NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

Species Recovery Grants to States (Section 6 Program)

Pursuant to NOAA Award No. **NA14NMF4720011**

Studies of Eulachon in Oregon and Washington

Report Period: **January 1 - June 30, 2016**

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Studies of Eulachon in Oregon and Washington

Semi-Annual Performance Progress Report
January 1 to June 30, 2016

ODFW COST CODE: 55000 420009-02

Personnel

Both permanent and seasonal personnel worked on these tasks.

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Project Accomplishments by Objective

A) Stock Assessment Objective

1. *Complete larval sampling in the Columbia River and Oregon and Washington coastal rivers December 1- May 31.*

   Season One: December 1, 2014–May 31, 2015

   (See previous progress report for time period 1 January through 30 June, 2015)

   Season Two: December 1, 2015 – May 31, 2016

   Staff from ODFW visited three Oregon coastal streams – Cummins, Tenmile and Big creeks – during the January – June reporting period to: (1) collect ichthyoplankton samples to quantify outflow of larval eulachon smelt (Big, Cummins and Tenmile creeks) and (2) collect water quantity data to develop models relating discharge and water level (Big and Cummins creeks; see sub-objective 2). Ichthyoplankton samples were collected regularly (i.e., weekly or bi-weekly) from all three creeks, unless sampling was precluded by unsafe environmental conditions. During this reporting period, staff from ODFW visited Big, Cummins and Tenmile creeks on 25 different occasions; collecting 50 ichthyoplankton samples each from Big and Cummins creeks and 48 samples from Tenmile Creek. Throughout season two of field activities – encompassing the third and fourth reporting periods – field personnel collected a total of 172 ichthyoplankton samples. In addition, during the current reporting period, ODFW staff collected 20 discharge samples from Big Creek and 38 samples from Cummins Creek (season one total = 38 samples; Table 1). As described previously (Mallette 2014), conditions (i.e., elevated water levels and increased velocity) in Tenmile Creek precluded collection of

information necessary to estimate instantaneous discharge and thus no data characterizing water quantity were collected in that stream during the entirety of the second sampling season.

Table 1. Distribution of sampling episodes and ichthyoplankton and stream discharge samples collected in Big, Cummins and Tenmile creeks during seasons one and two.

Reporting Period	Water Body	Sampling Period	Sampling Trips	Ichthyoplankton Samples	Discharge Samples
Jul.–Dec., 2014	Big Cr.[a]	n/a	n/a	n/a	n/a
	Cummins Cr.	12/09/2014–12/30/2014	4	7	3
	Tenmile Cr.	12/09/2014–12/30/2014	3	7	n/a[b]
Jan.–Jun., 2015	Big Cr.	03/04/2015–05/05/2015	13	26	10
	Cummins Cr.	01/08/2015–05/05/2015	28	56	25
	Tenmile Cr.	01/08/2015–04/28/2015	27	53	n/a[b]
Jul.–Dec., 2015	Big Cr.	12/16/2015–12/31/2015	4	8	1
	Cummins Cr.	12/16/2015–12/31/2015	4	8	2
	Tenmile Cr.	12/17/2015–12/31/2015	4	8	n/a[b]
Jan.–Jun., 2016	Big Cr.	01/04/2016–04/29/2016	25	50	20
	Cummins Cr.	01/04/2016–04/29/2016	25	50	38
	Tenmile Cr.	01/04/2016–04/29/2016	25	48	n/a[b]
		Total	162	321	96

Note: [a] sampling did not commence until March 4, 2015 due to delays in permitting (i.e., the permit was not received until 3/3/2015).

[b] Conditions (i.e., water level and velocity) precluded the installation of a water-level logger and the collection of data necessary to estimate instantaneous discharge. Thus, only larval outflow was/will be quantified.

Season Three: December 1, 2016 – June 21, 2017

(Work not scheduled to occur during this reporting period.)

2. *Complete calculations of river discharge by July 31.*

Season One: December 1, 2014 – May 31, 2015

(See previous progress report for time period 1 January through 30 June, 2015)

Season Two: December 1, 2015 – May 31, 2016

In both Big and Cummins creeks, when environmental conditions allowed, water data characterizing velocity ($m \cdot sec^{-1}$) and depth measurements (m) were collected at regular intervals along a transect. These data, and measurements of stream width (i.e., transect width), were used to calculate instantaneous discharge ($m^3 \cdot s^{-1}$). Instantaneous discharge values estimated throughout the sampling period were then used in conjunction with water level measurements (m), recorded by water-level data loggers, to develop

predictive models relating discharge and water level (Figures 1 and 2). Water-level data loggers were installed in Cummins and Big creeks on December 3, 2016. A storm event during mid-January dislodged the water-level sensor at Cummins Creek and high flows occurring at that time washed the device downstream. After considerable searching, the logger was not recovered, and consequently all measurements recorded to that point were lost. A replacement data logger was installed in on January 19, 2016. Data were successfully downloaded at both sites on April 29, 2016. Predictive models were then applied to water-level data recorded by data loggers to predict discharge during intervals when it was not quantified directly. To evaluate these relationships, an ordinary least-squares (OLS) model was fit to untransformed data collected from Cummins and Big creeks, separately. Assessment of the model assumptions indicated heteroscedastic and non-normal errors. In light of this, a second OLS model was fit after log transforming both response (discharge) and independent (water level) variables. Reassessment of the model assumptions indicated that the transformation effectively stabilized the variance and helped normalize residuals; thus, log-log formulations of the models were used for predictive purposes.

As stated previously, the water body-specific discharge-water level relationships were applied to water-level data to predict discharge during intervals when it was not quantified directly. Because the models were developed based on log-transformed data, output was back-transformed by taking the anti-log of the predictions. To account for bias associated with back-transformation, a correction factor (MSE/2) was applied, as proposed by Baskerville (1972). Lastly, mean daily discharge predictions ($m^3 \cdot s^{-1}$) were converted to daily discharge values ($m^3 \cdot d^{-1}$; Figures 3 and 4).

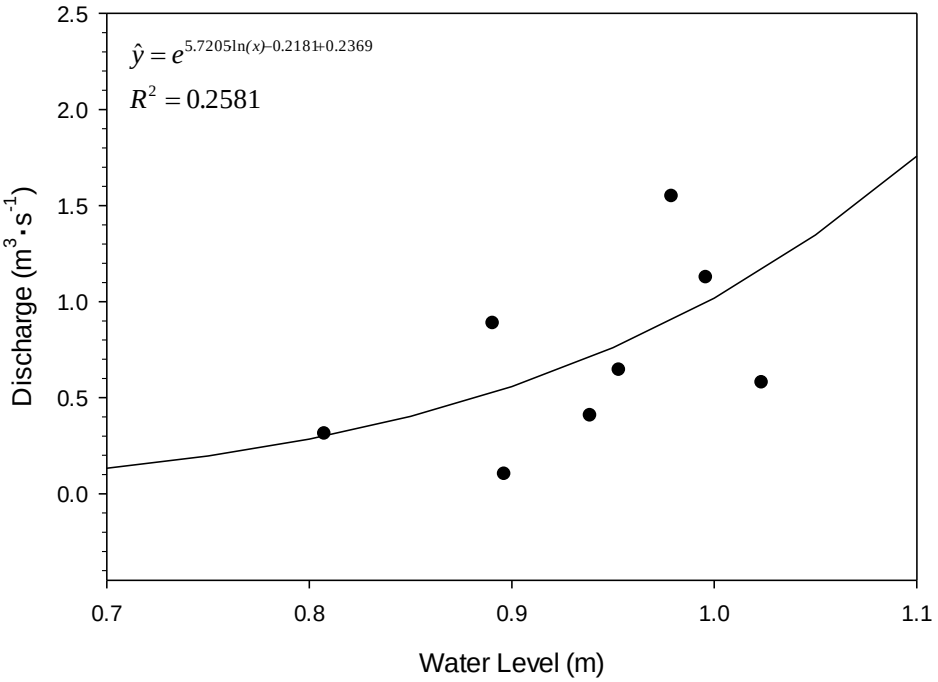

Figure 1. Relationship between water level and discharge in Cummins Creek. Data used in model development were collected from 1/19/2016–4/29/2016.

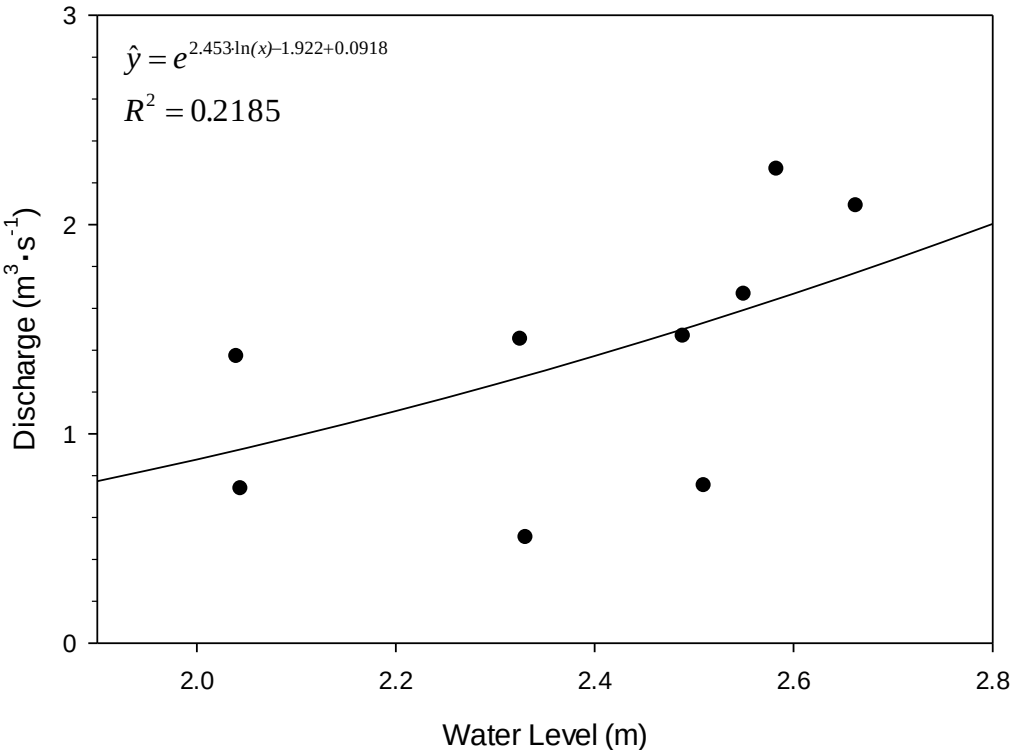

Figure 2. Relationship between water level and discharge in Big Creek. Data used in model development were collected from 12/16/2015–4/29/2016.

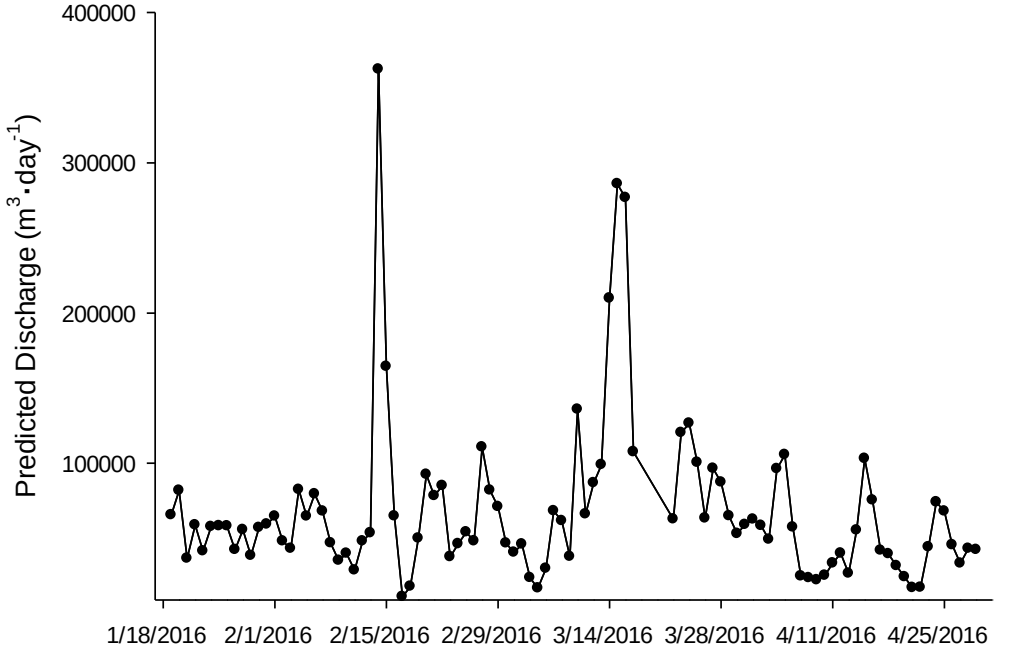

Figure 3. Predicted discharge in Cummins Creek.

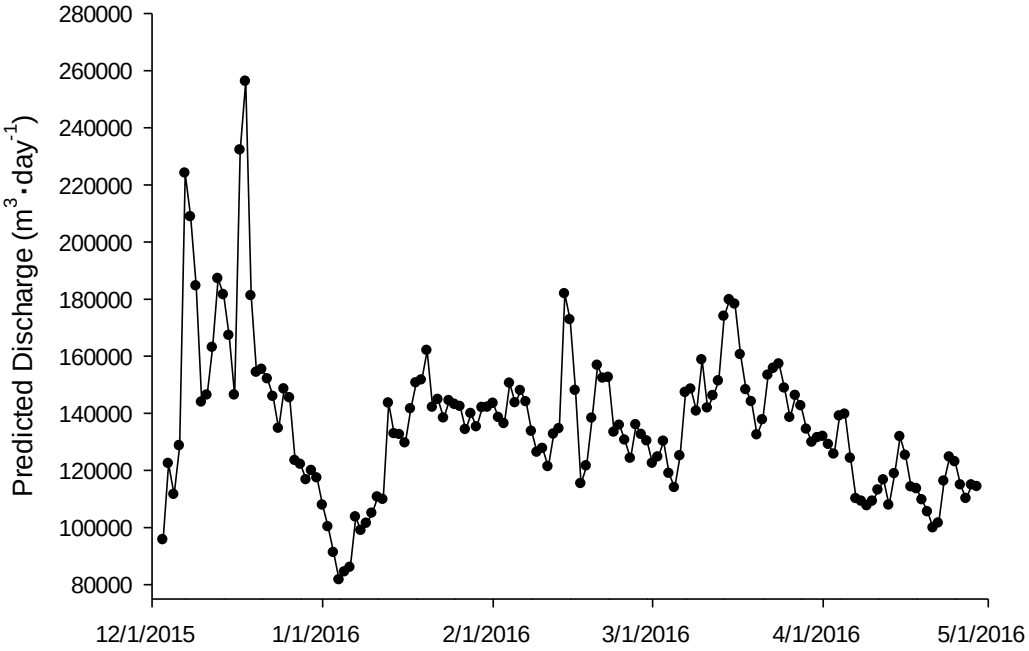

Figure 4. Predicted discharge in Big Creek.

Season Three: December 1, 2016 – June 21, 2017

(Work not scheduled to occur during this reporting period)

3. *Complete laboratory work (larval densities in samples) by August 31.*

Season One: December 1, 2014–May 31, 2015

(See previous progress report for time period 1 January through 30 June, 2015)

Season Two: December 1, 2015 – May 31, 2016

From December 16, 2015 – April 29, 2016, staff from ODFW collected a total of 172 individual ichthyoplankton samples from Cummins, Tenmile and Big creeks (Table 1). Although ichthyoplankton were encountered in several samples collected during season two, none of the specimens were identified as eulachon.

To support data management and analyses (e.g., linear model development, density estimation, etc.), staff from ODFW developed a database relating field and laboratory parameters. This database continues to be maintained and refined.

Season Three: December 1, 2016 – June 21, 2017

(Work not scheduled to occur during this reporting period.)

4. *Complete calculation of Spawning Stock Biomass calculations by September 30.*

Season One: December 1, 2014 – May 31, 2015

(See previous progress report for time period 1 January through 30 June, 2015)

Season Two: December 1, 2015 – May 31, 2016

We developed and implemented a sampling design that would allow collection of information necessary to estimate Spawning Stock Biomass (SSB) for Big and Cummins creeks (see above and Mallette 2014). However, lack of encounters with eulachon larvae will preclude estimation of SSB for the second season.

Season Three: December 1, 2016 – June 21, 2017

(Work not scheduled to occur during this reporting period.)

B) Genetic Analysis Objective.

1. *Complete collection of genetic samples in conjunction with activities under objective A by June 30.*

Season One: December 1, 2014 – May 31, 2015

(See previous progress report for time period 1 January through 30 June, 2015)

Season Two: December 1, 2015 – May 31, 2016

Because no eulachon larvae were encountered during examination of samples from Cummins and Big creeks samples will not be available for genetic analysis from season two.

Season Three: December 1, 2016 – June 21, 2017

(Work not scheduled to occur during this reporting period.)

2. *Complete all laboratory work (genetic sample processing) by August 31, 2017.*

   Eulachon larvae collected from Oregon coastal streams for genetic analysis (see above) during season one of sampling were transferred to the Washington Department of Fish and Wildlife's Molecular Genetics Laboratory to allow for subsequent genetic analysis. To date, ODFW has submitted for genetic analysis nine individual Eulachon larvae (Mallette 2015a).

3. *Complete all genetic analyses by September 30, 2017.*

   Eulachon larvae collected from Oregon coastal streams for genetic analysis (see above) during season one of sampling were transferred to the Washington Department of Fish and Wildlife's Molecular Genetics Laboratory to allow for subsequent genetic analysis.

C) Outreach and Education Objective.

1. *Complete webpage development and populate webpages with information from previous studies by December 31, 2014.*

   (See previous progress report for time period 1 January through 30 June, 2015)

2. *Complete annual webpage update by October 31.*

   Year One: July 1, 2014 – June 30, 2015

   (See previous progress report for time period 1 January through 30 June, 2015)

   Year Two: July 1, 2015 – June 30, 2016

   The progress report for the July–December, 2015 (Storch and Mallette 2015b) reporting period has been uploaded to the interim project webpage (http://www.dfw.state.or.us/fish/OSCRP/CRI/publications.asp#Eulachon). Project staff and web developers at ODFW continue to work toward development of a stand-alone, eulachon-specific, webpage.

   Year Three: July 1, 2016 – June 30, 2017

   (Work not scheduled to occur during this reporting period.)

3. *Incorporate more eulachon information into the displays and activities at the City of Vancouver, WA/WDFW Annual Sturgeon Festival.*

   Year One: July 1, 2014 – June 30, 2015

   (See previous progress report for time period 1 July through 33 December, 2014)

   Year Two: July 1, 2015 – June 30, 2016

   ODFW staff participated in, and developed material for, the Vancouver, WA/WDFW Annual Sturgeon Festival held on September 19th 2015.

   Year Three: July 1, 2016 – June 30, 2017

   (Work not scheduled to occur during this reporting period.)

4. *Attend and present work at a regional meeting and a conference or workshop annually.*

   Year One: July 1, 2014 – June 30, 2015

   (See previous progress report for time period 1 January through 30 June, 2015)

   Year Two: July 1, 2015 – June 30, 2016

   (This task was not addressed in this reporting period)

   Year Three: July 1, 2016 – June 30, 2017

   (Work not scheduled to occur during this reporting period.)

5. *Present findings of previous work and preliminary year one work at the national meeting of the American Fisheries Society at Portland, OR in August 2015.*

   (See previous progress report for time period 1 July through 31 December, 2015)

D) Reporting.

1. *Complete semi-annual progress reports for each objective by June 30 and December 31.*

   Year One: July 1, 2014 – June 30, 2015

   (See previous progress report for time period 1 January through 30 June, 2015)

Year Two: July 1, 2015 – June 30, 2016

This is the fourth progress report for the current grant prepared and submitted by the Oregon Department of Fish and Wildlife. The co-awardee (WDFW) will be filing separate progress reports as separate awards were granted to both agencies listed in the joint-state proposal.

Year Three: July 1, 2016 – June 30, 2017

(Work not scheduled to occur during this reporting period.)

2. *Complete comprehensive report of study by December 31, 2017.*

   (Work not scheduled to occur during this reporting period).

3. *Document and distribute datasets from the study by December 31, 2017.*

   (Work not scheduled to occur during this reporting period).

4. *Complete submission of articles to peer reviewed journals by December 31, 2017.*

   (No articles were submitted during this reporting period)

Expenditures (Estimated; ODFW only, excludes expenditures by co-awardee):

Total expenditures January 1 – June 30, 2016**:** **$ 12,163**

References

Baskerville, G. L. 1972. Use of logarithmic regression in the estimation of plant biomass. Can. J. For. Res. 2:49-53.

Mallette, C. 2014. Studies of eulachon smelt in Oregon and Washington. Project completion report by the Oregon Department of Fish and Wildlife and the Washington Department of Fish and Wildlife. Submitted to the National Oceanic and Atmospheric Administration.

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