

Metadata for the Stockton Fish and Wildlife Office's Delta Juvenile Fish Monitoring Program

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Name of study: IEP Delta Juvenile Fish Monitoring Program

Program manager

Name: Matthew Dekar

Agency: U.S. Fish and Wildlife Service – Stockton Fish and
Wildlife Office

Address: 850 S. Guild Ave, Suite 105
Lodi, CA 95240

Phone: (209) 334-2968

Purpose/Objective: The original objective of the Delta Juvenile Fish Monitoring Program in the 1970's and 1980's was to monitor effects of water projects in the Delta on abundance, distribution and survival of juvenile fall run Chinook salmon in the lower Sacramento and San Joaquin Rivers and the San Francisco Estuary. This objective was broadened in the 1990's to include relative abundance and distribution of all races of juvenile Chinook salmon. In 2001, the program objectives were broadened further to reflect the value of gathering information on non-salmonid species. Species information at times has also been recorded for jellyfish and crustaceans spp. that are encountered as well.

General category of data collected: Native and non-native species of fish found within the San Francisco Estuary and lower Sacramento and San Joaquin Rivers.

Geographic range of current field work: There are currently fifty-eight (58) beach seine sites located on the Lower Sacramento and San Joaquin Rivers, North, Central and South Delta and San Francisco Bay (Table 2; Figure 1). Three (3) boat trawling stations are also regularly sampled (Table 3; Figure 1). These are located at Sherwood Harbor on the Sacramento River, Chipps Island in Suisun Bay and Mossdale Crossing County Park on the San Joaquin River. In addition, special studies have been conducted throughout the years (i.e., Liberty Island, Delta Cross Channel, VAMP, Six Year Study, etc).

Each sampling site is designated by a Station Code which displays the abbreviations of the body of water sampled (Table 1), the number of miles from the mouth of the river or bay, and the orientation within the sample site (e.g., site AM001S is 1 mile from the mouth of the American River on the south bank).

Figure 1. Current Sampling Sites

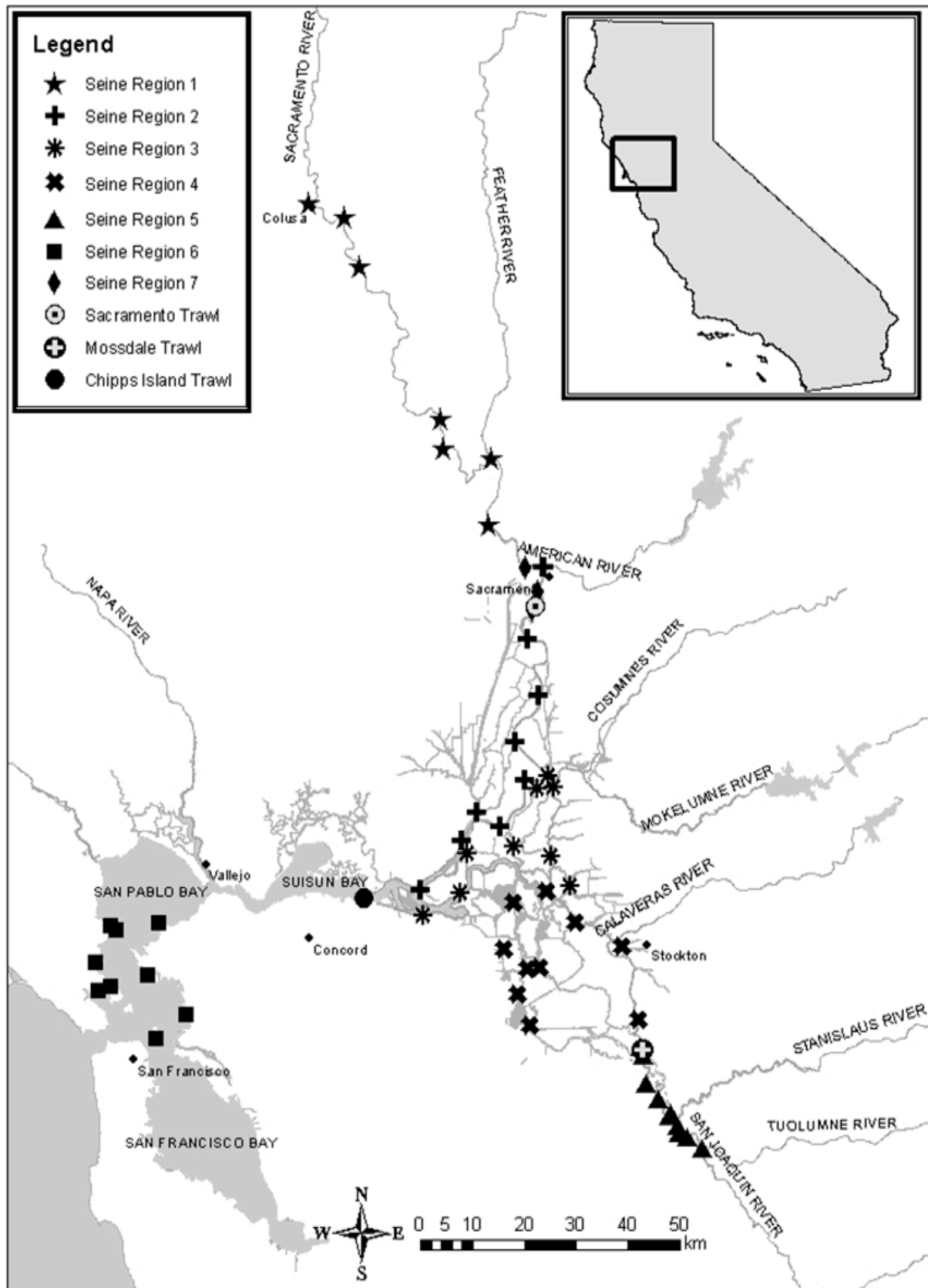


Table 1. Abbreviations of sampling sites.

Name of the body of water	Abbreviations
American River	AM
Big Break	BB
Clifton Court Forebay	CC
Columbia Cut	CL
Calaveras River	CR
Carquinez Straight	CS
Disappointment Slough	DS
Fabian Bell Canal	FC
False River	FR
Georgiana Slough	GS
Holland Cut	HC
Little Potato Slough	LP
North Fork Mokelumne River	MK
Middle River	MR
3 Mile Slough	MS
Montezuma Slough	MZ
Old River	OR
Petaluma River	PR
Richardson Bay	RB
Roaring River	RR
Rock Slough	RS
San Francisco Bay	SA
Suisun Bay	SB
South Fork Mokelumne River	SF
San Joaquin River	SJ
San Pablo Bay	SP
Sacramento River	SR
Steamboat Slough	SS
Turner Cut	TC
Tuolumne River	TM
Victoria Canal	VC
Werner Dredger Cut	WD
Whiskey Slough	WS
Delta Cross Channel	XC

Table 2. Current beach seining locations (2012). Location data are from UTM Zone 10 S.

Station Code	Site Name	Seine Routes	Region	Northing	Easting
SR144W	Colusa St. Park	Lower Sacramento	1	4341652	585032
SR138E	Wards Landing	Lower Sacramento	1	4338873	591787
SR130E	South Meridian	Lower Sacramento	1	4329625	594819
SR119E	Tisdale	Lower Sacramento	1	4320172	601969
SR094E	Reels Beach	Lower Sacramento	1	4301235	610500
SR090W	Knights Landing	Lower Sacramento	1	4295506	610842
SR080E	Verona	Lower Sac. & Sac.	1	4293731	620049
SR071E	Elkhorn	Lower Sac. & Sac.	1	4281359	619626
SR062E	Sand Cove	Sacramento	7	4273283	626860
SR057E	Miller Park	Sacramento	7	4269001	629279
SR055E	Sherwood Harbor	Sacramento	7	4265358	628190
SR060E	Discovery Park	N. Delta & Sac.	2	4273503	629820
AM001S	American River	N. Delta & Sac.	2	4273377	630121

Table 2. Continued

SR049E	Garcia Bend	N. Delta & Sac.	2	4259863	627056
SR043W	Clarksburg	North Delta	2	4249352	629186
SS011N	Steamboat Slough	North Delta	2	4240586	624600
SR024E	Koket	North Delta	2	4233475	626473
SR017E	Isleton	North Delta	2	4224781	621633
SR015E	Vieira's Resort	North Delta	2	4225797	618951
SR014W	Rio Vista	North Delta	2	4227355	617119
SR012W	Sandy Beach	North Delta	2	4222029	614333
XC001N	Delta Cross Channel	North Delta	3	4234115	630930
GS010E	Georgiana Slough	North Delta	3	4231900	628914
SF014E	Wimpy's	North Delta	3	4232068	632064
SR015E	Viera's	North Delta	2	4225804	618947
MS001N	Sherman Island	Central Delta	2	4212733	606513
DS002S	King Island	Central Delta	3	4213457	635248
LP003E	Terminus	Central Delta	3	4219075	631488
MK004W	B&W Marina	Central Delta	3	4220909	624418
TM001N	Brannan Island	Central Delta	3	4219577	615378
SJ005N	Eddo's	Central Delta	3	4212249	614110
SJ001S	Antioch Dunes	Central Delta	3	4208157	606855
SJ032S	Lost Isle	South Delta	4	4206624	636393
SJ026S	Medford Island	South Delta	4	4212589	630739
OR003W	Franks Tract	South Delta	4	4210312	624458
WD002W	Veale Tract	South Delta	4	4201793	622619
OR014W	Cruiser Haven	South Delta	4	4198087	626927
OR023E	Union Island	South Delta	4	4187462	627498
MR010W	Woodward Island	South Delta	4	4198130	629336
OR019E	Old River	South Delta	4	4193094	625167
SJ041N	Dad's Point	South Delta	4	4202181	645287
SJ051E	Dos Reis	San Joaquin	4	4188374	648601
SJ056E	Mossdale	San Joaquin	5	4183536	649043
SJ058W	Weatherbee	San Joaquin	5	4181923	649451
SJ058E	Weatherbee E (Alt.)	San Joaquin	5	4181796	649579
SJ063W	Big Beach	San Joaquin	5	4176666	650093
SJ065W	Critchett Rd.	San Joaquin	5	4175464	651896
SJ068W	Durham Site	San Joaquin	5	4173594	652327
SJ070N	Durham Ferry	San Joaquin	5	4172602	653315
SJ074W	Sturgeon Bend	San Joaquin	5	4170903	654784
SJ074A	Sturgeon Bend Alt.	San Joaquin	5	4170228	654634
SJ076W	North of Route 132	San Joaquin	5	4168198	656679
SJ077E	Route 132	San Joaquin	5	4167222	656395
SJ079E	San Luis Refuge	San Joaquin	5	4166449	657914
SJ083W	North of Tuol. River	San Joaquin	5	4164462	660960
SA010W	San Quentin	Bay West	6	4199450	545475
SA004W	Tiburon	Bay West	6	4194324	544827
SA008W	Paradise Beach	Bay West	6	4194207	547678
SP001W	China Camp	Bay West	6	4205986	547332
SP000W	McNear's Beach	Bay West	6	4205115	548092
SA001M	Treasure Island	Bay East	6	4185320	555450
SA007E	Berkeley Frontage	Bay East	6	4189618	561558
SA009E	Keller Beach	Bay East	6	4197177	553896
SP003E	Point Pinole E.	Bay East	6	4206949	556120

Table 3. Current boat trawling stations (2012), Location data are from UTM Zone 10 S.

Station Code	Site Name	Northing	Easting
SB018X	Chippis Island	4211218	595531
SR055M	Sherwood Harbor	4265965	628707
SJ054M	Mossdale Crossing	4185588	648278

If Latitude and Longitude are provided how were they determined? Latitude and Longitude are determined by either a hand held (Garmin, GPSmap76) or a mounted (Furuno, GPS1850D) GPS receivers are used to determine northing or easting coordinates. The coordinates are recorded as Zone 10 S UTM (Universal Transverse Mercator) beginning in 1995.

Period of record (start year): The Stockton Fish and Wildlife Office (STFWO) started sampling in 1976. In the 1990's, the range and scope of the study were broadened and are similar to those presently conducted. The number and location of the sites sampled and the methods have changed slightly over the years (see Tables 4, 5, & 6).

Sample frequency per time unit (week, month, etc): The number of days that a given trawl location or seine site is sampled has varied by location and by season (see Table 4 for the current year (2012), Table 5 for historical trawls and Table 6 for historical seines).

Currently, the Sherwood Harbor Trawl samples the Sacramento River three days per week between October 1st and March 31st using a Kodiak trawl (see methods). During the months of April, July, August and September Sherwood Harbor is sampled three days per week with a mid-water trawl. During the months of May and June the site is sampled twice per week with a mid-water trawl. The Mossdale Crossing Trawl site on the San Joaquin River is sampled three days per week year round with a Kodiak trawl. However, during the months of April, May and June the sampling is typically conducted by CDFG Region 4 and data are reported by STFWO. The Chippis Island Trawl site in Suisun Bay is sampled three days per week year round, except during May and June, and sometimes April, when it is sampled daily and at times two shifts per day for a total of 20 tows per day. During December and January, Chippis Island is sampled 7 days per week with ten 20 minute trawls conducted daily. This additional sampling is conducted to recover marked juvenile salmon released in the Delta and upstream. Sample times are recorded as military time and observe daylight savings time.

A daily take limit was established for delta smelt, primarily for the Chippis Island Trawls, since the majority of the delta smelt caught by the monitoring program are captured at Chippis Island. The Interagency Ecological Program has allotted an annual take for delta smelt of 1000 individuals per calendar year. Beginning October 21, 2011 sampling efforts (seine and trawls) were curtailed to limit the number of delta smelt caught. From October 26 to November 30, 2011 one day sampling per week were conducted and from January 09 to October 19, 2012 two day sampling per week were conducted for Chippis Island trawls. The field crew conducting Chippis Island trawls are required to get supervisory

approval before continuing sampling after 8 delta smelt per day have been caught. The delta smelt daily catch limit can be adjusted in response to actual catch numbers.

Boat trawls are usually conducted in the upstream direction in the center of the river, with the exception of Chipps Island, which is conducted traveling either upstream or downstream depending on the tidal flux and in the north, center or south sides of the channel. Since the 2011 field season Mossdale trawl sampling is conducted upstream of a dividing bridge from August 08 to November 02 and downstream of the bridge after November 02 if flows increase.

Table 4. Current sampling methods (2012) and frequency of samples per week.

Sampling Method	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sherwood Harbor MWTR				2	2	2	3	3	3			
Sherwood Harbor MWTR				1								
Sherwood Harbor KDTR	3	3	3							3	3	3
Chipps Island MWTR	3	3	3	2	2	2	3	3	3	3	3	3
Chipps Island MWTR	4			1	1	1						4
Mossdale KDTR	3	3	3	3	3	3	3	3	3	3	3	3
Sacramento Seine	1									3	3	3
Lower Sacramento Seine	1	1	1	1	1	1	1	1	1	1	1	1
North Delta Seine	0.5	0.5	0.5	1	1	1	1	1	1	1	1	1
North Delta Seine	0.5	0.5	0.5									
Central Delta Seine	1	1	1	1	1	1	1	1	1	1	1	1
South Delta Seine	1	1	1	1	1	1	1	1	1	1	1	1
San Joaquin Seine	1	1	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.5
West and East Bay Seines	1	1	1	1	1	1	1	1	1	1	1	1
Item 1	Juvenile salmon long-term fall-run abundance trends											
Item 2	Year-round abundance of juvenile Chinook salmon (less abundance races)											
Item 3	Monitoring for water project operations assistance and DAT											
Item 4	Monitoring the long-term abundance trends of Delta and Bay resident fishes											
Item 5	B(2) Late-fall											
Item 6	Sampled by DFG Region IV											

Table 5. Trawl locations (Historical) and dates sampled, mid-water and Kodiak trawls.

Year	Location/Station	Method	Tows/Day	Min./Tow	Days/Wk	Dates
1976	Clarksburg/SR043*	MWTR	2-18	8-15	0-5	05/13/76- 07/09/76
1976	Chipps Is./SB018*	MWTR	5-13	17-20	0-6	05/18/76- 07/09/76, 10/18/76- 11/16/76
1977	Clarksburg/SR043*	MWTR	7-28	7-19	0-7	05/09/77- 07/08/77
1977	Chipps Is./SB018*	MWTR	6-12	19-20	1-7	05/09/77- 06/28/77
1978	Clarksburg/SR043*	MWTR	7-12	8-10	0-6	06/05/78- 06/15/78
1978	Chipps Is./SB018*	MWTR	7-12	19-20	0-7	04/03/78- 06/26/78
1979	Clarksburg/SR043*	MWTR	10	10	0-5	06/04/79- 06/14/79
1979	Chipps Is./SB018*	MWTR	3-10	19-20	0-7	04/02/79- 07/12/79
1980	Clarksburg/SR043*	MWTR	10	10	0-7	06/02/80- 06/25/80
1980	Chipps Is./SB018*	MWTR	1-10	15-20	0-7	01/14/80- 06/30/80, 10/01/80- 12/30/80
1981	Clarksburg/SR043*	MWTR	9-10	10	0-6	06/01/81- 06/17/81
1981	Chipps Is./SB018*	MWTR	3-10	18-20	0-7	04/06/81- 07/02/81
1982	Chipps Is./SB018*	MWTR	2-10	20	0-6	04/06/82- 06/24/82
1983	Chipps Is./SB018*	MWTR	1-10	13-20	1-7	04/08/83- 07/01/83
1984	Chipps Is./SB018*	MWTR	2-10	18-20	0-7	04/02/84- 07/03/84

Table 5. Continued

1985	Chippis Is./SB018*	MWTR	2-10	15-20	0-7	04/01/85- 06/20/85
1986	Chippis Is./SB018*	MWTR	8-10	20	2-7	04/07/86- 06/18/86
1987	Chippis Is./SB018*	MWTR	8-10	19-25	0-7	04/06/87- 06/22/87
1988	Chippis Is./SB018*	MWTR	3-21	18-20	2-7	04/05/88- 07/08/88
1988	Sherwood Hbr./SR055*	MWTR	5-10	6-20	2-5	04/05/88- 06/28/88
1989	Chippis Is./SB018*	MWTR	6-10	19-20	1-7	04/05/89- 06/30/89
1989	Sherwood Hbr./SR055*	MWTR	5-10	14-20	0-5	04/14/89- 06/28/89
1990	Chippis Is./SB018*	MWTR	3-10	17-20	1-7	04/05/90- 06/22/90
1990	Courtland/SR035*	MWTR	3-12	10	0-5	02/02/90- 03/22/90, 04/11/90- 06/20/90
1990	Hood/SR036*	MWTR	5-12	10	0-2	02/02/90- 03/22/90
1990	Hood/SR037*	MWTR	6-9	10	0-2	02/02/90- 03/22/90
1990	Hood/SR038*	MWTR	3-12	10	0-2	02/02/90- 03/22/90
1991	Chippis Is./SB018*	MWTR	8-10	19-20	1-7	04/02/90- 06/28/90
1991	Sherwood Hbr./SR055*	MWTR	2-12	10-20	0-3	04/15/91- 06/12/91, 12/05/91- 12/30/91
1992	Chippis Is./SB018*	MWTR	3-10	18-20	0-7	04/03/92- 06/26/92
1992	Sherwood Hbr./SR055*	MWTR	4-12	10-20	0-7	01/02- 03/25, 05/06- 06/12, 09/08-12/31
1992	Mayberry Slough/MS020*	MWTR	10	20	0-5	04/20/92- 05/01/92
1992	Sac. River/SR027*	PUSH	4-9	10-15	0-1	12/04/92- 12/10/92
1992	Walnut Grove/SR026*	PUSH	6-8	10-13	0-1	12/04/92- 12/15/92
1992	Verona/SR080*	PUSH	3	10	0-1	11/10/92
1992	Sac. River/SR059*	PUSH	3	10	0-1	11/17/92
1992	Sac. River/SR034*	PUSH	2-9	10-20	0-1	11/20/92, 12/04/92
1992	Georgiana Sl./GS009*	PUSH	5	10	0-1	12/15/92
1992	Georgiana Sl./GS004*	PUSH	4	10	0-1	12/15/92
1992	Sac. River 1/SR131*	PUSH	1	10	0-1	11/03/92
1992	Sac. River 2/SR132*	PUSH	2	10	0-1	11/03/92
1992	Sac. River 3/SR134*	PUSH	3	10	0-1	11/03/92
1992	Sac. River 4/SR137*	PUSH	4	10	0-1	11/03/92
1992	Wards Landing/SR138*	PUSH	5	10	0-1	11/03/92
1992	Sac. River/SR028*	PUSH	9-10	20	0-1	12/01/92
1992	Sac. River/SR090*	PUSH	1	10	0-1	11/20/92
1992	San Joaquin River/SJ019*	PUSH	1	10	0-1	12/18/92
1992	Mokelumne River/MK001*	PUSH	1-5	10	0-1	12/18/92- 12/29/92
1992	Mokelumne River/MK002*	PUSH	1-10	10	0-2	12/18/92- 12/31/92
1992	Mokelumne River/MK003*	PUSH	4-10	10	0-1	12/18/92- 12/29/92
1992	Delta X-Channel/XC001*	PUSH	3-4	10	0-1	12/01/92- 12/10/92
1992	Georgiana Sl./GS001*	PUSH	5-7	8-10	0-1	12/10/92- 12/29/92
1993	Chippis Is./SB018*	MWTR	7-10	10-20	1-7	04/05/93- 07/08/93, 11/01/93- 12/30/93
1993	Sherwood Hbr./SR055*	MWTR	4-11	10-20	0-5	01/04/93- 06/23/93, 09/27/93- 12/30/93
1993	Georgiana Sl./GS004*	PUSH	8	10	0-1	01/19/93
1993	Old River 5/OR015*	PUSH	2-10	20	1-3	02/09/93- 03/29/93
1993	Old River 4/OR018*	PUSH	10	21	0-1	03/30/93
1993	Montezuma Sl./MZ020*	MWTR	5-11	20	0-5	05/12/93- 05/25/93
1993	Montezuma Sl./MZ021*	MWTR	5-10	20	0-5	05/12/93- 05/25/93
1993	Sac. River/SR047*	MWTR	6	20	0-1	06/09/93
1993	Sac. River/SR048*	MWTR	7	20	0-1	06/09/93
1993	Sac. River/SR050*	MWTR	3	20	0-1	06/09/93
1993	Sac. River/SR053*	MWTR	2	20	0-1	06/09/93
1993	Mokelumne River/MK001*	PUSH	1-4	10	0-2	01/12/93- 01/19/93
1993	Mokelumne River/MK002*	PUSH	1-10	10	0-2	01/05/93- 01/19/93
1993	Mokelumne River/MK003*	PUSH	1-10	10	0-2	01/05/93- 01/19/93
1993	Mokelumne River/MK003*	MWTR	1-10	10-20	0-1	01/07/93- 01/11/93

Table 5. Continued

1993	Georgiana Sl./GS001*	PUSH	4-10	20	0-3	01/21/93- 02/04/93, 04/02/93- 04/12/93
1993	Georgiana Sl./GS001*	MWTR	5-10	18-20	0-4	01/13/93- 04/01/93
1994	Chippis Is./SB018*	MWTR	5-10	19-20	1-7	01/03/94- 06/20/94, 10/03/94- 12/31/94
1994	Sherwood Hbr./SR055*	MWTR	1-10	10-20	0-5	01/03/94- 06/17/94, 09/26/94- 12/28/94
1994	Sherwood Hbr./SR055*	KDTR	7-10	20	0-2	12/22/94- 12/30/94
1994	Mossdale/SJ054*	KDTR	1-10	10	0-5	04/22/94- 06/08/94
1994	Mayberry Slough/MS020*	MWTR	1-13	20	0-5	04/25/94- 05/06/94
1994	Mokelumne River/MK001*	MWTR	1-10	10-20	0-3	01/07/94- 02/16/94
1994	Mayberry Slough/MS021*	MWTR	5-15	20	0-5	04/26/94- 05/06/94
1994	Rock Slough/RS001*	PUSH	1-10	20	0-3	02/18/94- 06/03/94
1995	Chippis Is./SB018*	MWTR	1-10	16-20	0-7	01/03/95- 12/28/95
1995	Sherwood Hbr./SR055*	MWTR	4-26	18-20	0-7	03/16/95- 10/23/95
1995	Sherwood Hbr./SR055*	KDTR	1-10	10-20	0-7	01/03- 03/07, 04/06- 04/27, 10/20- 12/31
1995	Bacon Island/MR009*	KDTR	5-10	19-20	0-7	05/01/95- 06/29/95
1995	Fay Island/OR009*	KDTR	5-10	19-20	0-7	05/01/95- 06/29/95
1995	Jersey Point/SJ011*	MWTR	6-10	20	0-7	05/01/95- 05/21/95
1995	Head Old River/OR046*	KDTR	1-8	20	0-7	05/12/95- 05/20/95
1995	Dos Reis/SJ051*	KDTR	6-10	16-20	0-6	05/12/95- 05/20/95
1995	Webb Tract/OR001*	KDTR	1-10	20	0-7	05/02/95- 06/30/95
1996	Chippis Is./SB018*	MWTR	1-10	18-20	0-7	01/03/96- 08/19/96, 10/09/96- 12/30/96
1996	Sherwood Hbr./SR055*	MWTR	2-10	17-20	0-7	04/01/96- 10/03/96
1996	Sherwood Hbr./SR055*	KDTR	4-10	20	0-7	01/02/96- 04/04/96, 10/04/96- 12/31/96
1996	Mossdale/SJ054*	KDTR	1-13	10-20	0-7	04/01/96- 06/28/96, 09/04/96- 12/27/96
1996	Bacon Island/MR009*	KDTR	1-10	17-20	0-4	05/07/96- 06/29/96
1996	Fay Island/OR009*	KDTR	5-11	20	0-4	05/07/96- 06/29/96
1996	Jersey Point/SJ011*	MWTR	5-11	18-20	0-7	04/01/96- 06/30/96
1996	Head Old River/OR046*	KDTR	5-12	14-20	0-7	04/01/96- 05/06/96
1996	False River/FR002*	KDTR	5-11	20	0-7	04/04/96- 06/30/96
1996	Turner Cut/TC002*	KDTR	4-19	16-20	0-7	04/01/96- 06/30/96
1996	Walnut Grove/SR026*	KDTR	9-27	10	0-4	04/01/96- 06/27/96
1996	Dos Reis/SJ051*	KDTR	1-10	20	0-7	04/01/96- 05/06/96
1996	Webb Tract/OR001*	KDTR	1-10	5-25	0-7	04/05/96- 06/30/96
1996	Columbia Cut/CL000*	KDTR	5-11	13-20	0-7	04/01/96- 06/30/96
1996	Georgiana Sl./GS001*	KDTR	6-27	10	0-4	04/01/96- 06/27/96
1997	Chippis Is./SB018*	MWTR	2-10	18-20	0-7	01/03/97- 12/31/97
1997	Sherwood Hbr./SR055*	MWTR	5-10	18-20	0-5	01/24/97- 02/14/97, 03/31/97- 10/16/97
1997	Sherwood Hbr./SR055*	KDTR	2-10	17-20	0-5	01/21, 02/18- 03/25, 10/17- 12/23
1997	Mossdale/SJ054*	KDTR	9-21	10	1-7	03/21/97- 06/27/97
1997	Jersey Point/SJ011*	KDTR	1-10	20	0-5	04/03/97- 06/26/97
1997	Head Old River/OR046*	KDTR	2-5	19-20	0-4	04/03/97- 04/12/97
1997	False River/FR002*	KDTR	4-11	17-20	0-5	04/17/97- 06/26/97
1997	Turner Cut/TC002*	KDTR	2-10	18-20	0-5	04/03/97- 06/28/97
1997	Webb Tract/OR001*	KDTR	1-10	5-20	0-5	03/31/97- 06/28/97
1997	Columbia Cut/CL000*	KDTR	5-11	18-20	0-5	04/03/97- 06/28/97
1998	Chippis Is./SB018*	MWTR	1-20	10-20	0-7	01/03/98- 06/29/98, 09/02/98- 12/31/98
1998	Sherwood Hbr./SR055*	MWTR	5-11	18-20	0-3	03/30/98- 06/29/98, 12/01/98- 12/04/98
1998	Sherwood Hbr./SR055*	KDTR	1-10	18-20	0-5	01/02/98- 03/27/98, 09/03/98- 12/28/98
1998	Mossdale/SJ054*	KDTR	3-10	10-21	0-5	04/02/98- 06/30/98, 11/04/98- 12/28/98
1998	Bacon Island/MR009*	KDTR	10	20	0-2	04/20/98- 04/21/98
1998	Fay Island/OR009*	KDTR	10	20	0-5	05/11/98- 05/18/98
1998	Jersey Point/SJ011*	KDTR	2-10	18-20	0-5	04/03/98- 06/30/98
1998	Head Old River/OR046*	KDTR	5	20	0-2	04/17/98- 04/18/98

Table 5. Continued

1998	False River/FR002*	KDTR	5-11	15-20	0-5	04/04/98- 06/30/98
1998	Turner Cut/TC002*	KDTR	5	18-20	0-6	04/02/98- 06/30/98
1998	Webb Tract/OR001*	KDTR	1-10	20	0-5	04/02/98- 06/30/98
1998	Columbia Cut/CL000*	KDTR	6-10	19-20	0-5	04/02/98- 06/30/98
1999	Chippis Is./SB018*	MWTR	1-21	13-20	0-7	01/01/99- 12/31/99
1999	Sherwood Hbr./SR055*	MWTR	2-13	14-20	0-5	03/26/99- 10/01/99
1999	Sherwood Hbr./SR055*	KDTR	4-10	20	0-5	01/04/99- 03/26/99, 10/05/99-12/30/99
1999	Mossdale/SJ054*	KDTR	2-11	19-20	0-5	01/06/99- 06/29/99, 10/18/99- 12/29/99
1999	Bacon Island/MR009*	KDTR	2-10	10-20	0-5	04/02/99- 07/02/99
1999	Turner Cut/TC002*	KDTR	1-4	20	0-5	04/01/99- 07/02/99
1999	Webb Tract/OR001*	KDTR	1-10	14-20	0-5	04/01/99- 06/24/99
1999	Quimby East/OR004*	KDTR	3-9	12-22	0-5	04/01/99- 06/24/99
1999	Palm Tract/OR008*	KDTR	1-8	20-30	0-5	04/01/99- 06/29/99
1999	Prisoners Point/SJ024*	KDTR	1-10	19-20	0-5	04/01/99- 06/24/99
1999	Little Mandeville/HC002*	KDTR	1-8	20-30	0-5	04/01/99- 06/29/99
1999	San Joaquin River/SJ031*	KDTR	3-5	10-20	0-5	04/01/99- 07/02/99
1999	Connection Slough/CS001*	KDTR	7-8	13-20	0-5	04/01/99- 07/02/99
1999	Columbia Cut/CL000*	KDTR	5-7	10-20	0-5	04/01/99- 07/02/99
2000	Chippis Is./SB018*	MWTR	3-20	18-20	0-7	01/02/00- 12/27/00
2000	Sherwood Hbr./SR055*	MWTR	7-20	20	0-3	03/29/00- 09/28/00
2000	Sherwood Hbr./SR055*	KDTR	3-10	14-20	0-5	01/03/00- 03/27/00, 10/04/00-12/30/00
2000	Mossdale/SJ054*	KDTR	1-20	10-20	0-5	01/03/00- 06/30/00
2000	Sac. River/SR027*	MWTR	15-166	14-17	0-3	11/13/00- 11/22/00
2000	Delta X-Channel/XC001*	MWTR	16-90	14-19	0-3	11/13/00- 11/22/00
2001	Chippis Is./SB018*	MWTR	1-20	17-20	0-7	01/03/01- 12/31/01
2001	Sherwood Hbr./SR055*	MWTR	5-10	19-20	0-3	03/28/01- 07/16/01, 08/06/01- 09/28/01
2001	Sherwood Hbr./SR055*	KDTR	5-10	18-20	0-4	01/02/01- 03/26/01, 10/01/01-12/28/01
2001	Mossdale/SJ054*	KDTR	3-20	18-20	0-7	02/13/01- 09/10/01
2001	Sac. River/SR027*	MWTR	40-69	14	0-2	10/29/01- 11/02/01
2001	Benicia/SB001*	MWTR	5-10	17-20	0-6	01/20/01- 01/29/01
2001	Benicia/CS008*	MWTR	6-10	18-20	0-6	01/21/01- 02/16/01
2001	Antioch Dunes/SJ001*	KDTRX	5	19-20	0-1	05/01/01- 05/08/01
2001	Delta X-Channel/XC001*	MWTR	39-68	15	0-2	10/29/01- 11/02/01
2002	Chippis Is./SB018*	MWTR	10	20	0-7	01/02/02- 12/31/02
2002	Sherwood Hbr./SR055*	MWTR	2-10	19-20	0-3	03/28/02- 09/26/02
2002	Sherwood Hbr./SR055*	KDTR	4-51	17-20	1-4	01/02/02- 03/26/02, 09/30/02- 12/30/02
2002	Mossdale/SJ054*	KDTR	6-15	18-20	0-7	01/07- 01/18, 02/27- 07/17, 12/11- 12/30
2003	Chippis Is./SB018*	MWTR	1-61	18-20	0-7	01/02/03- 12/31/03
2003	Sherwood Hbr./SR055*	MWTR	3-48	18-20	0-3	04/02/03- 09/29/03
2003	Sherwood Hbr./SR055*	KDTR	2-51	20-21	0-4	01/03/03- 03/31/03, 10/01/03- 12/31/03
2003	Mossdale/SJ054*	KDTR	3-15	19-20	0-7	01/15/03- 12/31/03
2004	Chippis Is./SB018*	MWTR	2-20	18-20	0-7	01/02/04- 12/31/04
2004	Sherwood Hbr./SR055*	MWTR	6-10	12-20	0-3	02/18/04- 03/12/04, 04/05/04- 09/29/04
2004	Sherwood Hbr./SR055*	KDTR	6-42	18-20	0-4	01/02- 02/17, 03/15- 03/31, 10/01- 12/30
2004	Mossdale/SJ054*	KDTR	2-15	18-20	0-7	01/02/04- 12/30/04
2005	Chippis Is./SB018*	MWTR	8-20	19-20	0-7	01/02/05- 12/30/05
2005	Sherwood Hbr./SR055*	MWTR	9-55	19-20	0-4	04/01/05- 09/30/05
2005	Sherwood Hbr./SR055*	KDTR	9-10	19-20	0-3	01/03/05- 03/30/05, 10/03/05- 12/30/05
2005	Mossdale/SJ054*	KDTR	10-15	19-21	0-7	01/03/05- 12/30/05
2006	Chippis Is./SB018*	MWTR	10-20	20	3	01/02/06- 12/31/06
2006	Sherwood Hbr./SR055*	MWTR	10	20	2-3	04/03/06- 09/29/06
2006	Sherwood Hbr./SR055*	KDTR	10	20	3	01/06/06- 03/31/06, 10/02/06- 12/29/06

Table 5. Continued

2006	Mossdale/SJ054*	KDTR	10	20	3	01/04/06- 12/29/06
2007	Chippis Is./SB018*	MWTR	10-13	5-20	3	01/02/07- 12/31/07
2007	Sherwood Hbr./SR055*	MWTR	10	20	2-3	04/02/07- 09/29/07
2007	Sherwood Hbr./SR055*	KDTR	10	20	3	01/02/07- 03/30/07, 10/01/07- 12/31/07
2007	Mossdale/SJ054*	KDTR	10	20	3	01/03/07- 12/31/07
2008	Chippis Is./SB018*	MWTR	13	5-20	3	01/02/08- 02/04/08, 03/10/08- 12/17/08
2008	Benicia/SB001*	MWTR	10	20	3	02/08/08- 03/08/08
2008	Sherwood Hbr./SR055*	MWTR	10	20	2-3	04/02/08- 09/29/08
2008	Sherwood Hbr./SR055*	KDTR	10	20	3	01/02/08- 03/31/08, 10/01/08- 12/17/08
2008	Mossdale/SJ054*	KDTR	10	20	3	01/02/08- 12/17/08
2009	Chippis Is./SB018*	MWTR	10-20	20	3	01/02/09- 12/30/09
2009	Sherwood Hbr./SR055*	MWTR	10	20	2-3	04/01/09- 09/30/09
2009	Sherwood Hbr./SR055*	KDTR	10	20	3	01/02/09- 03/30/09, 10/02/09- 12/30/09
2009	Mossdale/SJ054*	KDTR	10	20	3	01/02/09- 12/30/09
2010	Chippis Is./SB018*	MWTR	10-20	20	3	01/01/10- 12/31/10
2010	Sherwood Hbr./SR055*	MWTR	10	20	2-3	04/02/10- 09/29/10
2010	Sherwood Hbr./SR055*	KDTR	10	20	3	01/01/10- 03/31/10, 10/01/10- 12/31/10
2010	Mossdale/SJ054*	KDTR	10	20	3	01/01/10- 12/31/10
2011	Chippis Is./SB018*	MWTR	10-20	20	2-3	01/03/11- 12/30/11
2011	Sherwood Hbr./SR055*	MWTR	10	20	3	04/01/11- 09/30/11
2011	Sherwood Hbr./SR055*	KDTR	10	20	3	01/03/11- 03/30/11, 10/03/11- 12/30/11
2011	Mossdale/SJ054*	KDTR	10	20	3	01/03/11- 12/30/11
2012	Chippis Is./SB018*	MWTR	10	20	2-3	01/02/12- Present
2012	Sherwood Hbr./SR055*	MWTR	10	20	3	04/02/12- 09/28/12
2012	Sherwood Hbr./SR055*	KDTR	10	20	3	01/02/12- 03/30/12, 10/01/12- Present
2012	Mossdale/SJ054*	KDTR	10	20	3	01/02/12- Present

* Indicates that channel location or compass bearings are not specified.

Table 6. Seine sites (Historical) and dates sampled

Station Code	Site Name	Region	First Sampled	Last Sampled
SR144W	Colusa St. Park	1	03/24/81	04/02/14
SR138E	Wards Landing	1	02/18/81	Current
SR130E	South Meridian	1	05/19/81	Current
SR119E	Tisdale	1	01/10/12	Current
SR094E	Reels Beach	1	02/18/81	Current
SR090W	Knights Landing	1	02/18/81	Current
SR080E	Verona	1	02/18/81	Current
SR071E	Elkhorn	1	02/18/81	Current
SR130X	Ox Bow	1	04/22/81	04/22/81
SR184E	Ord Bend	1	02/18/81, 09/01/92	06/23/82, 11/12/97
SR258E	Bend Bridge	1	02/19/81	06/23/82
SR298W	Posse Grounds	1	02/19/81, 03/24/84	06/23/82, 03/24/84
SR284W	Anderson	1	02/19/81	06/23/82
SR119A	Tisdale Weir	1	02/18/81	03/24/81
SR185W	Glen Gravel Bar	1	02/18/81	03/24/81
SR163W	Princeton	1	02/18/81, 09/01/92	06/23/82, 12/09/97
SR276E	Balls Ferry	1	02/19/81	06/23/82
SR244E	Lake Red Bluff	1	02/19/81	04/23/82
SR243E	RBDD	1	02/19/81, 05/24/03	06/23/82, 05/24/03
SR218E	Woodson Bridge	1	02/19/81	05/24/82
SR252W	Iron Canyon	1	12/09/92	12/09/92

Table 6. Continued

SR193E	Bidwell	1	09/01/92	09/09/92
SR062E	Sand Cove	7	09/30/94	Current
SR057E	Miller Park	7	09/21/94	Current
SR055E	Sherwood Harbor	7	09/28/94	Current
SR060E	Discovery Park	2	12/07/76	Current
AM001S	American River	2	05/28/76	Current
SR049E	Garcia Bend	2	03/08/76	Current
SR043W	Clarksburg	2	03/08/76	Current
SS011N	Steamboat Slough	2	03/08/76, 11/18/92	06/21/78, Current
SR024E	Koket	2	03/09/76	Current
SR017E	Isleton	2	03/09/76	Current
SR015E	Viera's	2	10/25/12	11/06/12
SR014W	Rio Vista	2	03/09/76	Current
SR012W	Sandy Beach	2	04/19/07	Current
SR012E	Stump Beach	2	03/09/76	02/06/07
MS001N	Sherman Island	2	03/24/76	Current
SS005W	Steamboat Slough	2	03/09/76	03/29/78
SR014E	Cliff House	2	06/15/76	06/15/76
XC001N	Delta Cross Channel	3	03/09/76	Current
GS010E	Georgiana Slough	3	03/09/76	Current
SF014E	Wimpy's	3	10/26/76	Current
DS002S	King Island	3	02/07/79	Current
LP003E	Terminus	3	10/26/76, 02/07/79	11/03/76, Current
MK004W	B&W Marina	3	02/07/79	Current
TM001N	Brannan Island	3	03/09/76	Current
SJ005N	Eddo's	3	03/16/76	Current
SJ001S	Antioch Dunes	3	02/06/79	Current
SB019S	Pittsburg Bridge	3	03/26/76	02/06/79
BB001S	Big Break	3	05/04/77	05/04/77
RR001N	Roaring River	3	01/30/80	05/20/81
CR005S	Calaveras River	3	12/02/93	01/14/99
MZ023E	Montezuma Slough 1	3	01/30/80	06/24/80
MZ022W	Montezuma Slough 2	3	01/30/80	06/24/80
MZ021W	Montezuma Slough 4	3	01/30/80	06/24/80
SJ032S	Lost Isle	4	11/23/93	Current
SJ026S	Medford Island	4	01/24/02	Current
OR003W	Franks Tract	4	11/23/93	Current
WD002W	Veale Tract	4	11/23/93	Current
OR014W	Cruiser Haven	4	11/23/93	Current
OR023E	Union Island	4	06/06/97	Current
OR001M	Webb Tract	4	03/16/76, 04/21/97	06/11/76, 04/21/97
MR010W	Woodward Island	4	02/07/79	Current
SJ041N	Dad's Point	4	02/07/79	Current
SJ051E	Dos Reis	4	03/30/94	Current
OR019E	Old River 1	4	12/05/93	Current
FC006X	Fabian Bell Canal	4	03/12/76	05/15/78
OR001X	Old River (mouth)	4	03/16/76, 04/21/97	06/11/76, 04/21/97
OR022W	Federal Fish Facility	4	03/26/76	06/09/76
OR018W	Old River 4	4	03/26/76, 11/16/92	04/11/86, 01/27/94
SJ026N	Venice Island	4	02/07/79	09/02/03
TC002E	Turner Cut	4	01/28/93	08/31/95
WS001E	Whiskey Slough	4	03/17/93	11/12/93

Table 6. Continued

VC002N	Victoria Canal	4	11/12/93	11/05/96
OR017E	Old River 3	4	11/23/93	01/06/94
OR018E	Old River 4	4	01/17/87	05/15/92
SJ056E	Mossdale	5	03/30/94	Current
SJ058W	Weatherbee	5	03/30/94	Current
SJ058E	Weatherbee E (Alt.)	5	02/22/95	Current
SJ063W	Big Beach	5	03/30/94	Current
SJ065W	Critchett Rd.	5	06/19/08	Current
SJ068W	Durham Site	5	03/30/94	Current
SJ070N	Durham Ferry	5	08/12/08	Current
SJ074A	Sturgeon Bend Alt	5	06/19/08	Current
SJ074W	Sturgeon Bend	5	03/30/94	Current
SJ076W	North of Route 132	5	06/19/08	Current
SJ077E	Route 132	5	03/30/94	Current
SJ079E	San Luis Refuge	5	08/12/08	Current
SJ083W	North of Tuol. River	5	03/30/94	Current
SJ087W	Grayson	5	12/21/00	05/03/04
SJ063E	Big Beach E	5	06/24/97, 05/12/04	06/24/97, 05/12/04
SA010W	San Quentin	6	02/04/80, 01/29/97	02/04/80, Current
SA004W	Tiburon	6	02/04/97	Current
SA008W	Paradise Beach	6	03/11/76, 02/04/80, 01/29/97	05/20/76, 04/16/82, Current
SP001W	China Camp	6	01/29/97	Current
SP000W	McNear's Beach	6	03/11/76, 02/04/80, 01/29/97	05/20/76, 03/18/82, Current
SA001M	Treasure Island	6	03/10/76, 01/30/80	05/20/76, 04/16/82, Current
SA007E	Berkeley Frontage	6	03/10/76, 02/04/80, 01/28/97	5/20/76, 03/18/82, Current
SP000E	Point Molate	6	02/04/80, 02/18/98	02/18/82, 07/11/03
SA009E	Keller Beach	6	02/04/80, 02/05/98	02/04/80, Current
SP003E	Point Pinole E.	6	01/30/80, 02/05/98	04/16/82, Current
SP003W	Point Pinole W.	6	02/03/81	05/12/81
SB000X	Martinez Bridge	6	01/30/80	01/30/80
SP008E	Rodeo	6	03/10/76, 01/30/80	06/09/76, 01/30/80
SP004E	Wilson Point	6	03/10/76	05/20/76
SB010X	Middleground Island	6	03/16/76	06/11/76
CS006S	Brickyard Beach	6	03/25/76, 05/15/78, 01/30/80	06/09/76, 05/15/78, 04/16/82
SB009S	Port Chicago	6	02/06/79	03/14/79
CS003S	Port Costa	6	02/06/79	02/06/79
CS001S	Crockett	6	01/30/80	04/16/82
PR001W	Petaluma River Br.	6	02/04/80, 02/25/98	04/16/82, 02/25/98
SA008E	Point Richmond Jetty	6	02/04/80	02/04/80
SP001E	Pt. San Pablo Harbor	6	02/04/80	02/04/80
RB003X	Richardson Bay	6	02/04/80	02/04/80
SA003S	S.F. Municipal Pier	6	02/04/80	02/04/80
SA010W	San Quentin Beach	6	02/04/80, 01/29/97	02/04/80, Current
SA003W	Sausalito Harbor	6	02/04/80	02/04/80

San Pablo and San Francisco Bay seine sites are presently sampled once every two weeks year round. The San Joaquin River seine sites are sampled weekly from January to June, then every two weeks from July to December. However, the San Joaquin River has often been too low to sample these sites effectively from July to December, so alternate truck accessible sites have been designated as sample sites during these times. Currently, the

South, Central and North Delta seine sites are sampled weekly year round. South and Central Delta were only sampled every other week during the summer months in some years due to funding limitations. The Lower Sacramento seine sites are sampled once per week from January 1st to December 31st. The Sacramento seine sites are sampled three days per week from October 1st to January 31st. The Sacramento seine route combines some of the sites from the Lower Sacramento seine route and some of the sites from the North Delta seine route, plus three seine sites that are only sampled from October through January (Sand Cove, Sherwood Harbor and Miller Park).

Comments about study (e.g. idiosyncrasies, changes over time, special events, etc.):

Modifications are made regularly to accommodate safety conditions and/or special studies. Of the 58 beach seine sites sampled, three of the sites on the Sacramento seine routes are only sampled between October and January (see comments above). The beach seine sites on the San Joaquin River are only sampled by boat when there is sufficient water depth for these sites to be accessible; otherwise, alternate sites that are accessible by truck are sampled (see comments above). All other sites are sampled year round if weather and physical site condition permits. Beach seine sites are evaluated regularly for access and suitability, and, since 1993, if the original seine site was compromised or was not suitable, an alternative site adjacent (within 50 m) to the original may have been selected.

Before August 1, 1977 all Chinook salmon captured were measured and fork lengths recorded. Between August 1, 1977 and July 31, 1992 only 50 Chinook salmon from each sample taken were measured and those not measure were recorded as a total sum, minus those measured. After August 1, 1992 fifty individuals from each race of Chinook salmon were measured and those not measured were summed and assigned a count reference number to associate with measured Chinook salmon. After August 1, 2007 the need for count reference numbers was eliminated as unmarked Chinook salmon and their associated summed counts were automatically raced in the database.

Our database program uses a length at date captured criteria to calculate the salmon race (see "Race Table" under the data tab, <http://www.fws.gov/stockton/jfmp/>). Fish that are not measured are designated with a fork length of "0" and a summed count of "1" or greater. Chinook salmon that were not measured between August 1, 1977 and July 31, 1992 are not able to be raced nor are they able to be associated with any measured fish.

Since July 1995, fish species collected shorter than 25 mm FL are considered to be too small to be accurately identified in the field and as such are not recorded. Exceptions to this are: rainwater killifish, Sacramento sucker, mosquito fish, Sacramento splittail and three-spine sticklebacks which are considered identifiable down to 20 mm FL in the field.

Flow meters are checked every six months for accuracy using flow tanks at the UC Davis campus and if a meter's discrepancy is greater than 5% outside of the factory stated calibration (K factor = 0.026873) then it is taken out of service and replaced with a meter that is within 5% of specifications. Previously, before 2007, re-calculated K factors were applied to each meter tested. K factors are used to calculate catch per unit effort (CPUE)

and different K factors could be used depending on which meter was used at what time. Currently, we use one K factor for all flow meters, past or present, and assume an error rate up to 5%. CPUE = (Total flow meter value) x (mouth area of net) x (K factor).

Table 7. Idiosyncrasies, changes over time and special events

Changes in Procedure	Date	Reason or Result
Juvenile salmon monitoring program started	1976	To monitor impact of water projects on juvenile salmon
Mid-water trawls conducted at Clarksburg	1976-1981	Recovery of marked fish released upstream
Gear Condition Codes 5, 6 and 7 used for some samples	1976-1992	To indicate: non-target species caught, or numbers were estimated, or 100-150 ft. seine nets were used.
No start or end values recorded for flow meters, only total meter entered into database	1976-1986	Transcription efficiency
Beach seining moved from beaches to boat ramps on Lower Sacramento River	1978	Many of the beaches previously sampled were rip-rapped
Reassigned beach seining sites upstream of Colusa to Red Bluff office	1982	Travel times to and from sample sites were unreasonable.
Numbers of a salmon race in excess of 50 are plus counted	1983	Sampling efficiency
All beach seine CWT fish frozen w/o head tags	1983-1985	Measured frozen and tried to match to fresh catch measurement
All Chipps Island Trawl CWT fish frozen w/o head tags	1985	Measured frozen and tried to match to fresh catch measurement
All beach seine CWT fish frozen w/o head tags	1987-1988	Measured frozen and tried to match to fresh catch measurement
All Chipps Island Trawl CWT fish frozen w/o head tags	1987-1989	Measured frozen and tried to match to fresh catch measurement
All Sacramento Trawl CWT fish frozen w/o head tags	1989-1990	Measured frozen and tried to match to fresh catch measurement
All Courtland Trawl CWT fish frozen w/o head tags	1990	Measured frozen and tried to match to fresh catch measurement
Net dimensions and flow meter values started being recorded for catch per cubic meter calculations	1985	To determine volume of water sampled
Mid-water trawls conducted at Courtland and Hood	1990	* See notes below
Program's objective broadened to include all races of juvenile salmon	1992	Obtain information on all races of juvenile salmon
Tow net used at Sherwood Harbor	1991-1992	Index abundance of fry entering the delta
Push-net used on Sacramento & Mokelumne Rivers, Georgiana & Rock Sloughs	1992-1994	Alternative sampling methods evaluated
Salmon identified by race, determined by size criteria	1993	Estimate abundance of each race
Beach seining conducted on a year round basis	1993	To obtain information on all races of juvenile salmon
Kodiak trawls routinely conducted at Sherwood Harbor	1994	Greater chance of capturing larger, less abundant races of salmon
Beach seining was expanded to include San Joaquin River and South Delta	1994	Greater coverage of spatial area for juvenile salmon
Size restriction on measuring fish <25 mm FL	07/09/1995	Difficult to identify larval fish in field accurately
Flow meter gear ID recorded	1996	Document changing K factors
15 minute rule formalized on all disturbed areas prior to sampling	1996	To negate influences of recreational users and boat traffic on sampling results
Temperatures recorded in °C instead of °F	1996	To be consistent with scientific literature
Beach seines reinitiated in San Francisco and San Pablo Bays	1997	Greater spatial coverage for juvenile salmon

Table 7. Continued

New net with a bigger mesh (1/4" changed to 5/16") used on Chipps trawl, not used consistently.	10/06/1997	To reduce capture of juvenile and larval Delta smelt
Adult salmon and steelhead counted, but not measured. Documented as >500 mm & >300 mm, respectively.	1998	Reduces handling stress
Fish not identified by species recorded as unidentified species	2000	Makes the database more consistent and less ambiguous
Program name changed to the Delta Juvenile Fish Monitoring Program	2001	To reflect broadened objectives and catch of multiple species
Larger mesh trawl nets (5/16") used consistently at Chipps Island for midwater trawls	11/01/2001	Previously, we used several trawl nets with smaller mesh sizes (1/4") intermittently at Chipps Island.
New seine nets ordered and 15 m measuring tape attached to nets	2004	To ensure accurate measurement of sampling area. Previous nets were found to be short 1-2 meters.
Gear Condition Code 4's are entered into database	08/01/2006	To provide electronic documentation of when sites are not sampled
Small gauge wires used to secure flow meters	10/06/2006	To reduce turbulence and improve flow meter accuracy
Chinook salmon automatically raced in database	08/01/2007	Count referencing not required
Turbidity, D.O., & Conductivity measurements taken	08/01/2011	To provide environmental data for all sites
Mossdale trawl sampling area shift	08/01/2011	Bridge avoidance
Sampling efforts curtailed at Chipps Island	10/21/2011	To limit delta smelt catches
All sampling nets re-measured, new nets ordered	05/01/2012	Standardization & documentation
Gear Condition Code 9's entered into database	04/01/2013	Fish gilled in nets, but not caught. Species take reports

* Sampling conducted at Hood in February, March for winter run salmon to compare results with earlier study conducted at same location by Ray Shaffter (CDFG) in 1973.

* Sampling conducted near "Courtland" to determine how juvenile salmon were horizontally distributed across the channel just upstream of the Delta Cross Channel.

Field Sampling

Gear type or field instrument used:

Beach Seines

- A 50 ft. x 4 ft. (15.2 m x 1.3 m) seine net with 35 lb. Delta 1/8 inch (0.3 cm) square mesh and a 4 ft. x 4 ft. (1.3 m x 1.3 m) bag. Each net has a float line and lead line attached to 6 ft. (1.8 m) wooden poles at each end.
- An YSI Model 30 electro-conductivity meter for recording conductivity and temperature became part of the program's standard operating procedure in 1999, and an YSI Model 85 salinity, conductivity, dissolved oxygen and temperature meter became part of the program's standard operating procedure in 2010.
- A darkened bottle containing MS-222 in solution and two shallow 2 gal. (7.6 l) tubs for the anesthetizing and recovery of fish. Became part of the program's standard operating procedure in 2005.

- A sub-sampling kit composed of graduated containers of different sizes (4 liter, 700 ml and 600 ml) with 2 mm holes in the bottoms to allow drainage. Became part of the program's standard operating procedure in 2005.
- A Celsius thermometer (analog) is also available if a YSI meter is not.

Nets and gear used while seining are numbered and are uniquely identified and specifically used for individual routes to help prevent the spread of invasive species as part of our Hazard Analysis Critical Control Point Program (HACCP). This became part of the program's standard operating procedure in 2005.

Trawling

- Secchi disc
- Calibrated Flow meter, General Oceanics Inc., Model # 2030R.
- An YSI Model 85 became part of the program's standard operating procedure in 2010.
- The mid-water trawl net used at Sacramento is composed of six panels, each decreasing in mesh size towards the cod end. Fully extended mouth size is 13.6 ft. x 16.4 ft. (4.15 m x 5.0 m) dry measurement and mesh size range from 8 inch (20.3 cm) stretch at the mouth to ½ inch (1.3 cm) stretch just before the cod end. The cod end is composed of 1/8 inch (0.3 cm) weave mesh. Doors made of ¼ inch (0.6 cm) stainless steel (one on each side of the bottom of the net) are attached to the net with shackles and connected to bridles with chain and then Miller Swivels. Hydrofoils with floats spread the top of the net at water level and are attached using the same equipment as the depressors. One hundred foot long ¼ inch (0.6 cm) diameter Amsteel rope bridles are attached to Miller Swivels and attached to the cables from the boat. The net is fished 100 ft. (30.5 m) from the boat (swivels are located just aft of the A-frame). Actual fishing dimensions of the net vary due to currents and weather conditions and have been described in past reports (1992 Annual Report, Sacramento/San Joaquin Estuary Fishery Resource Office, U. S. Fish and Wildlife Service, Stockton, California, 1993, pp. 23-27).
- The larger mid-water trawl net used at Chipps Island is similar in construction to the mid-water trawl net used at Sacramento and has a mouth dimension of 25.1 ft. x 31.7 ft. (7.64 m x 9.65 m) dry measurement. Six panels, each decreasing in mesh size towards the cod end. Mesh sizes ranged from 4 inch to ½ inch (10 cm to 1.3 cm) stretch just before the cod end. Cod end is composed of 5/16 inch (0.8 cm) knotless material. Depressors and hydrofoils were connected in the same manner as with the smaller Sacramento mid-water trawl. The net is fished 150 ft. (45.7 m) aft of the vessel.
- Kodiak trawl nets are used at Sacramento and Mossdale. They have variable mesh with fully expandable mouth openings of 6.4 ft. x 25 ft. (1.96 m x 7.62 m) dry measurement.
- Although called mid-water trawling, the trawls for all sampling are towed at the surface.

The estimated fishing net mouth area, extrapolated from mid-water trawl studies (United States Fish and Wildlife Service, 1993), is 12.5 m² for the Kodiak trawl, 18.6 m² for Chipps Island mid-water trawl and 5.08 m² for the smaller Sacramento mid-water trawl.

The Kodiak trawl nets have a float line and lead line attached to spreader bars that enables the net to fish the top 1.8 m of the water column. It is also fished with an aluminum live box as a cod end to avoid excessive fish mortality. Two boats tow the Kodiak net through the water, one pulling each wing. At the end of each tow, field crew on one of the boats retrieve the live box from the end of the net and remove the fish. To help prevent the spread of invasive species as part of our Hazard Analysis Critical Control Point Program (HACCP) trawl net and sampling gear are dedicated to specific sampling areas and sampling sites are visited in order from upstream to downstream.

Beach Seining

For on-shore sampling, a 50' (15.2 m) beach seining net is used. One person holds one end of the net on shore while the other person wades out to either the length of the net, a maximum 1.2 m depth or to where a break or obstruction occurs on the slope. The depth and distance out from shore is recorded in meters, which are pre-marked on each net. The person on shore brings the other end of the net out and the first person then stretches the net across parallel to the shore until either the full 15 m are deployed or an obstruction is reached. If the distance is less than 15 m the net is pulled taut and the measurement (in m) is recorded. The net is then pulled in towards the shore using the attached 6 ft (1.8 m) wooden poles, keeping the lead line on the bottom. Average depth (calculated from the two ends of the net), width, and length of the net are also recorded.

Trawling

On mid-water boat trawls, the cod end of the net is tied with a quick release knot and thrown overboard when the boat operator has given the signal to toss. The Amsteel lines on the hydraulic spools are let out until the net has reached the proper distance from the boat (Chipps Island 45.7 m; Sherwood Harbor 30.5 m). The hydraulic spools are locked in place and the boat maintains a steady trawl speed for 20 minutes. Once time has been reached, the hydraulic spools are engaged to bring the net back in. Crew members haul the net back into the boat and pile it loosely in the stern of the boat. The cod end is picked up over the transom, untied and the contents are released into one of the water filled tubs. The fish are then counted in the same way as for beach seining as described below in the fish handling section. The measured and counted fish are then placed into another tub that has flowing water for recovery prior to release.

For Kodiak trawls, a live box is attached to the cod end and the cod end is left untied. At the end of each tow, one boat maintains headway with both wings of the net attached while the other boat motors back to retrieve the live box and process the catch.

Efficiency Studies

Attempts are being made to determine both the seine and trawl efficiency of our sampling efforts.

Fish Handling and Identification

The bag of the net is collected and placed into a 10 gallon (38 l) tub with water from the river or bay. The net is thoroughly checked to ensure no fish are unaccounted for. Every organism found is placed in the tub. Fish are retrieved from the tub with a small hand net and are placed on a measuring board for identification to species and to obtain fork length measurements (in mm). The fish are then transferred to a 5 gallon (19 l) recovery bucket prior to being released.

Thirty individuals from each species are measured. The sum of all individuals in excess of these 30 is also recorded. The endangered, threatened, or species of management concern-- Chinook salmon, delta smelt, green sturgeon, hardhead, longfin smelt, river lamprey, Sacramento perch, Coho salmon and steelhead-- 50 of each species or race of salmon are measured with the remaining enumerated. Chinook salmon with a clipped adipose fin are brought back to the office to extract the embedded coded wire tags. A coded wire tag detector wand (Northwest Technologies) is used for adipose clipped Steelhead trout to determine the presence of coded wire tags. Those with embedded coded wire tags are brought back to the office.

If there are too many fish recovered (>2000), a sub-sample may be taken from the recovery tub and placed into six sub-samples, after first ensuring that a homogenous mix has been achieved. A graduated container, with holes in the bottom to allow for water drainage, is used to collect sub-samples. Sub-samples are then placed into flow through containers which are transferred to another tub to await identification, measurement and enumeration. Once a volume has been determined, remaining fish are then released to minimize handling stress and overcrowding. Measurements, numbers of individuals and the species composition of sub-samples are then extrapolated to the population previously in the tub. This new sub-sampling protocol was implemented in 2005. In the early 1980's sub-sampling was conducted at Chipps Island using a graduated cylinder and discarding the excess water. In addition, reducing sampling times or areas have also been employed to reduce catch if too many fish are caught or the catch rate is anticipated to be high.

Physical Data Documentation

For each site sampled, a separate data sheet is used to record data. Much of the same physical data is recorded for both seines and trawls; this includes location, station code, sample date, sample time, gear code, conductivity, dissolved oxygen, turbidity, water temperature, weather code, gear serial numbers, and names of the crew involved. For beach seines, the measurement of the area seined and the substrate code are recorded. The volume of water sampled is determined by the product of the net length, width and depth multiplied by 0.5. For boat trawls, tow number, tow duration, tow direction, vessel used, and start and end values of the flow meter are recorded. For boat trawls, volume of water sampled is determined by subtracting the start from the end values of the flow meter and multiplied by the net size (face area) and then multiplied by a flow meter

correction factor supplied by the manufacturer (Standard Factory K Value = 0.026873). Flow meters are checked annually at the University of California Davis to ensure accuracy. The flow meters are not calibrated, but the K values for the flow meters are re-estimated. If the K values are greater or less than 10% of the standard factory K value then the flow meter is taken out of service and replaced with one that is within tolerance.

The field “condition” is used to qualify data. A condition of “1” indicates no variation from the standard procedure. Condition of “2” indicates a less than perfect set of the net or an improperly tied net. A condition of “3” indicates that a sample was taken, but the catch was impeded by a blockage in the net or the net came untied completely. A condition of “4” indicates that a sample was not taken. A “code 4” has not been entered into the database prior to the 2006 field season. In 1976, 1977, 1981 and 1984 codes 5, 6 and 7 were recorded for Chipps Island and Clarksburg trawls and some seines. A condition code of “5” indicates that other species (other than Chinook) were caught, but were not recorded. A condition code of “6” indicates that the count of individual organisms was estimated. A condition code of “7” indicates that a 100-150 ft. (30.5 - 45.7 m) seine net was used.

References to any written protocols and how to obtain a copy: The Standard Operating Procedures manual (SOP) is updated on an annual basis and is available for review at the Stockton Fish and Wildlife Office.

Changes in gear or procedures that affected the data over time: Boat trawls conducted at Sherwood Harbor change from a Kodiak trawl, which uses two boats and a larger net (12.5 m² face area) to a mid-water trawl, which uses one boat and a smaller net (5.1 m² face area) usually from April 1st to September 30th to keep in accordance with historical sampling methods and to reduce operating costs. The Kodiak trawl is more efficient in capturing the larger and less abundant salmon races and is used from October 1st through March 31st. During high water or high debris events, the mid-water trawl is used during these months instead of the Kodiak trawl for fish health and safety reasons.

Quality assurance/control (QA/QC) procedures: Since 2001, a fishery biologist has been responsible for training field personnel in the identification of fish species and implementing a QA/QC program for fish identification in the field. The QA/QC program includes testing field fish identification skills twice a year at various life history stages, reviewing preserved fish samples and accompanying field personnel in the field to assure the correct identification of the fish species collected. All personnel are trained following standard operating procedures (SOP) for field sampling during their first week of employment and then work with experienced employees for the first 3 months of their employment. The field personnel are often tested using preserved and wild specimens to insure the correct identification of fish species in various stages of their life cycles. All unknown fish species found in the field are brought back to the office for identification.

Table 8. QA/QC activity

Activity	Primary	Secondary
Fish Identification	Printed photos, preserved fish collection, QC biologist, experienced field partner	Lab work and routine testing of identification skills

Data Entry	Data sheets proofed before entry, line by line proofing after entry	Spot checks, random queries, end of year proofing
Employee Training	Standard Operating Procedures, Training checklist	Experienced field partner first 3 months, formal training

Standard operating procedures and various reference sources on fish and invertebrate identification are used, including:

Cairns, Stephen D., et al. Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Cnidaria and Ctenophora. Am. Fish. Soc. Sp. Pub. 28, 2nd ed., 2002.

McLaughlin, Patsy A., et al. Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Crustaceans. Am. Fish. Soc. Sp. Pub. 31, 2005.
Miller, Daniel and Lea, Robert. Guide to the Costal Marine Fishes of California: California Fish Bulletin Number 157. Berkeley: The University of California Press, 1975.

Moyle, Peter. Inland Fishes of California. Berkeley: The University of California Press, 2002.

Nelson, Joseph, et al. Common and Scientific Names of Fishes from the United States, Canada and Mexico, Sixth Edition. Bethesda: American Fisheries Society Special Publication 29, 2004.

Turgeon, Donna, D., et al. Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Mollusks. Am. Fish. Soc. Sp. Pub. 26, 2nd ed., 1998

U.S. Fish & Wildlife Service Standard Operating Procedures, U.S. Fish & Wildlife Service, Stockton, California, 2005.

Laboratory analysis – Chemical – n/a
Laboratory analysis – Biological

Current procedure since (1984)

Historical procedures (if known) or reference to other documentation: Chinook salmon and Steelhead/Rainbow trout that have been tagged with a coded wire tag are brought back to the office to have the tags removed and read. All adipose fin clipped (ad-clipped) salmon are returned to the office for tag processing, while ad-clipped Rainbow trout are checked with a Northwest Marine Technologies wand CWT detector to determine if there is the presence of a coded wire tag. The coded wire tags are read twice and any discrepancies are resolved with a third reading.

Reference used for identification of organisms: Moyle, Peter. Inland Fishes of California. Berkeley: The University of California Press, 2002.

Location of reference collection: STFWO Field Office

Appendix

Table 9. Species list

OrganismCode	Common Name	Family	Genus	Species
AAURIT	moon jelly	Ulmaridae	Aurelia	aurita
ACL	Asian clam	Sphaeriidae	Potamocorbula	amurensis
ALABIA	Aurelia labiata	Ulmaridae	Aurelia	labiata
AME	American eel	Anguillidae	Anguilla	rostrata
AMS	American shad	Clupeidae	Alosa	sapidissima
ARG	arrow goby	Gobiidae	Clevelandia	ios
BAS	bass unknown	Centrarchidae	Micropterus	n/a
BG	bay goby	Gobiidae	Lepidogobius	lepidus
BGS	bluegill	Centrarchidae	Lepomis	macrochirus
BKB	black bullhead	Ictaluridae	Ameiurus	melas
BKS	black crappie	Centrarchidae	Pomoxis	nigromaculatus
BLC	blue catfish	Ictaluridae	Ictalurus	furcatus
BMS	bigmouth sole	Paralichthyidae	Hippoglossina	stomata
BPF	bay pipefish	Syngnathidae	Syngnathus	leptorhynchus
BRB	brown bullhead	Ictaluridae	Ameiurus	nebulosus
BRF	Brown Rockfish	Scorpaenidae	Sebastes	auriculatus
BRY	bat ray	Mobulidae	Myliobatis	californica
BSFP	black perch	Embiotocidae	Embiotoca	jacksoni
BSK	big skate	Rajidae	Raja	binoculata
BSM	brown smoothhound	Carcharhinidae	Mustelus	henlei
BSP	barred surfperch	Embiotocidae	Amphistichus	argenteus
BT	brown trout	Salmonidae	Salmo	trutta
BUT	butter sole	Pleuronectidae	Isopsetta	isolepis
BVIRGI	Blackfordia virginica	Blackfordiidae	Blackfordia	virginica
C	common carp	Cyprinidae	Cyprinus	carpio
CAH	California halibut	Bothidae	Paralichthys	californicus
CAR	California roach	Cyprinidae	Hesperoleucus	symmetricus
CAT	catfish unknown	Ictaluridae	n/a	n/a
CBZ	cabezon	Cottidae	Scorpaenichthys	marmoratus
CCAPIL	lions mane	Cyaneidae	Cyanea	capillata
CFUSCE	Chrysaora fuscescens	Pelagiidae	Chrysaora	fuscescens
CHC	channel catfish	Ictaluridae	Ictalurus	punctatus
CHG	chameleon goby	Gobiidae	Tridentiger	trigonocephalus
CHN	Chinook salmon	Salmonidae	Oncorhynchus	tshawytscha
CHO	coho salmon	Salmonidae	Oncorhynchus	kisutch
CMC	Chinese mitten crab	Varunidae	Eriocheir	sinensis
Cnidaria	Cnidarian unknown	n/a	n/a	n/a
CPY	crappie unknown	Centrarchidae	Pomoxis	n/a
CRKF	crevice kelpfish	Clinidae	Gibbonsia	montereyensis
CSG	cheekspot goby	Gobiidae	Llypnus	gilberti
CSN	sunfish unknown	Centrarchidae	n/a	n/a
CSP	calico surfperch	Embiotocidae	Amphistichus	koelzi
Cspp	Crangon Spp.	Crangonidae	Crangon	n/a
DACE	speckled dace	Cyprinidae	Rhinichthys	osculus
DMT	diamond turbot	Pleuronectidae	Pleuronichthys	guttulatus

Table 9. Continued

OrganismCode	Common Name	Family	Genus	Species
DSH	Dock Shrimp	Pandalidae	Pandalus	danae
DSM	Delta smelt	Osmeridae	Hypomesus	transpacificus
DSP	dwarf surfperch	Embiotocidae	Micrometrus	minimus
EEL	eel unknown	n/a	n/a	n/a
ELS	English sole	Pleuronectidae	Parophrys	vetulus
EXP	Siberian prawn	Palaemonidae	Exopalaemon	modestus
FHM	fathead minnow	Cyprinidae	Pimephales	promelas
FLF	flatfish unknown	n/a	n/a	n/a
FWH	freshwater hydroid	Clavidae	Cordylophora	caspia
GBY	goby unknown	Gobiidae	n/a	n/a
GF	goldfish	Cyprinidae	Carassius	auratus
GKF	giant kelpfish	Clinidae	Heterostichus	rostratus
GSF	green sunfish	Centrarchidae	Lepomis	cyanellus
GSM	grey smoothhound	Carcharhinidae	Mustelus	californicus
GSN	golden shiner	Cyprinidae	Notemigonus	crysoleucas
GST	green sturgeon	Acipenseridae	Acipenser	medirostris
HCH	hitch	Cyprinidae	Lavinia	exilicauda
HER	herring unknown	Clupeidae	n/a	n/a
HH	hardhead	Cyprinidae	Mylopharodon	conocephalus
Hspp	Heptacarpus Spp.	Hippolytidae	Heptacarpus	n/a
JSM	jacksmelt	Atherinidae	Atherinopsis	californiensis
KOS	kokanee salmon	Salmonidae	Oncorhynchus	nerka
KSP	kelp perch	Embiotocidae	Brachyistius	frenatus
LAM	lamprey unknown	Petromyzontidae	Lampetra	n/a
LFS	longfin smelt	Osmeridae	Spirinchus	thaleichthys
LIC	lingcod	Hexagrammidae	Ophiodon	elongatus
LMB	largemouth bass	Centrarchidae	Micropterus	salmoides
LMS	longjaw mudsucker	Gobiidae	Gillichthys	mirabilis
LP	bigscale logperch	Percidae	Percina	macrolepidia
LPS	leopard shark	Triakidae	Triakis	semifasciata
MIN	minnow unknown	Cyprinidae	n/a	n/a
MMARGI	Black Sea jellyfish	Olindiidae	Maeotias	marginata
MOERIS	Moerisia sp.	Moerisiidae	Moerisia	sp.
MQF	western mosquitofish	Poeciliidae	Gambusia	affinis
MSS	inland silverside	Atherinopsidae	Menidia	beryllina
NAN	northern anchovy	Engraulidae	Engraulis	mordax
NPK	northern pike	Esocidae	Esox	lucius
NSM	night smelt	Osmeridae	Spirinchus	starksi
ORSH	oriental shrimp	Palaemonidae	Palaemon	macrodactylus
OSH	opossum shrimp	Mysidae	Antromysis	cenotensis
PAH	Pacific herring	Clupeidae	Clupea	pallasii
PBACHE	comb jelly	Pleurobrachiidae	Pleurobrachia	bachei
PBL	western brook lamprey	Petromyzontidae	Lampetra	richardsoni
PBU	Pacific pompano	Stromateidae	Peprilus	simillimus
PCAMTS	egg yolk jelly	Ulmaridae	Phacellophora	camtschatica
PCH	perch unknown	Percidae	n/a	n/a
PCOLOR	purple-striped jelly	Pelagiidae	Pelagia	colorata

Table 9. Continued

OrganismCode	Common Name	Family	Genus	Species
PELR	Pacific electric ray	Torpedinidae	Torpedo	californica
PHA	Pacific halibut	Pleuronectidae	Hippoglossus	stenolepis
PHAP	penicillate jellyfish #2	Polyorchidae	Polyorchis	haplus
PKS	pink salmon	Salmonidae	Oncorhynchus	gorbuscha
PL	Pacific lamprey	Petromyzontidae	Lampetra	tridentata
PMP	plainfin midshipman	Batrachoididae	Porichthys	notatus
PPE	pile perch	Embiotocidae	Rhacochilus	vacca
PPENIC	penicillate jellyfish #1	Polyorchidae	Polyorchis	penicillatus
PRS	prickly sculpin	Cottidae	Cottus	asper
PS	Pacific sanddab	Paralichthyidae	Citharichthys	sordidus
PSA	Pacific sardine	Clupeidae	Sardinops	sagax
PSF	pumpkinseed	Centrarchidae	Lepomis	gibbosus
PspP	Palaemonetes Spp.	Palaemonidae	Palaemonetes	n/a
PSS	Pacific staghorn sculpin	Cottidae	Leptocottus	armatus
PTG	penpoint gunnel	Pholidae	Apodichthys	flavidus
PTO	Pacific tomcod	Gadidae	Microgadus	proximus
RBT	rainbow / steelhead trout	Salmonidae	Oncorhynchus	mykiss
RDG	red gunnel	Pholidae	Pholis	schantzi
REB	redest bass	Centrarchidae	Micropterus	coosae
RES	redest sunfish	Centrarchidae	Lepomis	microlophus
RFF	righteye flounder unknown	Pleuronectidae	n/a	n/a
RFK	rainwater killifish	Fundulidae	Lucania	parva
RFS	rosyface shiner	Cyprinidae	Notropis	rubellus
RL	river lamprey	Petromyzontidae	Lampetra	ayresii
ROC	rockfish unknown	Scorpaenidae	n/a	n/a
ROS	rock sole	Pleuronectidae	Lepidopsetta	bilineata
RSC	rifle sculpin	Cottidae	Cottus	gulosus
RSN	red shiner	Cyprinidae	Cyprinella	lutensis
RSP	redtail surfperch	Embiotocidae	Amphistichus	rhodotus
RSU	rubberlip seaperch	Embiotocidae	Rhacochilus	toxotes
SAPM	Sacramento pikeminnow	Cyprinidae	Ptychocheilus	grandis
SAS	sand sole	Pleuronectidae	Psettichthys	melanostictus
SASU	Sacramento sucker	Catostomidae	Catostomus	occidentalis
SBG	saddleback gunnel	Pholidae	Pholis	ornata
SBS	saddleback sculpin	Cottidae	Oligocottus	rimensis
SCB	Sacramento blackfish	Cyprinidae	Orthodon	microlepidotus
SCU	sculpin unknown	Cottidae	n/a	n/a
SDO	spiny dogfish	Squalidae	Squalus	acanthias
SHG	Shokihaze goby	Gobiidae	Tridentiger	barbatus
SHI	shiner unknown	Cyprinidae	n/a	n/a
SHM	shimofuri goby	Gobiidae	Tridentiger	bifasciatus
SHRIMP	shrimp unknown	n/a	n/a	n/a
SIL	silversides unknown	n/a	n/a	n/a
SKP	striped kelpfish	Clinidae	Gibbonsia	metzi
SMB	smallmouth bass	Centrarchidae	Micropterus	dolomieu
SMT	smelt unknown	Osmeridae	n/a	n/a
SMU	striped mullet	Mugilidae	Mugil	cephalus

Table 9. Continued

OrganismCode	Common Name	Family	Genus	Species
SPACIF	Scrippsia pacifica	Polyorchidae	Scrippsia	pacifica
SPB	spotted bass	Centrarchidae	Micropterus	punctulatus
SPCH	spotfin surfperch	Embiotocidae	Hyperprosopon	anale
SPK	speckled sanddab	Paralichthyidae	Citharichthys	stigmaeus
SPLT	splittail	Cyprinidae	Pogonichthys	macrolepidotus
SPR	Sacramento perch	Centrarchidae	Archoplites	interruptus
SRF	shiner perch	Embiotocidae	Cymatogaster	aggregata
SSM	surf smelt	Osmeridae	Hypomesus	pretiosus
STB	striped bass	Moronidae	Morone	saxatilis
STF	starry flounder	Pleuronectidae	Platichthys	stellatus
STSP	Striped Seaperch	Embiotocidae	Embiotoca	lateralis
STU	sturgeon unknown	Acipenseridae	Acipenser	n/a
SUC	sucker unknown	Catostomidae	n/a	n/a
SVR	silver surfperch	Embiotocidae	Hyperprosopon	ellipticum
TC	tui chub	Cyprinidae	Gila	bicolor
TFS	threadfin shad	Clupeidae	Dorosoma	petenense
TGO	tidewater goby	Gobiidae	Eucyclogobius	newberryi
THORNB	Thornback Ray	Platyrrhinidae	Platyrrhinoidis	triseriata
TP	tule perch	Embiotocidae	Hysterothorax	traskii
TPS	tidepool sculpin	Cottidae	Oligocottus	maculosus
TSM	topsmelt	Atherinopsidae	Atherinops	affinis
TSS	threespine stickleback	Gasterosteidae	Gasterosteus	aculeatus
UNID	unidentified fish	n/a	n/a	n/a
W	warmouth	Centrarchidae	Lepomis	gulosus
WAG	wakasagi	Osmeridae	Hypomesus	nipponensis
WBS	whitebait smelt	Osmeridae	Allosmerus	elongatus
WCK	white croaker	Sciaenidae	Genyonemus	lineatus
WEE	wolf-eel	Anarrhichadidae	Anarrhichthys	ocellatus
WHB	white bass	Moronidae	Morone	chrysops
WHC	white catfish	Ictaluridae	Ameiurus	catus
WHS	white crappie	Centrarchidae	Pomoxis	annularis
WSP	walleye surfperch	Embiotocidae	Hyperprosopon	argenteum
WST	white sturgeon	Acipenseridae	Acipenser	transmontanus
WTSP	white seaperch	Embiotocidae	Phanerodon	furcatus
YEB	yellow bullhead	Ictaluridae	Ameiurus	natalis
YEP	yellow perch	Percidae	Perca	flavescens
YFG	yellowfin goby	Gobiidae	Acanthogobius	flavimanus