PROGRESS REPORTS

2015

FISH DIVISION

Oregon Department of Fish and Wildlife

2015 Umpqua Dace Investigations

ANNUAL PROGRESS REPORT

FISH RESEARCH PROJECT
OREGON

PROJECT TITLE: **Distribution and Abundance of Umpqua Dace in the Umpqua River Basin, Oregon**

Photograph of a longnose dace and its habitat.

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Abstract— The Umpqua dace (*Rhinichthys evermanni)* is a form of longnose dace endemic to the Umpqua River drainage in southwestern Oregon. Sparse species records in the Oregon State University Ichthyology Collection and infrequent recent encounters prompted a survey to assess the current status and distribution of these fish. We surveyed historical locations using backpack electrofishing to document presence/absence and to estimate dace capture probabilities and abundance. We used an N-mixture model to estimate abundance and capture probability for Umpqua dace at each sampling location. We evaluated the effects of habitat covariates on both capture probability and abundance at each sample site. We found Umpqua dace were widespread and relatively abundant in the drainage, but in lower abundance or absent when the habitats were occupied by nonnative fish, primarily smallmouth bass and brown bullhead. We collected Umpqua dace from swift water habitats, which were relatively uncommon in the basin, and found them typically associated with cobble or boulder substrates. Abundance estimates ranged from 1 to 176 dace per sampling location with a total estimated abundance (sum of site estimates) of 1,479 dace for the sites we sampled. Dace abundance was lower at sites containing smallmouth bass, averaging 67 fewer dace per site than those sites where bass were not present. Umpqua dace capture probabilities varied with electrofishing time/duration, averaging 27%.

INTRODUCTION

The longnose dace *Rhinichthys cataractae* is widespread in North America and in Oregon. The Umpqua dace is a form of longnose dace endemic to the Umpqua River drainage in southwestern Oregon. Bisson and Reimers (1997) first described the unique characters of Umpqua dace *R. evermanni* and nearby Millicoma dace and found large morphological differences between these coastal dace and those inhabiting Columbia River tributaries, likely resulting from prolonged geographical isolation. McPhail and Taylor (2009) conducted a phylogeographical maximum likelihood analysis that indicated that together the Umpqua and Millicoma dace form a distinctive Oregon coastal clade within the *R. cataractae* species group (originated from a common *R. cataractae* like ancestor) and the Millicoma dace evolved from the Umpqua dace (sister taxa).

A recent review of fish museum records from the Oregon State University (OSU) Ichthyology Collection revealed only 24 records for Umpqua dace, collected from 15 locations in the Umpqua drainage between 1926 and 1997 (Table 1; Figure 1). Recent concern regarding the current status and distribution of Umpqua dace prompted this study.

The objectives of this study were to: 1) sample historical Umpqua dace locations using backpack electrofishing, 2) estimate dace detection probabilities using repeated sampling visits, and 3) estimate dace abundance using N-mixture modeling.

METHODS

We sampled locations within the known historical range of Umpqua dace, and as near as possible to historical locations, from 14–24 September 2015. The historical range was estimated from OSU Ichthyology Collection records (Table 1; Figure 1). At each location, we used single-pass backpack electrofishing to sample a section (length) of stream that was approximately six times the wetted width and included riffle habitat. We flagged the upstream and downstream boundaries. We placed the Umpqua dace that we captured in a five gallon bucket until the entire site was sampled. After sampling was completed, we measured the Umpqua dace to the nearest 1 mm (FL). If Umpqua dace were collected at a location, we repeated the sampling on one more occasion, 1–3 d later. If no dace were collected at a site, we repeated the sampling on two more occasions. We recorded the other fish species collected and counted all Coho salmon *Oncorhynchus kisutch*, to satisfy National Oceanic and Atmospheric Administration 4(d) permit reporting requirements.

We collected habitat information at each location that we visited. We used a graduated measuring tape or a laser range finder to measure stream width and site length. We determined the stream length for each sampling location by multiplying the average wetted stream width by six, thus scaling the sampling area to the size of the stream channel. At three transects at each site, we determined the site depth using a graduated measuring staff and calculated the average of five equally spaced measurements across the channel and recorded the dominant substrate type based on the following categories: fines- <0.063 mm, sand- 0.063-2 mm, gravel- 3-64 mm, cobble- 65-256 mm, boulder- >256 mm, or bedrock. We calculated average site depth and dominant substrate for each site from these measurements. We estimated the cover provided by large wood and/or large boulders, expressed as a percentage of surface area of the site. We recorded the water temperature using a hand held thermometer. We recorded the Universal Transverse Mercator (UTM) coordinates for the start and end points at each site using a handheld Global Positioning System (GPS), recorded start and end times for electrofishing, and photographed each sampling location.

We used an N-mixture or binomial-mixture model, which uses data from spatially replicated populations (i.e., sampling sites) with temporally replicated counts of independent individuals (i.e., multiple sampling occasions) within a period of closure (i.e., assuming no immigration, emigration, or mortality), to estimate abundance and capture probability for Umpqua dace at each sampling location (Royle 2004; Kéry and Schaub 2012). The N-mixture model allows us to estimate abundance, corrected for imperfect capture, using counts without individual identification. The capture of dace present at a site was modeled assuming a binomial distribution, whereas the variation in abundance among sites was assumed to follow a negative binomial distribution. The negative binomial distribution was used because the variation in dace abundance exceeded that assumed by a Poisson distribution.

The N-mixture model allowed us to evaluate evidence for the effect of covariates on both capture probability and abundance at a sample site. We included the following habitat covariates as potential predictors for the capture probability submodel: amount of time spent

Table 1. Umpqua dace occurrence records from the Oregon State University Ichthyology Collection. Map codes refer to sites on Figure 1.

Date	Location	Watershed	Latitude	Longitude	Museum #	Map #
01-Sep-40	Smith River	Lower Smith River-Lower Umpqua River	43.773975	-123.994837	UMMZ138641	1
17-Oct-79	Smith River	Lower Smith River-Lower Umpqua River	43.785954	-123.832672	OS008991	2
26-Aug-67	Mill Creek, 8 miles above Umpqua River confluence	Mill Creek-Lower Umpqua River	43.616856	-123.860329	OS006223	3
07-Aug-69	Umpqua River at Elk Creek confluence near Elkton	Upper Umpqua River	43.632854	-123.566200	OS006779	4
03-Jun-83	Calapooya Creek at Highway 138 crossing	Calapooya Creek	43.400345	-123.373146	OS010906	5
15-Aug-26	N. Umpqua River near Roseburg dam	Lower North Umpqua River	43.283971	-123.353228	UMMZ94149	6
09-Jul-71	Little River at Glide	Lower North Umpqua River	43.297546	-123.099792	OS008014	7
09-Jul-71	Little River at Glide	Little River	43.296978	-123.099075	OS008013	8
10-Sep-61	Steamboat Creek at Steamboat falls	Steamboat Creek	43.373795	-122.639595	OS009461	9
07-May-59	Steamboat Creek	Steamboat Creek	43.383263	-122.623207	OS004561	10
unknown	S. Umpqua River, Roseburg	Lower South Umpqua River	43.219100	-123.356800	USNM61573	11
unknown	S. Umpqua River, Roseburg	Lower South Umpqua River	43.219100	-123.356800	USNM61572	12
unknown	Umpqua River, Roseburg	Lower South Umpqua River	43.215944	-123.344642	USNM126494	13
31-Jul-97	South Umpqua River	Middle South Umpqua River	42.988545	-123.339958	OS016079	14
11-Oct-67	S. Umpqua River below Riddle	Middle South Umpqua River	42.986897	-123.340607	OS004574	15
30-Jul-97	South Umpqua River	Middle South Umpqua River-Dumont Creek	43.036623	-122.807966	OS016138	16
18-Sep-97	South Umpqua River	Middle South Umpqua River-Dumont Creek	43.036623	-122.807966	OS016447	17
11-Oct-67	Cow Creek at Riddle	Lower Cow Creek	42.948544	-123.359291	OS004572	18
03-Jun-83	Cow Creek	Lower Cow Creek	42.933079	-123.390671	OS010901	19
07-Aug-97	West Fork Cow Creek	West Fork Cow Creek	42.801455	-123.618291	OS016198	20
28-Sep-54	Cow Creek at US 99 bridge	Middle Cow Creek	42.781235	-123.270233	OS000335	21
30-Jul-70	Cow Creek at Quines Creek Rd and I-5	Middle Cow Creek	42.781456	-123.273926	OS009227	22
30-Jul-70	Cow Creek at Quines Creek Rd and I-5	Middle Cow Creek	42.781448	-123.273720	OS010038	23
30-Jul-70	Cow Creek at Quines Creek Rd and I-5	Middle Cow Creek	42.781513	-123.273125	OS009578	24

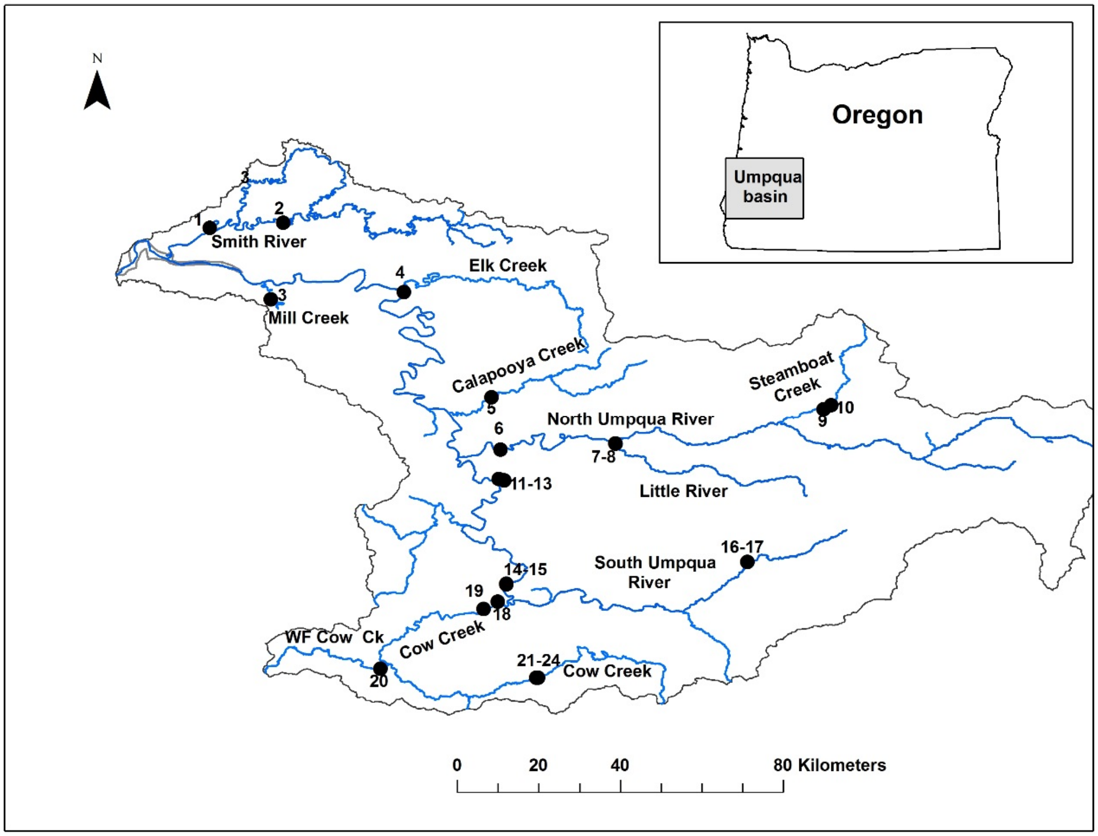

Figure 1. Historical locations for Umpqua dace from the Oregon State University Ichthyology Collection. Site numbers refer to museum records listed in Table 1.

electrofishing (duration), stream width, dominant substrate type, stream temperature, percent cover, average depth, and mean stream cross-sectional area. We also evaluated the following habitat covariates as predictors for the abundance submodel: stream temperature, percent cover, average depth, sample unit length, and sample unit area, and whether smallmouth bass were present at the sample site. We evaluated the effect of these variables by systematically fitting alternative submodels with and without the predictors and selected the best model using Akaike's Information Criteria with a small sample bias adjustment (AICc; Burnham and Anderson 2002). During the model selection procedure, the same covariate (e.g., average depth) was not included simultaneously in both submodels to avoid model convergence and parameter identifiability problems. We calculated 95% confidence limits for abundance estimates using the asymptotic variance for lambda, which represents the density of occurrences within a time interval, as described by Royle (2004). All models were fit using R statistical package UNMARKED (Fiske and Chandler 2011). Goodness-of-fit of the best supported model was evaluated using a bootstrap goodness-of-fit test, as implemented in R package AICcmodavg (Mazerolle 2014).

RESULTS

We sampled 16 locations in the Umpqua River drainage and collected Umpqua dace from 13 of these locations (Figure 2). We collected dace from these 13 locations on both the first and second sampling occasions and the numbers of individuals caught were remarkably consistent across repeat sampling visits at these locations (Table 2). The three locations where we did not capture dace included sites in the mainstem Umpqua River, lower South Umpqua River, and middle Cow Creek.

Umpqua dace ranged in abundance between 1 and 276 fish per location (Table 3). Abundance for all sites combined totaled 1,479 fish. Dace were most abundant at the Little River site and at the North Umpqua River site 1 (276 and 236 fish, respectively). Umpqua dace were in lower abundance in several habitats co-occupied by smallmouth bass (e.g. - Umpqua River site 1, Cow Creek 2, and South Umpqua River site 1).

We collected Umpqua dace from swift water habitats, which were relatively uncommon in the basin, and found them typically associated with cobble or boulder substrates. When the Umpqua basin was previously logged (1880's-1950's), the timber was transported downstream using water stored behind splash dams. When the spillway of these dams was opened to release a large flood of water stored in the upstream reservoir, the stream bed was severely scoured, resulting in low habitat complexity and a stream substrate that was dominated by bedrock. This logging practice resulted in an environmental legacy which has been slow to reverse. The majority of the stream channels in the study area had low channel gradient and were dominated by pools and glides.

We collected ten non-target fish species during our sampling, including native speckled dace *Rhinichthys osculus*, coastrange sculpin *Cottus aleuticus*, riffle sculpin *C. gulosus*, rainbow trout *Oncorhynchus mykiss,* largescale sucker *Catostomus macrocheilus,* and redside shiner *Richardsonius balteatus*, and nonnative pumpkinseed *Lepomis gibbosus*, bluegill *Lepomis macrochirus*, brown bullhead *Ameiurus nebulosus,* and smallmouth bass *Micropterus salmoides.* (Table 2). We also captured native signal crayfish *Pacifasticus leniusculus*, Pacific Giant salamanders Di*camptodontidae*, and tailed frog tadpoles *Ascaphus truei,* and nonnative ringed crayfish *Orconectes neglectus*.

Table 2. Fish catch and habitat details for 2015 Umpqua dace sampling locations. Fish codes: UD- Umpqua dace, SD- speckled dace, CRS- coastrange sculpin, RT- rainbow trout, RS- riffle sculpin, LSU- largescale sucker, RSS- redside shiner, LAM- lamprey ammocoete, PKS- pumpkinseed, BG- bluegill, BBU- brown bullhead, and SMB- smallmouth bass. Site access is described in APPENDIX A.

Date	Site Name	Subbasin	Water temperature (C)	Pass	Shock time (min)	Length (m)	Width (m)	Average depth (m)	Dominant substrate	Cover (%)	**UD**	SD	CRS	RT	RS	LSU	RSS	LAM	PKS	BG	BBU	SMB
9/17/15	Umpqua 1	Umpqua	18.5	1	45	152.0	15.0	0.18	bedrock	10	**0**		x						x	x	x	x
9/21/15	Umpqua 1	Umpqua	19.0	2	46	152.0	15.0	0.18	bedrock	10	**0**		x							x	x	x
9/21/15	Umpqua 1	Umpqua	19.0	3	40	152.0	15.0	0.18	bedrock	10	**0**		x									
9/16/15	Calapooya Creek	Umpqua	16.0	1	37	38.6	5.5	0.11	bedrock	0	**9**	x						x				x
9/17/15	Calapooya Creek	Umpqua	16.0	2	41	38.6	5.5	0.11	bedrock	0	**8**	x										
9/14/15	North Umpqua 1	N. Umpqua	16.0	1	69	78.0	10.7	0.23	cobble	10	**81**	x	x	x								
9/15/15	North Umpqua 1	N. Umpqua	15.0	2	76	78.0	10.7	0.23	cobble	10	**100**	x	x	x		x						
9/16/15	North Umpqua 2	N. Umpqua	15.0	1	55	59.4	11.4	0.22	bedrock	10	**34**	x	x			x						
9/17/15	North Umpqua 2	N. Umpqua	15.0	2	55	59.4	11.4	0.22	bedrock	10	**35**	x	x									
9/15/15	Little River	N. Umpqua	15.0	1	46	81.0	6.9	0.19	cobble	10	**41**	x	x	x			x					
9/16/15	Little River	N. Umpqua	15.0	2	48	81.0	6.9	0.19	cobble	10	**47**	x	x	x			x					
9/14/15	Steamboat Creek 1	N. Umpqua	13.0	1	44	134.0	14.4	0.21	boulder	10	**22**		x	x								
9/15/15	Steamboat Creek 1	N. Umpqua	11.0	2	39	134.0	14.4	0.21	boulder	10	**17**		x	x								
9/14/15	Steamboat Creek 2	N. Umpqua	15.0	1	55	100.0	18.0	0.30	bedrock	10	**19**	x	x									
9/15/15	Steamboat Creek 2	N. Umpqua	12.0	2	49	100.0	18.0	0.30	bedrock	10	**19**	x	x				x					
9/16/15	South Umpqua 1	S. Umpqua	18.0	1	28	85.0	11.6	0.22	bedrock	5	**0**	x									x	x
9/17/15	South Umpqua 1	S. Umpqua	18.5	2	25	85.0	11.6	0.22	bedrock	5	**0**											x
9/17/15	South Umpqua 1	S. Umpqua	18.5	3	29	85.0	11.6	0.22	bedrock	5	**0**		x								x	x
9/22/15	South Umpqua 2	S. Umpqua	20.0	1	65	81.2	13.5	0.27	cobble	5	**19**	x									x	x
9/23/15	South Umpqua 2	S. Umpqua	16.0	2	69	81.2	13.5	0.27	cobble	5	**40**										x	x
9/23/15	South Umpqua 3	S. Umpqua	16.0	1	76	82.8	10.6	0.22	cobble	5	**27**	x					x					
9/24/15	South Umpqua 3	S. Umpqua	18.5	2	90	82.8	10.6	0.22	cobble	5	**33**	x										
9/23/15	South Umpqua 4	S. Umpqua	15.0	1	66	88.0	14.6	0.25	boulder	15	**50**	x	x		x	x						
9/24/15	South Umpqua 4	S. Umpqua	16.5	2	70	88.0	14.6	0.25	boulder	15	**55**	x	x		x	x						
9/23/15	South Umpqua 5	S. Umpqua	17.0	1	61	69.3	9.9	0.28	cobble	15	**23**	x	x		x		x					x
9/24/15	South Umpqua 5	S. Umpqua	16.0	2	58	69.3	9.9	0.28	cobble	15	**22**	x	x		x		x					x
9/23/15	Jackson Creek	S. Umpqua	14.0	1	74	68.0	10.5	0.19	boulder	5	**2**	x		x								
9/24/15	Jackson Creek	S. Umpqua	14.5	2	66	68.0	10.5	0.19	boulder	5	**5**	x	x	x								
9/21/15	Cow Creek 1	S. Umpqua	20.0	1	50	76.5	9.8	0.14	cobble	10	**7**	x	x		x							
9/22/15	Cow Creek 1	S. Umpqua	19.0	2	45	76.5	9.8	0.14	cobble	10	**8**	x	x		x							
9/21/15	Cow Creek 2	S. Umpqua	17.0	1	45	72.0	12.0	0.20	gravel	5	**0**	x	x	x	x						x	x
9/22/15	Cow Creek 2	S. Umpqua	15.0	2	44	72.0	12.0	0.20	gravel	5	**0**	x	x	x	x						x	x
9/22/15	Cow Creek 2	S. Umpqua	15.0	3	40	72.0	12.0	0.20	gravel	5	**0**	x	x	x	x						x	x
9/21/15	Cow Creek 3	S. Umpqua	13.0	1	38	46.0	7.6	0.19	cobble	5	**1**	x	x	x	x							
9/22/15	Cow Creek 3	S. Umpqua	12.0	2	35	46.0	7.6	0.19	cobble	5	**3**	x	x	x								

The best approximating N-mixture model included boulder as the dominant substrate for estimating capture probability and abundance modeled as a function of smallmouth bass presence plus dispersion (i.e., additional variation not described by the Poisson distribution). The second best approximating model included capture probability modeled as a function of time spent electrofishing and abundance was a function of smallmouth bass presence at the site. The best model was only slightly better that the second best (ΔAICc = 0.97). However, the estimated capture probabilities for the former (best model) were unrealistically high for sites with boulder as a dominant substrate (97%), which suggested the occurrence of quasi-complete separation in the logit-linear capture probability submodel. Quasi-complete separation is due to the distribution of successes (here, captures) in the data relative to covariates and results in highly biased parameter estimates (Heinze 2006). Therefore, we based our inferences on the AICc second best approximating model. Estimated capture probabilities increased with increasing electrofishing duration, ranged from 6.3% (25 min) to 58.2% (90 min) (Figure 3), and averaged 27%, which is similar to values reported for dace species in other stream systems

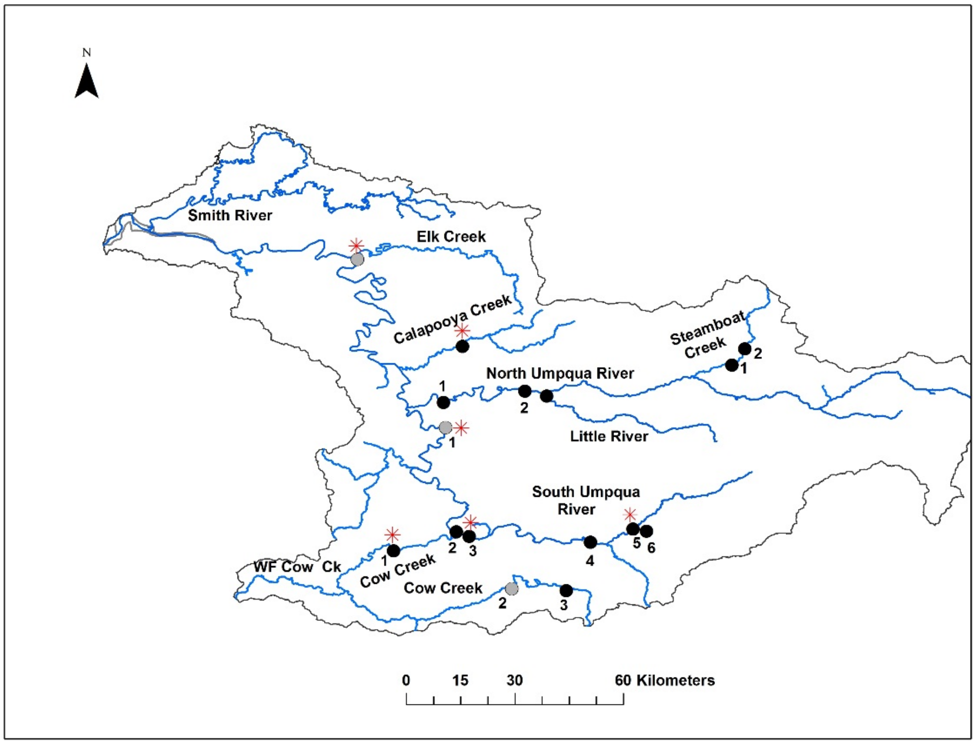

Figure 2. Sites where Umpqua dace were detected (black circles) and not detected (gray circles) in 2015. We detected smallmouth bass at sites marked with red asterisks. Site numbers refer to those listed in Table 2 for each tributary. Site access is described in APPENDIX A.

Table 3. Estimated 2015 Umpqua dace abundance and 95% confidence limits from the best fitting N-mixture model. Also included is the presence/absence of smallmouth bass.

	Estimate	Lower 95%	Upper 95%	Smallmouth presence
Umpqua 1	**1**	0	6	yes
Calapooya Creek	**73**	45	108	yes
North Umpqua 1	**236**	210	264	no
North Umpqua 2	**161**	129	196	no
Little River	**276**	226	332	no
Steamboat Creek 1	**153**	112	200	no
Steamboat Creek 2	**99**	73	129	no
South Umpqua 1	**3**	0	13	yes
South Umpqua 2	**93**	76	113	yes
South Umpqua 3	**59**	50	70	no
South Umpqua 4	**157**	134	183	no
South Umpqua 5	**88**	68	112	yes
Jackson Creek	**11**	6	18	no
Cow Creek 1	**46**	28	70	no
Cow Creek 2	**1**	0	6	yes
Cow Creek 3	**22**	7	45	no

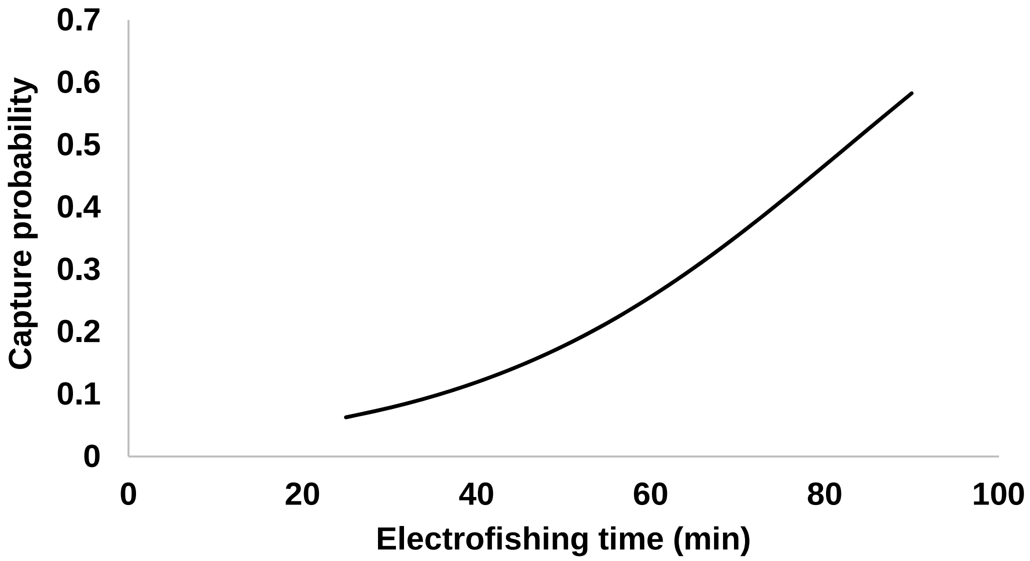

Figure 3. Relationship between electrofishing time (duration) and dace capture probability.

Table 4. N-Mixture model parameter estimates, standard errors, and confidence limits.

Parameter	Estimate	Standard error	Lower 95%	Upper 95%
Abundance (log-scale)				
Intercept	4.766	0.779	3.2392	6.2928
Smallmouth bass presence	-0.839	0.537	-1.8915	0.2135
Dispersion	-0.385	0.394	-1.1572	0.3872
Capture probability (logit-scale)				
Intercept	-3.8698	1.1365	-6.0973	-1.6423
Shocking time (min)	0.0467	0.0206	0.0064	0.0870
Estimated capture probability	0.2707	0.0462	0.1708	0.3705

(Price and Peterson 2010; Scheerer et al. 2015). We found no apparent relationship between electrofishing duration and site area (linear regression: R^2=0.0038, P=0.726), thus electrofishing duration may be considered an indirect measure of habitat complexity. Abundance was negatively related to the presence of smallmouth bass and the parameter estimates suggested that there were, on average, 67 fewer Umpqua dace abundance at sites containing smallmouth bass (Table 3). The bootstrap goodness-of-fit test indicated that the model met the statistical distributional assumptions of the N-mixture model with the chi square test p-value of 0.60. Parameter estimates for the model are shown in Table 4. We collected a wide range of sizes of Umpqua dace (32-111 mm FL), with no apparent size/age classes at most locations (Figure 4).

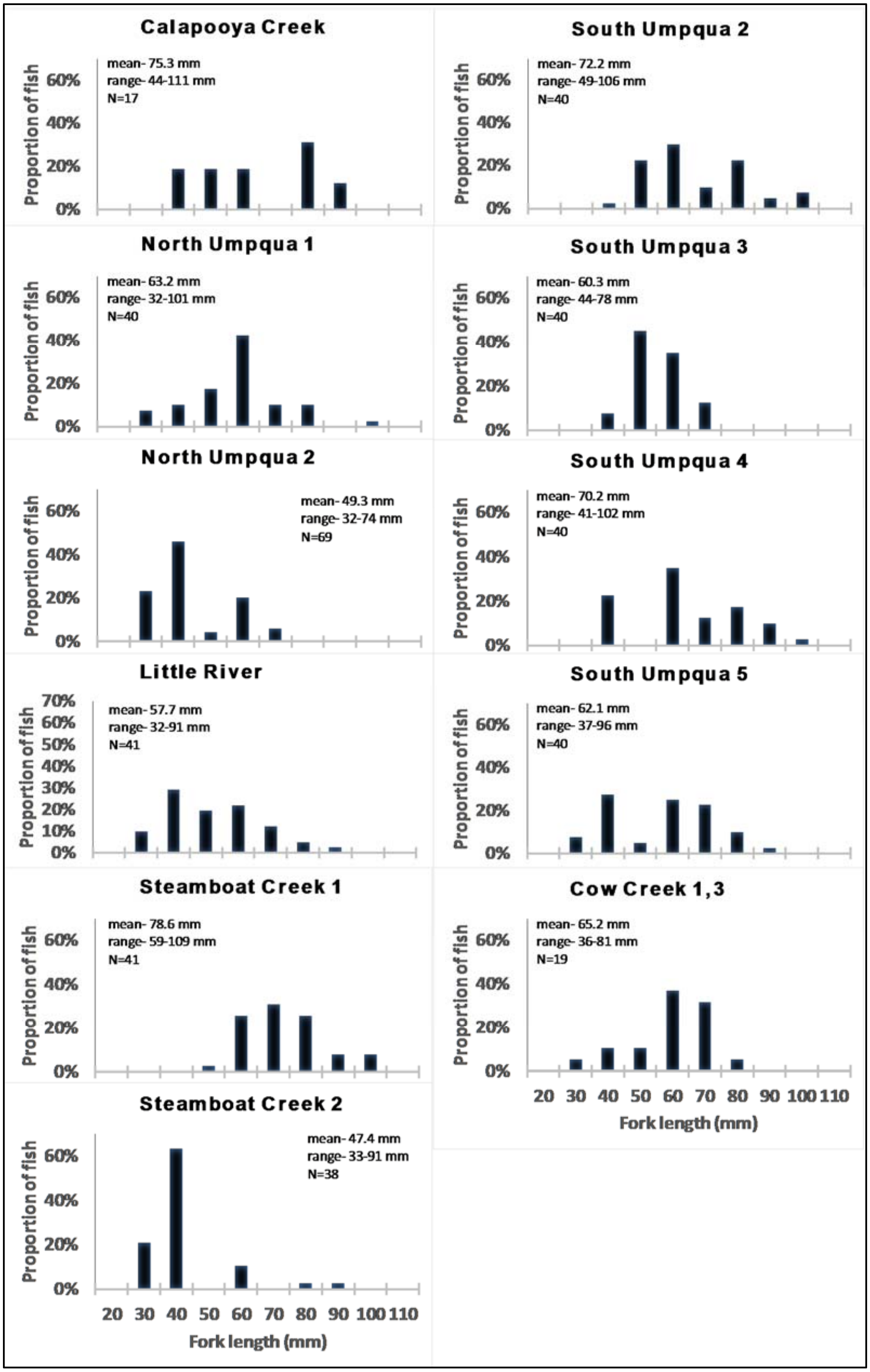

Figure 4. Umpqua dace length-frequency histograms for locations sampled in the Umpqua drainage, 2015.

DISCUSSION

We found Umpqua dace were widespread and relatively abundant in the Umpqua drainage. All 16 of the sites we sampled were within the previously known historical distribution; we collected Umpqua dace from 13 of these locations. At nine of these 13 sampling locations, we found Umpqua dace associated exclusively with native fishes. At the six locations where nonnative smallmouth bass were detected, we found co-occurrence of Umpqua dace at four locations (Calapooya Creek, South Umpqua 2, South Umpqua 5, and Cow Creek 1) and detected no Umpqua dace at two locations (Umpqua 1 and South Umpqua 1). Notably, we did not detect smallmouth bass or other nonnative fishes in the North Umpqua River drainage. The relatively cooler water temperatures may limit smallmouth bass colonization and abundance in this drainage (J. Brandt, ODFW Assistant District Biologist, personal communication). Dace abundance was lower at sites containing smallmouth bass, averaging 67 fewer dace per site than those sites where bass were not present. These data suggest that smallmouth bass, and possibly brown bullhead which co-occurred with smallmouth bass at many locations, may be limiting Umpqua dace distribution and abundance in the drainage.

Based on our field observations, we found that Umpqua dace have very specific habitat requirements, preferring swift water habitats, which were relatively rare in the Umpqua drainage where we sampled. We only collected Umpqua dace from riffles and rapids, primarily associated with (hiding under) cobble or boulder substrates. Due to the history of splash dam logging in the basin, complex stream habitats with large wood and coarse substrate are currently uncommon in the basin.

We used an N-mixture model to estimate dace abundance at the sampling locations. This type of model has most commonly been used with bird counts (Kéry 2008; Kéry and Royle 2010). The appeal of these models is the ability to estimate abundance and capture probability from sparse count data. These models assume: 1) each sample site is closed between visits, i.e., no immigration, emigration, birth or death; 2) capture probability is constant for all individuals present during a visit to a sample site; 3) the capture of individuals at a sample site is independent of others at that site; 4) the distribution of animals among sample sites is adequately described by the chosen parametric distribution, i.e., negative binomial; and 5) there are no false positives such as double counts or species misidentification. We believe that we met these assumptions. We conducted our surveys over a very short time period, thus meeting the assumption of closure. We collected and measured all dace at a site at a single time point, thus eliminating the possibility of double counting individuals during a sampling visit. The goodness-of-fit test indicated that we met the distributional assumptions.

We recommend additional surveys in the lower South Umpqua and mainstem Umpqua rivers, areas where smallmouth are present, as well as in the Smith River and Elk Creek, areas where we did not sample in 2015 due to time constraints, to better describe smallmouth bass and Umpqua dace distribution in these areas. Additionally, we recommend periodic surveys (every ~5 years) across the basin to assess the status and abundance trends of this species in the future. These surveys would benefit by incorporating available habitat surveys and targeting sites within stream segments that have higher amounts of riffle and rapid habitat. If restoration projects are implemented in the basin, we suggest addition of boulder substrate to increase the amount of physical structure in bedrock dominated, swift water habitats to benefit this and other native fish species.

ACKNOWLEDGEMENTS

We thank S. Ince-Johannsen, J. Soy, K. Voll, and M. Hansen for field assistance. Thanks to S. Moyer and J. Brandt for help locating sampling sites and contacting landowners.

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APPENDIX A. Description of site access for locations sampled for Umpqua dace, 2015.

Site Name	Subbasin	Access
Umpqua 1	Umpqua	City Park next to RV Park in Elkton, downstream of Elk River confluence
Calapooya Creek	Umpqua	Sterns Park, Oakland
North Umpqua 1	N. Umpqua	ODOT boat ramp east of office. Entrance near gravel piles.
North Umpqua 2	N. Umpqua	Amacher Park, downstream of Winchester dam and I-5
Little River	N. Umpqua	Colliding Rivers viewpoint, just upstream of confluence with N. Umpqua
Steamboat Creek 1	N. Umpqua	Industrial camp site upstream of bridge crossing
Steamboat Creek 2	N. Umpqua	USFS land just upsteam of Steamboat falls
South Umpqua 1	S. Umpqua	Middle channel upstream of Gaddis Park
South Umpqua 2	S. Umpqua	I-5 southbound pullout near MP 102.5
South Umpqua 3	S. Umpqua	Stanton Park, Riddle
South Umpqua 4	S. Umpqua	Tiller Wayside/day use, ~1 mile west of Tiller USFS office
South Umpqua 5	S. Umpqua	3C Rock, ~4 miles upstream of Tiller USFS office
Jackson Creek	S. Umpqua	USFS Jackson Creek smolt trap location; ~ 2 miles up Jackson Ck road
Cow Creek 1	S. Umpqua	BLM Island Creek Day Use Area, west of Riddle
Cow Creek 2	S. Umpqua	Long Fibre Park, Cow Creek Road
Cow Creek 3	S. Umpqua	USFS property upstream of Dismal Creek confluence

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