



United States Department of the Interior



FISH AND WILDLIFE SERVICE

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Memorandum

To: Potter Valley Project Fish Working Group

From: Damon H. Goodman, USFWS, Fish Biologist, damon_goodman@fws.gov

Date: July 11, 2018

Subject: Pacific Lamprey migration timing

The Potter Valley Project Fish Working Group requested a compilation information on seasonality of upstream and downstream Pacific Lamprey migration to inform the development and evaluation of passage scenarios. This memo summarizes some relevant information. More information is available upon request.

Life history - Pacific Lamprey are an anadromous fish species with a complex life history. Adult lampreys move from the Pacific Ocean to riverine cobble and gravel bed spawning grounds, during this life stage they are about 2ft long. Some individuals migrate directly to spawning grounds and construct nests in the same season others burry themselves in the bottom of the river, hold for a year and spawn the following spring. Pacific Lamprey parish after spawning. Larval lampreys or ammocoetes emerge from nests about the size of an eyelash and seek depositional sand-bottomed habitats like eddies and pools where they create burrows and filter feed for 5 to 7 years. At the end of their rearing period, lamprey are about the size of a pencil and transform into a downstream migrant or macrophthalmia. Downstream migrants wait for peak flow events and then migrate to the Pacific Ocean to begin feeding as a predator.

Upstream migration timing - Adult upstream migration timing has been evaluated at Cape Horn Dam by USFWS and CDFW since 2012. In July of 2016 a motion activated video monitoring system was installed on a lamprey specific fishway (lamprey tube) to count lampreys as they pass Cape Horn Dam. The data provided in Figure 1 is a compilation of count data collected from July of 2016 to May of 2018 using the video monitoring system. Also note that monitoring was not continuous during that period due to high streamflow conditions during 2017. The monitoring and passage system was modified in the Fall of 2017 to function in a wider range of conditions. Count data presented for the Eel River should be considered a minimum time period when migration would be expected due to limited years of operation and limited monitoring windows within that period.

Adult lamprey migration was observed in 6 months of the year at Van Arsdale. During the monitoring period adult migration was observed in every month between April and September and again in

between November and December. Peak migration timing appears to be between April and into July and may vary by year. Substantial differences in abundance were observed among years with 2017 having the highest counts and the widest range of migration timing among years. The highest count observed in a single day was 806 on July 1, 2017.

Adult lamprey counts from other river systems in California indicate migration may occur in nearly every month of the year. Lamprey counts from Mirabel Fishway on the Russian River (S. Chase Sonoma County Water Agency) collected between 2000 and 2012 documented migration from April to through December. On Battle Creek in the Sacramento River lamprey have been observed from March to August. At the Vern Freeman Diversion in the Santa Clara River adults were observed from January to May.

Downstream migration timing – We studied the downstream migration of Pacific Lamprey over a 10-year period at the Red Bluff Diversion Dam in the Sacramento River. The trapping location is an ideal location to study lamprey migration as sampling can occur over a wide range of streamflows, at multiple traps across the channel and traps are operated year round. Downstream migrants were detected year-round at the site but primarily between November and May (Figure 2). Downstream migration was punctuated with 90% of downstream migrants caught in groups of 50 or more with a maximum daily catch of 4,172 individuals. In addition 93% of migrants were caught during or within two days subsequent of a rainfall event, which was used as a surrogate for peak flow event for modeling purposes. This information was published in the Canadian Journal of Aquatic and Fisheries Sciences in 2015 and is available upon request. Ongoing analysis of outmigration data indicates that in flowing water, downstream migrants are associated with the channel thalweg.

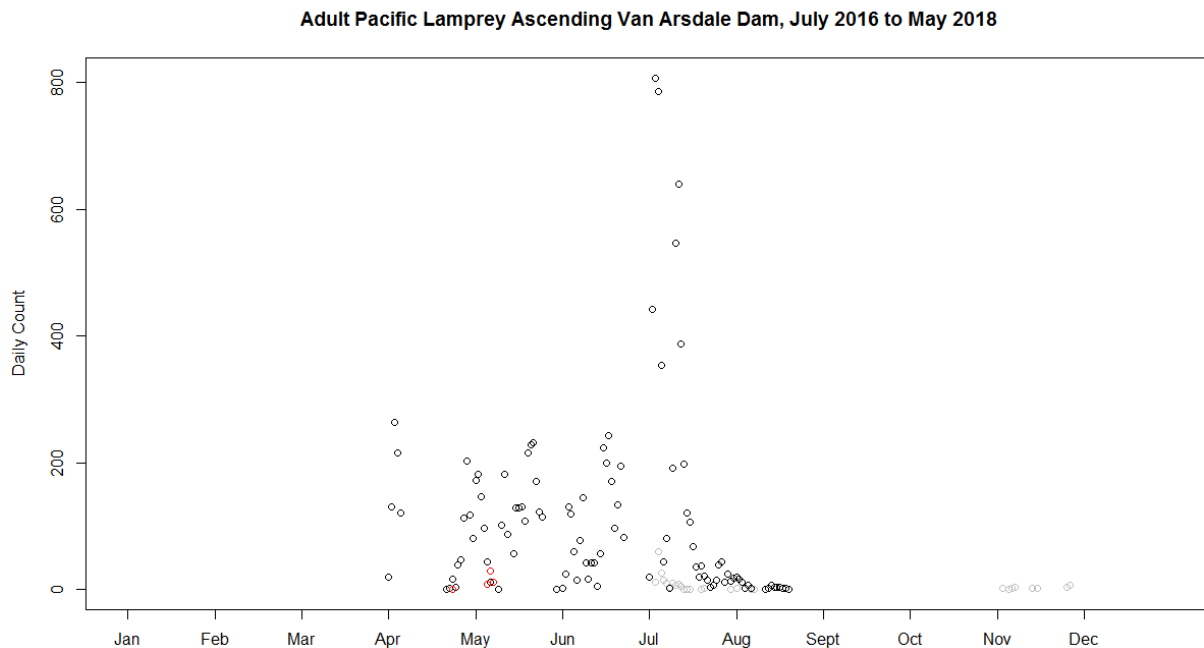


Figure 1. Adult Pacific Lamprey counts at Van Arsdale. Each circle indicates a daily count of lamprey. Grey circles indicate 2016, black 2017 and red 2018. Note monitoring was not conducted continuously since 2016 due to operational constraints.

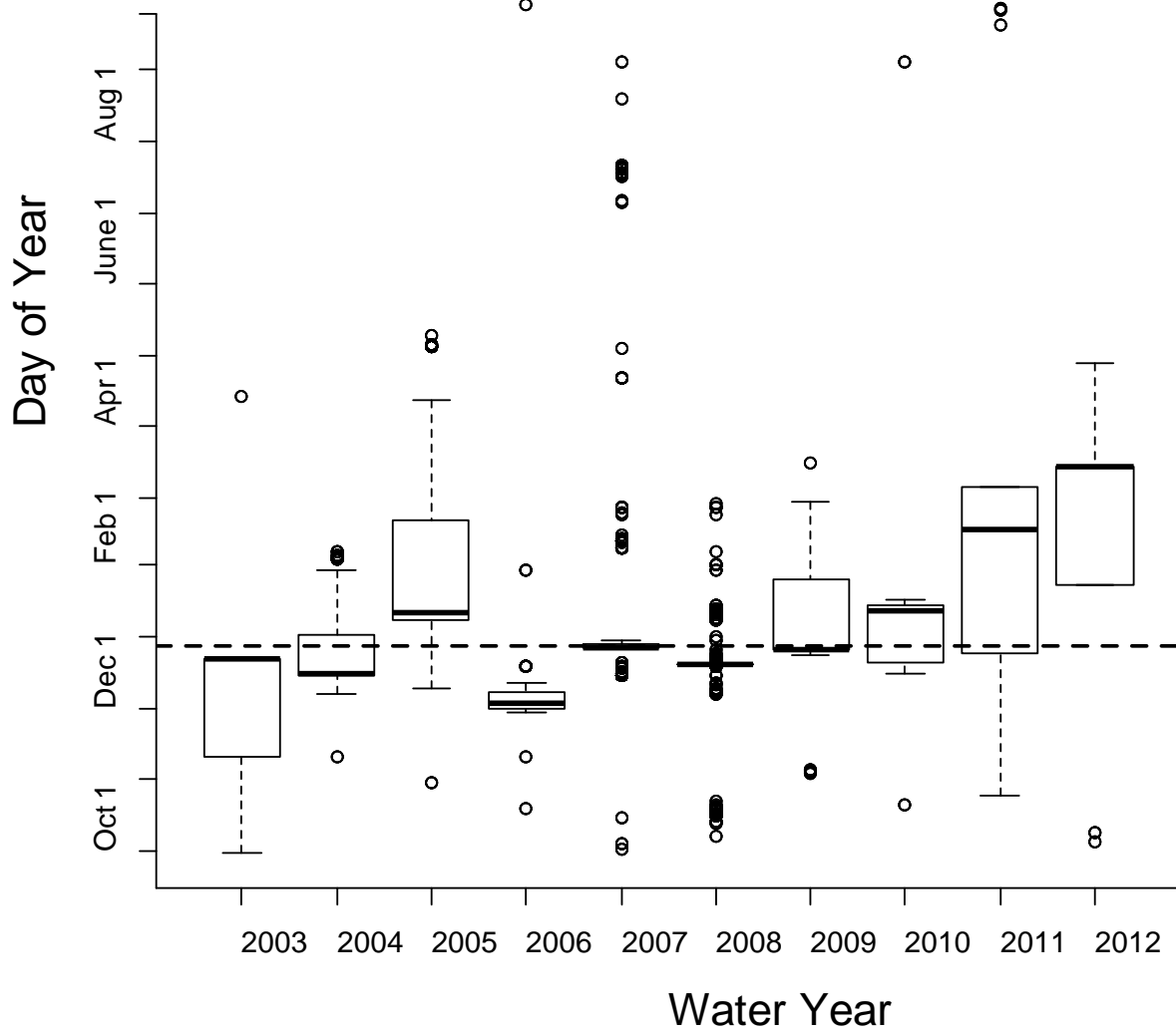


Figure 2. Pacific Lamprey downstream migrant catch by water year. Dotted line indicates the median migration date of 29 December.