The following supplements accompany the article

Match-mismatch dynamics and the relationship between ocean-entry timing and relative ocean recoveries of Central Valley fall run Chinook salmon

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Marine Ecology Progess Series 511:237–248 (2014)

Supplement 1. Data Filtering

In addition to the 5 extant Central Valley hatcheries producing fall run Chinook (Coleman National Fish Hatchery, Feather River Hatchery, Nimbus Hatchery, Mokelumne River Fish Installation, and the Merced River Fish Facility) and the discontinued Tehama-Colusa Spawning Channel, the RMIS identifies 2 additional 'hatcheries': the Tiburon Minor Port and Tiburon Net pens, which release only Feather River Hatchery-sourced fish. We recategorized these fish as Feather River Hatchery.

We compared the distribution of release times across hatcheries to identify the potential confounding of source hatchery and release timing. There were clear differences among hatcheries in their release times (Fig. S1; ANOVA $F_{3,284}$=13.4, p < 0.01). Among the 2 hatcheries with substantial variability in release times, nearly all of the variation for the Mokelumne River Hatchery was across years rather than within years (Fig. S2), while the Feather River Hatchery had substantial within-year variability, although releases tended to occur earlier and with less temporal spread in later years (Fig. S2). We therefore focused our analysis on Feather River Hatchery releases, since such releases provide the majority of the available data (Table 1 in the main article) and cover the widest range of release times (Fig. S1).

In general, later releases tend to be of larger fish. To reduce the collinearity between weight and release timing, we restricted our analysis to fish released as 'fingerlings' or 'advanced fingerlings', which make up the majority of releases (~90%), rather than the much larger smolts or much smaller fry. Excluding fish released as smolts or fry substantially reduces the extent of collinearity between release weight and release timing of release groups (from r = 0.73 for year-day and release weight, r = 0.63 for time lag and release weight to r = 0.52 for year-day and release weight, r = 0.40 for time lag and release weight).

Historically, estimates of age 2 recoveries are, on average, ~0.1% (SD = 0. 14) of tagged releases, whereas recoveries of age 3 fish are ~0.9% (SD = 0.93). Age 4 recovery rates are similar to those for age 2 (mean ± SD = 0.1 ± 0.13%). Estimating such low recovery rates of age 2 and age 4 fish could result in relatively high sampling errors. Thus, we restricted our analysis to age 3 recoveries. However, age 3 availability is affected by (generally low) harvest or early maturation of age 2 fish, potentially confounding the effects on survival. Another concern is the amount of time that different release groups spend in the ocean (i.e. greater cumulative daily mortality can accrue for earlier releases), but for recoveries at age 3 or later, the differences in cumulative time spent in the ocean are relatively small. An additional reason for restricting our analysis to age 3 ocean recoveries is that age 2 harvest data are more uncertain due to generally low recoveries and uncertainty in how much age 2 harvest actually occurred in a sampling stratum from which no age 2 tags were recovered, but only a fraction of the harvest was examined for tags. In addition, age 3 fish are nearly always of legal size to retain in the fishery but age 2 fish often are not, so attempting to model age 2 harvest would introduce major confounding due to annual variability in fish size, variation from year to year in minimum size limit regulations, and variability in the relative magnitude of recreational versus commercial fisheries which have substantially different minimum size limits and thus very different relative impacts on age 2 versus older fish.

It should be noted that O'Farrell et al. (2013) define fish as reaching age 3 in September 2 yr after the brood year; thus, the harvest metric *h* was calculated including a small number of fish harvested toward the end of the calendar year in which we would still refer to them as age 2 using the aging convention in this paper. Similarly, we would consider a fish harvested in October 3 yr after the brood year to be age 3, but in the O'Farrell et al. (2013) calculation, such fish would be considered age 4. However, since the majority of the fishery occurs in spring and summer, the vast majority of harvest would be considered age 3 under either designation, and the calculations and assumptions underlying the calculation of *h* in O'Farrell et al. (2013) do not distinguish age 3 from age 4 and older fish.

Fig. S1. Box-and-whisker plot of release dates of different release groups (not of individual fish) by hatchery. Thick lines denote median release date, boxes the central 50%, whiskers the furthest data points within 1.5 times the interquartile range, and open circles any outliers beyond this

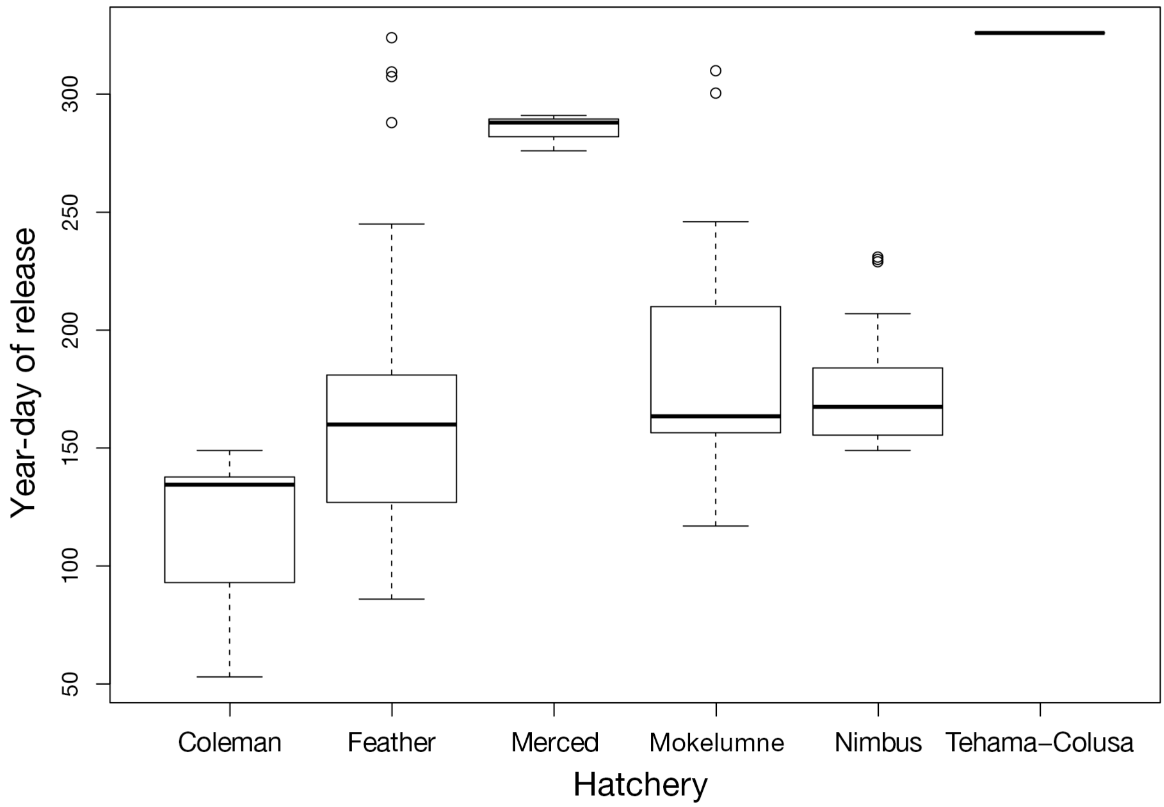
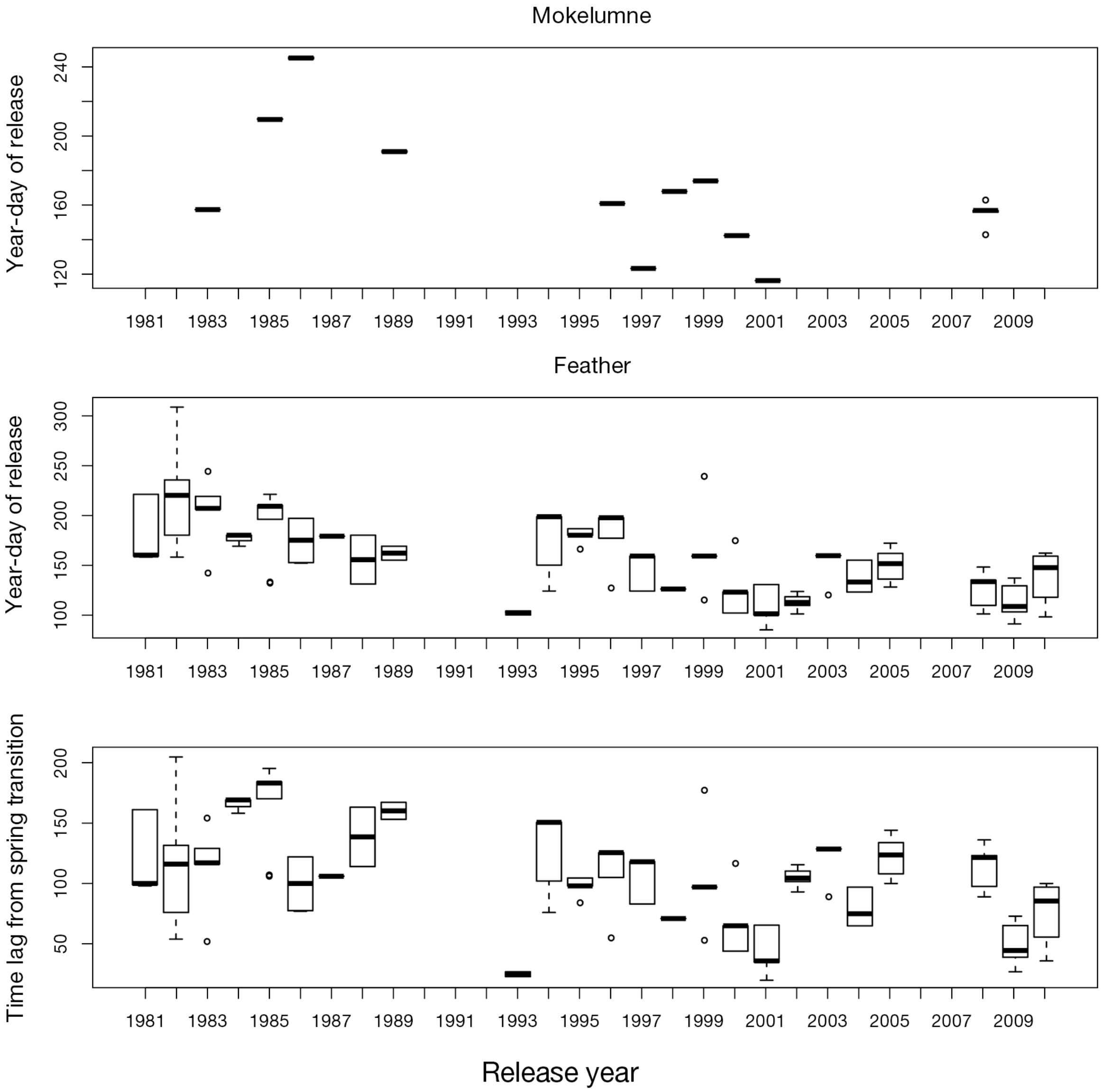


Fig. S2. Box-and-whisker plot of release dates of different release groups (not of individual fish) by year for Mokelumne and Feather hatcheries (the hatcheries with the largest range in reported release dates) and time lag from spring transition for Feather River Hatchery only. Releases spanning >30 d were excluded, as were release groups with missing weight information and those released as smolts or fry (see 'Materials and Methods'). Thick lines denote median release date, boxes the central 50%, lines the furthest data points within 1.5 times the interquartile range, and open circles any outliers beyond this. In most years, the Mokelumne River hatchery released all its fish in a single day


Mokelumne
Year-day of release
120
160
200
240
Feather
Year-day of release
100
150
200
250
300
Time lag from spring transition
50
100
150
200
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
Release year

Supplement 2. Diagnostic Plots

Fig. S3. Diagnostic plots for the best-supported model for releases from Feather River Hatchery that included a nonlinear effect of time lag from spring transition day, a linear effect of weight, and fixed effects of net pen and disease. Releases spanning >30 d were excluded, as were release groups with missing weight information and those released as smolts or fry