Interagency Ecological Program San Francisco Estuary Spring Kodiak Trawl Survey (SKT) Metadata

Contents

Study Management

IEP Study Name: Spring Kodiak Trawl (SKT)

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Study Overview

Purpose/Objective: The SKT fish survey monitors and provides information on pre-spawning and spawning Delta Smelt (*Hypomesus transpacificus*) in the upper San Francisco Estuary (SFE). The objectives of this project are to:

1) improve the ability to detect Delta Smelt,
2) obtain sexual maturity data of adult Delta Smelt, and
3) provide results to scientists and managers on a near real-time basis to aid in resource management decisions.

Data collected: Surface water temperature (°C), surface electro-conductivity (EC, μS/cm, normalized at 25 °C), Secchi depth (cm), water volume (m^3), tidal stage, and identification, counts, and lengths (mm, fork lengths or total length for species without a forked tail) of fishes to the lowest possible taxon.

History: The Spring Midwater Trawl (SMWT) was an extension of the Fall Midwater Trawl (FMWT) Survey and sampled the months of January, February, and March from 1991-2001. Data collected by the SMWT provided information on the distribution of pre-spawning Delta Smelt to assist in real-time management of water export operations within the Delta. In 1995, a net evaluation studies conducted by the Interagency Ecological Program (IEP) compared the relative efficiency of three types of nets (Chipps Island Trawl, Midwater trawl, and Kodiak trawl) and determined that the most effective net for sampling adult Delta Smelt was the Kodiak Trawl. As such, in 2002, the SMWT was changed from an obliquely towed Midwater trawl to a surface towed Kodiak trawl.

Study Design

Geographic range of work:

Number of sites: 39 core stations that have been sampled since 2002 (survey's inception). Beginning in 2005, 1 additional station was added. See the metadata section for additional details.

Data range: 2002-01-07 to 2022-05-12 (YYYY-mm-dd)

Sampling frequency: Sampling begins January and is conducted monthly. Sampling ends in the late spring (**month? May?**) or when spawning Delta Smelt can no longer be detected **(What are these specific ending conditions?)**. Standard sampling surveys are numbered 1-9, while supplemental sampling surveys are identified as ≥ 10.

Field Sampling Methods

Net: The SKT employs a standard Kodiak trawl. A weighted foot-rope and head-rope with floats allows the trawl to fish the top 1.8 meter of the water column. Specifications:

1. Net length: 19.8 m
2. Mouth opening (fully opened): 7.62 m by 1.83 m (an area of 13.9446 m^2)
3. Mesh size: variable; from 2" knotted stretched mesh at the mouth, decreasing by $\frac{1}{2}$" across a series of 5 panels to $\frac{1}{4}$" knotless stretched mesh at the cod-end. The cod end mesh size has changed several times over the years, specifically in 2004 and 2007 (Table 4). New nets were incorporated in 2014 but were made to specifications of the previous nets.

Biotic Data: The SKT is a fish survey with the primary goal of monitoring Delta Smelt, which is a surface oriented fish. However, all other fish, jellyfish, and shrimp species are also sampled if captured during a tow (all other invertebrate are not sampled; see Table 6). With exceptions of years early in the program (Table 4), all samples are processed, counted, and measured on board after each tow; only unidentifiable fish are returned to the CDFW Stockton laboratory for positive identification.

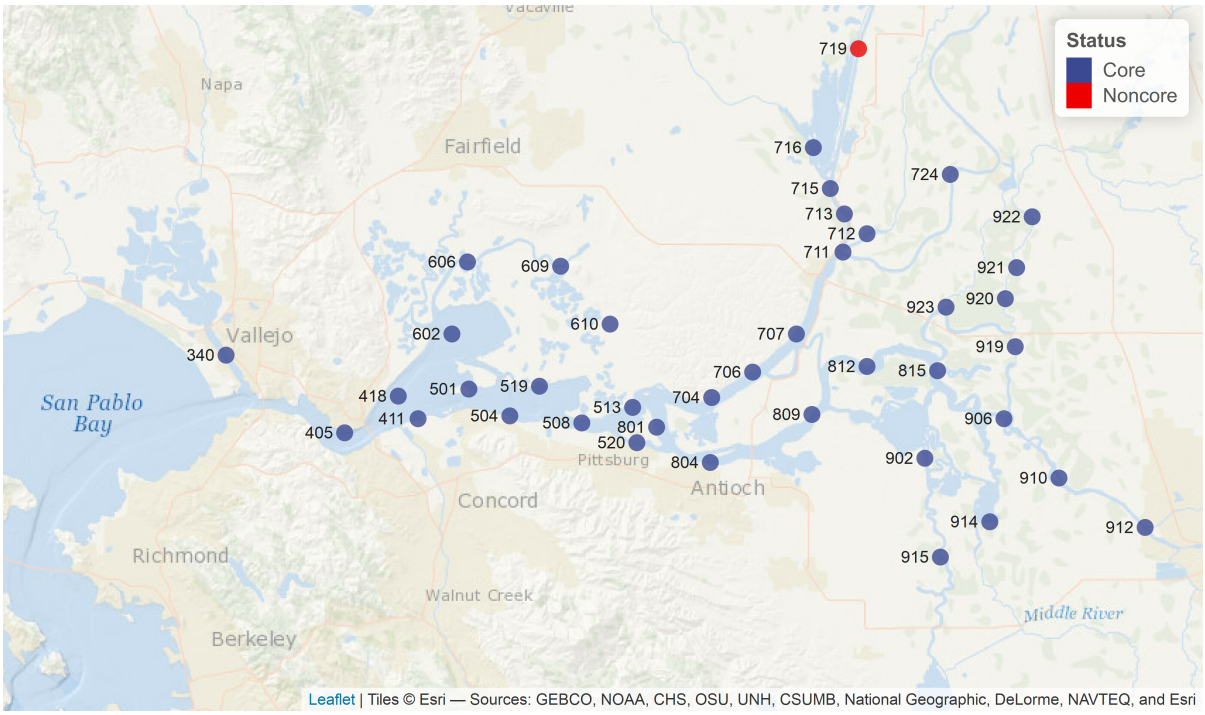

Figure 1: The geographic range of the SKT Survey covers a total of 40 primary sampling stations, each represented by a point on the map. The stations are color-coded based on their relationship with the SKT index calculation: blue "core" stations that are included in the calculation, and red "non-core" station(s) that is/are not included.

Environmental Data: Surface water temperature, surface turbidity, surface electroconductivity, Secchi depth, flow meter readings, water depth, and tidal stage are recorded (Table 1). Prior to each tow at each station, Secchi depth is measured off the shaded side of the boat, the surface of the water is sampled using a bucket, depth (ft) is recorded using a digital depth finder from the boat's navigation system, and tide data is documented visually by the captain (high slack, ebb, low slack, or flood). Immediately after the tow begins, a flow meter is tossed into the water and the beginning flow meter reading is recorded. Water temperature (°C), water turbidity, and water EC are then quickly recorded from the water sample taken prior to the start of the tow. At the end of the tow, the final flow meter reading is recorded.

Table 1: The SKT collects various environmental data per tow per station.

Variable	Equipment	Unit
Water temperature (surface)	YSI 30	°C
Water EC (surface)	YSI 30	µm/cm
Water turbidity (surface)	Hach Model #2100P	NTU
Secchi depth	Two meter sticks	m
Flow meter		
Depth	Onboard meter	Feet
Tide	Visual	

FILL in missing data for flow meter equipment

Tow:

1. Two boats are required to execute a Kodiak trawl: a net and a chase boat
2. Gear deployment: the boats should be positioned so that the designated station coordinates is halfway through the tow. To execute the tow, the tied-off cod-end of the net is thrown overboard and the bridles are guided by two deckhands over the stern to prevent snags. The net is allowed to free-spool until the warp line is out 110 feet. Once the winches have stopped, the chase boat will come alongside with its port side paralleled to the net boat to attach one side of the net. Once both sides are attached, both boats are put into forward gear, the net is opened, and the tow begins. Both boats are to remain parallel throughout the tow.
3. Duration: 9.5 minutes (9 minutes and 30 seconds)
4. Tows per station: 1
5. Re-tows: required if a tow is invalid for any reason, including any deviations from protocols. Examples include: abnormal flow meter readings (10,000 - 30,000), the cod-end has become untied, the net gets snagged, the net did not open correctly, or the net has filled with a large amount of mud or peat. If more than 20 minutes have elapsed since the environmental data were recorded, a new set must be recorded.
6. Habitat type bias(es): the Kodiak net only surveys the top 1.8 m of the water column and thus is biased to surface-oriented fishes.

Content processing: All fish are measured up to 50 individuals to the nearest mm fork length or total length (non-forked caudal tail). If there are more than 50 individuals, 50 individuals are randomly selected for measurements and the rest are enumerated as plus-counts or sub-sample.

1. Plus-counts is defined as counting all remaining individuals without taking length measurements to get a total catch number.
2. Subsampling is defined as counting individuals into sub-sample containers (usually 1 liter) and multiplying that count by the total number of sub-sample containers required to hold all remaining individuals. For example, 50 individuals are counted and measured + 100 individuals are required to fill a 1-liter container * 5 total 1-liter containers to hold all non-measured individual = 550 fish caught. Subsampling can occur for extremely large catches, such as of Threadfin shad, Northern anchovy, or Siberian prawns.
3. Unidentifiable fish are placed into 10% formalin and returned to the CDFW Stockton lab for identification.
4. Certain species are retained for further studies. Specifically, Longfin Smelt and Wakasagi are retained in ethanol, Delta Smelt in liquid nitrogen, and clipped salmonids in ice. All other species are released after being counted and measured. Sex and sexual maturity data are collected only for Delta Smelt, unless there is a special request for Longfin Smelt or a misidentification occurs.

Delta Smelt: The SKT focuses on the Delta Smelt and special considerations are given to the species. There are additional processing done to obtain sex and maturity data (Table 5) of all caught Delta Smelt and to collect various other components of the fish, e.g., eggs from ripe females, for further studies. The logistics for this additional processing have evolved over time:

Table 2: The SKT Survey focuses on collecting data on Delta Smelt and employs additional processing for the species. Over time, these sampling protocols have been refined to incorporate lessons learned and to minimize impact to the species.

Year	Processing
2002	The first year of the SKT during which all Delta Smelt were returned to the laboratory to determine sex and maturity stage (which includes the collection of eggs from females). As a result, all Delta Smelt lengths recorded for this year are affected by the effects of formalin preservation, i.e., shrinkage.

2003	Delta Smelt were returned to the laboratory during Surveys 11 (December) and 1 (January) to determine sexual maturity stage; the previously described formalin effects on fork length applies to these samples. For the remainder of the season, Delta Smelt were processed (sex and maturity stages) on board and, thus, all fork lengths for those individuals are fresh, i.e., not affected by shrinkage caused by formalin preservation.
2004	Due to limited funding, only egg samples from stage 4 females were retained, with a limit of no more than 30 stage 4 individuals per station. Sex and maturity stage data were still recorded for all individuals.
2005	Egg samples were taken only from stage 3 and 4 females, with a limit of no more than 20 fish per tow during non-supplementa surveysl and 30 fish per tow during supplemental surveys.
2006-present	All sampling is done on board. Egg samples are not explicitly sampled for other studies, and the entire fish is preserved.

Another consideration occurred in 2009 when a subsampling protocol was enacted to limit the number of Delta Smelt caught by the survey. Using historical SKT data, areas of high Delta Smelt catches are identified each year. In these areas, a 5-minute tow is conducted and up to 50 individuals are randomly selected to be measured, while the remaining are counted and released back into the wild. If there are less than 50 individuals caught, a second 5-minute tow is conducted and individual are counted and measured, but only up to 50 total individuals for the entire station. These subsampling events can be identified by their 5-minute tow durations, as compared to the normal 10-minute tows.

Flowmeter calibration: General Oceananics flowmeters are used to estimate the volume of water sampled by each net. This calculation relies on a calibration factor specific to the flowmeter model that equates the rotor constant with the number of counts during the tow (eq. 1). Prior to 2015, the calibration factor each every flow meter was calibrated at UC Davis before the start of the season. Beginning in 2015, the calibration flume at UC Davis became inoperable, and the meters were sent to General Oceanics for refurbishing before each field season to justify using the factory calibration factor. Since 2019, meters are inspected at the end of every field season and are replaced with brand new units if refurbshing is required.

Lab analysis, fish ID and QC

Fish caught by the SKT are generally adult fish and are easily identifiable; most samples are processed on board after each tow. Samples are only returned to the lab if the fish is unidentifiable or confirmation is required.

Calculations

Relative density analysis: Catch per unit effort (CPUE) is provided as catch standardized to 10,000 m^3 using the following two equations:

$$V_t = A * K * D_t \tag{1}$$

Where:

V_t = volume of water (m^3) filtered through the net per tow t

A = mouth opening of the net (13.9446 m^2)

K = calibration factor of the flow meter, 0.026873027 since 2015

D_t = difference in flow meter counts from start to finish of tow t

$$n_t = F_t/V_t * 10000m^3 \tag{2}$$

Where:

n_t = number of fish per 10,000 m^3

F_t = fish caught per tow t

V_t = volume of water filtered through the net m^3 per tow t

$$N_t = \frac{\sum n_t}{r_t} \tag{3}$$

Where:

N_t = number of fish per 10,000 m^3 per tow t

F_t = fish caught per tow t

V_t = volume of water filtered through the net m^3 per tow t

Delta Smelt Index of Relative Abundance:

$$I_y = \sum_{s=1}^{4} \sum_{r=1}^{3} N_{rs} \tag{4}$$

Where:

I = Delta Smelt Index of Relative Abundance of year y

s = survey, where 1 is the January Survey. Only the first four surveys (beginning in January) are used

r = region, the 39 SKT stations are defined across 3 regions (Table 6)

N = mean of CPUE (eq. 3) of Delta Smelt per region

Adjusted Count: This metric is provided in the "sktJoined" table, which integrates the relational tables together, calculated as:

$$F_{a,l} = T_c\left(\frac{F_{m,l}}{T_m}\right) \tag{5}$$

Where:

$F_{a,l}$ = adjusted frequency of each recorded length l

T_c = total catch

$F_{m,l}$ = measured frequency of each recorded length l

T_m = total number of fish measured

Data management

1. Application: Microsoft Office Access database
2. Datasheets: all hard copies are retained at the CDFW Stockton Office
3. Data entry protocols: field data is entered as soon as possible through a front-end application of the Access database by a dedicated Key Data Operator using forms
4. QAQC protocols: after data is entered, each entered row is checked with data recorded on the datasheet, a process known as a line-by-line. There are two line-by-lines done by separate staff after the initial data entry. At the end of the season when all field data has been entered, two additional line-by-lines occurs. After this, a survey lead runs a series of coded queries to analyze the underlying data distribution of the environmental data to flag potential outliers (generally calculated as beyond two standard deviations of the mean). Not all flagged data are outliers. These queries simply serve to alert the project lead of potentially erroneous data and care is taken to edit only data that truly needs to be edited, e.g., data entered incorrectly or caused by equipment failure. All queries are coded in Access and R, with the R script published in the EDI publication. All resulting data edits of these outlying data points are documented in a separate log file.
5. Publication:
    - Location: data is published across three main locations: 1) CDFW Tier 3 server, 2) CDFW FTP website, and 3) EDI repository
    - Frequency: per week for the CDFW Tier 3 server and per season for the CDFW FTP website and EDI repository. Due to the weekly frequency, data on the Tier 3 server includes more preliminary data than data on the FTP and EDI locations, and is meant to inform real-time management.

The provided data tables

Tables "tblCatch", "tblFishInfo", "tblOrganismCodes", "tblSample", and "tblStationCoordiantes" are available "relational tables" from the SKT Access database. These tables are presented "as-is", exported directly from Access from R without any modifications. The "sktJoined" table is the integrated dataset that combines these relational tables together (Figure 2) with various manipulations to make the data as usable as possible. Users should be aware of the differences in units and column names of the recorded values between the relational and integrated tables (documented in the metadata section of the EDI publication page). All steps are coded in R and the relevant codes are provided in the EDI publication and/or housed on trinhxuann/CDFW-IEP-Surveys Github page.

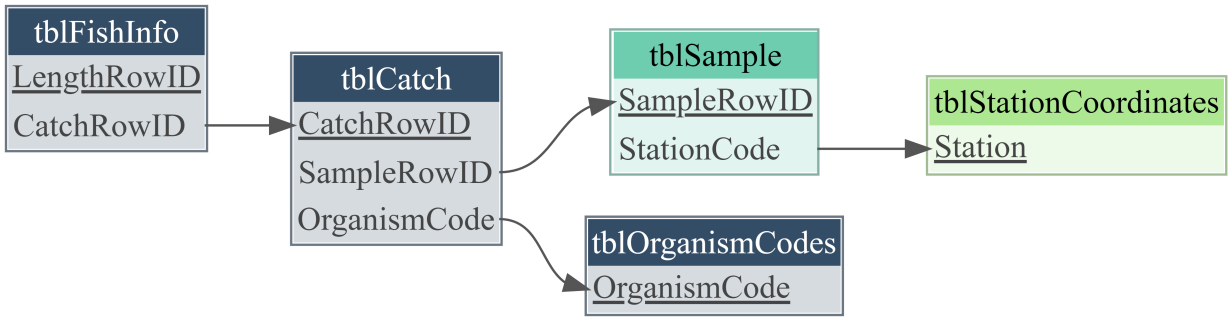

Figure 2: The relational schema between the relational tables in the SKT database, used to produce the "sktJoined" table.

Station Metadata

Table 3: List of stations sampled by SKT since its inception. "StartDate" indicates the date when sampling first began for a station, "EndDate" indicates the date when sampling last ended at a station, and "Ongoing" represents stations that are still actively sampled by the survey. The non-core station(s) is/are not included in the SKT Delta Smelt Index of Relative Abundance due to being included after the inception of the survey, but are still regularly sampled.

StationCode	StartDate	EndDate	Status
340	2002-01-08	Ongoing	Core
405	2002-01-08	Ongoing	Core
411	2002-01-08	Ongoing	Core
418	2002-01-08	Ongoing	Core
501	2002-01-08	Ongoing	Core
504	2002-01-09	Ongoing	Core
508	2002-01-09	Ongoing	Core
513	2002-01-09	Ongoing	Core
519	2002-01-09	Ongoing	Core
520	2002-01-09	Ongoing	Core
602	2002-01-08	Ongoing	Core
606	2002-01-08	Ongoing	Core
609	2002-01-08	Ongoing	Core
610	2002-01-08	Ongoing	Core
704	2002-01-09	Ongoing	Core
706	2002-01-08	Ongoing	Core
707	2002-01-08	Ongoing	Core
711	2002-01-10	Ongoing	Core
712	2002-01-10	Ongoing	Core
713	2002-01-10	Ongoing	Core
715	2002-01-10	Ongoing	Core
716	2002-01-10	Ongoing	Core
719	2005-02-10	Ongoing	Noncore
724	2005-02-25	Ongoing	Core
801	2002-01-09	Ongoing	Core
804	2002-01-09	Ongoing	Core
809	2002-01-07	Ongoing	Core
812	2002-01-07	Ongoing	Core
815	2002-01-07	Ongoing	Core
902	2002-01-07	Ongoing	Core
906	2002-01-07	Ongoing	Core
910	2002-01-07	Ongoing	Core
912	2002-01-07	Ongoing	Core
914	2002-01-07	Ongoing	Core
915	2002-01-07	Ongoing	Core
919	2002-01-07	Ongoing	Core
920	2002-01-07	Ongoing	Core
921	2002-02-04	Ongoing	Core
922	2002-02-04	Ongoing	Core
923	2002-02-04	Ongoing	Core
323	2017-01-13	2017-01-13	NA
328	2017-01-13	2017-01-13	NA
329	2017-01-13	2017-01-13	NA

334	2017-01-13	2017-01-13	NA
335	2017-01-13	2017-01-13	NA
336	2017-01-13	2017-01-13	NA
342	2006-02-28	2017-01-13	NA
343	2006-02-28	2017-01-13	NA
344	2006-02-28	2006-02-28	NA
345	2006-02-28	2006-02-28	NA
346	2006-02-28	2006-02-28	NA
507	2014-12-08	2014-12-08	NA
510	2014-12-08	2014-12-08	NA
511	2014-12-08	2014-12-08	NA
512	2014-12-08	2014-12-08	NA
515	2014-12-08	2014-12-08	NA
516	2014-12-08	2014-12-08	NA
517	2014-12-08	2014-12-08	NA
518	2014-12-08	2014-12-08	NA
608	2005-02-08	2014-12-08	NA
699	2003-03-04	2005-05-17	NA
701	2014-12-09	2014-12-09	NA
703	2014-12-09	2014-12-09	NA
705	2008-05-06	2014-12-09	NA
708	2014-12-09	2014-12-09	NA
709	2014-12-09	2014-12-09	NA
710	2014-12-09	2014-12-09	NA
725	2002-02-07	2005-04-18	NA
799	2003-03-03	2010-04-22	NA
807	2014-12-10	2014-12-10	NA
808	2014-12-10	2014-12-10	NA
814	2008-05-19	2008-05-19	NA
899	2004-04-20	2007-02-20	NA
908	2014-12-10	2014-12-10	NA
909	2014-12-10	2014-12-10	NA
911	2014-12-10	2014-12-10	NA
913	2014-12-10	2014-12-10	NA
999	2004-01-26	2015-02-25	NA

Project history

The table below is a timeline of critical changes to the survey methods since its inception. The years listed below are water years, which begins three months before the new calendar year on October 1.

Table 4: Historical protocol changes and deviations to the SKT Survey since its inception. Rows are highlighted per unique water year.

Year	Changes
2002	Survey's inception. Delta Smelt are returned to the lab for sampling. Delta Smelt lengths are formalin preserved for this year.

2003	Delta Smelt are measured and counted in the field, and thus, lengths are not formalin preserved. Sex and maturity/egg stages for all Delta Smelt are determined in the field. Sampling only takes place February to May; a January survey is not conducted.
2004	Egg samples are only retained for stage 4 females, collecting no more than 30 stage 4 females per station.
2004	Halfway through survey 3, the cod-end was caught in the propeller; the replacement cod-end had a 1/8" mesh (instead of 1/4") for the rest of the year.
2005	Station 719 (Sacramento Deep Water Channel) added. Only egg samples from stage 3 and 4 females are retained. 1/8" cod end mesh still used.
2006	No egg or caudal fin samples are collected or retained.
2007	Cod end mesh changed from 1/8" back to 1/4" mesh.
2008	Elimination of Supplemental Surveys to reduce Delta Smelt take.
2009	Implementation of two 5-minute tows to reduce Delta Smelt take.
2010	Begin recording turbidity in NTU's using a Hach Model #2100P turbidity meter. Survey 11 is a Smelt Turbidity Study.
2011	
2012	Delta Smelt are field staged and preserved whole in liquid nitrogen
2013	
2014	New nets purchased (made to standard specifications) on 03/25/2014 and used for the remaining of the season. Implementation of a new data management system. Data is now hosted in a back-end and uploaded to a Tier 3 server for display on the webpage.
2014	Implementation of a new data management system. Data is now hosted in a back-end and uploaded to a Tier 3 server for display on the webpage.
2015	A new net was purchased from Research Nets (matching existing specifications) and used for the season.
2015	Delta Smelt Abundance Index calculations was reviewed, and changes were made. See 2015 Delta Smelt abundance index memo for details.
2016	"FieldRace" and "FinalRace" fields were added to "tblFishInfo" in the access database to track Chinook salmon in compliance with ESA reporting requirements.
2017	
2018	A new vessel, the "New Munson" was used for two days in February but was discontinued due to very slow winch speed.
2019	
2020	

Appendix

Delta Smelt Gonadal Staging:

Table 5: Characteristics of male and female Delta Smelt gonads used to stage sexual maturity of captured Delta Smelt.

Sex	Stage	MicroCharacteristics	MacroCharacteristics
Male	1	Proliferation of spermatogonia.	Left testis is barely visible and the right testis is impossible to find. Gonads < 0.1% of body weight.
Male	2	Early recrudescence-spermatogonia and spermatocytes present.	Testis visible as thin strands ventrolateral to the swim bladder. Gonads are less than 0.5% of body weight.
Male	3	Mid recrudescence- all stages of germ cells present.	Right testis is visible as a small pale white or grey cord. Left testis has developed in the central portion of the gonadal cord.
Male	4	Late recrudescence- cysts filled with spermatozoa attached to sertoli cells.	Both testes are clearly visible, smooth, and pale white.
Male	5	Functional maturity- lobules filled with ripe spermatozoa, very few spermatocutes and spermatids present.	Testes are bright white and very smooth. Testes account for 2-4% of body weight. Milt can be released by gentle pressure applied anterior to urogenital vent.
Male	6	Post spawning- indicated by discharge of spermatozoa and presence of phagocytic cysts.	Testes and milt not as bright white as during stage V. During summer months, can be indicated by decrease in size of testes.
Female	1	Primordial follicles characterized by small oocytes with centrally located nucleus containing a single large nucleolus.	Left ovary translucent and grainy in texture. Right ovary difficult to impossible to find.
Female	2	Primary growth follicles with larger nuclei, basophilic oocytes cytoplasm, and multiple nucleoli located at the periphery of oocyte nucleus.	Looks the same as stage 1 when observed without a microscope.
Female	3	Primordial cortical alveoli stage, characterized by distinct clusters of enlarged oocytes, with PAS-positive cortical alveoli in the peripheral cytoplasm	Individual oocytes slightly orange, 0.25-0.50 mm in diameter, and visible to the naked eye.
Female	4	Vitellogenic oocytes with cytoplasm containing yolk bodies and surrounded by two layered zona radiate.	Fertile and ripe females. Abdomen is enlarged with egg mass and observable without dissection. Oocytes are bright orange and about 1 mm in diameter. Eggs can be stripped with gentle pressure.
Female	5	Postvitellogenic oocytes characterized by fusion of yolk bodies into homogenous yolk mass.	Females that have not released their eggs for some reason. Oocytes are larger than 1mm in diameter, and hydrated. Clear fluid surrounds the orange oocytes that become increasingly cloudy and degenerate.

Female	6	Postovulatory follicles with no oocytes and folded follicular layers	Females that have successfully spawned. Gonad is translucent and textured with a few leftover oocytes embedded in tissue. Loose abdomen easily detected.

Delta Smelt Index of Relative Abundance Regional Groupings:

Table 6: Regional groupings for the 39 core SKT stations used to calculate the Delta Smelt Index of Relative Abundance (eq.4).

Region	Station
Confluence and West	340
Confluence and West	405
Confluence and West	411
Confluence and West	418
Confluence and West	501
Confluence and West	504
Confluence and West	508
Confluence and West	513
Confluence and West	519
Confluence and West	520
Confluence and West	602
Confluence and West	606
Confluence and West	609
Confluence and West	610
Confluence and West	801
Sacramento River System	704
Sacramento River System	706
Sacramento River System	707
Sacramento River System	711
Sacramento River System	712
Sacramento River System	713
Sacramento River System	715
Sacramento River System	716
Sacramento River System	724
San Joaquin River System	804
San Joaquin River System	809
San Joaquin River System	812
San Joaquin River System	815
San Joaquin River System	902
San Joaquin River System	906
San Joaquin River System	910
San Joaquin River System	912
San Joaquin River System	914
San Joaquin River System	915
San Joaquin River System	919
San Joaquin River System	920
San Joaquin River System	921
San Joaquin River System	922

Species Sampled:

Table 7: The SKT Survey identifies all captured fish, jellyfish, and shrimp species. The date associated with the first identification of each species is provided. There is not been a species that is no longer identified by the survey if captured.

OrganismCode	CommonName	DateFirstID
0	No Catch	2002-02-04
3	common carp	2003-02-21
4	channel catfish	2003-05-13
5	white catfish	2002-01-07
6	black crappie	2005-07-21
7	white crappie	2003-04-17
8	jacksmelt	2002-03-05
9	chinook salmon	2002-01-07
10	Pacific lamprey	2002-01-08
11	river lamprey	2008-01-08
12	inland silverside	2002-01-07
13	northern anchovy	2004-01-15
16	Pacific herring	2003-03-19
19	American shad	2002-01-07
20	threadfin shad	2002-01-07
21	shiner surfperch	2008-04-11
22	crangon shrimp	2002-03-05
23	palaemon shrimp	2002-03-05
24	Delta Smelt	2002-01-07
25	longfin smelt	2002-01-08
27	surf smelt	2008-03-14
29	splittail	2002-01-08
30	Pacific staghorn sculpin	2003-02-21
31	starry flounder	2003-05-15
32	steelhead	2002-01-09
33	striped bass age 0	2002-01-07
34	striped bass age 1	2002-01-07
35	striped bass age 2	2003-05-16
37	white sturgeon	2007-03-21
38	threespine stickleback	2002-02-05
39	topsmelt	2005-01-27
40	tule perch	2003-05-16
42	yellowfin goby	2003-02-21
52	bluegill	2002-01-07
53	green sunfish	2005-02-25
55	largemouth bass	2004-02-23
61	hitch	2002-01-08
62	Sacramento blackfish	2007-02-07
63	Sacramento pikeminnow	2002-01-07
64	goldfish	2019-01-25

65	golden shiner	2002-02-04
69	brown bullhead	2014-12-16
70	mosquitofish	2007-01-22
71	bay pipefish	2014-12-18
72	bigscale logperch	2009-05-14
73	prickly sculpin	2012-04-05
74	bay goby	2011-01-13
79	Pacific halibut	2016-01-14
83	English sole	2012-02-16
88	Unidentified (UNID)	2019-03-21
93	wakasagi	2003-04-28
95	shimofuri goby	2003-02-21
97	shokihaze goby	2003-05-16
98	Jellyfish	2009-01-16
101	Maeotias	2008-01-11
102	Blackfordia	2018-01-11
103	Siberian prawn	2002-01-07
104	redear sunfish	2006-05-08
105	Centrarchid (UNID)	2014-05-05
106	spotted bass	2017-01-10
107	Bell Jelly	2017-12-14
111	Rainwater Killifish	2004-05-06
112	Striped Mullet	2014-12-10
113	Lamprey (ammocoete)	2019-01-25
114	Pleurobrachia	2016-12-12
115	Mississippi Grass Shrimp	2017-02-07
116	Bluefin Killifish	2022-01-18