

A Method to Estimate the Annual and Daily Abundance of Salmonid Juveniles in the Delta

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Why Annual or Daily Abundance?

- ❖ **Annual Juvenile Abundance (Flux)** may be used for
 - population trend analysis
 - incidental take limit determination
 - overall Delta survival estimation
 - life cycle model calibration/validation
- ❖ **Daily Juvenile Abundance** may be used
 - as one of the independent variables for estimating daily juvenile salvage/loss
 - for managing water exports, flows, and gates operation on a daily basis

Daily Juvenile Abundance in the Delta

$$\begin{aligned}
 A &= \sum_1^t \{ N_{in} (1 - \gamma)^t \} - N_{out} \\
 &= \sum_1^t \{ (N_{SR} + N_{SJ}) (1 - \gamma)^t \} - N_{CH}
 \end{aligned}$$

Fish into the Delta (points to N_{in})
 # Fish out of the Delta (points to N_{out})
 Residence time (points to t)
 Daily Mortality (points to γ)
 # Fish from Sac R (points to N_{SR})
 # Fish from San Joaquin R (points to N_{SJ})
 # Fish through Chipps Island (points to N_{CH})

Parameter Estimates

- ❖ Juvenile Residence Time in the Delta (t)
 - 15 days for juvenile Chinook
 - 10 days for juvenile steelhead
- ❖ Daily Juvenile Mortality Rates in the Delta (γ)
 - 0.087 for winter-run (0.28 overall survival)
 - 0.060 for spring-run (0.42 overall survival)
 - 0.068 for steelhead (0.53 overall survival)
- ❖ Number of Juveniles into or out of the Delta (N)

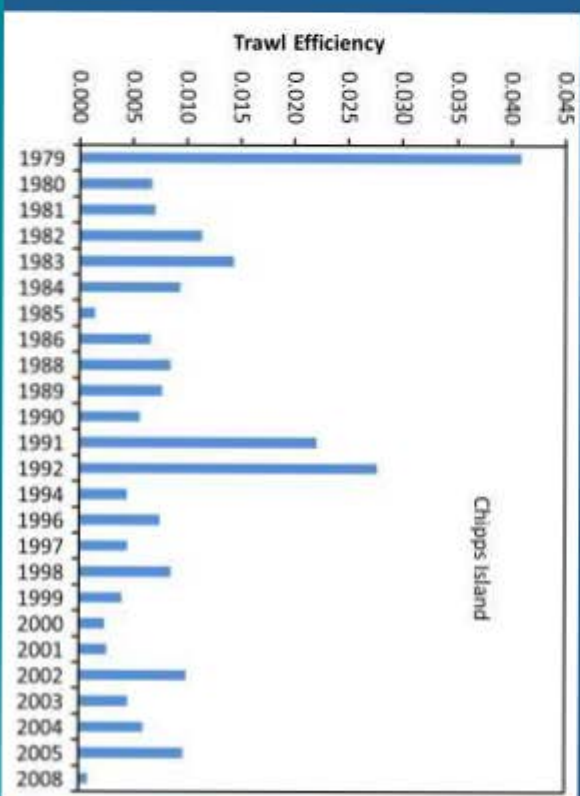
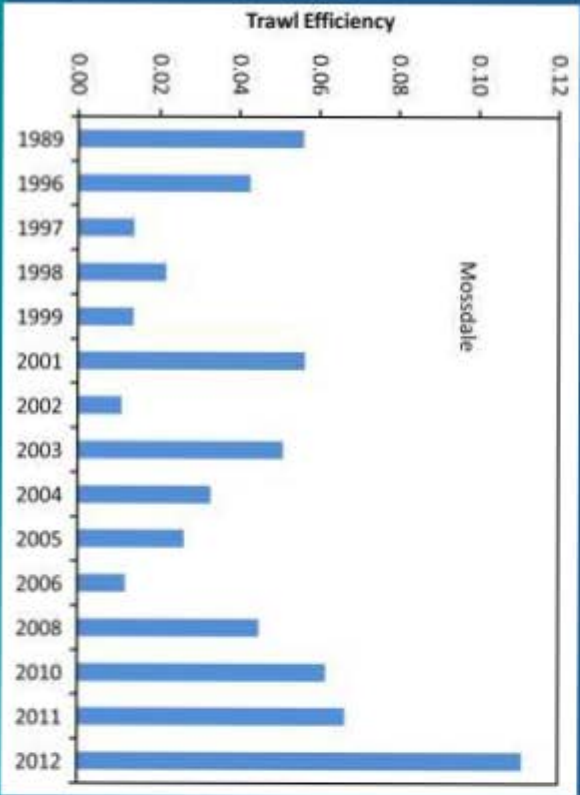
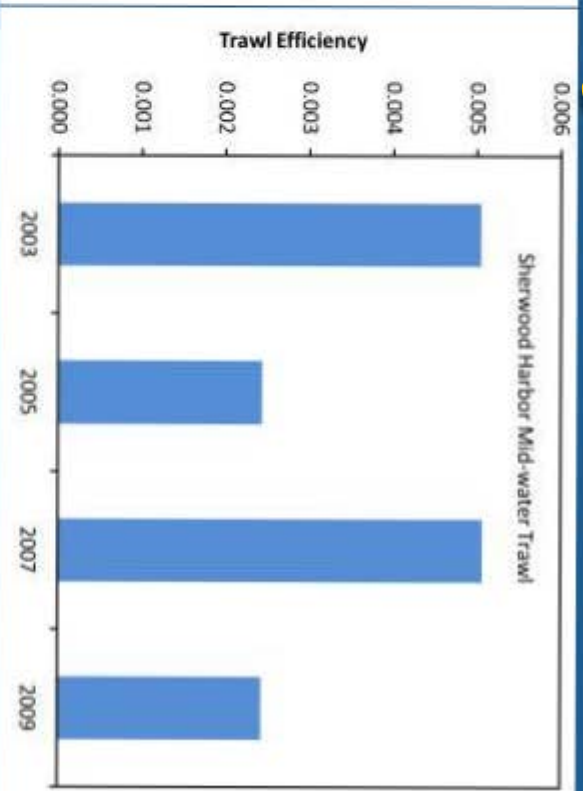
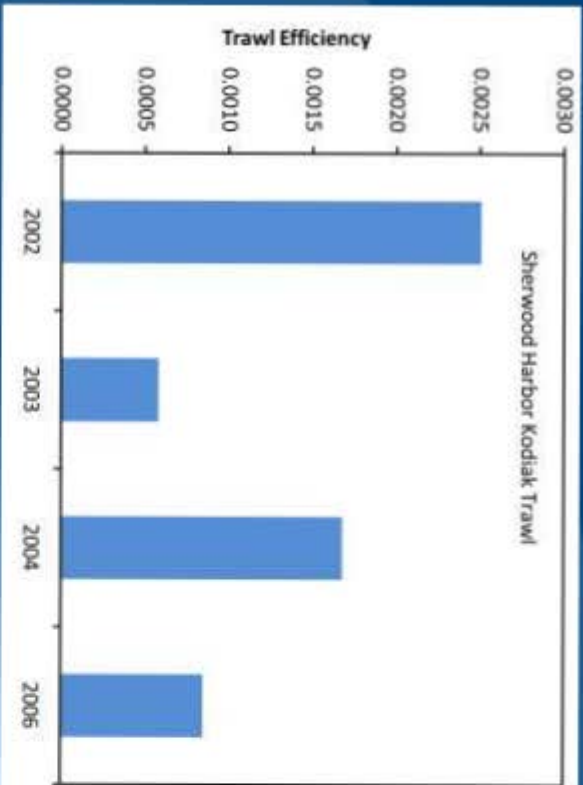
$$N = n/f_d * E$$

n = number of juveniles caught by trawl

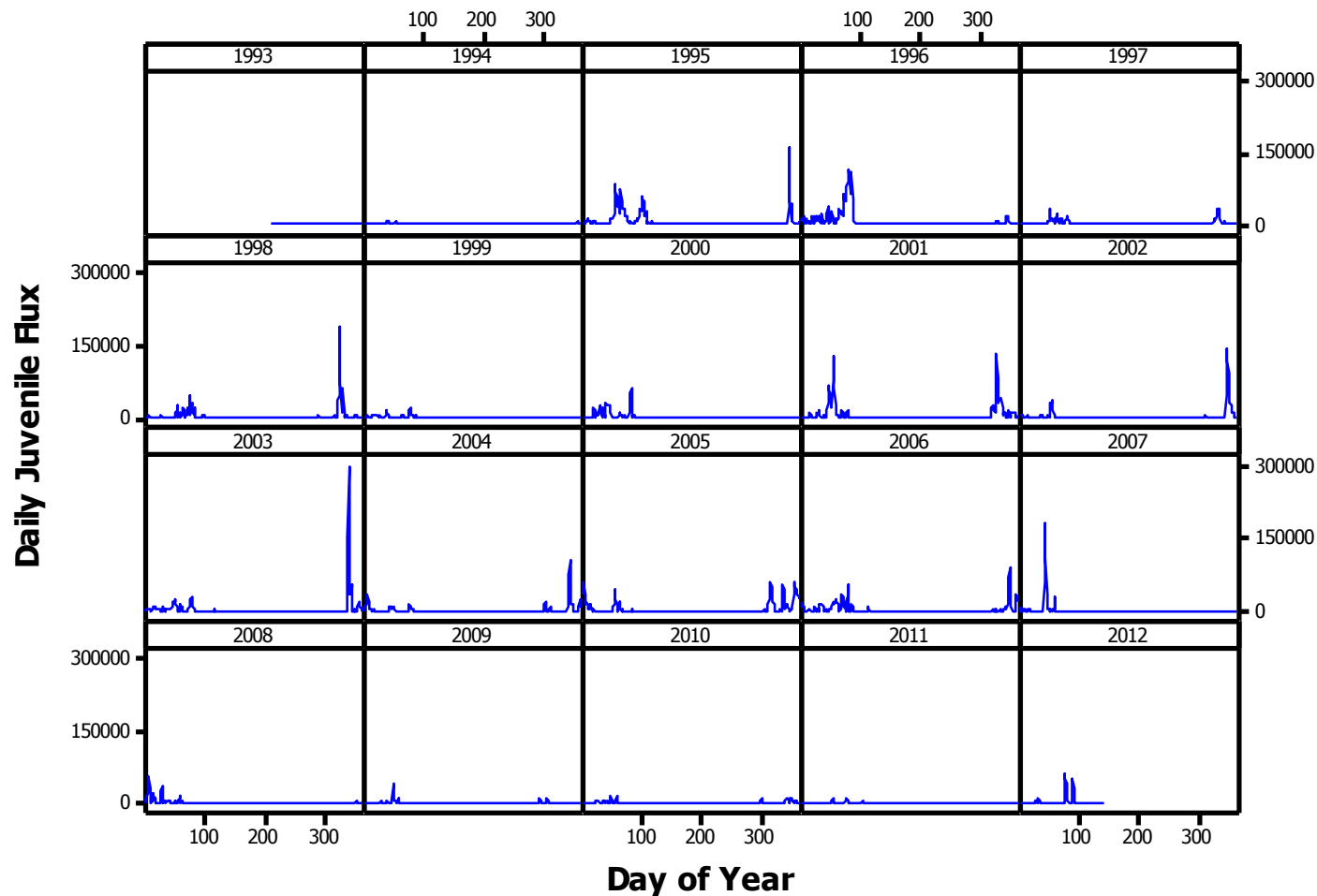
f_d = Trawl time fraction in 24 hours

E = Trawl efficiency

Trawl Efficiency Estimates

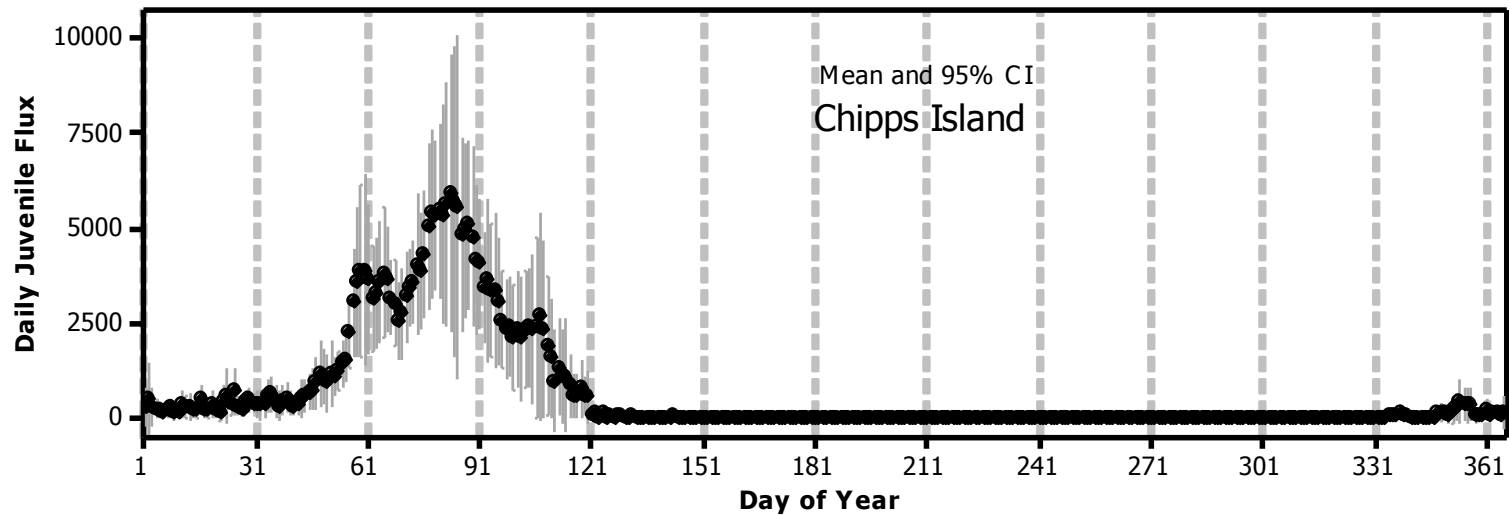
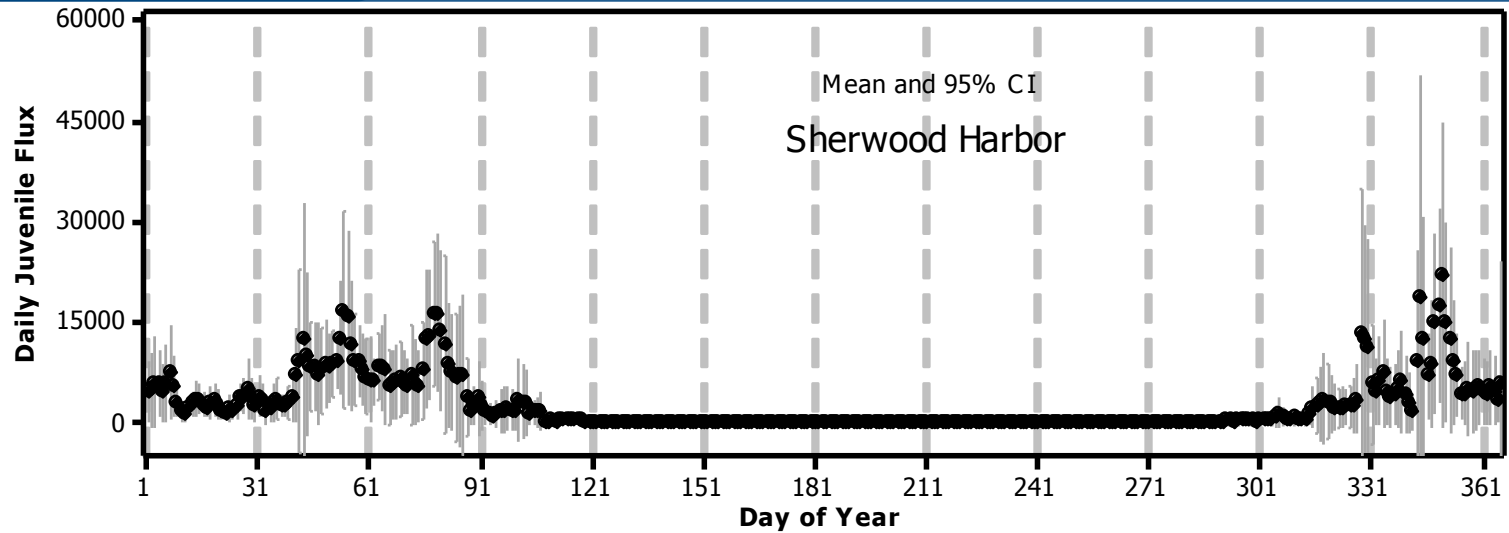


Daily Winter-run Flux by Year at Sherwood Harbor



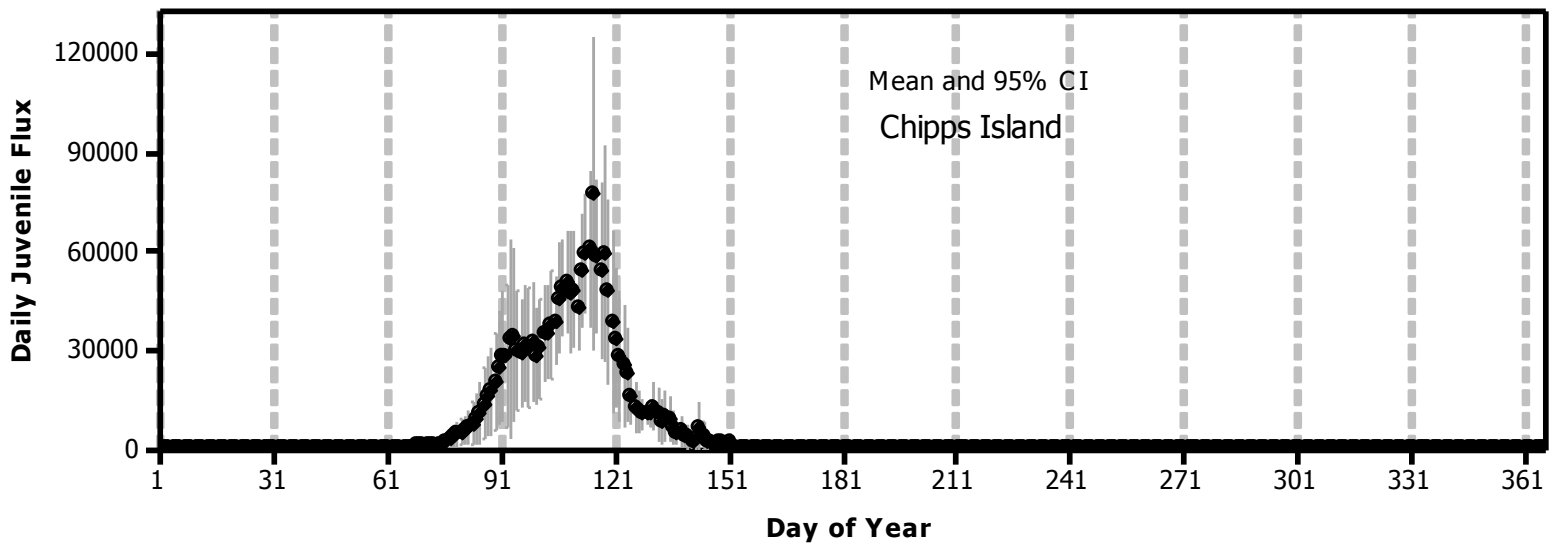
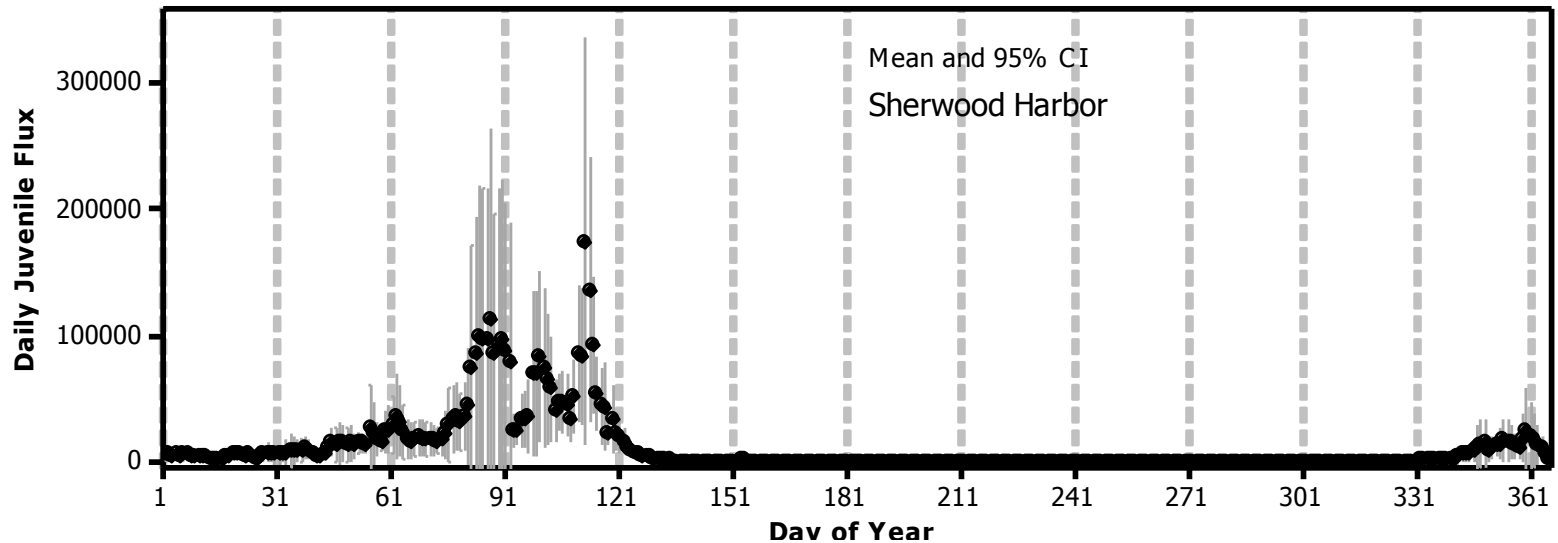
Wild Juveniles - Broodyear 1993-2011

Daily Winter-run Flux



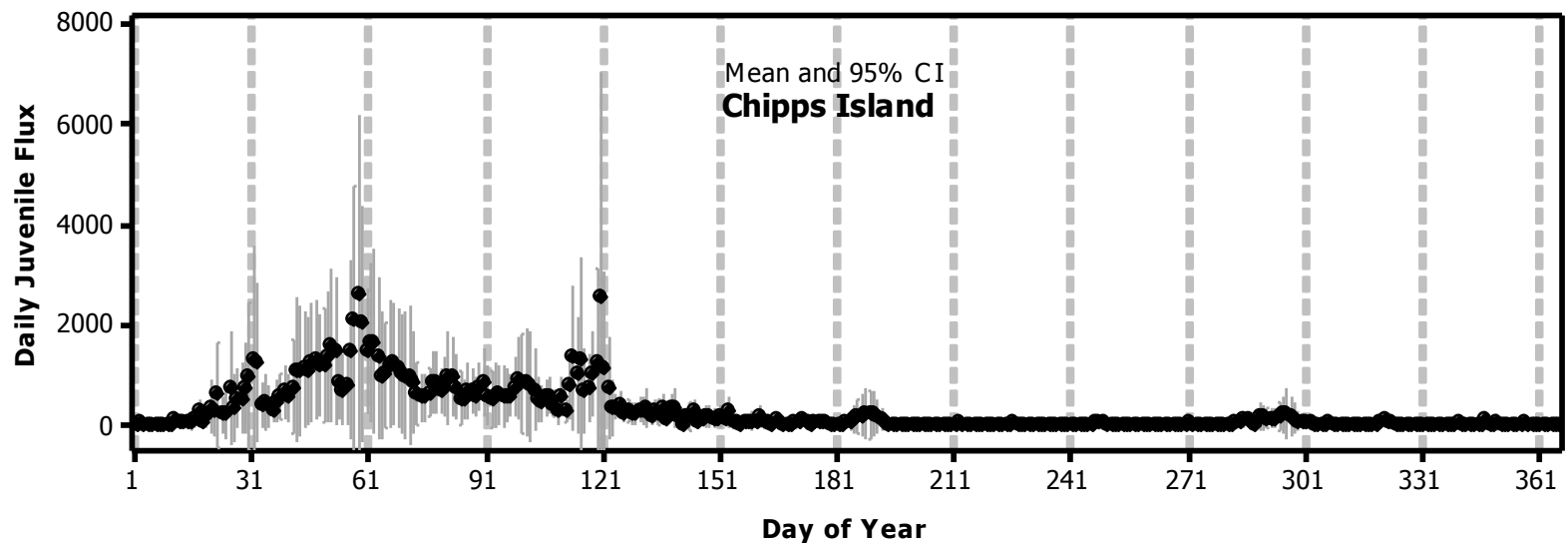
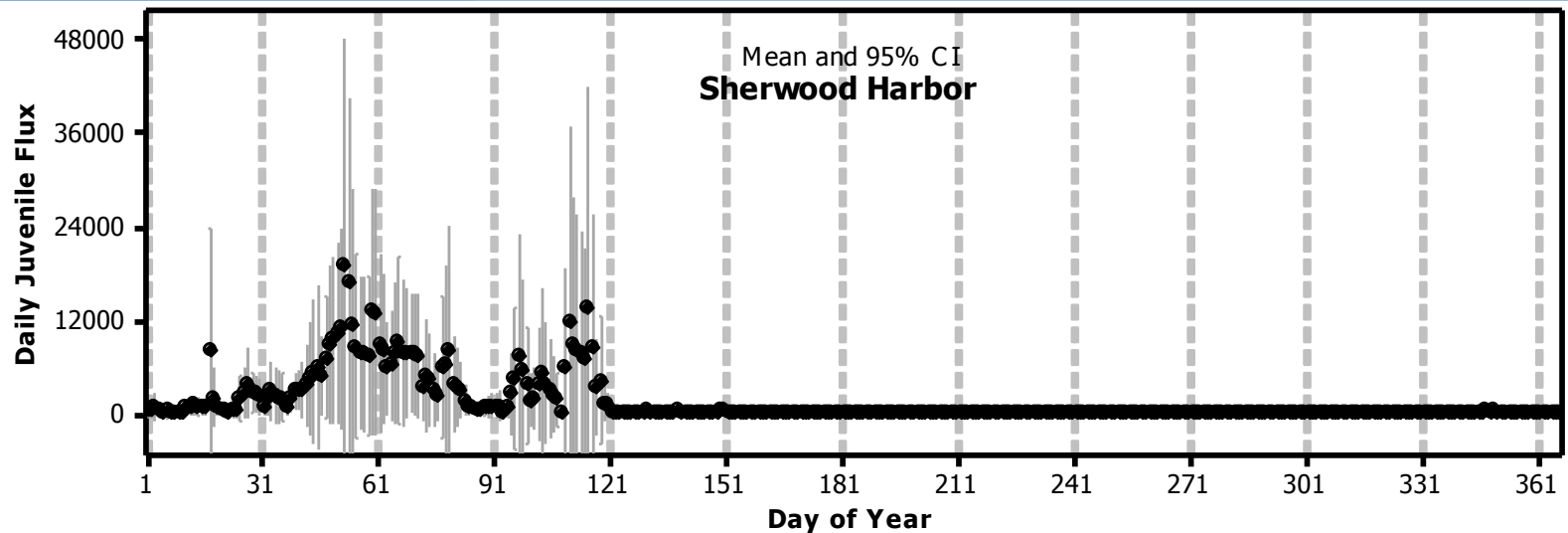
Wild Juveniles - Broodyear 1993-2011

Daily Spring-run Flux



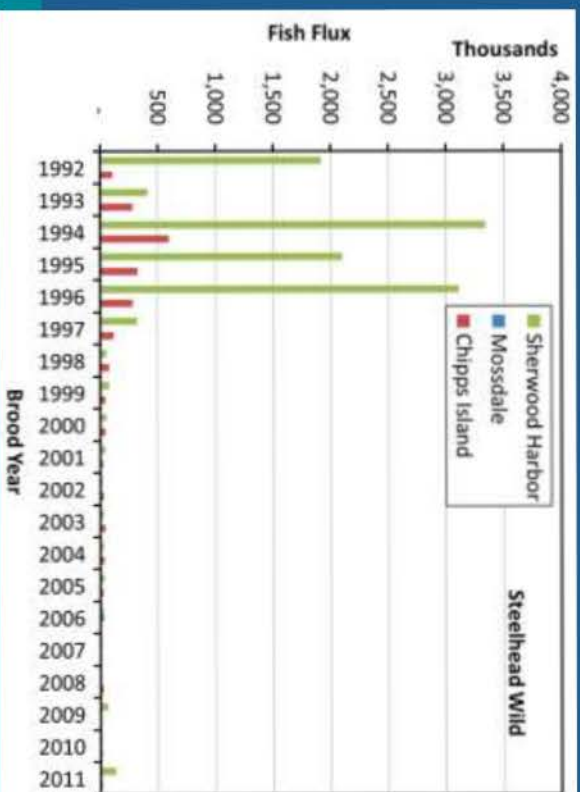
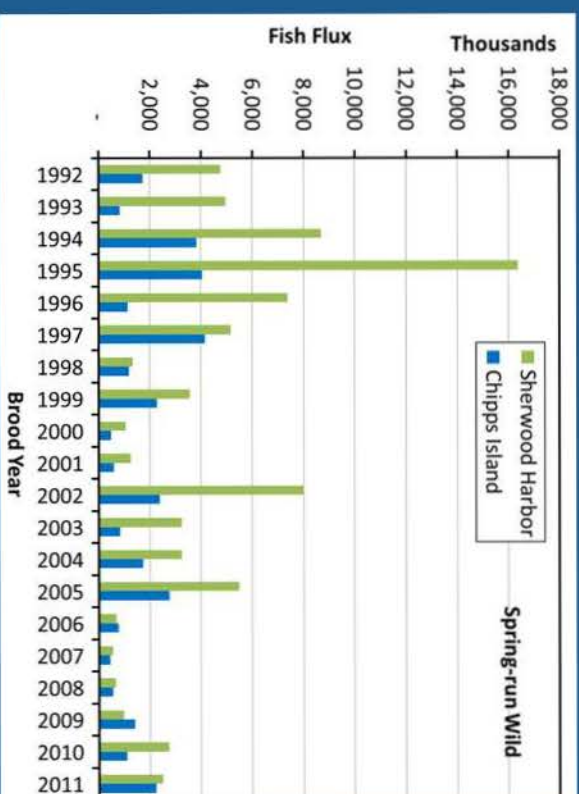
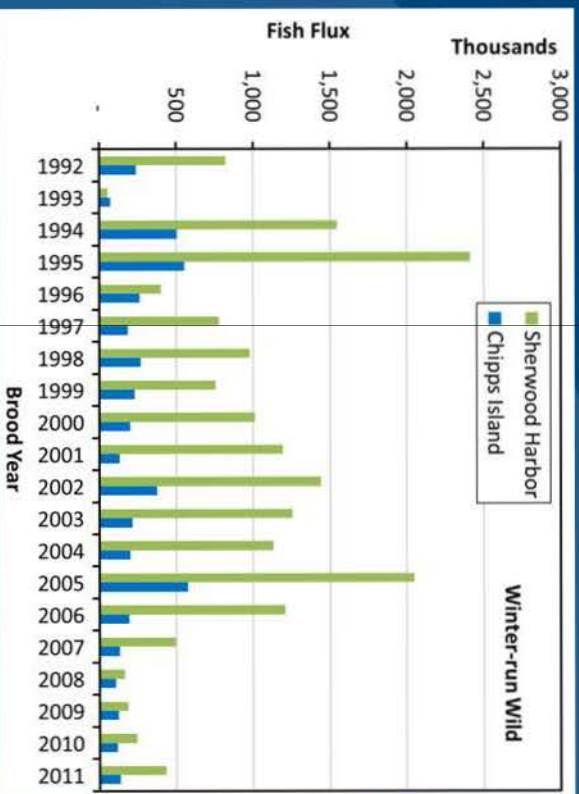
Wild Juveniles - Broodyear 1993-2011

Daily Steelhead Flux

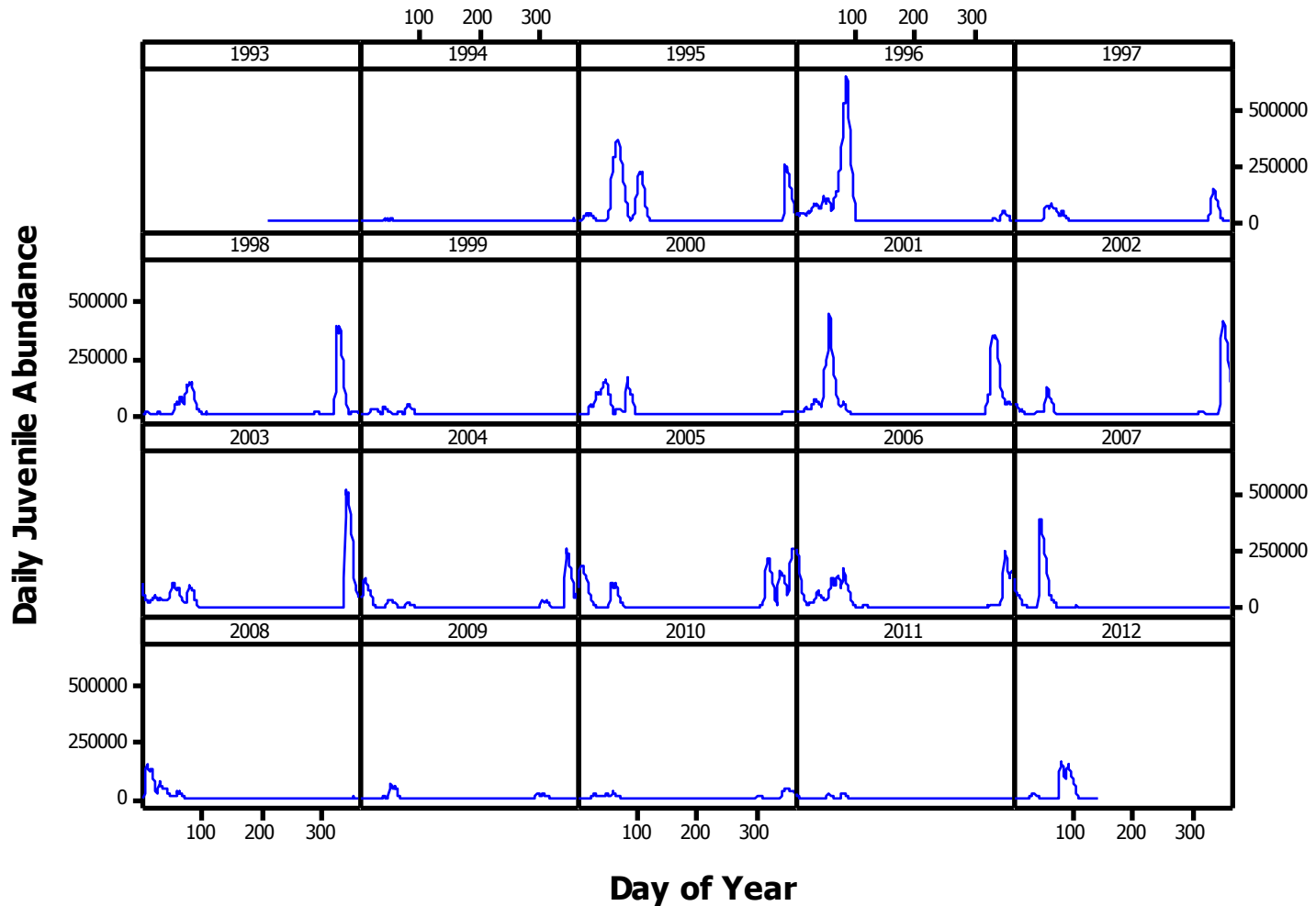


Wild Juveniles - Broodyear 1993-2011

Annual Juvenile Abundance (Flux)

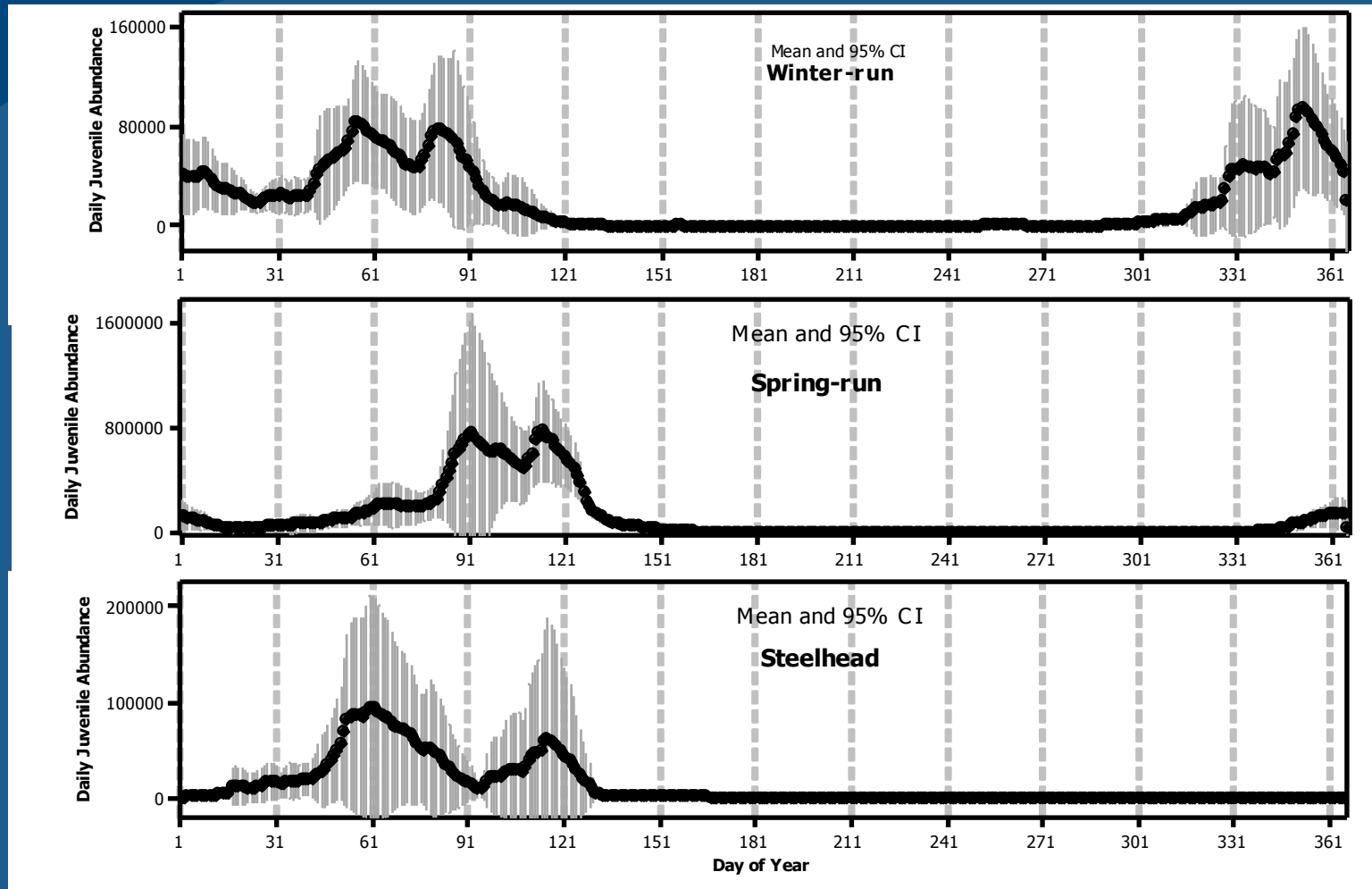


Daily Winter-run Abundance



Wild Juveniles - Broodyear 1993-2011

Daily Juvenile Abundance



Wild Juveniles - Broodyear 1993-2011

Acknowledgement

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