Euphausiid Availability Explains Marine Survival Variation for Barkley Sound Coho Salmon (*Oncorhynchus kisutch*) and Sockeye Salmon (*O. nerka*)

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We have been monitoring the population biology of euphausiids (*Thysanoessa spinifera*, *Euphausia pacifica*) from the southwest coast of Vancouver Island (SWCVI) since 1991, a period during which there have been significant ocean warming and cooling events. We have found recently that coho salmon (*Oncorhynchus kisutch*) and sockeye salmon (*O. nerka*) smolts originating in Barkley Sound feed on *T. spinifera* when they move to continental shelf waters along the SWCVI. Coho salmon ate 9–12 mm long *T. spinifera* and sockeye salmon fed on animals that were 3–5 mm in length. This information allowed us to test the null hypothesis that smolt abundance and food availability during the first marine year have no effect on the number of returning adults. The null hypothesis was rejected for both species. Results of multiple regression analyses showed that the parameter estimate for the smolt effect did not differ significantly from 1; therefore, smolt number had no compensatory or depensatory effect on returns. For coho, median *T. spinifera* abundance over June–August of the first marine year improved the regression fit and accounted for a significant proportion (23%) of the explained variation. Figure 1 shows results of a retrospective analysis of forecasts of marine survival for wild (Carnation Creek) coho salmon; data are presented as marine survival rate because Carnation Creek and Kirby Creek (another "wild indicator stream about 100 km away) have different smolt outputs. For sockeye salmon, the median biomass of *T. spinifera* over April–June of the first marine year improved the regression fit and explained 58% of the variation in the number of sockeye salmon returning to Great Central and Sproat Lakes. Fits of age-specific regressions for Great Central Lake are show in Fig. 2. Explained variation ranged between 70 and 98% depending on the lake and age-group for which the analysis was done.

Fig. 1. Results of retrospective analysis of forecasting accuracy of smolt-euphausiid regression for Carnation Creek wild coho salmon (top panel) and Robertson Creek Hatchery coho salmon. Solid circles – observed survival rate. Open circles – predicted survival rate. Error bars – 95% CL. K – observed marine survival rate for Kirby Creek coho salmon.

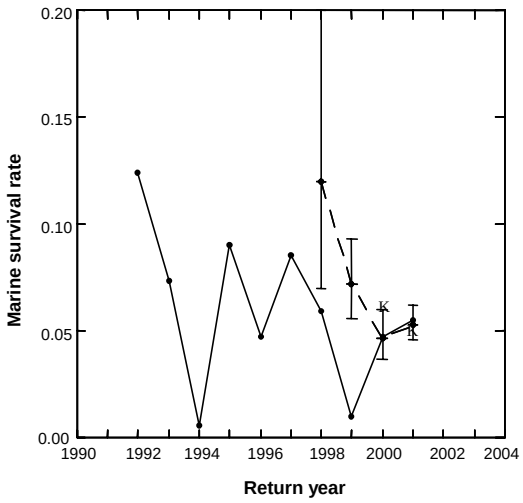
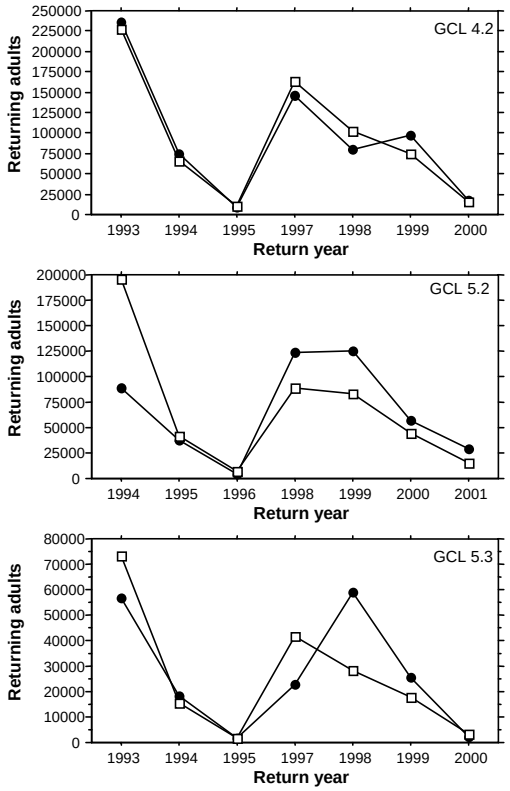


Fig. 2. Plots of observed (solid circles) and fitted estimates (open squares) of number of returning sockeye salmon by lake and age. This is a representative subset and is for the dominant age classes in Great Central Lake.



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