

# What Moves You? Clear Creek Juvenile Salmon 24-hour Passage Timing Studies 2012- 2013



U.S. Fish and Wildlife Service, Red Bluff FWO



# Objectives

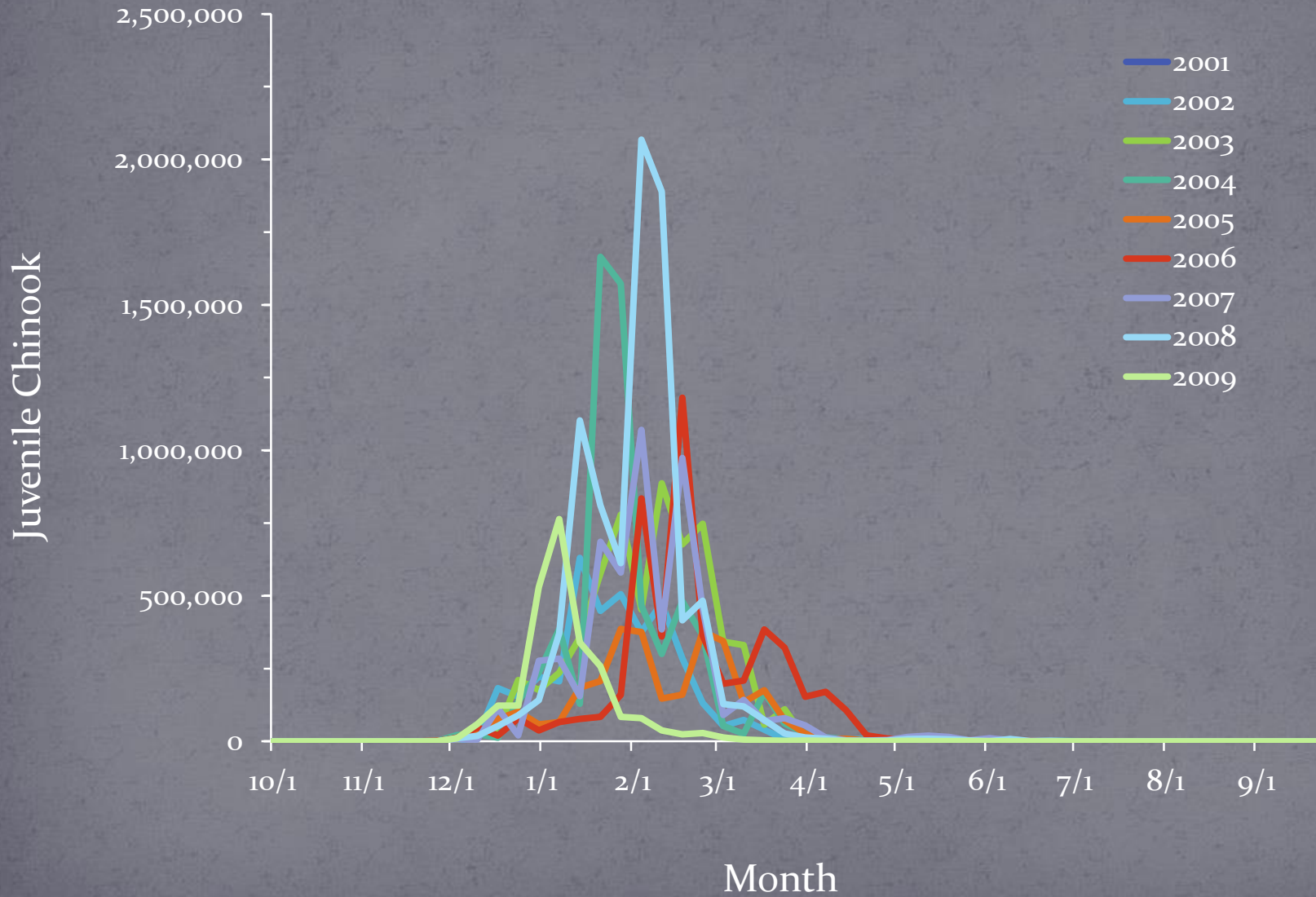
- Identify daily temporal passage
- Identify if particular environmental variables contribute to fish passage
- Determine if fish passage is proportionate to flow increases
- Utilize data to assist with passage interpolation when traps aren't fished;



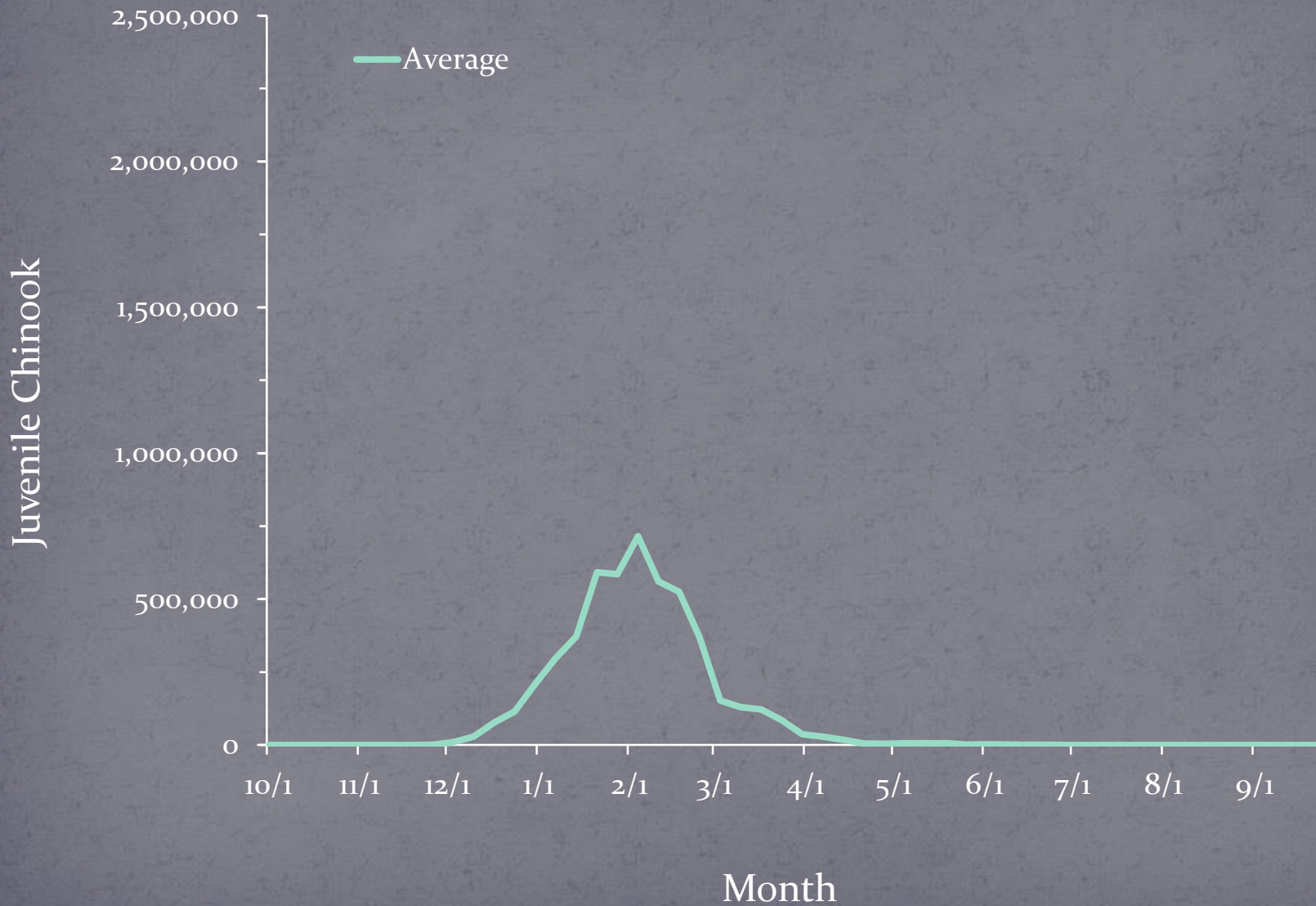
# Methods

- Sample RST every hour for 24-hour period, every two weeks (where possible) during fall Chinook outmigration
- Measure environmental data at each sampling (i.e. flow, turbidity, barometric pressure, lunar phase, etc.)
- Year 1 - Sample 24-hours
- Year 2 and 3- Target peak passage times to confirm timing and possible migration cues and compare to spring Chinook emigration

# Annual Weekly FCS Passage BY 2001-2009



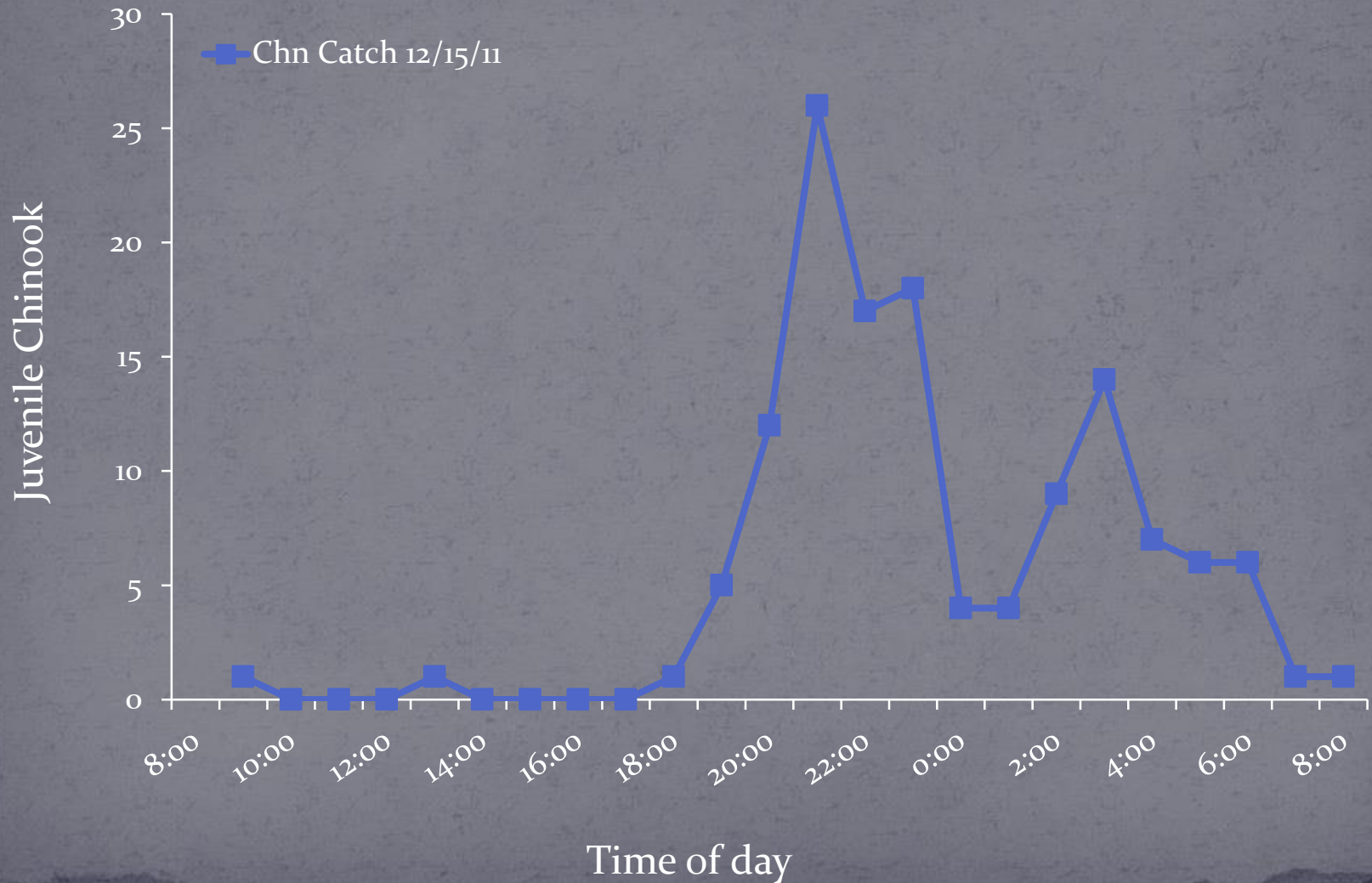
# Average Weekly FCS Passage BY 2001-2009





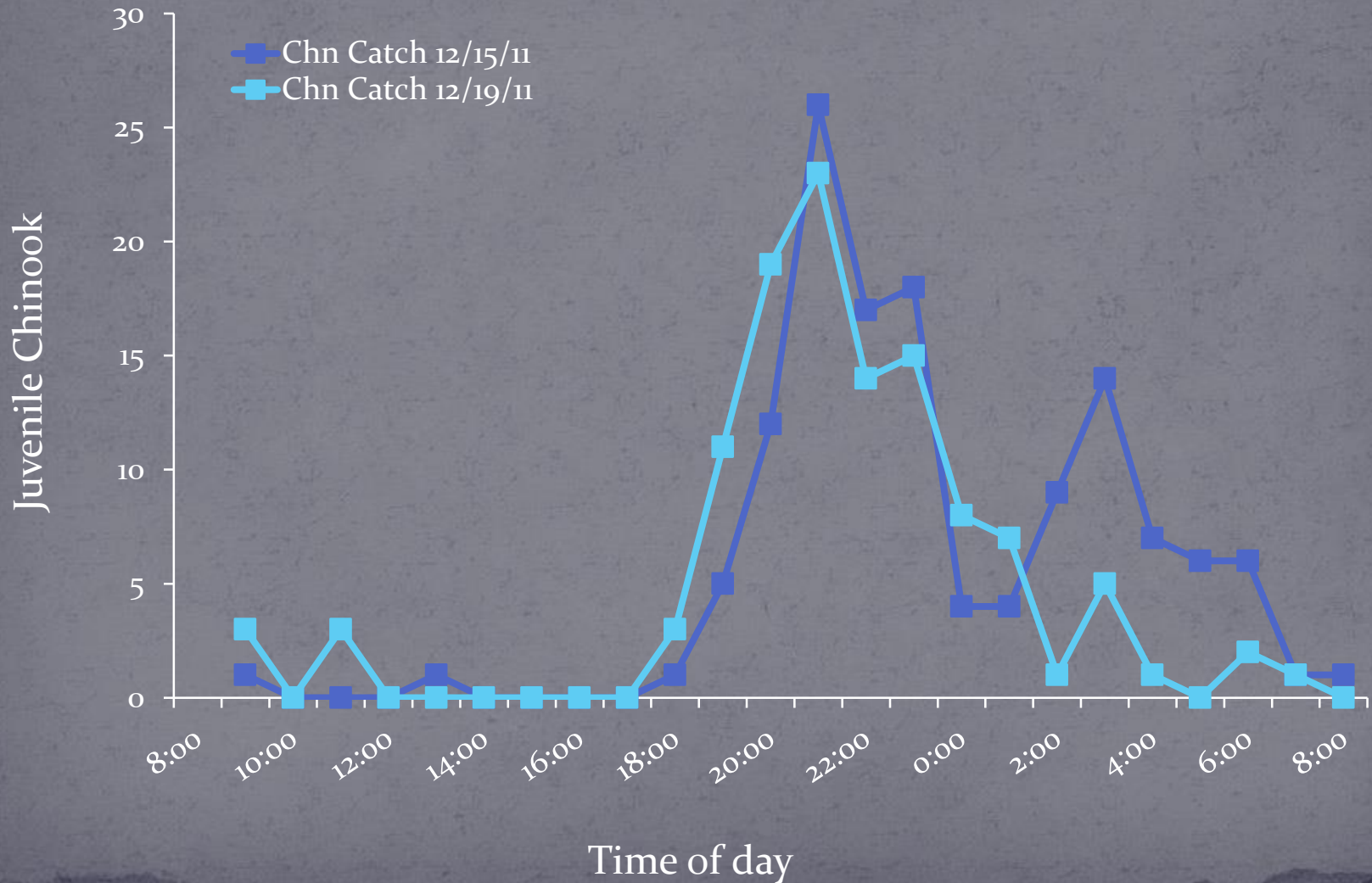
# Lower Clear Creek RST 2011-2012

## Chinook Daily Distribution Dec 2011 - March 2012



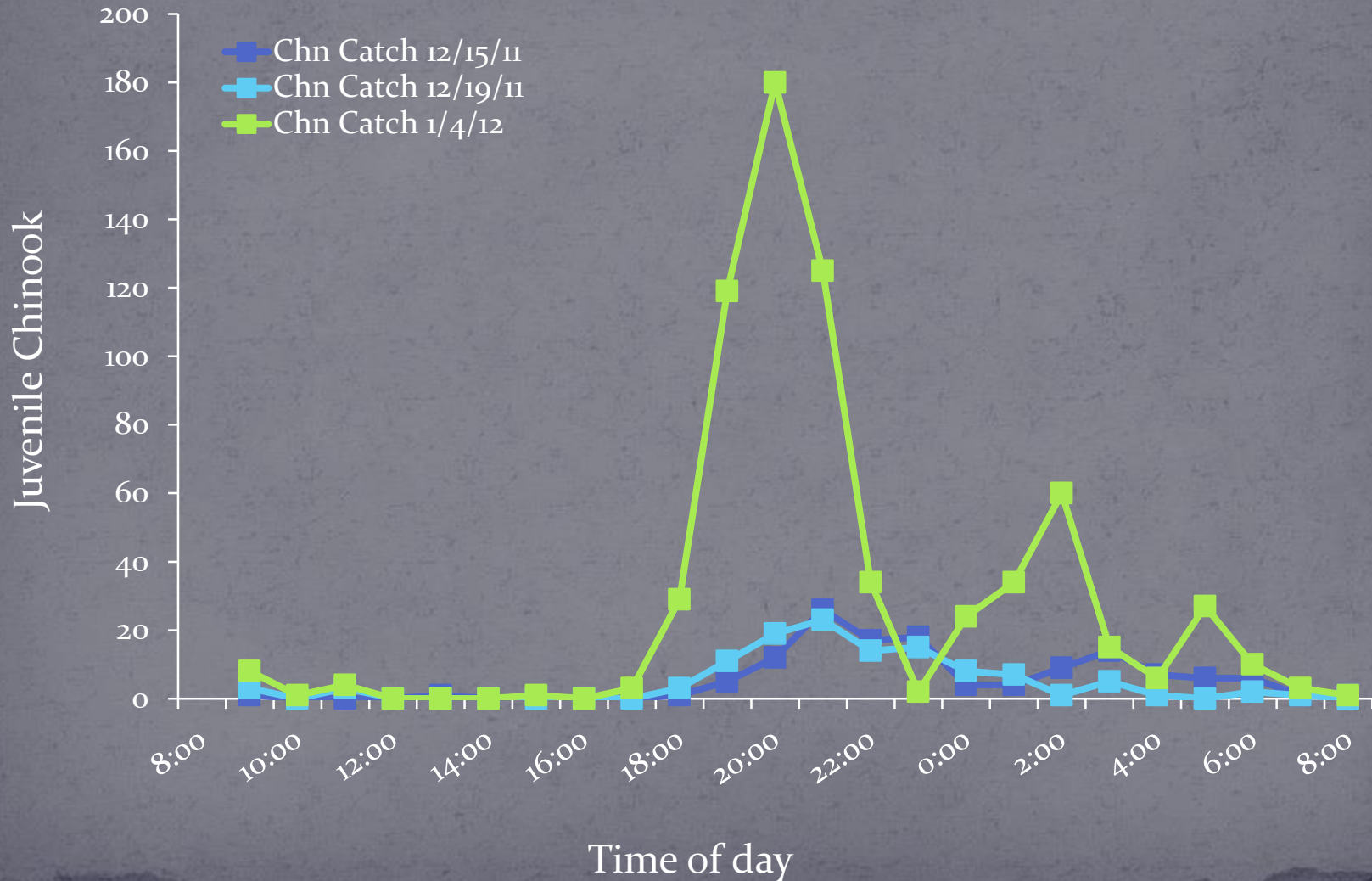
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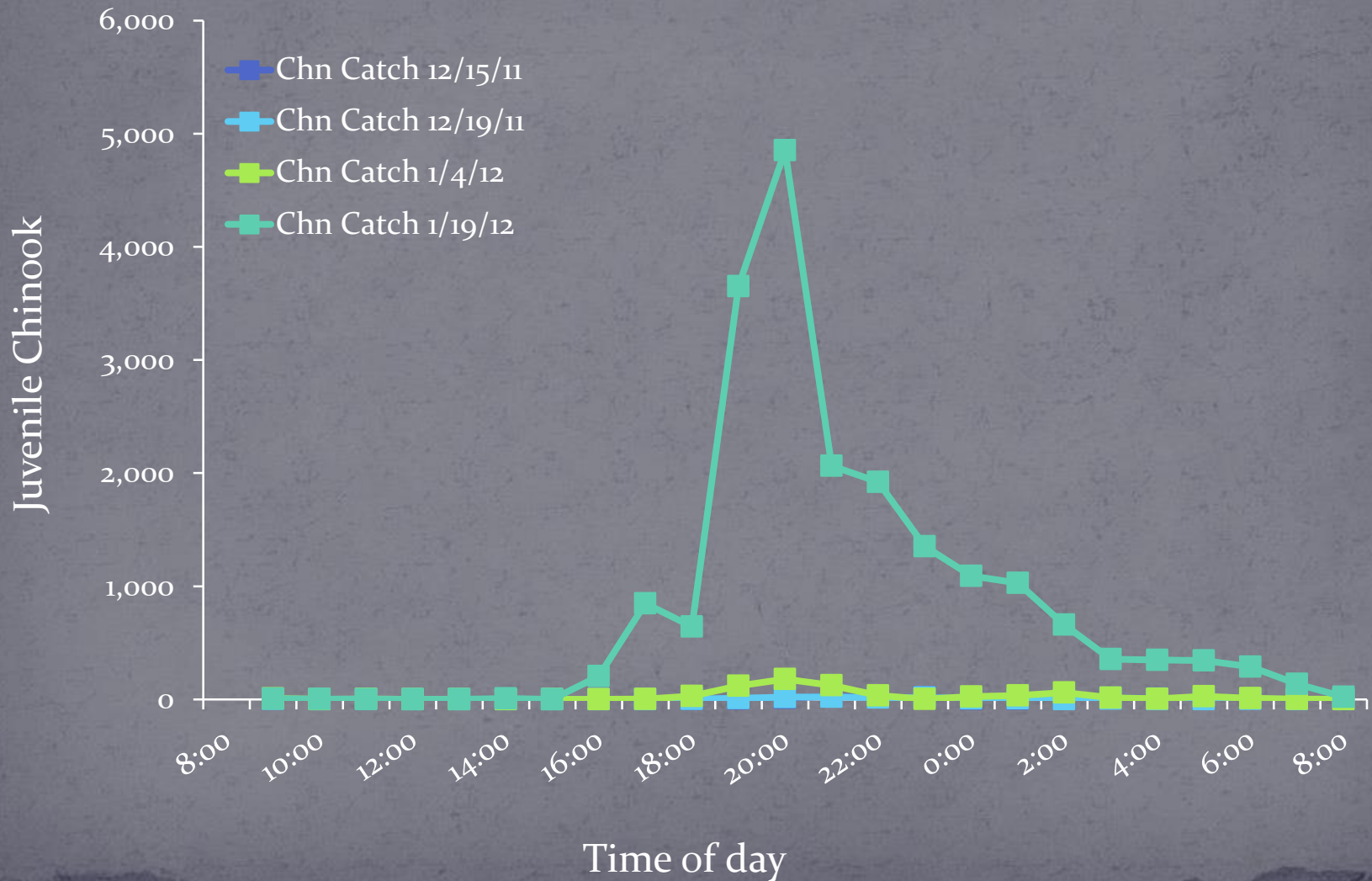
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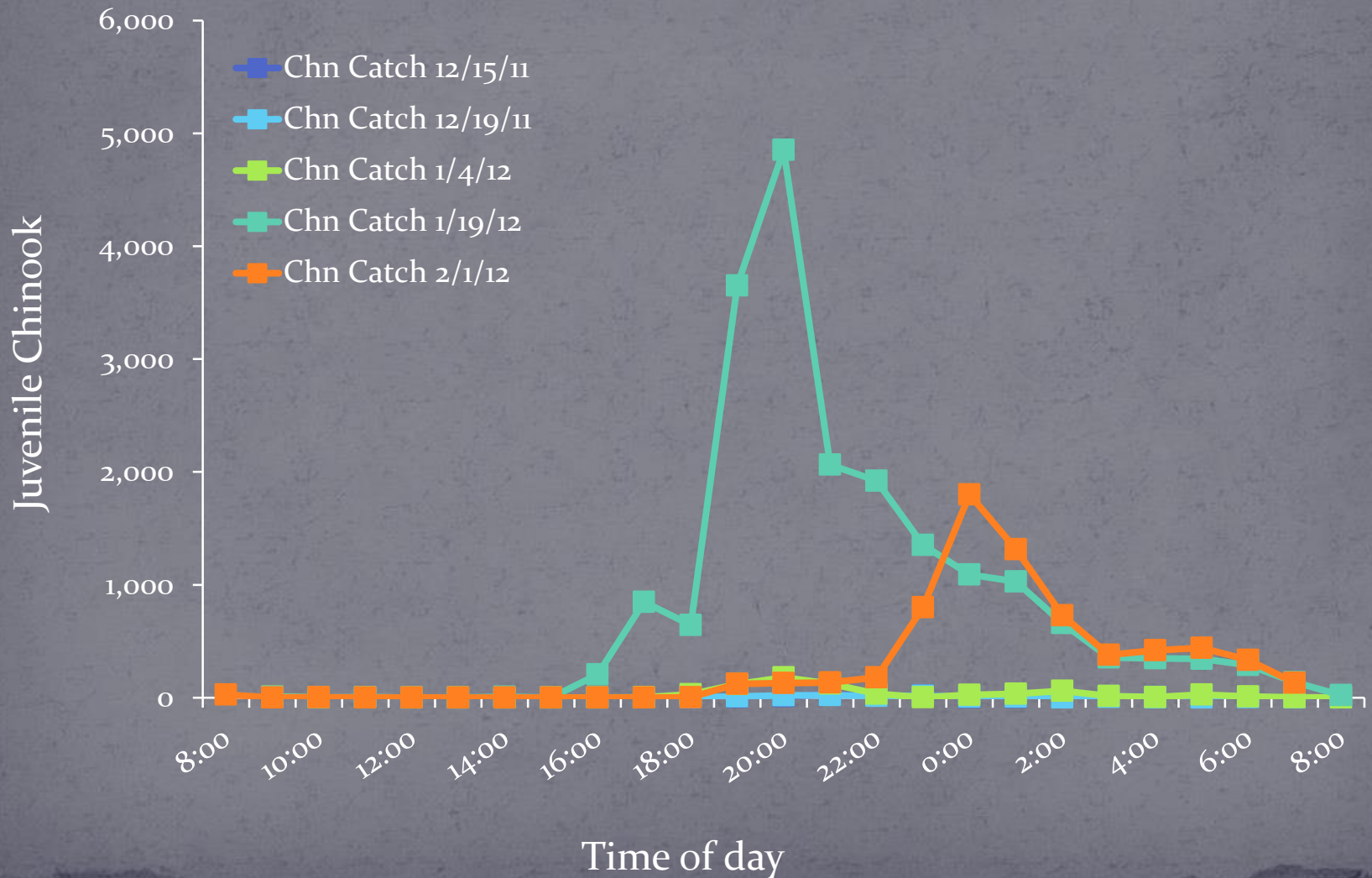
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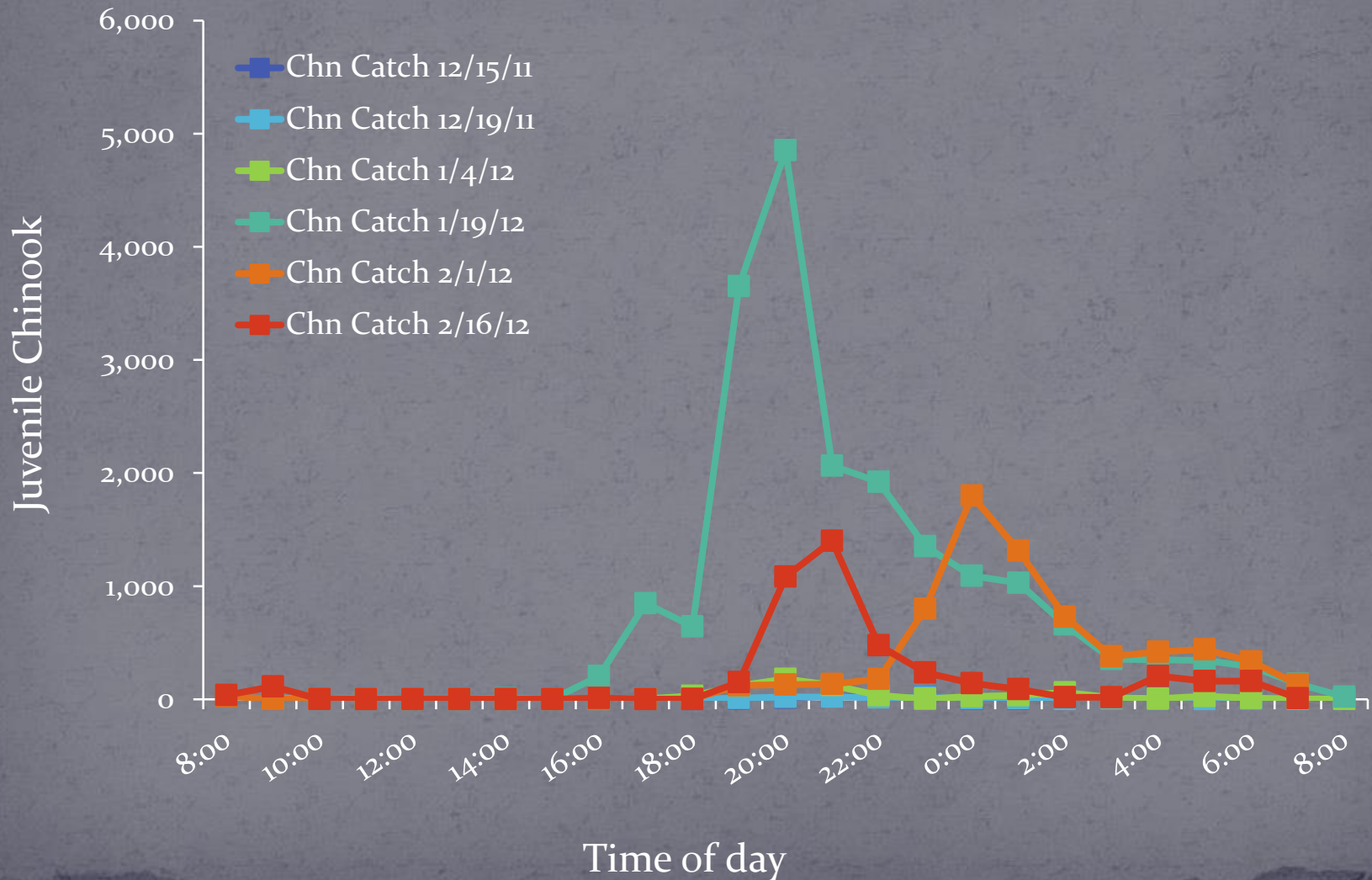
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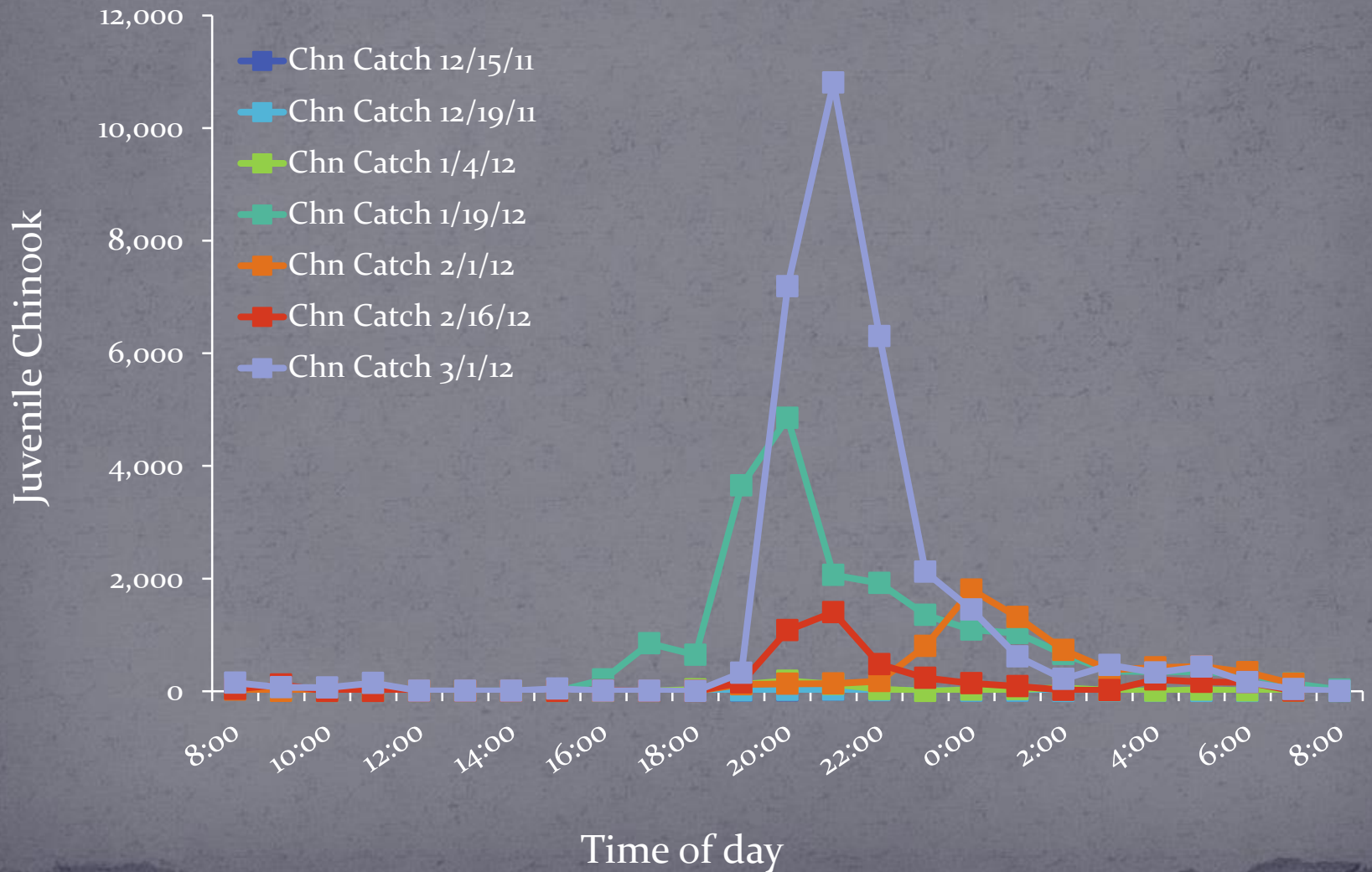
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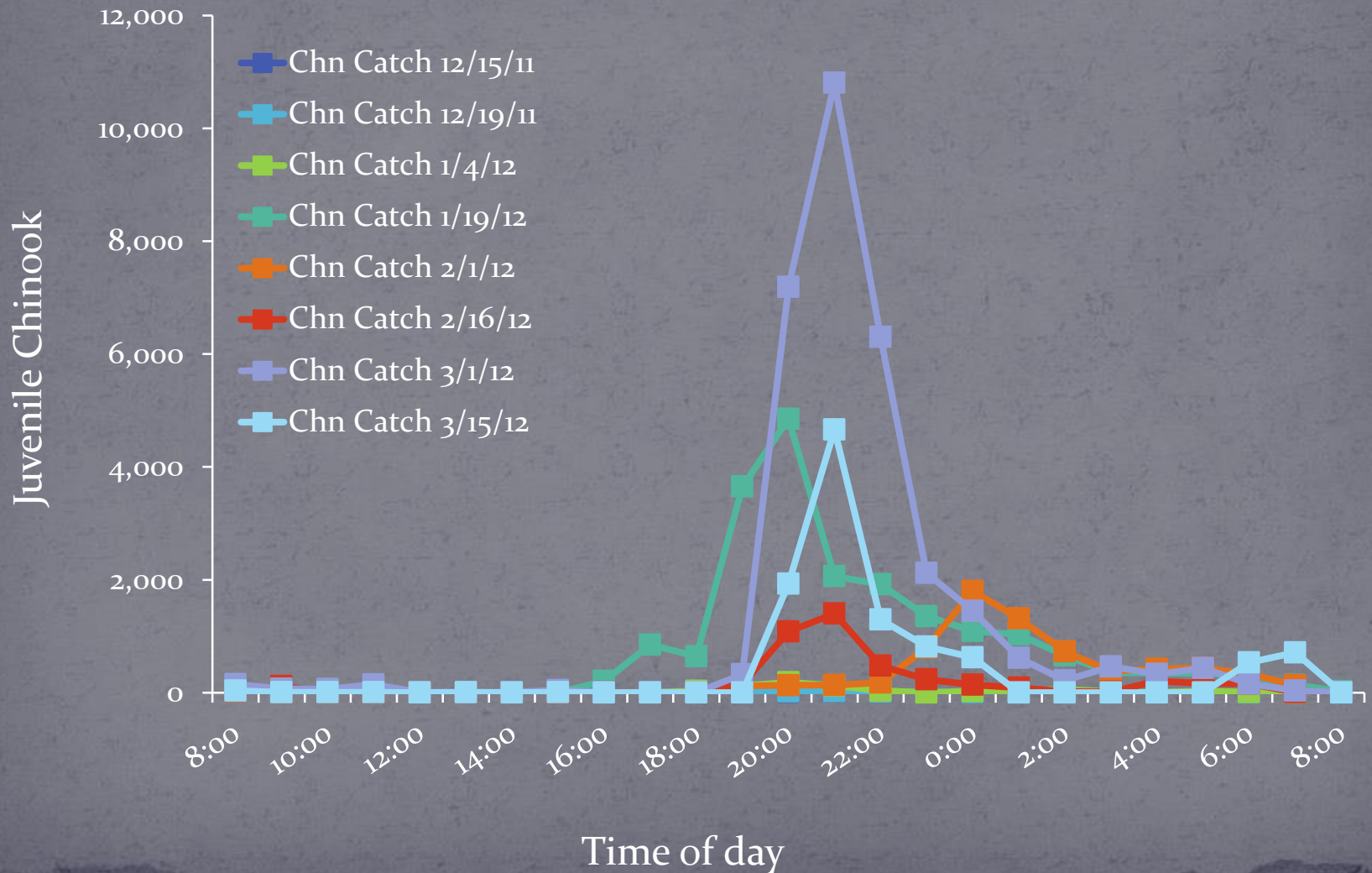
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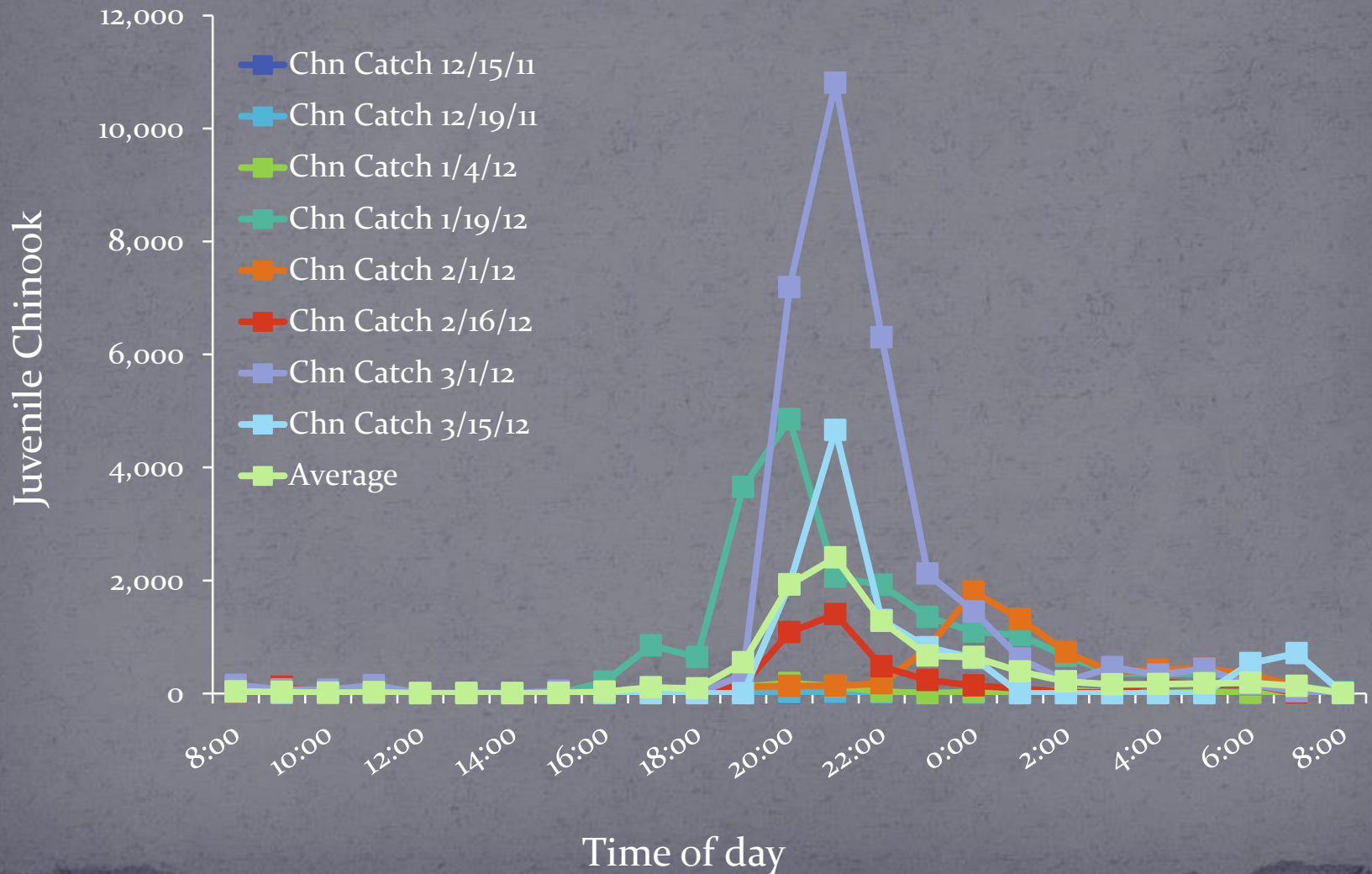
# Lower Clear Creek RST 2011-2012

## Chinook Daily Distribution Dec 2011 - March 2012



# Lower Clear Creek RST 2011-2012

## Chinook Daily Distribution Dec 2011 - March 2012





# Lower Clear Creek RST 2012-2013

## Chinook Hourly Distribution Jan 2013 - Mar 2013



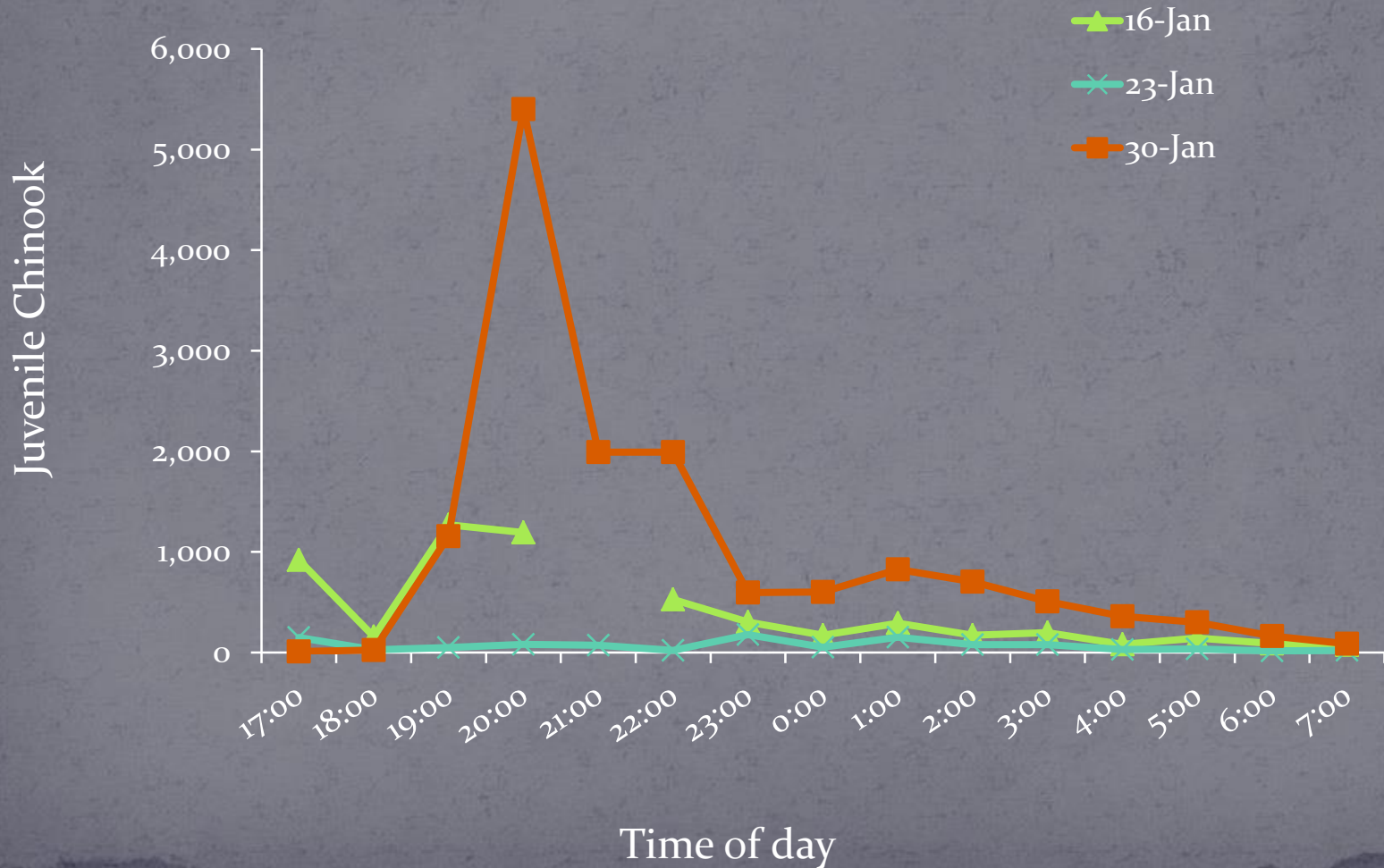
# Lower Clear Creek RST 2012-2013

## Chinook Hourly Distribution Jan 2013 - Mar 2013



# Lower Clear Creek RST 2012-2013

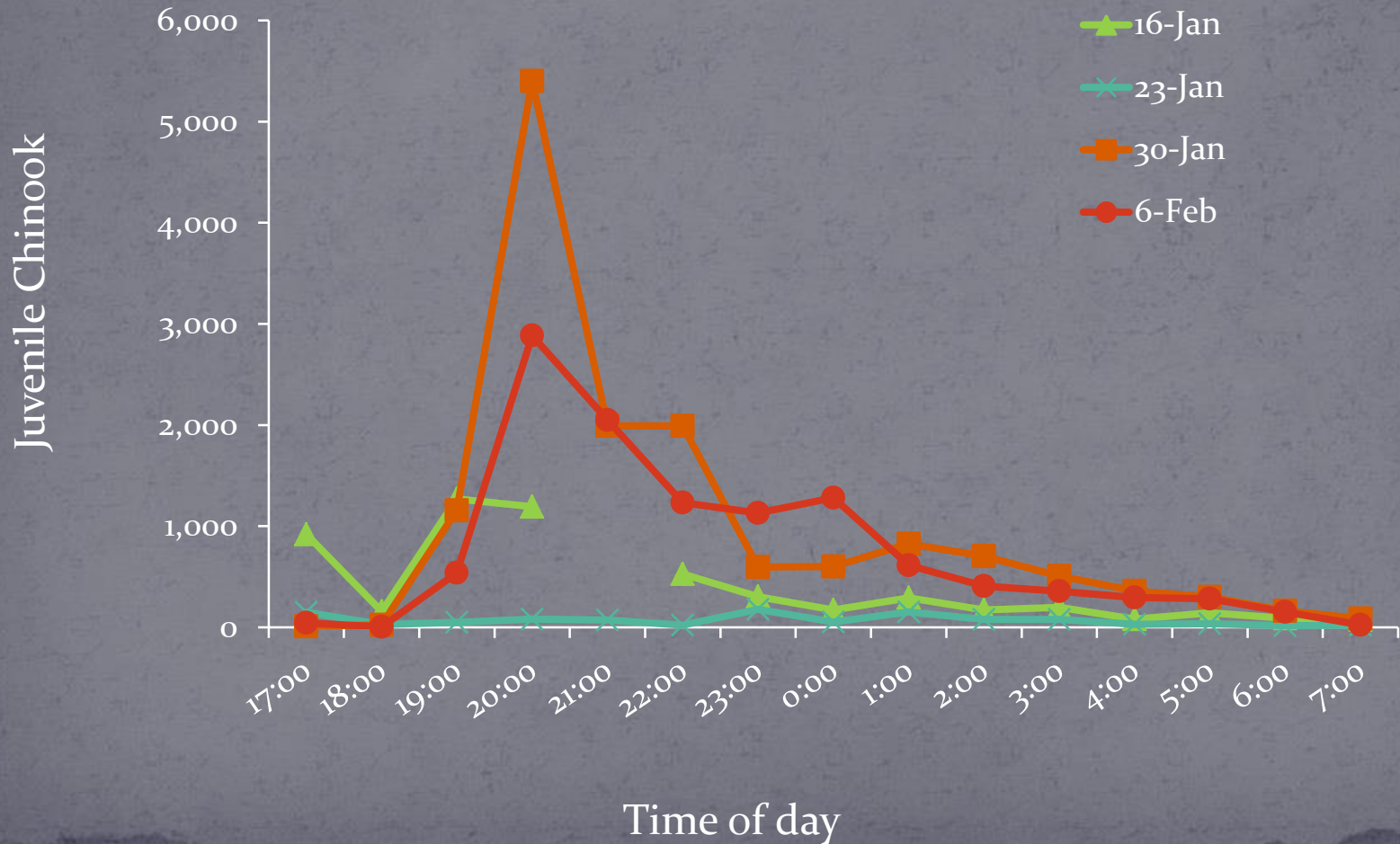
## Chinook Hourly Distribution Jan 2013 - Mar 2013





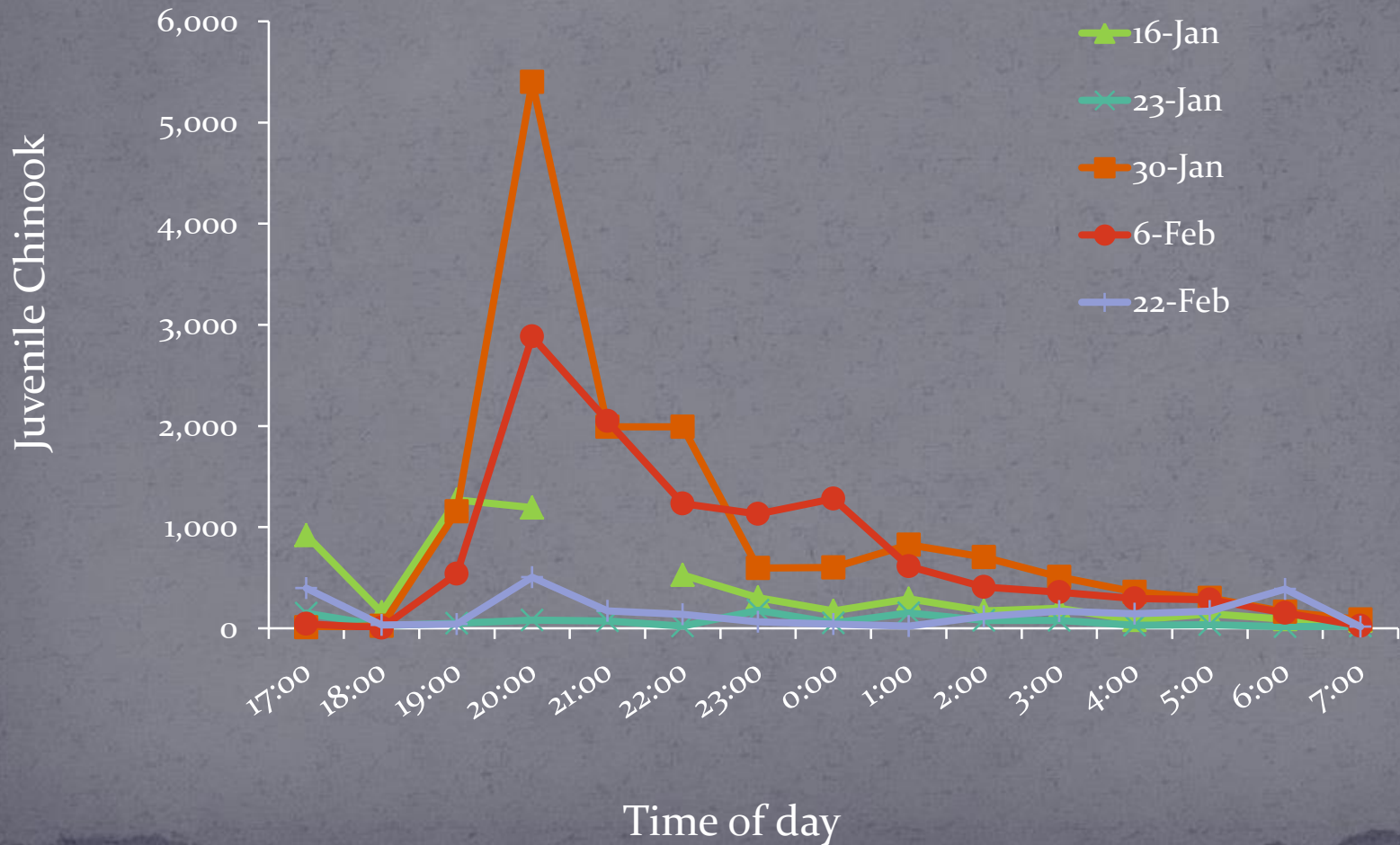
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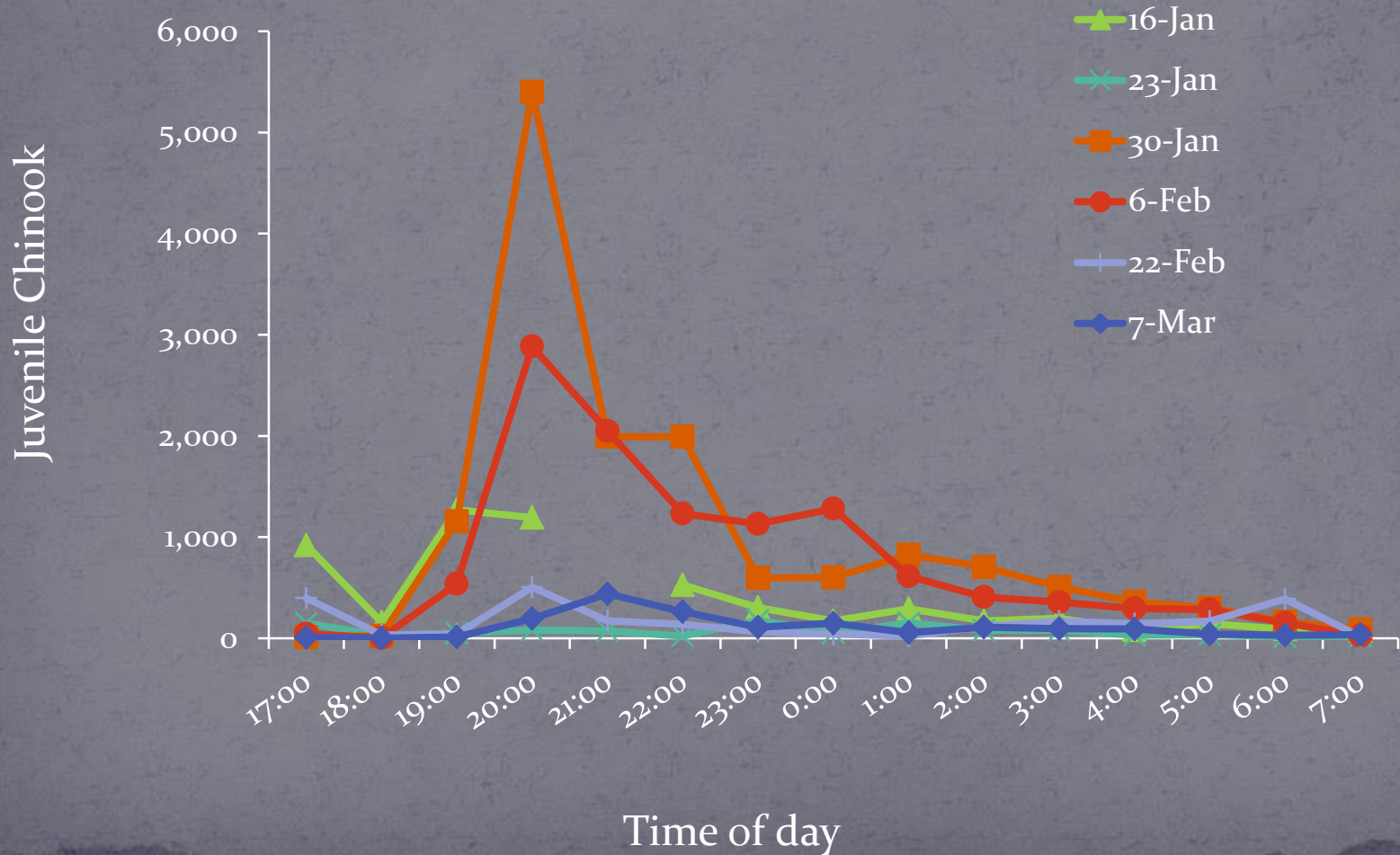
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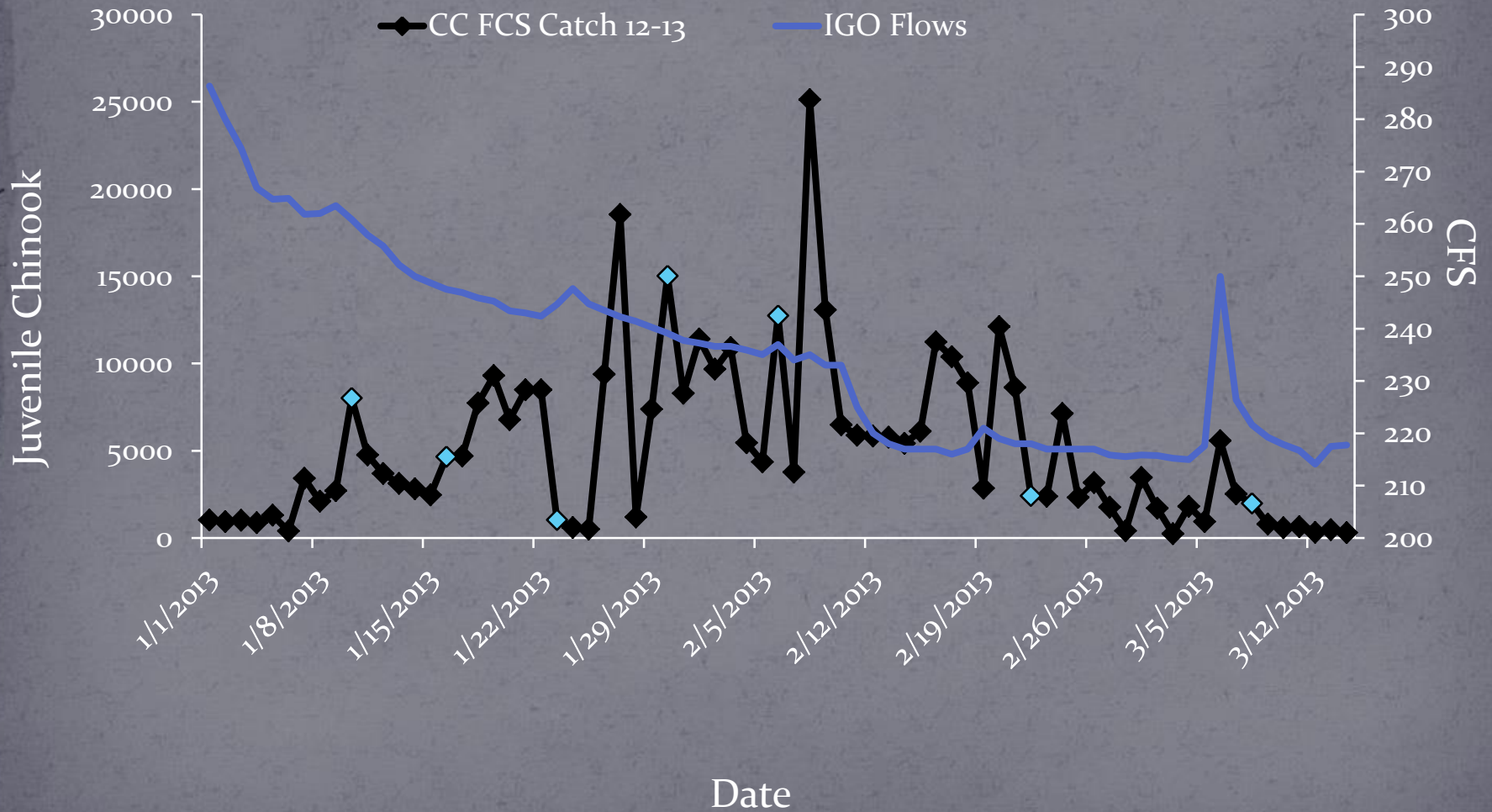
# Lower Clear Creek RST 2012-2013

## Chinook Hourly Distribution Jan 2013 - Mar 2013



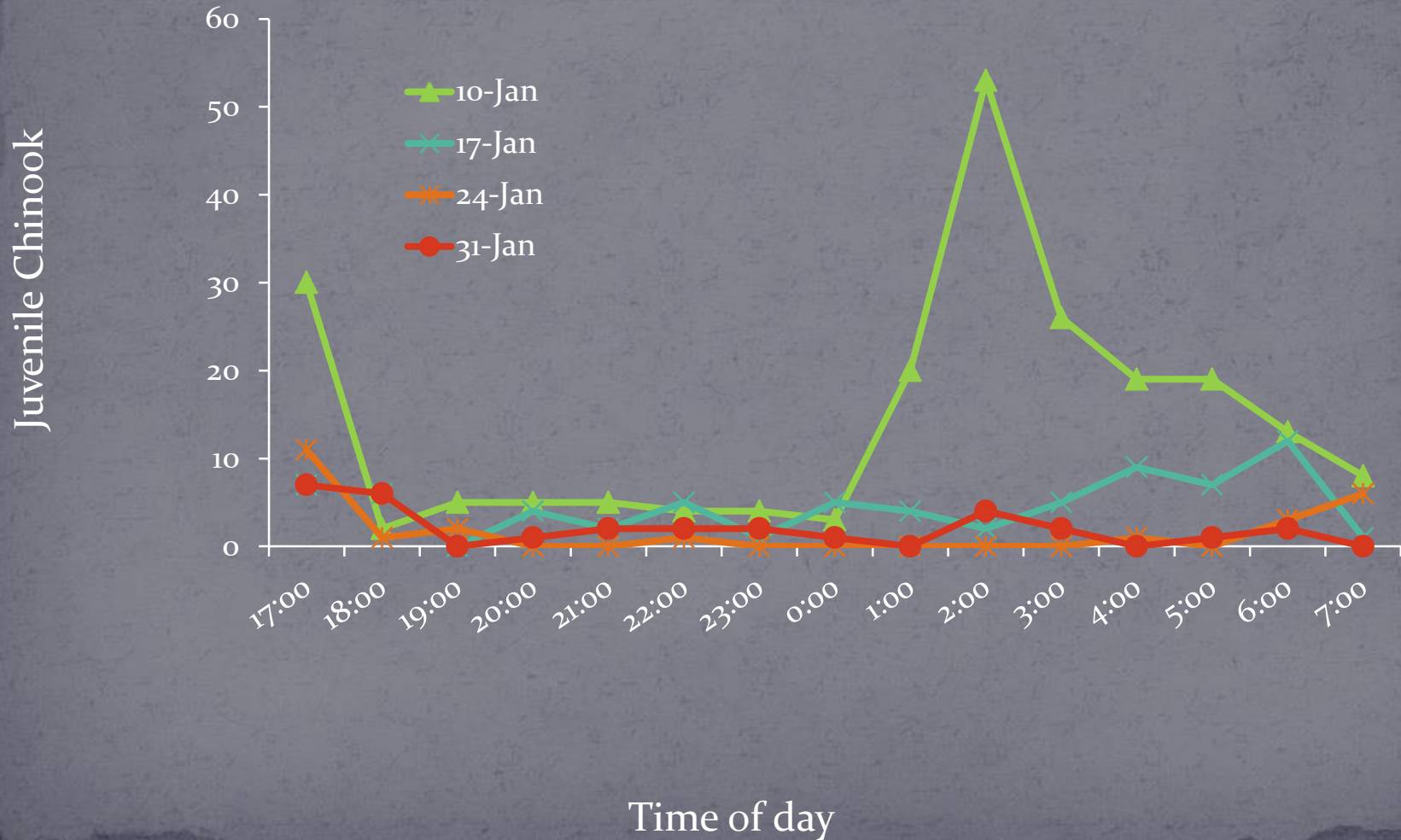


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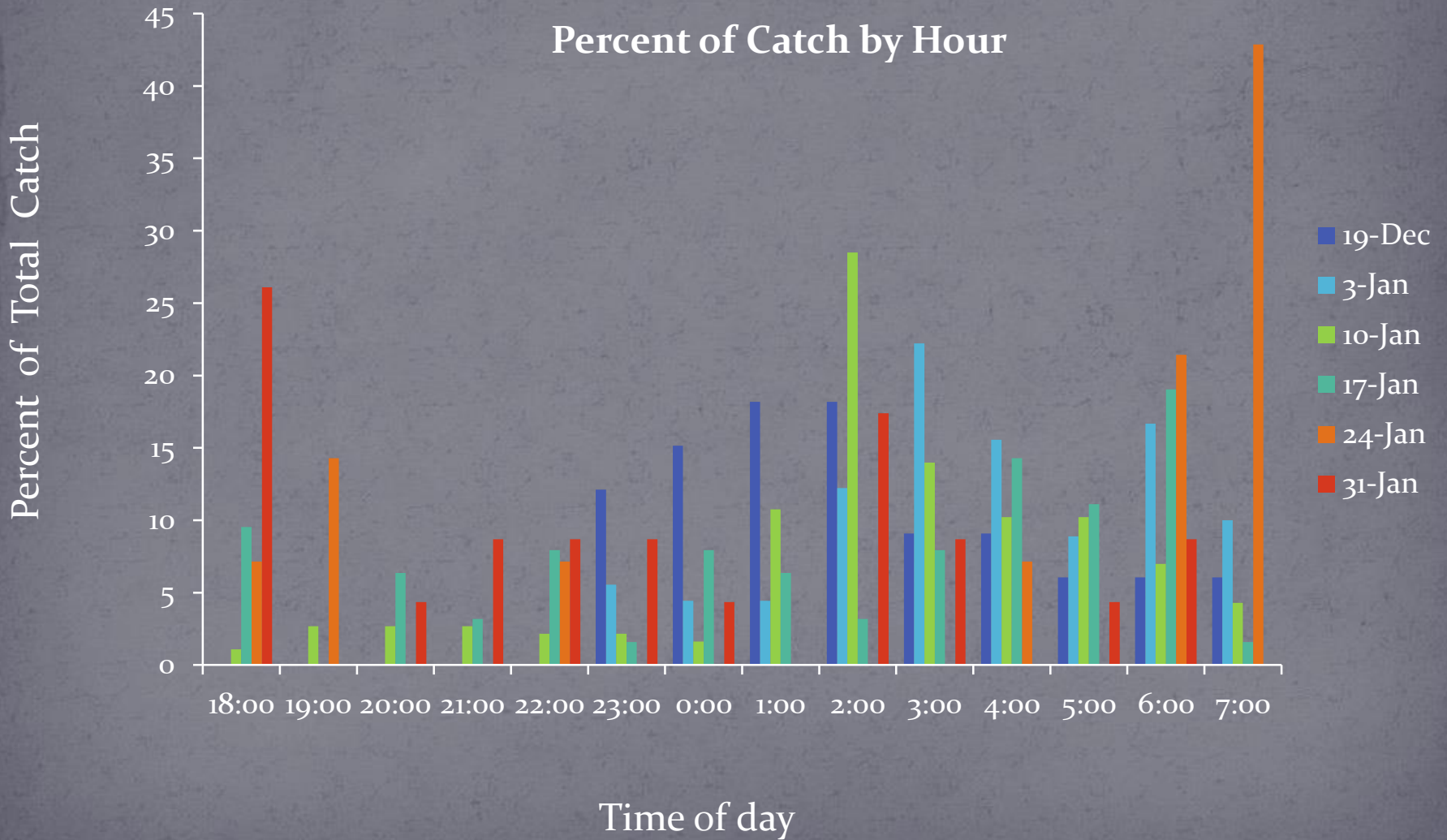


# Upper Battle Creek RST 2012-2013

## Chinook Hourly Distribution Jan 2013



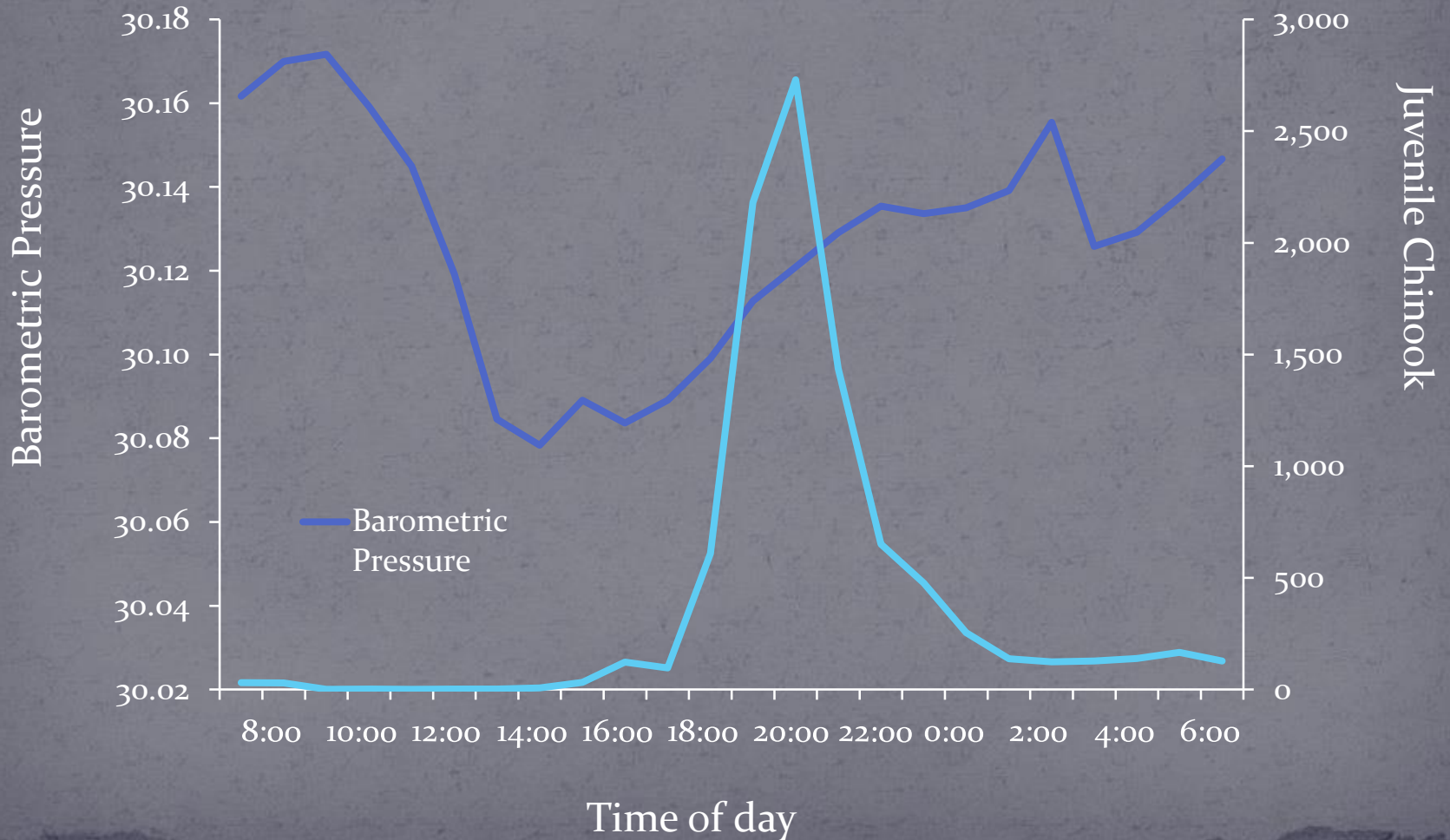
# Upper Battle Creek RST 2012-2013





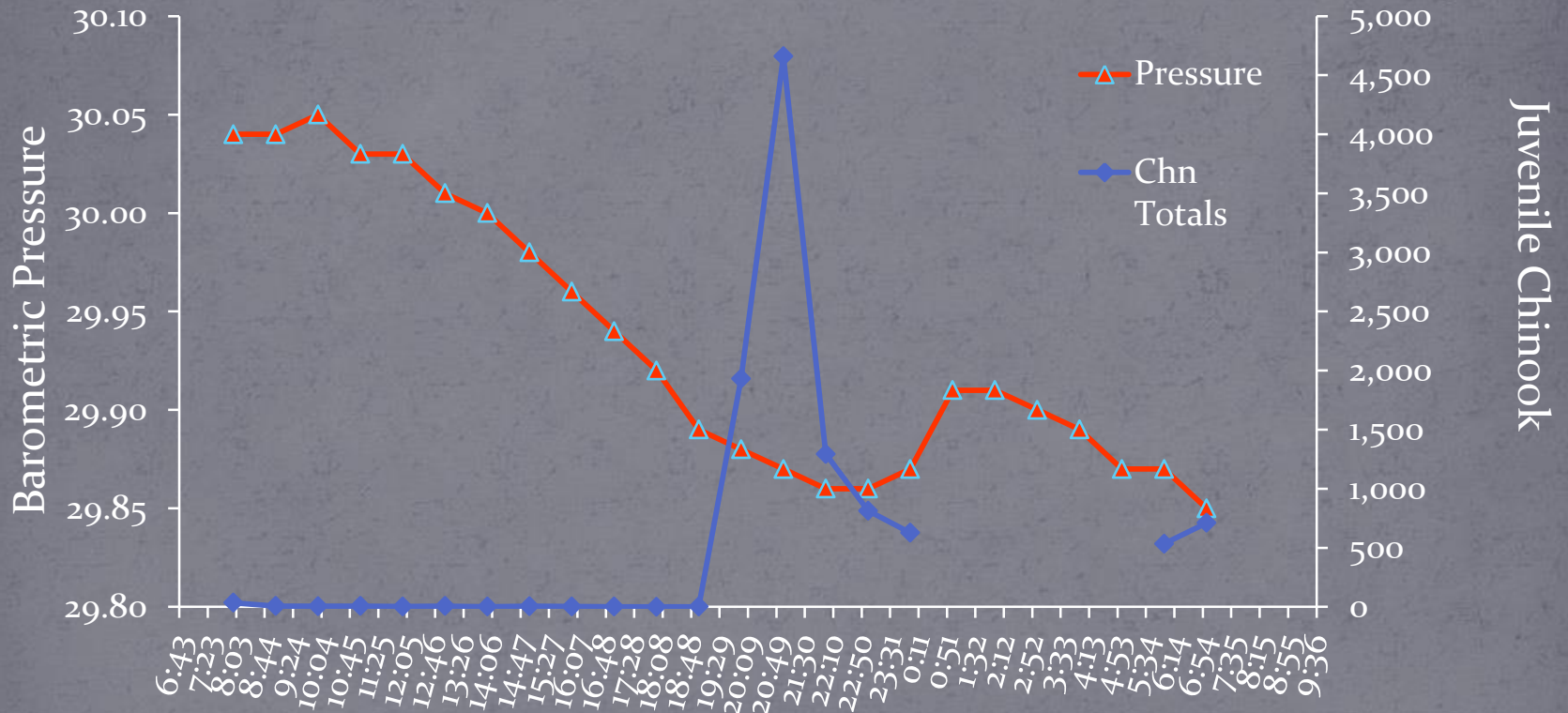
# What did we observe?

## Avg. Hourly Barometric Pressure and Chn Catch



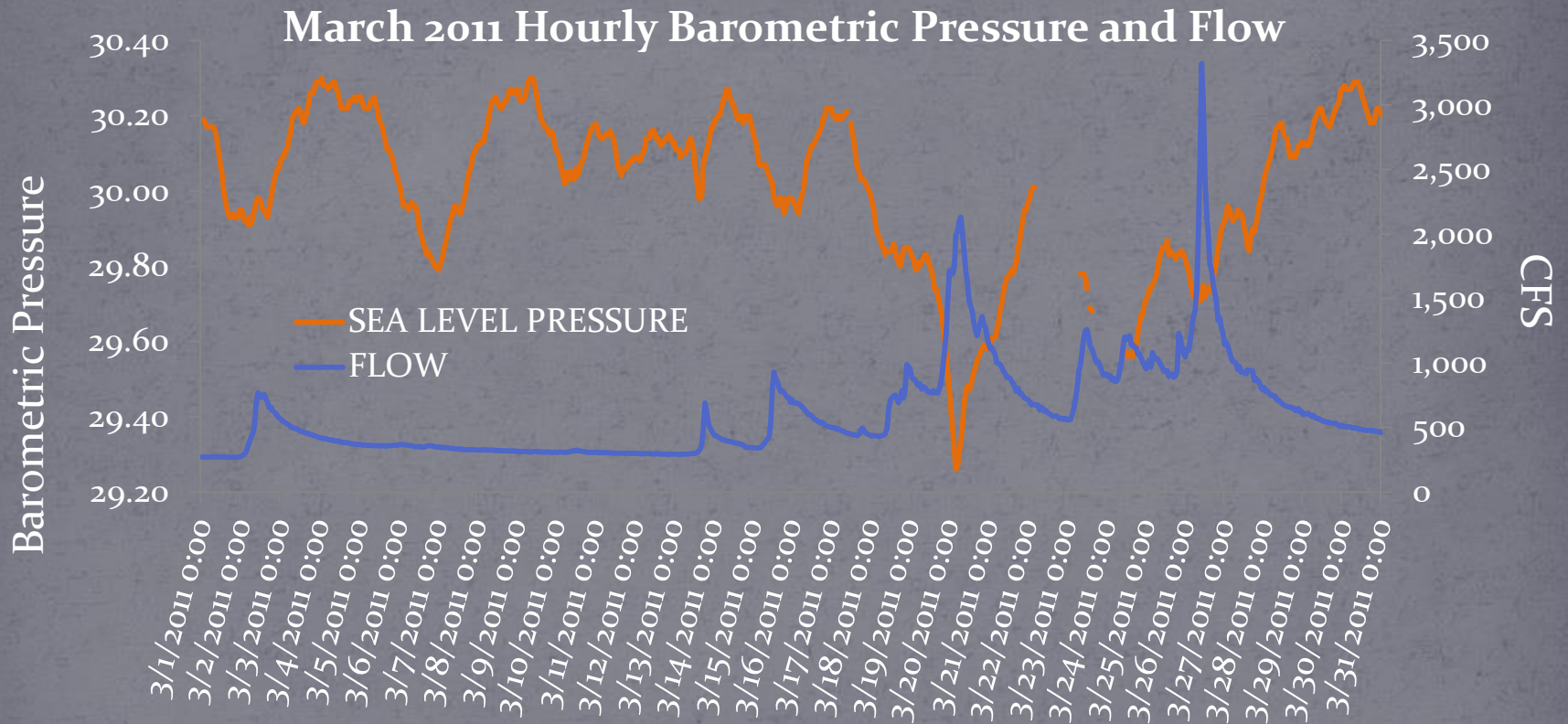
# What did we observe?

## Catch vs Barometric Pressure



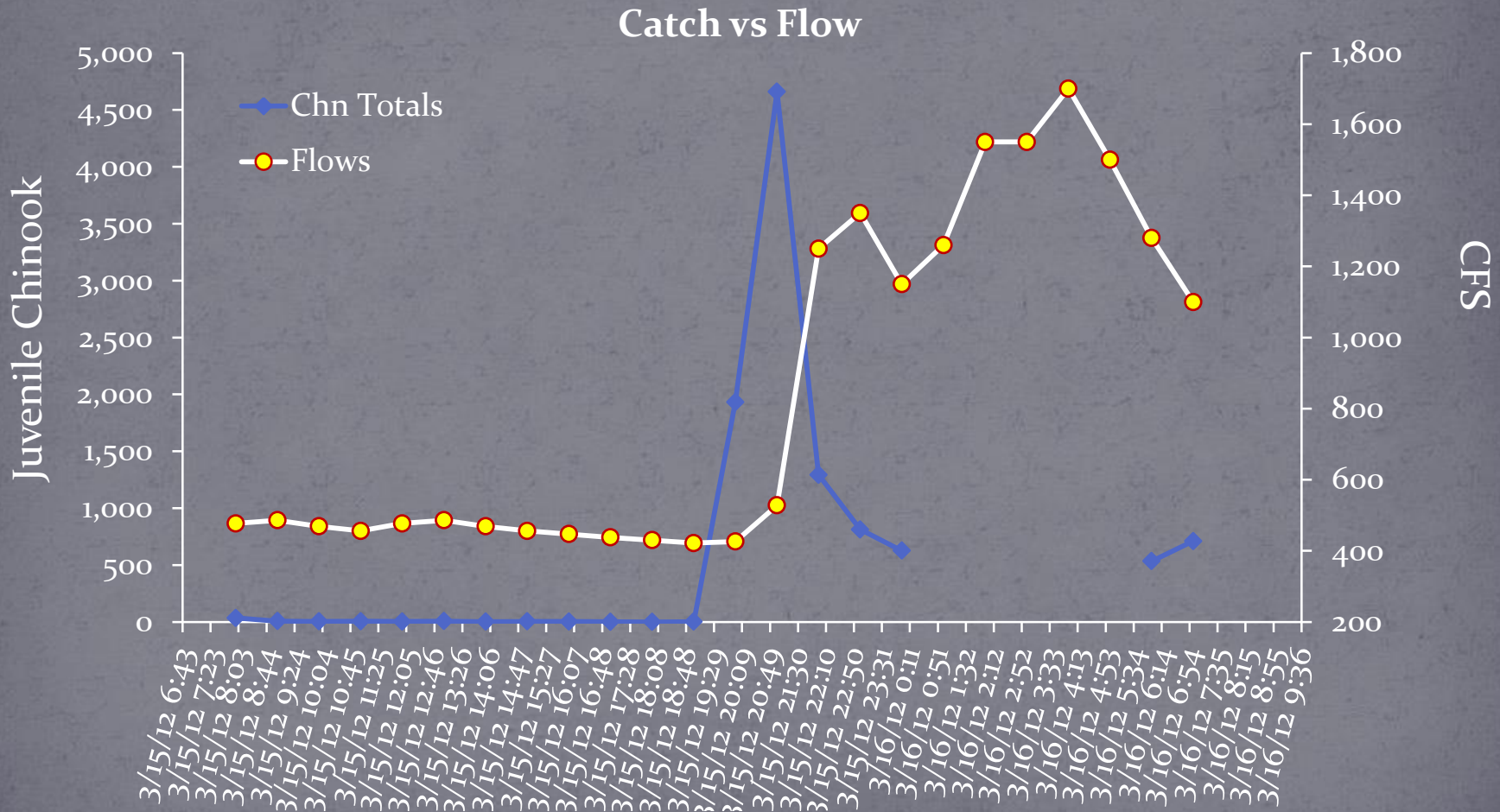


# What did we observe?





# What did we observe?



# What did we learn in 2012?

- Passage peaks daily in a three hour period from 1900 – 2200.
- 85 % of salmon are passing between 1900 – 0000.
- Daily distribution during 24-hour interval sampling, did not change throughout the season.



# What did we learn in 2013?

- Passage peaks daily in a three hour period from 1900 – 2200.
- 77 % of salmon are passing between 1900 – 0000.
- Average passage timing was an hour earlier than 2012.



# What did we learn in 2013?

- Barometric Pressure and flow changes do not seem to affect general timing.
- Both Chinook and Steelhead responded better to natural flow events versus artificial pulse flows.

# Where do we go from here?

- Continue evaluation of environmental variables.
- Gather more data from flow events and determine if fish are holding during moderate or high flow events.
- Build time step model to more accurately project fish passage timing when traps aren't fishing.

Questions?