

Supplement for Ward et al., ‘Effects of increased
specialization on revenue of Alaskan salmon fishers over
four decades’

Appendix

Overall trends in participation across permits

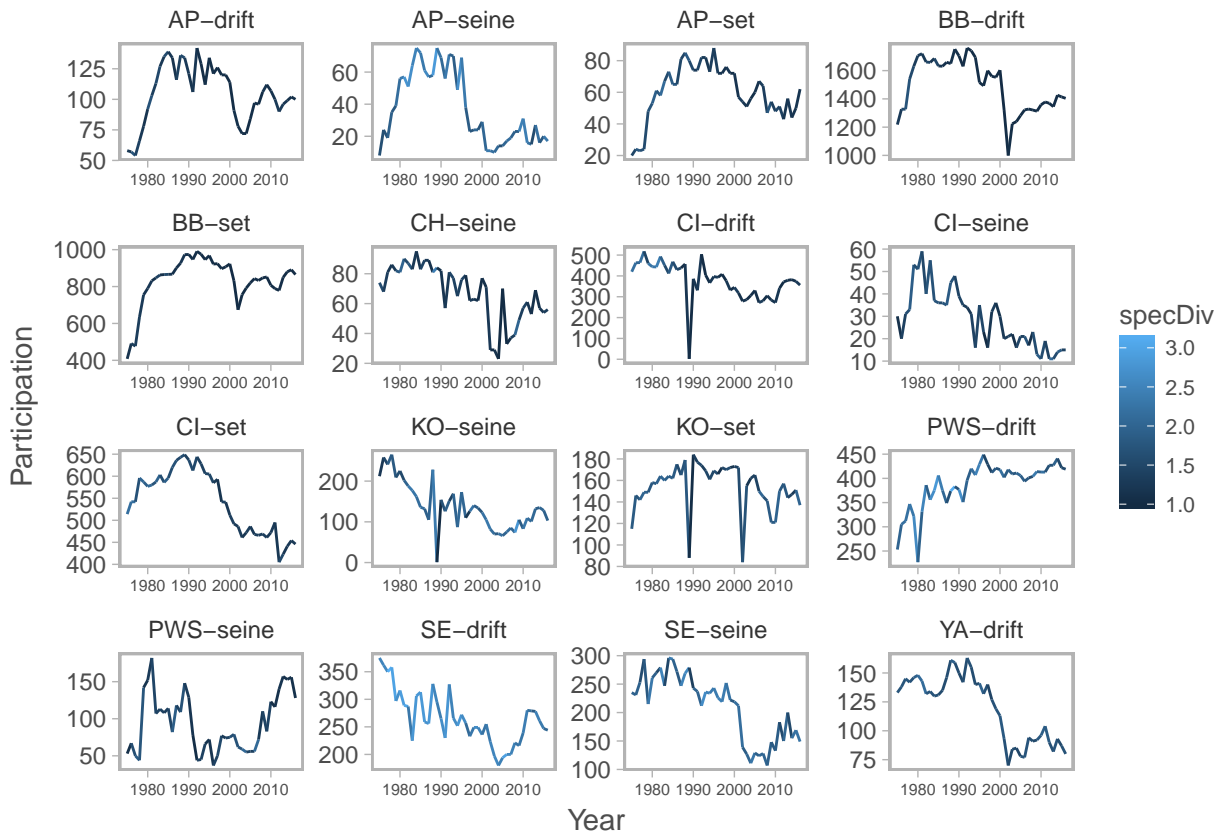


Figure 1: Participation (unique people). Permits are coded by gear (purse seine, set and drift gillnets) and region ('AP' = Alaska Peninsula, 'BB' = Bristol Bay, 'CH' = Chignik, 'CI' = Cook Inlet, 'KO' = Kodiak, 'PWS' = Prince William Sound, 'SE' = Southeast, 'YA' = Yakutat). Effective species diversity is calculated as $1/\text{Simpson's Diversity}$.

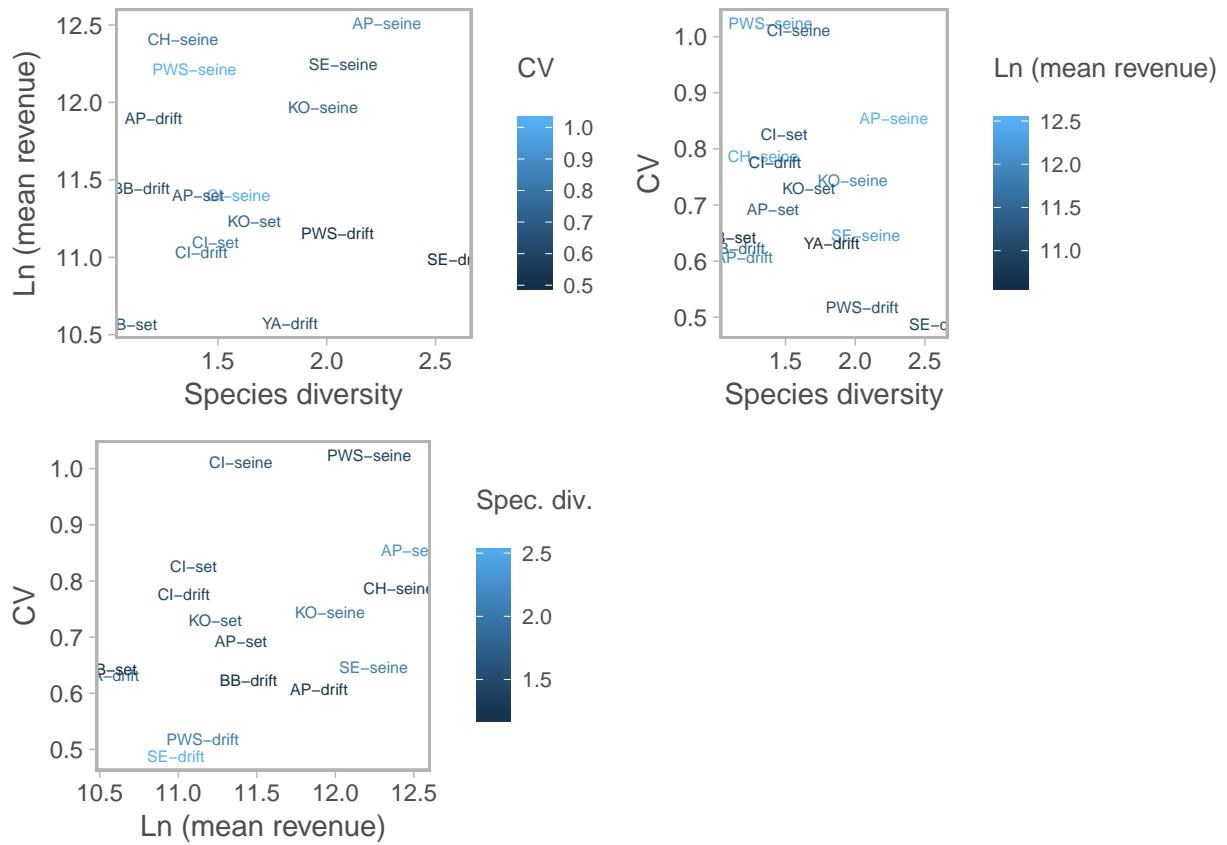


Figure 2: Diversity, mean revenue and CV (aggregated across years). Permits are coded by gear (purse seine, set and drift gillnets) and region ('AP' = Alaska Peninsula, 'BB' = Bristol Bay, 'CH' = Chignik, 'CI' = Cook Inlet, 'KO' = Kodiak, 'KU' = Kuskokwim, 'PWS' = Prince William Sound, 'SE' = Southeast, 'YA' = Yakutat). Effective species diversity is calculated as $1/\text{Simpson's Diversity}$.

Trends in revenue and prices

Across regions, we see lots of synchrony in prices between coho, chum, and pink salmon, with them increasing more quickly than sockeye/Chinook. Sockeye/Chinook have been the highest priced historically, with coho > chum > pink. For most permit types, median revenue / person has generally increased, especially since early 2000s. For some permits, variability appears to have changed through time (quartile range getting smaller).

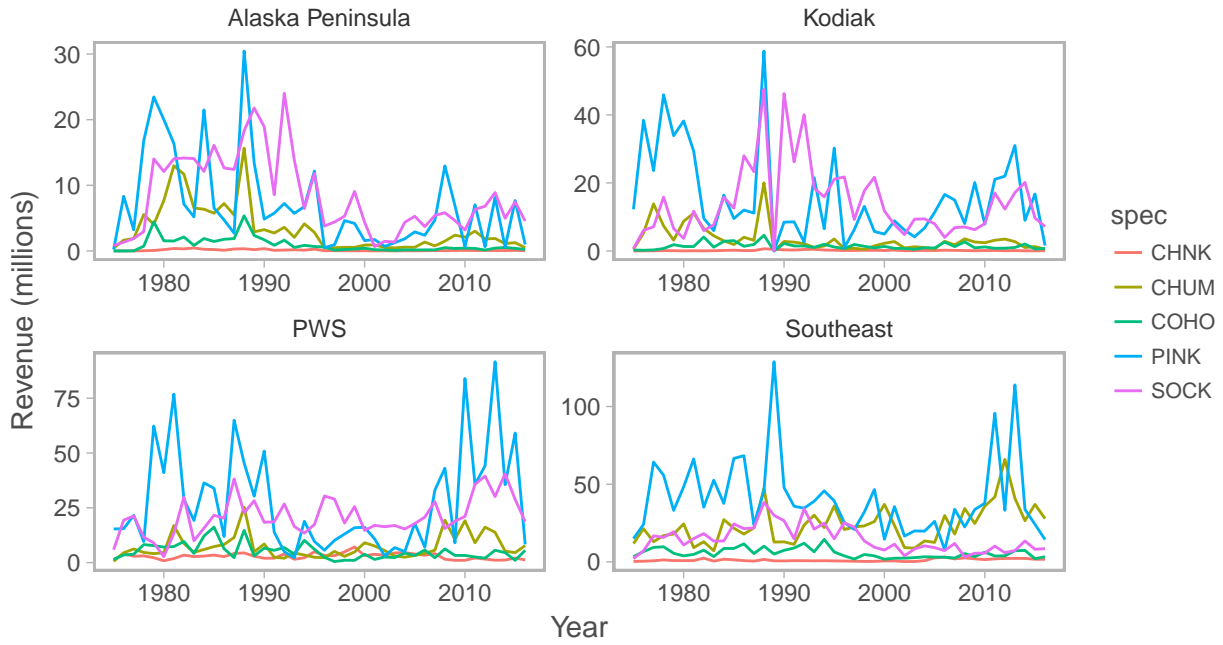


Figure 3: Total revenue by area (across people and permits within each)

Synchrony in prices: relative change

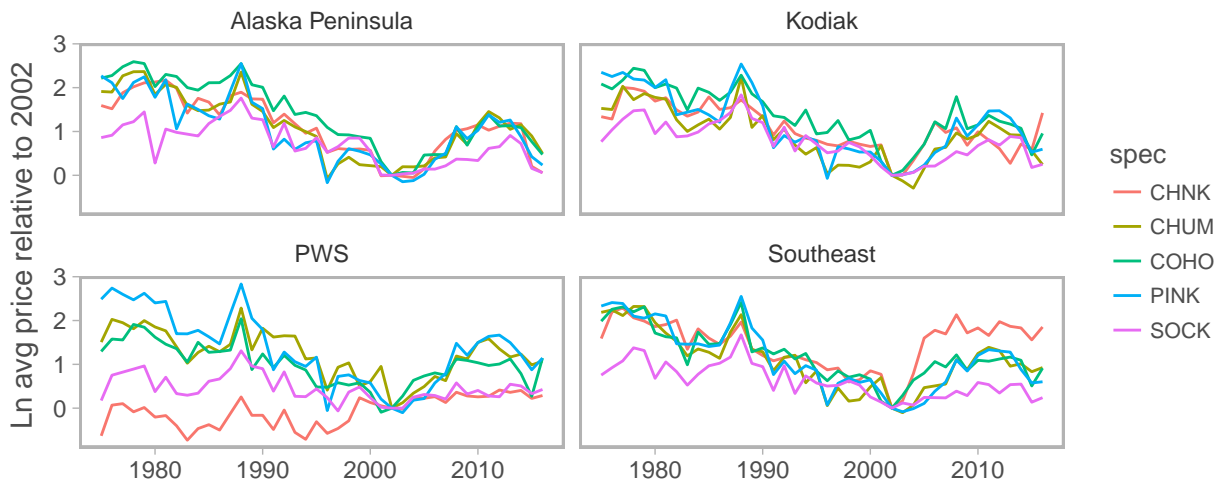


Figure 4: Inflation adjusted prices / species by area, relative to 2002 (the year corresponding to the lowest average prices).

Synchrony in prices: percent change

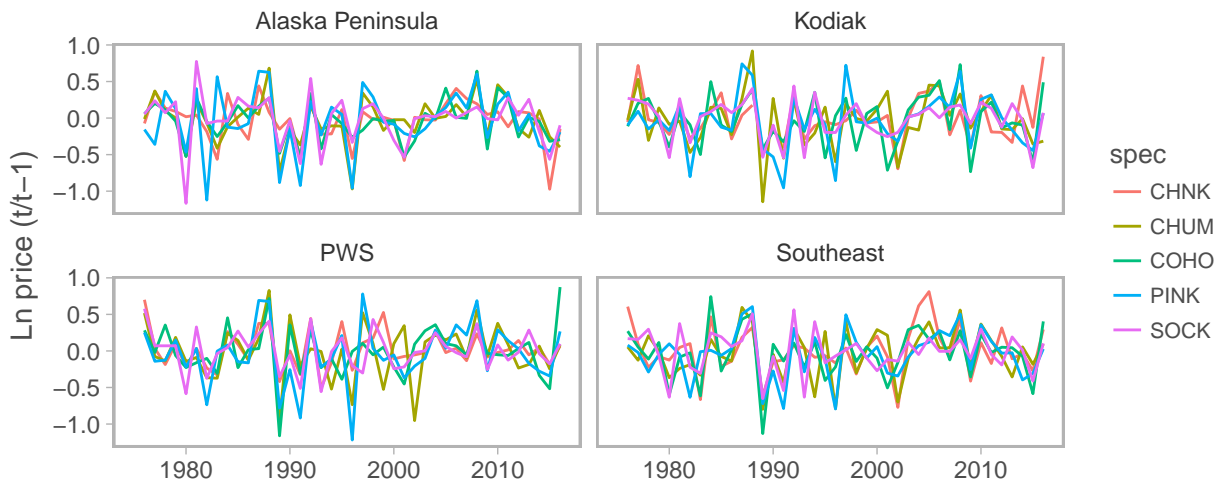


Figure 5: Percent change (log-difference) in inflation adjusted prices / species by area

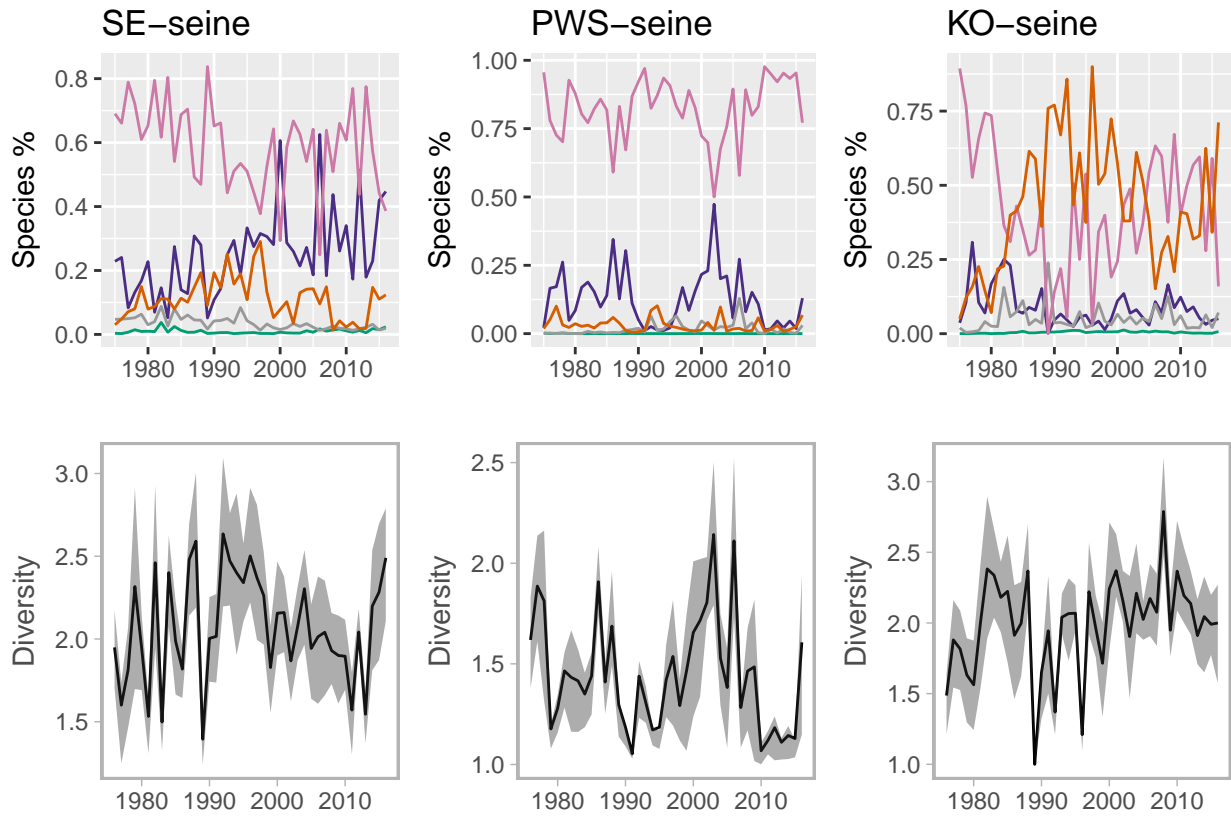


Figure 6: Time varying species composition and effective species diversity ($1 / \text{Simpson's Diversity}$), by permit for seine fisheries in Southeast Alaska ('SE', S01A), Prince William Sound ('PWS', S01E) and Kodiak ('KO', S01K). Species are colored as follows: green (Chinook), purple (chum), silver (coho), pink (pink), red (sockeye)

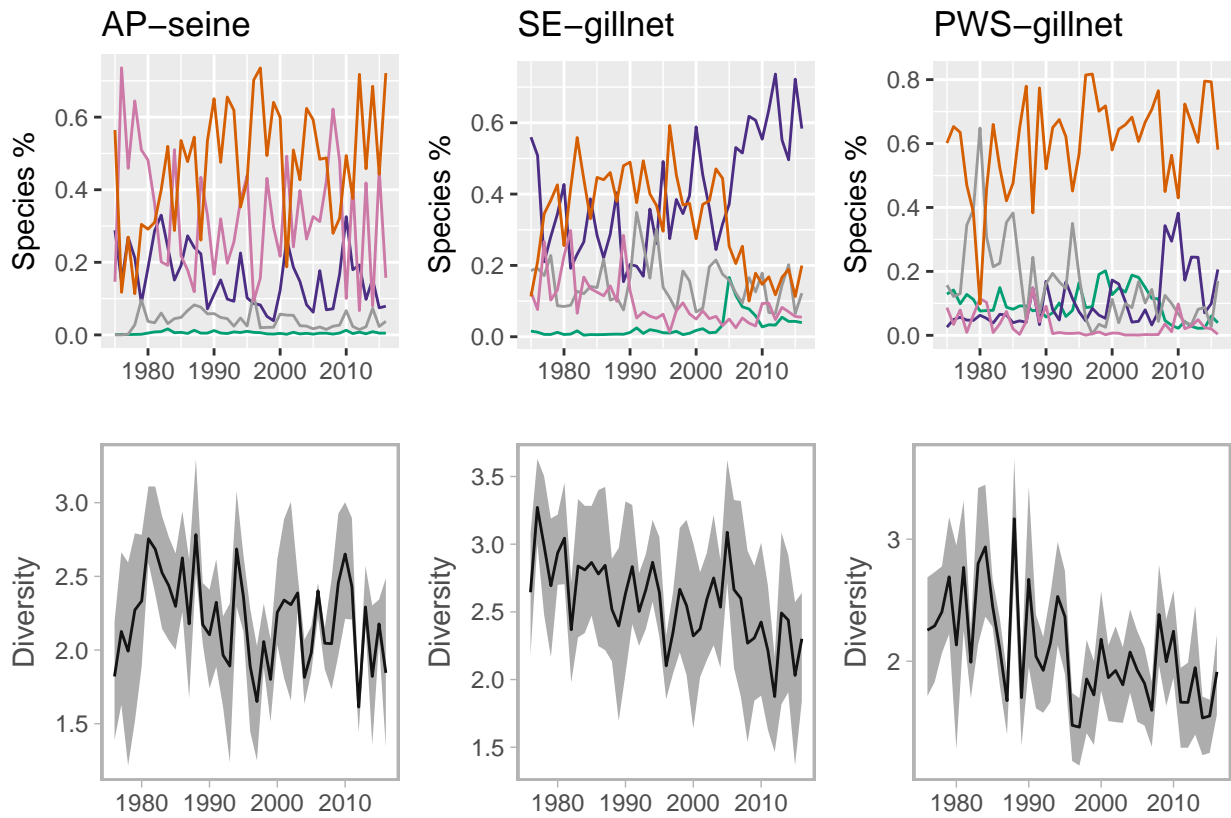


Figure 7: Time varying species composition and effective species diversity ($1 / \text{Simpson's Diversity}$), by permit, for seine fisheries on the Alaska Peninsula ('AP', S01M), and gillnet fisheries in Southeast Alaska ('SE', S03A) and Prince William Sound ('PWS', S03E).

Model Results

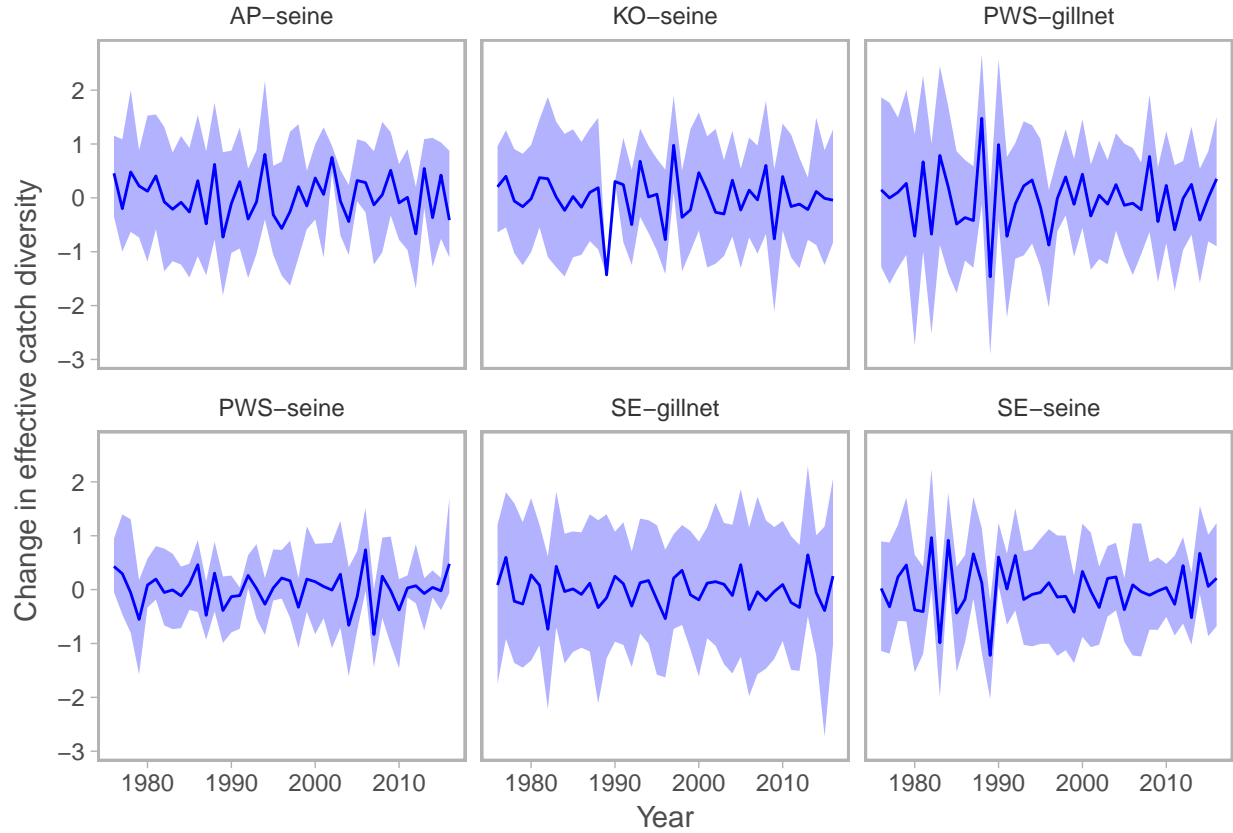


Figure 8: Change in effective catch diversity, year over year, by permit. Change in diversity is calculated as diversity in the current year minus diversity in the previous year (thus, positive values represent diversity has increased). The solid line represents the mean, and shaded region represents 95% intervals.

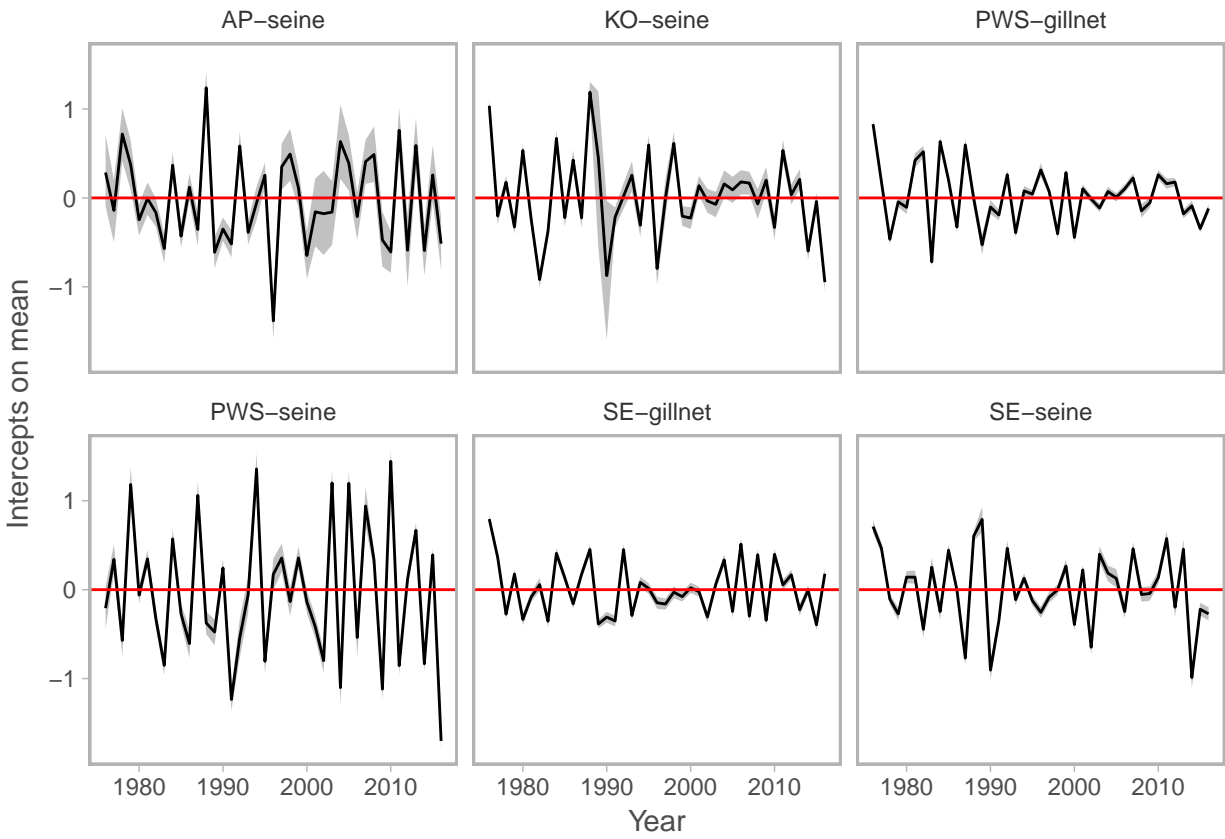


Figure 9: Time varying intercepts on estimated mean revenue, by permit. These are interpreted as the mean change in revenue for each permit holder in each year (positive equates to increasing revenue, etc), after accounting for effects of catch diversification and days fished.

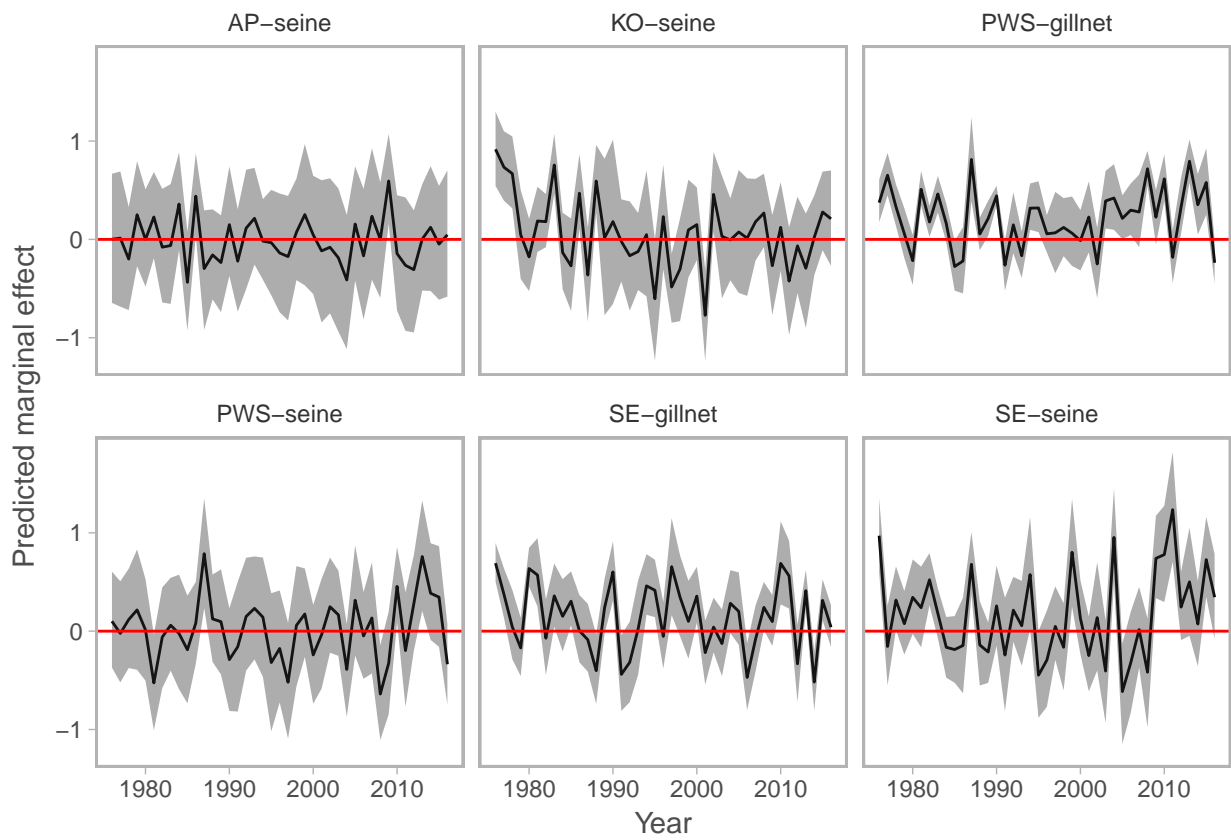


Figure 10: Time varying effects of increasing the effective species diversity of catch from 1 to 2 species, on log standard deviation of revenue.

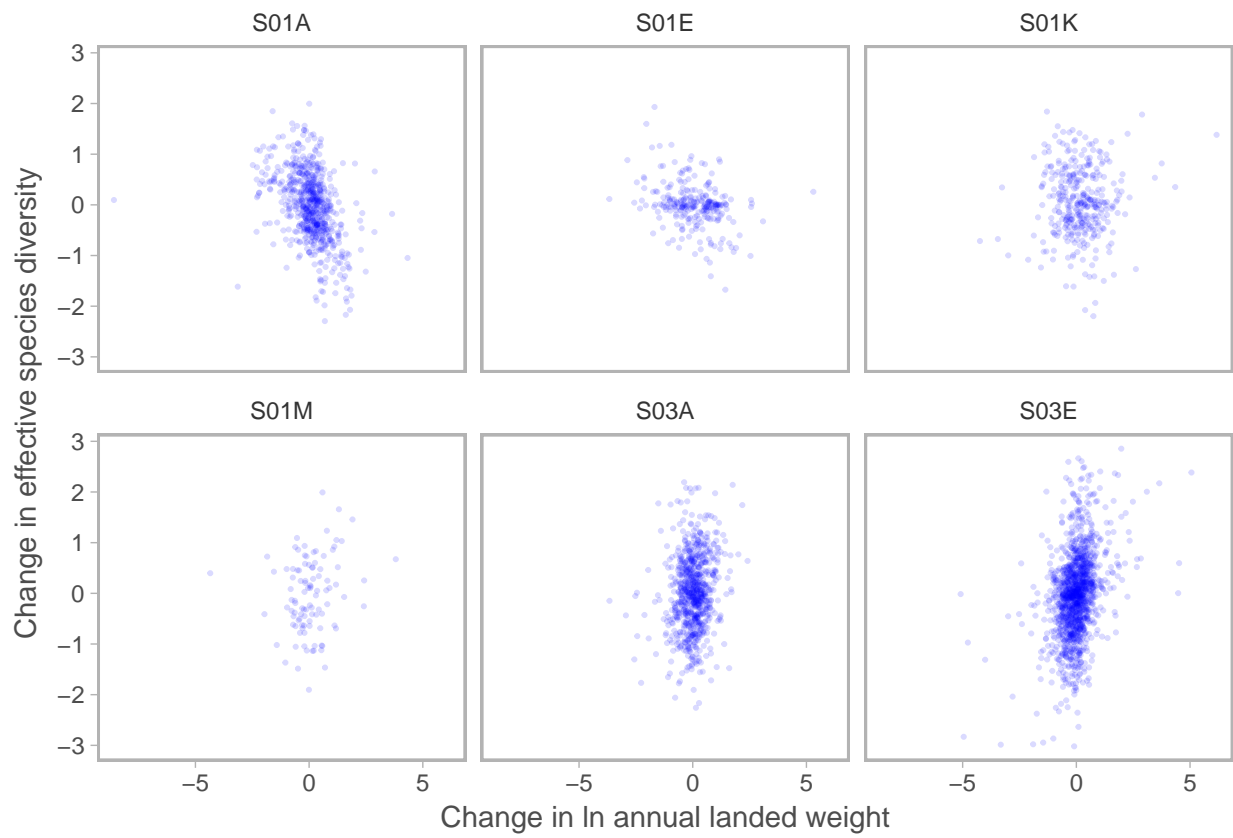


Figure 11: Change in natural log of landed weight versus change in effective species diversity, by permit. Decreases in landed weight is often accompanied by reduced catch diversity.

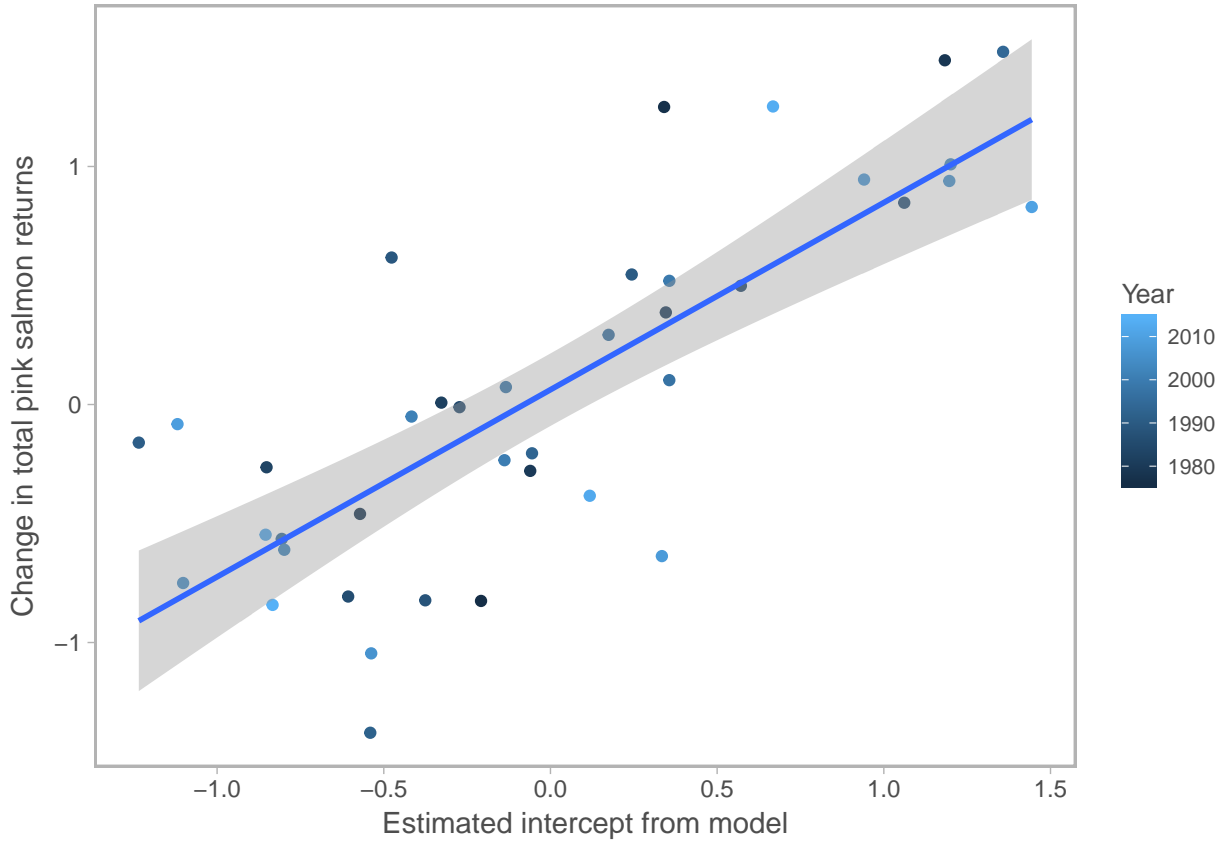


Figure 12: As model validation, we can compare the estimated intercepts for PWS S01E (purse seine) representing average year to year change in revenue versus the change year over year in $\ln(\text{pink salmon returns})$. Correlation between them is ~ 0.8 . This suggests (as expected) people on average make a lot more money in years when pink salmon returns are high.

Season length

There appears to be no significant trend in season length (defined as the difference between 95% CIs) or mean Julian day for any fishery. In all cases, the dates are weighted by the earnings associated with landed catch.

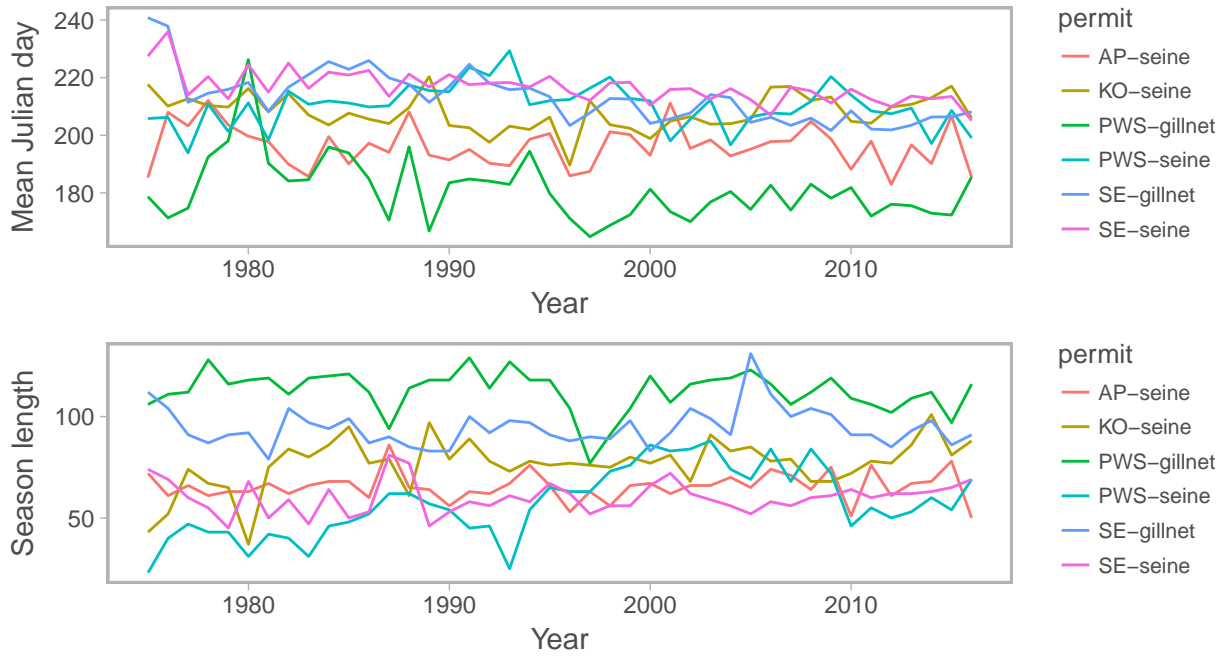


Figure 13: Trends in mean Julian day and season length by fishery