeting 6 years ago…that SSRAA would increase annual fall coho production by about 1 million smolt. Ultimately the USFS and AK DNR could not decide who had permitting authority for Connell Lake (a reservoir), and though permitted by DNR it was not considered compatible with the current public use designation for Connell Lake. Subsequently, SSRAA increased annual fall coho production by 2 million smolts that are reared in Neck Lake and transported for release at Anita Bay, Nakat Inlet, and Neets Bay.

- Assume full cost of Whitman Lake chinook production despite the loss of $200K a year in state funds in 2014 forward.
- Continue operation of Crystal Lake Hatchery at about $300,000 a year to SSRAA. The original cost to SSRAA was less than $200K a year. The State contribution has been fixed for the past 12 years with all increases in cost going to SSRAA. Crystal Lake is a chinook hatchery.

Management Changes:

- Include trollers in the Kendrick Bay SHA (SSRAA proposal to BOF 2015).
- Open the outer portion of the Neets Bay SHA to chum troll from 2011 forward.
- Propose/Support other troller proposals to leave an area of Behm Canal adjacent to Neets Bay open to coho harvest through September regardless of the general troll closure at an earlier date.
- Open large portions of the Neets Bay SHA to troll in September for fall chum and coho harvest.
- Reestablish the Carroll Inlet SHA for chinook trolling, through spring RPT 2015.

Program changes/issues:

- 1998, added 140,000 coho smolt to Neets Bay release.
- 1999, rear and release 250,000 chinook smolts in Long Lake (drains into Neets Bay).
- 1999, active and intense lobbying effort with governor to keep CLH open when the current SF Director proposed closing the site. Found funding to continue the program through 1999. Negotiated SSRAA's operating the site for SF Division in 2000 with State Administration and Legislative support. At the time SSRAA assumed 1/3 of the direct operating expenses at the site with the State paying 2/3 the cost. Costs have increased since 2000. Currently it costs SSRAA more than $300K annually with the state paying a fixed cost…SSRAA's increase has been more than $100K a year.

- 2001 Increase fall coho production/release by 100,000 fish at Nakat Inlet (most of these fish are caught by trollers).
- 2002 SSRAA adopts a Neets Bay Management Plan that sets 3 priorities: broodstock, cost recovery, and a chum troll harvest of at least 200,000 fish. The chum troll fishery in 2003 harvested 171,000 fish, which was all they were able to harvest (SSRAA did not constrain the harvest)
- 2006 add 8 million summer chum to Anita Bay release and 1 million to Neets Bay.
- 2006 provide 250K to 300K chinook eggs to POWHA for the Port St. Nick facility – release at Port St. Nick and Coffman Cove.
- 2008 Initiate the Bakewell Lake coho project with the USFS (500,000 to 1 million coho smolt annually).
- 2009 Joint RPT/Fisherman's proposal for the BOF: retrofit Burnett Inlet Hatchery to accommodate 22 million additional summer chum; increase the release of summer chum at Neets Bay by 12 million smolt (61 million overall from 49 million); propose a fall coho project for 1.2 million smolt to be reared in Connell Lake (ultimately was not permitted and production was moved to Neck Lake); and, actively promoted the chum troll fishery in Neets Bay involving gaining a commitment from fishermen and subsequently for tendering from Ketchikan processors.
- 2011 redefine a Neets Bay Harvest Fund (reserve) that would insure a chum troll fishery even if this caused SSRAA to fall short of cost recovery. The cost recovery shortfall, if caused by overharvest (primarily intended for chum troll), would be paid from the fund. Since this time (and before) SSRAA has designated a chum troll target as part of its annual budget process. The forecasted return to Neets Bay is often exceeded by the total of fish designated for chum troll, broodstock and cost recovery. Broodstock is the single priority, but chum trolling will not be curtailed until their annual target is hit. This is a management target…the point at which the chum fishery may be curtailed by SSRAA, but it will not be curtailed at any point short of that target.

Douglas Island Pink and Chum Capital and Operational Changes

Capital Expenditures

- Expanded Macaulay Salmon Hatchery in 2012-2013 to maintain king production & restore coho production to previous levels ($3 million).

Program Changes

- Transferred ADF&G Chinook program from Snettisham Hatchery to Macaulay Salmon Hatchery in 1994. Increased production from 250,000 to 600,000 smolts; total operational costs $350,000. Abandoned plans to increase coho production and reduced existing production by 200,000 in order to accommodate extra Chinook.
- Initiated Skagway Chinook program in 1998. Increased Chinook production from 600,000 smolts to 900,000 smolts; total operational costs $500,000. Reduced coho production by an additional 300,000 to accommodate extra Chinook.
- Increased coho production from 500,000 smolts to 1,000,000 smolts; operational costs $400,000.

Management Changes

- Allocated $6 million to NSRAA over last three years to reduce cost recovery and increase common property access in THAs as well as assist in development of new enhancement.
    - 2013: $1.5 million for Deep Inlet cost recovery.
    - 2014: $2.5 million for the following:
        - $1.5 million for Deep Inlet cost recovery.
        - $500,000 for portion of Hidden Falls cost recovery.
        - $450,000 for capital costs for infrastructure development at Southeast Cove.
        - $50,000 for 2013 Deep Inlet cost recovery shortfall.
    - 2015: $2 million for all Deep Inlet and a portion of Hidden Falls cost recovery.
- Allocated $2.5 million to SSRAA over last two years reduce cost recovery and increase common property access in THAs as well as provide financial support for Klawock Hatchery.
    - 2014: $2 million for the following:
        - $1.5 million for Neets Bay cost recovery fund.
        - $500,000 for Klawock Hatchery operations.
    - 2015: $1 million for the following:
        - $500,000 for Neets Bay cost recovery fund.
        - $500,000 for Klawock Hatchery operations.
- Supported development of directed troll chum fishery at Homeshore, Icy Strait and Hawk Inlet.
- Provided otolith reading of Homeshore troll-caught chums at the request of the Chum Trollers Association in order to provide ADF&G with necessary information to manage fishery and improve access to hatchery chums.

Armstrong-Keta Capital and Operational Changes

Capital Expenditures to Increase Troll Fish:

- Expansion of the Port Armstrong chinook and coho programs in 1993-1997: $1.18m US/Canada mitigation capital funds plus $453,000 in associated operations funds.
- Initiation of the Port Armstrong chum program (ultimately directed at a Port Lucy troll terminal harvest) with construction of new incubation building in 2003-2005: $1.46m Southeast Sustainable Salmon Fund grant.

- Expansion of the Port Armstrong coho program in 2003-2005: $670,00 Sustainable Salmon Fund grant.
- Coho and chinook handling equipment in 2007-2008: $28,000 Fisheries Economic Development grant, plus $9,000 in AKI matching funds.
- Additional net pens for Port Armstrong coho program in 2007: $133,000 Fisheries Economic Development grant, plus $44,000 in AKI matching funds.
- Facilities upgrade for the Port Armstrong coho and chinook programs in 2011-2013: $631,000 Chinook Mitigation Fund grant.
- Expansion and improvement of Little Port Walter facilities in order to move the Port Armstrong chinook program to LPW, creating space for additional coho production at Port Armstrong in 2014-2015: $201,000 Chinook Salmon Hatchery Enhancement Fund grant.
- Additional troll facility capital improvements for coho and chinook incubation building, saltwater pump system, rearing water system additions, raceways, net pens and feed storage, 2000-2015: $1.45m in AKI funds.

Program Changes to Increase Troll Fish since 2000:

- Shift production at Port Armstrong by decreasing chinooks to approximately 200,000 annually and increasing cohos proportionally, using the rearing facilities to triple the benefit to trollers for the same cost.
- Initiation of a chinook zero check program in 2005, eventually releasing 20g smolts of Unuk River stock in early May by utilizing surplus heated water from the Port Armstrong hydropower load banks to accelerate incubation.
- Support both financially and in-kind for the Keta River chinook stock remote egg takes and rearing in 2014 and 2015 at Little Port Walter.
- Provide showers and laundry facilities and serve countless dinners to trollers at the Port Armstrong Hatchery manager's residence since 2007.

Management Changes to Increase Troll Fish since 2000:

- Removal of the infamous Port Armstrong gut harvest barrier net from 2009 on.
- Open Port Armstrong SHA except for a small broodstock reserve area annually since 2011 for trolling during the chinook cost recovery season.
- Permit retention of chinooks 26" or larger in the Port Armstrong SHA annually since 2011.
- Extend the coho troll season in the Port Armstrong SHA past the ADF&G September fall closure in 2014 with plans to continue to do so in the future.
- Obtain a permit increase of 30 million chums in 2015 for release at Port Lucy and establishment of a troll terminal harvest.

Joint Regional Planning Team Recommendations, a Selected History

The following is a small selection of annual recommendations to the commissioner from the JRPT. These excerpts demonstrate the extent and seriousness that the RPT members brought to the discussion regarding allocation. The complete text of JRPT letters to the commissioner are presented in Appendix XXX

May 1997, started discussing roe and value calculations and two motions were made:
Wyman moved and Mecum seconded the Joint RPT direct the regional associations to work collectively to resolve what should constitute the value of the enhanced salmon used for the Southeast allocation plan and Fisher moved and Bigsby seconded the motion to request the original Allocative Task Force look at the different levels of participation in the fishery (total permit in a gear/active participation) and factor those in when deciding the allocative percentages per gear group.

April 1999 letter to the commissioner – JRPT
Allocation of enhanced fish: Most of the day-long meeting was dedicated to a discussion of the status of allocation. This was the first consideration for submitting BOF proposal(s) that addressed the troll imbalance.

Meeting December 7, 2004
Allocation of Enhanced Fish Task Force meeting chaired by Ken Duckett. Value calculation delivered by CFEC Kurt Iverson. All day meeting.

December 2008 – Workshop to discuss the allocation situation including considerations of reasons for the current imbalance, modeling what would happen if Hidden Falls Hatchery returned to standard survival rates, and modeling what would occur if one or more special harvest area management plans were changed.

December 2009 – *Industry members of the RPT would like to state that this is the first time since 1994 where both net fleets are significantly out of their ranges in opposite directions. It is the first time the joint RPT has needed to consider recommending changes in SHA rotations. The JRPT recognizes that there may be a better and timelier alternative than the Board of Fish process for continually readjusting the management of rotational fisheries. The joint RPT will consider alternatives and may have a recommendation by the 2012 board meeting that will allow significant adjustments in SHA's without requiring board of fisheries action. These adjustments would be conducted within the current Southeast Enhanced Allocation Plan and would not make any changes to the allocation ranges. If the RPT cannot come up with a plan the RPT will submit Board of Fish proposals as appropriate for the gear groups based on the current situation within the allocation plan. (Industry Consensus 12/9/08) (AGENDA LEADIN 12/10/09)*

December 2011 – Industry consensus to support proposal 325, chum access in districts 9, 12, & 14.

April 2014 Letter to the Commissioner excised selection

Efforts continue to be made to improve chum salmon harvest opportunities for the troll fleet and the troll fleet is increasing its success at harvesting chum salmon.

SSRAA has established a Neets Bay Harvest Fund, which is intended to provide regular and increased chum salmon harvesting opportunities for trollers. DIPAC has contributed to this fund. The fund will also increase opportunities for net fishermen, but will likely help seiners more than gillnetters.

Hatchery operators continue to increase production of Chinook and coho salmon, which are the targeted troll species.

Cost of Production: Coho/Chinook Smolt vs Chum Fry

The capital and operational costs of Chinook and coho production are significantly higher due to the requirements of freshwater rearing environment; an environment that is not necessary for chum salmon. Capital costs for Chinook/coho is approximately 80% of hatchery construction costs, while annual operational costs of production are close to 50%. Looking at costs by individual fry/smolt release the differential is tremendous, about one cent per chum fry compared to $0.30 per Chinook and $0.15 per coho.

Program Costs	Annual Budget	Proportion for coho/chinook
NSRAA	**$7,000,000**	**46%**
SSRAA	**$9,000,000**	**50%**
DIPAC	**$5,000,000**	**45%**
Armstrong Keta	**$4,000,000**	**50%**
Total	**$25,000,000**	**$12,000,000 (48%)**

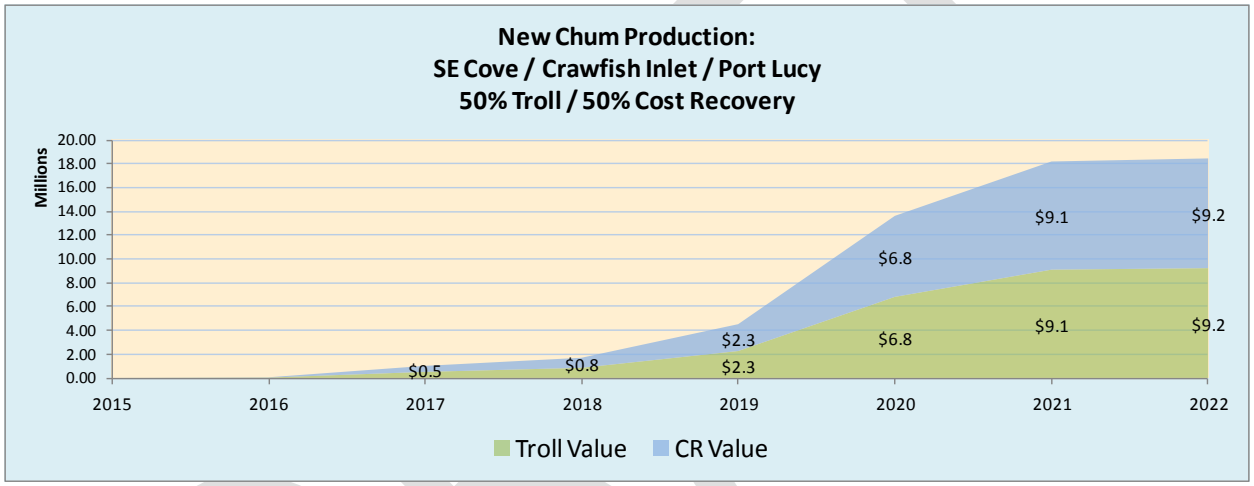
When looking at the costs of production versus the value of returns to commercial fisheries the differential or benefit to cost is also stark: Chinook 1:1, coho 4:1, and chum salmon 8:1.

Future Salmon Production

New chum salmon programs are in the works that are expected to benefit the troll fleet significantly. These programs were specifically designed to avoid net harvest and provide troll opportunities – Southeast Cove (2013), Crawfish Inlet (2015), Port Lucy (2016), and Port Assumption (2017). Coho and Chinook programs are mature and not expected to expand with the exception of Sawmill Creek

Hatchery where smolt production will increase from its current 500,000 smolt to two million smolt by 2017.

In a general sense these programs can be considered an experiment that will test whether additional production with an emphasis toward terminal area troll harvest can move the trollers into their allocation range. The total fry production of these chum programs is about 140 million or 3.5 million adults valued at $16.8 million. This value if harvested primarily by trollers could easily move the trollers into their allocation range; this assumes the cleanup is conducted for cost recovery revenue, not harvested by the net fleets. Alternatively if there are surplus terminal fish that are not needed by aquaculture associations for their operational and capital revenues, operators will be forced to open these terminal areas to the net groups.

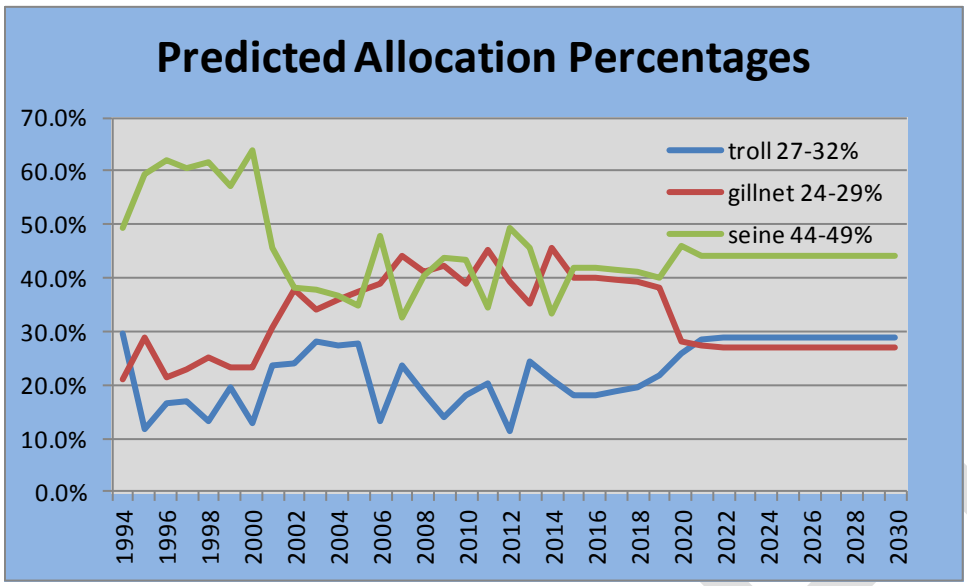


			2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
50%	SEC	Fish				-	5,144	108,029	173,190	297,509	717,623	931,109	943,113
	CRAW					-	-	-	7,716	169,760	414,112	509,281	514,425
	AKI					-	-	-	-	15,433	324,088	504,137	514,425
	Troll Fish					**-**	**5,144**	**108,029**	**180,906**	**482,702**	**1,455,823**	**1,944,527**	**1,971,963**
7.8	SEC	Value				$ -	$ 24,075	$ 505,577	$ 810,528	$ 1,392,343	$ 3,358,475	$ 4,357,591	$ 4,413,767
$ 0.60	CRAW					$ -	$ -	$ -	$ 36,113	$ 794,478	$ 1,938,045	$ 2,383,434	$ 2,407,509
	AKI					$ -	$ -	$ -	$ -	$ 72,225	$ 1,516,731	$ 2,359,359	$ 2,407,509
	Troll Value					**$ -**	**$ 24,075**	**$ 505,577**	**$ 846,641**	**$ 2,259,046**	**$ 6,813,250**	**$ 9,100,384**	**$ 9,228,785**

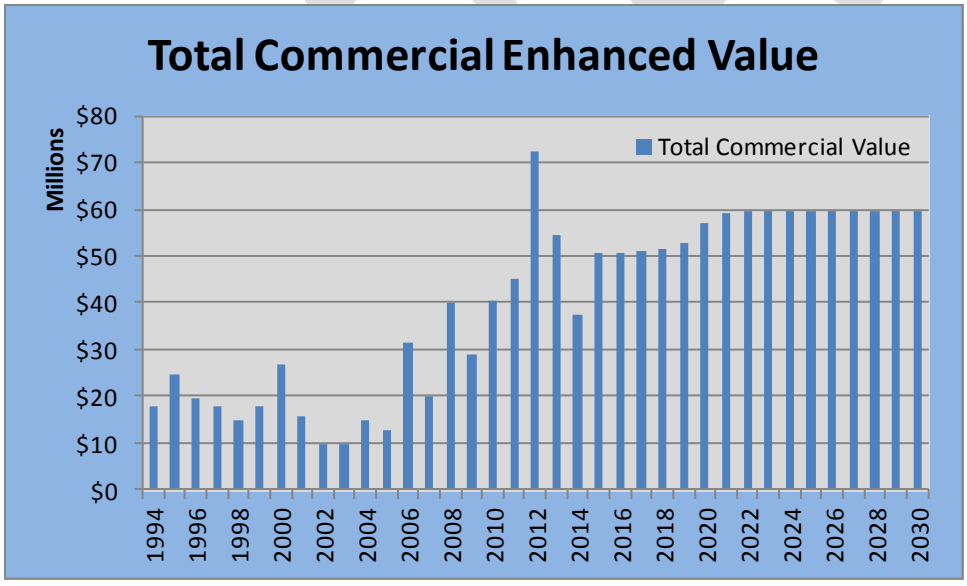
Table and Graph xxx. Three new chum projects – Crawfish Inlet, Southeast Cove, and Port Lucy (AKI) have been permitted and are at various stages of development. The first 3 year olds return to SE Cove in 2015. Value to trollers is based on a fifty percent exploitation rate; full value expected beginning in 2021.

The best case scenario is the troller fleet will increase their gross revenue and attain their allocation range; worst case scenario trollers will increase their gross revenue but not attain their allocation. Both scenarios increase the size of the pie significantly to float all boats higher.

Enhanced Allocation Tables and Graph Projections for 2020 & 2025



Graph xxx. Troll, gillnet, and seine allocation percentages, actual for 1994 – 2013 and predicted for 2014 – 2030 based on new chum production at Crawfish Inlet, SE Cove, and Port Lucy. Predicted values use the recent five year averages and assume status quo for all other programs and harvest. Trollers are predicted to be in their allocation range beginning in 2021.



Graph xxx. Total commercial value of southeast Alaska enhanced salmon 1994 – 2013 actual and 2014 – 2030 predicted with the additional production of new projects Crawfish Inlet, Southeast Cove, and Port Lucy. Value is expected to average close to $60 million annually beginning in 2021.

Wild Coho Allocation Accounting and Discounting

Table showing Board of Fish designated allocation percentages of coho among gear groups and actual results in percent and catch averages. Note the past ten year average shows trollers 7% above their prescribed allocation.

	Seine	Gill net	Set net	Troll	Total
Allocation	19%	13%	7%	61%	100%
1962-2013	333,425	262,305	141,388	1,238,144	1,975,262
2004-2013	294,993	312,316	127,399	1,581,723	2,316,431
1962-2013	17%	13%	7%	63%	100%
2004-2013	13%	13%	5%	68%	100%

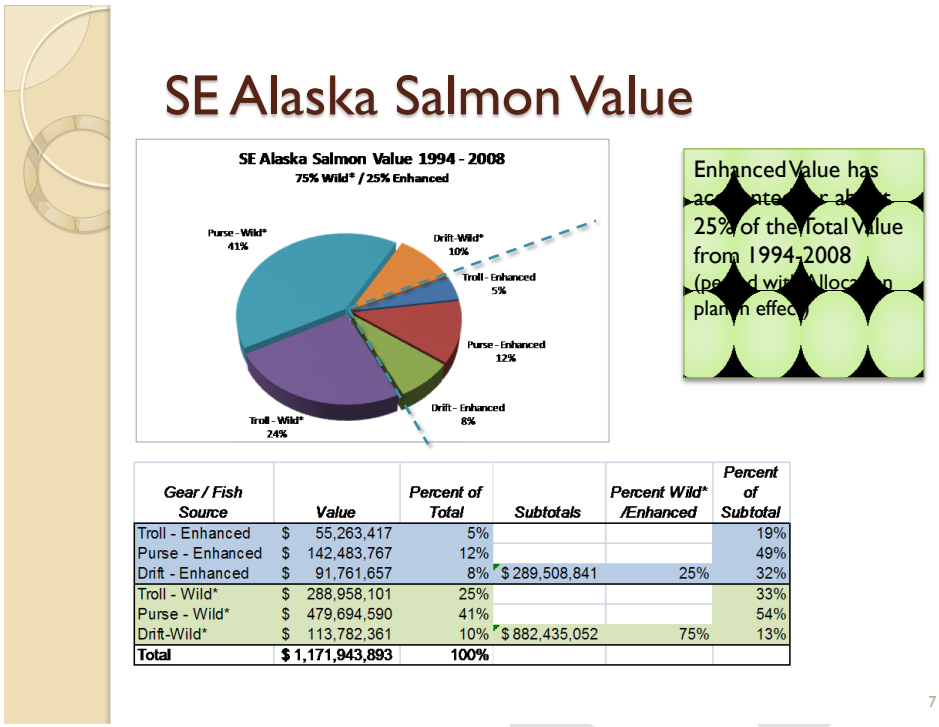
The last ten year cumulative overage of wild coho allocation is 1.62 million fish or 11.3 million pounds for a value imbalance of $19.9 million using a seven pound average and $1.75/lb.

Alternative Models for Allocation (THIS SECTION TO BE UPDATED THROUGH 2016)

A Rising Tide Perspective

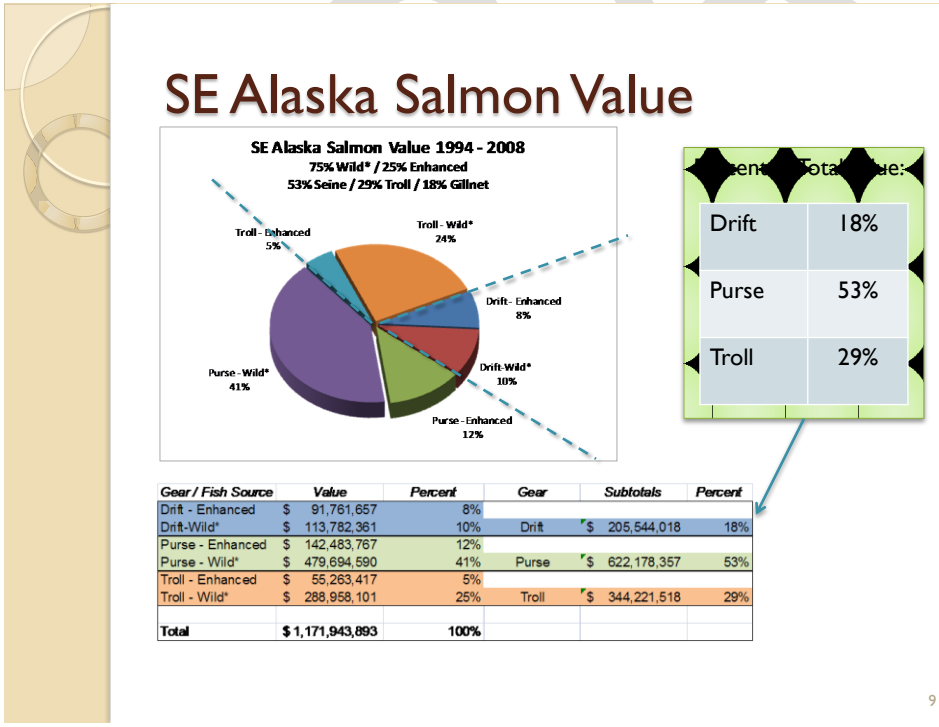
The Allocation Plan is based solely on the value of enhanced salmon, while salmon fisheries of southeast Alaska operate in a more encompassing context. Overall, enhancement represents 25% of the total salmon value in commercial fisheries, wild capture fisheries the other 75%. These proportions do not represent the magnitude of importance for individual gear types. The troll fleet gets 84% of its harvest value from wild salmon whereas the gillnet fleet derives only 55% of their value from wild harvest. The seine fleet derives 77% of their value from wild stock fisheries and 23% from enhanced salmon, close to the overall value that enhanced salmon represents when all salmon and fisheries are combined – 75% wild and 25% enhanced.

The gillnet fleet is more dependent on the enhancement program for its livelihood than either the seine or troll fleets. An alternative method for viewing allocation is combining wild and enhanced salmon in its entirety. As noted enhanced salmon represents 25% of the overall value but is distributed among the three groups disproportionately. When viewed this way, coincidentally perhaps, the percentages come close to falling within the Allocation Plan ranges, gillnet 18% (range 24-29%), seine 53% (44-49%), and troll 29% (27-32%). The following graphic illustration provides a look at the value numbers for wild and enhanced in southeast Alaska.



Gear / Fish Source	Value	Percent of Total	Subtotals	Percent Wild* /Enhanced	Percent of Subtotal
Troll - Enhanced	$ 55,263,417	5%			19%
Purse - Enhanced	$ 142,483,767	12%			49%
Drift - Enhanced	$ 91,761,657	8%	$ 289,508,841	25%	32%
Troll - Wild*	$ 288,958,101	25%			33%
Purse - Wild*	$ 479,694,590	41%			54%
Drift-Wild*	$ 113,782,361	10%	$ 882,435,052	75%	13%
Total	**$ 1,171,943,893**	**100%**			

Fig. 1 Enhanced salmon represents about 25% of the total commercial salmon catch which has been documented in this report. However, the wild component of the harvest is distributed differently than the enhanced portion. The gillnet fleet gets a small sliver of their value from wild fish (13% of total wild), whereas the troll fleet gets 33% of wild salmon pie; seine 54%. The seine fleet harvests a similar proportion of wild and enhanced.



Gear / Fish Source	Value	Percent	Gear	Subtotals	Percent
Drift - Enhanced	$ 91,761,657	8%			
Drift-Wild*	$ 113,782,361	10%	Drift	$ 205,544,018	18%
Purse - Enhanced	$ 142,483,767	12%			
Purse - Wild*	$ 479,694,590	41%	Purse	$ 622,178,357	53%
Troll - Enhanced	$ 55,263,417	5%			
Troll - Wild*	$ 288,958,101	25%	Troll	$ 344,221,518	29%
Total	**$ 1,171,943,893**	**100%**			

Figure 2. Perhaps coincidentally, the distribution of enhanced plus wild catch falls close to the enhanced allocation percentages for the three gear groups.

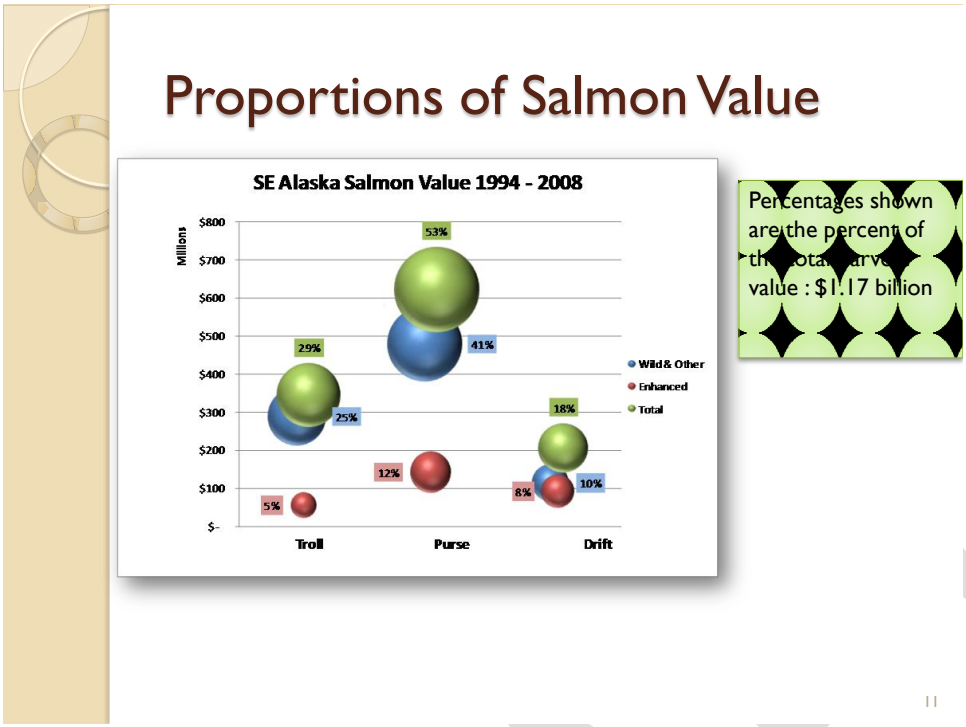


Figure 3. It is evident that enhanced salmon is most critical to the gillnet fleet in the sense that it makes up nearly half of their total value. Conversely, seine total value is less sensitive to enhanced salmon, primarily due to importance of wild pink salmon to their gross revenue.

Using the SATF allocation ranges and combining enhanced and wild value the graphic results follow.

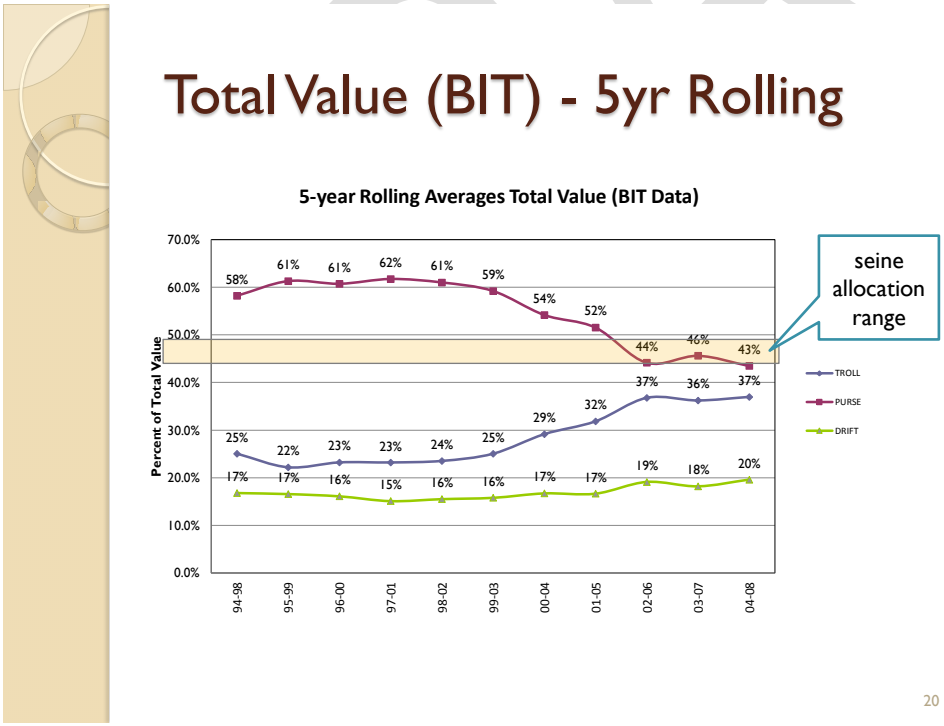


Figure 4. Total seine value puts the seiners in the lower range of their allocation for the 2003 to 2009 five year rolling average periods.

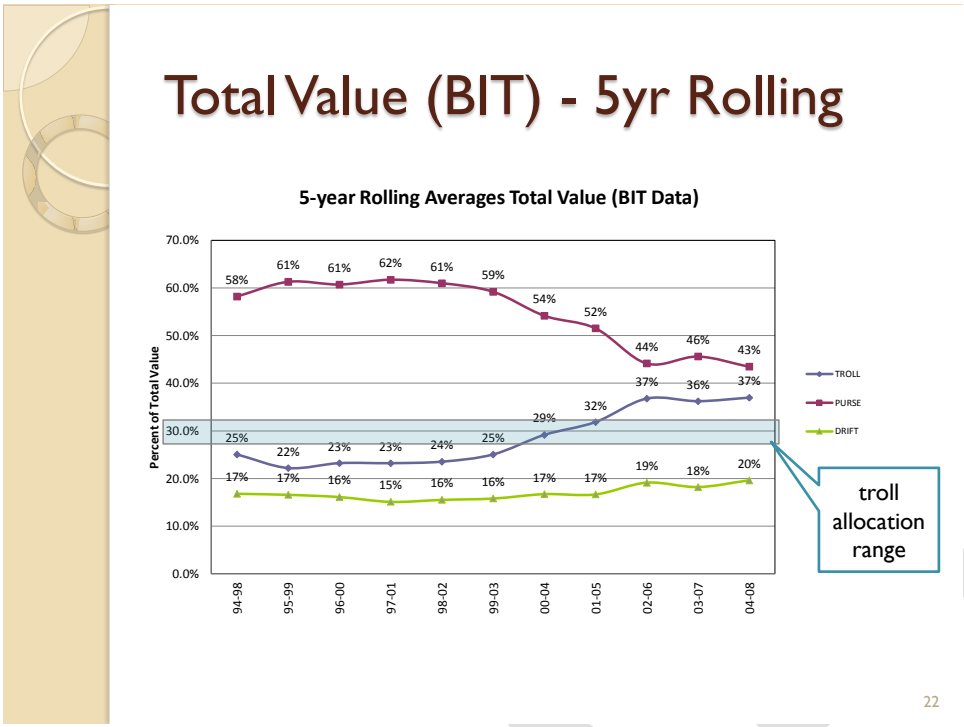


Figure 5. Total troll values show the trollers above their range for the 2002 to 2009 period; the rolling average is 36% to 37%. The increasing trend from 1994 is being driven by lower chum survivals at Hidden Falls and Deep Inlet but also by high troll prices for coho and Chinook in recent years.

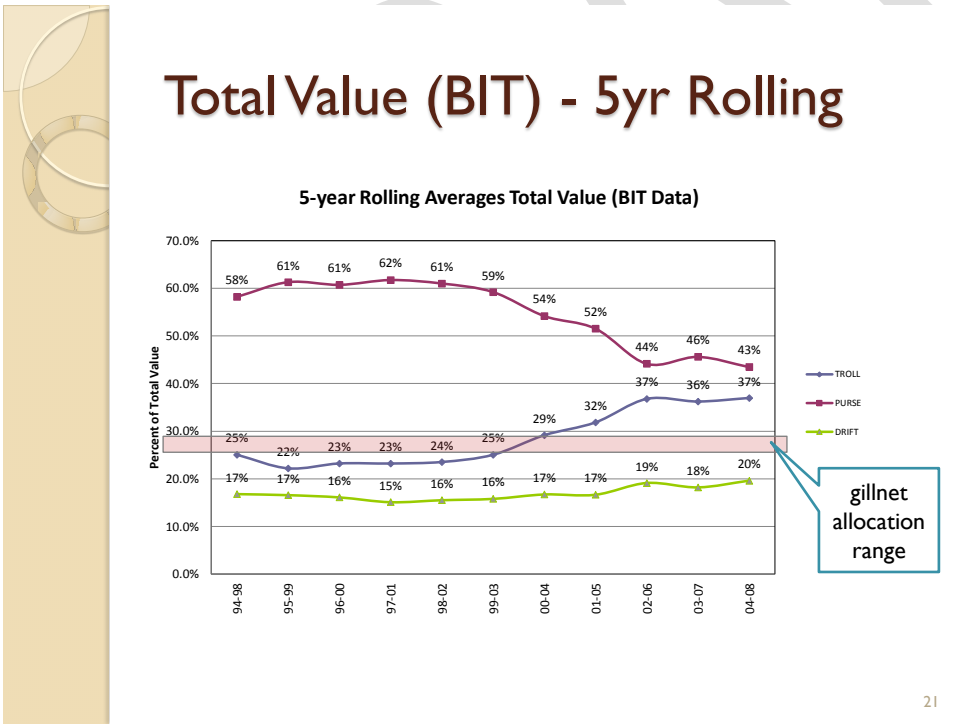


Figure 6. Total gillnet value by percentage creates a contrary allocation reality for the gillnet fleet. They show a relatively low proportion of value and which is well below the enhanced allocation range. The period from 2002 to 2009 shows the rolling average is 18% to 20%.

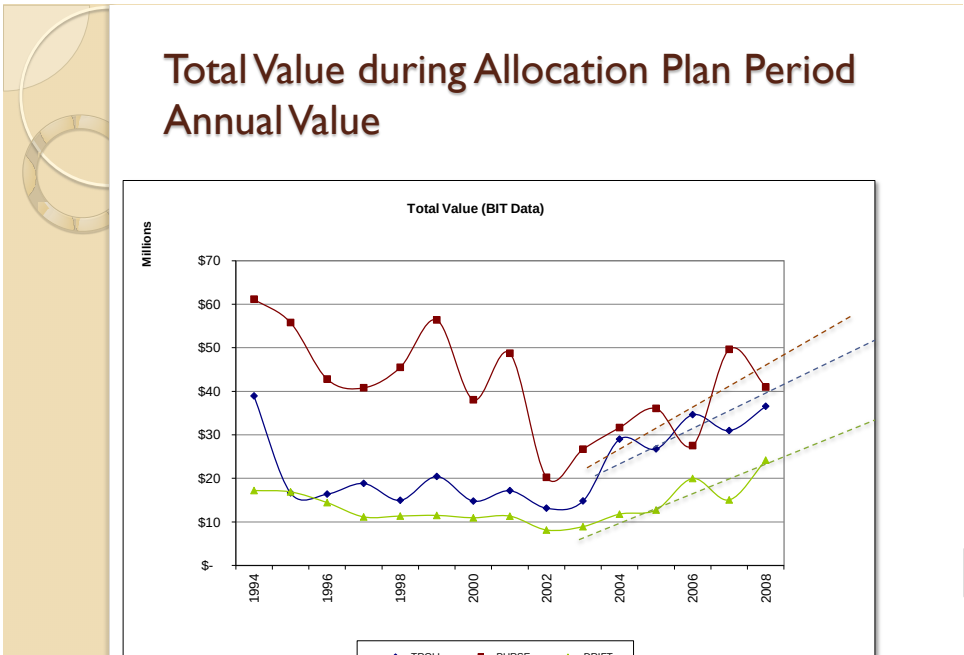


Figure 7. Total salmon value has trended up for all three gear groups since the low period of 2001 and 2002.

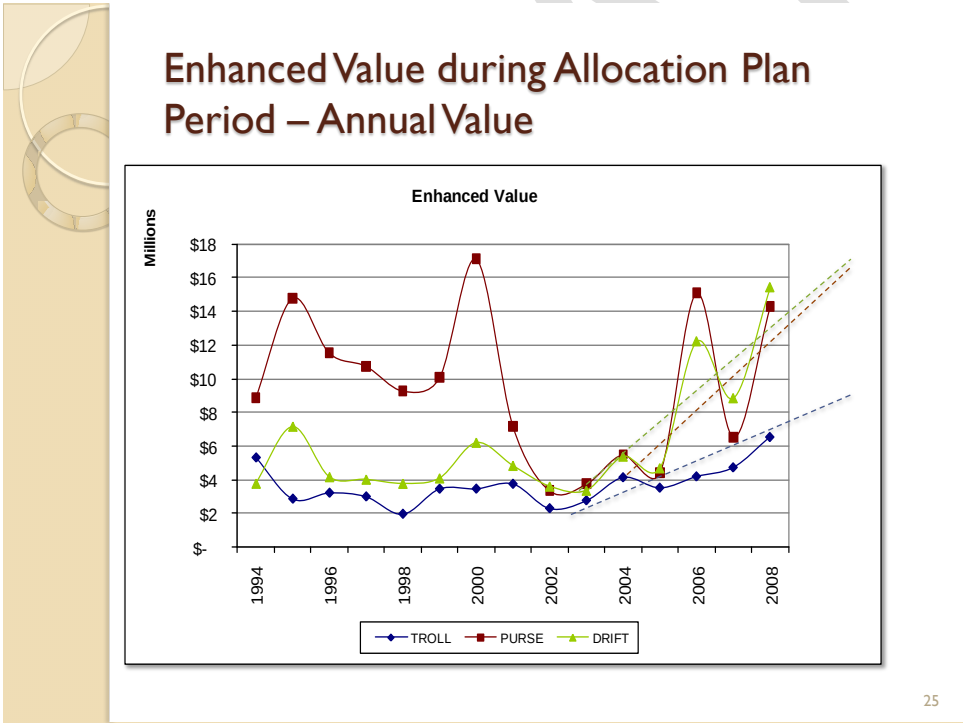


Figure 8. Enhanced value has demonstrated an even steeper increase in value than total wild and enhanced value. Filtering just for the net groups the increase in enhanced value shows a dramatic increase driven by the success of DIPAC's chum program.

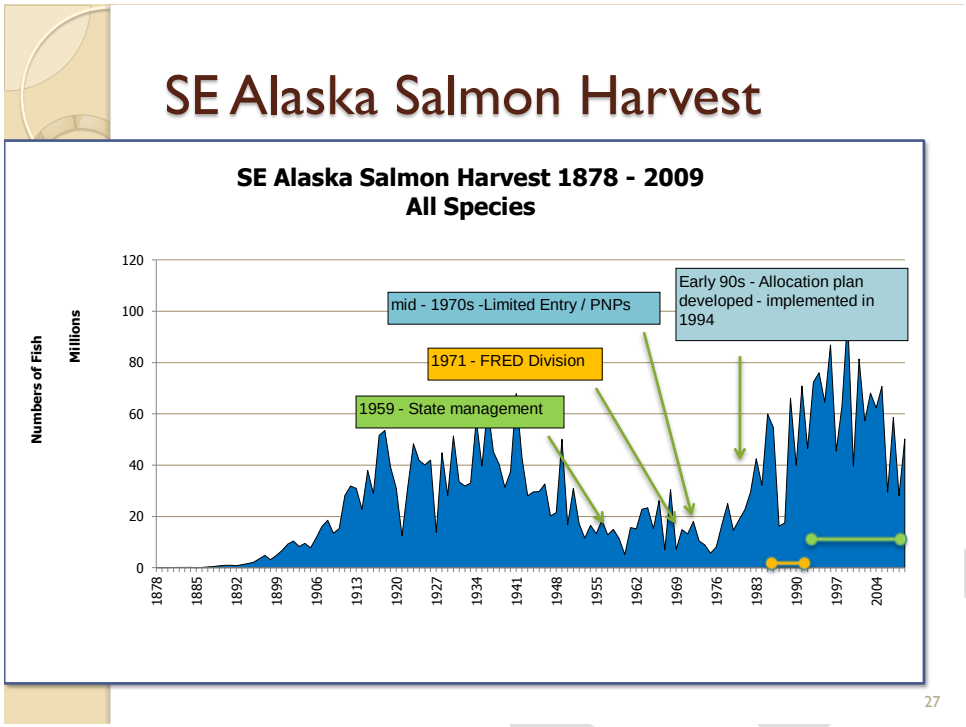


Figure 9. The historical harvest of salmon in Alaska has several important milestones including statehood in 1959, ADF&G FRED division, limited entry, and private non-profit aquaculture production.

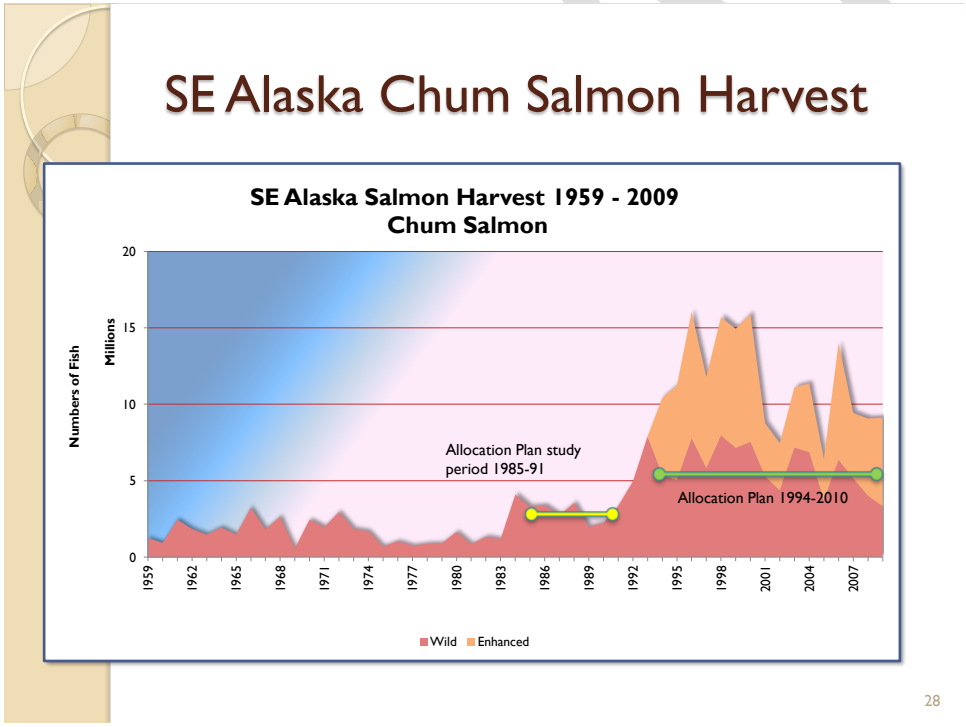


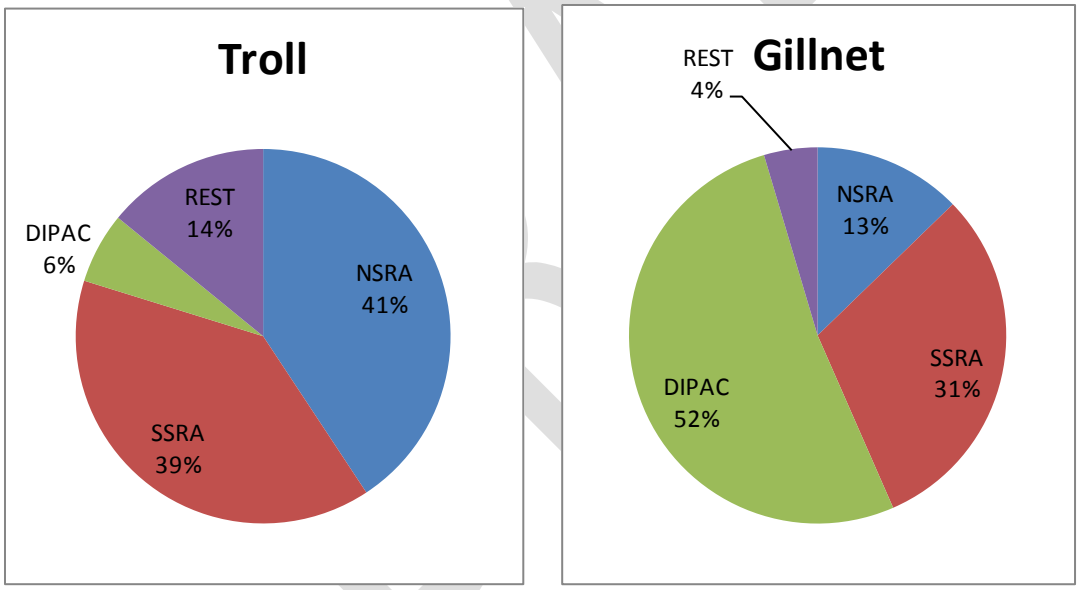
Figure 10. The allocation plan was adopted in 1994 and based on enhanced salmon catches from the 1985 to 1991 period, a seven year block of time when very little enhanced chum salmon was produced. The twenty year period 1994 – 2015 was defined by significant chum salmon harvest numbers and value, representing some 80% of all enhanced salmon.

Exclusion of Non-Regionals from Allocation Plan Perspective

There has been discussion and proposals at the board of fish to remove non-regionals from the Allocation Plan or remove just DIPAC. If the allocation ranges are not changed there are many ways producers can be included/excluded from the Allocation Plan but agreement to remove or slice and dice hatchery operators will always result in winners and losers. In order to visualize the results of removing DIPAC, for example, the past twenty years of production value has been calculated for each organization and then summarized by gear, averaged, and presented in tables and graphs.

ALL Years 1994-2013*				
	troll	gillnet	seine	Grand Total
NSRA	$ 39,611,496	$ 24,005,116	$ 137,976,704	$ 201,593,316
SSRA	$ 38,014,623	$ 57,963,518	$ 76,278,563	$ 172,256,703
DIPAC	$ 5,948,904	$ 98,062,716	$ 13,038,313	$ 117,049,933
REST	$ 13,711,132	$ 8,664,156	$ 21,861,920	$ 44,237,208
	$ 97,286,155	*$ 188,695,506*	*$ 249,155,500*	*$ 535,137,160*

Table 1. DIPAC contributes most significantly to the gillnet fleet. Of the $117 million value in the past twenty years nearly $100 million is to the gillnet fleet.



Graph 1. From 1994 to 2013, the last year of official value data, DIPAC contributed 52% of the gillnet value for all of southeast Alaska. The troll fleet received its greatest value from NSRAA (41%) and SSRAA (39%), or 80% from the regional's. The troll fleet receives significant benefits from Klowack and Port Armstrong coho programs.

There is little surprise that with DIPAC out of the Allocation Plan that the gillnet proportion will plummet precipitously. Table 3 shows the five year rolling average and results. The proportion for troll comes up primarily because the pie is $117 million smaller, $98 million of that from the gillnet column. The allocation pie slices are closer to the consensus ranges.

NSRAA & SSRAA ONLY				
Group	(All)			
Sale Type	(All)			
Area (N-S)	(All)			
Project	(All)			
Agency	(Multiple Items)			
Species	(All)			
Sum of Value	Gear			
Year	troll	gillnet	seine	Grand Total
1994	$ 4,214,924	$ 2,273,963	$ 7,455,209	$ 13,944,096
1995	$ 2,455,982	$ 3,439,660	$ 13,360,623	$ 19,256,265
1996	$ 2,737,604	$ 1,468,159	$ 9,678,070	$ 13,883,833
1997	$ 2,354,905	$ 2,343,057	$ 10,217,260	$ 14,915,222
1998	$ 1,698,679	$ 2,388,167	$ 8,727,320	$ 12,814,167
1999	$ 2,985,497	$ 2,134,440	$ 8,857,012	$ 13,976,949
2000	$ 2,916,946	$ 2,577,953	$ 16,370,518	$ 21,865,417
2001	$ 3,162,960	$ 2,395,153	$ 6,372,574	$ 11,930,687
2002	$ 1,866,676	$ 1,435,891	$ 3,187,451	$ 6,490,018
2003	$ 2,348,288	$ 2,078,916	$ 3,175,983	$ 7,603,187
2004	$ 3,675,370	$ 2,320,403	$ 4,069,303	$ 10,065,076
2005	$ 2,988,186	$ 3,127,354	$ 3,612,226	$ 9,727,766
2006	$ 3,628,856	$ 5,863,507	$ 13,891,791	$ 23,384,154
2007	$ 3,533,327	$ 3,863,965	$ 5,605,401	$ 13,002,693
2008	$ 6,135,756	$ 5,494,954	$ 15,677,252	$ 27,307,962
2009	$ 3,501,470	$ 4,336,893	$ 11,624,976	$ 19,463,339
2010	$ 5,945,269	$ 7,429,768	$ 15,532,603	$ 28,907,641
2011	$ 6,529,276	$ 7,627,044	$ 11,569,800	$ 25,726,120
2012	$ 6,964,819	$ 11,880,235	$ 30,894,596	$ 49,739,650
2013	$ 7,981,329	$ 7,489,152	$ 14,375,297	$ 29,845,778
Grand Total	$ 77,626,119	$ 81,968,634	$ 214,255,267	$ 373,850,020
Total Enhanced	*$ 97,286,155*	*$ 188,695,506*	*$ 249,155,500*	*$ 535,137,160*
Percent	*80%*	*43%*	*86%*	*70%*

Table 2. NSRAA and SSRAA only with DIPAC and other producers out of the allocation for years 1994 to 2013. The percentages represent NSRAA and SSRAA portion of total value by gear. NSRAA and SSRAA programs provide only 43% of the gillnet value, but 80% of the troll value.

	Troll	Gillnet	Seine	
94-98	18%	16%	66%	100%
95-99	16%	16%	68%	100%
96-00	16%	14%	70%	100%
97-01	17%	16%	67%	100%
98-02	19%	16%	65%	100%
99-03	21%	17%	61%	100%
00-04	24%	19%	57%	100%
01-05	31%	25%	45%	100%
02-06	25%	26%	49%	100%
03-07	25%	27%	48%	100%
04-08	24%	25%	51%	100%
05-09	21%	24%	54%	100%
06-10	20%	24%	56%	100%
07-11	22%	25%	52%	100%
08-12	19%	24%	56%	100%
09-13*	20%	25%	55%	100%
ALL YEARS	21%	22%	57%	100%
Target	27-32%	24-29%	44-49%	

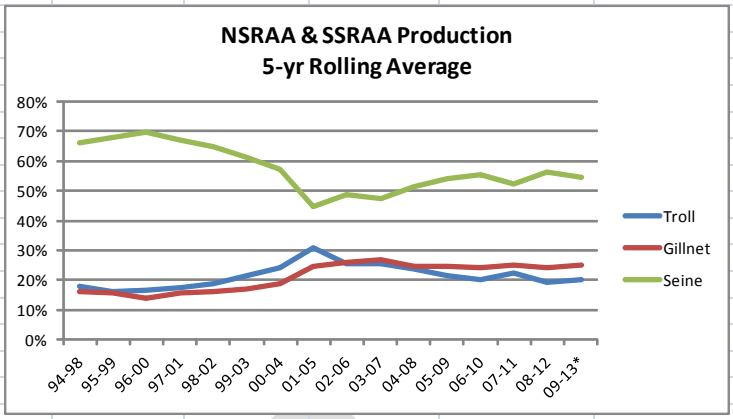


Table 3. SSRAA and NSRAA production only with all other producers removed for years 1994 – 2013. The greatest effect aside from shrinking the pie is to lower the gillnet proportion from 35% with all producer value to 22% for NSRAA and SSRAA only. The seine fleet shows a larger piece of the pie in this scenario with 57%.

There are a variety of permutations that could be considered to evaluate which combination of producers delivers the appropriate gear percentages vis-à-vis the allocation ranges. There does not seem to be merit in this exercise given that the regulations for allocation include all producers in southeast Alaska except Metlakatla's Tamgass Hatchery. The solution based on current regulation **5AAC 33.364** will need to be found by increasing production and getting that production into the holds of the troll fleet. (See section on Future Production pg. 28)

Discussion

Allocation has been a vexing issue since the inception of salmon enhancement program. The initial concept of a northern southeast association in the mid 1970s was limited to Baranof-Chichagof Islands while simultaneously Juneau gillnetters were considering only the Juneau area. Nevertheless, when incorporation became official, gillnet, troll, and seine had equal representation in NSRAA. The conceptual plan in 1979 was to develop Coho Lake stocking on Baranof, Chichagof, and Admiralty Islands using local broodstocks and as many as fifty lakes. A program to benefit the troll fleet was at the core of NSRAA origins.

Simultaneously Medvejie and Salmon Lake (Juneau) hatcheries were being designed and developed for central incubation facilities for coho and chum salmon. In these early years there were few fish to divvy up, the struggle was funding, establishing a legal enhancement tax, site selection, brood sources, and cash flow. The 1980s were a development decade and learning period. By the end of the 1980s Coho

and chum demonstrated that production was possible and return on investment could be favorable. Chinook and sockeye were thought to have great promise during this decade although there was much to be worked out with regard to standard operating procedures for eggtakes, disease management, rearing strategies, and costs. The Allocation Plan participants (1991 – 1994) believed that 100,000 adult chinook and a million adult sockeye could be produced and caught in commercial troll and gillnet fisheries, respectively.

What we now know is that adult sockeye production is elusive. Chilkat Lake, Redoubt, Beaver Lake and other programs all failed to measure up to expectations and were shut down. Only Snettisham Hatchery has been successful, although moderately so. If it were not for Snettisham's political and financial connection to the PST's Transboundary River programs on the Taku and Tatsameni Rivers the domestic sockeye program might not have the requisite benefit to continue operation. The SATF predicted that these sockeye programs were to benefit the net groups. In some ways this left a huge gap in expected value.

Chinook smolt production on the other hand was more much successful with large programs at Macaulay, Medvejie, Hidden Falls, Port Armstrong, Crystal Lake, Whitman Lake, and Metlakatla. Some seven million Chinook smolt are released each year from these facilities. A marine survival of 2% would produce 140,000 adults. The last ten year average harvest is 53,000 adults Chinook (cost recovery harvest not included) with the ten year average troll harvest of 22,700 adults with an average value of just under a million dollars. A troll caught Chinook is much more valuable than a net caught king. Even though the 22,700 troll caught chinook represent 42.8% of the number of fish, it represents 68% of the value. This demonstrates how important and consequential a higher harvest rate would be to the allocation balance.

The Chinook smolt production numbers surpass the two decade old goals but the harvest is far below the 100,000 chinook in the fish holds of trollers envisioned in 1994. The cost of this production is significant compared to the other salmon species; the cost to benefit is close to 1:1 when considering only commercial benefit but near 2:1 when cost recovery value is included.

Chinook programs may be underperforming to the original expectations but continue to have enthusiastic support from fishermen. Producers continue to experiment with a variety of rearing strategies and Chinook stocks (Andrews, Chickamin, Unuk, and Blossom) to increase survival and troll exploitation. There is great frustration that the traditionally most important and valuable species thwarts producers and trollers alike. Hatchery raised Chinook is the only species that underperforms their wild cohort. Wild Chinook smolt on the Taku and Stikine Rivers are considerably smaller (4 – 6grams) than hatchery smolt (20 – 70 grams) yet the wild fish have a higher marine survival rate. Work continues in hopes of a breakthrough.

As the Alaska Chinook program developed, 'experimental' and 'spring access' Chinook fisheries were implemented to provide additional troll opportunity and harvest in major corridors leading up to the Chinook facilities. These spring fisheries in May and June have successfully increased Alaska Chinook contributions that otherwise would not occur. By the late 2000s, the spring Chinook fisheries evolved to a standard operating procedure, although it took much work on the part of the Chinook producers, fishermen, and ADF&G to get to this point.

Coho salmon have provided the greatest benefit to the troll fleet in terms of value, $2.4 million average from 1994 – 2014; the record year in 2013 was $6.5 million in value. On average trollers capture 69% of the commercially caught enhanced coho. Coho is one species that could be developed further; although ADF&G has concerns about the already large percentage of hatchery coho in the troll catch (~25%).

Chum salmon is confounding as a problem solver for the allocation of enhanced salmon. Chum value is second to coho in value to the troll fleet. The past twenty year average commercial chum value is $15.9 million with 6% of that going to the troll fleet, or just under a million dollars. The biggest year for chum troll value was $4.9 million in 2013, but still just 11.6% of all gear chum value. So the chum conundrum is that when chum are schooling properly the troll fleet can have a good catch rate but the net groups due to efficiencies of scale do proportionately better. There is a larger pie but little or no incremental change in proportions.

Troll chum catch rates and efficiency are part of the puzzle when attempting to solve the allocation imbalance. Currently there are three primary chum troll areas – Homeshore, Eastern Channel, and Neets Bay. Analysis of these three troll fisheries during the peak weeks show a daily catch/boat of 140-150 chum (data in file: ALLOC NSRAA proforma 4.30.14 (2).xlsx). There are anecdotal reports of 1,000 fish per day but the average based on actual catch data is much lower. Large cumulative catches do occur when there are 250 boats fishing which has resulted in 35,000 fish in a single day and 400,000 or even 500,000 chum in a season. To solve the allocation with chum salmon the catch rate would need to move to 280/day/boat or there would need to be twice as many boats fishing. Active power troll permits in all of Southeast for the recent ten year average is 741. Using the 140/chum/boat average, 741 boats could theoretically harvest 104,000 fish per day. Hand troll permits make up another 300 harvesters each year although their effort and catch rate is comparatively small.

As the new chum programs at Crawfish Inlet, Southeast Cove, and Port Lucy come on line the troll fleet will have more options and be able to spread out geographically. This may help increase catch per unit effort and overall harvest proportion. These projects are partitioned geographically but also temporally. Crawfish and Eastern Channel are Medvejie stock fish with return timing in August. Neets Bay, Port Lucy, Southeast Cove, and Homeshore use summer run chum stocks with similar run timing.

One of the challenges for the troll fleet at Eastern Channel, Homeshore, and to a lesser degree Neets Bay is variability of catch from year to year. Chum salmon migratory behavior is strongly influenced by numerous factors, including water temperature, wind, and barometric pressure. The catch at Homeshore was promising in 2011 with 137,000 chum harvested but fell flat the next year although the DIPAC run was quite large both years. In 2013, the highest harvest recorded for Homeshore was 311,000 chum. The fish traveled in large schools and milled in the Homeshore area for several weeks, two weeks which had a maximum catch rate of 131 chum/permit/day. The following year an equally large DIPAC return swam deep and the troll fleet caught very few fish, in fact the worst catch in the five year history of the Homeshore fishery.

Eastern Channel near Sitka has the longest chum troll history dating to 1988 when 1,000 fish were harvested. Since 1994, total returns have ranged from 370,000 to 3.6 million; the average close to two million. Troll harvest during this period has ranged from 24,000 in 2012 to 455,000 in 2013, the same year the troll fleet caught nearly a million chum region-wide. Given the long history in Eastern Channel it is evident that high troll catches are strongly related to run strength, high barometric pressure, absence of cost recovery harvest, and price. The strongest influence is weather. During the peak of the return in mid August if the barometric pressure is low bringing wind and rain, the chum move straight through Eastern Channel to Deep Inlet. The result is poor troll exploitation. In 1999, the largest chum return on record, 3.6 million fish, and the troll fleet harvested only 67,000. The following year in 2000 an equally large return with a more favorable weather pattern delivered 450,000 chum to trollers.

Price is always a factor for the troll fleet as it is with any salmon permit holder. Maximizing daily or weekly revenues is based on price/pound times biomass harvested. A thousand pounds of chum at sixty cents/pound is more lucrative than 200 pounds of coho at $1.75. This is simplistic as there are many other factors fishermen consider, for example tradition and herd mentality or alternatively loner mentality.

Hatchery operators and more particularly the fishermen boards have a long track record of expanding Chinook and coho programs designed to increase troll harvest and value. Many millions of dollars from three percent revenues, cost recovery, State of Alaska, and Pacific Salmon Treaty mitigation monies have been spent on infrastructure to maximize smolt production. In 2014, 23 million coho smolt and 7 million Chinook smolt were released to the ocean; these programs were developed over the past twenty years for the benefit of the troll fleet. In 1994, coho and Chinook smolt production was 13 million and 7 million, respectively; coho is nearly double that today. The fact that Chinook has not increased during the period speaks to the relatively low performance and high costs of raising Chinook.

Chum production also increased significantly over these same years, with the intent to target the net fisheries. All chum salmon program development was expected to benefit the troll fleet at least

marginally since State of Alaska waters are open to trolling most of the year. The Homeshore troll fishery is an example of serendipity. Considering that the DIPAC program had been in operation since the late 1980s, it wasn't until 2010 that large numbers of DIPAC chum were taken in the Homeshore area. Chum trolling in nearby Icy Strait and Cross Sound in June has a much longer history, although the magnitude of the catch was never as large as at Homeshore.

Chinook and coho have a high demand for space, water, and dollars which can and has posed limits on chum salmon production. Leaving aside the issue of permitting, associations and hatchery producers allocate resources with reference to allocation and cost effectiveness. All hatcheries have limited space and water, so production of smolt species can preclude additional chum production. Chum require relatively little freshwater but if water is finite, new production requires lower one species to increase another. Approximately 20 million chum fry can be incubated and hatched on one cubic foot of water whereas this same amount of water could raise about 200,000 coho or Chinook. These water, space, and financial demands limit smolt production at most facilities today.

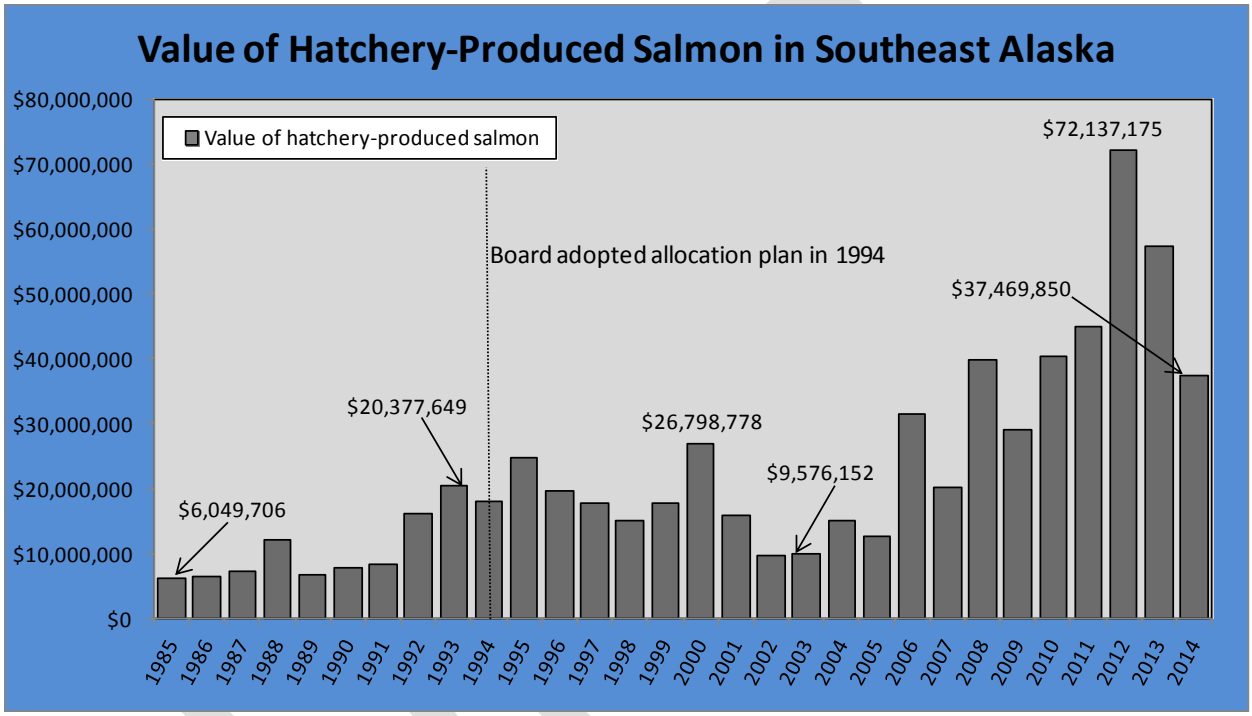
At times the allocation imbalance limits new program options especially if it includes chum production in traditional seine or gillnet areas with a known interception fishery leading up to the terminal area. This type of program would likely worsen the allocation imbalance and therefore doesn't even make it to the permitting stage.

The troll allocation percentage is 18% for the past five year average, 2010-2014 or 9% below their lower range of 27%. The five year rolling average has ranged from 15% to 26% for the past twenty years. Significant money has been expended over the past two decades to move the troll percentage into their range without success. Efforts to increase the overall enhanced troll value has been successful to a large degree but seine and gillnet harvest shares have increased to a greater degree. The seine fleet is also out of its expected range but to a much smaller degree than the trollers. Projects that benefit trollers and only trollers are difficult to construct, especially in inside fisheries and programs such as DIPAC, SSRAA, and NSRAA typically conduct. Factors contributing to this outcome include gear efficiency, low exploitation rates, catch per unit effort, mixed stock net fishery interception of enhanced stocks, and terminal net fisheries.

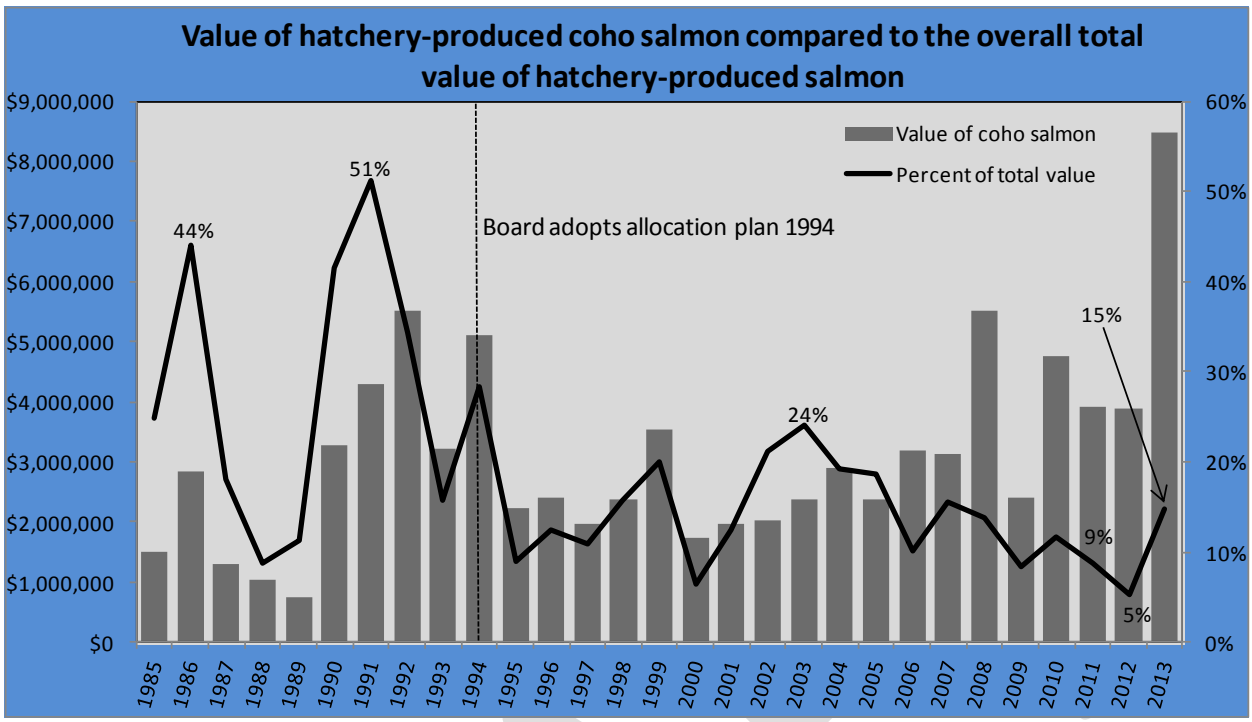
New chum programs at Port Lucy and Crawfish Inlet are located in outside areas and have the potential to change the above circumstances to some extent, particularly because there are few or no net fisheries in the migratory path as the chum return to their natal release sites. Southeast Cove, Kuiu Island is similarly situated except it potentially will have some seine interception during Chatham Strait pink salmon directed fisheries in late July. Nevertheless, the run timing for Southeast Cove chum will favor troll interception from Port Malmesbury to Keku Strait rather than the seine fleet. Southeast Cove terminal harvest area is small, rocky, and poorly suited for troll drags.

SSRAA has a permit to produce chum salmon at Port Assumption near Craig, Alaska. If this program goes forward it could also benefit the troll fleet as it is located on the outside waters where fish will migrate via traditional troll fisheries. Summer chum run timing should segregate these fish from net fisheries for the most part, but early Noyes Island seine openings may intercept some of the returning chum.

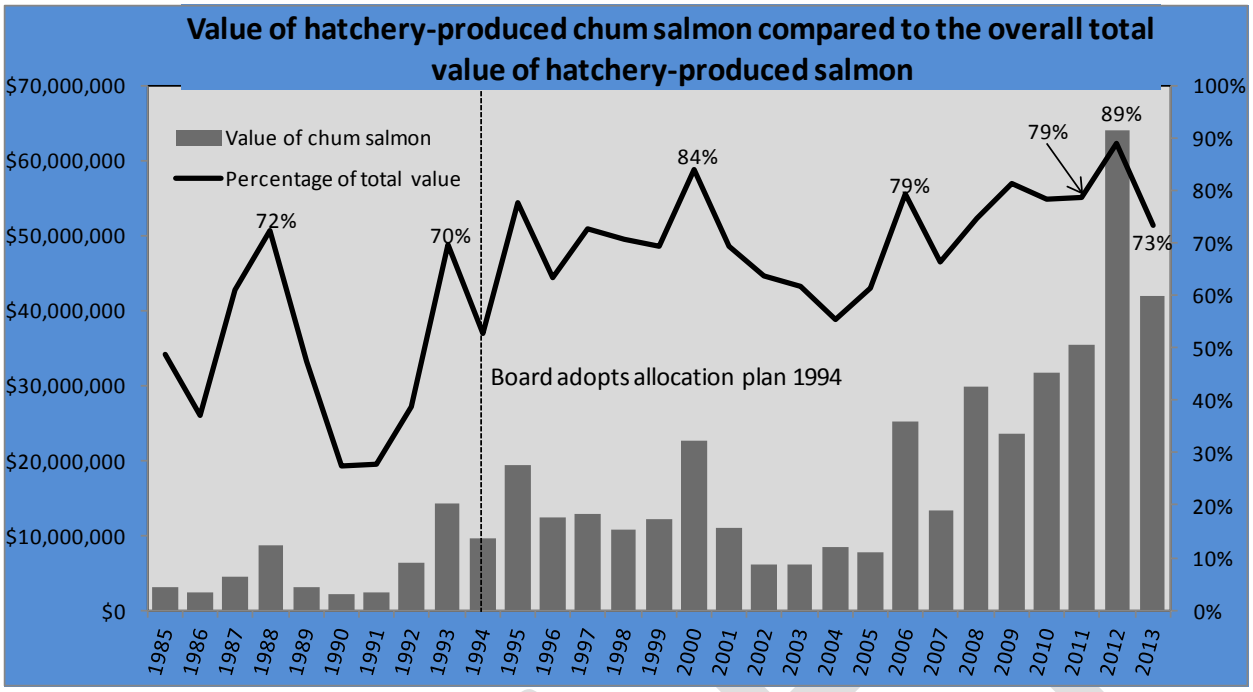
The new chum production, Crawfish, Port Lucy, and SE Cove, has the potential to move the trollers into their allocation range assuming the trollers maintain current exploitation rates on Chinook, coho, and chum salmon production. Certainly troll values will increase; it is the proportions that are unknown.



Graph x. Value of enhanced salmon in southeast Alaska from 1985 to 2014, a thirty year period. In the first decade average value was less than $10 million, the next decade averaged close to $20 million in value, while the past decade took a considerable jump in value to $40 million or more.



Graph xx. Coho salmon has been the second most valuable species second to chum salmon in total value. Coho are relatively easy to produce in a hatchery and lake environment. Marine survival of hatchery reared coho normally range from range from 6% to 10% and have relatively high exploitation rates by the troll fleet. Production has increased since the inception of the allocation plan but the overall value has moved up only slightly. As a proportion of the total value of enhanced fish, coho has declined from around 20% of the total value to 10% or less. This is driven more by the tremendous increase in chum value than any other factor. See Graph xxx.



Graph xxx. Chum salmon value has increased since 1994 to a greater extent than other salmon species. In the 1980s chum value was in the $5 million range while the past ten year average is $29.8 million for all gear combined. As a proportion of total value, chum has also increased. In the pre-allocation years the proportion was about 50% while the past ten year average is about 75%.

Conclusions

<Conclusions section will not be developed until gear group consensus. This seems unlikely to occur before the December 2015 JRPT meeting. However, after review of the document if there seems to be consensus on certain points, they could be added to conclusion section as draft or interim>

References

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Appendices

Joint RPT Minutes
Findings of the Alaska Board of Fisheries 94-148-FB
Allocation percentage history
Allocation of Enhanced Salmon by Dr. Don Amend
Benefit Cost Analysis

Southeast Allocation Base Period 1985 - 1991 (#94-148-FB)

Species	Gear	Value	1985-1991 Percent	Total	Annual Average Value	Percent Value	1985-1991 Total	Annual Full Production Value	Annual Full Production Percent	Total
Coho				$ 15,018,474			$ 2,145,496.29			$ 4,201,270
	Troll	$ 10,775,635	71.7%		$ 1,539,376	71.7%		$ 3,021,781	71.9%	
	Seine	$ 1,626,678	10.8%		$ 232,383	10.8%		$ 540,786	12.9%	
	Gillnet	$ 2,616,161	17.4%		$ 373,737	17.4%		$ 638,703	15.2%	
Chinook				$ 5,266,284			$ 752,326.29			$ 5,473,259
	Troll	$ 4,559,573	86.6%		$ 651,368	86.6%		$ 4,773,109	87.2%	
	Seine	$ 260,671	4.9%		$ 37,239	4.9%		$ 359,042	6.6%	
	Gillnet	$ 446,040	8.5%		$ 63,720	8.5%		$ 341,108	6.2%	
Chum				$ 26,048,248			$ 3,721,178.29			$ 24,632,796
	Troll	$ 521,184	2.0%		$ 74,455	2.0%		$ 293,658	1.2%	
	Seine	$ 17,265,856	66.3%		$ 2,466,551	66.3%		$ 16,010,792	65.0%	
	Gillnet	$ 8,261,208	31.7%		$ 1,180,173	31.7%		$ 8,328,346	33.8%	
Pinks				$ 3,675,425			$ 525,060.71			$ 2,197,761
	Troll	$ 124,857	3.4%		$ 17,837	3.4%		$ 57,882	2.6%	
	Seine	$ 2,377,096	64.7%		$ 339,585	64.7%		$ 1,370,607	62.4%	
	Gillnet	$ 1,173,472	31.9%		$ 167,639	31.9%		$ 769,272	35.0%	
Sockeye				$ 4,196,804			$ 599,543.43			$ 2,150,892
	Troll	$ 119,287	2.8%		$ 17,041	2.8%		$ 51,810	2.4%	
	Seine	$ 1,856,903	44.2%		$ 265,272	44.2%		$ 953,598	44.3%	
	Gillnet	$ 2,220,614	52.9%		$ 317,231	52.9%		$ 1,145,484	53.3%	
All Species				$ 54,205,235			$ 7,743,605.00			**$ 38,655,978**
	Troll	$ 16,100,536	29.7%		$ 2,300,077	29.7%		**$ 8,198,240**	**21.2%**	
	Seine	$ 23,387,204	43.1%		$ 3,341,029	43.1%		**$ 19,234,825**	**49.8%**	
	Gillnet	$ 14,717,495	27.2%		$ 2,102,499	27.2%		**$ 11,222,913**	**29.0%**	

NOTES:

1. Current annual production includes permited capacity on existing ongoing projects using assumed survival rates and average prices, weights
2. Future production includes Deep Cove Chinook, Snettisham sockeye, and Chilkat Lake sockeye enhancement
   - Chilkat will produce 264,000 sockeye: 250,800 to gillnet, 13,200 to seiners
   - Snettisham will produce 320,000 sockeye: 288,000 gillnet, 32,000 seiners
   - Beaver Falls and Klawock will produce 259,000 sockeye: 123,000 gillnet, 130,000 seine, 5,000 troller (current production)
   - Deep Cove will produce 75,000 harvestable Chinook: 55,250 troll, 14,400 seine, 5,250 gillnet
3. AAI (Alaska Aquaculture Inc) added November 1992: 300,000: gillnet 239,000, seine, 61,000 chum
4. Future potential is a best guess of what might happen. It is not an allocation.

Annual Value by Gear and Species 185-1991 Table from Board of Fish #94-148-FB finding

Southeast Allocation Base Period 1985 - 1991 (#94-148-FB)

Species		1985		1986		1987		1988		1989
Coho	Troll	$ 1,120,260		$ 2,112,686		$ 856,309		$ 632,589		$ 575,520
	Seine	$ 242,393		$ 343,375		$ 253,299		$ 165,428		$ 111,567
	Gillnet	$ 141,413		$ 372,281		$ 191,580		$ 253,141		$ 63,014
Chinook	Troll	$ 277,615		$ 287,758		$ 602,578		$ 1,006,808		$ 858,148
	Seine	$ 19,863		$ 27,627		$ 8,421		$ 26,095		$ 62,598
	Gillnet	$ 8,192		$ 17,641		$ 20,803		$ 126,444		$ 84,369
Chum	Troll	$ 18,352		$ -		$ -		$ 228,299		$ 150,186
	Seine	$ 2,434,775		$ 1,914,279		$ 3,415,435		$ 4,800,895		$ 1,608,162
	Gillnet	$ 495,683		$ 466,695		$ 979,408		$ 3,659,772		$ 1,392,331
Pinks	Troll	$ 4,559		$ -		$ 1,909		$ 12,166		$ 3,854
	Seine	$ 460,262		$ 233,509		$ 432,197		$ 73,214		$ 475,615
	Gillnet	$ 313,174		$ 164,939		$ 64,125		$ 64,125		$ 307,825
Sockeye	Troll	$ -		$ -		$ -		$ 107,554		$ 11,733
	Seine	$ 271,551		$ 252,000		$ 189,296		$ 410,095		$ 460,868
	Gillnet	$ 241,614		$ 224,306		$ 170,328		$ 444,065		$ 475,552
All Species										
	Troll	$ 1,420,786	23.5%	$ 2,400,444	37.4%	$ 1,460,796	20.3%	$ 1,987,416	16.5%	$ 1,599,441
	Seine	$ 3,428,844	56.7%	$ 2,770,790	43.2%	$ 4,298,648	59.8%	$ 5,475,727	45.6%	$ 2,718,810
	Gillnet	$ 1,200,076	19.8%	$ 1,245,862	19.4%	$ 1,426,244	19.8%	$ 4,547,547	37.9%	$ 2,323,091
	Total	$ 6,049,706		$ 6,417,096		$ 7,185,688		$ 12,010,690		$ 6,641,342
5 Year Average		1985 - 1989		1986 - 1990		1987 - 1991				
	Troll	$ 8,868,883	23.2%	$ 11,222,626	28.0%	$ 12,279,306	29.4%			
	Seine	$ 18,692,819	48.8%	$ 17,581,992	43.8%	$ 17,187,570	41.2%			
	Gillnet	$ 10,742,820	28.0%	$ 11,323,618	28.2%	$ 12,271,557	29.4%			
	Total	$ 38,304,522		$ 40,128,236		$ 41,738,433				

Southeast Allocation Base Period 1985 - 1991 (#94-148-FB)

1987	1988		1989		1990		1991		Total Value	Percent
$ 856,309	$ 632,589		$ 575,520		$ 2,615,031		$ 2,863,240		$ 10,775,635	71.7%
$ 253,299	$ 165,428		$ 111,567		$ 227,665		$ 282,951		$ 1,626,678	10.8%
$ 191,580	$ 253,141		$ 63,014		$ 433,459		$ 1,161,273		$ 2,616,161	17.4%
$ 602,578	$ 1,006,808		$ 858,148		$ 969,528		$ 557,138		$ 4,559,573	87%
$ 8,421	$ 26,095		$ 62,598		$ 50,626		$ 65,441		$ 260,671	5%
$ 20,803	$ 126,444		$ 84,369		$ 124,042		$ 64,549		$ 446,040	8%
$ -	$ 228,299		$ 150,186		$ 122,652		$ 1,695		$ 521,184	2%
$ 3,415,435	$ 4,800,895		$ 1,608,162		$ 1,457,908		$ 1,634,402		$ 17,265,856	66%
$ 979,408	$ 3,659,772		$ 1,392,331		$ 580,084		$ 687,235		$ 8,261,208	32%
$ 1,909	$ 12,166		$ 3,854		$ 67,318		$ 35,051		$ 124,857	3%
$ 432,197	$ 73,214		$ 475,615		$ 342,602		$ 359,697		$ 2,377,096	65%
$ 64,125	$ 64,125		$ 307,825		$ 150,760		$ 108,524		$ 1,173,472	32%
$ -	$ 107,554		$ 11,733		$ -		$ -		$ 119,287	3%
$ 189,296	$ 410,095		$ 460,868		$ 239,216		$ 33,877		$ 1,856,903	44%
$ 170,328	$ 444,065		$ 475,552		$ 492,529		$ 172,220		$ 2,220,614	53%
$ 1,460,796	20.3%	$ 1,987,416	16.5%	$ 1,599,441	24.1%	$ 3,774,529	47.9%	$ 3,457,124	43.1%	$ 16,100,536	**29.7%**
$ 4,298,648	59.8%	$ 5,475,727	45.6%	$ 2,718,810	40.9%	$ 2,318,017	29.4%	$ 2,376,368	29.6%	$ 23,387,204	**43.1%**
$ 1,426,244	19.8%	$ 4,547,547	37.9%	$ 2,323,091	35.0%	$ 1,780,874	22.6%	$ 2,193,801	27.3%	$ 14,717,495	**27.2%**
$ 7,185,688		$ 12,010,690		$ 6,641,342		$ 7,873,420		$ 8,027,293		$ 54,205,235
1987 - 1991										
$ 12,279,306	29.4%								Basis for Allocation Ranges	
$ 17,187,570	41.2%									
$ 12,271,557	29.4%									
$ 41,738,433										

Annual Value by Gear and Species 185-1991 Table from Board of Fish #94-148-FB finding, continued

Sum of Value	Gear			
Year	**troll**	**gillnet**	**seine**	**Grand Total**
1994	5,317,271	3,797,692	8,876,576	17,991,540
1995	2,871,032	7,169,053	14,789,338	24,829,423
1996	3,224,761	4,184,597	12,061,185	19,470,543
1997	3,004,073	4,037,169	10,752,998	17,794,241
1998	1,973,521	3,792,912	9,277,676	15,044,109
1999	3,461,492	4,110,113	10,061,642	17,633,247
2000	3,465,550	6,219,903	17,113,326	26,798,778
2001	3,752,912	4,852,294	7,170,159	15,775,364
2002	2,303,490	3,627,174	3,645,488	9,576,152
2003	2,774,408	3,385,285	3,744,188	9,903,881
2004	4,139,539	5,400,059	5,498,187	15,037,785
2005	3,522,736	4,707,650	4,405,236	12,635,622
2006	4,192,671	12,215,370	15,109,033	31,517,075
2007	4,728,923	8,851,525	6,531,971	20,112,418
2008	7,319,611	16,385,073	16,158,998	39,864,442
2009	4,032,749	12,255,256	12,746,563	29,034,568
2010	7,215,190	15,728,240	17,451,677	40,395,107
2011	9,109,654	20,391,332	15,430,492	44,931,479
2012	8,113,226	28,453,598	35,570,351	72,288,600
2013	13,266,168	19,221,485	24,815,716	54,502,787
2014	7,900,306	17,050,323	12,519,221	37,469,850
2015	9,120,909	20,168,996	21,157,491	50,447,396
2016	9,120,909	20,168,996	21,157,491	50,447,396
2017	9,626,486	20,168,996	21,157,491	50,952,973
2018	9,967,550	20,168,996	21,157,491	51,294,037
2019	11,379,955	20,168,996	21,157,491	52,706,442
2020	14,713,556	16,135,197	26,235,289	57,084,042
2021	17,000,690	16,135,197	26,235,289	59,371,176
2022	17,129,091	16,135,197	26,235,289	59,499,576
2023	17,129,091	16,135,197	26,235,289	59,499,576
2024	17,129,091	16,135,197	26,235,289	59,499,576
2025	17,129,091	16,135,197	26,235,289	59,499,576
2026	17,129,091	16,135,197	26,235,289	59,499,576
2027	17,129,091	16,135,197	26,235,289	59,499,576
2028	17,129,091	16,135,197	26,235,289	59,499,576
2029	17,129,091	16,135,197	26,235,289	59,499,576
2030	17,129,091	16,135,197	26,235,289	59,499,576

Allocation Value Actual 1994-2014 and Projected for 2015-2030, New Production Included

5-Year Rolling Averages for Gear Groups

Source: ADF&G ESTIMATES (SE ALLOCATION DATA FROM ADF&G)

	SE	SE	SE		Annual Percent		
	Gear						
Period	Troll	Gillnet	Seine	TOTAL	**troll 27-32%**	**gillnet 24-29%**	**seine 44-49%**
94-98	17%	24%	59%	100%	29.6%	21.1%	49.3%
95-99	15%	25%	60%	100%	11.6%	28.9%	59.6%
96-00	16%	23%	61%	100%	16.6%	21.5%	61.9%
97-01	17%	25%	58%	100%	16.9%	22.7%	60.4%
98-02	18%	27%	56%	100%	13.1%	25.2%	61.7%
99-03	20%	28%	52%	100%	19.6%	23.3%	57.1%
00-04	21%	30%	48%	100%	12.9%	23.2%	63.9%
01-05	26%	35%	39%	100%	23.8%	30.8%	45.5%
02-06	22%	37%	41%	100%	24.1%	37.9%	38.1%
03-07	22%	39%	40%	100%	28.0%	34.2%	37.8%
04-08	20%	40%	40%	100%	27.5%	35.9%	36.6%
05-09	18%	41%	41%	100%	27.9%	37.3%	34.9%
06-10	17%	41%	42%	100%	13.3%	38.8%	47.9%
07-11	19%	42%	39%	100%	23.5%	44.0%	32.5%
08-12	16%	41%	43%	100%	18.4%	41.1%	40.5%
09-13	17%	40%	44%	101%	13.9%	42.2%	43.9%
10-14	18%	40%	42%	101%	17.9%	38.9%	43.2%
11-15	18%	41%	42%	101%	20.3%	45.4%	34.3%
	18%	40%	43%	101%	11.2%	39.4%	49.2%
	20%	40%	41%	101%	24.3%	35.3%	45.5%
	19%	41%	40%	100%	21.1%	45.5%	33.4%
	19%	39%	41%	100%	18.1%	40.0%	41.9%
16-20	21%	37%	42%	100%	18.1%	40.0%	41.9%
	23%	34%	43%	100%	18.9%	39.6%	41.5%
	25%	32%	43%	100%	19.4%	39.3%	41.2%
	27%	29%	44%	100%	21.6%	38.3%	40.1%
	28%	27%	44%	100%	25.8%	28.3%	46.0%
21-25	29%	27%	44%	100%	28.6%	27.2%	44.2%
	29%	27%	44%	100%	28.8%	27.1%	44.1%
	29%	27%	44%	100%	28.8%	27.1%	44.1%
	29%	27%	44%	100%	28.8%	27.1%	44.1%
	29%	27%	44%	100%	28.8%	27.1%	44.1%
26-30	29%	27%	44%	100%	28.8%	27.1%	44.1%
					28.8%	27.1%	44.1%
					28.8%	27.1%	44.1%
					28.8%	27.1%	44.1%
					28.8%	27.1%	44.1%

Table 19.–Weekly troll chum salmon harvest and effort in Icy Straits/Homeshore, Neets Bay/West Behm Canal, Sitka Sound, and the region-wide totals 2010–2014.

Icy Strait/Homeshore/Northern Chatham Strait

	2010		2011		2012		2013		2014	
Week	Harvest	Permits	Harvest	Permits	Harvest	Permits	Harvest	Permits	Harvest	Permits
23	–	–	–	–	–	–	14,103	43	–	–
24	–	–	5,613	27	554	24	35,710	118	99	5
25	–	–	23,571	100	8,088	95	140,859	154	2,290	30
26	16,603	30	79,951	140	9,386	83	99,977	141	15,405	36
27	14,878	36	27,496	87	7,340	37	18,810	57	2,196	19
28	15,863	32	451	6	1,665	18	1,111	15	[a]	[a]
29	2,137	14	[a]	[a]	[a]	[a]	[a]	[a]	–	–
Total	49,556	56	137,244	158	27,175	133	311,236	193	19,990	51

Neets Bay/West Behm Canal

	2010		2011		2012		2013		2014	
Week	Harvest	Permits	Harvest	Permits	Harvest	Permits	Harvest	Permits	Harvest	Permits
26	[a]	[a]	[a]	[a]	13,862	45	2,227	11	–	–
27	3,968	10	1,225	17	32,108	106	18,250	41	1,680	11
28	37,631	48	35,576	78	77,851	209	54,597	106	12,141	43
29	116,454	106	129,775	141	99,560	247	67,987	115	47,889	85
30	45,881	82	122,864	153	78,078	182	22,383	77	32,729	68
31	393	4	48,499	97	17,238	97	10,554	20	15,748	47
32	[a]	[a]	24,527	45	1,714	10	3,877	15	9,438	18
33	[a]	[a]	6,387	21	8,750	26	328	4	1,306	10
34	–	–	8,289	18	13,920	33	369	4	1,024	5
35	–	–	16,230	31	29,897	55	914	5	1,331	7
36	599	3	20,563	47	28,143	72	2,643	7	6,666	13
37	3,503	5	10,499	36	4,117	51	2,007	7	13,494	26
38	6,736	6	16,728	25	872	10	–	–	4,866	18
Total	216,489	114	441,371	175	406,335	265	186,701	137	148,330	98

Sitka Sound

	2010		2011		2012		2013		2014	
Week	Harvest	Permits	Harvest	Permits	Harvest	Permits	Harvest	Permits	Harvest	Permits
25	–	–	–	–	–	–	831	3	–	–
26	–	–	–	–	–	–	7,305	14	–	–
27	–	–	–	–	–	–	2,495	12	–	–
28	–	–	–	–	–	–	5,599	13	–	–
29	112	4	–	–	–	–	5,531	18	–	–
30	26	3	[a]	[a]	–	–	33,582	46	–	–
31	18,421	44	3,798	24	377	3	80,843	94	522	4
32	35,632	84	14,962	81	15,529	39	122,081	101	9,485	34
33	30,098	86	4,315	34	6,742	31	153,748	106	198	8
34	22,941	51	90	3	1,136	8	42,120	78	180	3
35	2,930	18	31	3	–	–	1,198	8	871	5
36	5,958	15	–	–	–	–	[a]	[a]	[a]	[a]
Total	116,118	105	23,428	92	23,797	51	455,510	147	11,411	42

-continued-

Table 19.–Page 2 of 2.

Region-wide Totals

	2010		2011		2012		2013		2014	
Week	Harvest	Permits	Harvest	Permits	Harvest	Permits	Harvest	Permits	Harvest	Permits
23	–	–	[a]	[a]	[a]	[a]	14105	44	[a]	[a]
24	–	–	5613	27	558	25	35727	120	151	8
25	–	–	23,571	100	8,239	102	141,851	162	2,359	32
26	16,608	32	80,146	142	23,234	125	109,594	167	15,453	40
27	18,846	45	28,873	105	39,422	143	41,355	101	4,089	33
28	53,494	69	36,829	88	79,508	226	63,492	137	12,523	49
29	118,703	124	130,225	145	99,685	250	74,708	139	47,893	86
30	45,907	85	123,183	156	78,078	182	56,088	123	32,764	72
31	18,814	46	52,297	121	17,615	100	92,533	117	16,414	55
32	36,819	85	39,489	125	17,243	49	127,392	117	20,126	58
33	30,215	87	10,702	55	15,736	58	154,152	111	1,546	19
34	22,941	51	8,379	21	14,951	40	44,037	84	1,297	9
35	2,930	18	16,261	34	29,906	56	2,112	13	2,240	13
36	6,557	18	20,569	48	28,143	72	2,817	9	11,464	28
37	3,503	5	10,570	38	4,117	51	2,156	8	13,494	26
38	6,736	6	16,778	27	872	10	[a]	[a]	4,866	18
Total	382,163	193	603,533	299	457,352	352	962,181	366	186,710	183

Notes: Numbers for harvest and permits fished are based on vessels that targeted chum salmon.
Region-wide totals do not reflect the sum of these directed fisheries.
– denotes no effort or harvest.

[a] confidential data

An Alternative Benefit: Cost Estimate for SE Alaska All Salmon

Introduction

There are a variety of ways to evaluate the benefits of salmon enhancement. 1) use three percent money paid in by fishermen against the value fishermen get from harvest, 2) cost of operating hatchery programs against value they provide to fishermen, 3) same as two but include cost recovery value, 4) total economic output vis-à-vis a McDowell type report, among other approaches.

The salmon fisheries of southeast Alaska consist of a wild component (75%) and an enhanced component (25%) and are prosecuted simultaneously. Sometimes these fisheries are discrete such as Kendrick Bay or Amalga Harbor terminal harvest areas, but often harvest of wild and enhanced salmon occurs in mixed stock common property fisheries. The value of each can be determined by CWT and otolith sampling but in terms of prosecution of the fisheries and in the eyes of the CFEC limited entry permit, wild and enhanced are integrally linked. Wild and enhanced dovetail or work in concert with one another.

Therefore, simply as an exercise, looking at the wild and enhanced benefits as they accrue to troll, gillnet, and seine is informative.

Methods:

1. "Cost" side: estimated 3% Salmon Enhancement Tax (SET) paid by gear group.
    a. 3% SET is not tracked by gear; however an estimate of 3% SET by gear might be made by taking the total annual value by gear x 3%.
    b. Total Value estimates by gear were obtained from CFEC BIT data.
    c. Seine and gillnet values are for SEAK. Troll includes Yakutat, which may make up 1-2% (?) of the total value. For this initial analysis, no adjustment is made for the (slightly) larger troll area.
2. "Benefit" side: value of SEAK enhanced harvest from allocation data.
3. Offset: 3% SET collected in any given year funds future releases & returns. For instance, 3% tax collected in 2014 might fund 2015 chum releases which have a major age class (four-year-olds) return in 2018. In this example, the cost year of 2014 would have an offset of 4 years until the major benefit year of 2018. A case might be made for a 4 or 5 year offset; I've chosen to use a 4 year offset in this analysis.
4. Calculations are made by gear for annual and 5-year rolling averages.

Data:

Table 1. Total Value of SEAK Salmon				
Year	DRIFT GILLNET	TROLL*	PURSE SEINE	Total
1994	17,207,769	38,943,302	61,164,567	117,315,638
1995	16,899,040	16,673,792	55,806,812	89,379,644
1996	14,430,995	16,394,667	42,813,455	73,639,117
1997	11,143,699	18,853,651	40,813,997	70,811,347
1998	11,345,286	14,974,147	45,509,746	71,829,179
1999	11,489,118	20,442,587	56,402,089	88,333,794
2000	10,940,909	14,786,178	38,060,764	63,787,851
2001	11,316,836	17,191,517	48,742,800	77,251,153
2002	8,132,853	13,164,474	20,244,170	41,541,497
2003	8,903,210	14,812,555	26,705,739	50,421,504
2004	11,778,867	29,016,910	31,672,452	72,468,229
2005	12,753,519	26,770,816	36,073,649	75,597,984
2006	20,007,955	34,645,576	27,536,028	82,189,559
2007	15,081,267	30,985,116	49,646,050	95,712,433
2008	24,209,429	36,566,992	40,986,039	101,762,460
2009	18,578,453	22,942,077	48,417,377	89,937,907
2010	26,618,998	31,945,182	56,238,100	114,802,280
2011	31,126,506	32,407,478	122,177,082	185,711,066
2012	37,475,213	29,859,299	73,082,389	140,416,901
2013	29,456,345	41,312,132	154,063,995	224,832,472
Grand Total	**348,896,267**	**502,688,448**	**1,076,157,300**	**1,927,742,015**
	100.0%	100.0%	100.0%	100.0%

Note: Color scales are relative to each gear group (applied on a column - by - column basis).

Table 1. Total value for all commercially harvested salmon, enhanced and wild, for years 1994 to 2013. Percents are for individual gear and therefore all percents add to 100%.

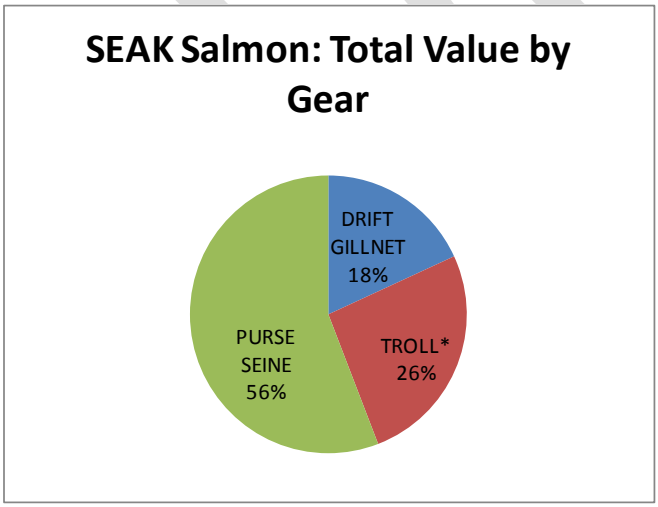

Chart 1. Total Value for the period (1994-2013) is 1.93 billion dollars with proportions by gear. Note wild and enhanced salmon proportions are very different than the Allocation percentages. Gillnet percentage is 18% based on all salmon harvest and troll is 26%.

Table 2. Estimate of SET by Gear: 3% of Total Value				
Year	DRIFT GILLNET	TROLL*	PURSE SEINE	Total
1994	516,233	1,168,299	1,834,937	3,519,469
1995	506,971	500,214	1,674,204	2,681,389
1996	432,930	491,840	1,284,404	2,209,174
1997	334,311	565,610	1,224,420	2,124,340
1998	340,359	449,224	1,365,292	2,154,875
1999	344,674	613,278	1,692,063	2,650,014
2000	328,227	443,585	1,141,823	1,913,636
2001	339,505	515,746	1,462,284	2,317,535
2002	243,986	394,934	607,325	1,246,245
2003	267,096	444,377	801,172	1,512,645
2004	353,366	870,507	950,174	2,174,047
2005	382,606	803,124	1,082,209	2,267,940
2006	600,239	1,039,367	826,081	2,465,687
2007	452,438	929,553	1,489,382	2,871,373
2008	726,283	1,097,010	1,229,581	3,052,874
2009	557,354	688,262	1,452,521	2,698,137
2010	798,570	958,355	1,687,143	3,444,068
2011	933,795	972,224	3,665,312	5,571,332
2012	1,124,256	895,779	2,192,472	4,212,507
2013	883,690	1,239,364	4,621,920	6,744,974
Grand Total	**10,466,888**	**15,080,653**	**32,284,719**	**57,832,260**
	3.0%	3.0%	3.0%	3.0%

Table 2. Using the total commercial harvest by gear the 3% dollars paid is calculated. The 3% is collected on enhanced as well as wild salmon. These are monies that have been paid out to SSRAA and NSRAA. Trollers have paid $15.0 million, gillnet $10.4 million, and seine $32.3 million.

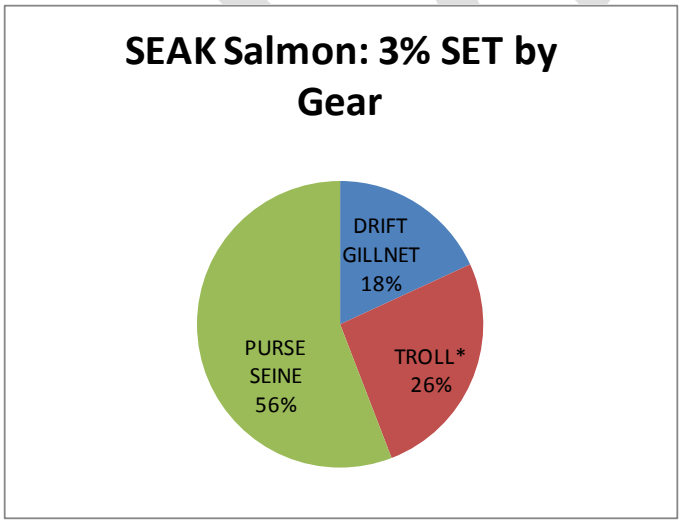

Chart 2. Estimated 3% SET collected for the period is 57.8 million dollars and is represented by the same percentages as the total salmon values by gear.

Table 3. Enhanced Value - SEAK Salmon				
Year	DRIFT GILLNET	TROLL*	PURSE SEINE	Total
1994	3,797,692	5,317,271	8,876,576	17,991,540
1995	7,169,053	2,871,032	14,789,338	24,829,423
1996	4,184,597	3,224,761	12,061,185	19,470,543
1997	4,037,169	3,004,073	10,752,998	17,794,241
1998	3,792,912	1,973,521	9,277,676	15,044,109
1999	4,110,113	3,461,492	10,061,642	17,633,247
2000	6,219,903	3,465,550	17,113,326	26,798,778
2001	4,852,294	3,752,912	7,170,159	15,775,364
2002	3,627,174	2,303,490	3,645,488	9,576,152
2003	3,385,285	2,774,408	3,744,188	9,903,881
2004	5,400,059	4,139,539	5,498,187	15,037,785
2005	4,707,650	3,522,736	4,405,236	12,635,622
2006	12,215,370	4,192,671	15,109,033	31,517,075
2007	8,851,525	4,728,923	6,531,971	20,112,418
2008	16,385,073	7,320,371	16,158,998	39,864,442
2009	12,255,256	4,032,749	12,746,563	29,034,568
2010	15,728,240	7,215,190	17,451,677	40,395,107
2011	20,391,332	9,109,654	15,430,492	44,931,479
2012	28,453,598	8,113,226	35,570,351	72,137,175
2013	19,128,923	12,717,367	20,863,723	52,710,013
Grand Total	**188,693,218**	**97,240,936**	**247,258,807**	**533,192,962**
% of Total Value:	54.1%	19.3%	23.0%	27.7%

Table 3. Value of enhanced salmon by gear for 1994 – 2013. This table pulls out the enhanced value from Table 1 but shows the value percentage of enhanced salmon to total enhanced plus wild by gear. This could be viewed as relative importance of enhanced salmon by gear.

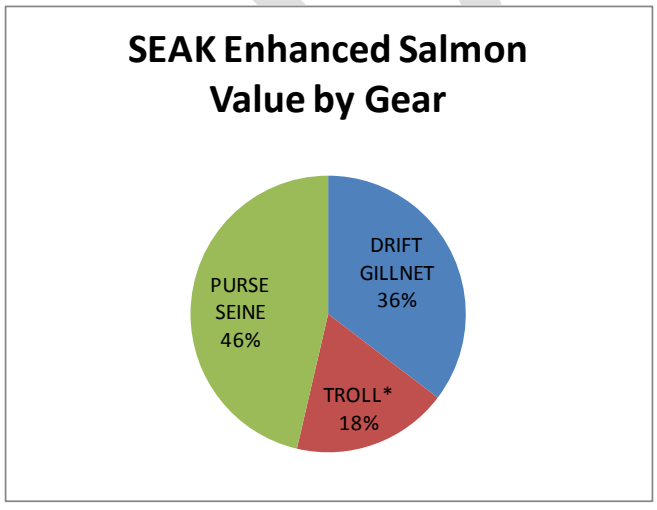

Chart 3. Percentage of enhanced salmon by gear for comparison to Table 3. Estimated value of enhanced production for the period is 533.2 million dollars, which is 27.7% of the total SEAK salmon value.

Table 4. Enhanced B:C estimates by gear (4-year offset)				
Year	DRIFT GILLNET	TROLL*	PURSE SEINE	Total
1994				
1995				
1996				
1997				
1998	7	2	5	4
1999	8	7	6	7
2000	14	7	13	12
2001	15	7	6	7
2002	11	5	3	4
2003	10	5	2	4
2004	16	9	5	8
2005	14	7	3	5
2006	50	11	25	25
2007	33	11	8	13
2008	46	8	17	18
2009	32	5	12	13
2010	26	7	21	16
2011	45	10	10	16
2012	39	7	29	24
2013	34	18	14	20
	25	**8**	**10**	**12**

Table 4. Enhanced Value by gear (Benefit) and divide by the 3% SET Estimate (Cost) by gear a benefit: cost can be calculated, as shown above in Table 4.

Overall, there is a 12:1 Benefit: Cost Ratio for the period with this gear split:

Gillnet 25:1 Troll 8:1 Seine 10:1

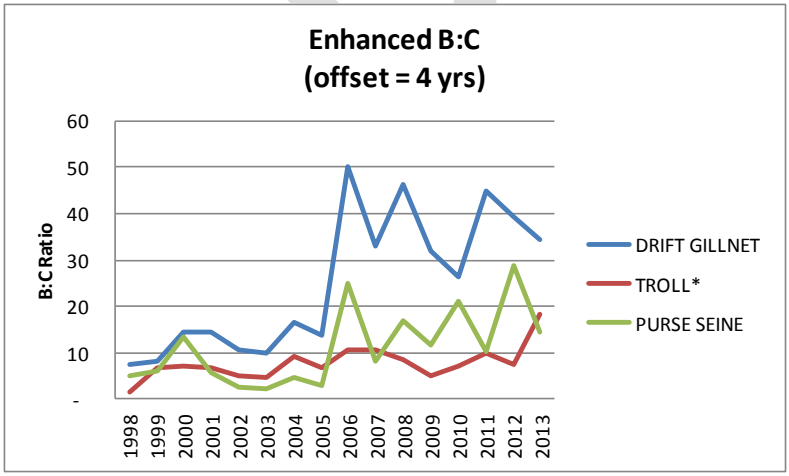

Chart 4. Benefit to Cost by gear for 1998 to 2013. Note product occurs in year 1998 but not accrue to benefits until four years later.

Table 5. Cumulative Enhanced B:C estimates by gear (4-year offset)					
Year	DRIFT GILLNET	TROLL*	PURSE SEINE	Total	
1994					
1995					
1996					
1997					
1998	7	2	5	4	
1999	8	3	6	5	
2000	10	4	8	7	
2001	11	5	7	7	
2002	11	5	6	7	
2003	10	5	6	6	
2004	11	5	6	6	
2005	11	5	5	6	
2006	14	6	6	7	
2007	16	6	6	8	
2008	18	6	7	9	
2009	20	6	7	9	
2010	20	6	8	10	
2011	22	7	8	10	
2012	24	7	10	11	
2013	25	8	10	12	

Table 5. Cumulative enhanced B:C by gear. This has the effect of smoothing out the annual fluctuations as shown in Chart 5.

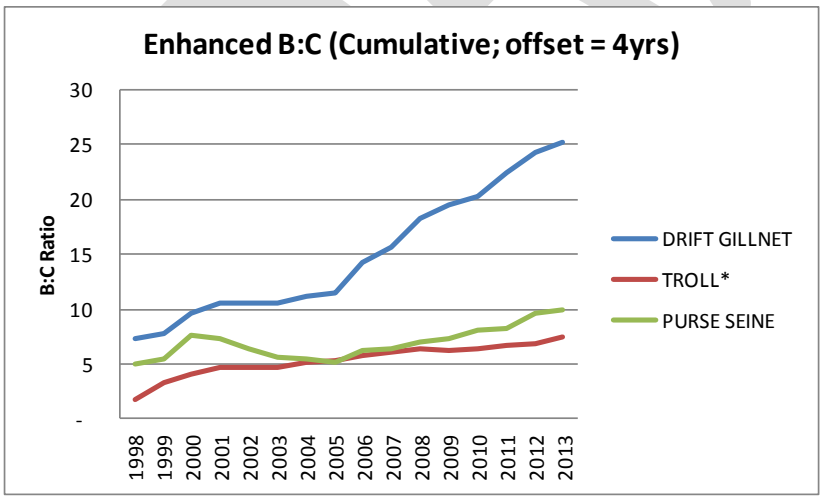

Chart 5. Benefit to Cost cumulative by gear 1998 to 2013.

Table 6. Percent of Value from Enhanced				
Year	DRIFT GILLNET	TROLL*	PURSE SEINE	Total
1994	22%	14%	15%	15%
1995	42%	17%	27%	28%
1996	29%	20%	28%	26%
1997	36%	16%	26%	25%
1998	33%	13%	20%	21%
1999	36%	17%	18%	20%
2000	57%	23%	45%	42%
2001	43%	22%	15%	20%
2002	45%	17%	18%	23%
2003	38%	19%	14%	20%
2004	46%	14%	17%	21%
2005	37%	13%	12%	17%
2006	61%	12%	55%	38%
2007	59%	15%	13%	21%
2008	68%	20%	39%	39%
2009	66%	18%	26%	32%
2010	59%	23%	31%	35%
2011	66%	28%	13%	24%
2012	76%	27%	49%	51%
2013	65%	31%	14%	23%
Grand Total	54%	19%	23%	28%

Table 6. Percentage of value each gear group derives from enhanced salmon for 1994 to 2013. Importance of enhanced fish to each gear type is evident.

What is driving the large B:C for drift gillnet? Dividing enhanced value by total value results in the portion of value from enhanced production. This shows that drift gillnet gets a much larger share of their value from enhanced fish.

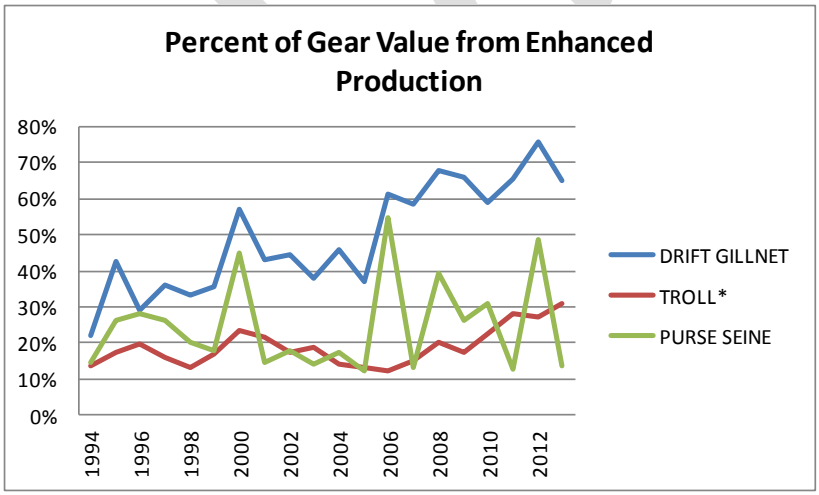

Chart 6. Chart plots Table 6 data. Troll and gillnet percent value from enhanced salmon show a general trend up while seine has an undulating high and low value. Seine value is pegged to odd year pink cycle abundance. Low seine value years correspond to large pink catches and high value.

Table 7. NON-ENHANCED (WILD+ non-AK Hatchery) VALUE				
Year	DRIFT GILLNET	TROLL*	PURSE SEINE	Total
1994	13,410,077	33,626,031	52,287,991	99,324,098
1995	9,729,987	13,802,760	41,017,474	64,550,221
1996	10,246,398	13,169,906	30,752,270	54,168,574
1997	7,106,530	15,849,578	30,060,999	53,017,106
1998	7,552,374	13,000,626	36,232,070	56,785,070
1999	7,379,005	16,981,095	46,340,447	70,700,547
2000	4,721,006	11,320,628	20,947,438	36,989,073
2001	6,464,542	13,438,605	41,572,641	61,475,789
2002	4,505,679	10,860,984	16,598,682	31,965,345
2003	5,517,925	12,038,147	22,961,551	40,517,623
2004	6,378,808	24,877,371	26,174,265	57,430,444
2005	8,045,869	23,248,080	31,668,413	62,962,362
2006	7,792,585	30,452,905	12,426,995	50,672,484
2007	6,229,742	26,256,193	43,114,079	75,600,015
2008	7,824,356	29,246,621	24,827,041	61,898,018
2009	6,323,197	18,909,328	35,670,814	60,903,339
2010	10,890,758	24,729,992	38,786,423	74,407,173
2011	10,735,174	23,297,824	106,746,590	140,779,587
2012	9,021,615	21,746,073	37,512,038	68,279,726
2013	10,327,422	28,594,765	133,200,272	172,122,459
Grand Total	**160,203,049**	**405,447,512**	**828,898,493**	**1,394,549,053**
% of Total Value	46%	81%	77%	72%
Non-enhanced relative to drift	1.0	2.5	5.2	

Table 7. Non enhanced value by gear for 1994 to 2013. Troll and seine derive 81% and 77% respectively from wild salmon harvests. Relative to gillnet, trollers get 2.5 times the value that gillnetters get; seiners 5.2 times.

The flip-side is this: trollers and seiners have much greater access to non-enhanced salmon. Of this non-enhanced value, trollers get 2.5x the value and seine 5.2x the value of drift gillnet.

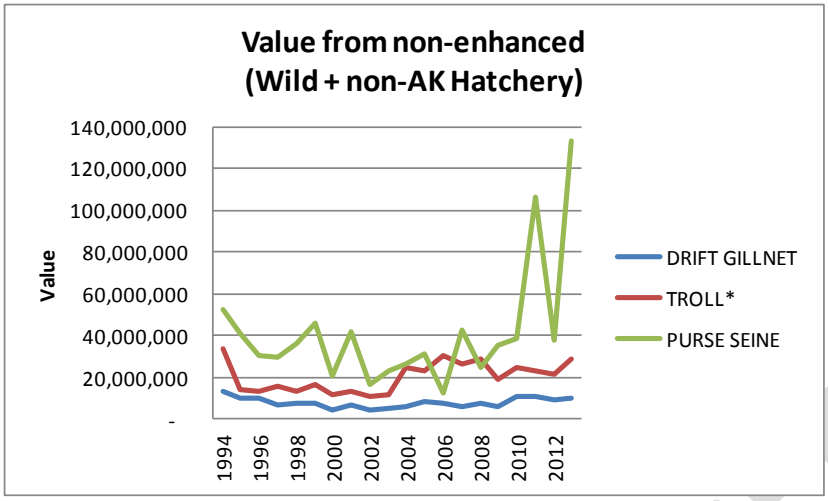

Chart 7. Graphic of Table 7 showing wild salmon harvest value by gear for 1994 – 2013.

Table 8. Enhanced B:C estimates by gear using TOTAL VALUE as the Benefit (4-year offset)

Year	DRIFT GILLNET	TROLL*	PURSE SEINE	Total
1994				
1995				
1996				
1997				
1998	22	13	25	20
1999	23	41	34	33
2000	25	30	30	29
2001	34	30	40	36
2002	24	29	15	19
2003	26	24	16	19
2004	36	65	28	38
2005	38	52	25	33
2006	82	88	45	66
2007	56	70	62	63
2008	69	42	43	47
2009	49	29	45	40
2010	44	31	68	47
2011	69	35	82	65
2012	52	27	59	46
2013	53	60	106	83
	43	**37**	**44**	**42**

Table 8. A unique way to look at benefit cost is to combine the value of wild and enhanced salmon compared to the cost of the enhancement program. This methodology allows viewing southeast fisheries in total as the

benefits to fishermen accrue from both types of production. Annual variation in B:C is great but long term B:C is similar for the three groups – 43:1 for gillnet, 37:1 for troll, and 44:1 for seine.

The original allocation plan probably envisioned a more stable sharing / growth of both enhanced and non-enhanced salmon value among gear groups. Un-foreseen circumstances have caused some un-expected imbalances. Above (Table 8.) is an alternative look at the data - where the Benefit side of the equation is changed from Enhanced Value to Total Value.

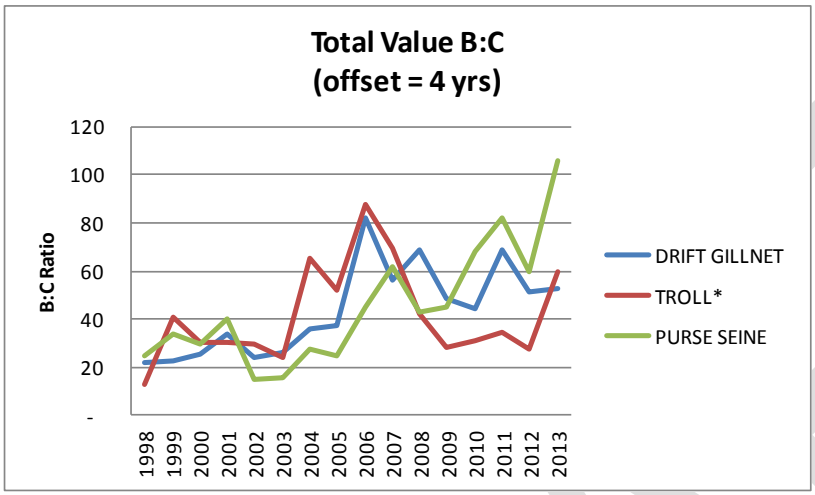

Chart 8. Annual benefit to cost graphed for total value of wild and enhance salmon. The trend for all groups is up since 1998 and is expected to continue rising. Chart 8 is a graphic of table 8.

Table 9. Cumulative TOTAL VALUE B:C estimates by gear (4-year offset)				
Year	DRIFT GILLNET	TROLL*	PURSE SEINE	Total
1994				
1995				
1996				
1997				
1998	22	13	25	20
1999	22	21	29	26
2000	23	23	29	27
2001	25	25	31	29
2002	25	25	28	27
2003	25	25	26	26
2004	26	29	26	27
2005	28	32	26	28
2006	31	36	27	30
2007	33	39	29	32
2008	36	39	30	34
2009	37	38	31	34
2010	38	37	33	35
2011	41	37	37	38
2012	42	36	39	38
2013	43	37	44	42

Table 9. Taking the same harvest data for enhanced and wild value, then calculating the running cumulative benefit to cost results in a smoothing of the trend. The trend is evident with the annual B:C in Table 8 and Chart 8, but can be seen more distinctly in Chart 9 below.

Here the same data is viewed cumulatively, smoothing out the annual fluctuations.

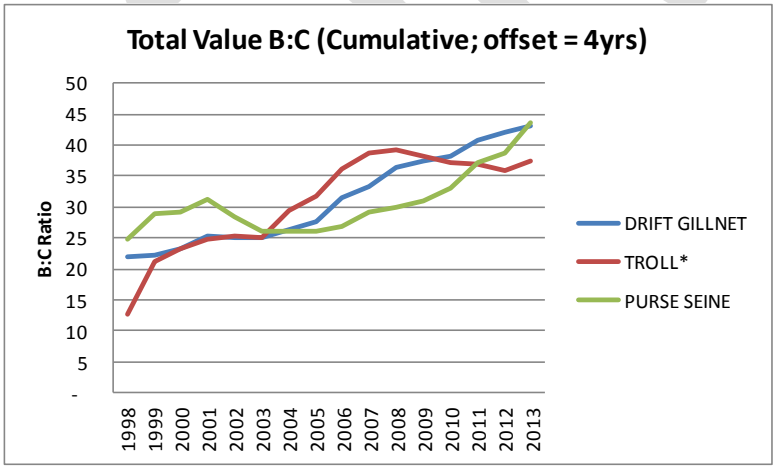

Chart 9. Cumulative benefit to cost of wild and enhanced salmon harvest. The benefits viewed in this fashion show similar outcomes for gillnet, troll, and seine in the past twenty years. In 1998, lagged four years from the start of the Allocation plan B:C ratios were in the 15 to 25 range compared to 2013 era where the B:C ratio is 40.

END