Chinook salmon bycatch in the at-sea sectors of the Pacific hake fishery: Summary of stock composition estimates for 1983, 2008–2013

In collaboration with FRAM, NWFSC Genetics Laboratories recently completed preliminary analysis of 2012 and 2013 Chinook salmon bycatch samples for the At-Sea Hake Observer Program (A-SHOP). We added those data to the temporal series presented in Moran and Tuttle (2011). The new results strongly confirm initial observation, as summarized in the PFMC June Briefing Book (Agenda Item D.3.a). The strongest effect we see remains that for mean latitude of sample collection. Samples from years with a more southerly distribution tended to include more southern stocks (Figure 1). This pattern was well known from historical CWT recoveries and genetic stock identification (GSI), but the new data offer the best opportunity yet to begin to quantify this latitudinal effect. Moreover, some stocks fit this pattern more closely than others due to different migration patterns (tending to migrate differentially north or south). A few northern and southern stocks, such as Georgia Basin and Klamath River show this pattern quite strongly (Figure 2).

The current goals of this study are to further explore the latitudinal effect among stocks and populations within stocks, and to compare those patterns with contemporary and historical GSI and CWT recoveries. We are especially interested in how the movement of the hake fleet over the course of the season affects stock composition of the Chinook salmon bycatch over time. We also look forward to expanding earlier analyses that appeared to show an effect of depth on some stocks; however, the relationship is complicated by movements of the fleet to maximize harvest while keeping bycatch at manageable levels (e.g., movement to the south to avoid Pacific Ocean perch). Bycatch samples from 2014 are currently being processed in the laboratory and those data will help evaluate the effects on stock composition of fishing farther offshore in deeper water. In the coming year we will analyze 2015 at-sea samples. With increased funds received, we will add 2014 and hopefully 2015 shoreside bycatch.

The proximate goals of the study are largely applied. We are interested in what stocks are being impacted, as well as the numbers and major drivers of those impacts, especially where ESA-listed populations are concerned. This information should be important not only in understanding bycatch patterns, but also in assessing the impact of various management measures on salmon bycatch. In the mid-term, we want to monitor those impacts over time, consistent with our MSA obligation to reduce bycatch. In the long-term, however, we seek a much more basic understanding of the response of individual Chinook salmon stocks to ocean conditions and to changes in those conditions over time. It is these basic pursuits that bring together the bycatch project described here with similar stock composition analysis we are doing in Washington's commercial troll fishery. At this point we have made preliminary results widely available, and we welcome comments by interested parties as we move ahead with peer-reviewed publication of both harvest and bycatch studies.

Stock composition plot

Genetic stock composition estimates for Chinook salmon bycatch in the at-sea sector of the Pacific whiting fishery show a strong effect of mean latitude. Years with similar mean latitude of bycatch had similar stock compositions (genetic stock groups optimized to FRAM stocks, ordered from south to north). Note: Non-FRAM stocks were singled out because of consistent and substantial contributions in at least some years

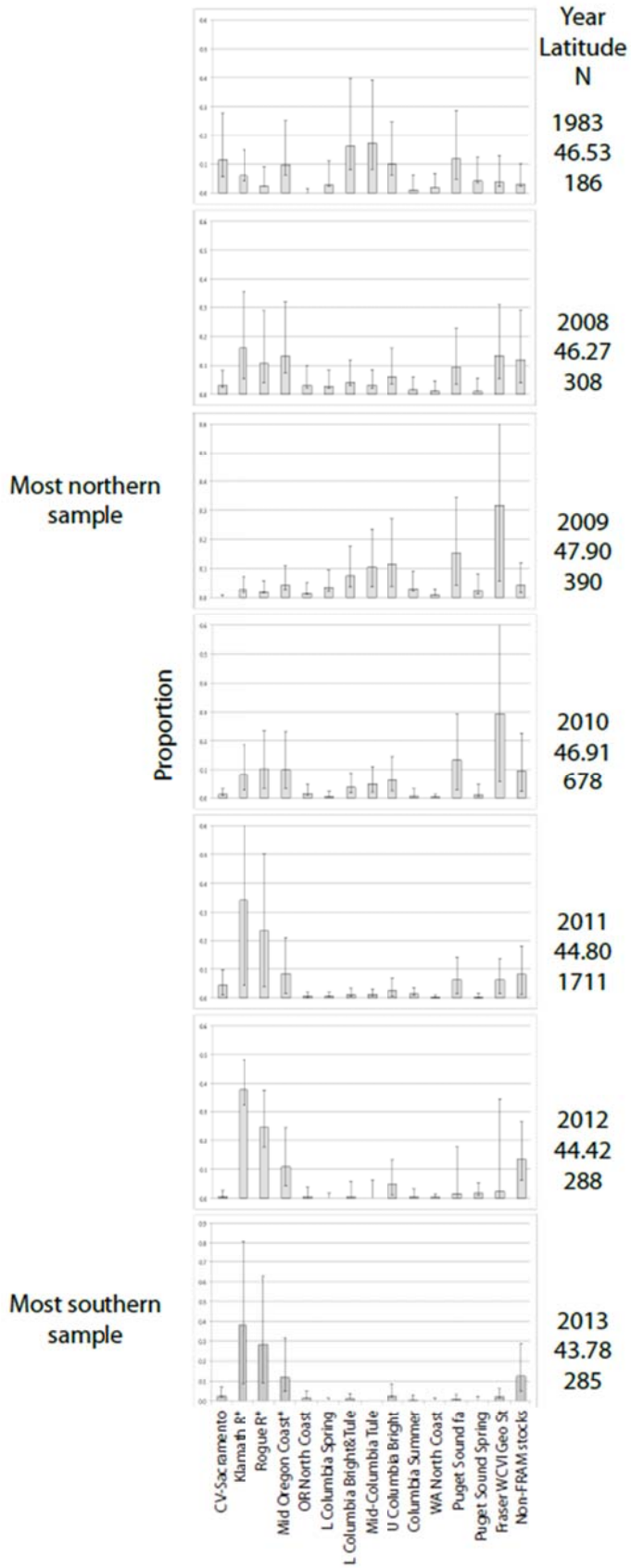

Figure 1 - Genetic stock composition of Chinook salmon bycatch in the at-seas Pacific whiting fisheries by year, 1983, 2008-2013.

Reciprocal impacts with latitude

Proportions of Klamath River and Georgia Basin fish in at-sea whiting fishery bycatch illustrated the reciprocal impacts on southern versus northern stocks attributable to mean latitude for bycatch within a given year (i.e., reflecting fishing effort). Consistent with previous genetic and CWT models, our results showed that fishing at southern latitudes substantially increases impacts on southern stocks of Chinook salmon.

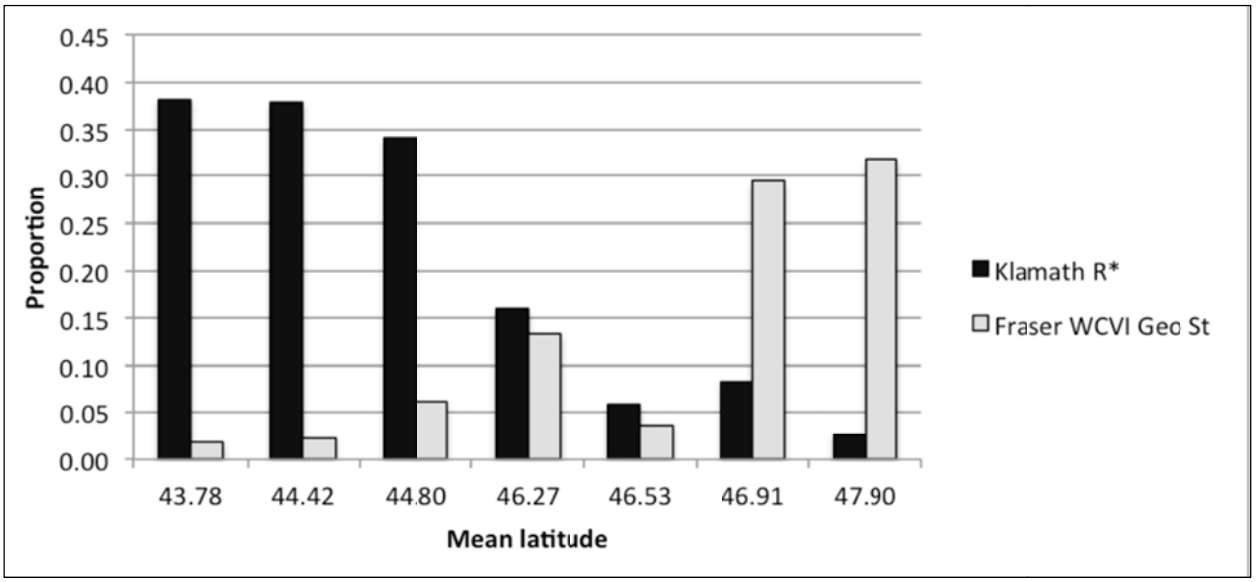

Figure 2. Proportions of Klamath River and Georgia Basin fish in at-sea Pacific whiting fishery bycatch by latitude.