

MEMORANDUM

DATE: July 28, 2014

TO: Nick Hetrick, Arcata FWO

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SUBJECT: 2014 Klamath River Juvenile Chinook Salmon Health Monitoring,
Ceratomyxa shasta Prevalence Data

As a component of Klamath River fish health assessment, the California-Nevada Fish Health Center is examining juvenile Klamath River Chinook salmon to monitor the prevalence of *Ceratomyxa shasta* and *Parvicapsula minibicornis* infection. Fish are collected by biologists with the Karuk Tribe, Yurok Tribe, and US Fish and Wildlife Service. The CA-NV Fish Health Center is coordinating disease monitoring efforts and providing laboratory support for the project.

To date, QPCR testing has been performed for fish collected from late March through mid-June for the Shasta to Scott (K4) reach, mid-April to mid-July for the Scott to Salmon (K3) reach, and mid-June through mid-July for the Salmon to Trinity (K2) and Trinity to Estuary (K1) reaches. Note the reach graphs include 2013 data to provide relative comparisons of *C. shasta* infection onset and prevalence from the previous monitoring year. *Parvicapsula minibicornis* test results are given by reach in Figure 1 and also by sample week in each reach table.

To summarize, *Ceratomyxa shasta* has been detected in 76.5% (604/790) and *Parvicapsula minibicornis* has been detected in 87.0% (687/790) of fish tested by Quantitative PCR to date. All data are preliminary and subject to revision.

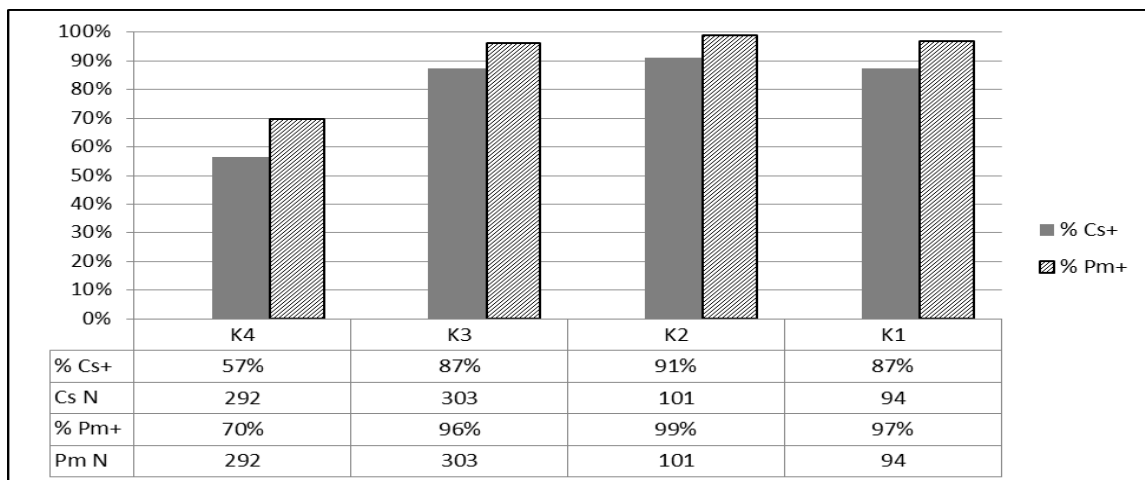


Figure 1. Prevalence of *Ceratomyxa shasta* and *Parvicapsula minibicornis* infection in juvenile Chinook salmon by capture reach.

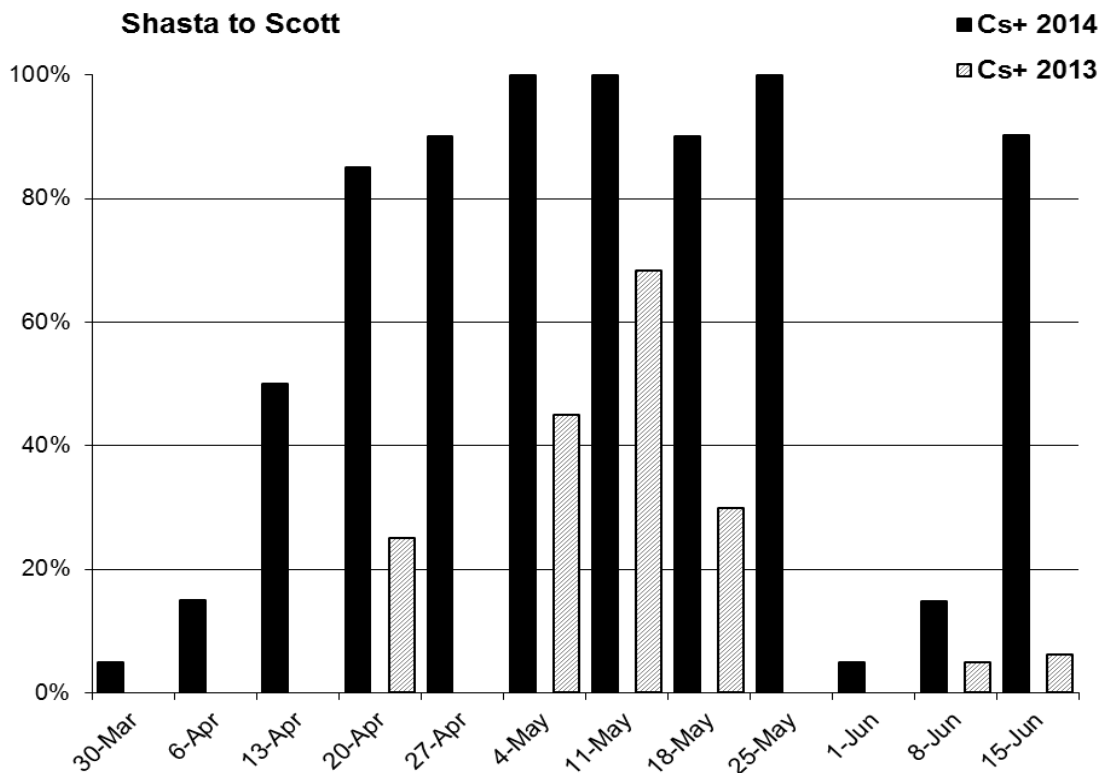


Figure 2. Weekly prevalence of *Ceratomyxa shasta* infection in juvenile Chinook salmon captured in the Shasta to Scott (K4) reach on the Klamath River from 30 March to 15 June. In 2013 twenty fish were sampled for every week shown on the graph, therefore the absence of a bar means that fish were sampled but were negative for *C. shasta*. Iron Gate Hatchery releases in 2014 began on 20 May and 23 May.

Table 1. *Ceratomyxa shasta* and *Parvicapsula minibicornis* prevalence of infection (POI) and mean DNA copy number by QPCR in the Shasta to Scott (K4) reach.

Reach:	Sample Week	Date	Total Number Samples	Number Positive	Parasite POI	Mean DNA Copy Number
Shasta to Scott (K4) <i>C. shasta</i>	1	30 Mar	20	1	5%	11
	2	6 Apr	20	3	15%	8
	3	13 Apr	20	10	50%	29
	4	20 Apr	20	17	85%	172
	5	27 Apr	20	18	90%	47,527
	6	4 May	20	20	100%	43,355
	7	11-May	20	20	100%	51,369
	8	18-May	20	18	90%	32,862
	9	25-May	20	20	100%	523
	10	1-Jun	20	1	5%	67
	11	8-Jun	61	9	15%	9,242
	12	15-Jun	31	28	90%	475

<i>P. minibicornis</i>	1	30 Mar	20	1	5%	16
	2	6 Apr	20	4	20%	82
	3	13 Apr	20	15	75%	394
	4	20 Apr	20	19	95%	3,748
	5	27 Apr	20	18	90%	36,635
	6	4 May	20	20	100%	298,243
	7	11-May	20	19	95%	538,027
	8	18-May	20	18	90%	92,968
	9	25-May	20	19	95%	228,522
	10	1-Jun	20	16	80%	3,709
	11	8-Jun	61	26	43%	60,390
	12	15-Jun	31	29	94%	59,013

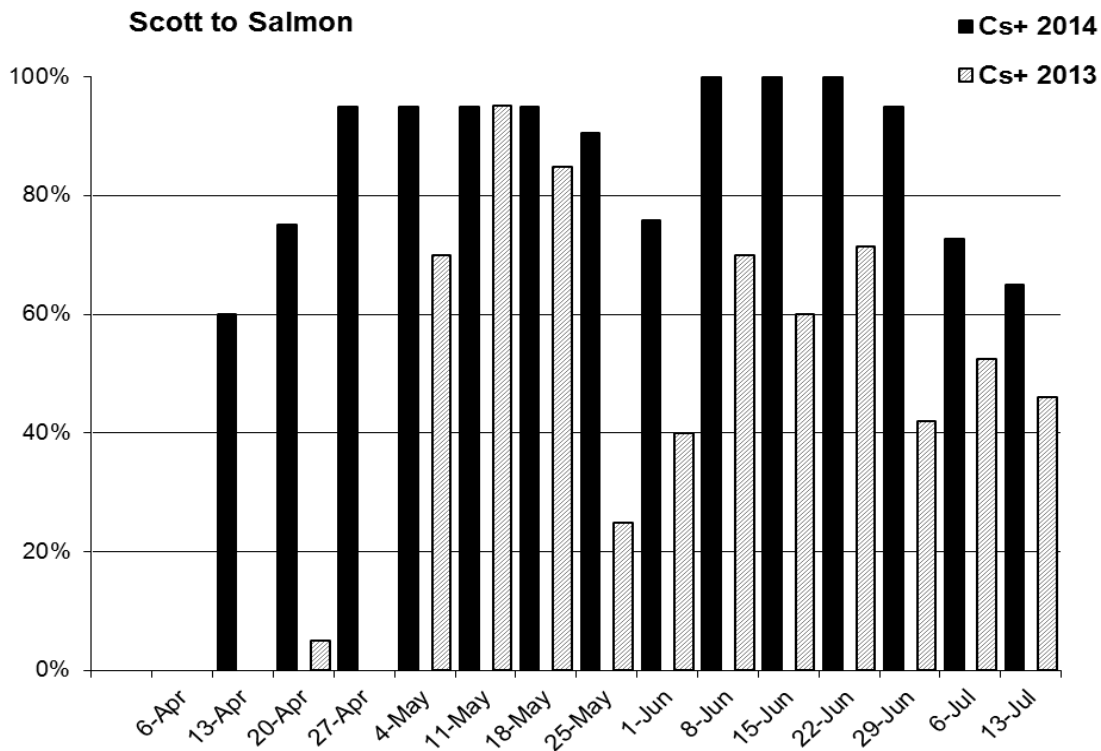


Figure 3. Weekly prevalence of *Ceratomyxa shasta* infection in juvenile Chinook salmon captured in the Scott to Salmon (K3) reach on the Klamath River from 13 Apr to 13 July. In 2013 twenty fish were sampled for all weeks shown (including 6 Apr), therefore the absence of a bar means that fish were sampled but negative for *C. shasta*.

Table 2. *Ceratomyxa shasta* and *Parvicapsula minibicornis* prevalence of infection (POI) and mean DNA copy number by QPCR in the Scott to Salmon (K3) reach.

Reach:	Sample Week	Date	Total Number Samples	Number Positive	Parasite POI	Mean DNA Copy Number	
Scott to Salmon (K3) <i>C. shasta</i>	3	13 Apr	20	12	60%	10	
	4	20 Apr	20	15	75%	37	
	5	27 Apr	20	19	95%	272	
	6	4 May	20	19	95%	2,178	
	7	11-May	20	19	95%	3,561	
	8	18-May	20	19	95%	23,298	
	9	25-May	21	19	90%	683	
	10	1-Jun	29	22	76%	24,311	
	11	8-Jun	21	21	100%	52,781	
	12	15-Jun	20	20	100%	2,231	
	13	22-Jun	21	21	100%	93,045	
	14	29-Jun	40	38	95%	14,293	
	15	6-Jul	11	8	73%	93	
	16	13-Jul	20	13	65%	85	
	<i>P. minibicornis</i>	3	13 Apr	20	17	85%	102
		4	20 Apr	20	18	90%	869
5		27 Apr	20	20	100%	9,503	
6		4 May	20	19	95%	62,465	
7		11-May	20	17	85%	1,308	
8		18-May	20	20	100%	196,394	
9		25-May	21	21	100%	116,598	
10		1-Jun	29	29	100%	285,113	
11		8-Jun	21	19	90%	312,300	
12		15-Jun	20	20	100%	166,496	
13		22-Jun	21	21	100%	1,672,358	
14		29-Jun	40	40	100%	770,950	
15		6-Jul	11	11	100%	191,006	
16		13-Jul	20	20	100%	178,365	

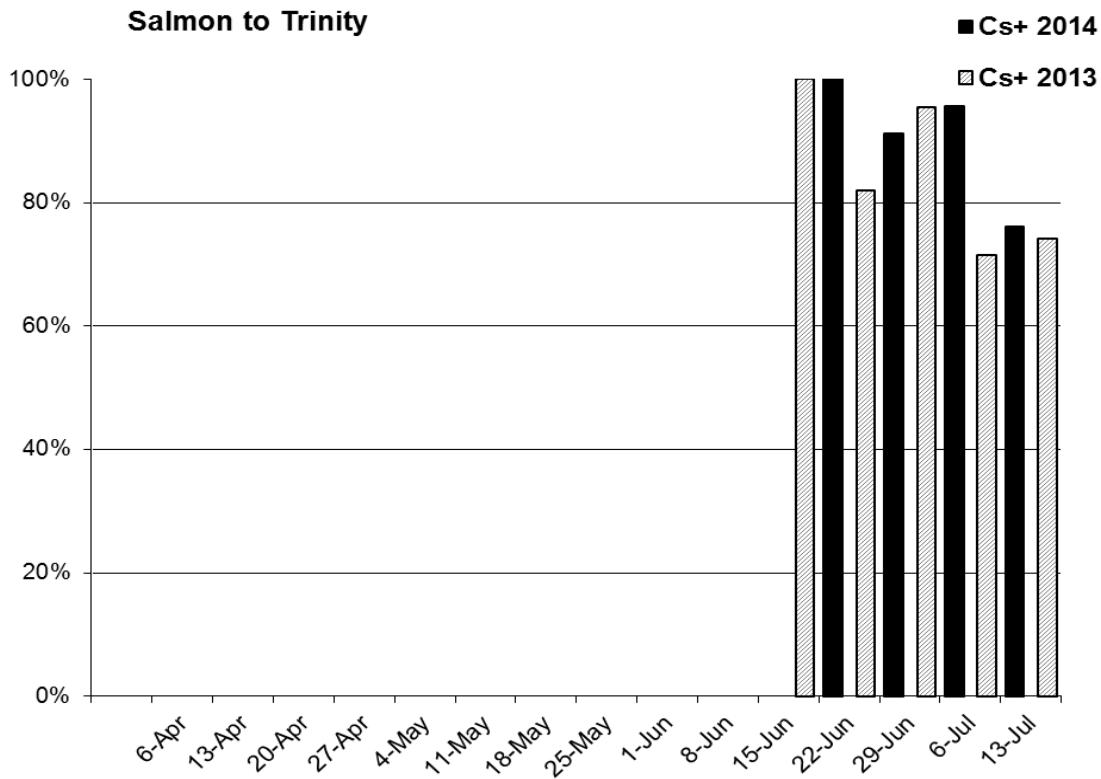


Figure 4. Weekly prevalence of *Ceratomyxa shasta* infection in primarily coded-wire tagged juvenile Chinook salmon captured in the Salmon to Trinity (K2) reach on the Klamath River from mid-June to mid-July. Entire sampling season is shown, however sampling for coded-wire tagged Chinook in this reach was initiated on 15 Jun in 2013, and on 22 Jun in 2014.

Table 3. *Ceratomyxa shasta* and *Parvicapsula minibicornis* prevalence of infection (POI) and mean DNA copy number by QPCR in the Salmon to Trinity (K2) reach.

Reach:	Sample Week	Date	Total Number Samples	Number Positive	Parasite POI	Mean DNA Copy Number
Salmon to Trinity (K2) <i>C. shasta</i>	13	22-Jun	23	23	100%	69,666
	14	29-Jun	34	31	91%	18,526
	15	6-Jul	23	22	96%	34
	16	13-Jul	21	16	76%	47
<i>P. minibicornis</i>	13	22-Jun	23	23	100%	404,618
	14	29-Jun	34	33	97%	307,259
	15	6-Jul	23	23	100%	261,594
	16	13-Jul	21	21	100%	137,244

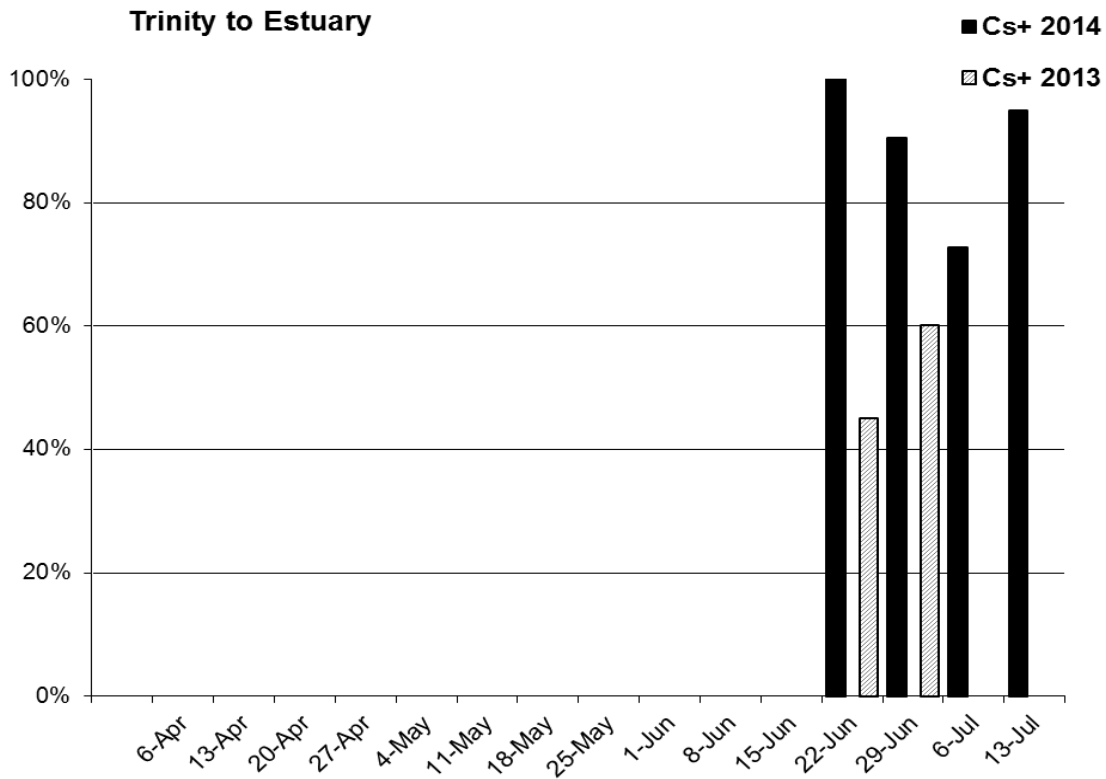


Figure 5. Weekly prevalence of *Ceratomyxa shasta* infection in coded-wire tagged juvenile Chinook salmon captured in the Trinity to Estuary (K1) reach on the Klamath River from 22 June to 13 July. Entire sampling season is shown, however sampling for coded-wire tagged Chinook in this reach occurred on the dates shown for each year.

Table 4. *Ceratomyxa shasta* and *Parvicapsula minibicornis* prevalence of infection (POI) and mean DNA copy number by QPCR in the Trinity to Estuary (K1) reach.

Reach:	Sample Week	Date	Total Number Samples	Number Positive	Parasite POI	Mean DNA Copy Number
Trinity to Estuary (K1) <i>C. shasta</i>	13	22-Jun	20	20	100%	179,271
	14	29-Jun	21	19	90%	6,441
	15	6-Jul	33	24	73%	25,877
	16	13-Jul	20	19	95%	149
<i>P. minibicornis</i>	13	22-Jun	20	20	100%	755,689
	14	29-Jun	21	21	100%	1,299,104
	15	6-Jul	33	31	94%	250,680
	16	13-Jul	20	19	95%	118,941