

**Analysis of By-Catch Data Collected by Washington Department
of Fish and Wildlife in Areas 10, 11 and 12 during 2011 Puget
Sound Non-Tribal Gill Net and Purse Seine Fisheries.**

by

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ABSTRACT

This report confirms the major conclusions from an earlier report (Mathews, 2012) that the by-catch rates of both chinook and coho by purse seines (number caught per 1,000 chums) during the Puget Sound chum season are greater than those by gill nets. The by-catch rate of coho by gill nets appears to be adequately measured from fish ticket catch data but not necessarily so for chinook. My conclusion that the purse seine chinook by-catch rate tends to be higher than that for gill nets was considered controversial by WDFW according to their analysis of observations taken during the 2011 chum season. My conclusion was strengthened by on-board sampling two months earlier that showed a relatively high rate of capture of small chinook by purse seiners during a 2011 pink salmon experimental fishery.

For non salmonid by-catch, the main conclusions from the 2011 data sets were these: (1) The by-catch rate and mortality rate for marine birds are higher for gill nets than for purse seines; most birds caught are common murrelets, whose populations on a continental scale are healthy; (2) dogfish is the only significant non-salmon fish species taken as by-catch and most are taken by gill nets, from which almost all can be released alive; and (3) direct marine mammal encounters in purse seines may be more frequent than in gill nets, although the relative lethality in each is not certain. Indirect marine mammal encounters registered as damaged fish in gill nets, occurred as a low percentage of the total gill net catch, and probably also occur in purse seines at some rate difficult to measure.

A discussion of relative by-catch consequences of gill netting and purse seining, presented in a 2012 Concise Explanatory Statement (CES) on Puget Sound salmon regulations by the Washington Department of Fish and Wildlife (WDFW) is mostly unsubstantiated by data or analysis. WDFW makes the barest of references to their 2011 observations and only for negative gill net opinions; they reference no facts or analysis from a 2001-2010 data set of purse seine observations that they consider to be adequate for demonstrating a "low" by-catch encounter rate for ESA species; and they minimally reference the abundant scientific literature on by-catch mortality in salmon fisheries, thus failing to confirm opinions on important by-catch issues.

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Contract Report for Puget Sound Salmon
Commission (PSSC)

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INTRODUCTION

In Feb. 2012, I submitted a report to PSSC on salmonid by-catch in non-Indian purse seine and gill net fisheries for chum salmon in Puget Sound. My major conclusions were: (1) that the coho salmon by-catch rate (numbers caught per 1,000 chums) is two or three times greater for purse seiners than gill netters, but that the majority of coho caught by seiners could be released unharmed if careful handling rules were enforced; and (2) for chinook salmon the purse seine by-catch rate is substantially greater than that for gill netters, and the majority of these small, immature fish would be dead or moribund on capture and therefore incapable of survival by careful handling and release.

In the 2012 Concise Explanatory Statement (CES) for Puget Sound Commercial Salmon Regulations, the WDFW criticized my by-catch rate estimates, which I based primarily upon two sets of data: (1) fish ticket landings by gill nets (which

are allowed to land by-catch of chinook and coho in all years and areas) and by purse seiners in the relatively few circumstances where landings of coho were allowed (purse seiners were never allowed to retain chinook for my years' of analysis); and (2) by-catch rates of chinook and coho by purse seiners in the Apple Tree Cove Point chum salmon run update test fishery. About 30-40 test sets are made each year over the course of the chum season at Apple Tree Cove Point near Kingston, and trained biological observers are aboard.

WDFW's main concerns about my Feb. 2012 conclusions can be summarized as follows:

1. Additional data were available that I did not analyze or discuss.
2. My analysis did not include species other than salmon.
3. My analysis assumed that fish tickets give an accurate representation of by-catch.
4. My analysis did not address additional sources of fishing induced mortality.

I will discuss each of these concerns in reverse order, which will lead me to the focus of the present report - analysis of the 2011 WDFW by-catch observational data for Areas 10, 11, and 12.

Regarding point (4) I believe they are referring primarily to sea lion or seal depredation in gill nets, which is well

registered by the damaged parts left in the nets. I doubt that WDFW is simultaneously referring to likely, but less obvious, marine mammal predation that may occur in purse seine sets. Sea lions are seen within and occasionally caught by purse seine sets. They apparently do not get killed in purse seines or gill nets, being pretty tough, smart animals. But it is quite likely that - just like with gill nets - they are drawn to seine sets because of the concentration of salmon to eat. However, most of what they would maim, injure, or kill without eating in a seine set, would fall to the bottom, unlike in a gill net - i.e., out of sight, out of mind. To measure this for seiners would be difficult of course, but an objective viewpoint on non-capture fishing mortality would consider this potential occurrence as well as the gill net depredation by marine mammals. WDFW monitored 3,407 purse seine sets between 2001-2010, according to their Oct. 5, 2011 e-mail to a PSSC board member. They should review and publish the record of these sets to report on the frequency of seals or sea lions in purse seines, as well as report on other by-catch issues that could be clarified by these data.

Regarding their concern about fish tickets, I make no claim that such data are 100% accurate for estimating salmonid by-catch. The full sequence of events of filling out the tickets at the point of first sale, interpreting the various scrawls and random slop on the tickets by the data recorders, and correctly programming the electronically encrypted information leaves some room for errors. In defense of my reliance on such data, I would emphasize that most fisheries agencies around the world base their management upon some trust of their systems of recording

the catch. And why would gill net and purse seine by-catch of coho salmon from fish tickets in circumstances where both can legally land such by-catch not be valid for comparison?

Regarding point (2), I was asked by PSSC to analyze only salmonid by-catch for the Feb. 2012 report. But for the present report I have been specifically asked to extend my analysis to all other by-catch species.

For point (1) I concur that any and all relevant data should be reviewed, presented, and discussed. In this present report, I specifically address the 2011 on-board monitoring of gill netters and purse seiners during the chum season, to which the WDFW refers. I also reviewed some on-board observer data for an Area 10 special experimental purse seine fishery for pink salmon in 2011, which has relevance to the by-catch issues for the chum season. I suggest that WDFW should do their own analysis of their previous relevant data sets such as Apple Tree Cove Point test set data prior to 1996, and a substantial body of purse seine and gill net observations of theirs from 2001-2010, and present reports on these for public review..

2011 WDFW Sampling Protocols

WDFW observed 97 Area 12 gill net sets, 47 Areas 10 and 11 gill net sets, and 81 Area 10 and 11 purse seine sets during the 2011 fall chum season. The period of these observations was late Oct. through early Nov. Additionally they observed 104 purse seine sets during a 2011

experimental fishery targeting pink salmon in Area 10, which occurred in late Aug through early Sept.

According to WDFW, most of the gill net sets for Areas 10 and 11 and some in Area 12 were monitored by observers who were on-board for the entire fishing period. Usually these were fishers who volunteered to have observers on board. WDFW told me that some of the Area 12 gill net sets and all of the Areas 10 and 11 purse seine sets were monitored by observers who were placed aboard from a WDFW vessel for just one or two sets, and then taken off and transferred to another vessel. I surmised that if a hailed boat was unwilling to take an observer aboard, that the WDFW vessel would then go to another one waiting to make a set, and so forth, until a willing skipper was found. This would, as in use of volunteer gill netters, avoid any potential confrontation or discomfort involving an observer and an unwilling skipper. But, reliance on willing skippers creates biased sampling for either gear type, as I discuss later. However, the purse seine sampling process gets even murkier. WDFW informed me that some uncertain proportion of the purse seine sets were not fully sampled, start to finish; only the payload was observed. I discuss the likely bias of such incomplete sampling later. All of the Area 10 pink season sets were monitored by observers who were aboard for the entire day's fishing. In fact, since this was a new, experimental fishery, purse seiners were required to have observers aboard at all times in order to participate.

Much of the methodology can be understood by referring to their data forms - which are quite different for the two gear types. (Appendix 1:Charts 1A, 1B, 1C, 1D and 1E).

Each gill net set requires two separate pages (1A, 1B), which are front and back of a sheet. The observer records standard items relative to vessel, location, date, net, skipper, observer's name, timing of the observation, weather, etc. Then, detailed catch information for all animals caught on a particular set is recorded. There are 14 separate lines for the various species of fish that conceivably could be encountered. For each species, apparently, information is supposed to be added as to extent of harm due mostly it seems to marine mammals. Thus for target fish the observer is required to indicate how many were damaged but salable, and damaged but unsalable. The total catch of a retained species like chum would be the sum of four separate columns according to the form instructions (# retained marked, # retained unmarked, # salable damaged, # unsalable damaged). The form has 14 lines for up to 14 total species of fish. Thus, in addition to the six categories of salmon (chinook can be "adults" (>22") or "juveniles"), the form has lines for possibly eight more species of fish. The back side (1B) is where the observer can keep track of all birds and marine mammals caught, and their condition. There are lines for up to 11 potential species of birds and four species of marine mammals. There is also a lot of room for comments.

The purse seine forms (1C, 1D) are quite different. Each set is simply one line. The headings relate to a series of sets that may be observed on some day by a trained observer