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Who's your daddy? Validating length-at-date run assignments with genetics for Central Valley Chinook.

Abstract: The Length-at-Date approach uses fork length and sampling date to assign run-origin to juvenile Central Valley Chinook salmon. Fork length ranges of each run are assumed to vary according to the earliest and latest estimated emergence dates and an estimated average growth rate. Following federal ESA listing of Sacramento River winter-run Chinook salmon in 1990, the Length-at-Date approach was adopted to assess take of winter-run juveniles entrained at federal and state water project facilities in the southern Sacramento-San Joaquin Delta. Soon after, genetic assays to evaluate the accuracy of the Length-at-Date approach were developed. More than 11,000 genetic run-origin assignments have been made since 2003 using the most accurate assays. Length-at-Date assignments conflicted with genetic assignments for nearly half of these genetically tested fish. Only genetic winter run consistently fell within corresponding Length-at-Date size criteria. However, many fish genetically assigned to other runs also fell within winter-run Length-at-Date criteria. All other runs had much lower agreement between genetic and Length-at-Date run assignment. For example, genetically assigned late-fall run was 27 times more abundant than Length-at-Date late-fall run, while genetic spring run was one fiftieth the abundance of Length-at-Date spring run. However, the latter result may reflect the inability of the genetic tests to distinguish phenotypic spring run and fall run in the Feather River, where these two runs have hybridized. Overall, these results do not support two central assumptions of the Length-at-Date approach as applied at the south Delta salvage facilities: (1) for each juvenile Chinook salmon run, average fork length increases with time, and (2) juvenile fork length size ranges of the different runs are segregated. Genetic run assignment provides a more accurate examination of take at water project facilities, and brings into question the use of the Length-at-Date approach for quantifying take for sampling programs throughout the Delta.

Statement of Relevance: ESA listed salmon take based on Length-at-Date run identification is a central factor controlling water export rates at state and federal pumping facilities. Length-at-Date run identification is also central to salmon monitoring programs throughout the Central Valley. Our results suggest a more accurate identification method could alter water export constraints and would improve our understanding of run-specific migration behavior.