

## APPENDIX L

### Species Composition of Fish, Shrimp, and Crabs Collected by the California Department of Fish and Game Fishery Surveys from South Bay

#### Introduction

California Department of Fish and Game (Baxter *et al.* 1999; CDFGF unpublished) has conducted an extensive fishery survey within the Bay-Delta estuary, which began in 1980 and continues to date. The fishery survey program designed and implemented by CDFG (Baxter *et al.* 1999) is a long-term study with data collected monthly, primarily in deeper sub-tidal areas, using multiple gear types including the otter trawl, mid-water trawl, beach seine and plankton nets. This survey is useful as a long-term record on the regional occurrence of various species within the area and intra- and inter-annual variability in their abundance.

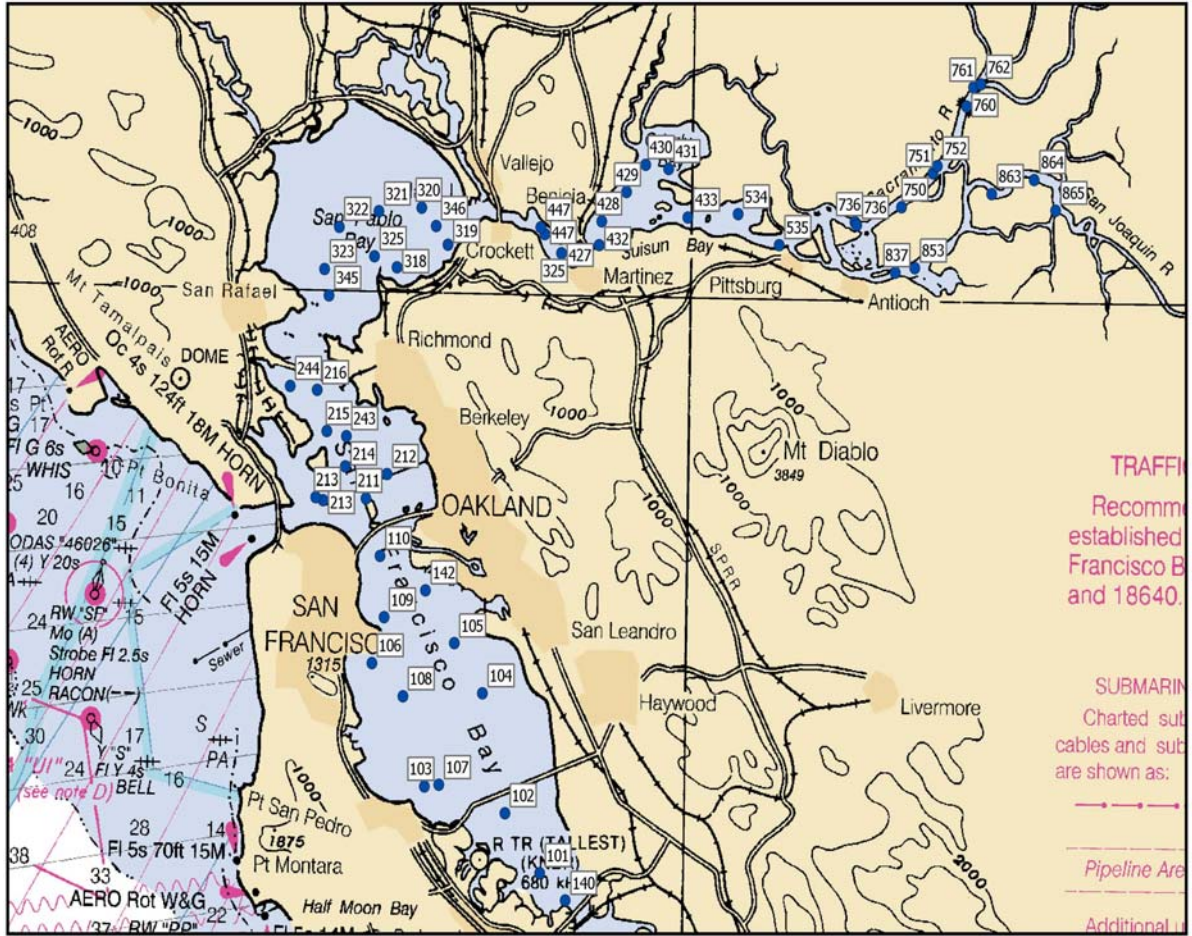
The objective of this write-up is to summarize and analyze information from CDF & G surveys to characterize: species composition, differences by location/habitat, and occurrence of threatened and endangered species.

#### CDF & G 1980-2001 Surveys

##### Survey design

Fishery samples have been collected by CDF & G at approximately monthly intervals, using mid-water trawls and otter trawls, from 35 stations from the South Bay and upstream in the Sacramento River to Sherman Island and the San Joaquin River at Antioch (Figure 1). An additional 17 sampling stations were added between 1988 and 1994. The frequency of sampling between 1980 and 2001 (Baxter *et al.* 1999) is shown in Figure 2.

Based on the types of trawls and data available, CDF & G sampling stations were chosen for analysis that would reflect the conditions of the South Bay that may be affected by the proposed project. Three open water stations, with data collected by otter and mid-water trawls and plankton nets, are in the vicinity of Alviso and Baumberg Unit Ponds: Stations 101, 102 and 140 (Figure 3). Two beach seine stations in the general vicinity of the pond units are Station 171 and 172. Further information regarding the fishery surveys, analysis of species composition, and maps showing sampling sites are presented by Baxter *et al.* (1999) and briefly summarized below.

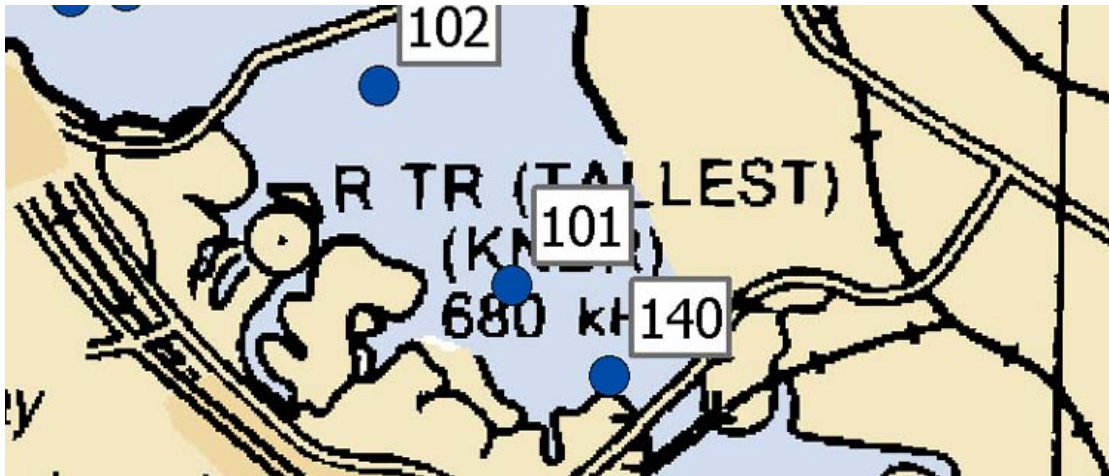


**Figure 1.** CDFG open water stations (Baxter *et al.* 1999) within the Bay-Delta estuary.



	January	February	March	April	May	June	July	August	September	October	November	December
	Plankton Net					a-Midwater trawl sampled only Feb. to April						
	Midwater and Otter Trawls					b-Midwater Trawl Sampled to April to Dec. except Aug (did not sample)						
	Only Midwater Trawl					c-Midwater trawl sampled April to Dec.						

**Figure 2. Frequency of fishery sampling by CDF&G within the Bay-Delta estuary.**



**Figure 3:** Close Up of CDF&G open water stations (Baxter *et al.* 1999) within the South Bay in the general vicinity of the proposed project.

### **Sampling Methods**

Open water stations were sampled using otter trawls, mid-water trawls and plankton nets. The otter trawl was towed on the bottom against the current for 5 minutes and then retrieved. The mid-water trawl was towed with the current for 12 minutes and retrieved obliquely. The plankton net was towed for 5 minutes on the bottom, and retrieved obliquely.

### **Species Composition**

Species composition of the fish community as well as the macroinvertebrate (crab and shrimp) community sampled in the vicinity of the proposed project were summarized and analyzed using the data from the 1980-2002 CDF & G surveys. crab and shrimp data were collected from 1980-2001. Species composition is determined as a percentage of the catch of each individual species divided by the total catch of all species for each group of surveyed stations. Results of the fishery surveys showing species composition, by sampling station and collection method are summarized in the following tables.

**Otter Trawl****Station 101**

<b>Common Name</b>	<b>Percent Composition</b>
northern anchovy	34.76%
shiner perch	19.23%
longfin smelt	13.86%
white croaker	9.75%
Pacific staghorn sculpin	4.46%
bay goby	4.34%
plainfin midshipman	3.06%
brown smoothhound	1.66%
English sole	1.25%
California tonguefish	1.13%
yellowfin goby	1.10%
leopard shark	1.01%
speckled sanddab	0.79%
cheekspot goby	0.59%
chameleon goby	0.44%
striped bass	0.37%
dwarf perch	0.35%
Pacific herring	0.35%
bat ray	0.15%
topsmelt	0.15%
showy snailfish	0.12%
starry flounder	0.12%
brown rockfish	0.10%
threadfin shad	0.10%
barred surfperch	0.08%
jacksmelt	0.08%
California halibut	0.07%
big skate	0.05%
bonehead sculpin	0.05%
Pacific lamprey	0.05%
pile perch	0.05%
silver surfperch	0.05%
white sturgeon	0.05%
arrow goby	0.03%
bay pipefish	0.03%
American shad	0.02%
diamond turbot	0.02%
longjaw mudsucker	0.02%

<b>Common Name</b>	<b>Percent Composition</b>
Pacific tomcod	0.02%
sand sole	0.02%
threespine stickleback	0.02%
white seaperch	0.02%

**Otter Trawl****Station 102**

<b>Common Name</b>	<b>Percent Composition</b>
northern anchovy	24.64%
bay goby	19.06%
shiner perch	17.05%
English sole	11.96%
cheekspot goby	5.72%
speckled sanddab	4.03%
Pacific herring	3.46%
white croaker	3.46%
Pacific staghorn sculpin	1.67%
chameleon goby	1.55%
California tonguefish	1.04%
longfin smelt	1.02%
plainfin midshipman	0.92%
dwarf perch	0.83%
brown smoothhound	0.57%
yellowfin goby	0.26%
barred surfperch	0.24%
starry flounder	0.24%
California halibut	0.22%
black perch	0.20%
diamond turbot	0.20%
bat ray	0.16%
threadfin shad	0.16%
Pacific lamprey	0.14%
walleye surfperch	0.14%
leopard shark	0.12%
arrow goby	0.10%
brown rockfish	0.10%
showy snailfish	0.10%
bay pipefish	0.08%
pile perch	0.08%
striped bass	0.08%
topsmelt	0.08%
white seaperch	0.06%
American shad	0.04%
unidentified rockfish	0.04%
white sturgeon	0.04%
big skate	0.02%

<b>Common Name</b>	<b>Percent Composition</b>
bonehead sculpin	0.02%
curlfin sole	0.02%
jacksmelt	0.02%
Pacific tomcod	0.02%
sand sole	0.02%
silver surfperch	0.02%
threespine stickleback	0.02%
whitebait smelt	0.02%

**Otter Trawl****Station 140**

<b>Common Name</b>	<b>Percent Composition</b>
shiner perch	34.72%
bay goby	8.32%
plainfin midshipman	7.85%
northern anchovy	7.67%
English sole	7.37%
Pacific staghorn sculpin	6.96%
white croaker	4.40%
California tonguefish	3.86%
white seaperch	2.97%
brown smoothhound	2.44%
speckled sanddab	2.08%
bat ray	1.72%
chameleon goby	1.19%
leopard shark	1.07%
Pacific herring	0.59%
threespine stickleback	0.59%
American shad	0.54%
pile perch	0.54%
big skate	0.42%
showy snailfish	0.42%
spiny dogfish	0.42%
longfin smelt	0.36%
Pacific tomcod	0.36%
brown rockfish	0.30%
cheekspot goby	0.30%
walleye surfperch	0.30%
lingcod	0.24%
Pacific lamprey	0.24%
yellowfin goby	0.24%
white sturgeon	0.18%
barred surfperch	0.12%
California halibut	0.12%
California lizardfish	0.12%
sand sole	0.12%
threadfin shad	0.12%
arrow goby	0.06%
bay pipefish	0.06%
black perch	0.06%

<b>Common Name</b>	<b>Percent Composition</b>
bonehead sculpin	0.06%
diamond turbot	0.06%
dwarf perch	0.06%
jacksmelt	0.06%
river lamprey	0.06%
starry flounder	0.06%
striped bass	0.06%
surf smelt	0.06%
topsmelt	0.06%
whitebait smelt	0.06%

## Midwater Trawl

### Station 101

Common Name	Percent Composition
northern anchovy	93.48%
longfin smelt	1.43%
white croaker	1.37%
shiner perch	0.95%
jacksmelt	0.69%
Pacific herring	0.57%
plainfin midshipman	0.47%
topsmelt	0.27%
bat ray	0.22%
Pacific sardine	0.12%
brown smoothhound	0.07%
striped bass	0.06%
bay goby	0.05%
American shad	0.04%
leopard shark	0.03%
English sole	0.03%
threadfin shad	0.02%
yellowfin goby	0.02%
Pacific pompano	0.02%
Pacific staghorn sculpin	0.01%
starry flounder	0.01%
chinook salmon	0.01%
night smelt	0.01%
chameleon goby	0.01%
speckled sanddab	0.01%
spiny dogfish	0.01%
whitebait smelt	0.00%
cheekspot goby	0.00%
rainwater killifish	0.00%
bay pipefish	0.00%
California grunion	0.00%
Pacific electric ray	0.00%
surf smelt	0.00%
threespine stickleback	0.00%
walleye surfperch	0.00%

**Midwater Trawl****Station 102**

<b>Common Name</b>	<b>Percent Composition</b>
northern anchovy	92.78%
topsmelt	2.21%
jacksmelt	1.99%
Pacific herring	1.65%
shiner perch	0.52%
bat ray	0.18%
longfin smelt	0.14%
California grunion	0.11%
white croaker	0.06%
American shad	0.05%
Pacific sardine	0.04%
bay goby	0.03%
yellowfin goby	0.03%
English sole	0.03%
striped bass	0.02%
brown smoothhound	0.01%
California halibut	0.01%
cheekspot goby	0.01%
threadfin shad	0.01%
leopard shark	0.01%
Pacific staghorn sculpin	0.01%
plainfin midshipman	0.01%
chinook salmon	0.01%
Pacific electric ray	0.01%
chameleon goby	0.00%
Pacific pompano	0.00%
surf smelt	0.00%
walleye surfperch	0.00%
barred surfperch	0.00%
bay pipefish	0.00%
California tonguefish	0.00%
diamond turbot	0.00%
night smelt	0.00%
Pacific tomcod	0.00%
rainwater killifish	0.00%
sevengill shark	0.00%
speckled sanddab	0.00%
spiny dogfish	0.00%

<b>Common Name</b>	<b>Percent Composition</b>
starry flounder	0.00%
threespine stickleback	0.00%
white sturgeon	0.00%
whitebait smelt	0.00%

## Midwater Trawl

### Station 140

Common Name	Percent Composition
northern anchovy	87.69%
white croaker	3.16%
shiner perch	2.29%
walleye surfperch	2.08%
English sole	1.31%
Pacific herring	0.89%
topsmelt	0.69%
plainfin midshipman	0.32%
bat ray	0.26%
longfin smelt	0.21%
jacksmelt	0.16%
bay goby	0.15%
Pacific sardine	0.13%
American shad	0.12%
striped bass	0.11%
whitebait smelt	0.08%
surf smelt	0.06%
yellowfin goby	0.04%
speckled sanddab	0.04%
threadfin shad	0.04%
Pacific tomcod	0.04%
night smelt	0.02%
Pacific staghorn sculpin	0.02%
California halibut	0.01%
big skate	0.01%
brown smoothhound	0.01%
pile perch	0.01%
Pacific pompano	0.01%
spiny dogfish	0.01%
bay pipefish	0.00%
California tonguefish	0.00%
chinook salmon	0.00%
diamond turbot	0.00%
eulachon	0.00%
leopard shark	0.00%
lingcod	0.00%
prickly sculpin	0.00%
queenfish	0.00%

<b>Common Name</b>	<b>Percent Composition</b>
sand sole	0.00%
starry flounder	0.00%
threespine stickleback	0.00%
white sturgeon	0.00%

**Plankton Net****Station 101**

<b>Common Name</b>	<b>Percent Composition</b>
northern anchovy	85.53%
Pacific herring	5.72%
arrow/cheekspot goby	2.82%
yellowfin goby	2.30%
goby type II	2.24%
unidentified fish	0.43%
chameleon goby	0.25%
cheekspot goby	0.16%
jacksmelt	0.14%
Pacific staghorn sculpin	0.10%
bay goby	0.07%
longfin smelt	0.07%
arrow goby	0.06%
unidentified goby	0.03%
white croaker	0.02%
longjaw mudsucker	0.02%
topsmelt	0.02%
diamond turbot	0.00%
prickly sculpin	0.00%
starry flounder	0.00%
bay pipefish	0.00%
English sole	0.00%
bonehead sculpin	0.00%
plainfin midshipman	0.00%
unidentified sculpin	0.00%
threespine stickleback	0.00%

**Plankton Net****Station 102**

<b>Common Name</b>	<b>Percent Composition</b>
northern anchovy	82.22%
Pacific herring	10.34%
goby type II	2.03%
arrow/cheekspot goby	1.80%
yellowfin goby	1.51%
unidentified fish	0.80%
jacksmelt	0.33%
Pacific staghorn sculpin	0.24%
chameleon goby	0.18%
longfin smelt	0.13%
bay goby	0.12%
topsmelt	0.12%
white croaker	0.06%
arrow goby	0.05%
cheekspot goby	0.03%
bay pipefish	0.01%
diamond turbot	0.01%
longjaw mudsucker	0.01%
English sole	0.01%
bonehead sculpin	0.00%
unidentified goby	0.00%
starry flounder	0.00%
threespine stickleback	0.00%
kelp greenling	0.00%
plainfin midshipman	0.00%
prickly sculpin	0.00%
speckled sanddab	0.00%
unidentified sculpin	0.00%

**Plankton Net****Station 140**

<b>Common Name</b>	<b>Percent Composition</b>
northern anchovy	36.69%
unidentified fish	34.05%
arrow/cheekspot goby	21.13%
goby type II	3.79%
Pacific herring	2.28%
yellowfin goby	1.09%
chameleon goby	0.11%
prickly sculpin	0.11%
bay goby	0.09%
Pacific staghorn sculpin	0.09%
English sole	0.09%
cabezon	0.07%
jacksmelt	0.06%
starry flounder	0.05%
California halibut	0.04%
striped kelpfish	0.04%
bay pipefish	0.04%
threespine stickleback	0.04%
unidentified sculpin	0.03%
unidentified prickleback	0.02%
longjaw mudsucker	0.01%
unidentified rockfish	0.01%
arrow goby	0.01%
topsmelt	0.01%
California tonguefish	0.00%
cheekspot goby	0.00%
diamond turbot	0.00%
longfin smelt	0.00%
plainfin midshipman	0.00%
speckled sanddab	0.00%
unidentified goby	0.00%
unidentified snailfish	0.00%
white croaker	0.00%

**Beach Seine****Station 171**

<b>Common Name</b>	<b>Percent Composition</b>
topsmelt	37.27%
arrow goby	22.58%
yellowfin goby	16.88%
jacksmelt	16.21%
Pacific staghorn sculpin	3.27%
northern anchovy	1.15%
striped bass	1.10%
threespine stickleback	0.68%
starry flounder	0.15%
rainwater killifish	0.14%
California halibut	0.09%
Pacific herring	0.07%
bay pipefish	0.06%
walleye surfperch	0.06%
diamond turbot	0.04%
surf smelt	0.04%
shiner perch	0.03%
splittail	0.03%
barred surfperch	0.02%
dwarf perch	0.02%
cheekspot goby	0.01%
English sole	0.01%
inland silverside	0.01%
longfin smelt	0.01%
pile perch	0.01%
plainfin midshipman	0.01%
American shad	0.01%
bay goby	0.01%
chameleon goby	0.01%
chinook salmon	0.01%
longjaw mudsucker	0.01%
Sacramento blackfish	0.01%

**Beach Seine****Station 172**

<b>Common Name</b>	<b>Percent Composition</b>
topsmelt	54.35%
jacksmelt	23.40%
Pacific herring	9.66%
Pacific staghorn sculpin	3.03%
northern anchovy	2.02%
yellowfin goby	1.79%
shiner perch	1.47%
arrow goby	1.01%
bay pipefish	0.84%
dwarf perch	0.76%
English sole	0.57%
threespine stickleback	0.26%
cheekspot goby	0.15%
diamond turbot	0.13%
chinook salmon	0.11%
striped bass	0.08%
rainwater killifish	0.08%
California halibut	0.06%
American shad	0.04%
bay goby	0.03%
barred surfperch	0.03%
surf smelt	0.02%
walleye surfperch	0.02%
inland silverside	0.01%
longfin smelt	0.01%
longjaw mudsucker	0.01%
pile perch	0.01%
plainfin midshipman	0.01%
splittail	0.01%
starry flounder	0.01%
striped kelpfish	0.01%
threadfin shad	0.01%
western mosquitofish	0.01%

## Crab and Shrimp Data

### Station 101

Common Name	Percent Composition
Dungeness crab	52.63%
Chinese mitten crab	42.11%
red rock crab	2.63%
graceful rock crab	1.32%
Pacific rock crab	1.32%
Common Name	Percent Composition
California bay shrimp	79.47%
blacktail bay shrimp	12.82%
blackspotted bay shrimp	3.20%
oriental shrimp	2.99%
Stimpson coastal shrimp	1.52%
stout coastal shrimp	0.00%

## Crab and Shrimp Data

### Station 102

Common Name	Percent Composition
Dungeness crab	43.75%
graceful rock crab	18.75%
Pacific rock crab	18.75%
Chinese mitten crab	12.50%
red rock crab	6.25%
Common Name	Percent Composition
California bay shrimp	58.75%
blacktail bay shrimp	34.23%
blackspotted bay shrimp	5.32%
Stimpson coastal shrimp	1.48%
oriental shrimp	0.22%
stout coastal shrimp	0.00%
unidentified Beteaus	0.00%

## Crab and Shrimp Data

### Station 140

<b>Common Name</b>	<b>Percent Composition</b>
Dungeness crab	73.27%
Chinese mitten crab	18.81%
Pacific rock crab	2.97%
red rock crab	2.97%
graceful rock crab	0.99%
yellow rock crab	0.99%
<b>Common Name</b>	<b>Percent Composition</b>
California bay shrimp	78.69%
blacktail bay shrimp	13.98%
oriental shrimp	6.13%
blackspotted bay shrimp	0.75%
Stimpson coastal shrimp	0.45%
miniature spinyhead	0.00%
unidentified Beteaus	0.00%
ridgetail prawn	0.00%
visored shrimp	0.00%