

Oceanic Distribution of Chinook Salmon Inferred from Age-Specific Arrival Timing

Chloe Bracis¹ and James J. Anderson²

¹*Quantitative Ecology and Resource Management, University of Washington, Box 355020, Seattle, WA 98195, USA*

²*School of Aquatic and Fishery Sciences, University of Washington, Box 358218, Seattle, WA 98195, USA*

Keywords: Chinook salmon, ocean migration, arrival order, age

While Columbia River spring–summer Chinook salmon *Oncorhynchus tshawytscha* are known to proceed northwards along the North American coast during their first summer and autumn at sea, their subsequent oceanic distribution is essentially unknown, until they are again detected in the fishery at the mouth of the river or at Bonneville Dam, located 235 km upstream of the river mouth. In addition to the known arrival time ordering of the distinct populations comprising this run, our analysis of returning tagged adults shows that within populations, the oldest fish (ocean age-3) arrive first, the ocean age-2 fish next, and the ocean age-1 fish last (Bracis and Anderson 2013). To explore possible mechanisms underlying this persistent age-dependent ordering of arrival time, we simulated the fish’s return migration using a model based on a geomagnetic homing mechanism with age-specific swimming speeds (Bracis and Anderson 2012). To reproduce the observed age-dependent differences in arrival times with the model, within a population, the ocean age-2 and -3 fish needed to initiate migration from the same location and time. On the other hand, ocean age-1 fish may initiate homeward migration from a more consistent location in the northern Gulf of Alaska with some delay (Bracis and Anderson 2013). This would suggest these populations overwinter near the Alaskan coast during their first year at sea before dispersing more broadly during subsequent years of ocean residence. Arrival timing patterns have valuable information that can be used to infer the features of homing migrations, which in turn may be useful for considering potential responses to climate change.

REFERENCES

- Bracis, C., and J.J. Anderson. 2012. An investigation of the geomagnetic imprinting hypothesis for salmon. *Fish. Oceanogr.* 21: 170–181.
- Bracis, C., and J.J. Anderson. 2013. Inferring the relative oceanic distribution of salmon from patterns in age-specific arrival timing. *Trans. Am. Fish. Soc.* 142: 556–567.