New Observations in PIT tag Detection Data Collected with a Surface Trawl in the Columbia River Estuary

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We have used a surface pair trawl to guide juvenile salmonids (*Oncorhynchus* ssp.) through PIT-tag detection antennas affixed to the cod end of the trawl since 1995. Sampling has occurred annually (except 1997) during the spring migration period for juvenile salmonids entering in the Columbia River estuary and we have averaged about 12,000 annual detections through this multi-year period, culminating in over 31,000 detections in 2010. Consistent daily sampling, much using 2-daily sample crews, over such a long term provides information on many common behavioral trends. Variation in these common trends associated with individual fish is easily overlooked against a background of normal and expected behaviors. Changes in regional tagging strategies provide new opportunities to report on species not previously represented in detection data. In 2010, there were three new trends in the detection data that merit discussion. First, we detected 27 individual fish (14 Chinook salmon and 13 steelhead) multiple times over a period of 24 to 48 hours. Typically, the difference between first and last observation time of an individual fish is within seconds of each other, with some delay possible, but generally no more than an hour. Delayed seaward migration in the estuary prior to ocean entry by use of shorelines and tidal marshes has been previously documented by other researchers; however we have never documented mid-channel detections of the same fish over multiple days. Secondly, annual detections of Sockeye salmon were minimal through 2008 (less than 250) but increased PIT-tagging and releases of sockeye were sufficient to enable estimates of travel speed to the estuary following detection at Bonneville Dam, and to analyze diel availability, for the first time in 2009 and 2010 ($n = 952$ and 640 respectively). Lastly, the number of Willamette River basin PIT-tagged juvenile Chinook salmon and steelhead, and their time of arrival to the trawl, has varied considerably through the years. Some of these fish migrate early in the season and have been detected in the estuary as early as mid-March. In general, the recent increase in tagging efforts in the Willamette River and its tributaries has provided sufficient estuary detection data for comparing the migration timing of these stocks to those from other river systems upstream from Bonneville Dam. Further, detections of fish at Sullivan Dam on the Willamette River near Portland, OR, enable us to compare travel speed of individual fish from their upriver release sites to Sullivan Dam and from Sullivan Dam to our trawl in the estuary. These data show that, Willamette River source fish traveled significantly faster from Sullivan Dam to the estuary than from their release site to Sullivan Dam (22.8 and 10.3 km/d respectively, $p < 0.001$). Thus we show that our multi-year PIT tag sampling effort provides an extensive data set enabling better understanding of the range of behaviors, survival, and timing of juvenile salmonids passing through the estuary and into the ocean.