KLAMATH RIVER ESTUARY JUVENILE SALMONID MONITORING PROJECT

CDFG Grant Number P0410544

FINAL REPORT
JUNE 2008

Prepared by Monica Hiner
Yurok Tribal Fisheries Program
PO Box 1027
Klamath, California 95548
Phone (707) 482-2841

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

This report is dedicated to Scott Gibson, who passed away unexpectedly on June 14, 2008. Scott was passionate about his work in fisheries, and loved being on the river. Scott was full of knowledge, ingenuity, and was a perfectionist when it came to writing field notes, drawing maps, or 'dialing out traps'. Scott worked for the Yurok Tribal Fisheries Program for almost ten years, during which time he trained many biologists and rescued hundreds of juvenile coho, chinook, steelhead, and cutthroat as tributaries went subsurface in the late spring. Scott will be greatly missed and was an irreplaceable part of our crew—he will hold a place in our hearts forever.

Scott Gibson taking field notes, May 10th, 2008

ACKNOWLEDGMENTS

We would first like to acknowledge and thank the California Department of Fish and Game for funding this project. We greatly appreciate all of Mike Wallace's (CDFG) help with this project since it is a continuation of work he has conducted for numerous years. Mike has truly been invaluable over the years and he always went out of his way to provide us with information and insight. This project couldn't have been completed without all of the effort and time spent on this project by Sarah Beesley and Andrew Antonetti, who coordinated fieldwork, generated weekly summaries that were widely distributed, and were the 'ring leaders' for this project. This project could not have been completed without Carl Anderson, Dwayne Davis, Brian Donahue, Nick Folkins, Oscar Gensaw III, Scott Gibson, Robert Grubbs, Delmer Jordan, Ben Laukka, Josh Lewis, Aldaron McCovey, Steven Nova Jr., A.J. Webster, and Dave Weskamp from the Yurok Tribal Fisheries Program who spent many hours pulling leadline, removing algae from nets, and measuring fish. I would also like to acknowledge Dan Gale and Sarah Beesley from the Yurok Tribal Fisheries Program for their time reading and editing this report.

INTRODUCTION

The Klamath River Basin in Northwestern California historically produced millions of anadromous salmonids (Snyder 1931). These populations have declined considerably due to the degradation of river conditions caused by dam construction, water diversion, timber harvesting, surface mining activities, agriculture and natural events (Klamath River Task Force 1991). In 2002 the California Fish and Game Commission issued a finding that coho salmon (*Oncorhynchus kisutch*) warranted listing as a threatened species from the Oregon border south to Punda Gorda and the species was subsequently listed as threatened by the National Marine Fisheries Service (NMFS) and the State of California. The Commission also directed the Department of Fish and Game (DFG) to develop a Recovery Strategy for Coho Salmon, which was finalized and approved in 2004. One of the high priority tasks (KR-KG-01) in the Recovery Strategy for the Klamath Glen HSA is to "resume estuary investigations to better understand the estuary's role in survival of Klamath Basin River coho salmon".

Protected status has been considered for other Klamath Basin salmonids. Declining fish populations spurred Congress to pass the Trinity River Basin Fish and Wildlife Restoration Act (PL-98-541) in 1984 and the Klamath River Basin Conservation Area Restoration Program (PL-99-552) in 1986 to rebuild fisheries resources in the Klamath and Trinity Rivers. The State of California also enacted the Salmon, Steelhead and Anadromous Fisheries Program Act (SB 2261) in 1988 that directed DFG to develop a statewide plan and program with the objective of doubling the State's natural anadromous fish production by the end of the 20th century.

Fish populations in the Klamath River are central to Yurok culture and livelihood of Yurok People. The Klamath River estuary serves as a vital nursery and staging area for spring and fall chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), steelhead trout (*O. mykiss*), coastal cutthroat trout (*O. clarki*), green sturgeon (*Acipenser medirostris*), eulachon (*Thaleichthys pacificus*), and Pacific lamprey (*Lampetra tridentata*). It is likely that tens of millions of juvenile salmonids migrate through the Klamath River estuary every year on their way to the ocean (Wallace 1995). Estuary rearing allows juvenile fish to physiologically adapt to ocean conditions and to amass growth prior to ocean entry. Studies conducted in Oregon suggest ocean survival of juvenile chinook salmon was greatly increased when fish entered the ocean at larger sizes (120-160 mm) (Nicholas and Hankin 1989).

From 1993 - 2003, the California Department of Fish and Game (CDFG) monitored juvenile salmonid populations in the Klamath River estuary to assess relative abundance, estimate the ratio of natural to hatchery fish leaving the basin over time, and assess the condition of juvenile salmonids relative to flow conditions. Unfortunately, budget cuts at CDFG forced the elimination of the Klamath River estuary program in 2003. In 2006, Yurok Tribal Fisheries Program (YTFP) received grant funding to continue juvenile salmonid monitoring in the Klamath River estuary during the 2006 and 2007 seasons. This report summarizes methods and results for estuary beach seining activities conducted in 2006 and 2007.

METHODS

In March 2006, the Yurok Tribal Fisheries Program (YTFP) established eight beach seining locations along the south spit of the Klamath River estuary and in the vicinity of the south slough (Figure 1, Figure 2, Table 1). Sites were selected in 2006 based on the ability to sample these sites at flow levels ranging from 2,000 – 40,000 cfs. Many of the sites previously sampled by CDFG were not feasible during 2006 given the estuary configuration and river flow conditions (i.e. river current was too swift or the area was too deep). The sites were the same during both 2006 and 2007 sampling seasons to maintain continuity between years.

Juvenile salmonids were sampled weekly from March through September in 2006 and 2007 using a beach seine. A net 150 ft in length x 10 ft deep with a 10 ft x 10 ft bag with a one foot deep pocket was deployed from the bow of a boat (Figure 3). Sampling was conducted on a single day and the net was set only once per sample site. Boat operators were careful to avoid submerged wood or snags. However, sets were abandoned if the net became severely entangled on submerged debris and was not re-sampled on that date. The total number of sets per day was variable depending on snags, weather, and/or flows.

All salmonids were identified and inspected for fin or maxillary clips, marks, scars, disease indicators, and other identifiable features. Fork length and weight were obtained from individual salmonids whenever possible to examine seasonal trends. Chinook with adipose fin clips were collected to retrieve Coded Wire Tags (CWT) to determine hatchery origin and release date. CWTs were decoded by either YTFP or the United States Fish and Wildlife Service Fish Health Center staff in the laboratory using standard methods. All captured coho and steelhead were examined for adipose fin and maxillary clips: a left maxillary clip is given to all coho and steelhead released from the Trinity River Hatchery (TRH) and a right maxillary clip is applied releases from Iron Gate Hatchery (IGH).

Trinity River and Iron Gate Hatcheries were contacted to determine release dates, CWT codes, number of fish released, number of fish marked, and production multipliers for chinook young-of-year (YOY) releases (Table 2, Table 3). Individual production multipliers were applied to each release group to estimate the proportion of chinook that were not marked but were of hatchery origin. Each production multiplier was calculated using the following formula using data provided by both TRH and IGH:

$$PM = \frac{(\#\ Tagged) + (\#\ Poor\ Tagged) + (\#\ Unmarked)}{\#\ Tagged}$$

Where:

# Tagged	=	The actual number of adipose clipped fish released with a CWT
# Poor Tagged	=	The number of adipose clipped fish that were tagged and shed the tag
# Unmarked	=	The number of unmarked fish in a release group

The following parameters were calculated weekly for each sampling event: mean FL for chinook and coho (+/- standard deviation); catch per unit effort (CPUE) for chinook (number of fish/number of sets); hatchery proportion and origin for chinook, coho, and steelhead; migration time for hatchery releases from hatchery to estuary capture (Days At Liberty DAL); and capture trends for coho, steelhead, and coastal cutthroat.

Table 1. GIS locations of beach seine sampling locations in the Klamath River Estuary during 2006 and 2007 (GIS projection: UTM Zone 10 North; NAD27).

SITE	NORTHING	EASTING
1	4599296.36	410078.83
2	4599148.78	410110.45
3	4599032.83	410103.42
4	4598930.93	410089.37
5	4598836.06	410110.45
6	4598741.19	410106.94
7	4598597.12	410085.85
8	4598684.97	410331.82

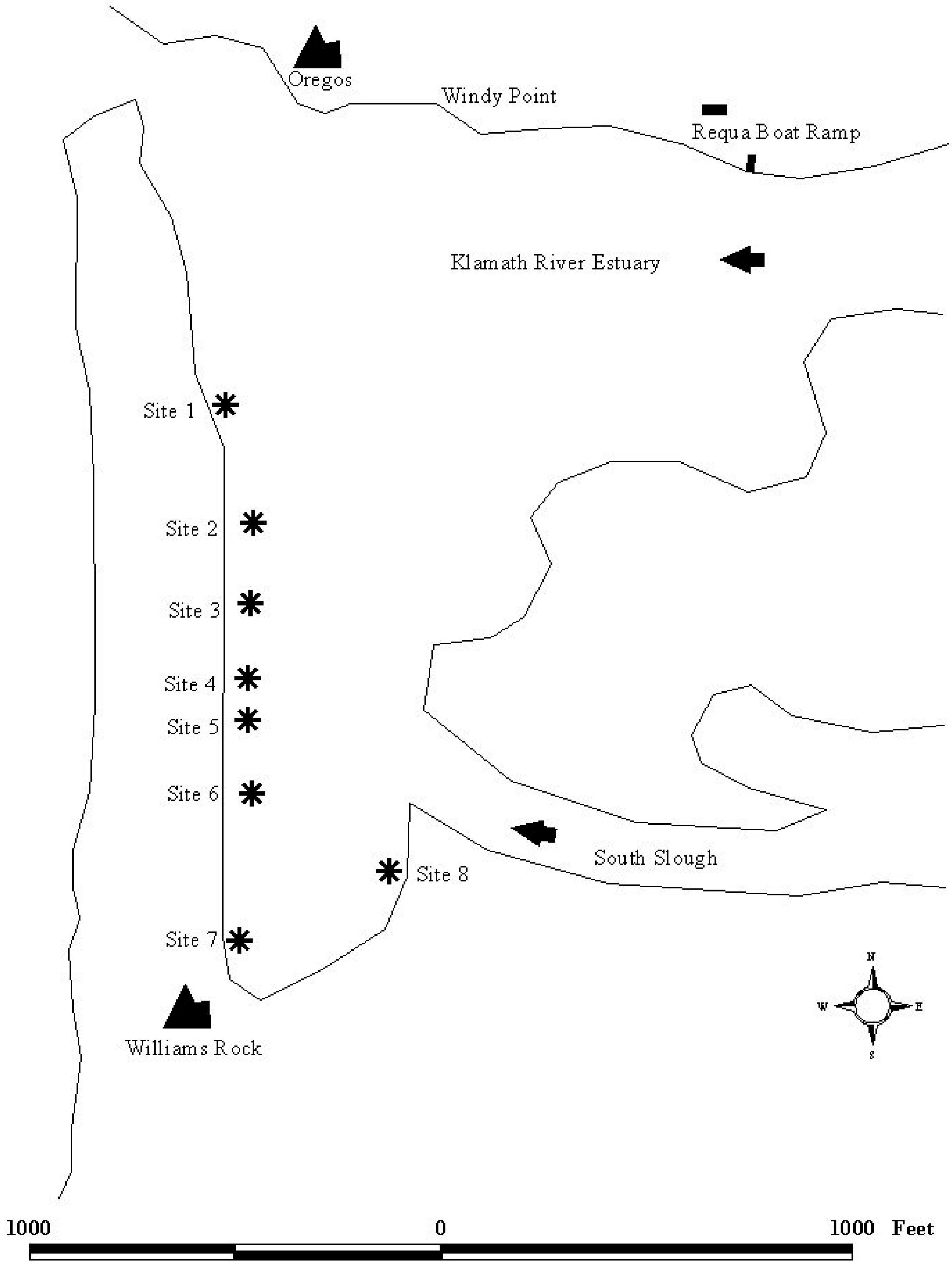

Figure 1. Locations of beach seine monitoring sites in the Klamath River Estuary, California.

Figure 2. GIS datapoints depicting beach seine monitoring sites in the Klamath River Estuary, California.

Figure 3. Photograph of Yurok Tribal Fisheries Program staff conducting a beach seine survey in the Klamath River Estuary at Site 2.

Results

Chinook Salmon

Fish Emigration

During the 2006 sampling season, a total of 696 YOY chinook were captured (Appendix 1). The first YOY were captured during the week of May 10th and peak catch occurred during the week of August 2nd. During the peak, a total of 308 fish were captured during this peak, equating to a CPUE of 44 chinook per set (Figure 4).

Significantly fewer fish were captured in 2007, with a total of 359 YOY chinook captured (Appendix 2). In 2007, the first YOY was captured during the week of March 28th and peak catch occurred during the week of September 20th when 182 fish were captured with a CPUE of 30.33 (Figure 5).

Very few yearling chinook were captured in the estuary during either sampling year (Appendix 1, Appendix 2). In 2006, two yearlings were captured, one during the week of April 19th and the other during the week of July 13th. During 2007 one yearling was captured during the week of April 4th and five were captured during the week of July 18th. No yearling chinook captured had any distinguishing fin clips or marks.

Table 2. Summary of hatchery produced chinook tagged and released in 2006 from Iron Gate (IGH) and Trinity River (TRH) Hatcheries.

[redacted]

Table 3. Summary of hatchery produced chinook tagged and released in 2007 from Iron Gate (IGH) and Trinity River (TRH) Hatcheries.

[redacted]

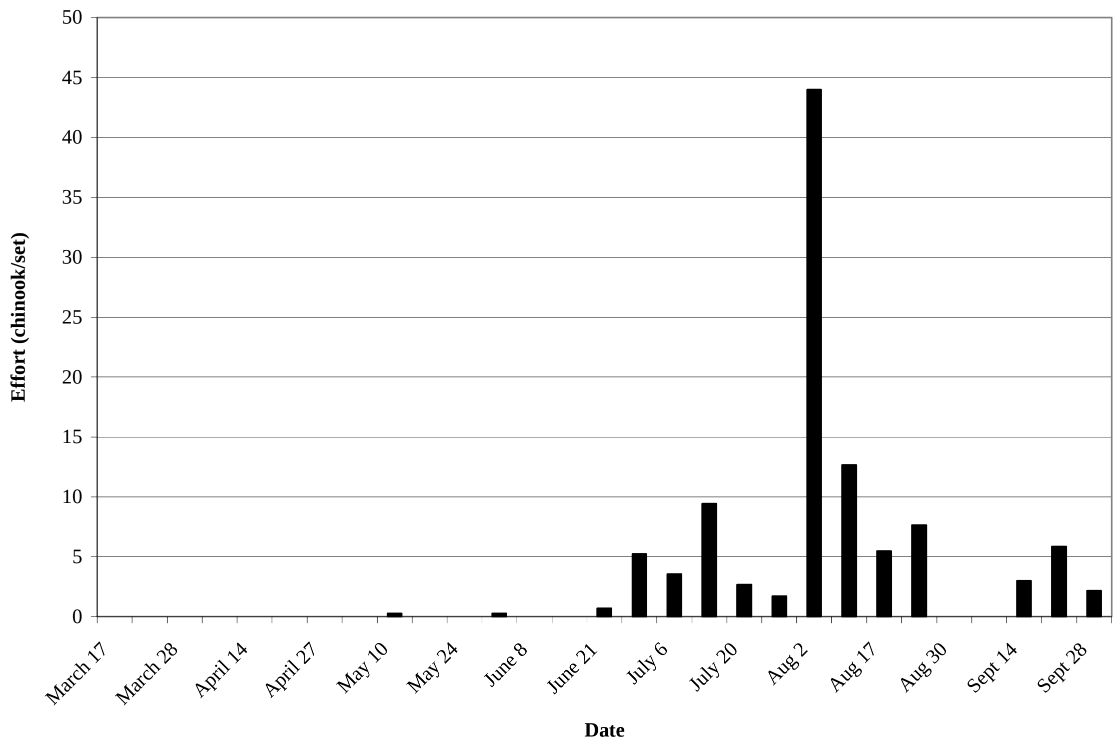

Figure 4. Catch Per Unit Effort of young-of-the-year juvenile chinook captured in the Klamath River Estuary during beach seine sampling, 2006.

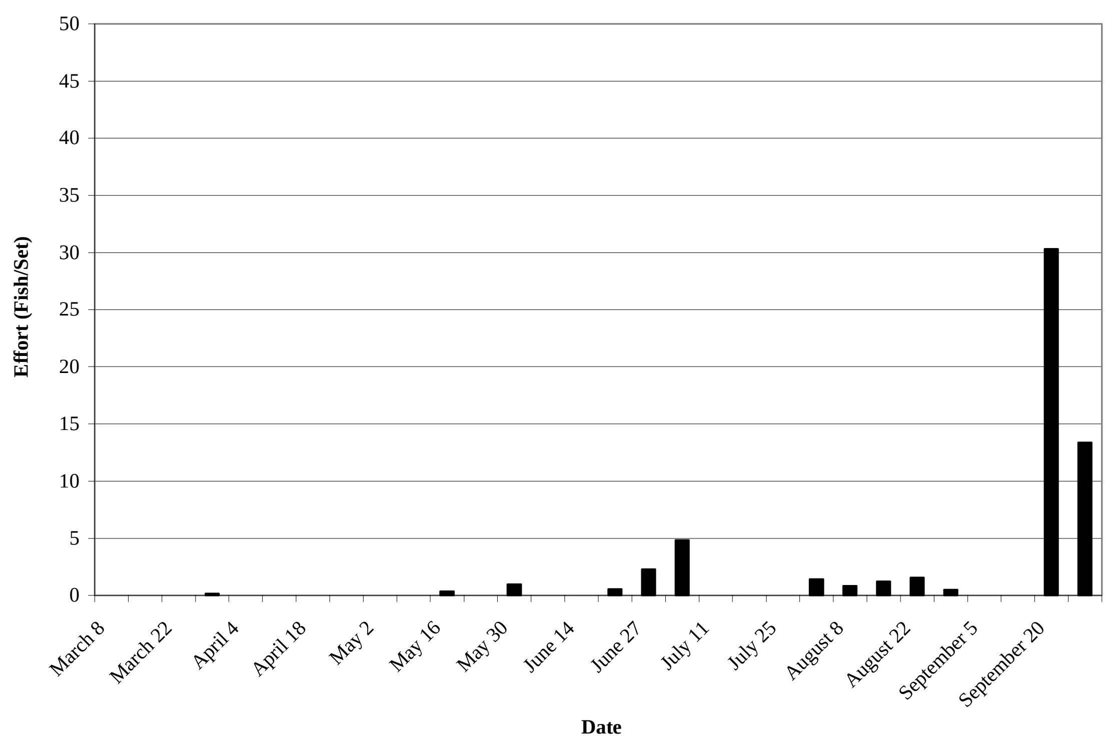

Figure 5. Catch Per Unit Effort of young-of-the-year juvenile chinook captured in the Klamath River Estuary during beach seine sampling, 2007.

Hatchery Composition and Travel Time

Based on hatchery expansions, hatchery fish accounted for 49.7% of YOY chinook captured in 2006 and 39.3% captured in 2007 (Table 4). Expansions from 2006 hatchery captures indicated that IGH releases accounted for 48% of the hatchery fish while TRH spring and fall chinook accounted for 25% and 27% respectively. Data from 2007 hatchery expansions also indicated that hatchery chinook from IGH accounted for roughly half (49%) of hatchery origin fish. Trinity River Hatchery spring chinook made up 39% of the hatchery origin catch, and Fall Chinook from TRH accounted for 12% of hatchery captures. Emigration timing patterns were similar among natural and hatchery YOY chinook outmigrants during both 2006 and 2007 (Figures 6 and 7).

Table 4. Proportions of natural and hatchery origin young-of-the-year chinook captured during emigration studies in the Lower Klamath River Estuary, 1993 – 2007 (Wallace, 2003 and Yurok Tribal Fisheries Program data).

Year	% Natural	% Hatchery
1993	83.5	16.5
1994	78.0	22.0
1996	76.3	23.7
1997	58.1	41.9
1998	34.2	65.8
1999	58.6	41.4
2000	58.2	41.8
2001	87.1	12.9
2002	68.4	31.6
2006	50.3	49.7
2007	59.0	41.0

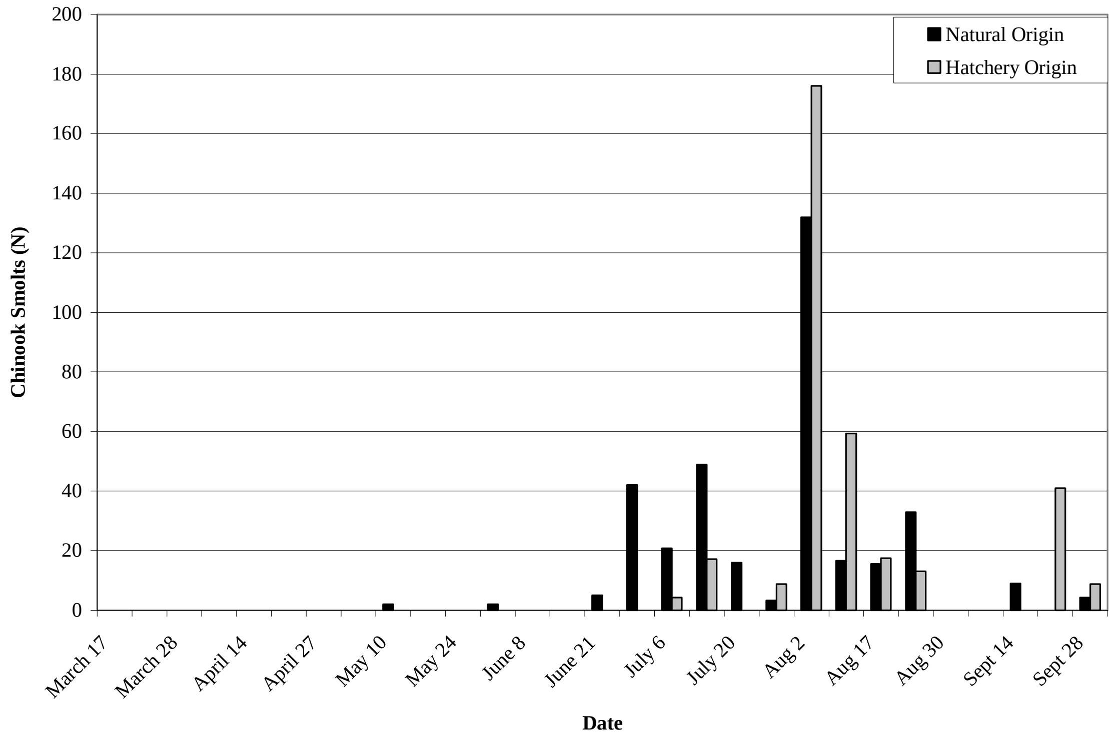

Figure 6. Number of natural and hatchery young-of-the-year chinook captured during beach seine sampling in the Klamath River Estuary, 2006.

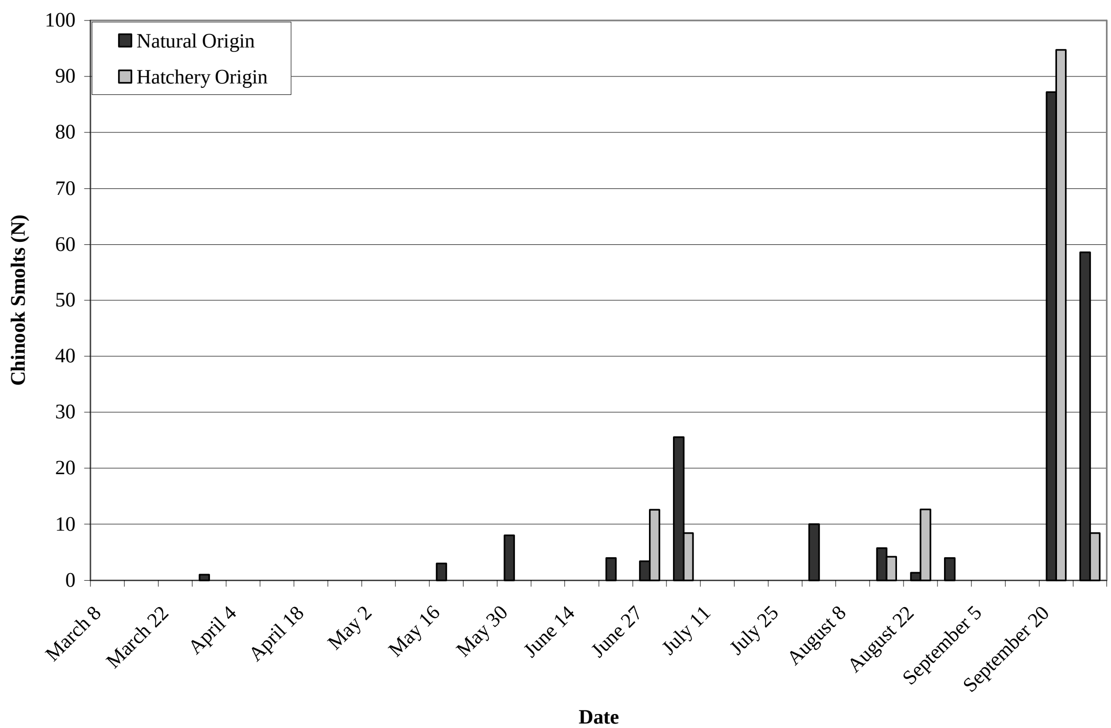

Figure 7. Number of natural and hatchery young-of-the-year chinook captured during beach seine sampling in the Klamath River Estuary, 2007.

Travel Time

Median travel times for all groups of hatchery fish were reduced in 2006 relative to the travel times observed in 2007 (Table 5). Travel time for IGH released YOY chinook ranged from 62 - 77 days in 2006 to 113 days in 2007. Travel time for TRH spring chinook ranged from 36 – 63 days in 2006 and from 27 – 112 days in 2007. Trinity River fall chinook took slightly longer to emigrate than spring chinook releases, with travel time ranging from 43 – 120 days in 2006 and from 27 – 119 days in 2007 (Table 6, Table 7).

Size

Young-of-the-year chinook captured in the estuary during May were generally smaller than fish captured later in the season. Mean FL in 2006 was 48.5 mm; however, this is only based on a sample size of two (range 48 – 49 mm). In May of 2007, mean FL was 89.3 mm, with size ranging between 49 – 110 mm. It is unclear whether the largerr chinook captured during May of 2007 were large young-of-the-year or small yearlings. FL did not differ greatly for fish captured in June, July, and August in either 2006 or 2007. Fish captured during those months in 2006 ranged between 72 – 114 mm, with mean monthly FL measurements of 88.2 mm, 92.0 mm, and 89.4 mm (respectively). Fish captured in June, July, and August of 2007 were slightly larger, ranging between 74 – 127 mm in length. Mean FL for those months were 96.4 mm, 89.9 mm, and 98.3 mm (respectively). Fish captured in September of both years were larger than previous months. Mean FL in 2006 was 110.7 mm with individual lengths ranging between 94 – 126 mm. In September of 2007, FL ranged between 94 – 173 mm with an average of 117.4 mm (Figure 8, Figure 9).

Table 5. Median and range of travel time (days) for young-of-the-year chinook from hatchery of origin to the Klamath River Estuary, 1998 – 2007 (Wallace 2003 and Yurok Tribal Fisheries Program 2006-2007).

[redacted]

Table 6. Summary of young-of-the-year Coded Wire Tagged (CWT) juvenile chinook captured in the Klamath River Estuary during beach seine sampling, 2006.

[redacted]

DAL = Days at Liberty

Table 7. Summary of young-of-the-year Coded Wire Tagged (CWT) juvenile chinook captured in the Klamath River Estuary during beach seine sampling, 2007.

[redacted]

DAL = Days at Liberty

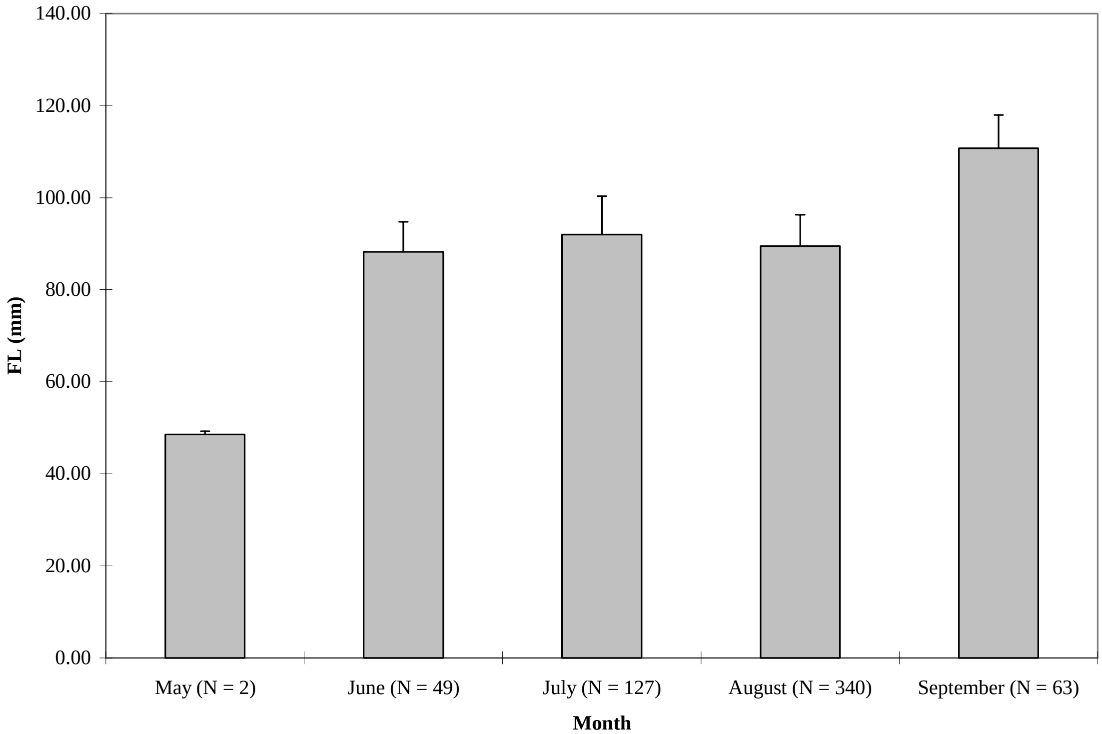

Figure 8. Mean fork length, standard deviation, and sample size (in parenthesis) of young-of-the-year chinook captured during beach seine sampling in the Klamath River Estuary, 2006.

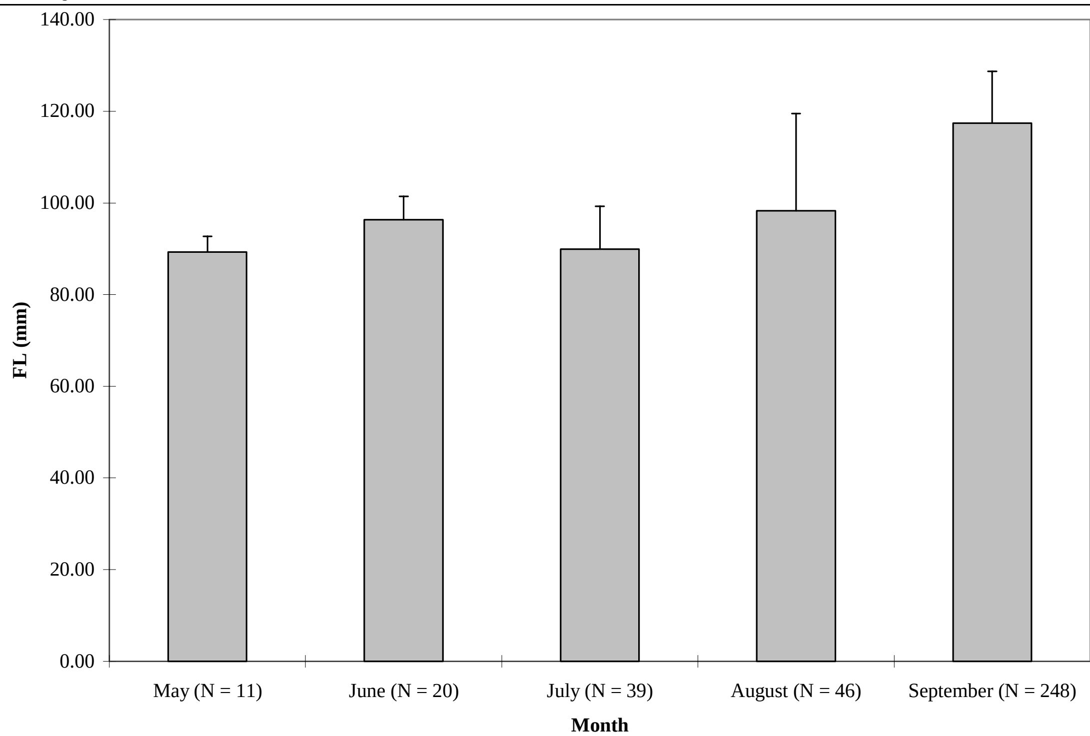

Figure 9. Mean fork length, standard deviation, and sample size (in parenthesis) of young-of-the-year chinook captured during beach seine sampling in the Klamath River Estuary, 2007.

Coho Salmon

<u>Fish Emigration</u>

A total of 210 coho yearlings were captured during beach seine sampling in 2006. Fish were captured from the week of March 28th through the week of June 14th, with peak catch occurring during the week of May 18th (Figure 10).

During 2007, 67 coho yearlings were captured in the estuary. Coho were first observed during the week of March 22nd and peak catch occurred during the week of May 9th. The majority of coho were captured during March, April, and May; however, one coho was captured during the week of September 20th (Figure 11).

Outmigration timing between natural and hatchery fish did not seem to differ among years (Figure 12, Figure 13). No coho were captured beyond mid-June during either year, with the exception of one TRH produced coho captured during the week of September 20th (Figure 12).

<u>Hatchery Composition</u>

Hatchery produced coho accounted for 46.2% of the fish captured in 2006 and 79.1% in 2007. The majority originated from Trinity River Hatchery (TRH). In 2006, 96 coho were from TRH, one from IGH, and 113 were naturally produced fish. During 2007, 52 outmigrating coho were from TRH, one from IGH, and 14 were naturally produced.

<u>Size</u>

Hatchery produced coho were generally larger than naturally produced coho during both years (Figure 14, Figure 15). During 2006, mean FL for hatchery produced fish was 182 mm in April, 164 mm in May, and 157 mm in June. Mean FL for naturally produced coho captured during the same months were 121 mm, 122 mm, and 124 mm respectively (Figure 14). The same trend was observed in 2007. Mean FL for hatchery produced coho captured in April was 168 mm and 163 mm in May. Naturally produced coho captured had a mean FL of 151 mm in April and a mean FL of 139 mm in May (Figure 15).

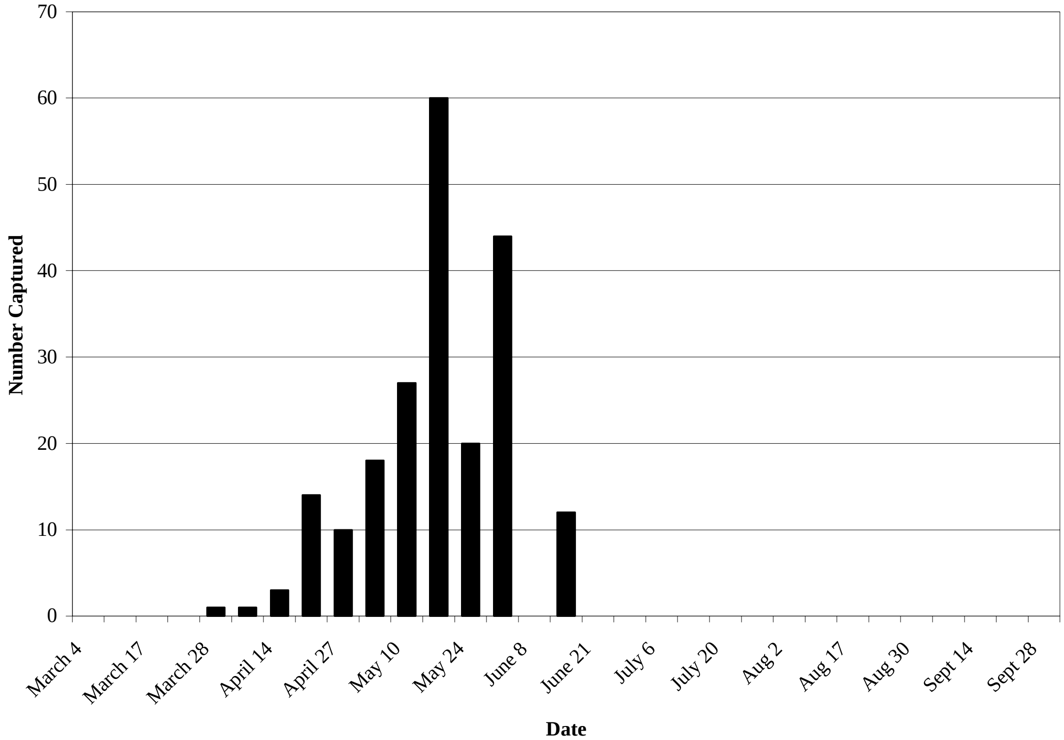

Figure 10. Number of coho outmigrants captured during beach seine sampling in the Klamath River Estuary, 2006.

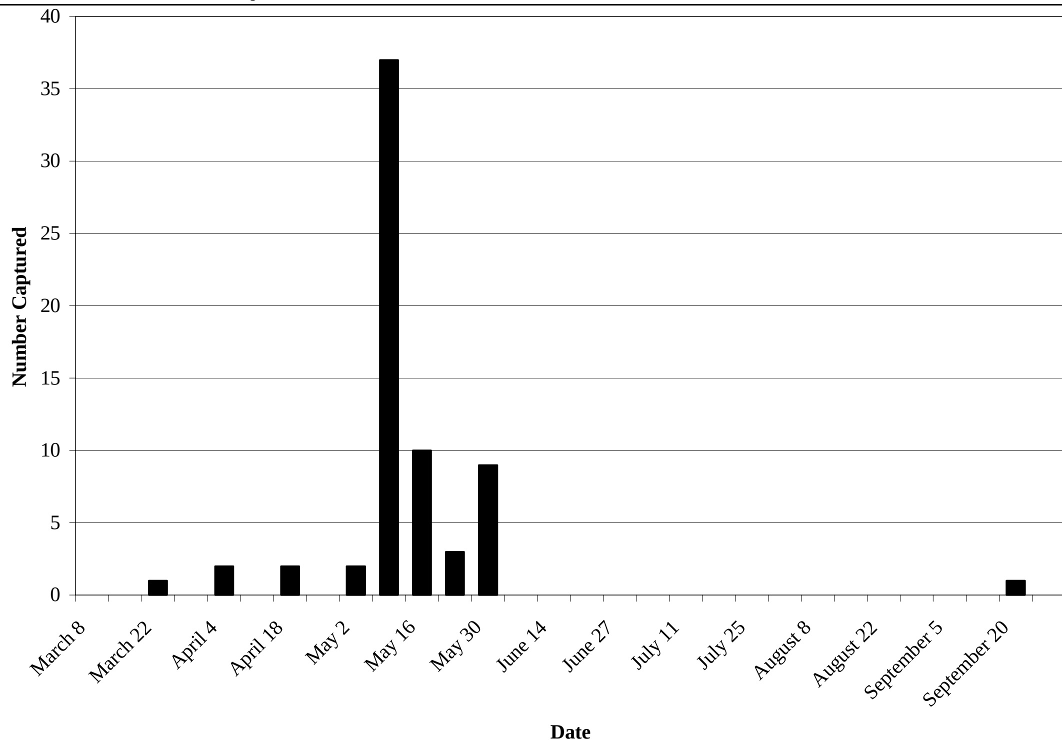

Figure 11. Number of coho outmigrants captured during beach seine sampling in the Klamath River Estuary, 2007.

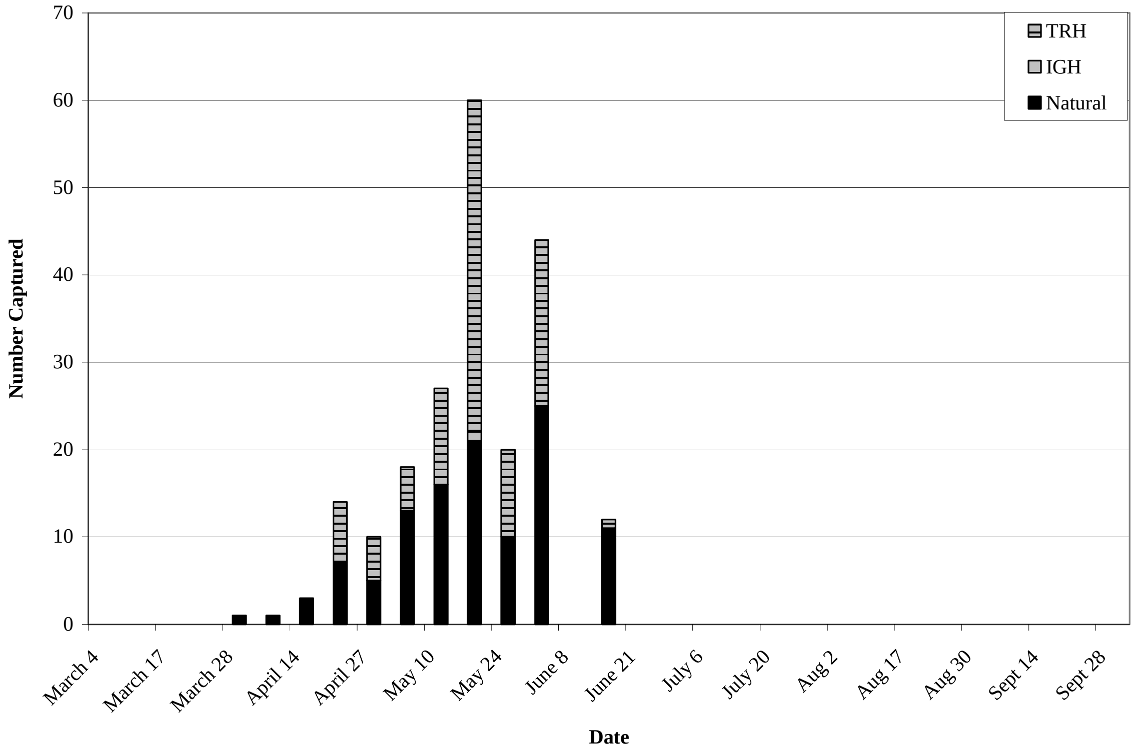

Figure 12. Number of natural, Trinity River Hatchery (TRH), and Iron Gate Hatchery (IGH) produced coho outmigrants captured during beach seine sampling in the Klamath River Estuary, 2006.

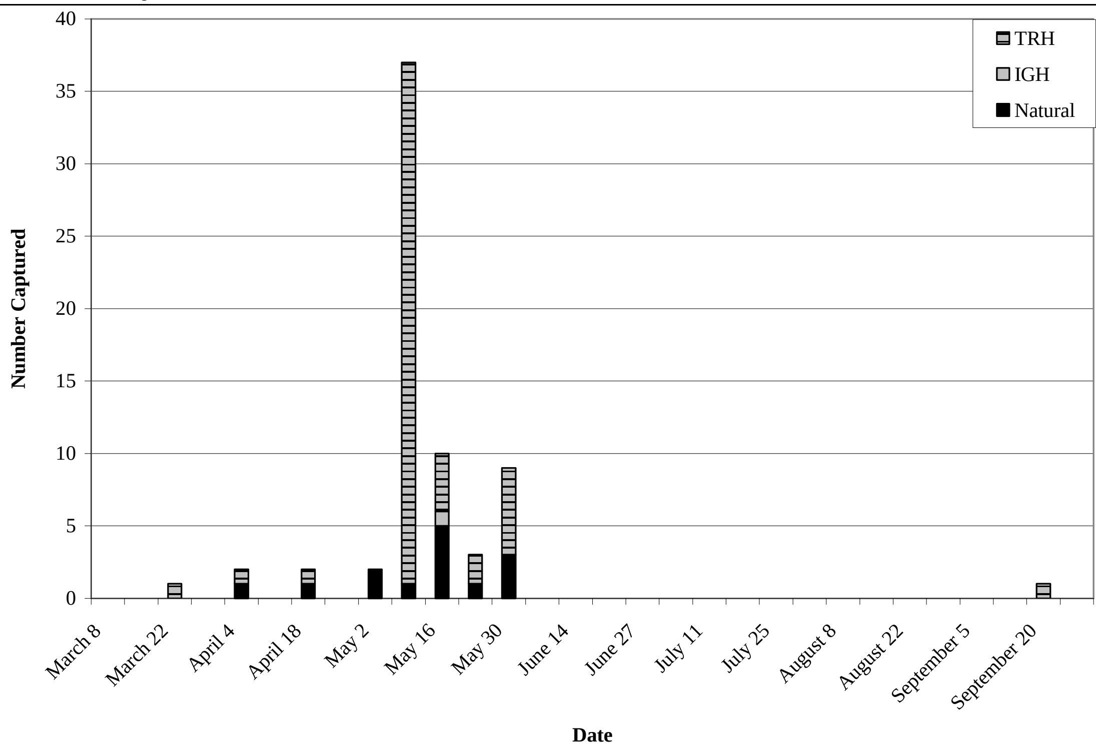

Figure 13. Number of natural, Trinity River Hatchery (TRH), and Iron Gate Hatchery (IGH) produced coho outmigrants captured during beach seine sampling in the Klamath River Estuary, 2007

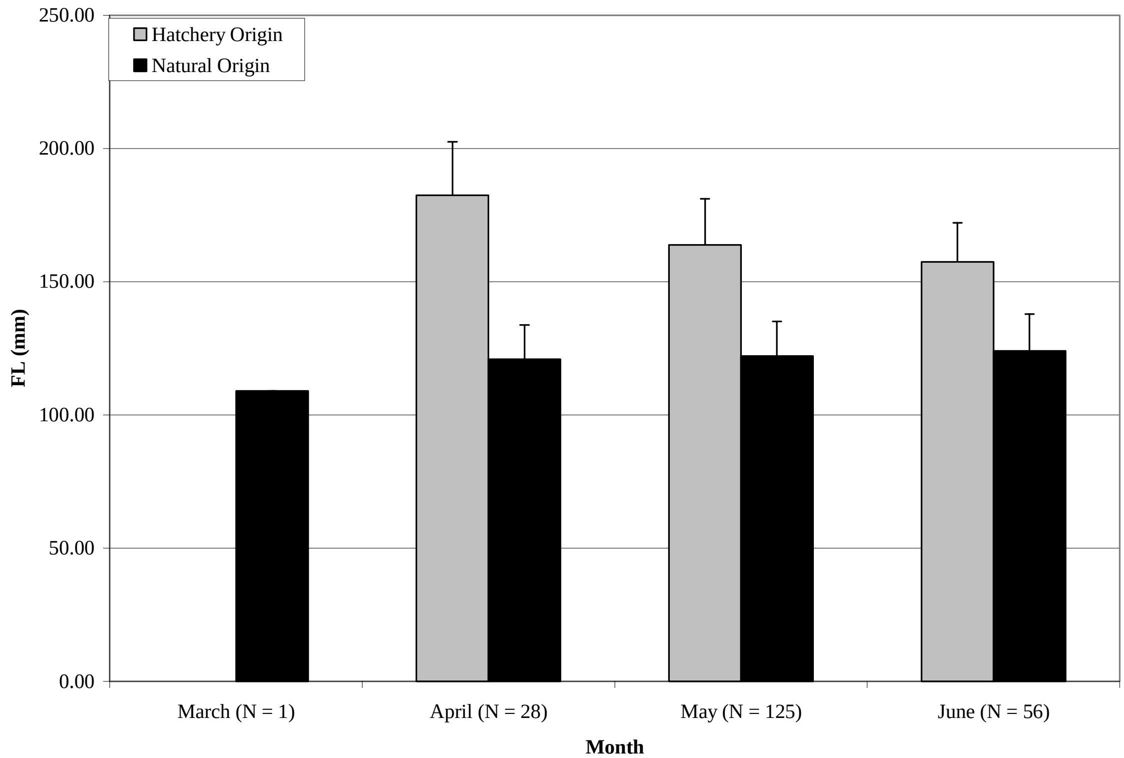

Figure 14. Mean fork length, standard deviation, and sample size (in parenthesis) of coho outmigrants captured during beach seine sampling in the Klamath River Estuary, 2006.

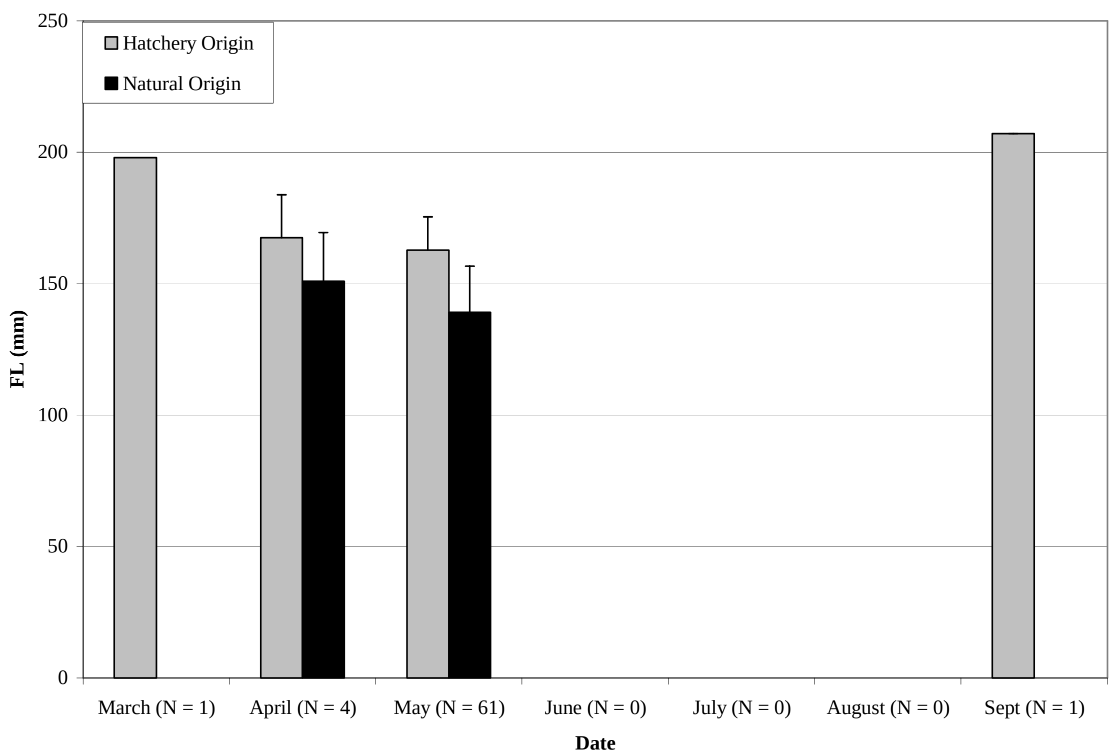

Figure 15. Mean fork length, standard deviation, and sample size (in parenthesis) of coho outmigrants captured during beach seine sampling in the Klamath River Estuary, 2007.

Steelhead and Coastal Cutthroat Trout

Fish Emigration

Juvenile steelhead were first captured during the week of March 22nd during both 2006 and 2007 (Figure 16, Figure 17). A total of 107 steelhead were captured in 2006 and 48 in 2007. In 2006, peak emigration of steelhead occurred during the week ending June 28th when 24 were captured (Figure 16). During 2007, peak catch of steelhead occurred during the week of April 18th, much earlier than in 2006.

Adult steelhead were captured during both survey years. Five adult steelhead were captured in 2006, four in July and one in September. Two of the adults captured in July were of natural origin, and the other three were of hatchery origin. During 2007, two adults of natural origin were captured in August.

Observations of coastal cutthroat trout were similar both in number and in trend to steelhead during both 2006 and 2007. Coastal cutthroat were first observed several weeks after the first steelhead observations during 2006, and peak catch occurred during the week ending July 13th (Figure 16). Total catch during 2006 was 114 fish. During 2007, coastal cutthroat were first observed during the week ending March 22nd and were observed sporadically throughout the season (Figure 17). Substantially fewer cutthroat were caught during 2007 relative to 2006, with weekly catches never exceeding seven fish and a total of only 50 fish observed (Appendix 2).

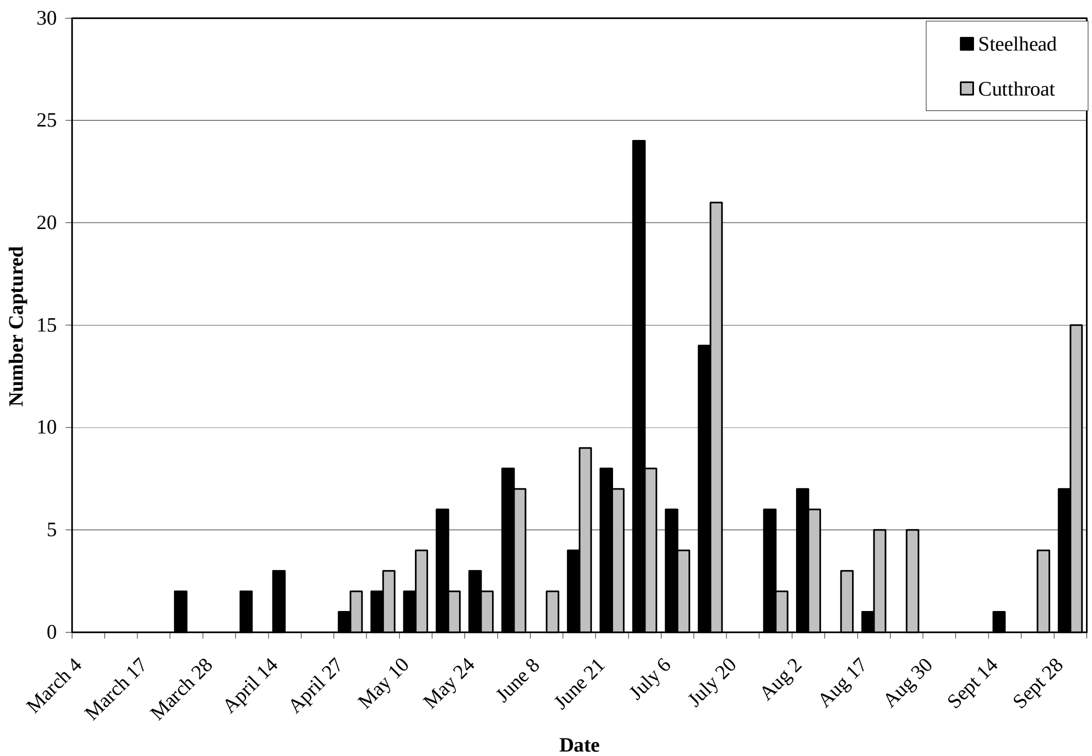

Figure 16. Number of steelhead and coastal cutthroat captured during beach seine sampling in the Klamath River Estuary, 2006.

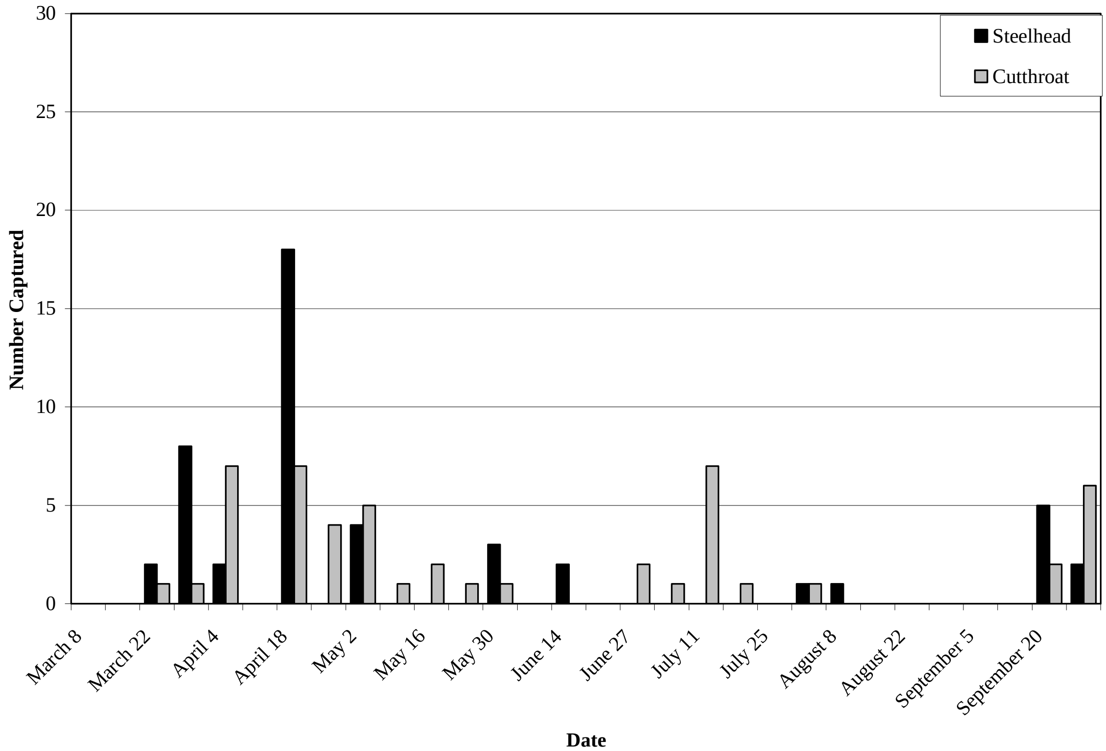

Figure 17. Number of steelhead and coastal cutthroat captured during beach seine sampling in the Klamath River Estuary, 2007.

<u>Hatchery Composition</u>

During 2006, only four of the 107 steelhead captured, or 3.7% were of hatchery origin. Steelhead captured in 2007 were comprised of substantially more hatchery fish. Half of the steelhead observed in 2007 had adipose clips, indicating hatchery origin.

<u>Size</u>

Steelhead captured in the estuary varied widely in size during both 2006 and 2007. During 2006, fish captured during May, June, July, and August were smaller than fish captured in March, April, and September (Table 8). During 2007, only two fish were observed that were smaller than 145 mm. This varied from 2006 since mean FL during May, June, July, and August was less than 145 mm (Table 8).

As was observed with steelhead size distributions, coastal cutthroat size varied during both years of sampling. Similar to steelhead, mean FL was smaller for cutthroat during May, June, and July during both years relative to mean fork lengths observed in March, April, August, and September (Table 9).

Table 8. Mean, standard deviation, and range (mm) of fork length measurements from steelhead captured during beach seine sampling in the Klamath River Estuary, 2006 and 2007.

Month, 2006 (Sample size)	Mean FL	St. Dev	Range		Month, 2007 (Sample size)	Mean FL	St. Dev	Range
March (N = 2)	189.50	20.51	175 - 204		March (N = 10)	193.00	28.34	147 - 225
April (N = 6)	215.17	67.84	123 - 298		April (N = 20)	217.25	25.16	145 - 258
May (N = 13)	123.08	23.17	96 - 174		May (N = 7)	170.00	63.51	62 - 242
June (N = 44)	134.89	14.09	105 - 172		June (N = 2)	201.50	0.71	201 - 202
July (N = 22)	144.48	14.28	104 - 165		July (N = 0)			
August (N = 8)	133.00	39.40	74 - 175		August (N = 0)			
Sept (N = 7)	206.17	26.56	166 - 231		Sept (N = 7)	243.71	55.08	199 - 362

Table 9. Mean, standard deviation, and range (mm) of fork length measurements from coastal cutthroat trout captured during beach seine sampling in the Klamath River Estuary, 2006 and 2007.

Month, 2006 (Sample size)	Mean FL	St. Dev	Range		Month, 2007 (Sample size)	Mean FL	St. Dev	Range
March (N = 1)	379.00	N/A	379		March (N = 10)	193.00	28.34	147 - 225
April (N = 3)	235.67	72.50	152 - 280		April (N = 20)	217.25	25.16	145 - 258
May (N = 11)	177.73	65.25	114 - 308		May (N = 7)	170.00	63.51	62 - 242
June (N = 34)	188.85	63.21	124 - 386		June (N = 2)	201.50	0.71	201 - 202
July (N = 27)	182.96	23.85	150 - 256		July (N = 0)			
August (N = 19)	202.47	54.67	146 - 344		August (N = 0)			
Sept (N = 19)	241.63	39.48	206 - 385		Sept (N = 7)	243.71	55.08	199 - 362

DISCUSSION

Outmigration timing of YOY chinook captured during 2006 and 2007 differed with results observed by Wallace (2003), who reported peak emigration during June and July. Peak emigration was observed during the week of August 2nd in 2006 and during the week of September 20th in 2007. An interesting note is that very few fish were captured in 2007 until the water levels began rising in the estuary due to the mouth 'closure' (some water still leaves the mouth, but flows are impeded and tidal influence is minimal). Whether fish utilize near shore areas more frequently when this occurs is not known, but it likely has effects on the presence and distribution of the salt wedge in the estuary which creates thermal refugia during late summer months and is undoubtedly beneficial during the smoltification process. With more freshwater and less stratification in the estuary, fish may be utilizing near shore habitats more frequently.

Overall, fewer fish were captured in 2007 compared with 2006 and past studies conducted by CDFG (Wallace 2003). This was likely in part due to the fact that the same sampling locations were used during both project years at the request of the CDFG project manager. The estuary is a dynamic area that changes annually and efficiency of beach seines due to depth, presence of snags, and shoreline configuration is a factor that needs to be addressed prior to each year's sampling locations being selected.

Size of chinook YOY captured in June, July, and August of 2006 and 2007 was similar to results obtained by CDFG during previous years sampled (Wallace 2003). Chinook YOY size varied only slightly during these months; however, fish captured during September were significantly larger. Previous work by Wallace in the Klamath River estuary was concluded by September, so comparisons cannot be made with recent data. However, historical observations from CDFG detail large chinook smolts captured during September in the estuary ranging between 6 – 7 inches (152 – 177 mm). Scale samples from these fish showed increased growth during estuarine residence, and scales from returning adults showed that fish with this scale pattern had a higher ocean survival rate (Snyder 1931). Currently, water temperatures and prey availability may limit extended estuarine rearing.

Hatchery produced coho were larger than naturally produced coho yearlings during both years, and size differences were also observed between both counterparts between years. Mean FL data for naturally produced coho indicated that fish were slightly larger in 2007 than 2006. Due to small sample sizes during March and April, it is difficult to make comparisons that are not biased. Mean FL for coho captured in May of 2007 was 17 mm larger than fish captured in during the same month in 2006. Hatchery produced coho captured in May of both 2006 and 2007 were similar in size. Proportions of hatchery produced coho during 2006 (46.2%) and 2007 (79.1%) were comparable with CDFG data, which varied annually during sampling between 1997 – 2002. Wallace reported proportions of hatchery produced coho ranging from 33.6 – 73.2% during that period (Wallace 2003). Coho produced in Trinity River hatchery were more abundant than coho released from Iron Gate Hatchery during both 2006 and 2007, which was also consistent with previous CDFG data (Wallace 2003).

The percentage of hatchery steelhead captured varied substantially in 2007 compared with other sampling years. In 2006, 96% of steelhead outmigrants captured by YTFP were of wild origin. Only 50% of steelhead captured during 2007 were of natural origin. This may be a factor of small sample size since the number of steelhead captured in 2007 was less than half of that observed in 2006. In comparison, the proportion of wild steelhead captured by CDFG in the estuary was 99% in 2000, 83% in 2001, and 87% in 2002.

It is worth noting that one steelhead captured in 2007 during the week ending May 2nd was a PIT tag recapture originally tagged by Seth Naman at the Trinity River Hatchery. Seth tagged the juvenile steelhead on 2/6/07 with PIT Tag #149196246. It's FL and weight were 140 mm and 35.7 g respectively. It was detected during the last day of volitional releases on 3/26/07 leaving the hatchery flume and was later detected 3 km downstream on 4/05/07. At the time that it was captured in the estuary on 5/2/07 it was 187 mm in length and weighed 63.2 g. Total growth for the steelhead smolt was 47 mm and 27.5 g during its 86 days at liberty between being tagged at TRH and recaptured in the estuary. Growth estimates are 0.55 mm/day for fork length and 0.32 g/day for body weight between tag date and recapture.

During June of both years, fish disease sampling in the estuary began in coordination with the US Fish and Wildlife Service's California-Nevada Fish Health Center. Adipose clipped YOY chinook were collected, clinical signs of disease were noted, and tissues were examined histologically and using Q-PCR (Quantitative Polymerase Chain Reaction) methodology for *Ceratomyxa shasta* and *Parvicapsula minibicornis* (Nichols and True 2007). Results from 2007 were still being reviewed as this report was being prepared, but results from 2006 showed mild to moderate incidence of clinical signs and infection for both pathogens during early July and no signs of disease through clinical signs or histology in late July. Q-PCR results for *C. shasta* infections in fish collected in the estuary indicate that disease prevalence peaked in late June and early July and remained below 20% for the remainder of the sampling period (through August). Incidence of *P. minibicornis* infections persisted throughout the sampling period, with between approximately 65 – 80% of fish collected infected with the pathogen, except during the week of July 3rd when 100% of fish collected tested positive (Nichols and True 2007).

Juvenile salmonid outmigration through the Klamath River estuary is an important monitoring dataset that needs to be continued in future years. The Yurok Tribe acknowledges the importance of this data collection, especially since it is a longstanding dataset and gives managers the opportunity to examine potential changes in juvenile chinook, coho, and steelhead emigration timing, hatchery production, disease prevalence, estuarine utilization, and overall smolt condition before leaving the Klamath Basin. In addition, no monitoring of outmigrating salmonids takes place below the confluence of the Trinity and Klamath Rivers (RM 44) except activities in the Klamath River estuary.

Increased efforts throughout the Basin in PIT (Passive Integrated Transponder) tagging salmonid species (especially coho) also increases the importance of this project, since it is the last chance we have to collect recapture data. In addition to beach seining, YTFP recently purchased an electrofishing boat that they plan to use in future years of sampling to allow for a more complete sampling throughout the estuary and to make results more comparable with work conducted by Mike Wallace of CDFG. The Yurok Tribe does not have secure funding to continue this work, but will seek funds annually through available funding sources.

REFERENCES

Nichols, K and K. True. 2007. Monitoring incidence and severity of *Ceratomyxa shasta* and *Parvicapsula minibicornis* infections in juvenile Chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon (*Oncorhynchus kisutch*) in the Klamath River, 2006. United States Fish and Wildlife Service California-Nevada Fish Health Center. FY 2006 Investigational Report.

Nicholas, J.W. and D.G. Hankin. 1989. Chinook salmon populations in Oregon coastal river basins: Descriptions of life histories and assessment of recent trends in run strengths. United States Fish and Wildlife Service. Corvallis, Oregon.

Snyder, J.O. 1931. Salmon of the Klamath River California. Division of Fish and Game of California. Fish Bulletin No. 34. 130 pp.

Wallace, M. 1995. The emigration timing of juvenile salmonids through the Klamath River estuary. Pages 54-72 in T.J. Hassler (ed.), Proceedings of the Klamath Basin Fisheries Symposium. March 23-24, 1994. Eureka, California.

Wallace, M. 2003. Natural vs hatchery proportions of juvenile salmonids migrating through the Klamath River Estuary and monitor natural and hatchery juvenile salmonid emigration from the Klamath River Basin. Project F-51-R-6; Project No. 17; Job No. 1 & 2. 50 pp.

Appendix 1. Weekly catch summary for beach seine sampling in the Klamath River Estuary, 2006.

[redacted]

Appendix 2. Weekly catch summary for beach seine sampling in the Klamath River Estuary, 2007.

	Number	1+ Chinook			YOY Chinook			Coho					Steelhead			Coastal	Unk
Date (2007)	of Sets	No Clip	Ad-Clip	Total	No Clip	Ad-Clip	Total	YOY	Y Wild	Y LMax	Y RMax	Total	Wild	Hatch	Total	Cutthroat	Trout fry
March 8	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
March 22	0				Did Not Sample Due to High Water and Turbidity												
March 22	7	1	0	1	0	0	0	0	0	0	1	1	2	0	2	1	0
March 28	6	0	0	0	1	0	1	0	0	0	0	0	4	4	8	1	0
April 4	7	1	0	1	0	0	0	0	1	0	1	2	1	1	2	7	0
April 11	0				Did not sample Due to Death on the River												
April 18	8	0	0	0	0	0	0	0	1	0	1	2	3	15	18	7	0
April 25	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
May 2	8	0	0	0	0	0	0	0	2	0	0	2	2	2	4	5	0
May 9	8	0	0	0	0	0	0	0	1	0	36	37	0	0	0	1	0
May 16	8	0	0	0	3	0	3	0	5	1	4	10	0	0	0	2	0
May 23	7	0	0	0	0	0	0	0	1	0	2	3	0	0	0	1	0
May 30	8	0	0	0	8	0	8	0	3	0	6	9	3	0	3	1	0
June 6	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June 14	7	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0
June 22	7	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0
June 27	7	0	0	0	13	3	16	0	0	0	0	0	0	0	0	2	0
July 5	7	0	0	0	31	3	34	0	0	0	0	0	0	0	0	1	0
July 11	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
July 18	7	5	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0
July 25	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August 1	7	0	0	0	10	0	10	0	0	0	0	0	1	0	1	1	0
August 8	7	0	0	0	5	1	6	0	0	0	0	0	0	1	1	0	0
August 15	8	0	0	0	9	1	10	0	0	0	0	0	0	0	0	0	0
August 22	9	0	0	0	11	3	14	0	0	0	0	0	0	0	0	0	0
August 29	8	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0
September 5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
September 12	0				Boat repairs did not sample												
September 20	6	0	0	0	173	9	182	0	0	0	1	1	5	0	5	2	0
September 27	5	0	0	0	65	2	67	0	0	0	0	0	1	1	2	6	0