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Review of California Recreational Fisheries Survey Methods

by
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INTRODUCTION

The California Recreational Fisheries Survey (CRFS) was begun in January 2004 to provide catch and effort estimates for marine recreational finfish fisheries. It is a collaborative effort between the California Department of Fish and Game (the Department) and the Pacific States Marine Fisheries Commission, and is funded by state and federal sources. The goal of the CRFS is to produce, in a timely manner, marine recreational fishery data needed for sustainable management of California's marine resources. A high priority is placed on meeting the data needs for species that are currently under active management.

The Department and the Pacific States Marine Fisheries Commission are conducting a review of the CRFS. The objective of the review is to ensure that CRFS data and estimates address management needs and conform to the best available science. The review will examine each part of the CRFS program: sample design, survey methods, statistical methods, estimation procedures, computer programs, data and documentation needs, and outreach. The purpose of this report is to describe current survey design and methods, identify areas where the survey might be modified to improve the estimates, identify assumptions and biases that might need validation, and document changes to the program. This is report is a working document that will be revised throughout the review process.

GENERAL OVERVIEW OF CRFS

Key Features

Key features of the CRFS are:

- CRFS includes all marine finfish that are caught in the state
- Catch and effort data are collected on the four major modes (*i.e.,* the type of place or boat where the fishing occurred) in California: private and rental boats, commercial passenger fishing vessels (CPFVs, also commonly called charter boats or party boats), man-made structures, and beaches and banks.
- Same methods are being used statewide so the estimates are directly comparable
- Sampling occurs year-round for all modes
- Monthly estimates are produced
- Preliminary estimates are available one month after the end of the sampling period

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- Estimates are produced for each of six geographic districts, and for each fishing mode

Districts

California has been divided into six geographic areas or Districts for CRFS. The district boundaries coincide with county boundaries. Each district is briefly described below.

1. South District – **Los Angeles, Orange, and San Diego counties.** This highly urbanized district has many harbor and marina facilities for boaters, and has dozens of piers and other man-made structures that are heavily used by shore anglers. The coastal waters are influenced by sub-tropical currents from the south, and are home to warm-water pelagic species, such as tunas, yellowtail, and barracuda. The nearshore coastal waters and the Southern Channel Islands are fished for kelp and sand basses, white seabass, and California halibut.

2. Channel District – **Santa Barbara and Ventura counties.** This district is in an ecological transition zone that harbors both warm- and cold-water fish species. Warm-water pelagic species and surface species like yellowtail, barracuda, bonito, white seabass, and kelp bass are seasonally available, and cold-water species, including Chinook salmon and rockfishes, are also targeted. The Santa Barbara Channel and the Northern Channel Islands are fished year around by private boats and CPFVs based in the four ports in the district.

3. Central District - **Santa Cruz, Monterey, and San Luis Obispo counties.** The Central District has five major ports for private boats and CPFVs, and miles of open coast that are fished by surf anglers and rocky bank fishermen for surfperch, nearshore rockfish, and cabezon. Boaters fish for Chinook salmon in season and run offshore for albacore. Rockfish, cabezon, and lingcod are also targeted by boat anglers throughout the district. Large sections of the coast in southern Monterey and San Luis Obispo counties remain inaccessible to shore anglers, due to their remoteness or lack of public access.

4. San Francisco District - **Marin, San Francisco, and San Mateo counties on the coast, and the six counties surrounding San Francisco and San Pablo bays (Alameda, Contra Costa, Solano, Marin, San Francisco, and San Mateo counties).** This highly urbanized district includes the state's largest estuary and is home to some unique sport fisheries such as white sturgeon and striped bass. Chinook salmon and California halibut also migrate into the San Francisco Bay, and are targeted by boat anglers. Offshore anglers on private boats and CPFVs fish for Chinook salmon, rockfish, lingcod and, seasonally, for albacore. Anglers catch surfperch, jacksmelt, and white croaker from piers in the bays. On the coastal beaches, anglers fish seasonally for surfperch, striped bass, and surf and night smelt.

5. Wine District - **Mendocino and Sonoma counties.** Most fishing in this district is for Chinook salmon, rockfish, lingcod, and cabezon. Private boats and CPFVs operate out of Bodega Bay, Fort Bragg, and Shelter Cove. These boats also target Chinook salmon seasonally. Much of the shoreline is rocky and backed by high bluffs; angler access is frequently limited by the steep terrain. Shore anglers fish for rockfish, lingcod, and cabezon. Surf fishermen fish for redtail surfperch, and can net surf and night smelt on sandy beaches.

6. Redwood District - **Del Norte and Humboldt counties**. This district includes one of the state's largest bays, Humboldt Bay, and several major river estuaries, including the Eel, Klamath, and Smith rivers, where salmon are targeted. Private boat and CPFV anglers from Eureka, Trinidad, and Crescent City target Chinook salmon, lingcod, and rockfish. Shore anglers fish for lingcod, greenlings, black rockfish, and blue rockfish on rocky shores and jetties. Redtail and other surfperches are taken on sandy beaches and in Humboldt Bay.

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Trip-types

Anglers' responses to the kind of fish that they were targeting during their fishing trip are place into 16 trip-type categories (Table A). Effort and catch-per-unit-effort are generally stratified by trip-type during the estimation procedures.

Table A. Trip-types or target species used in the California Recreational Fisheries Survey (CRFS).

Trip-type category	Species and/or groups included in the trip-type category
Anything	Unidentified fish; angler targeting 'anything'
Salmon	Chinook, coho, pink, chum, and sockeye salmon; sea run trout, steelhead
Rockfish	All rockfish species
Lingcod	Lingcod
Tuna/Sharks/Billfish	Tunas, sharks, billfish, skates, rays, mackerels, skipjacks, manta, louvar
Yellowtail	Yellowtail
White Seabass	White seabass
Bass/Barracuda/Bonita	Kelp bass, sand basses, barracuda, giant seabass
Halibut	California halibut, Pacific Halibut
Croakers	Croakers (except black & spotfin), drum family, shortfin corvina
Perches	Surfperches, seaperches, perches
Corbina	California corbina
Smelt	Surf smelt, jacksmelt, topsmelt, silversides family, eulachon
Sturgeon	White and green sturgeon
Striped Bass	Striped bass
Other (includes any finfish species code not included in the above categories)	Any species or kind of fish that is not specifically listed under the 15 other trip-types is placed in the "Other" trip-type category. These include: Bottomfish (groundfish), cabezon, greenlings, scorpionfish, black and spotfin croakers, flounders, hake, herring, anchovies, jack mackerel, cods, sablefish, wrasses, soles, turbots, sculpins, gobies, gunnels, pricklebacks, unidentified surface fish, unidentified tunas (non-mackerel), and basic family groups of other trip types - salmon, sea bass, and perch families

DESCRIPTION OF SURVEY COMPONENTS

The CRFS is a multi-part survey to estimate the total catch and fishing effort of marine recreational anglers in California. Field sampling is conducted at about 580 publicly-accessible sites during daylight hours (Appendix F) to gather catch and effort data. A telephone survey of licensed anglers is conducted to gather data on effort when field observations of effort are not feasible, such as fishing at night and fishing from boats that return to private marinas. A telephone survey of commercial passenger fishing vessel (CPFV) operators is conducted to gather data for effort estimates for this mode of fishing. The data gathered from field sampling, the telephone survey of licensed anglers, sport fishing license sales, and the telephone survey of CPFV operators are combined to estimate catch and effort. The table below shows the surveys that are used for each mode of fishing, access type (public or private), and period of the day (daytime or nighttime).

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Table B. Surveys used in the California Recreational Fisheries Survey (CRFS).

Mode	Estimate	Public Access		Private Access	
		Day ☼	Night ☾	Day ☼	Night ☾
1° Sites Private & Rental Boats	Effort	Field access point	ALD Telephone	ALD Telephone	ALD Telephone
	Catch	Field access point	Use estimate from day	Use estimate from day	Use estimate from day
2°Sites Private & Rental Boats	Effort	Field roving	ALD Telephone	ALD Telephone	ALD Telephone
	Catch	Field access point	Use estimate from day	Use estimate from day	Use estimate from day
CPFV	Effort	PCPS Telephone	PCPS Telephone	Not Applicable	Not Applicable
	Catch	Field onboard & dockside	Field onboard & dockside		
Man-made Structures	Effort	Field roving	NO ESTIMATE	NO ESTIMATE	NO ESTIMATE
	Catch	Field access point			
Beaches & Banks	Effort	ALD Telephone	ALD Telephone	ALD Telephone	ALD Telephone
	Catch	Field access point	Use estimate from day	Use estimate from day	Use estimate from day

1. Angler License Directory Telephone Survey

Sample Design

The Angler License Directory Telephone Survey collects angler data for all fishing modes, both access types (public and private), and daytime and nighttime fishing. The data are used to estimate effort for private and rental boats returning to private access sites or fishing at night, and to estimate all effort on beaches and banks. For comparison purposes, the data can be used to estimate effort for other modes, and for private and rental boats fishing during the day and returning to publicly-accessible sites.

Frame: All anglers who purchased an annual sport fishing license (Annual Resident Sport Fishing License or Annual Non-resident Sport Fishing License) prior to the start of the sampling period (month of the sample), all anglers who purchased a short-term sport fishing license (Ten-day Non-resident Sport Fishing License, Two-day Sport Fishing License, and One-day Sport Fishing License) during the two-month period before the start of the sampling period (except at the end of the license year), and a small number of anglers who purchased a short-term sport fishing license more then two months.

Stratification: License type, geographic area (based on telephone area code), and month.

Frequency: About one-half of one percent of all fishing license holders in 2004, and about one percent of all fishing license holders in 2005. California issues about two million sport fishing licenses each year, and the survey completed telephone interviews with about 10,000 licensed

anglers in 2004, and about 20,000 in 2005 (Appendix A). We expect to complete about 26,000 interviews in 2006.

Description of the Angler License Directory: When anglers purchase their fishing license, those individuals purchasing the first license in each license booklet are asked to fill out their contact information, including name and phone number, on the cover page. There are five types of sport fishing licenses used in the survey: Annual Resident, Annual Non-resident, Ten-day Non-resident, Two-day, and One-day. Depending on the license type, each booklet contains 5-20 licenses. The resulting angler contact list is considered a systematic sample of holders of those types of sport fishing licenses in California.

Individuals with the following types of sport fishing licenses are not currently included in the directory: Lifetime Sport Fishing License, Reduced-fee Sport Fishing License and Wildlife Area Pass, Five-year Free Sport Fishing License and Wildlife Area Pass, and One-year Free Sport Fishing License and Wildlife Area Pass. Those four license types comprise one to 2 percent of the total sport fishing licenses issued annually.

A new list is created each year, beginning with license sales in January. Additions to the list are made monthly within 30 days of each month's end. Annual license holders are included in all months of the license year after sale. Day license holders are contacted for the immediate two months after sale (except at the end of the license year). Because day licenses can be legally be activated anytime after sale in the calendar year, 10 percent of the monthly sample for day license holders includes day license holders in the sample frame for more than two months. This 10 percent sub-sample begins with March sales and ends in January of the next calendar year.

Sample selection and scheduling: The directory is stratified based on the proportion of license types sold. License holders from the various license-type groups are sub-sampled by systematically sorting the frame geographically by telephone area code. This helps produce a uniform spatial distribution of the sample population. Observations falling within each area code are randomized and sampled in proportion to the area code contribution and number of initial contacts wanted for dialing. The number of initial contacts is adjusted upwards by a percentage to account for no-contact rates seen in the previous performance of this survey. No additional sample may be added once the selection has been made. The sampling is with replacement; so, all license holders in the sample may be contacted more than once during the year.

Data Elements Collected

The following key data elements are collected during the Angler License Directory Telephone Survey for effort. An example of the telephone survey questionnaire is in Appendix A; it shows all the data elements that are collected.

1. Location of permanent residence.
2. Occurrence of sport fishing activity in the last 12 months.
3. Proportion of trips in freshwater and in saltwater.
4. Number of saltwater trips in the last two months
5. Dates of saltwater fishing trips in the last two months.
6. Fishing mode for each trip.
7. For trip in a boat:
    a. Type of boat (CPFV, private, or rental)
    b. Day of the week that the trip was taken

c. Location of fishing activity
d. For private and rental boats, type of access (private or public) and type of facility (*e.g.,* launch ramp, hoist, marina, or beach)
e. Date and length of the trip
f. Whether fishing occurred at night
g. Target species (trip-type)
h. Location where the trip ended (where the angler came ashore)

8. For shore-based trips:
   a. Location of the fishing activity
   b. Type of access (public or private)
   c. Target species (trip-type)
   d. Duration of the trip (wet-gear hours)
   e. Whether fishing occurred at night

Survey Methods

Telephone survey

Anglers contacted by the telephone survey are asked to provide information on all marine fishing trips made during the previous two months. For each fishing trip taken, anglers are asked to provide fishing mode, water area (ocean or inland), trip-type, and access- type (public or private). For private and rental boats, the starting and ending times (duration and time of day) of each trip is recorded to determine night trips (identified by both start and end times reported outside of daylight hours). The trip-type is necessary for determining which catch rates to apply from the on-site private and rental boat surveys. The name of any private access launch ramp is also recorded and added to site list for private and rental boat.

Field survey for licensed- and unlicensed anglers

State law requires that all licensed anglers display their license above their waistline so that it is plainly visible when engaged in fishing. Samplers ask anglers not displaying their license which type of license they have, and record the number of unlicensed anglers that they interview. Anglers under age 16 and anglers fishing from a public pier are not required to have a fishing license under State law. The samplers record the number of anglers under age 16 that they interview, and the number of licensed and unlicensed anglers that they interview on man-made structures. These data are used for adjustments in the estimates.

Estimation Procedures

Monthly estimates of angler-trips are made for each stratum of license type, trip-type, water area (ocean or inland marine waters), fishing mode, district, and access type (public-daylight or private-nighttime).

Effort estimates are calculated by expansion from the contacted sample of *n* anglers to the population of all *N* licensed anglers. An adjustment for unlicensed anglers from public access sites (anglers not in the telephone survey) is made. It is assumed that for each stratum angler trip rates are the same for unlicensed and licensed anglers.

Effort in any given angler-trip stratum is estimated using this basic method:

$$\hat{E}_1 = \frac{N}{n}\sum_{i=1}^{n} t_i \quad ,$$

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Where, for each *i* among the *n* contacted anglers, t_i is the number of trips in the stratum made by angler *i*. Thus, the average number of per-angler stratum trips – the average taken for contacted licensed anglers - is multiplied by the total number *N* of licenses issued.

The variance of this effort estimate is estimated as

$$\hat{Var}(\hat{E}_1) = N^2 \sum_{i=1}^{n} \frac{(t_i - \bar{t})^2}{n(n-1)}$$

Where, $\bar{t}$ is the mean of the sampled values t_i.

Adjustment factors for trips not covered by the telephone survey are estimated from data collected by the boat intercept survey. In particular, the following adjustment is made for anglers not holding a fishing license. The proportion *p* = (number unlicensed / total anglers) is estimated by $\hat{p}$ = *U/n*, where *n* is the number of intercepted anglers and *U* is the number of those anglers without a license. Unlicensed anglers $\hat{E}_2$ is estimated by

$$\hat{E}_2 = \hat{p}\hat{E}_1,$$

The variance is estimated as the variance of a product, as was first done above for the Primary PR survey. Here, the factors of the product are $\hat{p}$ and $\hat{E}_1$,

$$\hat{Var}(\hat{E}_2) = (\hat{p})^2 \hat{Var}(\hat{E}_1) + (\hat{E}_1)^2 \hat{Var}(\hat{p}) - \hat{Var}(\hat{p})\hat{Var}(\hat{E}_1)$$

where $\hat{Var}(\hat{p}) = \frac{p(1-p)}{n}$

Total effort for licensed and unlicensed anglers is sum or the estimators and total variance the sum of their variances.

$\hat{E} = \hat{E}_1 + \hat{E}_2$ and

$$\hat{Var}(\hat{E}) = \hat{Var}(\hat{E}_1) + \hat{Var}(\hat{E}_2)$$

Plans for Improving the Surveys or the Estimation Procedures

The number of completed interviews by the telephone survey (about 10,000 in 2004 and about 20,000 in 2005) is small compared to the number of angler interviews in the field (about 117,000 in 2004 and about 109,000 in 2005). While the number of interviews completed by the telephone survey will never approach the number completed by the field survey, we would like to increase the number of calls. However, we cannot increase the number of calls until we increase the size of our volunteer pool of licensed anglers. The volunteers for the telephone survey are recruited when they purchase their sport fishing license. License vendors are asked to obtain the name and telephone number of one volunteer for each book of 20 licenses. In 2004 and 2005, the response rate was about 30 percent which resulted in a pool of less than 30,000 licensed anglers.

The Department has initiated a number of short-term and long-term plans to increase the number of volunteers for the telephone survey. The Department is working to improve cooperation by license vendors and the public by producing and distributing materials to explain the purpose of the telephone survey and the relation between the catch estimates and fishing season, size limits, and bag limits. The Department plans to replace the current paper-based licensing system with the automated license data system beginning in July 2007 with full

implementation planned for December 2007. The automated license data system will provide the Department with data on each of the two million license buyers, and will provide timely and accurate data on license sales.

2. Private and Rental Boats

There are hundreds of sites for launching, mooring, and docking private and rental boats along the California coast and within its harbors and bays. In designing CRFS, a decision was made to stratify the access sites for private and rental boats based on access type (public and private) and relative catch of species under active management. It was not feasible to sample the private access sites for catch or effort in the field, and a decision was made to use the estimated catch rates from public access sites and the effort estimates from a telephone survey.

The design team analyzed catch by site to determine which public access sites had the highest catch of management species. For the analysis, management species were defined as those with active or proposed fishery management plans (FMPs) and include salmon, groundfish (rockfish, lingcod and certain roundfishes, flatfishes, sharks and rays), highly migratory species (tunas, billfishes, dolphinfish, and certain oceanic sharks); and nearshore and estuarine species such as California sheephead, California halibut, and surfperches. Catch data for these species were analyzed separately for sites north and south of Point Conception.

The results suggested that within a survey area, the sites could be split into two-tiered sampling: primary and secondary. The primary sites are sampled at a 20 percent level for both the collection of effort (anglers/boats) and species-specific catch rates. The secondary sites clustered and sampled at a 10 percent level for both effort and catch rate data.

A. Primary Sites for Private and Rental Boats (Public Access and Daylight Hours)

The Primary PR sites (PR1) are public ramps, hoists, and other launch facilities where the majority (≥90%) of fishing effort and catch of important management species by private skiffs and rental vessels occurs in California. These sites are sampled using an access point survey (*i.e.*, on-site, intercept design). Estimation of effort is based on the total number of boats sampled during the time period (adjusted for missed boats), expanded for total day-type (weekend/holidays or weekday) days available per month. Missed boats include boats that were not sampled due to high activity at the site or trailers remaining in the parking lot at the end of the sample day.

Sample Design

Frame: All PR1 sites in the district and all daylight-hours for all the days in the month.

Stratification: Sampling is stratified by month, district, and day-type for each PR1 site. To maintain continuity with OSP, sampling is also stratified by half-month period at sites open during the salmon season.

Frequency: Each PR1 site is generally sampled 8 days a month; however this may vary slightly in districts north of Pt Conception during the salmon season. A minimum sampling level of 20% in needed for both day-type strata to ensure a representative collection of coded-wire tags (CWTs) occurs throughout the month since salmon stocks of special concern can move in and out of fishing areas quickly.

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Description of sites: Primary PR sites include launch ramps, hoists, and public docks where significant PR fishing activity occurs. There are 28 PR1 sites used statewide by CRFS (Table 2.A.1); however some PR1 sites are reclassified as PR secondary sites (PR2) or become inactive during months of reduced effort. During salmon season, 17 PR1 sites are grouped by major port area based on salmon management lines (Table 2.A.1).

Sample selection and scheduling: Each CRFS supervisor creates a monthly sample schedule for all PR1 sites within his/her respective district(s). Generally 8 days are scheduled per month with samples distributed evenly between day-type strata (i.e., 4 weekend samples, 4 weekday samples); however in districts north of Pt Conception during the salmon season, 5 weekday and 2 weekend days are generally scheduled each month to meet the minimum 20% sampling level by day-type strata needed by OSP. Whenever possible, two additional weekend samples are scheduled in these districts to increase the sample size in the CRFS program each month. Currently, the northern California CRFS supervisor works closely with the OSP to produces the monthly PR1 schedule for all districts open to salmon fishing. PR1 sites in each district (and salmon management area) are scheduled to get an even distribution of assignments throughout the month by day-type and major port area. No more than two weekdays and one weekend day can be sampled at a PR1 site per week.

At least one sampler is assigned to each PR1 site. During busy days, two or more samplers may be scheduled to work the same PR1 site to ensure that as many boats as possible are sampled. Table 2.A.2 shows the PR1 sample schedule for the San Francisco major port area during June 2005.

Data Elements Collected

The following key data elements are collected on the PR1 Form (Appendix B):

1. CRFS PR1 site code (plus OSP port code if salmon open)
2. Date
3. CRFS sample number (only assigned to boats fishing for finfish)
4. Time
5. Number of anglers
6. Number of anglers without a license*
7. County of residence for first angler interviewed
8. Number of days fished
9. Primary and secondary target species (primary target species determines trip-type)
10. Primary and secondary gear types
11. Catch location within 1 square nautical mile where most fish were caught (CDFG location block maps used whenever possible)
12. Number of fish harvested by species – examined
13. Number of fish caught but unavailable – released alive, released dead, or not examined
14. Number of fish taken by pinnipeds (primarily sea lions)
15. Sample of fish lengths (mm) and weights (kg) of priority species
16. Fork length (mm) recorded and the head removed from any sampled ad-clipped salmon; a headtag is attached to each head and its unique number recorded next to the sample
17. Depth fished where most fish were caught
18. Missed boats on-site (boats missed at PR1 site due to high activity)
19. Missed boats off-site (boats passing by PR1 site into private marinas and other facilities)
20. Count of trailers remaining on-site at end of sample day

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*Note: The angler license question is used by the ALD survey to determine what proportion of sampled anglers in the public PR fishery possess fishing licenses. It is not used for enforcement purposes.

Table 2.A.1 California PR1 sites used by CRFS and OSP by district and major port areas (n=28).

CRFS site code	Site name	OSP port code*	OSP Major port area	Salmon Management Area
District 6				
15100	Crescent City launch ramp	**CRL**	**Crescent City**	OR border to Horse Mtn
15101	Crescent City docks	**CRD**	**Crescent City**	OR border to Horse Mtn
23102	Trinidad docks	**TRD**	**Eureka**	OR border to Horse Mtn
23102	Trinidad hoist	**TRH**	**Eureka**	OR border to Horse Mtn
23103	Fields Landing launch ramp	**FLD**	**Eureka**	OR border to Horse Mtn
23120	Eureka Marina launch ramp	**EUR**	**Eureka**	OR border to Horse Mtn
23106	Shelter Cove tractor launch	**SHC**	**Fort Bragg**	Horse Mtn to Pt Arena
District 5				
45100	Fort Bragg Noyo launch ramp	**FTB**	**Fort Bragg**	Horse Mtn to Pt Arena
97100	Bodega Westside launch ramp	**BOD**	**San Francisco**	Pt Arena to Pigeon Pt
District 4				
1100	Berkeley launch ramp	**BER**	**San Francisco**	Pt Arena to Pigeon Pt
41100	Sausalito launch ramp	**SAU**	**San Francisco**	Pt Arena to Pigeon Pt
81100	Princeton launch ramp	**PRI**	**San Francisco**	Pt Arena to Pigeon Pt
District 3				
87101	Santa Cruz launch ramp	**SCR**	**Monterey**	Pigeon Pt to Pt Sur
53104	Moss Landing launch ramp	**MOS**	**Monterey**	Pigeon Pt to Pt Sur
53107	Monterey Harbor launch ramp	**MON**	**Monterey**	Pigeon Pt to Pt Sur
79100	Morro Bay launch ramp	**MOR**	**Morro Bay**	Pt Sur south
79101	Avila Beach hoist	**AVI**	**Morro Bay**	Pt Sur south
District 2				
83400	Santa Barbara launch ramp	SBA	Santa Barbara	Pt Sur south
111104	Ventura launch ramp	VEN	Santa Barbara	Pt Sur south
111103	Channel Islands launch ramp	OXN	Santa Barbara	Pt Sur south
District 1				
37010	Marina Del Rey launch ramp		Los Angeles	Pt Sur south
37105	Dave's launch ramp		Los Angeles	Pt Sur south
37110	Cabrillo launch ramp		Los Angeles	Pt Sur south
59104	Sunset Aquatic launch ramp		Orange	Pt Sur south
59101	Dana Pt launch ramp		Orange	Pt Sur south
73104	Shelter Island launch ramp		San Diego	Pt Sur south
73113	Oceanside launch ramp		San Diego	Pt Sur south
73204	Dana Basin launch ramp		San Diego	Pt Sur south

* OSP ports & major port area used by OSP for salmon PR1 catch and effort estimations (in bold). OSP ports in District 2 used only during times when salmon effort occurs.

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Table 2.A.2. PR1 sampling schedule for San Francisco major port area during June 2005.

June 2005 San Francisco Major Port Areas PR1 Sample Schedule						
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1 BOD SAU **S** BER PRI	2 BOD SAU BER **S** PRI	3 BOD **S** SAU BER PRI	4 BOD SAU BER **S** PRI C
5 BOD C SAU **S** BER PRI	6 BOD **S** SAU BER PRI	7 BOD SAU BER PRI **S**	8 BOD SAU BER **S** PRI	9 BOD SAU **S** BER PRI	10 BOD SAU BER PRI **S**	11 BOD **S** SAU C BER PRI
12 BOD SAU BER C PRI **S**	13 BOD SAU **S** BER PRI	14 BOD SAU BER PRI	15 BOD **S** SAU BER PRI	16 BOD SAU BER PRI **S**	17 BOD SAU BER **S** PRI	18 BOD C SAU **S** BER PRI
19 BOD SAU BER **S** PRI C	20 BOD SAU BER **S** PRI	21 BOD SAU BER PRI	22 BOD SAU BER PRI **S**	23 BOD **S** SAU BER PRI	24 BOD SAU **S** BER PRI	25 BOD SAU BER C PRI **S**
26 BOD **S** SAU C BER PRI	27 BOD SAU BER PRI **S**	28 BOD **S** SAU BER PRI	29 BOD SAU BER **S** PRI	30 BOD SAU **S** BER PRI		

Port codes:
BOD - Bodega Bay
SAU - Sausalito
BER - Berkeley/Emeryville
PRI - Princeton

Sample codes
S = OSP / CRFS PR1 site
C = CRFS only PR1 site

Survey Methods

The samplers receive their monthly PR1 assignments generally a week or two before the start of each month. The sampler assigned to the PR1 site is responsible for being on-site when the first boat returns. Sampling continues throughout the day until the last boat returns or if nearing sunset, there has been no recent activity and only a few trailers remain in the parking lot. On busy days or at busy sites, additional samplers are assigned to help.

The procedures for each boat landing at the site visit during the assignment are as follows for the PR1 mode (in sequential order):

1. The sampler records the time each boat returns and determines if the boat was sport fishing for finfish.

2. If sportfishing for finfish, the boat is considered a CRFS vessel and it is assigned a unique sample number (all CRFS boats numbered sequentially thereafter). If the boat was not fishing for finfish, it is considered a 'nonfishing' vessel and 'NF' is recorded as the primary target along with a code identifying the 'non-fishing' activity (e.g., NFSHL = fishing for shellfish).

If the vessel is a CRFS boat, the sampler continues the interview to collect:

1. Number of anglers that fished and of these, the number without a fishing license (e.g., children under the age of 16).
2. Number of days fished
3. County of residence for the first angler contacted.
4. Primary and secondary species targeted during the trip.
5. Primary and secondary gear used
6. Location and depth where most fish were caught
7. Species and number of fish caught but unavailable for examination because they were released either dead or alive.
8. Species and number of fish examined by the sampler. The fork length and head are collected from all ad-clipped salmon. Lengths and weights are collected from other management species as needed.
9. The sampler tracks any missed boats landing on-site but not interviewed.
10. At the end of the sample day, the number of trailers remaining is recorded.

To maintain continuity with the OSP historical salmon catch and effort data, there are several PR1 sites where the sampler also records arrival and departure trailer-counts at nearby PR2 sites during the salmon season. The sampler may also track PR boats going by the PR1 site into nearby marinas and private docks. These data are used by OSP only.

Estimation Procedures

Effort

Estimates of total effort for the primary sites is calculated using the total number of boats sampled during the month, including missed fishing boats, for each type of day (weekend/weekday) and site by water area and trip-type domains. Estimation of effort (as in Pollock et al. 1994) is calculated for each stratum by

$$\hat{E} = N\sum_{i=1}^{n}\frac{e_i}{n},$$

where *N* is the number of possible sample days, *n* is the number of actual sample days and e_i is the fishing effort (boat-trips) on the *i*th sample day. The variance is estimated by

$$\hat{Var}(\hat{E}) = N^2\left(1-\frac{n}{N}\right)\frac{\sum_{i=1}^{n}(e_i-\bar{e})^2}{n(n-1)}.$$

This equation is given by Equation 2.19 on page 25 of Cochran 1963 and by Equation 2.21 on page 26 of Cochran 1977. Total effort estimates from selected strata is combined to produce summaries of estimated total catch for combined strata (e.g. monthly, annual, and regional estimates). Angler effort (angler days) $\hat{A}$ is estimated as the product of the estimated number of boats (boat-trips) $\hat{E}$ and of the estimated average number $\hat{a}$ of angler days per boat by

$$\hat{A} = \hat{a}\times\hat{E}$$

and the variance of this estimated effort by,

$$\hat{Var}(\hat{A}) = \hat{E}^2\hat{Var}(\hat{a}) + \hat{a}^2\hat{Var}(\hat{E}) - \hat{Var}(\hat{E})\hat{Var}(\hat{a})$$

[Note. This equation is a corrected version of equation 15.8 on page 222 of Pollock et al 1994. Our equation here gives an unbiased estimate of the variance of $\hat{A}$, whereas equation 15.8 replaces our – with +, thereby giving a positively biased estimate. Equation 15.8 was likely suggested by the fact that the analogous equation for the true (rather than estimated) variance $Var(\hat{A})$ of $\hat{A}$ does use +; namely it reads: $Var(\hat{A}) = E^2\,Var(\hat{a}) + a^2Var(\hat{E}) + Var(\hat{E})Var(\hat{a})$.]

Catch-per-unit-effort

As with the estimation of total effort, estimates of CPUE are calculated for each trip-type and water area domain within each day type (weekend or weekday), month, water area and site. For each trip-type and water area domain, catch rate (modified from Pollock et al 1994, page 221) is estimated by

$$\hat{R} = \frac{\sum_{i=1}^{n} c_i}{\sum_{i=1}^{n} m_i},$$

where c_i is the catch sampled on sampled boats, m_i is the number of boats sampled on the i^{th} sample day (missed boats are counted as un-sampled), and the summations are over all n sampled days. The estimated variance of this estimate is found as in Cochran 1964, 2.29 (and ensuing text on pages 30-31), or as in Cochran 1977, 2.39 (and ensuing text on pages 31-32). Namely, let $\overline{m}$ be the mean of the values m_i. Then:

$$\hat{Var}(\hat{R}) = \frac{1}{\overline{m}^2}\,\frac{(1-\frac{n}{N})}{n}\,\frac{\sum_{i=1}^{n}(c_i - \hat{R}m_i)^2}{n-1}$$

Estimates of total catch are calculated for each day type (weekend/weekday), month, water area, trip-type and site (as in Pollock et al. 1964, 15.3, page 220) by

$$\hat{C} = \hat{E}\hat{R}$$

The variance (as in the corrected version of Pollock et al. 1994, 15.8, page 222) is estimated by

$$\hat{Var}(\hat{C}) = \hat{E}^2\hat{Var}(\hat{R}) + \hat{R}^2\hat{Var}(\hat{E}) - \hat{Var}(\hat{E})\hat{Var}(\hat{R})$$

Total catch estimates from selected strata are combined to produce summaries of estimated total catch for combined strata.

Estimation programs

Three expansion factors are used to expand the boat sample data collected at each PR1 site by year, district, month and day-type:

1. Day-type sample expansion factor: determines sampling level for each PR1 site by day-type and month; calculated by dividing the total days available during the month by the actual days sampled for each PR1 site and day-type.

2. Missed boats expansion factor: expands sampled boats to adjust for missed boats and trailer departure counts on-site using the proportion of CRFS boats to nonfishing boats sampled. It is assumed that these missed boats have the same proportion of fishing and nonfishing effort as boats sampled.

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3. Multiple days fished expansion factor: determines the proportion of multiple day trips by trip-type by PR1 site and day-type. This expansion is used to expand sampled boat-trips into total boat days by trip-type, site, and day-type.

All catch and effort data collected monthly at each PR1 site are expanded by these three expansion factors to determine: 1) total effort (boat-trip and angler-trip estimates) by trip-type, day-type, and site and 2) total catch by catch-type of species by trip-type, day-type and site. There are three catch-types: type A catch – dead fish examined by sampler at dock; type B1 catch – fish reported dead but unexamined (e.g., fillets, fish used as bait, fish released dead at-sea, fish landed on-site but not examined by sampler) and type B2 catch – fish reported as released alive at-sea. Estimates from each site and day-type are then summed by district to produce monthly estimates of total catch, effort and for calculating district CPUE by catch-type and species.

Specific steps in the effort estimates

1. Check data for errors: compare data from Assignment Summary Forms with PR1 sampling assignments for the month to identify any errors or missed assignments.

2. Program determines day-type strata and CRFS district for each PR1 site by date.

3. Calculate day-type sample expansion factor by month/district/day-type/site stratum:
   A. Determines number of samples taken at each site by day-type (zero effort days included)
   B. Determines total available days for each day-type strata by month
   C. Calculates day-type sample expansion factor by dividing available days by number of samples taken

   Sample expansion factor = total day-type days available ÷ sampled day-type days

4. Calculate missing boats expansion factor by month/district/day-type/site stratum:
   A. Determines number of CRFS boats sampled at site
   B. Determines total number of boats sampled at site
   C. Determine number of on-site missed boats and trailers at site
   D. Determine 'missed' CRFS boats by multiplying missed boats times CRFS boats divided by total boats sampled at site
   E. Calculate missed boat factor by summing 'missed' CRFS boats and sampled CRFS boats and dividing by CRFS boats sampled

   Missed boats expansion factor = (missed CRFS boats+CRFS boats sampled)÷ CRFS boats sampled

5. Calculate multiple-days fished expansion factor by month/district/day-type/trip-type/site stratum:
   A. Determines number of CRFS boats sampled at site
   B. Determines number of days fished by CRFS boats at site
   C. Calculate multiple days fished expansion factor by dividing days fished by CRFS boats sampled

   Multiple days fished expansion factor= CRFS boat days fished ÷ CRFS boats sampled

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6. Estimate boat-trip effort for each site by month, district, day-type, water area, and trip-type stratum
   A. Multiply the number of sampled CRFS boats times the day-type sample expansion factor times the missed boats factor times the multiple days fished expansion factor.
   Note: all PR1 data are defaulting to water area '1' at this time so all effort and catch estimates are reported as 'within 3 miles of shore'

   Boat trip effort = CRFS boats sampled x day-type sample expansion factor x missed boats expansion factor x multiple days fished expansion factor

7. Estimate angler-trip effort for each site by month, district, day-type, water area, and trip-type stratum:
   A. Sum CRFS anglers sampled
   B. Multiply the boat-trips times CRFS anglers sampled divided by CRFS boats sampled

   Angler trip effort = Total boat-trips x CRFS anglers sampled ÷ CRFS boats sampled

Specific steps in the catch estimates

1. Determine number of each species sampled at each site by district, month, day-type, trip-type and water area stratum
   A. Sum the number of examined catch-type A and reported/unexamined catch-types B1 and B2 by species.

2. Determine boat CPUE (by catch-type) of each species by district, month, site, day-type, trip-type and water area stratum
   A. Divide the number of species sampled/reported by total CRFS boats sampled in strata

   Boat CPUE type A = Number of type A sampled ÷ CRFS boats sampled
   Boat CPUE type B1 = Number of type B1 reported ÷ CRFS boats sampled
   Boat CPUE type B2 = Number of type B2 reported ÷ CRFS boats sampled

3. Estimate catch (by type) of each species by district, month, site, day-type, trip-type and water area stratum by multiplying the total boat-trips by boat CPUE

   Catch A = Boat CPUE type A x estimated boat-trips
   Catch B1 = Boat CPUE type B1 x estimated boat-trips
   Catch B2 = Boat CPUE type B2 x estimated boat-trips

4. Determine angler CPUE of each species by district, month, site, day-type, trip-type and water area stratum by dividing the catch (by type) by angler-trips

   Angler CPUE type A = Catch A ÷ angler-trips
   Angler CPUE type B1 = Catch B1 ÷ angler-trips
   Angler CPUE type B2 = Catch B2 ÷ angler-trips

B. Secondary Sites for Private and Rental Boats (Public Access & Daylight Hours)

The survey for private and rental boats at secondary sites is based on a roving-access survey design and is conducted during daylight hours. Secondary PR sites (PR2) are defined as

publicly accessible launch facilities (e.g., launch ramps, hoists, beach tractors, rental shops) that have historically landed less than 10% of the PR catch of important management species.

Sample Design
A roving survey is used to obtain instantaneous arrival and departure counts of trailers at each PR2 site within a cluster. An access point survey is used to collect data on angler effort and catch by trip-type.

Frame: All clusters of publicly-accessible PR2 sites in the district and all daylight-hours for all the days in the month.

Stratification: Sampling is stratified by month, and day-type (weekend/holiday or weekday) for each cluster.

Frequency: Each cluster is sampled three days per month: one weekday and two weekend days. This is approximately 5% of all weekdays and 25% of all weekend days available.

Description of sites and clusters: Secondary PR structures include facilities where private skiffs and kayaks can be launched or where skiffs can be rented. They include launch ramps, hoists, public docks, and a few beach launch sites. The sites are grouped into clusters based geographic proximity. The clusters are designed to allow the sampler to travel to each site in the cluster and conduct on-site interviews for several hours at each site during an eight-hour workday. The number of sites per cluster varies depending upon the travel times among sites and distance from the sampler's workstation. The sites in a cluster are not homogenous in terms of species caught or effort. It should be noted that MM sampling is scheduled simultaneously with PR2 sampling and a cluster may contain PR2 only sites, MM only sites and sites containing both modes (MM-PR2).

The composition of sites in a cluster remains constant within a month, but can vary between months or years. A PR2 site may become inactive due to a facility being closed or due to a season closure on certain management species. In addition, PR1 sites may be reclassified as PR2 sites when effort and catch becomes low. In southern California, the number of sites per PR2 cluster decreases in some areas during the summer to accommodate longer travel times due to the difficulty of finding parking at some high activity sites. In northern California, some sites have no effort during the winter. A site may be permanently removed from a cluster due to a consistent lack of angler effort; however periodic checks are conducted to ensure low effort persists.

PR2 clusters and the number of sites in them vary by month and year; however there are approximately 30 to 40 PR2 clusters used during any given month. Table 2.B.1 shows the number of PR2 and MM-PR2 clusters and sites by district sampled in July 2006.

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Table 2.B.1 Number of PR2 and MM-PR2 sites and clusters by district and statewide (July 2006).

District	Number of secondary sites for private and rental boats (PR2)	Number of sites with both of MM and PR2 modes (MM-PR2)	Number of clusters with PR2 and/or MM-PR2 sites
1 South	22	2	11
2 Channel	2	2	1
3 Central	7	2	5
4 San Francisco	16	8	12
5 Wine	12	5	5
6 Redwood	3	6	3
Total	**67**	**25**	**37**

Table 2.B.2 shows the list of MM-PR2 cluster sites used for District 5 in June 2005. The list also identifies other modes which may be sampled opportunistically at each site if time allows.

Table 2.B.2 List of active MM-PR2 list of active cluster sites for District 5 (June 2005).

Cluster name	Route order	Mode	County code	Site code	Site name	Opportunistic sampling mode
FTB16	A	PR2	97	105	Doran Park (ramp)	BB
FTB16	B	MM	97	301	South Jetty – Doran Park	BB
FTB18	A	PR2	97	211	Stillwater Cove (beach access)	BB
FTB18	B	PR2	97	107	Timber Cove (hoist <17' skiffs)	BB
FTB18	C	PR2	97	210	Salt Point (beach access)	BB
FTB3	A	MM-PR2	45	103	Point Arena (hoist)	BB
FTB3	B	PR2	45	111	Anchor Bay (ramp)	BB
FTB4	A	PR2	45	205	Mendocino (beach access)	BB
FTB4	B	PR2	45	206	Van Damme (beach access)	BB
FTB4	C	MM-PR2	45	102	Albion (ramp)	BB
FTB5	A	MM	45	101	Dolphin Cove Marina	PR2
FTB5	C	MM-PR2	45	104	S. Harbor District (ramp)	
FTB5	D	MM-PR2	45	400	North Noyo Harbor	PC
FTB5	E	MM-PR2	45	204	Fort Bragg	BB

Sample selection and scheduling:
Each CRFS supervisor creates a monthly sample schedule for all MM-PR2 clusters within his/her respective districts. Generally each MM-PR2 cluster is scheduled one weekday and two weekend days.

Although they may employ different methods, the intent of all four CRFS supervisors is to get an even distribution of assignments throughout the month for the MM-PR2 mode and individual clusters sampled. The schedule also identifies which site of the cluster is to be sampled first and sites are generally sampled in the same order (e.g., ABCD, BCDA, CDAB) due to geographic and time limitations. Samplers are also instructed to vary their starting times in an attempt to have representative sampling over the entire daylight fishing period.

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On occasion, the sample-date must be reassigned due to scheduling conflicts with other assignments (e.g., BB, PC) that were randomly drawn for the same day. If a sampler misses an assignment, the assignment is rescheduled to the next available day of the day-type strata in the month. In rescheduling, an effort is made to ensure that at least one weekday and one holiday/weekend assignment is completed for each cluster in the month.

Data Elements Collected

The following key data elements are collected during the roving survey for effort, and reported on the Assignment Summary Form (Appendix B):

9. Date
10. Cluster name
11. For each PR2 site,
    a. Site name and number
    b. County code
    c. Number of boat trailers present at arrival (arrival count used in effort estimation)
    d. Time of arrival count
    e. Start time for sampling anglers
    f. Number of CRFS boats sampled
    g. Number of nonfishing or status '0' boats
    h. End time for sampling anglers
    i. Number of boat trailers present at departure (departure count used in effort estimation)
    j. Time of departure count

The following key data elements are collected during the access point survey using the Angler Form (Appendix B). These data elements are used in the effort and catch estimations.

1. Date
2. County code
3. Site name and number
4. General fishing effort area (e.g., ocean, bay, river, estuary)
5. Time of Interview
6. Mode of fishing (e.g. MM, PR, PC)
7. Number of anglers on boat
8. Trailer on-site (Y/N)
9. Number of anglers contributing to catch
10. Departure time
11. Wet-gear hours (trip duration)
12. Primary and secondary target of trip (type of trip)
13. Reported released or unavailable catch by angler interviewed (by species or highest taxonomic order possible)
14. Catch examined by the sampler (number of fish by species); plus other biological data such as lengths and weights
15. Distance from shore (<= 3 miles or >3 miles)
16. Specific fishing location where majority of fish caught
17. Changes in boat effort during the access point survey: the number of boats that landed but were not interviewed since last interview, and the number of boats that launched since last interview.

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Survey Methods

The samplers receive their assignments for the month a week or two before the start of the month. Table 2.B.3 shows an example of a MM-PR2 monthly sample schedule with the date and starting site for each cluster identified. The sampler follows the predetermine route and visits each site in the cluster during the assignment.

Table2.B.3. Monthly sample schedule for MM-PR2 clusters in District 5 (June 2005).

Day Type	Day of the week	June 2005 Date	County code	Site name	First site to visit in cluster	Assignment identification number
we	Sun	12	45	FTB3	A	65031
we	Sat	25	45	FTB3	B	65032
wd	Thu	9	45	FTB3	A	65033
we	Sat	4	45	FTB4	A	65034
we	Sun	19	45	FTB4	B	65035
wd	Tue	28	45	FTB4	C	65036
we	Sat	11	45	FTB5	A	65037
we	Sun	26	45	FTB5	C	65038
wd	Wed	15	45	FTB5	E	65039
wd	Thu	2	97	FTB18	A	65004
we	Sat	11	97	FTB18	B	65007
we	Sun	19	97	FTB18	B	65010
we	Sun	5	97	FTB16	B	65006
we	Sat	18	97	FTB16	A	65009
wd	WED	29	97	FTB16	A	65012

The time the sampler spends at each site typically ranges from a few minutes to several hours. The amount of time on-site depends on the number of sites in the cluster, travel time to the first site, travel time among the sites, and angling effort at each site. Samplers may return to previously visited sites once all of the sites have been visited and initial effort level at each site has been determined. Typically, samplers return to the site(s) with the most effort.

The sampler conducts the roving access point survey at each site. The on-site procedures for each site visit during the assignment are as follows for the PR2 mode (in sequential order):

1. The sampler records the time of arrival at each site and immediately records the number of trailers (arrival count) on-site.
2. If there is fishing activity, the sampler begins interviewing PR2 anglers as they land their vessels at the site.
3. The sampler attempts to interview each PR2 anglers using the standard methods for the Angler Form. The Angler Form is a scripted questionnaire designed to collect data on the angler, the angler's trip, and the angler's catch and discards. A copy of the Angler Form and the scripted questions are in Appendix B. Key data elements that are used in the effort and catch estimates are listed above in the subsection titled "Data Elements Collected." During times when there are no boats to interview, the sampler is still required to fill out an Angler Form within 15 minutes of any change in effort in the PR2 survey (e.g., launched boat, nonfishing boat landed).

4. The sampler also tracks the number of fishing boats that landed but were not interviewed.
5. After the sampling period, the sampler counts the number of trailers on-site (departure count) and records the departure time. The sampler does not count arriving and departing boats after the departure count is completed.

At MM-PR2 sites, the sampler also collects arrival and departure counts of MM anglers and conducts angler interviews for this mode as time allows. At some sites, it is impossible to monitor both modes at the same time so sampling will stop at one mode while the other mode is being sampled.

Estimation Procedures

Effort

Effort estimation begins by multiplying the average trailer-count times the length of the fishing period in hours (daylight-hours) (note Pollock et al. 1964, circa page 245) to generate estimates of trailer-hours per day. Effort a_i in angler days is the product of trailer hours per day and angler-trips per trailer hour, for a fishing period *i*, and is estimated by

$$\hat{a}_i = (\bar{I}_i T)\overline{(P_b H_t B)}_i ,$$

where trailer hours per day $(\bar{I}_i T)$ is the count of boat trailers for fishing period, $\bar{I}_i$, multiplied by the length of the fishing period T_i. In the case that only one trailer-count is made during the fishing period, this term has no variance and is assumed to be measured without error. In the case that several trailer-counts are made during a fishing period, then $(\bar{I}_i T)$ is estimated by

$$(\bar{I}_i T) = \frac{\sum_{l=1}^{L} (\bar{I}_{l,i} T_i)}{L}$$

where *l=1, …, L* trailer-counts are made during fishing period *i.* In this case, $(\bar{I}_i T)$ has the usual estimated variance

$$\hat{Var}(\bar{I}_i T_i) = \frac{T_i^2 \left[(I_{l,i} T) - \bar{I}_i T_i\right]^2}{l(l-1)}$$

Angler trips per trailer hour is the mean of $(P_b H_t B)_{i,k}$, the product of fishing boats per trailer (P_b), trips per hour (H_t) and anglers per boat (B) where each of the three terms is observed for each boat interviewed (*k*=1 … K_i boats) in fishing period *i*. Note that H_t is the inverse of hours for boat-trip *k*. P_b is the indicator (=0, 1) of whether the boat interviewed is a fishing boat. For a non-fishing boat, this product is zero (no angler hours) while for a fishing boat this product will measure the angler-trips per trailer hour for fishing boat *k*.

The mean angler-trips per trailer hour is

$$\overline{(P_b H_t B)}_i = \frac{\sum_{k=1}^{K} (P_b H_t B)_{i,k}}{K},$$

where K_i boats are interviewed in fishing period *i*. Its variance is

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$$\hat{Var}\left(\overline{P_b H_t B}\right)_i = \frac{\sum_{k=1}^{K_i}\left[\left(P_b H_t B\right)_{i,k} - \overline{\left(P_b H_t B\right)_i}\right]}{K_i(K_i - 1)}.$$

Total effort for a survey period in angler hours is estimated by

$$\hat{a} = \sum_{i=1}^{n}(\hat{a}_i / \pi_i)$$

Here π_i is the total probability (n/N) the period *i* is included in the sample. Assuming that non-fishing pleasure boats are out for about the same duration as fishing boats on average, the estimate is unbiased. If pleasure boats are out longer, then the effort estimates would be inflated. Studies aimed at measuring (and comparing) the trailer hours of fishing and non-fishing boats will measure this assumption.

The variance for angler effort is estimated by

$$\hat{Var}(\hat{a}_i) = (\hat{\bar{I}}_i T)^2 \hat{Var}(\hat{P}_b \hat{H}_t \hat{\bar{B}}) + (\hat{P}_b \hat{H}_t \hat{\bar{B}})^2 \hat{Var}(\hat{\bar{I}}_i T) - \hat{Var}(\hat{\bar{I}}_i T)\hat{Var}(\hat{P}_b \hat{H}_t \hat{\bar{B}})$$

Effort estimation is concluded with the calculation of the effort for the angler reported domains of water area fished and type of species targeted in the trip (trip-type). Domain classes are estimated by

$$\hat{a}_2 = \hat{a}\left(\frac{\sum_{i=1}^{n} a_i}{n}\right) = \hat{a}p$$

Where the sampling proportion *p* is estimated by percentage of anglers *a* in domain *i* among *n* trips in a particular stratum.

The variance for the domain is estimated by

$$\hat{Var}(\hat{a}_2) = (p)^2 \hat{Var}(\hat{a}) + (\hat{a})^2 \hat{Var}(p) - \hat{Var}(p)\hat{Var}(\hat{a})$$

where $\hat{Var}(p) = \frac{p(1-p)}{n}$

Catch-per-unit-effort

Catch rate is calculated as the estimated catch divided by the estimated total number of anglers. Estimated catch rate is calculated for each stratum to include the angler reported domains of water area fished and type of species targeted in the trip (trip-type). Estimation is based on summarizing the sample from angler intercepts during the roving survey. Catch rate $\hat{\bar{c}}_1$ is calculated by summing the total catch c_i divided by the sum of the number of anglers a_i sampled in each stratum and domain *i* by:

$$\hat{\bar{c}} = \sum_{i=1}^{n} c_i \Big/ \sum_{i=1}^{n} a_i \ ,$$

Total catch is estimated by

$$\hat{C} = \hat{a}_2 \times \hat{\bar{c}} \ ,$$

where $\hat{\bar{c}}$ is the catch rate of anglers and $\hat{a}_2$ is the effort estimate for the corresponding domain.

Variance is estimated by

$$\hat{Var}(\hat{C}) = (\hat{\bar{c}})^2 \hat{Var}(\hat{a}_2) + (\hat{a}_2)^2 \hat{Var}(\hat{\bar{c}}) - \hat{Var}(\hat{\bar{c}})\hat{Var}(\hat{a}_2)$$

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Specific steps in the effort estimates

For each district, cluster, and day-type, the effort estimation of PR2 angler-trips is calculated by multiplying the mean hourly trailer-count times the mean angler-trips per trailer hour times the monthly mean length of daylight-hours times the number of sites in a cluster times the number of days by day-type strata in the month.

1. Check data for errors: Compare data from Assignment Summary Forms with sampling assignments and PR2 cluster list for the month to identify any errors or missed assignments.

2. Program determines day-type strata and CRFS district for each PR2 cluster/site by date.

3. Estimate a mean hourly trailer-count by month/district/day-type/cluster stratum:
   A. Calculate mean hourly trailer-count.
      - Strata: month, district, day-type, and cluster
      - Use arrival and departure counts for all cluster sites collected on the ASF. The arrival and departure counts are made during each visit to a site in the cluster. Sites visited more than once have additional counts in these data.
      - Compute additional trailer-counts for each hour sampled between arrival and departure count. These computed counts are based on the PR2 effort changes recorded at each site during the sample period. In general, the longer the site is sampled, the more hourly trailer-counts are computed. Computed hourly counts include counts when there is no activity or when no change in activity occurs.
      - Computes a minimum hourly trailer-count for each site.
      - Calculates mean hourly trailer-count (i.e., trailers per hour) by averaging all of the above counts with equal weight.

   B. Calculated fishing period (mean number of daylight-hours per day)
      - Strata: month and district
      - Day length is the mean number of daylight-hours per day for the month and district. The number of daylight-hours is calculated for each district using the central latitude in each district. (Note: District 5 uses Fort Bragg latitude instead of central latitude).

   C. Calculate mean trailer-hours per day for all strata with observations.
      - Strata: month, district, day-type, and cluster

      trailer-hours per day = mean daylight-hours x weighted mean hourly trailer-counts

      - If a cluster is missing a mean hourly trailer-count for a day-type, the program calculates a district mean using the trailer-counts from all sampled sites in the district and day-type.

5. Estimate mean angler-trips per trailer-hour (= inverse of boat-trip duration of interviewed anglers) by month/district/day-type/cluster stratum:

   A. Estimate boat-trip duration and determine angler-trips per trailer-hour for each boat sampled.
      - Strata: month, district, day-type, and cluster

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- This calculation uses only information collected from PR2 angler interviews with boats that had trailers on-site. (note: all boats sampled with trailers offsite are assumed to have 0 ATPTH).
- Calculate boat-trip duration and thus trailer time (i.e., total time the trailer was on-site) by subtracting the departure time from the interview time of the first angler for each boat.
- Determine angler-trips per trailer-hour for each boat by dividing number of anglers by the trailer time.

  angler-trips per trailer-hour = *number anglers / trailer time*.

B. Determine proportion of PR2 boats sampled with trailers on-site and apply proportion to nonfishing boats landing at cluster sites.
   - Strata: month, district, day-type, and cluster
   - Divide total number of PR2 boats with trailers on-site by total number of PR2 boats interviewed to get on-site proportion.
   - Multiply number of nonfishing boats that landed by on-site proportion to determine number of nonfishing trailers on-site (assumes fishing and nonfishing vessels have same trailer rate).
   - Nonfishing boats with trailers on-site are assumed to have 0 angler-trips per trailer-hour.

4. Calculate mean angler-trips per trailer-hour by month/district/day-type/cluster stratum:

   A. Calculate mean angler-trips per trailer-hour for strata for clusters where angler interviews were conducted
      - Strata: month, district, day-type, and cluster
      - Calculate the mean angler-trips per trailer-hour for all boats (fishing and nonfishing) landing at the cluster site.

   B. Calculate a mean district angler-trips per trailer-hour by day-type to use as surrogate for all clusters without angler interviews. Program calculates the mean angler-trips per trailer-hour from all individual boats so district angler-trips per trailer-hour is weighted by sites with most interviews. Note: if no angler interview data for district and day-type, program then calculates and uses the mean angler-trips per trailer-hour for the California sub-region of the district (districts 1 and 2 are in sub-region 1; districts 3, 4, 5, and 6 are in sub-region 2).

5. Estimate total effort (angler-trips) by month/district/day-type/cluster stratum:

   A. Expand the mean angler-trips per trailer-hour for the month/district/day-type/cluster strata to the number of day-type days in the month and the number of sites in the cluster to get total effort for the month by cluster and day-type.

      Total angler-trips = angler-trips per trailer-hour x mean hourly trailer-count x number of day-type days x number of sites

   B. Sum total angler-trips/month/cluster by district and day-type.

C. Sum total angler-trips/month/cluster by district.

6. Post-stratify angler-trip effort by month/district/day-type/cluster stratum for trip-type and water area:

   A. Total angler-trip effort by strata is post-stratified into trip-type and water area (ocean within 3 miles, ocean outside 3 miles, bay waters, inland river waters, and Mexican waters) based on the proportion of CRFS boats interviewed by trip-type and water area. Proportions of CRFS boats sampled are either pooled by district and day-type or sub-region and day-type.

      Estimated angler-trips by trip-type and water type = total angler effort by cluster and day-type x proportion of boats sampled (pooled by district or by trip-type and water area (pooled by district or sub-region)

<u>Specific steps in the catch estimates</u>

1. Sum sampled anglers by district, month, trip-type and water area for both examined (type A) and reported/unexamined (types B1 and B2) catch.

   A. Sum anglers that reported unexamined catch (= B anglers).

   B. Sum anglers that contributed to the examined catch (= A anglers).

2. Sum examined and unexamined catch by species for month/district,/trip-type/water area/species stratum.

   A. Sum unexamined catch by species into type B1 and B2 categories based on reported disposition (released alive = catch-type B2; all other = catch-type B1).

   B. Sum examined catch by species (= catch-type A).

3. Calculate catch-per-unit of effort for catch-type A, B1 and B2 catch by species, district, month, trip-type, and water area strata.

   A. Divide B1 and B2 catch by B anglers by species, district, month, trip-type, and water area strata.

      CPUE catch-type B1 = catch-type B1 ÷ B anglers
      CPUE catch-type B2 = catch-type B2 ÷ B anglers

   B. Divide A catch by A anglers by species, district, month, day-type, trip-type, and water area strata.

      CPUE catch-type A = catch-type A ÷ A anglers

12. Determine total A, B1 and B2 catch by species, month, district, day-type, cluster, trip-type and water area
    A. Strata: district, month, cluster, day-type, trip-type, and water area

B. Multiply total angler-trips (by catch-type) times CPUE for each species by catch-type to get total catch estimates (type A, B1, and B) by month, district, cluster, day-type, trip-type and water area.

*Total catch-type A = total A angler-trips * CPUE catch-type B2 catch*
*Total catch-type B1 = total B angler-trips * CPUE catch-type B2 catch*
*Total catch-type B2 = total B angler-trips * CPUE catch-type B2 catch*

C. Night Fishing and/or Private Access Sites for Private and Rental Boats

Private access PR sites are not sampled directly by CRFS due to their inaccessibility and the large number of sites scattered throughout the state. In addition, public PR sites are only sampled during daylight hours. To estimate catch and effort for PR public access and night fishing (PAN), sample data from the on-site PR1 and PR2 surveys are merged with the PAN effort calculated from the ALD survey (see ALD section). Currently, PR anglers in the ALD are defined as PAN anglers if their boat wasn't launched from a public launch ramp or they fished at night. PAN angler trips are estimated by month, district, trip-type, and water area.

Estimation Procedures

Effort

Effort estimates are calculated based on expanding the sampled population of licensed anglers by trip-type and access type (public or private) to total licensed anglers in California (see ALD section for specific info).

PAN PR effort is estimated using this basic method

$$\hat{E}pan = \sum_{i=1}^{n} \frac{N}{n} \sum_{i=1}^{n} t \,,$$

where the number of PAN PR angler-trips *t* reported in geographic time stratum *i* is multiplied by the number of licensed anglers *n* contacted per *N* licenses issued. An adjustment for unlicensed anglers from public access sites (anglers not in the telephone survey) is also made using the proportions of unlicensed anglers observed in the PR1 and PR2 surveys. It is assumed that unlicensed angler rates are the same for both public and private access types.

Catch and effort estimates from PR1 and PR2 surveys are summed by month, district, trip-type, and water area (stratum *i*) to produce total catch and effort estimates for the public PR fishery. These combined data are used to produce the catch rate by catch-type A, B1, and B2 for each species by stratum. Since the catch rates are computed using the catch and effort estimates from the primary and secondary PR surveys, they will reflect the relative size of the primary and secondary site trip populations; however all PR1 data are currently defaulted into water area '1' (ocean waters inside 3 miles of shore); thus only PR2 data are being used to determine catch rates in the other water areas (ocean waters outside 3 miles and inland marine/bays).

It is assumed that catch rate by trip-type and water area is the same for public and private access. The catch rate $\hat{R}_i$ is calculated by summing the total catch $\hat{C}_i$ (by catch-types A, B1, and B2) of the public PR fishery divided by the PR angler effort $\hat{E}_i$:

$$\hat{R}_i = \sum_{i=1}^{n} \hat{C}_i \Big/ \sum_{i=1}^{n} \hat{E}_i \ ,$$

Based on the proportions of estimated PR angler-trips by ocean water area in stratum *i*, PAN ocean angler-trips are stratified into two water areas: fishing inside 3 nautical miles and fishing outside 3 nautical miles. The PAN catch $\hat{C}pan_i$ by month, district, trip-type and water area is then estimated by multiplying the PAN anglers-trips $\hat{e}_i$ by its corresponding catch rate $\hat{R}_i$:

$$\hat{C}pan_i = \hat{e}_i \times \hat{R}_i$$

3. Commercial Passenger Fishing Vessels

A telephone survey of commercial passenger fishing vessels (CPFVs) that operate in marine waters off California is used to collect fishing effort data. This survey is called the Party Charter Phone Survey or PCPS. An independent on-site, intercept survey is used to collect data on catch. The intercept survey is conducted either onboard CPFVs at-sea or dockside at the end of the fishing trip.

Sample Design
The effort survey is modeled after the vessel directory telephone survey developed by the National Marine Fisheries Service (NMFS) in cooperation with the various state and regional agencies. The components of the telephone survey for include:

- Compiling and maintaining a directory of CPFVs operating in marine waters in each district,
- Conducting a weekly telephone survey of a random sample of CPFV representatives (usually the CPFV operator) in each district, and
- Conducting dockside vessel checks to document CPFV activity and validate the self-reported data from the telephone survey.

The at-sea and dockside interviews collect information on the catch from anglers after they have completed their trip. In addition, the onboard survey collects data on discarded fish at-sea. The effort and catch surveys for salmon differ from those described in this section; the salmon survey methods and estimation procedures are described in Appendix C. Daily boat counts are conducted of CPFVs targeting salmon north of Point Conception (Santa Barbara County), and at least 20 percent of the salmon trips in each half-month period of the salmon season are sampled at the dock for effort (angler trips) and catch.

Effort Survey – Sample Design

Frame: All eligible CPFVs in the PCPS directory for the district at the beginning of the two-month wave. The waves are: January and February, March and April, May and June, July and August, September and October, and November and December.

Stratification: Sampling is stratified by wave and week.

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Frequency: Representatives from 10 percent to more than 50 percent of the CPFV in a district are contacted each week. The contact rate depends upon the number of active CPFVs in the district: the lower the number of active CPFVs the higher the contact rate. The contact rate initially was 10 percent in all districts, but the resulting estimates in the districts with relatively low numbers of CPFVs could not be stratified by district and trip-type.

Description of the CPFV directory:
The state requires that all vessels taking passengers for hire purchase a CPFV license from the Department of Fish and Game, and the CPFV license must be renewed annually. The initial directory of CPFVs was based on the list of licensed CPFVs. Information from a variety of sources (including field observations, United States Coast Guard records, advertisements, and fishing reports in newspapers and on websites) was used to ensure the directory was relatively complete.

The directory is updated throughout the year to maintain an accurate sampling over time. Newly licensed CPFVs and unlicensed CPFVs that are found during other field surveys (*e.g.*, the field survey for private and rental boats) are added to the directory. Inactive CPFVs, CPFVs operating in freshwater, and CPFVs that are ineligible for some other reason are flagged in the directory and not included in the sample frame. Information for each CPFV in the directory is continually updated.

The Department of Fish and Game sell about 450 CPFV licenses per year. Some of those vessels fish only in freshwater and some fish only for shellfish (*e.g.,* lobsters). The CPFV directory for the telephone survey has about 380 eligible vessels. The number of active and eligible vessel changes each wave. Table 3.1 shows the number of eligible CPFVs in the directory by district and angler-capacity category for a typical wave.

Table 3.1. Number of eligible CPFVs in the 2005 Wave 5 sampling frame by district and angler capacity.

Angler capacity range	District						Total	Percent of total
	1	2	3	4	5	6		
31-150	102	8	12	18	3	0	143	41%
7-30	34	8	1	27	2	3	75	22%
1-6	72	7	9	24	7	11	130	37%
Total	**208**	**23**	**22**	**69**	**12**	**14**	**348**	

Sample selection and scheduling:
Samples for each week of the wave are drawn before the beginning of the wave. Sample selection is based on a systematic random design. The directory is sorted by district and angler-capacity category to insure that all categories in the district are represented. The draw for each week is separate and uses the entire directory for the wave. The samples are drawn randomly within the district by selecting every *nth* vessel (with the sampling interval based on the prescribed contact rate for the district), and by randomly selecting the starting point for the first interval. The angler-capacity categories are: 1 to 6 anglers, 7 to 30 anglers, and 31 to 150 anglers. Currently, there are no CPFVs operating in California with an angler capacity greater than 150 anglers.

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The tables below show the results of the sample selection for Wave 5 of 2005. In each of the nine weeks of Wave 5, 51 CPFVs were selected following the systematic random design. Some CPFVs were selected multiple times during the wave, because each week is drawn independently.

Table 3.2. Total number of CPFVs selected in the nine weeks of Wave 5 of 2005 by district and angler capacity.

Angler capacity range	District						Total
	1	2	3	4	5	6*	
31-150	95	19	24	19	8	0	165
7-30	31	16	1	27	5	15	95
1-6	63	19	20	17	23	57	199
Total	**189**	**54**	**45**	**63**	**36**	**72**	**459**

* District 6 did not have any vessels in the telephone directory for Wave 5, 2005 with an angler capacity greater than 30.

Table 3.3. Average percent of CPFVs in the directory that were selected each week of Wave 5, 2005 by district and angler capacity.

Angler capacity range	District						Total
	1	2	3	4	5	6	
31-150	10%	26%	22%	12%	30%	NA*	13%
7-30	10%	22%	11%	11%	28%	56%	14%
1-6	10%	30%	25%	8%	37%	58%	17%

*The District did not have any vessels in the telephone directory for Wave 5, 2005 in this angler-capacity category.

Catch Survey – Sample Design

Sampling unit: The sampling unit is the CPFV for sample selection purposes. However, sampling occurs at the angler level, because a sampler typically is unable to observe and monitor the fishing activities of all the anglers on a CPFV trip for catch and discards and a sampler typically is unable to interview all the anglers on a CPFV.

Frame: The CPFVs operating from a fixed location (also know as a landing) in a district during the month. Small CPFVs (commonly called “six-packs”) that launch from ramps and CPFVs that leave from private marinas are excluded from the list. These CPFVs are sampled dockside when encountered during other surveys (*e.g.,* the private and rental boats survey).

Stratification: The sampling for catch is stratified by month, district, day-type, and kind of CPFV trip (*e.g.,* three-quarter to full-day, half-day, twilight, and/or trip-type).

Frequency: The frequency varies by month, but generally less than five percent of the trips are sampled. The exception is that at least 20 percent of the salmon trips are sampled at the dock.

Description of the landings and CPFVs that are sampled for catch:

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Most of the CPFVs with angler capacities greater than six anglers dock at fixed locations or landings. Table 3.4 shows the number of landings that are sampled and the number of vessels that are typically docked at those landings.

Table 3.4. Number of commercial passenger fishing vessel landings that are in the sampling frame for the catch survey and the number of commercial passenger fishing vessels at those landings by district and statewide.

District	Number of landing sites for commercial passenger fishing vessels that are in the sample selection frame	Total number of commercial passenger fishing vessels at those landings
1 South	17	186
2 Channel	5	26
3 Central	7	23
4 San Francisco	10	52
5 Wine	8	10
6 Redwood	10	14
Total	**53**	**310**

Sample selection and scheduling: Sample selection is a three-step process: (1) selection of landing sites; (2) selection of day-type, types of CPFV trips and area fished; and (3) selection of the CPFV at the landing. The selection of CPFV landing sites is base on past distribution of effort with adjustments for anticipated changes in effort. Selection of trips at a landing is systematic and in proportion to past effort for day-type, kind of CPFV trips and area fished.

Samplers attempt to schedule a trip for the day of the assignment that matches the kind of CPFV trip and fishing area listed for the assignment. The sampler will first determine whether a CPFV at the assigned landing is scheduling such a trip. If not, the sampler will attempt to find a CPFV at a nearby landing that is scheduling the assigned kind of trip. The sampler will go on an alternate kind of trip if he or she cannot find a CPFV taking the assigned kind of trip. If no CPFVs are going out the day of the assignment, the sample will reschedule the assignment to the nearest day when a CPFV is taking a trip from the assigned landing.

Data Elements Collected

Effort Survey – Data Elements

The following key data elements are collected during the weekly telephone survey for effort. A copy of the courtesy trip log (Charter Boat/Party Boat Weekly Telephone Survey Form) and the telephone survey questionnaire (Pacific Coast PC Telephone Survey Questions) are in Appendix D, and show all the data elements that are collected.

1. Name of the vessel and Fish and Game Boat Number
2. Number of trips with paying passengers during the specified week.
3. Number of saltwater fishing trips with paying passengers that targeted finfish during the specified week.
4. For each trip:
   - County from which the trip originated
   - Day of the week that the trip was taken

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- Date the trip was taken
- Length of the trip (*i.e.*, half-day, three-quarter day, full-day, or multi-day with the number of days)
- Mode by which the passengers paid for the trip (*i.e.*, charter trip where passengers hired the vessel as a group, and party boat-trip where passengers pay on an individual basis)
- Type of trip (*e.g.*, freshwater fishing, saltwater fishing for shellfish only, whale watching, scuba diving, saltwater fishing for salmon, saltwater fishing for groundfish, and saltwater fishing for pelagic species)
- Number of paying passengers
- Number of people who fished
- Primary area of fishing
  - Water area (*i.e.*, ocean or open bay, enclosed bay, and river)
  - Distance from shore (*i.e.*, 3 miles or less, 3 to 200 miles, and more than 200 miles)
- Total time for the trip
- Amount of time spent actively fishing with gear in the water to the nearest half hour

The following data elements are collected during the dockside vessel checks, and are reported on Passenger Vessel Check form (Appendix B).

1. Name of the vessel
2. County where the vessel was docked or where the vessel was seen launching
3. Date and time the vessel was observed or vessel's activity was determined

The vessel directory for the telephone survey includes the following information for each CPFV:

1. Vessel name and number
2. County for the primary location from which the vessel is launched or is docked (*i.e.*, landing)
3. Name of the primary location from which the vessel is launched or is docked (*i.e.*, landing)
4. Vessel length
5. Angler capacity
6. Willingness to cooperate in the telephone survey
7. Contact information:
   a. Name, telephone number, and address of the vessel representative
   b. Name, telephone number, and address of the vessel owner
   c. Name, telephone number, and address of the vessel operator
8. Vessel status
   a. Eligible or ineligible
   b. Active or inactive in the wave
   c. Active or inactive in the month

Catch Survey – Data Elements

The following key data elements are collected using the Angler Form (Appendix B) during interviews of anglers onboard a CPFV or interviews with anglers as they leave the CPFV at the end of a fishing trip. These data elements are used in the effort and catch estimations.

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1. Date
2. County code
3. Site name and number
4. CPFV name and number
5. Location where most of the fishing occurred
6. Number of anglers who fished on the CPFV
7. Gear used
8. The trip duration (departure and return times)
9. Wet-gear hours (amount of time with gear in the water)
10. Primary and secondary target of trip (trip-type)
11. Number of fish by species or highest taxonomic order possible that were reported caught and not available for examination, and the reason why the fish is unavailable (*e.g.*, discarded alive, discarded dead, fillet, used for bait, given away, and eaten)
12. Number of fish that were landed and examined by the samplers, and, if time allows, the lengths (fork length) weights, sex, and planned use (disposition) of the examined catch
13. Number of anglers who contributed to the "bag" of examined catch.

The following key data elements are collected at each fishing location during the trip, and recorded on the CPFV Onboard Catch Sampling Form (Appendix B).

1. Date
2. County code
3. Site name and number
4. CPFV name and number
5. Type of CPFV trip (*e.g.,* morning half-day, evening trip, or three-fourths to full-day trip)
6. Latitude and longitude of the fishing location
7. The amount of time spent at the location (start and stop times)
8. Minimum and maximum depths of the location
9. Number of anglers whose fishing activities the sampler observed (monitored) while at the location
10. Fishing method (*i.e.,* free drift, stationed, anchored, or troll)
11. Data on pinniped interactions
12. Species caught by the all the anglers who were observed, the number kept, the number discarded alive, and the number discarded dead (including fish that are obviously not going to survive).

Samplers also collect data on the lengths and weights of discarded fish while onboard CPFVs. These data are recorded on the Discarded Fish form (Appendix B).

Survey Methods

Effort Survey

Telephone survey

The vessel representative, usually the CPFV operator, for each CPFV that is selected for the survey is sent a letter before the start of the reporting period. The letter explains the survey and specifies the dates of the reporting period (one sample-week: Monday through Sunday) (Appendix D). The letter includes a log for recording the activities of the CPFV during the reporting period (Appendix D). The telephone survey contractor calls each of the selected CPFV representatives the week after the reporting period to interview the representative about the trips that their CPFV made during the reporting period. The interview questions are

provided in Appendix D The dial period lasts for three weeks. The representative may opt to fax the completed log to the telephone contractor rather than participate in an interview.

Dockside Vessel Checks

Data on the activities of CPFV from dockside checks are submitted weekly on the Passenger Vessel Check form (Appendix B). These data are used to validate the data from the telephone survey and update the CPFV directory. The dockside vessel checks are also used to identify the location of each CPFV, the angler capacity of each CPFV, the ability of each CPFV to carry an observer (sampler) on trips, changes in contact information, and changes in status (active or inactive).

Samplers collect data on the activities of the CPFVs in their district in a number of ways. Samplers visit CPFV landings, and record the presence or absence of each CPFV that normally docks at the landing. Samplers also look for the trailers of small CPFV that launch from ramps or hoists. If a CPFV is not at the dock or a CPFV trailer is in a parking lot, the sampler tries to ascertain the type of activity in which the CPFV is engaged by asking a reliable source such as a landing operator or booking agent. The samplers note any CPFV activity that they observe such as a CPFV entering or leaving the harbor and CPFVs they observe fishing while sampling onboard another CPFV.

The field samplers are given the list of vessels selected for the telephone survey each week. The highest priority for dockside vessel checks is determining the activities of the CPFVs that are drawn that week for the telephone survey.

Dockside checks for effort are also conducted for the salmon survey, and the data can also be used to validate the telephone survey. Samplers visit the primary salmon landing sites (see Appendix C for a list of sites) or telephone the landings and CPFV operators to determine the number of CPFVs that targeted salmon each day of the season. Samplers also meet at least 20 percent of the CPFV trips that target salmon at the dock and collect data on the number of anglers (including the skipper, crew, and non-paying passengers). The salmon effort data are submitted weekly during the salmon season.

CPFV Logbooks

Effort information taken from CPFV logbooks can be used to validate and adjust the CPFV telephone survey. As a condition of their CPFV license, CPFV operators are required to submit a record of their fishing activity on CPFV logs provided by the Department (Appendix D). The CPFV operator must complete and submit a separate log for each fishing trip or for each day of a multi-day trip, and a form must be submitted if no trips are taken are taken in a month. Compliance in submitting these logbooks is quite variable throughout the state so these logbook data are generally incomplete. The logbook data are not currently available in the time frame necessary for use producing the in-season estimates. Despite the compliance and timeliness issues, the CPFV logbook data provide a useful source of CPFV effort information for validating the telephone and catch surveys.

Catch Survey

Samplers receive their assignment for the month a week or two before the month begins. The sampler attempts to book trips with the CPFV operator or booking agent prior to the assigned day for the trip. Whenever possible, catch data is collected onboard the CPFV during a fishing trip. The onboard sampling procedures are described below.

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1. On the way to the fishing grounds, the sampler introduces him- or herself to the passengers, explains the survey, and interviews passengers using standard methods for the Angler Form (Appendix B) to learn where they live (*e.g.*, country, state, county, zip code), the type of fishing license they have, the number of days they saltwater fished in the last 12 months and in the last two months. A subsample of passengers is interviewed if a large number of passengers are onboard, otherwise all passengers are interviewed. A random subsample is taken by the sampler selecting every *nth* angler to interview. The Angler Form is a scripted questionnaire designed to collect data on the angler, the angler's trip, and the angler's catch and discards. A copy of the Angler Form and the scripted questions are in Appendix B. Key data elements that are used in the catch estimates are listed above in the subsection titled Data Elements Collected.

2. The sampler records the location, depth, and time of each fishing location (*i.e.,* stop or drift). In addition, the sampler observes and records data on catch and discards. If the sampler cannot observe all the anglers on the vessel or if the catch rates are high, the sampler observes the activities of a different subset of anglers at each fishing location. This may require the sampler to move to different positions on the vessel at each stop. Samplers record the location, depth, time, and catch data on the CPFV Onboard Catch Sampling Form (Appendix B), and the discard data on the Discarded Fish Form (Appendix B). Details of the data collected at each fishing location are in the subsection titled Data Elements Collected, above.

3. At the conclusion of fishing as the CPFV returns to port, the sampler completes the interviews with individual anglers using standard methods for the Angler Form to learn the number and type of fish they caught and what they did with the fish (*e.g.,* discarded, used for bait). The samplers measures the length of all available fish.

When it is not possible to observe fishing activities and interview the anglers onboard a CPFV at-sea, the sampler meets the CPFV at the dock and interviews the anglers as they depart the vessel. If the vessel carries more than six to ten anglers, the sampler typically cannot interview all the anglers as they depart, because the anglers don't want to wait to be interviewed. The sampler randomly selects the anglers to interview by picking every *nth* angler. The sampler uses standard methods for the Angler Form.

Estimation Procedures

Effort

The estimation procedures follow the statistical methods used by the NMFS vessel directory telephone survey which are documented in Appendix E.

Weekly estimates by district and water area are expanded as the product of total angler-trips reported by sampled vessels and the ratio of active vessels per sampled vessel. Intercepts of vessels in the CRFS field surveys are used to make an under coverage ratio to correct for participating vessels not included in the CPFV directory for the telephone survey and to make a response error ratio to correct for misreporting of vessel trips.

Catch-per-unit-effort

The estimated CPUE, as catch per angler-trip, is calculated for each stratum to include the angler-reported domains of water area fished and trip-type (type of species targeted in the trip).

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The estimation is based on summarizing the samples from angler intercepts. The CPUE ($\hat{\bar{c}}_1$) is calculated by summing the catch (c_i) and dividing by the sum of the number of anglers sampled (a_i) in each stratum and domain *i* as follows:

$$\hat{\bar{c}} = \sum_{i=1}^{n} c_i \Big/ \sum_{i=1}^{n} a_i$$

Total catch is estimated by

$$\hat{C} = \hat{a}_2 \times \hat{\bar{c}}$$

where

$\hat{C}$ = the estimated total number of fish caught

$\hat{\bar{c}}$ = the estimated catch per angler-trip in the stratum

$\hat{a}_2$ = the estimated total number of angler-trips in the stratum.

Variance is estimated by

$$\hat{Var}(\hat{C}) = (\hat{\bar{c}})^2 \hat{Var}(\hat{a}_2) + (\hat{a}_2)^2 \hat{Var}(\hat{\bar{c}}) - \hat{Var}(\hat{\bar{c}})\hat{Var}(\hat{a}_2)$$

Assumptions, Biases, and Weaknesses of the Surveys

1. Telephone survey refusals or non-participation: The estimation method for effort from the telephone survey assumes that a random sample was taken, and that the effort on the CPFVs of participants and non-participants is the same. Any difference would introduce a bias in the effort estimates. The participation rate is currently less than 50 percent. The Department is working to increase that rate. In addition, data from the vessel checks and from the logbooks can be used to document any bias.

2. Effort estimate dependent on self-reported data: The accuracy of the effort estimate is dependent on the accuracy of self-reported data. The survey incorporates several independent data sets to validate the self-reported data and improve confidence in the data.

3. Charter refusals: Chartered CPFVs are not exempt from the regulations requiring CPFVs to take samplers onboard all fishing trips. However, landings often refuse access to chartered CPFVs, because the charter master who rented the CPFV may not want a sampler onboard. This will introduce bias if the catch on charter trips differs from the catch on open party trips. The bias can be reduced by sampling dockside when the CPFV returns from the fishing trip.

4. Non-representative (Hawthorne effect):
Some CPFV operators may alter their "game plan" when a sampler is onboard. For example, they may avoid areas that they normally fish, so that the sampler will not observe any species of concern being caught. This behavior is known to social scientists as the Hawthorne effect. Humans have been known to alter their behavior when aware of being observed. Data from such trips may introduce a bias, since trips without samplers may have different fishing behavior. The presence of samplers may induce better compliance with regulations, which leads to a lower catch rate bias.

5. Busy CPFV trips: If the catch rate is high or if more than 20 anglers are onboard, the total catch of the boat-trip may be incomplete. The sampler may not always see what is thrown back, and some anglers may be too busy to be cooperative. Surveys, such as the current survey, which is based on random sampling of angler-trips rather than boats, need a sufficient number of anglers randomly selected for sampling.

6. Sampling of small CPFVs that launch from ramps and hoists may not be truly random: Samplers are unable to make at-sea observations on small CPFVs (often called six-packs). These boats are sampled dockside. Samplers are assigned to interview anglers as they depart small CPFVs that return to sampled landing sites, but transient CPFVs must be sampled opportunistically. The opportunistic samples may not be selected randomly.

7. Cluster effect: Interviewing multiple anglers from the same fishing trip may result in cluster effects (National Research Council, 2006). The CRFS sample selection procedures and estimation procedures may decrease the cluster effect. Samples are systematically selected to include all kind of CPFV trips and water areas in the district each month. Effort and CPUE estimates are stratified by trip-type (target species or species group).

Strengths of the Surveys

1. Access to all trips: State law requires CPFV to allow samplers to observe all fishing trips. This allow for a random sample of boats for onboard sampling of catch.

2. CPFVs must be licensed: State law requires CPFVs to obtain a CPFV license from the Department of Fish and Game, and to obtain a commercial boat registration from the Department of Fish and Game.

3. CPFV logbooks: State law requires CPFV operators to submit logs of all fishing trips. These logs can be used for validation of the surveys. The logbooks provide the following information on each fishing trip: target species, fishing method, trip duration, wet-gear hours, number of anglers, location and depth where most of the fishing occurred, and, by species, the number of fish that were kept and the number that were thrown back.

4. Vessel directory relatively complete: The vessel directory for the telephone survey is relatively complete. However, participation in the telephone survey is voluntary, and stands at less than 50 percent (Appendix D). Efforts to improve participation are underway.

5. Use the vessel directory is efficient: Use of the vessel directory is more efficient than use of a licensed-angler directory or random-digit dialing, and allows for greater sample size.

Plans for Improving the Surveys or the Estimation Procedures

We are reviewing all aspects of the CPFV surveys. The telephone survey. The Department is working to increase participation in the telephone survey. Participation has decreased since the telephone survey's inception in 2001. The greater the number of CPFV representatives who participate in the telephone survey, the more accurate and precise the estimates.

We are investigating ways to incorporate the mandatory CPFV logbook data that is already collected by the Department. This data does not arrive in time to be used in the monthly in-season estimates, but we may be able to use these data at the end of the year to improve the effort estimates.

4. Man-made Structures

The survey for man-made structures is based on a roving-access design. On-site surveys collect catch and effort data at publicly accessible structures such as piers, docks, and jetties during daylight-hours.

Catch and effort for night fishing or fishing from private-access sites are not estimated at this time. Sport fishing licenses are not required on most publicly-owned man-made structures under California law. Thus, the Angler License Directory Telephone Survey is not useful in estimating effort for night fishing or at unsampled sites.

Sample Design
A roving survey is used to obtain the instantaneous counts that are used in the effort estimates. An access point survey is used to collect data on catch, catch rates, and trip duration from anglers who have completed their fishing trips or anglers who state that they have completed at least 50 percent of their trip.

The man-made sites in each district are grouped into clusters. A sample assignment is for a cluster (or group) of man-made sites and secondary sites for private and rental boats, and each site in the cluster is visited during an assignment. A route (or order in which the sites are visited) is established for each cluster; however, the starting point of the route varies by assignment.

Frame: All cluster of publicly accessible man-made structure sites in the district and all daylight-hours for all the days in the month.

Stratification: Sampling is stratified by month, and day-type (holiday/weekend day or weekday) for each cluster.

Frequency: Each cluster is sampled three days per month: one weekday and two weekend days. This is approximately 10 percent of all the days in the month; 5 percent of the weekdays and 25 percent of the weekend days.

Description of sites and clusters:
Man-made structures include piers, jetties, bridges, and docks. The sites are grouped into clusters based geographic proximity. The clusters are designed to allow the sampler to travel to each site in the cluster and conduct on-site interviews for several hours at each site during an eight-hour work day. The number of sites per cluster varies depending upon the travel times among sites and distance from the sampler's work station. The sites within a cluster are not homogenous in terms of species caught or effort. However, sites on the open ocean and sites in enclosed bays and estuaries are not included in the same cluster.

The composition of sites in a cluster remains constant within a month, but can vary during the year. For example, the number of sites per cluster decreases during the summer in some areas to accommodate longer travel times due to the difficulty of finding parking at some sites.

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Sampling at man-made structures clusters and secondary launch facilities for private and rental boats is coordinated. A cluster may contain sites with man-made structures and sites with boat launch facilities (Table 4.1). In addition, some sites have both types of facilities. The monthly cluster list identifies the sites in each cluster, the assigned mode for each site in the cluster, and the route for each cluster. The list also identifies modes which may be sampled opportunistically at the site, and whether a site is inactive that month. A site may become inactive because it is temporarily closed, because effort is consistently low at the site, because access is newly restricted (*e.g.*, a military base), or because the site is unsafe. Site lists are continually updated and modified: new sites are added, and sites that are closed are flagged as inactive. Sites which are on the inactive list due to low effort are periodically monitored for effort, and will be added to the active site list if effort increases. In July 2006, there were 154 man-made structure sites and 53 clusters containing man-made structures statewide (Table 4.2).

Table 4.1. Example of a monthly cluster list for a district. The example shows the list for District 3 in February 2006.

Cluster name	Route order	Mode	County code	Site code	Site name	Mode for opportunistic sampling
CEN1	A	MM	87	100	Santa Cruz Wharf	
CEN1	B	PR2	87	100	Santa Cruz Boat Rentals	
CEN2	A	MM	87	305	SCR Marina West Jetty	
CEN2	B	MM	87	306	SCR Marina East Jetty	
CEN2	C	PR2	87	101	Santa Cruz Marina Launch Ramp	MM
CEN3	A	MM	87	111	Capitola Wharf	
CEN3	B	PR2	87	111	Capitola Boat Rentals	
CEN3	C	MM	87	301	Seacliff cement ship	
CEN4	A	MM	53	302	North Jetty	
CEN4	B	MM-PR2	53	108	Kirby Park	
CEN4	C	PR2	53	105	Woodward Boat Ramp	MM
CEN4	D	MM	53	303	South Jetty	
CEN4	E	PR2	53	104	Moss Landing	MM
CEN5	A	MM	53	107	Monterey Pier 2	
CEN5	B	MM	53	102	Coast Guard Jetty	
CEN5	C	PR2	53	102	Coast Guard Jetty Launch Ramp	
CEN5	D	MM-PR2	53	214	Pebble Beach Pier	
CEN5	E	MM-PR2	53	107	Monterey Marina Launch Ramp	
CEN6	A	MM	79	207	San Simeon Pier	
CEN6	B	PR2	79	203	Cambria, Leffingwell Landing	
CEN7	A	MM	79	300	Cayucos Pier	
CEN7	B	MM	79	100	Morro Bay	
CEN7	C	PR2	79	100	Morro Bay Launch Ramp	MM
CEN8	A	MM	79	101	Harford Pier	
CEN8	B	MM	79	304	Avila Public Pier	
CEN8	C	MM	79	305	Pismo Beach Public Pier	
CEN8	D	PR2	79	101	Avila Boat Sling	MM

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Table 4.2. Number of MM-PR2 sites and clusters by district and statewide (July 2006).

District	Number of man-made structure sites (MM)	Number of secondary private and rental boat sites (PR2)	Number of sites with both of MM and PR2 modes (MM-PR2)	Number of clusters with MM and/or MM-PR2 sites
1 South	39	22	2	14
2 Channel	13	2	2	3
3 Central	19	7	2	6
4 San Francisco	54	16	8	19
5 Wine	10	12	5	5
6 Redwood	19	8	6	6
Total	154	67	25	53

Sample selection and scheduling:
Sample selection is based on a systematic random design, and is done in combination with the sample selection for secondary public launch facilities for private and rental boats and beach bank sites. The systematic components of the site selection and scheduling process are: (1) distributing the sample days throughout the month; (2) varying the time of day that each site is visited during the month; and (3) distributing the assignments so that adjacent clusters are not sampled on the same day or within a few days of each other. The intent is to get a relatively even distribution of sampling effort throughout the month in terms of days of the month, time of day, and geography.

The three sampling days are systematically assigned to three weeks (or three intervals of about 10 days each), and then a day within each week (or interval) is chosen at random within the day-type stratum. In practice, the sample-date must be adjusted sometimes due to scheduling conflicts with other assignments that were randomly drawn for the same day.

The time of day that a site is visited is determined by the starting time of the sampling-day and the order in which the sites in the cluster are visited. To ensure that each site is visited at a variety of times during the day each month, the samplers are asked to vary their starting times. In addition, the samplers may be assigned early (6:00 a.m. to 9:00 a.m.) or late (10:00 a.m. to 1:00 p.m.) start times during the summer. Whenever feasible, the starting point of the route is randomly selected for each sampling day. The driving time for routes with a strong directional orientation (*e.g.*, north-south orientation) would be substantially increased and the amount of time at each site in the cluster decreased if the starting point were randomly selected. Thus, the sampler either starts at one end of the route or the other end.

If a sampler misses an assignment, the assignment is rescheduled to the next available day of the same kind (weekday or holiday/weekend day) in the month. In rescheduling, an effort is made to ensure that at least one weekday and one holiday/weekend assignment is completed for each cluster in the month.

Data Elements Collected
The following key data elements are collected during the roving survey for effort, and reported on the Assignment Summary Form (Appendix B):

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1. Date
2. Cluster name
3. For each site visit
   a. Site name and number
   b. County code
   c. Number of anglers present at arrival (arrival count)
   d. Time of arrival count (start time)
   e. Number of anglers present at departure (departure count)
   f. Time of departure count (stop time)

The following key data elements are collected during the access point survey using the Angler Form (Appendix B). These data elements are used in the effort and catch estimations.

1. Date
2. County code
3. Site name and number
4. Type of man-made structure
5. Water area (inside 3 miles or bay)
6. Number of anglers who arrive at the site after the arrival count
7. Time of interview
8. The trip duration (wet-gear hours) for completed a completed trip, or the amount of time the angler has fished (wet-gear hours) up to the time of the interview
9. Amount of time (wet-gear hours) the angler expects to fish after the interview
10. Primary and secondary target of trip (trip-type)
11. Number of fish by species or highest taxonomic order possible that were reported caught and not available for examination, and the reason why the fish is unavailable (*e.g.*, discarded alive, discarded dead, fillet, used for bait, given away, and eaten)
12. Number of fish that were landed and examined by the samplers, and the lengths and weights of examined catch
13. Number of anglers who contributed to the "bag" of examined catch
14. Changes in effort during the access point survey: the number of anglers who finished fishing and left the area but were not interviewed, and the number of anglers who started fishing after the arrival count was completed.

Survey Methods

The samplers receive their assignments for the month a week or two before the start of the month. Each cluster assignment shows the starting point for the route for that assignment (Table 4.3), and, in some cases, the starting time. The sampler follows the predetermine route and visits each site in the cluster during the assignment.

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Table 4.3. Example of a list of MM cluster assignments in District 3 for February 2006.

Day-type	Day of the week	Date	County code	Site name	First site to visit	Assignment identification number	Interviewer identification number
WE	Sat	11	87	CEN1	B	023014	275
WE	Sun	12	87	CEN2	B	023018	275
WE	Sun	19	87	CEN3	B	023020	275
WE	Sat	25	87	CEN1	A	023015	275
WD	Thr	2	53	CEN4	E	023022	269
WD	Fri	3	87	CEN1	A	023013	269
WD	Tue	7	87	CEN3	C	023019	269
WE	Sun	12	53	CEN5	C	023026	269
WE	Sat	25	53	CEN4	C	023024	269
WD	Mon	27	53	CEN5	D	023025	269
WD	Sat	4	87	CEN2	C	023017	261
WE	Sun	5	53	CEN5	B	023027	261
WE	Sat	11	53	CEN4	A	023023	261
WD	Thr	23	87	CEN2	A	023016	261
WE	Sat	25	79	CEN7	C	023033	261
WE	Sun	26	87	CEN3	A	023021	261
WD	Thr	2	79	CEN8	A	023034	262
WD	Mon	6	79	CEN7	C	023031	262
WD	Fri	10	79	CEN6	B	023028	262
WE	Sat	11	79	CEN8	C	023035	262
WE	Sat	18	79	CEN6	B	023029	262
WE	Sun	19	79	CEN7	A	023032	262
WE	Mon	20	79	CEN8	B	023036	262
WE	Sun	26	79	CEN6	A	023030	262

The time the sampler spends at each site typically ranges from one hour to three hours. The amount of time on-site depends on the number of sites in the cluster, travel time to the first site, travel time among the sites, and angling effort. Samplers may return to previously visited sites once all of the sites in the cluster have been visited and initial effort level at each site has been determined. Typically, samplers only return to previously visited sites when effort is low.

The sampler conducts the roving effort survey and the access point survey at each site. The on-site procedures for each site visited during the assignment are as follows (in sequential order):

1. The sampler counts and records the number of anglers (arrival count) and records the time of the arrival count upon arrival at the site.

2. The sampler stations him- or herself where he/she can see all the arriving and departing anglers and where he/she can easily approach all anglers who are leaving the site.

3. The sampler attempts to interview all anglers who have completed their fishing trip and are leaving the site using the standard methods for the Angler Form. The Angler Form is a scripted questionnaire designed to collect data on the angler, the angler's trip, and the angler's catch and discards. A copy of the Angler Form and the scripted questions are

in Appendix B. Key data elements that are used in the effort and catch estimates are listed above in the subsection titled Data Elements Collected.

4. The sampler tracks the number of arriving and departing anglers during the sampling period (*i.e.*, the time between the arrival count and the departure count), and the number of unsuccessful interview attempts. The sampler keeps a separate tally of: the number of arriving anglers; the number of departing anglers missed because the sampler was busy with other duties (*e.g.*, interviewing another angler); the number of anglers who refused the interview; the number of anglers who declined to answer key questions during the interview; and the number of angler who could not be interviewed due to a sampler-angler language barrier.

5. After the sampling period (typically one to three hours), the sampler counts the number of anglers at the site, records this as the departure count, and records the time the count was conducted. The sampler does not count arriving and departing anglers after the departure count is completed.

6. After conducting the departure count, the sampler asks the remaining anglers when they started to fish and how much longer they intend to fish to determine the projected wet-gear hours for the completed trip. The sampler interviews anglers who have completed at least half of their trip (by wet-gear hours). No more than 50 percent of the interviews for the day may be for "incomplete trips". The sampler uses the Angler Form for the interview (Appendix B), and collects angler and creel data.

Estimation Procedures

Effort

Effort as angler-trips per day for each fishing period *i* is estimated by

$$\hat{a}_i = (\hat{\bar{I}}_i T)\hat{H}_i$$

where

$\hat{a}_i$	=	the estimated effort for each fishing period *i*
$(\hat{\bar{I}}_i T)$	=	the estimate of angler-hours per day
$\hat{I}_i$	=	the averaged instantaneous angler-count
T	=	the length of the fishing period in hours per day
$\hat{H}_i$	=	the estimated of angler-trips per angler-hour.

Note that angler-trips per angler-hour ($\hat{H}_i$) is the inverse of trip duration.

Total effort for a survey period in angler hours is estimated by

$$\hat{a} = \sum_{i=1}^{n} (\hat{a}_i / \pi_i)$$

where π_i is the total probability (*n/N*) that the fishing period *i* is included in the sample.

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The variance for angler effort is estimated by

$$\hat{Var}(\hat{a}_i) = (\hat{\bar{I}}_i T)^2 \hat{Var}(\hat{H}_t) + \hat{H}_t{}^2 \hat{Var}(\hat{\bar{I}}_i T) - \hat{Var}(\hat{\bar{I}}_i T)\hat{Var}(\hat{H}_t)$$

Effort estimation is concluded with the calculation of the effort for the angler reported domains of water area fished and type of species targeted in the trip (trip-type). Domain classes are estimated by

$$\hat{a}_2 = \hat{a}\left(\frac{\sum_{i=1}^{n} a_i}{n}\right) = \hat{a}p$$

where the sampling proportion *p* is estimated by percentage of anglers *a* in domain *i* among *n* trips in a particular stratum.

The variance for the domain is estimated by

$$\hat{Var}(\hat{a}_2) = (p)^2 \hat{Var}(\hat{a}) + (\hat{a})^2 \hat{Var}(p) - \hat{Var}(p)\hat{Var}(\hat{a})$$

where $\hat{Var}(p) = \frac{p(1-p)}{n}$

Catch-per-unit-effort

Estimation is based on summarizing the sample from angler intercepts during the access point survey. Some of the trips are incomplete trips, which is adjusted to complete trips by imputation of added catch by computing an adjusted catch (c_i) for each angler *i* by

$$c_i = c\frac{h+r}{h}$$

where

h	=	the hours fished
r	=	added hours reported still to be fished
c	=	number of fish caught.

Note that when the value for added hours (r) is zero, catch is unadjusted ($c_i = c$).

Catch rate $\hat{\bar{c}}_1$ is calculated by summing the adjusted catch for each angler (c_i) divided by the sum of the number of anglers (a_i) sampled in each stratum and domain *i* as follows:

$$\hat{\bar{c}} = \sum_{i=1}^{n} c_i \Big/ \sum_{i=1}^{n} a_i$$

Total catch is estimated by

$$\hat{C} = \hat{a}_2 \times \hat{\bar{c}}$$

where

$\hat{C}$	=	the estimated total number of fish caught
$\hat{\bar{c}}$	=	the estimated catch rate of anglers

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$\hat{a}_2$ = the estimated effort for the corresponding domain.

Variance is estimated by

$$\hat{Var}(\hat{C}) = (\hat{\bar{c}})^2 \hat{Var}(\hat{a}_2) + (\hat{a}_2)^2 \hat{Var}(\hat{\bar{c}}) - \hat{Var}(\hat{\bar{c}})\hat{Var}(\hat{a}_2)$$

Specific steps in the effort estimates

1. Check data for errors:

   Compare data from Assignment Summary Forms with sampling assignments and man-made structures cluster list for the month to identify any errors or missed assignments.

2. Estimate angler-hours per day by month/district/kind-of-day/cluster stratum:

   A. Calculate an average hourly angler-count by month/district/kind-of-day/cluster stratum.

      1) Use all instantaneous counts of anglers from the arrival and departure counts on the Assignment Summary Form for each site. The arrival and departure counts are made for each visit to each site in the cluster. Strata at this point are: month, district, kind of day, cluster, and site.

      2) Compute additional hourly angler-counts for each site based on effort changes that take place each hour that the sampler is on-site. These changes are recorded on the Angler Forms. Computed hourly angler-counts include counts when there is no activity or when no change in activity occurs. Strata at this point are: month, district, kind of day, cluster, and site.

      3) Calculate average hourly angler-count from the arrival, departure, and computed angler-counts by month/district/kind-of-day/cluster stratum. This gives the average angler-count at any site in the cluster.

         Currently, this calculation is performed at the cluster level. We propose to change this to first calculate the average instantaneous angler-count at the site level and then aggregate the site averages to a cluster level. See the subsection below titled "Plans for Improving the Surveys or the Estimation Procedures" for a discussion of this proposed change.

   B. Calculate fishing period (mean number of daylight-hours per day) by month/district stratum.
      1) Day length is the mean number of daylight-hours per day for the month and district, and is reported in hours per day. The number of daylight-hours is calculated for each district using the central latitude in each district (see note under PR2).

   C. Calculate angler-hours per day for all month/district/kind-of-day/cluster strata with observations.

      Angler-hours per day = (average hourly angler-count) x (mean number of daylight-hours per day)

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This gives the estimated angler-hours per day at any site in the cluster. Currently, this calculation is performed at the cluster level. We propose to change this to first calculate angler-hours/day at the site level (using the site estimate for average instantaneous angler-count) and then aggregate the site values to a cluster level. See the subsection below titled "Plans for Improving the Surveys or the Estimation Procedures" for a discussion of this proposed change.

- For all clusters without observations (*e.g.*, assignment not completed), the district mean angler-count by day-type is used to produce angler-hours per day. Currently this is a weighted average of all counts for all sites.

E. Calculate the variance for angler-hours/day by month, district, and kind-of-day.

3. Calculate angler-trips per angler-hour (= inverse of angler trip duration) by month/district/kind-of-day/cluster stratum:

A. Calculate the angler-trip duration for each angler interviewed who had completed at least 50 percent of his/her fishing trip.

angler-trip duration = (completed wet-gear hours) + (computed wet-gear hours for remainder of the trip)

Note computed wet-gear hours for the remainder of the trip is zero if trip is completed at the time of the interview.

B. Calculate angler-trips per angler-hour for each angler interviewed who completed at least 50 percent of his/her fishing trip.

angler-trips per angler-hour = 1 /(angler trip duration)

C. Calculate the mean angler-trips per angler-hour by month/district/kind-of-day/cluster stratum.

Currently, this calculation is performed at the cluster level. If the trip duration varies by site, the estimate of mean angler-trips per angler-hour will be biases towards the sites in the cluster with the highest effort and/or most samples. We propose to change this to first calculate the mean angler-trips/angler-hour at the site level and then aggregate the site means to a cluster level. See the subsection below titled "Plans for Improving the Surveys or the Estimation Procedures" for further discussion of this change.

4. Calculate an estimate of mean angler-trips per day by month/district/kind-of-day/cluster stratum:

A. Calculate angler-trips per day for month/district/kind-of-day/cluster strata with both instantaneous counts of anglers and eligible angler interviews.

Angler-trips per day = angler-hours per day x mean angler-trips per angler-hour

B. Calculate angler-trips/day for month/district/kind-of-day/cluster strata with instantaneous counts of anglers and no angler interviews.

Compute trip duration (angler-trips per angler-hour) for strata with instantaneous counts of anglers and no eligible angler interviews using the mean trip duration for the district. Then calculate angler-trips per day using the compute values for trip duration. If there are no eligible angler interviews for the district, then use the mean trip duration for the subregion. The subregions are the area from the Mexico-California border to Point Conception (Districts 1 and 2), and the area from Point Conception to the Oregon-California border (Districts 3 – 6).

5. Estimate total effort:

   A. Expand the estimate of mean angler-trips per day for the month/district/kind-of-day/cluster strata to all days in the month and all sites in the cluster to get total effort for the month by cluster and kind-of-day.

      Total angler-trips/month/cluster = (mean angler-trips/day/cluster) x (number days) x (number of sites in the cluster)

   B. Sum total angler-trips/month/cluster by district and kind-of-day, and calculate variance.

   C. Sum total angler-trips/month/cluster by district.

6. Post-stratify angler-trip effort estimates by month/district/day-type/cluster stratum for trip-type and water area:

   A. Total angler-trip effort by month, district, day-type is post-stratified into trip-type and water area (ocean within 3 miles, bay waters, and inland river waters) based on the proportion of MM anglers interviewed by trip-type and water area. These proportions are based on sampled anglers pooled by district and day-type or sub-region and day-type.

      Estimated angler-trips by trip-type and water area = total angler effort by cluster and day-type x proportion of anglers sampled by trip-type and water area pooled by day-type and either district or sub-region.

<u>Specific steps in the catch estimates</u>

1. Sum sampled anglers by district, month, trip-type and water area for both examined (type A) and reported/unexamined (types B1 and B2) catch.

   A. Sum anglers that reported unexamined catch (= B anglers).

   B. Sum anglers that contributed to the examined catch (= A anglers).

2. Sum examined and unexamined catch by species for month/district,/trip-type/water area/species stratum.

   A. Sum unexamined catch by species into type B1 and B2 categories based on reported disposition (released alive = catch-type B2; all other = catch-type B1).

   B. Sum examined catch by species (= catch-type A).

3. Calculate catch-per-unit of effort for catch-type A, B1 and B2 catch by species, district, month, trip-type, and water area strata.

   A. Divide B1 and B2 catch by B anglers by species, district, month, trip-type, and water area strata.

      CPUE catch-type B1 = catch-type B1 ÷ B anglers
      CPUE catch-type B2 = catch-type B2 ÷ B anglers

   B. Divide A catch by A anglers by species, district, month, day-type, trip-type, and water area strata.

      CPUE catch-type A = catch-type A ÷ A anglers

4. Determine total A, B1 and B2 catch by species, month, district, day-type, cluster, trip-type and water area
   A. Strata: district, month, cluster, day-type, trip-type, and water area

   B. Multiply total angler-trips (by catch-type) times CPUE for each species by catch-type to get total catch estimates (catch-type A, B1, and B)

      *Total catch-type A = total A angler-trips * CPUE catch-type B2 catch*
      *Total catch-type B1 = total B angler-trips * CPUE catch-type B2 catch*
      *Total catch-type B2 = total B angler-trips * CPUE catch-type B2 catch*

Assumptions, Biases, and Weaknesses of the Surveys

1. Fishing at night or at private man-made structures: The measure of catch and effort for man-made structures is an underestimate, because the survey is not estimating catch and effort from night fishing or private man-made structures. In some areas, such as southern California, this is significant.

2. Sampling a portion of the fishing day: We have incomplete information on anglers who complete their trips outside of sampling hours, and on effort outside of sampling hours. These anglers may have different characteristics and catch from the sampled anglers. Effort early and late in the day may not be equal to effort during the times of the day most of the samples are taken. The survey attempts to reduce this bias by varying the starting time of the sampling-day.

3. Assume equal effort over the daylight period: Angler arrivals and departures are by no means uniform throughout the day. Randomized counting periods on each sampling day could be done to mitigate uneven effort throughout the day.

4. Angler refusals: If anglers who refuse to participate are significantly different from anglers who cooperate, this will introduce a bias.

5. Language barriers: A high percentage of non-English speaking anglers are present at many sites. Interviews cannot be conducted due to language difficulties. Bias is

introduced if the catch and discard characteristics of the non-English speakers differs from the English-speakers.

6. Dangerous locations that are not sampled: Some locations in urban areas are believed to be hazardous to samplers. These locations are not included in the sampling frame. The characteristics of the anglers at these sites and their catch may differ from those at safer or more populous sites.

7. Incomplete trips: The survey design and estimation procedures assume that the catch rate before the interview is an unbiased estimate of the catch rate of the completed trip, and that the angler will accurately predict the amount of time remaining for the trip. Factors such as weather and fishing success may cause the anglers plans to change. The survey attempts to reduce this bias by only allowing interviews for trips that are at least 50 percent complete.

8. Missed counts or counting nonanglers: Bias is introduced if the sampler misses anglers arriving or leaving the site, or if the sampler cannot distinguish between anglers and nonanglers.

Strengths of the Surveys
The strengths of the roving survey for effort include:

1. The same frame is being used for catch and effort.
2. Site-specific information can be gathered.
3. No recall bias.

The strengths of the access point survey for catch rate include:

1. Anglers are interviewed during or at the conclusion of their fishing trip which reduces recall and prestige bias.
2. Trained samplers examine the catch and are able to accurately identify the catch to species, and collect biological data (*e.g.*, length, weight, and sex).
3. Illegal harvest can be monitored.
4. Site-specific information can be gathered.

Plans for Improving the Surveys or the Estimation Procedures
Three areas of concern have been identified in the estimation procedures for man-made structures. The concern and proposed solutions are described below.

(1) In the current estimation program, the calculations for average instantaneous counts of anglers and angler-hours/day are performed at the cluster level. We propose to calculate these values at the site level and then to aggregate the site averages to a cluster level.

Statistical clusters by definition are homogeneous in terms of the attribute you are trying to sample. The sites were placed in clusters based on geography, rather than on levels of effort, species composition of the catch, or catch rate. The sites in a particular cluster may have effort that is similar or that may vary greatly. For example, a cluster could be composed of a few low effort jetties, or of a low effort jetty and a large high effort pier. Sites on the open ocean and sites in enclosed bays and estuaries are in separate clusters.

Sites are visited for differing amounts of time, including very short visits and revisits on the same day. If the sites in a cluster were sampled uniformly then the non-homogeneity of sites wouldn't be an issue with regard to calculating the mean cluster effort and variance. But since samplers tend to spend more time a sites with a higher effort, these sites will have a greater weight in the generation of the cluster mean, creating a positive bias.

(2) The data for trip duration come from interviews with individual anglers. The samplers tend to conduct more interviews at busy sites. Thus, the estimates of mean angler-trips/angler-hour will be biases towards the estimate for the sites in the cluster with the highest effort if the trip duration varies by site. We propose to change the procedures to first calculate the mean angler-trips/angler-hour at the site level and then aggregate the site means to a cluster level.

(3) The method used to generate instantaneous counts from changes in effort reporting during sampling use an interval of an hour. Large changes of effort can occur in a relatively short period of time at some sites. Hourly counts do not capture these changes in effort appropriately. The initial choice of a one hour time interval was arbitrary. Counts at a finer temporal resolution would more accurately represent what occurs in the field. We propose to use fifteen minute intervals.

5. Beaches and Banks

Two surveys are used for the beach and bank fishing mode: the angler license directory telephone survey for effort, and an on-site, intercept survey for catch rate. The catch data are collected at publicly accessible beaches and banks during daylight-hours using a roving design. Catch rates for trips that occur at night or at sites without public access are assumed to be the same as the catch rates for trips that occur at publicly accessible sites during daylight-hours in the same month/district/water area/trip-type stratum.

Sample Design

All effort data for the beach and bank fishing mode are collected by the Angler License Directory Telephone Survey. Effort is stratified by month, district, trip-type, and period of the day (daylight-hours or night).

A roving survey is used to collect data on catch and trip duration. Beach and bank sites often have multiple access points, and access at some sites is available along the entire stretch of beach or bank. A beach and bank cluster is defined either as a group of beach and bank sites or an extensive stretch of shoreline. A sample assignment is for a cluster. Each site in the cluster or the entire stretch of shoreline is visited during the assignment. The route (or order in which the sites are visited) is predetermined. The goal of the sampling is to get as many interviews as possible in the time allowed. The sample design information below is for the on-site, intercept survey for catch rate.

Frame (catch survey): All cluster of publicly accessible beach and bank sites in the district and all daylight-hours for all the days in the month.

Stratification (catch survey): Sampling is stratified by month, and cluster.

Frequency (catch survey): Each cluster is sampled one day per month which equals three percent of the days.

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Sample selection and scheduling (catch survey):
Assignments are selected randomly from a list of cluster for the district and from all the days in the month. A two-stage process is used. In the first stage, the days are randomly drawn with replacement. In the second stage, clusters are randomly selected without replacement for each of the chosen dates.

Samplers determine the best time to sample a cluster, but are required to vary their start time. If a sampler misses an assignment, the assignment is rescheduled to the next available day.

A sampler may modify an assignment when angling effort is low. If the sampler visits all sites in the cluster and finds that he or she is unlikely to complete at least one interview per hour at any of the sites, the sampler may either (1) reduce the hours for the assignment, or (2) terminate the assignment and begin a new beach and bank assignment. The new beach and bank assignment would either be from a list of alternate assignments that the sampler's supervisor provided in advance, or the sampler would choose the nearest cluster in the district. The sampler is expected to spend at least two hours on a beach and bank assignment before deciding to reduce the hours for the assignment of terminate the assignment.

Description of sites and clusters (catch survey):
The site list includes all beaches and banks that are open to the ocean or are within saltwater bays and estuaries. This includes all natural shoreline and all man-made shoreline that does not project into open water to form a structure with water on both sides. The sites are defined as stretches of shoreline with range boundaries. Private-access shoreline is excluded.

The sites are grouped into clusters based on geographic proximity. The travel time between two adjacent sites in the cluster is no more than one hour, and all sites in a cluster are in the same district. The number of sites per cluster varies depending on travel times among the sites and the distance from the sampler's work station. Some clusters consist of a single stretch of shoreline, while others consist of as many as 13 pocket beaches. Sites open to the ocean and sites within enclose bays and estuaries are assigned to different clusters.

The composition of sites in a cluster remains constant within a month, but can vary during the year. The site list is continually updated and modified: new sites are added, sites that are closed are removed, sites with consistently low effort are put on an inactive list, and sites that are unsafe are put on the inactive list. Sites which are on the inactive list due to low effort are periodically monitored for effort, and will be added to the active site list if effort increases. The current statewide site list for beaches and banks includes 277 sites in 72 clusters (Table 5.1).

Table 5.1. Number of beach and bank sites and clusters by district and statewide, and the number of miles of coastline covered by the survey (July 2006).

District	Number of beach and bank sites	Number of beach and bank clusters	Approximate number of miles coastline
1 South	46	15	190
2 Channel	27	8	140
3 Central	41	14	225
4 San Francisco	96	21	355
5 Wine	36	7	185
6 Redwood	31	7	150
Total	**277**	**72**	**1,245**

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Data Elements Collected (Catch Survey)
The following key data elements are collected during the on-site, intercept survey and recorded on the Angler Form (Appendix B). These data elements are used in the estimates of catch rate.

1. Date
2. County code
3. Site name and number
4. Water area
5. Time of interview
6. Type of fishing license
7. The trip duration (wet-gear hours) for completed a completed trip, or the amount of time the angler has fished (wet-gear hours) up to the time of the interview
8. Amount of time (wet-gear hours) the angler expects to fish after the interview
9. Primary and secondary target of trip (trip-type)
10. Number of fish by species or highest taxonomic order possible that were reported caught and not available for examination, and the reason why the fish is unavailable (*e.g.*, discarded alive, discarded dead, fillet, used for bait, given away, and eaten)
11. Number of fish that were landed and examined by the samplers, and the lengths and weights of examined catch
12. Number of anglers who contributed to the "bag" of examined catch

Samplers also collect data on the lengths and weights of discarded fish while sampling at beach and bank sites. These data are recorded on the Discarded Fish form (Appendix B).

Survey Methods (Catch Survey)
The samplers receive their assignments for the month a week or two before the start of the month. The sampler visits each site in the cluster during the assignment. Samplers may return to previously visited sites once all of the sites have been visited and initial effort level at each site has been determined.

The amount of time on-site depends on the number of sites in the cluster, travel time to the first site, travel time among the sites, and angling effort. The goal of the on-site sampling at beach and bank sites is to get as many interviews as possible.

The on-site procedures for each site visited during the assignment are as follows:

1. The sampler conducts a preliminary canvass to determine the number and location of anglers at the site. The sampler canvasses the entire area of the site which may include several access points. If the anglers are scattered or there are several access points, the sampler will contact the anglers to let them know about the survey and determine their approximate departure times.

2. The sampler will uses the information gained during the canvass to pick a location for conducting interviews with anglers who have completed their fishing trips. The sampler stations him- or herself where he or she can easily approach departing anglers and is likely to intercept the greatest number of departing anglers.

3. The sampler attempts to interview all anglers who have completed their fishing trip and are leaving the site using the standard methods for the Angler Form. The Angler Form is

a scripted questionnaire designed to collect data on the angler, the angler's trip, and the angler's catch and discards. A copy of the Angler Form and the scripted questions are in Appendix B. Key data elements that are used in the effort and catch estimates are listed above in the subsection titled Data Elements Collected.

4. If sampling becomes unproductive or it is time to move to another site in the cluster, the sampler asks the remaining anglers when they started to fish and how much longer they intend to fish to determine the projected wet-gear hours for the completed trip. The sampler interviews anglers who have completed at least half of their trip (by wet-gear hours). No more than 50 percent of the interviews for the day may be for "incomplete trips". The sampler follows the standard methods for interviewing anglers using the Angler Form.

Estimation Procedures

Effort

The estimation procedures for effort are described in the section of this report on the Angler License Directory Telephone Survey.

Catch-per-unit-effort

Estimation of the catch rate for beaches and banks is based on summarizing the samples from the on-site, intercept survey. Incomplete trips are adjusted to complete trips by imputation of added catch by computing an adjusted catch (c_i) for each angler *i* as follows:

$$c_i = c\frac{h+r}{h}$$

where

h	=	the hours fished
r	=	added hours reported still to be fished
c	=	the number of fish caught.

Note that when the value for added hours (r) is zero, catch is unadjusted ($c_i = c$).

Catch rate ($\hat{\bar{c}}_1$) is calculated by summing the adjusted catch for each angler (c_i) divided by the sum of the number of anglers (a_i) sampled in each stratum and domain *i* as follows:

$$\hat{\bar{c}} = \sum_{i=1}^{n} c_i \Big/ \sum_{i=1}^{n} a_i \ ,$$

Total catch is estimated by

$$\hat{C} = \hat{E} \times \hat{\bar{c}} \ ,$$

where

$\hat{C}$	=	the estimated total number of fish caught
$\hat{\bar{c}}$	=	the estimated catch per angler-trip in the stratum
$\hat{E}$	=	the estimated total number of angler-trips in the stratum.

Variance is estimated by

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$$\hat{Var}(\hat{C}) = (\hat{\bar{c}})^2 \hat{Var}(\hat{a}_2) + (\hat{a}_2)^2 \hat{Var}(\hat{\bar{c}}) - \hat{Var}(\hat{\bar{c}})\hat{Var}(\hat{a}_2)$$

Specific steps in the catch estimates

1. Get sampled trips information

Input Beach Bank mode trip data from sampled angler-trips file for specified year and month. Create district and subregion categories using county codes. Print records with missing hours fished.

2. Get catch information

Input a and b catches from each angler reported catch file for corresponding year and month. Allocate a catch of each bag to all contributors. Designate b catches into b1 and b2 catches. Merge the resulting a and b catch files.

3. Impute fishing hours and add hours of incomplete trip data from interviewed angler to non-interviewed anglers and adjust catches with add hours.

4. Calculate CPUE for a and b catches.

Sum a catch to lowest stratum level (cell) of year, wave, month, st, sub-reg, mode_fx, area_x, and triptype. Sum efforts to cell level and calculate number of angler with a catch. Merge a catch with effort and number of angler with a catch data then calculate CPUE for a catch. Similarly calculate CPUE for b catches. Merge both a and b CPUE into an all catches CPUE. Input ALD (offsite) BB mode trips data and sum trip estimates to cell level. Merge trips and CPUE data and calculate catches at district level.

5. Catch Estimates

Merge offsite trip estimates with sampled catch rate after no-catch effort were included with sampled catch rates resulting in three categories of estimates:

1. offsite (license phone survey) trips and onsite (field survey) trips match
2. offsite trips no onsite match

onsite trips no offsite match

Assumptions, Biases, and Weaknesses of the Surveys

Some of the assumptions and biases specific to the on-site, intercept survey for the beach and bank fishing mode are discussed below.

1. Assume catch rate at night is the same as catch rates during the day: We are not sampling in the field at night. It is likely that catch rates and species composition of catch at night differs from catch during the day. The characteristics of the anglers, such as license possession and type, may also differ.

2. Sampling a portion of the fishing day: We have incomplete information on catch and anglers who complete their trips outside of sampling hours. These anglers may have

different characteristics and catch rates than the surveyed anglers. The survey attempts to reduce this bias by varying the starting time of the sampling-day.

1. Incomplete trips: Assume that the catch rate before the interview is an unbiased estimate of the catch rate of the completed trip. Assume that the angler will accurately predict the amount of time remaining for the trip. Factors such as weather and fishing success may cause the anglers plans to change. The survey attempts to reduce the impact of this bias by only allowing interviews for trips that are at least 50 percent complete.

2. Length of stay bias: The probability of being interviewed is proportional to trip duration for anglers who are interviewed before they completed their trip. The survey attempts to reduce the impact of this bias by only allowing a maximum of 50 percent of the interviews during any cluster day to be of "incomplete trips".

3. Sites that are not sampled: Some beaches and banks are not sampled. Reasons include, the area is unsafe, access is restricted, and effort is low. The catch, catch rate and characteristics of the anglers may differ from those at the sampled sites.

Strengths of the Surveys
The strengths of the on-site, intercept survey of beach and bank anglers include:

1. Anglers are interviewed during or at the conclusion of their fishing trip. This reduces recall bias and prestige bias.
2. Trained samplers examine the catch and are able to accurately identify the catch to species, and collect biological data (*e.g.*, length, weight, and sex).
3. Illegal harvest can be monitored.
4. Site-specific information can be gathered.
5. The roving design allows samplers to actively seek anglers for interviews, and maximize the number of samples.
6. The roving design allows large geographic areas to be surveyed on a single day.

Plans for Improving the Surveys or the Estimation Procedures
Currently, an effort estimate is made each month for each angler-trip stratum based on the angler license directory telephone survey responses, the number of licenses sold, and the proportion licensed to unlicensed anglers in the field survey. The angler-trips are stratified by:

- Month,
- District,
- Water area (within 3 miles, outside 3 miles, inland marine, and Mexican waters),
- Trip-type (primary target species as stated by the angler),
- Mode of fishing (means of access: man-made structure, beaches and banks, private and rental boats, and party and charter boats),
- Access type (public access sites during daylight-hours, private access site, and night fishing), and
- License type.

The resulting effort estimates for the beach and bank fishing are used in calculating the catch and discards. The current estimation procedure uses the water area/trip-type strata from the

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telephone survey, because it was assumed that the water area/trip-type proportions for public and private access and for day and night trips would not be the same. However, the sample size for the telephone survey may not be large enough to accurately reflect all the area/trip-types for the beach and bank fishing mode. Trip-types sampled by the on-site, intercept survey are not being reported in the telephone survey. The current estimation procedure does not use the catch rates from sampled trips with trip-types that are not reported in the telephone survey. Thus, species that have been sampled in the field are not appearing in the estimates of total catch.

Two alternate methods for using the trip-type information in the catch estimates are under review. The first method would apply the water area/trip-type proportions from the field survey to total effort estimates for beach and bank fishing mode from the angler license directory telephone survey. The estimated number of angler-trips remains the same as in the current estimation procedure. However, the proportion of angler-trips in each water area/trip-type stratum changes. The second method would eliminate trip-type.

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Appendices

A. Angler License Directory Telephone Survey
   1. Example of a Questionnaire (from 2006)
   2. Summary of dialing results (2004 and 2005)
   3. Adjustment of CRFS Angler License Survey Estimates by Wade Van Buskirk

B. CRFS Forms
   1. PR1 Form
   2. Assignment Summary Form
   3. Angler Form
   4. Angler Form Questionnaire
   5. CPFV Vessel Check Form
   6. On-board CPFV Sampling Form
   7. Discarded Fish Form

C. Ocean Salmon Project Methodology for Estimating Recreational Salmon Landings by Melodie Palmer-Zwahlen and Allen Grover

D. Party Charter Phone Survey (PCPS)
   1. Example letter
   2. Charter Boat/Party Boat Weekly Telephone Survey Form (log)
   3. Pacific Coast PC Telephone Survey Questions – 2001
   4. Survey Contact Results (2001-2005, 2004, 2005)
   5. Example of California Department of Fish and Game CPFV Logbook (Central and Northern California version)

E. Part of a report on the Vessel Directory Telephone Survey by National Marine Fisheries Service

F. CRFS sample sites and clusters by district, county, and fishing mode

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Appendix A-1
Review of CRFS

Demo = cademo
Survey = ca0601

California License-Frame Telephone Survey - #656

February 2006 (for January 2006 Fishing)

Hello. May I please speak to (license holder)? (ARRANGE CALLBACK OR CONTINUE)
Hello, my name is _____, and I'm calling for the California Department of Fish and Game, which is collecting information about sportfishing. Your phone number was selected at random from all sport fishing license holders. May I ask you a few questions? The information you provide will be confidential.

Q1. First, in what state is your permanent residence?
State _____
or foreign country (specify) _____ (SKIP TO Q2)

Q1a. In what California County is your permanent residence?
California County _____(SKIP TO Q2)
Don't Know (CONTINUE)

Q1a. What city do you live in? _____

Q2. This is a very important study on sportfishing in California. By "sportfishing" I mean the primary purpose of fishing was for personal fun, relaxation or food – not for income or employment. For this entire study please exclude any non-sport fishing trips and trips outside of California. In the past 12 months, have you gone freshwater or saltwater sportfishing, including finfish and shellfish, in the state of California?

1. Yes (CONTINUE)
2. No (THANK & TERMINATE. COUNTS AS A COMPLETED INTERVIEW)

Q3. In the past 12 months, what percent of your California sportfishing trips have been freshwater and what percent have been saltwater?

_____% freshwater (IF 100%, ASK Q4 &5, THEN THANK & TERMINATE; COUNTS AS A COMPLETED INTERVIEW)
_____% saltwater (IF 100%, SKIP TO Q6)
100%

Q4. I'd like to ask you about your most recent **freshwater** fishing, which includes fishing in ponds, lakes, reservoirs, and freshwater portions of rivers and streams. In January, did you go **freshwater** sportfishing for fish in California?

1. Yes (CONTINUE)
2. No (SKIP TO Q6)

Q5. How many times did you go **freshwater** sportfishing for fish in California in January?

_____ Times

Q6. Now I'd like to talk about your most recent **saltwater** sportfishing. By "saltwater" I mean ocean, bays, estuaries and salty areas of rivers. In January, did you go **saltwater** sportfishing or spearfishing for fish, not shellfish, in California?

1. Yes (CONTINUE)
2. No (GO TO LOBSTER QUESTIONNAIRE AND Q11 AND Q12. COUNTS AS A COMPLETED INTERVIEW)

Q7. How many times did you go **saltwater** sportfishing for fish in California in January?
_____ Times
98 Don't know (no. of days not established) (PROBE WELL FOR THEIR BEST GUESS AND CONTINUE. IF ABSOLUTELY CANNOT REMEMBER ANYTHING, THANK & TERMINATE; NOT A COMPLETE)
99 Refused (no. of days not established) (THANK & TERMINATE; NOT A COMPLETE)

Q8. Can you recall the approximate dates? I have a calendar here with me in case you need help. (IF RESPONDENT CANNOT REMEMBER SPECIFIC DATES, PROMPT FOR MONTH AND WHETHER WEEKDAY OR WEEKEND)

Dates: _____

(IF Q7 = 1, SAY:) Now I'd like to ask for a little more information about your fishing on that day. (IF Q7>1, SAY:) Now I'd like to ask for a little more information about your fishing on each of those days, starting with the most recent.

Q9. Thinking about your saltwater fishing on (date), did you fish from a boat that day? . . . Did you (also) fish from the shore that day? (CHECK ALL THAT APPLY & ANSWER "B" AND/OR "S" SECTIONS AS APPROPRIATE. IF MORE THAN ONE SHORE MODE, ASK ABOUT THE ONE USED LAST THAT DAY)
1. boat (GO TO BOAT SECTION)
2. beach or bank (GO TO SHORE SECTION)
3. jetty, dock, pier, bridge or other man-made structure (GO TO SHORE SECTION)
4. other (SPECIFY) _____(GO TO SHORE SECTION)
8. don't know (PROBE FOR DESCRIPTION AND RECORD UNDER "OTHER") (Note: Man-made banks are 'beach and bank' unless the bank is surrounded by water on 3 sides, which are considered jetty 'structures'.

BOAT SECTION

B1. Was that on a charter, party or guide boat or a private or rental boat? (IF MORE THAN ONE BOAT MODE, ASK ABOUT THE ONE USED LAST THAT DAY) [NOTE: PARTY, CHARTER AND GUIDE BOATS HAVE PAID PASSENGERS WHOSE OPERATORS GENERATE INCOME OR EMPLOYMENT.]

1. charter or party boat (CONTINUE)
2. private boat (SKIP TO B3)
3. rental boat (SKIP TO B3)
4. don't know (SKIP TO B3)
5. refused (SKIP TO B3)

B2. Were you the captain or a crew member of the charter or party boat on that trip?
1. yes (GO TO NEXT TRIP) 3. refused (CONTINUE)
2. no (CONTINUE)

B3. Was most of that fishing in the ocean, a bay, an estuary or a river?
1. ocean (SKIP TO B7) don't know (SKIP TO B7)
2. bay or estuary (CONTINUE) refused (SKIP TO B7)
3. river (SKIP TO B5)
4. other (SPECIFY) _____ (SKIP TO B7)

B4. Which bay/estuary were you fishing in?
1. Anahiem Bay
2. Arcata Bay
3. Balboa Bay
4. Bodega Bay – outside of harbor/jetties
5. Bodega Bay – inside of harbor/jetties
6. Bolinas Bay
7. Crescent City – inside of harbor/jetties
8. Drakes Bay
9. Estero Bay
* Grizzley Bay (fresh only)
10. Half Moon Bay – outside of harbor/jetties
11. Half Moon Bay – inside of harbor/jetties
* Honker Bay (fresh only)
12. Humboldt Bay
13. Long Beach Harbor
14. Los Angeles Harbor
15. Mission Bay
16. Monterey Bay – outside of harbor/jetties
17. Monterey Bay – inside of harbor/jetties
18. Morro Bay – outside of harbor/jetties
19. Morro Bay – inside of harbor/jetties
20. Newport Bay
21. Noyo Bay
22. Pierpoint Bay
23. Richardson Bay
24. San Diego Bay
25. San Francisco Bay
26. San Leandro Bay
27. San Luis Obispo Bay – outside of harbor/jetties
28. San Luis Obispo Bay – inside of harbor/jetties
29. San Pablo Bay
30. San Pedro Bay
31. San Rafael Bay
* Suisun Bay (fresh only)
32. Tomales Bay
* Trinidad Bay (ocean)
0. Other (SPECIFY) _____ (NOW SKIP TOQB7)

B5. What was the name of the river you were fishing in?
1. Albion River (Mendocino)
2. Big River (Mendocino)
3. Eel River (Humboldt)
4. Kalmath River (Del Norte)
5. Mad River (Humboldt)
6. Napa River (Napa)
7. Navaro River (Mendocino)
8. Noyo River (Mendocino)
9. Redwood Creek (Humboldt)
10. Sacramento River (Solano/Contra Costa)
11. San Gabriel River (Los Angeles)
12. Smith River (Del Norte)
13. Ten Mile River (Mendocino)
14. Other (SPECIFY) _____(SKIP TO B7)

15. B6. Were you fishing upstream or downstream of (cutoff point)?
1. upstream (DELETE TRIP; GO TO NEXT TRIP)
2. downstream (CONTINUE)
3. both (CONTINUE)
4. DK
5. Refused

(ASK B7, Q8, Q8aa, Q8bb, & Q8a OF PRIVATE BOATS ONLY; PARTY/CHARTER BOATS SKIP TO Q9)

B7. Does the public have access to the place from which the boat left, or is it private access? Public access sites are those where everyone in the general public has access, even though you may have to pay a fee to use the site. Private access sites usually have restricted access, such as locked gates or guards. Personal residences are also private access sites.
1. public has access (CONTINUE)
2. private access only (the public does not have access) (CONTINUE)
3. military (do not read) (ASK QB8, THEN Q9)
4. DK (ASK QB8, THEN SKIP TO B8a; UNLESS "SLIP" OR "BEACH," THEN FOLLOW QB8 SKIP PATTERN)
5. Refused (ASK QB8, THEN SKIP TO B8a; UNLESS "SLIP," THEN FOLLOW QB8 SKIP PATTERN)

B8. Did you leave from a launch ramp, a beach launch, a hoist, or something else?
1. launch ramp (IF PUBLIC IN B7, SKIP TO Q9; IF PRIVATE IN B7, SKIP TO B8a)
2. hoist (~~IF PUBLIC IN B7, SKIP TO Q9; IF PRIVATE IN B7,~~ SKIP TO B8a)
3. slip (CONTINUE REGARDLESS OF WHETHER PUBLIC OR PRIVATE)
4. beach launch (SKIP TO B8cc)
5. something else (SPECIFY) _____
6. moored (CONTINUE REGARDLESS OF WHETHER PUBLIC OR PRIVATE)
7. berth (CONTINUE REGARDLESS OF WHETHER PUBLIC OR PRIVATE)
8. dock (CONTINUE REGARDLESS OF WHETHER PUBLIC OR PRIVATE)

B8aa. Do you or someone else pay to keep the boat there including mooring from a private residence or do you not have to pay to keep it there?
1. yes, I/they pay to keep the boat there (ASK B8bb)
2. no, I/they don't pay to keep the boat there (SKIP TO B8a)
3. the boat is moored from a private residence (SKIP TO Q9)

B8bb. To access the boat, do you have to go through a locked gate?
1. yes
2. no

B8cc. (IF BEACH LAUNCH, ASK:) What type of boat were you fishing from?
1. kayak
2. float tube
3. surfboard
4. inflatable (Zodiak, etc.)
5. other (SPECIFY) _____

(CONTINUE TO B8a)

B8a. ~~(IF PRIVATE ACCESS OR BEACH LAUNCH OR SLIP/MOORED/BERTH/DOCK, ASK:~~) (ASK ALL EXCEPT PUBLIC LAUNCH RAMP & PRIVATE RESIDENCE MOORING:) What was the name of the place you left from? (name of launch ramp, marina, hoist, beach, etc.)_____

B9 Did the boat depart and return on the same calendar day? (ONE DAY TRIP).
1. Yes (SKIP TO B13)
2. No

B10. What date did the boat depart? _____ Date

B11. What date did the boat return? _____ Date

B12. During that trip, on how many calendar days did you actually fish?
_____ Days

B13. What time did the boat leave?

1. 1 am	10. 10 am	19. 7 pm
2. 2 am	11. 11 am	20. 8 pm
3. 3 am	12. 12 pm (noon)	21. 9 pm
4. 4 am	13. 1 pm	22. 10 pm
5. 5 am	14. 2 pm	23. 11 pm
6. 6 am	15. 3 pm	24. 12 am (midnight)
7. 7 am	16. 4 pm	25. DK (ASK B14)
8. 8 am	17. 5 pm	26. Refused (ASK B14)
9. 9 am	18. 6 pm	

B14. Did your boat leave after sunset?
1. Yes
2. No

B15. And what time did the boat return?

1. 1 am	10. 10 am	19. 7 pm
2. 2 am	11. 11 am	20. 8 pm
3. 3 am	12. 12 pm (noon)	21. 9 pm
4. 4 am	13. 1 pm	22. 10 pm
5. 5 am	14. 2 pm	23. 11 pm
6. 6 am	15. 3 pm	24. 12 am (midnight)
7. 7 am	16. 4 pm	25. DK (ASK B16)
8. 8 am	17. 5 pm	26. Refused (ASK B16)
9. 9 am	18. 8 pm	

B16. Did your boat return before sunrise?
1. Yes
2. No

(IF B3 = 2 (BAY) OR 3 (RIVER), SKIP TO B19; ALL OTHERS CONTINUE)

B17. Was most of your fishing that day more or less than 3 miles from the mainland or an island?
1. more than 3 miles (inc. 3 miles) (SKIP TO B19)
2. less than 3 miles (CONTINUE)

B18. Were you fishing off the mainland or off an island?
1. off the mainland
2. off an island

B19. What was the primary kind of fish you were trying to catch that day? (SEE LIST; IF NO PRIMARY TARGET, CODE “ANYTHING”; IF NOT ON LIST, RECORD SPECIES UNDER “OTHER”) (IF ANYTHING/NOTHING IN PARTICULAR, ASK B19a)

_____

B19a. Were you bottom fishing or troll/drift fishing?
1. bottom fishing
2. troll/drift fishing

B19b. Was there a secondary kind of fish you were trying to catch that day? (SEE LIST; IF NOT ON LIST, RECORD UNDER "OTHER") (IF NO SECONDARY TARGET, CODE "NONE")

B20. When your fishing trip ended, to what county did your boat return to shore?

1. Alameda	9. Napa	17. Santa Clara
2. Contra Costa	10. Orange	18. Santa Cruz
3. Del Norte (ASKQB21)	11. Sacramento	19. Solano
4. Humboldt (ASKQB21)	12. San Diego	20. Sonoma
5. Los Angeles	13. San Francisco	21. Ventura
6. Marin	14. San Luis Obispo	22. Other _____(ASK B21)
7. Mendocino	15. San Mateo	23. DK (ASK B21)
8. Monterey	16. Santa Barbara	

(ALL EXCEPT DEL NORTE, HUMBOLDT, DK & OTHER SKIP TO B22)

B21. What town was nearest to where your boat returned to shore?

Town _____

B22. (IF SAN DIEGO, ORANGE, OR LOS ANGELES COUNTY, ASK:) Did you fish in Mexican waters on that trip?
1. yes (ASK B23)
2. no (SKIP TO NEXT SECTION)
3. DK (SKIP TO NEXT SECTION)
4. Ref (SKIP TO NEXT SECTION)

B23. Did you do some fishing in both Mexican and U.S. waters or were you fishing only in Mexican waters?
1. Both Mexican & U.S. waters
2. Mexican waters only

SHORE SECTION

S1. Was most of your fishing that day in the ocean, a bay, an estuary, or a river?
1. ocean (SKIP TO S5)
2. bay or estuary (CONTINUE)
3. river (SKIP TO S3))
4. other (SPECIFY) _____ (SKIP TO S5)
5. don't know (SKIP TO S5)
6. refused (SKIP TO S5)

S2. Which bay/estuary were you fishing in?

1. Anahiem Bay
2. Arcata Bay
3. Balboa Bay
4. Bodega Bay – outside of harbor/jetties
5. Bodega Bay – inside of harbor/jetties
6. Bolinas Bay
7. Crescent City
8. Drakes Bay
9. Estero Bay

* Grizzley Bay (fresh only)

10. Half Moon Bay – outside of harbor/ jetties
11. Half Moon Bay – inside of harbor/jetties

* Honker Bay (fresh only)

12. Humboldt Bay
13. Long Breach Harbor
14. Los Angeles Harbor
15. Mission Bay
16. Monterey Bay – outside of harbor
17. Monterey Bay – inside of harbor
18. Morro Bay – outside of harbor
19. Morro Bay – inside of harbor
20. Newport Bay
21. Noyo Bay
22. Pierpoint Bay
23. Richardson Bay
24. San Diego Bay
25. San Francisco Bay
26. San Leandro Bay
27. San Luis Obispo Bay – outside of harbor
28. San Luis Obispo Bay – inside of harbor
29. San Pablo Bay
30. San Pedro Bay
31. San Rafael Bay

* Suisun Bay (fresh only)

32. Tomales Bay

* Trinidad Bay (ocean)

0. Other (SPECIFY) _____

S3. What was the name of the river you were fishing in?

1. Albion River (Mendocino)
2. Big River (Mendocino)
3. Eel River (Humboltd)
4. Kalmath River (Del Norte)
5. Mad River (Humboldt)
6. Napa River (Napa)
7. Navarro River (Mendocino)
8. Noyo River (Mendocino)
9. Redwood Creek (Humboldt)
10. Sacramento River (Solano/Contra Costa)
11. San Gabriel River (L.A.)
12. Smith River (Del Norte)
13. Ten Mile River (Mendocino)
14. Other (SPECIFY) _____

S4. Were you fishing upstream or downstream of (cutoff point)?

1. upstream (GO TO NEXT TRIP)
2. downstream (CONTINUE)
3. both (CONTINUE)
4. DK
5. Refused

S5. Does the public have access to the place where you were fishing, or is it private? (Public access sites are those where everyone in the general public has access, even though you may or may not have to pay a fee to use the site. Private access sites often have restricted access, such as gates or guards like you find in clubs. Personal residences are also private access sites.)

1. public has access
2. private access only (the public does not have access)
3. military (DO NOT READ)
4. DK
5. Ref

S6. In what county were you fishing?

1. Alameda
2. Contra Costa
3. Del Norte
4. Humboldt
5. Los Angeles
6. Marin
7. Mendocino
8. Monterey
9. Napa
10. Orange
11. Sacramento
12. San Diego
13. San Francisco
14. San Luis Obispo
15. San Mateo
16. Santa Barbara
17. Santa Clara
18. Santa Cruz
19. Solano
20. Sonoma
21. Ventura
22. Other ___(ASK S7)
23. DK (ASK S7)

(ALL EXCEPT DK & OTHER, SKIP TO S8)

S7. What is the nearest town to where you did most of that fishing? Town _____

S8. What was the primary kind of fish you were trying to catch that day? (SEE LIST; IF NO PRIMARY TARGET, CODE "ANYTHING"; IF NOT ON LIST, RECORD SPECIES UNDER "OTHER") (IF ANYTHING/NOTHING IN PARTICULAR, ASK B19a)

_____

S8a. Was there a secondary kind of fish you were trying to catch that day? (SEE LIST; IF NOT ON LIST, RECORD UNDER "OTHER") (IF NO SECONDARY TARGET, CODE "NONE")

_____

S9. What time did you start fishing?

1. 1 am	8. 8 am	14. 2 pm	21. 9 pm
2. 2 am	9. 9 am	15. 3 pm	22. 10 pm
3. 3 am	10. 10 am	16. 4 pm	23. 11 pm
4. 4 am	11. 11 am	17. 5 pm	24. 12 am (midnight)
5. 5 am	12. 12 pm (noon)	18. 6 pm	25. DK (ASK S11)
6. 6 am		19. 7 pm	26. Refused (ASK S11)
7. 7 am	13. 1 pm	20. 8 pm	

S10. At what time did you stop fishing?

1. 1 am	8. 8 am	15. 3 pm	22. 10 pm
2. 2 am	9. 9 am	16. 4 pm	23. 11 pm
3. 3 am	10. 10 am	17. 5 pm	24. 12 am (midnight)
4. 4 am	11. 11 am	18. 6 pm	25. DK (ASK S11)
5. 5 am	12. 12 pm (noon)	19. 7 pm	26. Refused (ASK S11)
6. 6 am	13. 1 pm	20. 8 pm	
7. 7 am	14. 2 pm	21. 9 pm	

(IF S9 OR S10 = DK OR REFUSED, ASK S11; OTHERWISE SKIP TO S12)

S11. Did your fishing trip take place entirely at night?
1. Yes
2. No

S12. Did you finish fishing on the same calendar day that you started?
yes (GO TO NEXT TRIP OR Q10)
no (ASK S13)

S13. How many hours was your total trip duration? _____ hours

ASK EVERYONE:

Q10. While we were talking, did you think of any other saltwater sportfishing you did in California in <u>January</u> that we have not discussed?
1. yes (RETURN TO Q4 FOR THE DATE, THEN CONTINUE LOOP WITH Q5)
2. No (GO TO LOBSTER Q)
3. DK (GO TO LOBSTER Q)
4. Ref (GO TO LOBSTER Q)

LOBSTER QUESTIONNAIRE

CURRENT SEASON – Since January 1st, 2006

L1. Did you fish for lobster in California in the month of January?
1. Yes (CONTINUE)
2. No (SKIP TO LL1)

L2. How many lobster **trips** did you make in January? (NOTE: ONE TRIP CAN LAST MULTIPLE DAYS)
_____ trips

L3. How many **days** did you fish for lobster in January? _____ days

L4. How many lobsters did you keep in January? _____ lobsters

L5. In what geographic area did you take most of your lobster in January?

_____

CURRENT SEASON – Between Oct. 1 and Dec 31, 2005)

LL1. Did you fish for lobster in California between October 1st and December 31st of 2005?
1. Yes (CONTINUE)
2. No (SKIP TO LLL1)

LL2. How many lobster **trips** did you make between October 1st and December 31st last year? (NOTE: ONE TRIP CAN LAST MULTIPLE DAYS)
_____ trips

LL3. How many **days** did you fish for lobster between October 1st and December 31st last year? _____ days

LL4. How many lobsters did you keep between October 1st and December 31st last year?
_____ lobsters

LL5. In what geographic area did you take most of your lobster between October 1st and December 31st last year?

_____

LAST SEASON – Between Oct 2, 2004 and March 16, 2005

LLL1. Did you do any lobster fishing in California last season, that is, between October 2nd, 2004 and March 16, 2005?
1. Yes (CONTINUE)
2. No (IF L1 OR LL1 = YES, SKIP TO L6, OTHERWISE, SKIP TO Q11)

LLL2. How many lobster **trips** did you make last season? (NOTE: ONE TRIP CAN LAST MULTIPLE DAYS)
_____ trips

LLL3. How many **days** did you fish for lobster last season? _____ days

LLL4. How many lobsters did you keep last season? _____ lobsters

LLL5. In what geographic area did you take most of your lobster last season?

_____

L6. What method do you usually use in your pursuit of lobster? Do you dive, use a hoop net or something else?

1. Dive
2. Hoop net
3. Other (SPECIFY)_____

L7. What percent of the time do you use a boat or kayak to get lobster?

_____ % of the time (IF >0, ASK QL8; OTHERWISE, SKIP TO Q11)

L8. What kind of a boat do you usually use? Is it a . . .

1. kayak
2. private/rental boat
3. charter boat
4. party boat
5. other _____

Q11. One last thing. We're asking people who have been saltwater fishing in the past year to participate in a very important **mail** back survey to measure the impact of saltwater sportfishing on the economy. The questionnaire asks about your expenditures on your saltwater sportfishing trips in California and your investment in gear and boats. If you agree to participate, the National Marine Fisheries Service will send you a questionnaire that you can complete and mail back. Would you be willing to participate in this survey?

1. yes (CONTINUE)
2. no (SKIP TO CLOSING)

Q12. Can I verify your name and get your mailing address?

Name (Verify on-screen spelling of full name, **even if it looks obvious**)
Address _____
City _____
State _____
ZIP _____

Those are all my questions. On behalf of the California Department of Fish & Game, I want to thank you very much for taking the time to answer these questions. You have been very helpful. Thanks again, and good luck on your next fishing trip.

Summary of 2004 Dialing Results

Call Result	**Feb**	**Mar**	**Apr**	**Mav**	**Jun**	**Jul**	**Auq**	**§M**	**Oct**	**Nov**	**Dec**
No answer	63	27	1	13	20	37	13	31	13	62	18
Answering machine	83	17	52	46	90	425	138	132	103	85	97
Busy number	4	3	0	1	3	2	14	16	8	3	3
Callback	39	43	17	40	80	35	35	40	34	65	19
Respondent never available	14	22	35	9	16	22	17	45	42	40	56
Number not in service	59	65	83	56	89	149	174	158	183	226	154
Fax/Modem	42	24	51	20	27	27	24	49	37	83	46
Other language	16	6	16	12	10	19	20	40	20	36	17
Refused	51	46	73	50	66	73	74	119	100	ill	85
Wrong number	55	58	103	62	85	95	151	211	147	143	120
Blocked number	4	2	14	2	8	9	25	45	36	25	30
License sales vendor/employee (othl)									0	2	3
Hard refusal/add to DNC list (oth2)											
Name is not the license holder (oth3)											
Don't know/refused # of saltwater trips									0		1
Completed interviews	600	515	696	435	916	939	1,035	1,240	1,017	1,022	802
Total	**1,030**	**828**	**1,141**	**746**	**1,410**	**1,832**	**1,720**	**2,126**	**1,740**	**1,903**	**1,451**
Quota	**770**	**770**	**884**	**884**	**915**	**915**	**1,031**	**1,240**	**1,015**	**1,015**	**800**
No. of completed interviews	600	515	696	435	916	939	1,035	1,240	1,017	1,022	802
Sample used	1,030	828	1,141	746	1,410	1,832	1,728	2,131	1,741	1,902	1,452
Dialing attempts	2,908	3,629	5,137	3,468	6,719	8,615	9,311	11,909	9,056	9,654	8,079
Calls per sample point	2.8	4.4	4.5	4.6	4.8	4.7	5.4	5.6	5.2	5.1	5.56
Average completes/hour	6.9	4.7	5.4	3.9	5.0	4.6	4.3	4.7	4.3	4.1	4.28
No. of 12-month fishing households	543	475	634	382	829	868	942	1,090	918	916	727
12-month fishing incidence	90.5%	92.2%	91.1%	87.8%	90.5%	92.4%	91.4%	87.9%	90.3%	89.6%	90.6%
No. of 2/1 -month **freshwater** fishing anglers	307	254	311	211	555	599	628	684	474	298	244
2-month freshwater fishing incidence	51.2%	49.3%	44.7%	48.5%	60.6%	63.8%	60.7%	55.2%	46.6%	29.2%	30.4%
Total number of freshwater trips	1846	1194	1404	940	3194	3095	2,478	2,815	1,664	1,245	1,144
Average no. of freshwater trips	6.00	4.70	4.51	4.45	5.75	5.17	3.96	4.12	3.52	4.19	4.71
No. of 2/1 -month **saltwater** fishing anglers	106	125	113	112	192	214	245	269	260	234	139
2/1 -month saltwater fishing incidence	17.7%	24.3%	16.2%	25.7%	21.0%	22.8%	23.7%	21.7%	25.6%	22.9%	17.3%
Total number of saltwater trips	509	520	372	352	813	975	720	866	589	615	278
Average no. of saltwater trips	4.80	4.16	3.29	3.14	4.23	4.56	2.94	3.22	2.27	2.63	2.00

Summary of 2005 and 2004-5 Cumulative Dialing Results

Call Result	**Jan**	**Feb**	**Mar**	**April**	**Mav**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**	**PCT**
No answer	15	43	101	36	128	111	88	75	102	136	1133	2.5%
Answering machine	81	266	779	405	262	379	375	513	251	162	4741	10.5%
Busy number	4	12	19	18	4	16	26	23	19	12	210	0.5%
Callback	35	64	168	97	104	70	113	97	94	50	1339	3.0%
Respondent never available	24	26	27	32	44	77	79	130	84	76	917	2.0%
Number not in service	175	175	85	136	155	173	271	247	213	194	3220	7.1%
Fax/Modem	36	33	28	36	42	40	43	70	54	54	866	1.9%
Other language	14	34	16	21	23	22	32	45	47	25	491	1.1%
Refused	95	98	124	81	110	126	188	155	166	126	2117	4.7%
Wrong number	166	177	54	97	119	148	222	278	186	186	2863	6.3%
Blocked number	8	16	0	5	3	1	4	23	44	4	308	0.7%
License sales vendor/employee	2	6	6	6	1	0	7	10	3	7	53	0.1%
Hard refusal/add to DNC list		4	47	31	29	51	71	37	30	25	325	0.7%
Name is not the license holder		1	5	7	0	12	12	10	8	3	58	0.1%
Don't know/refused # of trips	0	3	1	1	0	0	0	0	0	0	6	0.0%
Completed interviews	803	1,543	1,762	1,772	1,723	2,021	2,261	2,215	1,758	1,616	26,691	58.9%
Total	**1,458**	**2,501**	**3,222**	**2,781**	**2,747**	**3,247**	**3,792**	**3,928**	**3,059**	**2,676**	**45338**	**100.0%**
Quota	**800**	**1,540**	**1,768**	**1,768**	**1,830**	**2,040**	**2,272**	**2,272**	**1,820**	**1,610**	**27,959**	
No. of completed interviews	803	1,543	1,762	1,772	1,723	2,021	2,261	2,215	1,758	1,616	26,691	
Sample used	1,458	2,501	3,222	2,785	2,747	3,247	3,792	3,929	3,059	2,676	45,357	
Dialing attempts	7,020	14,589	9,535	15,638	12,757	15,006	21,005	17,859	13,903	14,827	220,624	
Calls per sample point	4.81	5.8	2.96	5.62	5.6	4.6	5.5	4.55	4.54	5.54	4.9	
Average completes/hour	4.75	4.1	6.48	4.57	5.2	5.68	4.8	5.63	5.71	5.62	5.0	
No. of 12-month fishing households	717	1,394	1,590	1,646	1,598	1,864	2,091	2,049	1,621	1,479	24,373	
12-month fishing incidence	89.3%	90.3%	90.2%	92.9%	92.7%	92.5%	92.5%	92.5%	92.3%	91.5%	91.3%	
No. of 2/1 -month freshwater fishing	214	809	782	802	830	920	926	746	501	403	11,498	
2-month freshwater fishing incidence	26.7%	52.4%	44.4%	45.3%	48.2%	45.6%	41.0%	33.7%	28.5%	24.9%	43.1%	
Total number of freshwater trips	772	3,899	2,833	3,016	3,040	3,647	3,457	2,364	1,988	1,342	47,377	
Average no. of freshwater trips	3.62	4.84	3.64	3.79	3.68	3.99	3.75	3.18	3.97	3.35	4.12	
No. of 2/1 -month saltwater fishing anglers	113	201	168	223	286	306	423	401	253	154	4,537	
2/1 -month saltwater fishing incidence	14.1%	13.0%	9.5%	12.6%	16.6%	15.2%	18.7%	18.1%	14.4%	9.5%	17.0%	
Total number of saltwater trips	328	715	493	604	739	791	1190	982	633	351	13,435	
Average no. of saltwater trips	2.90	3.56	2.93	2.71	2.58	2.58	2.81	2.45	2.50	2.28	2.96	

Adjustment of the CRFS Angler License Survey Estimates

Prepared by Wade Van Buskirk, RecFIN Programmer Analyst for the RecFIN Statistical Subcommittee on March 9th, 2005.

Introduction

In 2004 the telephone contractor for the California Recreational Fisheries Survey (CRFS) Angler License Survey (ALS) in California performed improper sample selection from a list of licensed anglers (sample frame). A procedure was developed to calibrate the estimates to adjust for the potential bias in the response data due to the sampling error.

The primary purpose of the ALS is to estimate the effort for beach and bank fishing (BB) and a portion of the private and rental boats (PR) and man made structure (MM) effort. Publicly accessible MM and PR effort is sampled and estimated from field sampling of daytime trips. The majority of the ALS effort estimate used in the CRFS is the PR estimate from private access and night fishing (PAN) (figure 1a).

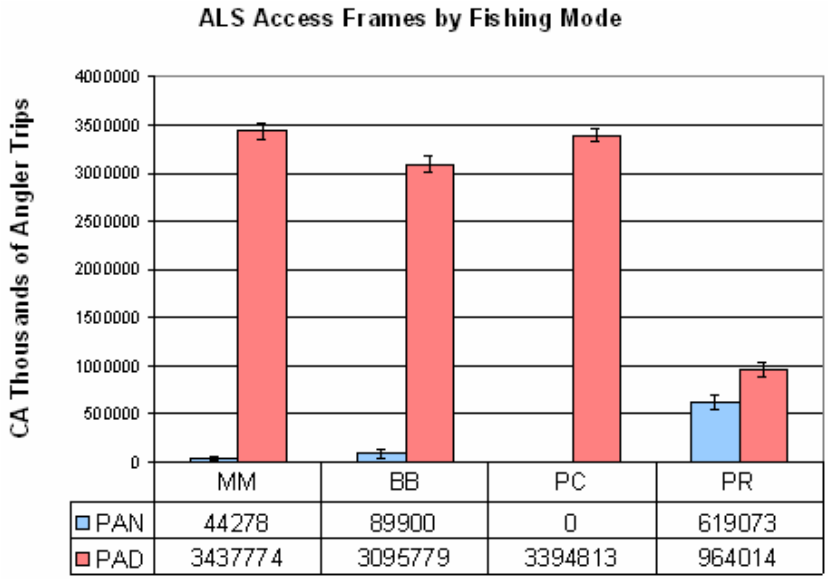


Figure 1a. CRFS ALS effort for private access and night (PAN) and public access and daylight (PAD) by fishing mode in 2004.

Private Access and Night PR Estimates - Angler License Survey (ALS) Telephone Survey General Description and Background

Private access sites and night fisheries have unknown catch rates because samplers are generally unable to access these boats at the end of their trips for interviews or unable to safely and efficiently survey fishing outside of daylight hours. The private access effort is diffuse with numerous access points, which are often secured to protect private property. The means to make catch and effort estimates will be a combination of data from an angler license directory

(ALD) telephone survey and information on catch rates by trip type from the two site access surveys.

General Effort Method

Effort estimates are based on the mean number of trips from a random sampling of ALD angler contacts from the approximate 5% sample frame coverage of the license population and for the unlicensed anglers sampled during angler intercepts.

Sample Selection (frame, design, sample sizes)

Beginning in 2004, an angler information form will be printed on the cover of annual (both resident and nonresident) and daily (10-day nonresident, 2-day nonresident, and 1-day nonresident) sport fishing license booklets. Each booklet contains 20 licenses and the angler purchasing the first license will be asked to record their name and telephone number. The resulting sample frame will be a systematic (approximately 5%) sample of all sport fishing license holders in California. The sample frame will begin each license year. Additions to the sample frame will be made at least monthly will be available within a month after the end of each month of sale, which begins prior to the calendar year. Licensed angler contacts on the license year begin after the first month of fishing with the new license in February and finish after the last month of fishing in the license year in January.

Based on preseason projections of license sales, approximately 2 million licenses with be sold in California during a typical license year; thus an estimated 200,000 (5%) anglers will be in the ALD. This program will complete at least 1000 licensed angler interviews per month.

Annual license holders will be included in all succeeding months of the license year after sale to determine fishing effort for the previous month. Daily license holders will be contacted for two months after sale (except at the end of the license year). Daily licenses can be activated anytime after sale in the calendar year; therefore10% of the monthly sample for daily license holders will be daily license holders in the sample frame for more then two months. This 10% sub-sample will begin with the March sales and end in January of the next calendar year.

Data Collection (method, elements)

The 5% systematic sample will be stratified by annual and daily license type based on the proportion of the license types sold. The proportion for annual licenses will be the cumulative number sold to date while the daily license proportion is based on the number sold in the most recent two month period (one month period for the first month in the license year). Ten percent of the daily license stratum will be daily licenses sold more then two months ago (once more then two months have passed). Each stratum will be sub-sampled by systematically sorting the frame geographically by area code to insure uniform spatial distribution of the sample population. Observations falling within each

area code will be randomized and sampled in proportion to the area code contribution and number of initial contacts wanted for dialing. The number of initial contacts will be adjusted upwards by a percentage to account for no-contact rates seen in the performance of this survey. No additional sample may be added once the selection has been made. The sampling is with replacement, meaning, no license holders will be exempt from re-contact between months.

Anglers will be asked to provide information on all marine fishing trips made during the previous two months in the telephone survey. For each trip anglers will be asked fishing mode, area of trip (ocean or inland), type of trip (target species) and access type (public or private). For PR mode, site of access for private launch ramps (name of site) will be asked. For MM and PR modes, starting and ending times (duration and time of day) will be asked. Trips that occur at night, with start and end times outside of daylight hours will be identified for all PR and MM fishing trips.

The trip type is necessary for determining which catch rates to apply from the public access intercepts. Trip types will be pre-defined. Trips not fitting into a pre-defined category will be categorized later based on the target species.

The access type is needed to determine if the site is a sampled public access site. Private PR ramp sites will be recorded and added to a list based on the description provided over the telephone and an investigation of the site by a sampler, if necessary.

Data Processing (data flow, validation)

Adjustments for unlicensed anglers in each mode will be based on a combination of data sources. Anglers fishing from public piers are exempt from the license requirement; however anglers fishing in that mode will be asked about their license status so that data collected from the ALD survey will be useful in the analysis of man-made structure fishing mode. Anyone under age 16 is exempt from the license requirement; however, under-age 16 angler counts will be made during sampling. The state requires that all anglers display their license on or above the waistline so that it is plainly visible when engaged in the take of any fish (i.e., fishing). However, samplers will ask anglers not displaying their license which type of license they have. These adjustments may be compared with enforcement statistics on the rate of unlicensed adult anglers cited by month, statistical area and fishing mode.

License and Revenue Branch in Sacramento will provide all anglers names and telephone numbers (angler contacts), as well as monthly license sales by license type, daily or annual, as part of their license tracking program. There is a unique bar code on each license book to assist tracking and quality control of the data. The names and phone numbers will be shipped to a telephone-dialing contractor in a timely manner for entry and selection of the dialing sample. The response data will be collected via computer assisted dialing (CAD) telephone surveying. The license sales, angler contacts, dialing sample and response data will be transmitted to PSMFC, the agency responsible for making the estimates.

The response data will be merged back with the dialing sample and angler contacts by unique identifier to validate the selection of observations used in each month of dialing. No-contact and non-response rates will be tracked and reported by the contractor. Complete response data will be available one month after dialing begins. Up to three weeks of dialing re-attempts will be allowed before a contact number is marked as a no-contact number.

2004 ALS Sampling Error

The ALS was not performed to the above specifications in 2004. The telephone contractor and CDFG Marine Region were jointly responsible for the collection and shipment of the sample frame from the license branch and sample selection for each monthly dialing.

The error was in the sample selection for each month. The sample was not selected from the entire sample frame with replacement; rather it was selected from the most recent shipment of contacts. In effect, the sample was based on contacting anglers who had most recently purchased their licenses. Although the recent license sale contacts could have been added to previous contacts to build the sample frame, each month of new contacts was treated as a separate batch of contacts for the monthly dialing. Each month nearly 100% of the batch was utilized for the dialing. Only in rare cases were previous batches utilized in the dialing. According to the contractor, the use of ‘used’ batches was purposely avoided to prevent potential contact with licensed anglers who had already been included. The perception of the contractor was that the ‘used’ batches might lead to reduced response rates.

Potential biases due to sampling error

The sampling error may introduce a positive bias due to higher trip rates from anglers who have recently purchased their license in order to participate in a planned near term trip. Conversely, the error could also lead to a delayed negative bias due to the omission of anglers who purchased their licenses early in the year in anticipation of many planned trips throughout the year. A study could be performed on annual license holders to compare the trips in a sample month with the time duration since the date of purchase. The results of the study could improve our understanding of the potential biases from this particular sampling error.

Overlap of ALS and field based PR effort estimates

Overlap exists between the ALS effort estimates and the field based effort estimates in PR fishing mode. The field based effort survey samples public fishing ramps during daylight hours. The ALS includes questions to detect the overlap so that estimates of non-public, non-ramp, and non-daylight effort can be calculated to complete the estimate if total PR effort. Since ALS estimates all effort, it can provide an alternative to the field based PR effort estimate.

Discovery of the Error

During initial review of the CRFS there was concern about the amount of effort estimated for total PR that had come from the ALS. Some reviewers thought that the proportion of effort coming from private access and night (PAN) fishing in PR mode was excessive (figure 1).

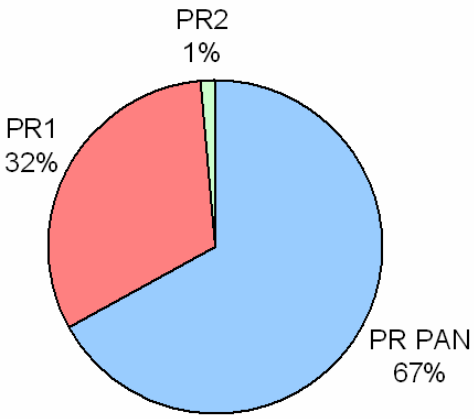
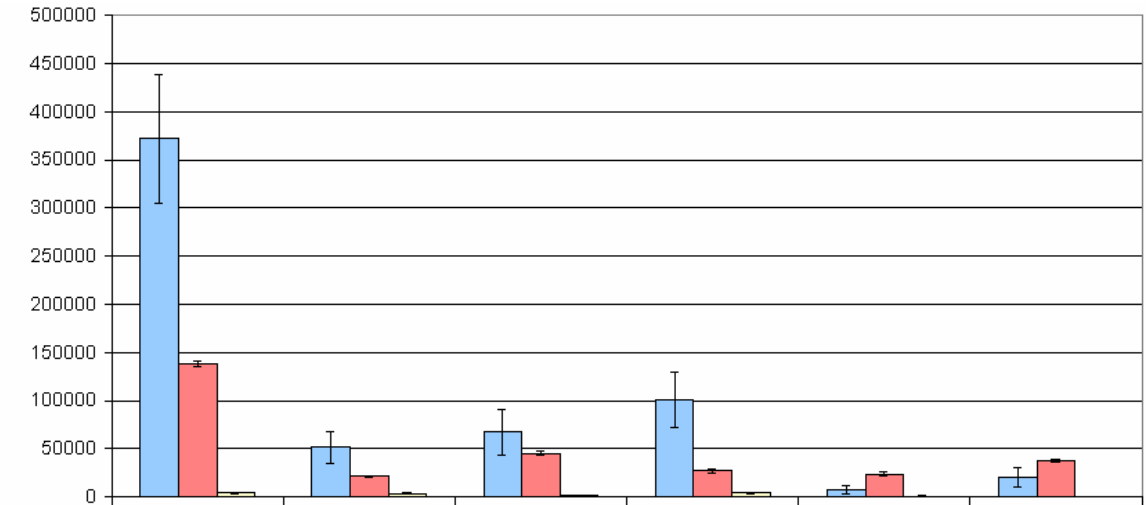


Figure 1. Initial proportion of ALS effort (PR-PAN) in the total PR effort estimate.

Reviewers also felt that the proportion of PR-PAN was excessive in each of the districts (figure 2). Some reviewers suggested that the additional catch of salmon estimated from the PR-PAN would be impossible for salmon management to accept as reality.



	South	Channel	Central	Bay	Wine	Redwood
PAN	371864.6	51273.67	67258.97	100728.06	7118.71	19786.58
PR1	137951.64	21500.8	44808.35	26836.35	23759.27	37712
PR2	3912.84	3209.33	1169.24	4065.21	613.69	332.32

Figure 2. Initial estimates of effort by district in the total PR effort estimate.

Reviewers suggested that the ALS data and estimation programs be examined for problems and additional comparisons be made among available sources of

data in order to try to identify the source of the problem and attempt to reduce the PR-PAN effort. Reviewers were aware that the CRFS PR effort estimates were coming out much lower then the estimates coming from the MRFSS (figure 3-4) and might fall even lower if the ALS effort was biased high.

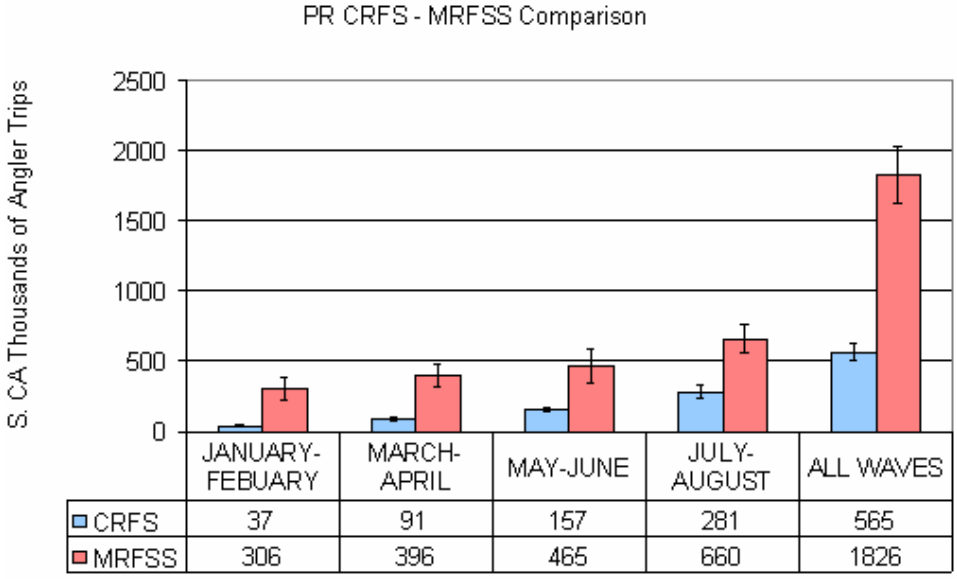


Figure 3. Initial comparison of PR effort between MRFSS and CRFS for Southern California.

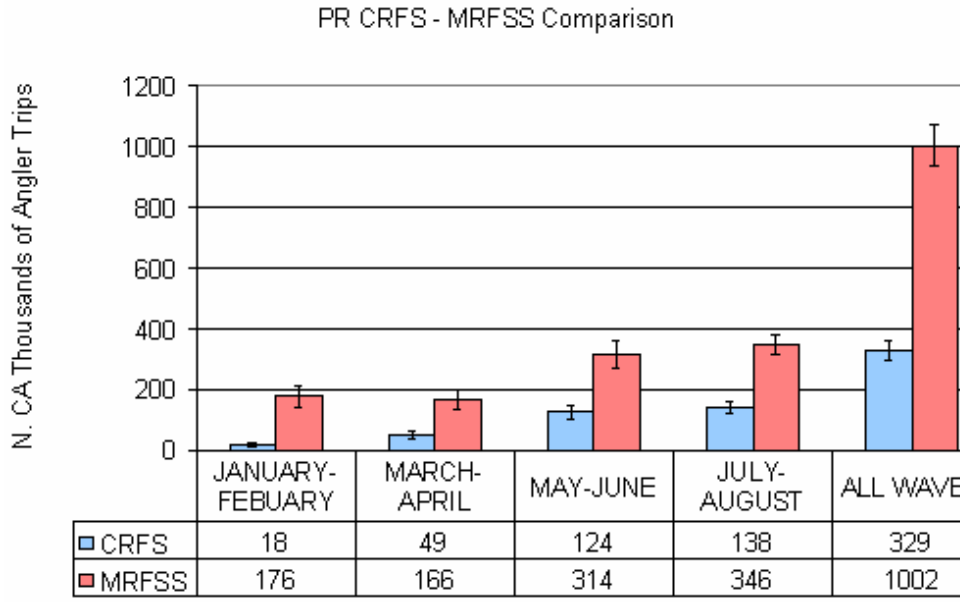


Figure 4. Initial comparison of PR effort between MRFSS and CRFS for Northern California.

During the subsequent investigation of the ALS and data the sampling error was discovered. At a subsequent review meeting the principal investigator offered calibration as a possible solution to the sampling error that may have resulted in the undesirable high estimate of PR-PAN effort.

Based on the comparison of the overlapping effort estimates from the field based effort and the ALS for the data processed so far in 2004 it was found that the ALS public access and daylight (PAD) portion of effort was an average of 2.75 times higher then the effort from the field based effort estimate (figure 5).

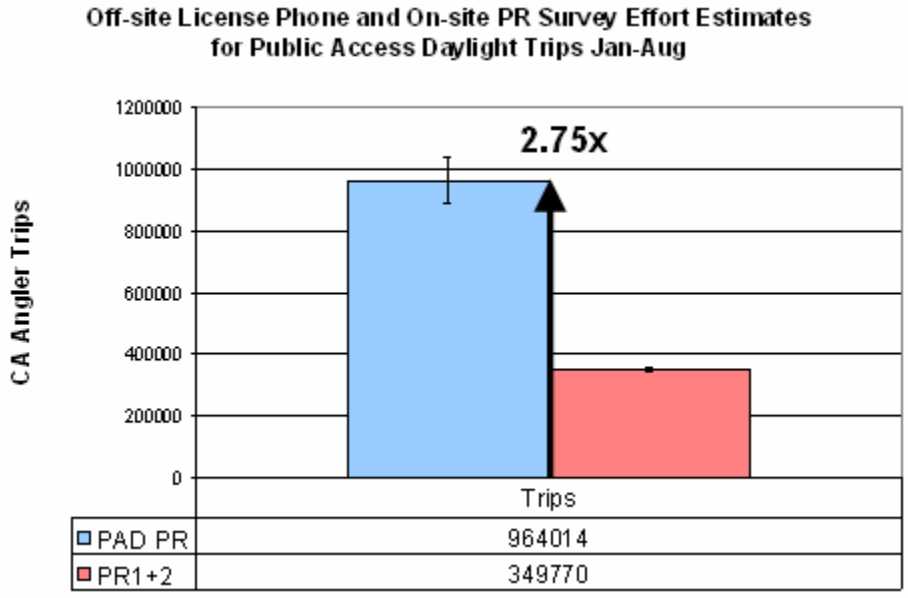
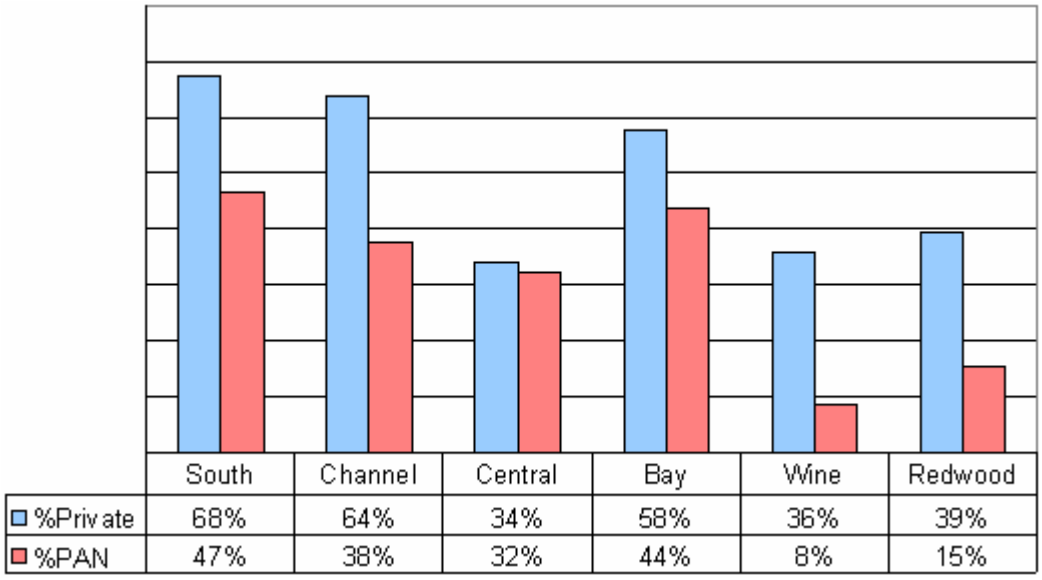


Figure 5. Comparison of ALS to field based PR effort in California for Jan-Aug, 2004.

The MRFSS phone survey also includes questions about the type of access for PR boats. Unfortunately, those questions were discontinued in the MRFSS in 2004. In another follow-up comparison, it was found that the proportion of PR from the ALS was lower then the proportion of private access trips reported in past MRFSS coastal household telephone surveys (figure 6).



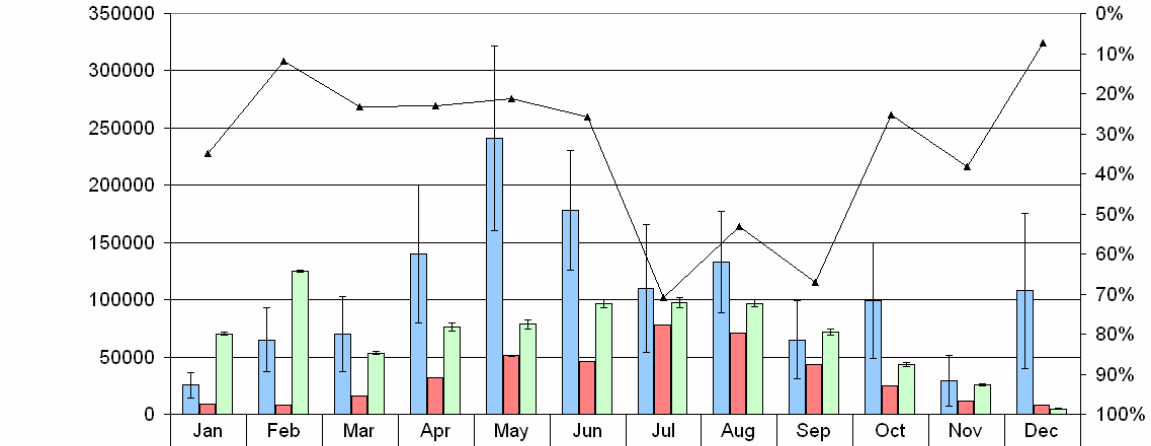
	South	Channel	Central	Bay	Wine	Redwood
%Private	68%	64%	34%	58%	36%	39%
%PAN	47%	38%	32%	44%	8%	15%

Figure 6. Comparison of ALS percent private access PR effort (%PAN) in Jan-Aug, 2004 to the MRFSS percent private (%Private) in 2001-2003 by CRFS geographic district.

CRFS reviewers felt that the MRFSS effort estimates and proportion of private access were too high and wished to proceed with the calibration of the 2004 CRFS ALS in order to reduce the PR-PAN effort.

2004 ALS Calibration

The ALS was calibrated using the monthly comparison between the field based effort and the matching ALS effort (for public daylight PR ramp effort). Each month of ALS in the calendar year is a separate estimate based on a growing population of licensed anglers. The sale of angler licenses is a normal distribution with the peak in sales during summer months with an additional peak in Jan-Feb (figure 7).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ALS PR Trips	25586	64907	70008	139615	241151	177746	110025	132931	65078	99093	29451	107821
PR1+2 Trips	8936	7717	16264	32170	51115	45744	78070	70711	43696	25000	11243	8005
License Sales	70210	124974	53332	76183	78662	96375	97214	96968	71656	43474	25899	4626
%Calibration	35%	12%	23%	23%	21%	26%	71%	53%	67%	25%	38%	7%

Figure 7. Calibration factors for the CRFS ALS expressed as a proportion of the field based effort estimate (PR1+2) over phone based effort estimate (ALS-PR) by month for 2004.

The population of licensed anglers in each month, N, is stratified by two license types, annual and daily licenses. Effort estimates are calculated by expansion from the contacted sample of *n* anglers in the ALS to the population of all *N* licensed anglers (cumulative license sales to the month of estimation for the calendar year). Effort estimates are made for each stratum of angler trips defined by license type, access type (public-daytime or private-nighttime), mode of fishing, water area of fishing and geographic district. Effort for licensed anglers in any given angler-trip stratum is estimated using this basic method:

$$\hat{E}_1 = \frac{N}{n}\sum_{i=1}^{n} t_i \quad ,$$

Here, for each *i* among the *n* contacted anglers, t_i is the number of trips in the stratum made by angler *i*. Thus, the average number of per-angler stratum trips – the average taken for contacted licensed anglers - is multiplied by the total number *N* of licenses issued.

Calibration method

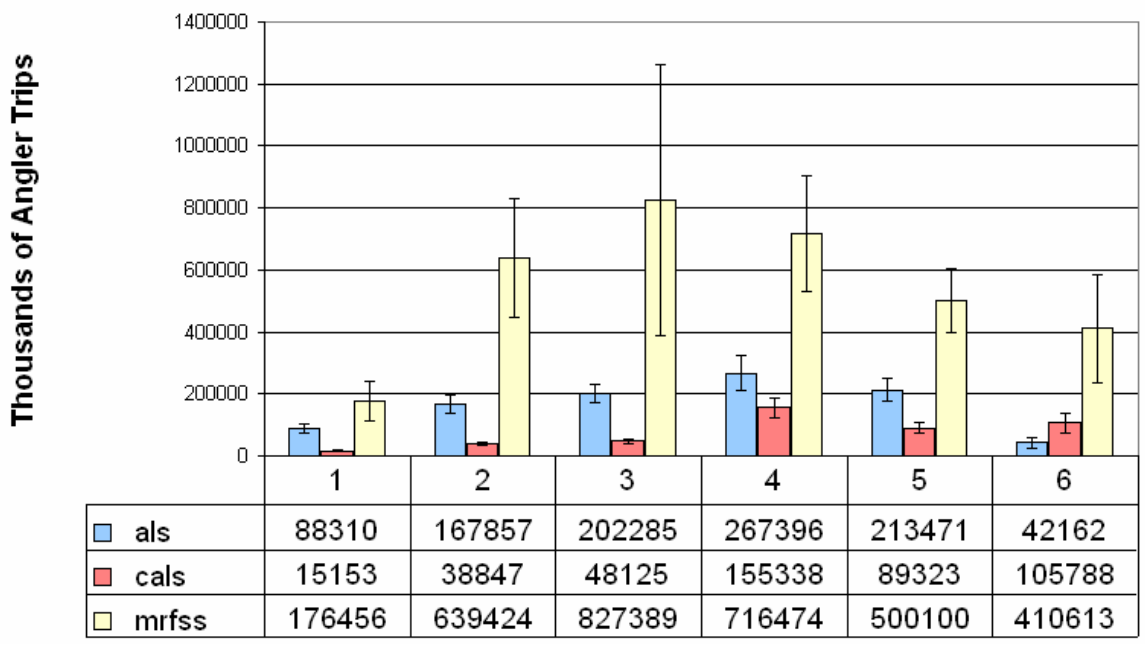
The calibration was performed by first generating the effort estimates as above and making the comparison of the estimates overlapping with the PR1+2 field based method for effort. The comparison proportions (%C) for each month in figure 7 were multiplied with N as:

$$\hat{E}_1 = \frac{NC}{n}\sum_{i=1}^{n} t_i$$

Here, C, the calibration proportion is multiplied by the total number *N* of licenses issued. The response data in trips per angler (t/n) is not altered. In effect, a potential bias in the response data is adjusted by changing the total angler population, not the response data. The remaining calculations remain the same for the calibrated ALS effort estimates.

Calibration results

The result was the desired decrease in the PR-PAN as well as declines in all other ALS based CRFS estimates, mainly BB. This also increased the difference between the MRFSS and the CRFS effort estimates (figure 8).



	1	2	3	4	5	6
als	88310	167857	202285	267396	213471	42162
cals	15153	38847	48125	155338	89323	105788
mrfss	176456	639424	827389	716474	500100	410613

Figure 8. Original ALS and results of the calibration (CALS) for CRFS compared with the MRFSS for PR mode of fishing in the South Coast district for bi-monthly waves 1-6, 2004.

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Appendix B
CRFS Review
August 2006

2006 PR1 FORM - CALIFORNIA RECREATIONAL FISHERY SURVEY (CRFS) 8/18/2006 Page _____ of _____

If you miss a boat, tally as missed boats with your current sampled boat if refused also put number with 'R' in the margin.

COUNTS: on-site / off-site

ASSN ID	DATE	CNTY	SITE	OSP	SAMPLER	SAMP #		on-site	off-site
							Arrival		
							Depart		

EFFORT							CATCH												
crfs #	BOAT TIME 2400	ANGS Fished w/o-lic	Res. County Days F	TARGET First / Second		GER First / Sec	CATCH LOC Block-box Lat / Lon	BOTM Depth (ft)	Catch Species	obs land seal tak	UNAV alive / dead	Fork len (mm) Wgt (decimal kg) or head (tag #) 1	2	3	4	5	MSD BOTS	MSD BOTS
					mex													
					salm													
					mex													
					salm													
					mex													
					salm													
					mex													
					salm													
					mex													
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					mex													
					salm													
			Page Total			X=yes targeted	SALMON TRIP DATA											
CRFS	BOATS	ANGS						*SALM BOATS*	*SALM ANGS*	*KING KEPT*		*COHO KEPT*	*KING RELS*	*COHO RELS*	*TAG COUNT*	*SEAL TAKE*	MSD BOTS	OFF SITE

Gears: **H**ook, **S**pear, **P**ot, **T**roll (Salm: **M**ooch, **B**oth mooch and troll)

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CRFS ASSIGNMENT SUMMARY FORM

Assn #	SAMPLER NAME	sampler ID	DATE	ASSN ID	ASSN MODE	CLUSTER	HOURS	
								TRAVEL
COMMENT	0.0hr = 58-3 mins 0.1hr = 4-9 mins 0.2hr = 10-15 mins 0.3 hr = 16-21 mins 0.4hr = 22-27 mins 0.5hr = 28-33 mins 0.6hr = 34-39 mins 0.7hr = 40-45 mins 0.8hr = 46-51 mins 0.9hr = 52-57 mins					ASSN DISP		SAMPLING
						ODO END		EDIT
						ODO START		NON-ASSN
						MILEAGE		LEAVE
						EXPENSES		TOTAL

Assignment dispositions: 1=Complete, 2=Reassigned, 6=Cancelled

☐ Edited. By:

	SITE NAME / COMMENT				TIME		MMPR2 CLUS ONLY		ANG FORM COUNTS / *PR1 BOATS*					TOT EFFORT		
							START COUNT	STOP COUNT	STATUS 12 or *CRFS BOATS*	STATUS 0 or *NF BOATS*	SPECIAL FISHERY B	SPECIAL FISHERY C	SPECIAL FISHERY	ESTIMATED ANGLERS	EST. FSHN BOATS	
1		CNTY		ARRV		MM										MM
		SITE		STRT		BB	☒-EFFORT									BB
		DISPO		STOP		PC	☐ MM	☐ PR2								PC
		HRS		DEPR		PR										PR
2		CNTY		ARRV		MM										MM
		SITE		STRT		BB	☒-EFFORT									BB
		DISPO		STOP		PC	☐ MM	☐ PR2								PC
		HRS		DEPR		PR										PR
3		CNTY		ARRV		MM										MM
		SITE		STRT		BB	☒-EFFORT									BB
		DISPO		STOP		PC	☐ MM	☐ PR2								PC
		HRS		DEPR		PR										PR
4		CNTY		ARRV		MM										MM
		SITE		STRT		BB	☒-EFFORT									BB
		DISPO		STOP		PC	☐ MM	☐ PR2								PC
		HRS		DEPR		PR										PR
5		CNTY		ARRV		MM										MM
		SITE		STRT		BB	☒-EFFORT									BB
		DISPO		STOP		PC	☐ MM	☐ PR2								PC
		HRS		DEPR		PR										PR
6		CNTY		ARRV		MM										MM
		SITE		STRT		BB	☒-EFFORT									BB
		DISPO		STOP		PC	☐ MM	☐ PR2								PC
		HRS		DEPR		PR										PR

Site dispositions: 0=Pressure check, 4=Low Effort, 5=Other(comment), 7=Roving (MM, BB or PR2). Total Effort: "/"=Mode present but total not determined "N"=Mode not possible at site.

PR1 TOTALS	CRFS BOATS	TOTAL BOATS	TOTAL ANGS	SALM BOATS	SALM ANGS	KING KEPT	COHO KEPT	KING RELS	COHO RELS	TAG COUNT	SEAL TAKE	MISSD BOATS	OFF SITE

Status12 are good angler forms, CRFS boats are PR1, status 0 are angler forms, NF boats are PR1 non-fishing, B=bonus C=crew T=tournament

7		CNTY		ARRV		MM											MM
		SITE		STRT		BB	☒-EFFORT										BB
		DISPO		STOP		PC	☐ MM	☐ PR2									PC
		HRS		DEPR		PR											PR
8		CNTY		ARRV		MM											MM
		SITE		STRT		BB	☒-EFFORT										BB
		DISPO		STOP		PC	☐ MM	☐ PR2									PC
		HRS		DEPR		PR											PR
9		CNTY		ARRV		MM											MM
		SITE		STRT		BB	☒-EFFORT										BB
		DISPO		STOP		PC	☐ MM	☐ PR2									PC
		HRS		DEPR		PR											PR
10		CNTY		ARRV		MM											MM
		SITE		STRT		BB	☒-EFFORT										BB
		DISPO		STOP		PC	☐ MM	☐ PR2									PC
		HRS		DEPR		PR											PR
11		CNTY		ARRV		MM											MM
		SITE		STRT		BB	☒-EFFORT										BB
		DISPO		STOP		PC	☐ MM	☐ PR2									PC
		HRS		DEPR		PR											PR
12		CNTY		ARRV		MM											MM
		SITE		STRT		BB	☒-EFFORT										BB
		DISPO		STOP		PC	☐ MM	☐ PR2									PC
		HRS		DEPR		PR											PR
13		CNTY		ARRV		MM											MM
		SITE		STRT		BB	☒-EFFORT										BB
		DISPO		STOP		PC	☐ MM	☐ PR2									PC
		HRS		DEPR		PR											PR
14		CNTY		ARRV		MM											MM
		SITE		STRT		BB	☒-EFFORT										BB
		DISPO		STOP		PC	☐ MM	☐ PR2									PC
		HRS		DEPR		PR											PR
15		CNTY		ARRV		MM											MM
		SITE		STRT		BB	☒-EFFORT										BB
		DISPO		STOP		PC	☐ MM	☐ PR2									PC
		HRS		DEPR		PR											PR
16		CNTY		ARRV		MM											MM
		SITE		STRT		BB	☒-EFFORT										BB
		DISPO		STOP		PC	☐ MM	☐ PR2									PC
		HRS		DEPR		PR											PR

ELIGIBILITY SCREENING: Completed a sport fishing trip in <one fishing mode> in U.S. marine waters for finfish?

Exceptions: 50% or more of a MM or BB trip. Non-finfish trips with a caught finfish. Mexican water boat

PRIVACY ACT: This study is being conducted in accordance with the privacy act of 1974. You are not required to answer any question you consider to be an invasion of your privacy. Use questionnaire for correct wording.

SPECIAL FISHERY CODE | Pg # | of # | 1=Yes 0=No 0123456789 | * = Key Question (for good interview)

MMPR2: A. **MM Anglers** skipped * (Since last interview) | B. MM Anglers that started fishing * (Since last interview) | C. # **PR2 Boats** TR Launched (Since last PR2 boat) | D.* Non-Fishing TR (Since last PR2 boat) | E.* Missed TR (Since last PR2 boat) | X-Effort

CRFS 2006 ANGLER INTERVIEW FORM

99...8 = Don't know (DK) **<blank>** = Not Applic. (NA) **99...9** = Refused (RE

Intercept

* 1. Assignment No. | 2. * Sampler

* 3. Month/Day

* 4. Interview #

* 5. Time interview started (24 Hr:Min)

* - 7. Cnty-Site Code

8. Site Name
First interview at site

* 9. Mode: **1**=Pier/Dock, **2**=Jetty/Breakwater, **3**=Bridge/Causeway, **4**=Other Structure, **5**=Beach/Bank, **6**=Party Boat (per head), **7**=Charter Boat (group paid), **8**=Private/Rental boat

* 10. Status: **0**=Non-angler **1**=Complete **2**=Non-key ref.

# of Initial Refusals | # Language Barriers | # of Key Refusals | < These must be in the mode of fishing above

Effort

* E1. Fishing Effort Area: **O**cean (or open bay), **R**iver, **B**ay or harbor, **S**.F. Bay, **M**exico

E2. Gear **1**=Hook & line **2**=Dip net **3**=Cast net **8**=Spear **9**=Hand

* E3. Wet Gear hours fishing in *above mode*?

* E4. SHORE trip add'nl hours. 0=Complete
Trip must be 1/2 done. 50% of all interviews must be "complete".

Target Species

1

2

*F1. PRIMARY AND SECONDARY TARGET SPECIES **0**=Anything **1**=Bottomfish **2**=Sharks **3**=Surface **4**=Tuna **F** = same as First boat angler

Fish

* F2. **R**eported or unavailable catch (for this angler only)? | * F3. **E**xamined and available catch? If yes, code F4-5 >> | ON THIS FORM *F4. # of contributors | ON OTHER FORM *F5. Interview ###

Angler

* A1. RESIDENCE? Country, State County: IF DK get City Name

A2. Zip code? **9**=Refused **8**=DK (get city)

A3. License Type: **0**=None, **1**=Annual, **3**=Daily, record days

A4. Daily License # Days

A6-7. Days Saltwater Sportfished in **DISTRICT**

A6... in last 12 Months?

A7.... in last **ONE** Month?

A8. Name:
Full name if >15

A9. Gender: **1**=Male **2**=Female

A10. A Phone #
7=< age 16 **0**=No phones
Foreign leave blank

Dialing Memo-When to call:

Economic Survey
1=yes-get FULL name above and address->

Boats

B1. Interview # of first boat angler.
(B2-B11 - First Boat Angler ONLY)

* B2. # Anglers in boat

B3. *PR Trailer 0=no 1=yes in Count Area? K=kayak

* B4. Departure Time? if prior day record date >>

B5. * Deprt. Date

* B6. Distance from any shore? **1** -<=3 mi. Code if island -> **2** -more than 3 mi.

B7. <=3 mi. CA Island

B8. **CPFV Boat** Permit Number

B9. **CPFV Boat** Name:

Location

L1. **BOATS**: **Asked** Fishing Location? (1=Yes, 0=NO, 3=Same as First).

L2. Location(s)

L5. Bottom Depth(s) [feet]

L3. Format:
1=Degrees° minutes'+ grid size
2=State site code# **8**=DK **9**=RE
3=Degrees° mins' secs"
4=Decimal. degrees°
5=CDFG Block-Box <+grid size>
B, B-b, B-b-b, B-b-b-b, B-b+g

L6. Depthfinder used?

Check all that apply

L4. Angler gave location using: Chart GPS/Loran Site name

Fishing Site Name {Record code(s) at L2]:

L7. All catch from this location? **1**=yes, **0**=no, then ✓ fish from Location on back. **8**=no catch

18-Aug-2006

CREEL SURVEY RECORDS

TYPE 2 REPORTED OR UNAVAILABLE CATCH (ONLY FOR THE ANGLER ON THIS FORM)

	Common Name	*Species	* No. of Fish		*Dispo.	Location	
1							1
2							2
3							3
4							4
5							5
6							6

TYPE 3 AVAILABLE EXAMINED CATCH

☐ ✓ GROUP Catch

	*Species	* No. of Fish	Fork Len. (mm)	Weight (kg)	D	L	Fish Sex	
1								1
2								2
3								3
4								4
5								5
6								6
7								7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

* What did you do or plan to do with the majority of the fish? (key question)

1=Thrown back alive (**type 2**)
3=Eat (fillets)
4=Bait
5=Give away
6=Throw back dead
7=Some other purpose, specify under common name.
8=Don't know (**type 3**)
9=Refused (**type 3**)

Fsex 1=Male 2=Female

✓=Catch at **L**ocation

Angler Form Questionnaire

2005 RecFIN Angler Questionnaire - Pacific Coast OMB No. 0648-0052 (Exp. 11/30/2004) v20051118
Note: * indicates key item for good interview.

INTRODUCTION: **Hello, my name is _____ and I represent (PSMFC / CDFG). We are interviewing marine recreational anglers for a study sponsored by the National Marine Fisheries Service.**

PRIVACY ACT STATEMENT: This study is being conducted in accordance with the Privacy Act of 1974. You are not required to answer any question that you consider to be an invasion of your privacy.

SCREENING: **Have you completed a saltwater sport fin-fishing trip today?** (IF shore fishing then determine if 50% or more complete)
Yes:——————— go to next
No:——————— ineligible
Refused:———————— code a refusal in the STATUS row.

SPECIAL FISHERY CODE: Specialized fisheries procedures.
Bonus:——————————— B (MM or PR2 not in cluster site mode).
Crew:——————————— C (Crew member who sport fished)
Tournament:———————— T (Anglers is in a fishing competition. Not PC mode)

X-EFFORT SECTION

*A. MM ANGLERS SKIPPED: MM mode anglers not interviewed in MM target mode since last interview or arrival on site. Include anglers you skipped due to high effort and missed eligible anglers while not on site. If none were missed, code 0 (zero).

*B. MM ANGLERS WHO STARTED FISHING: MM Anglers who began to fish in MM target mode since last interview or arrival on site. If no anglers started fishing, then code 0 (zero).

*C. PR BOATS LAUNCHED: PR boats launched since last boat or arrival on site. If no boats launched, code zero. PC mode=88

*D. PR NON-FISHING: non-fishing PR boats returned since last boat or arrival on site. If no non-fishing boats returned, code zero. PC mode=88

*E. PR MISSED: un-sampled PR boats returned since last boat or arrival on site. If no returns missed, code zero. PC mode=88

INTERCEPT SECTION - Note: * indicates key item for good interview.

*1. ASSIGNMENT #: Code 1 unless second assignment of the day.

*2. SAMPLER ID: Code your three digit Sampler code.

*3. MONTH DAY: Code today's date.

*4. INTERVIEW NUMBER: Code the sequence of interviews.

*5. TIME: Code the time interview started. If aboard a CPFV, code time interview completed.

*6. STATE: Code 6, unless in OR then code 41.

*7. COUNTY-SITE: Code the numeric county and site codes for location.

8. SITE NAME: Write the name of the site matching the site code.

*9. MODE: **Would you say you were fishing from…?**

Pier, dock:——————— 1
Jetty, breakwater:———— 2
Bridge, causeway:———— 3
Other man-made:———— 4
Beach or bank:————— 5
Partyboat:————————— 6
Charter boat:————————— 7
Private or rental boat:—— 8

*10. STATUS:
Questionnaire complete:— 1
Refused non-key items:— 2
REFUSALS: Record the number of initial refusals since last interview.
LANGUAGE: Record the number of anglers skipped due to language.
KEY REFUALS: Number of anglers skipped due to key items refused.

EFFORT SECTION

*E1. EFFORT AREA: **Was most of your fishing time today in the ocean, river or bay?**
Open water (open bay):— O
Mexico:————————— M
If river or bay, ask: **What (river/bay) was that?** Probe to determine correct area. Be aware of freshwater cutoffs.
San Francisco Bay:———— S
Other Bay / Harbor:——— B
River:————————— R

E2. GEAR: **Have you been fishing here today, primarily with a hook and line?**
Yes:————————— 1
If no, ask; **what type of gear have you been using?**
Dip net, A-frame net:—— 2
Cast net:————————— 3
Gill net:————————— 4
Seine:————————— 5
Trawl:————————— 6
Trap:————————— 7
Spear / spear gun:———— 8
Hand:————————— 9

*E3. WET GEAR HOURS: **How many hours have you spent < mode> fishing with your gear IN THE WATER today?**
Hours:————————— NN.N, Tenth hours.

*E4. SHORE ADDITIONAL HOURS: **How many more hours do you expect to fish with your gear in the water today?**
Boat mode:————————— 888
Complete SHORE trip:— 0
Hours:————————— NN.N, Tenth hours.
NOTE: If remaining hours is more then the fished hours, the angler is not yet eligible, terminate interview.)

FISH SECTION

F1. TARGETS: **Were you fishing for any particular kinds of fish today?**
No:————————— 0=anything
Yes:————————— **What kind was primary, secondary?**
Code 5 letter code or 3 digit code. Exception: Last digit may be coded
1=bottomfish
2=sharks
3=surface fish
4=tunas (not mackerel).

*F2. UNAVAILABLE CATCH (type 2):
Did you catch any fish while you were <specify mode> fishing that are not here for me to look at?
Refused:——————— Terminate and code STATUS=Key refused.
No:——————————— 0 a**ny thrown back or used for bait?**
Yes:——————————— 1 Complete Type 2 records by asking;
SPECIES: **What type of fish did you catch?**
NUMBER: **How many did you land?**
DISPOSITION: **What did you do with them?**

*F3. AVAILABLE CATCH: (Type 3):
Did you catch any fish while you were <specify mode and area> fishing today that I might be able to look at?
Refused:——————— Terminate and code STATUS=Key refused.
No:——————————— 0
Yes:——————————— 1 Complete Type 3 by asking;
DISPOSITION: **What do you plan to do with the majority of these fish?**

*F4. ON THIS FORM: **How many anglers including you have their catch here?**
Please don't include anyone who did not catch anything (they get their own form). Only count those people who have their catch here.
Refused:——————— Terminate and code STATUS=Key refused.
NN:——————————— Number of contributors to type 3 catch.

*F5. ON OTHER FORM: Record the interview number of angler with this angler's available (group) catch.

BOATS SECTION

*B1. FIRST BOAT INTERVIEW #: Record the interview number of the first angler from the boat.
First angler:————————— Re-record interview number (Q4)
Next angler:————————— Record interview number of the FIRST boat angler and skip B2-B12.
Shore:——————————— 8 (skip B2-B12)

Note: The remaining B questions are for the first boat angler.

*B2. ANGLERS IN BOAT: **How many people fished on your boat today?** Code number of anglers who fished (For PC mode this question is asked of the captain or crew).

*B3. PR TRAILER IN COUNT AREA: (PR only) **Is your boat trailer in the main parking lot?** (This question refers to the area(s) covered by the trailer count.)
No: ——————————— 0 (Trailer was not in the count or no trailer)
Yes: ——————————— 1

*B4. DEPARTURE TIME: **When did you launch your boat?**
Time launched today: —— 0000 to 2359 (skip B4)
Not today: ————————— Go to B4
Don't know: ————————— 9998 (status=5)
Refused: ——————————— 9999 (status=5)

*B5. DEPARTURE DATE: **What day was that?**
Month and day: ————— 0101 to 1231 (MMDD format)
Don't know: ————————— 9998 (status=5)
Refused: ——————————— 9999 (status=5)

*B6. DISTANCE FORM SHORE: **Was most of your fishing three miles or less from land or more than three miles?**
Three miles or less: ——— 1
More than three miles: — 2 (skip B7)
Inland: ——————————— 8 (skip B7)

B7: CALIFORNIA ISLAND: **Were you fishing within 3 miles of an island?** If within 3 miles of an island, record the island.
Island Codes 01-10

*B8: CPFV BOAT PERMIT NUMBER: For the first PC angler, record the DFG number of a passenger or paid guide boat.

*B9: CPFV BOAT NAME: the first PC angler, record the name of the boat.

LOCATION SECTION

L1: ASKED FISHING LOCATION: Criteria for not obtaining location: The Sampler may choose not to ask this series of questions during a "pulse" in anglers in order to complete the assignment with "enough" interviews.
Yes: ——————— 1
No: ——————— 0 (skip L2-L7)
Same as leader: ——————— 3 (skip L2-L7)

L2. COORIDNATES OR BLOCK-BOX: **What was the location of the majority of your <catch or fishing>?**
<PRIORITY> the location for the <1> type 3 fish, <2> type 2 fish, or <3> majority of fishing time.
Location provided: ——————— _ _ _ _ _ _, N1_ _ _ _ _ _W
Unknown: ——————— L3 = '8', (skip TO L5)
Refused: ——————— L3 = '9', (skip TO L5)

L3. LOCATION FORMAT: GIS Format used at L2 or the location is:
D=degrees, M=minutes, S=seconds, G=grid size, B=block, b=box, N=site #
Degrees, min - <grid>: ——— 1 (DDMM-DDMMGG DDMMMM-DDMMMM)
Site code: ——————— 2 (NNNN)
Degrees, min, sec: ——————— 3 (DDMMSS-DDMMSS)
Decimal degrees: ——————— 4 (DD.DDDD-DD.DDDD)
Block – box: ——————— BBB-bb - BBB-bb
Unknown: ——————— 8 (skip to L5)
Refused: ——————— 9 (skip to L5)

L4. ANGLER GAVE LOCATION USING: How was location determined?
CHECK BOXES (check all that apply) Yes: Check box, No: Box blank. The angler...
1. Pointed at a chart,
2. Read a GPS/Loran,
3. Gave a location name and found on chart (record site name in space provided).

L5. BOTTOM DEPTH: **What was the bottom depth in feet at that location?**
Depth in feet: ——————— FFFF
Don't Know: ——————— 9998 (skip to L7)
Refused: ——————— 9999 (skip to L7)

L6. DEPTHEFINDER USED: **Did you use a depth finder at that location?**
Yes: ——————— 1
No: ——————— 0

L7. ALL CATCH FROM THIS LOCATION: **Were all of your fish caught at that location / depth?**
Yes: ——————— 1
Don't Know: ——————— 8
Refused: ——————— 9
(IF 1, 8 or 9 leave all the fish record location check boxes blank)
No: ——————— 0 - **Can you tell me which fish were caught at that location?**
FISH RECORDS: Check location boxes for species where majority of fish were caught at that location. (TYPE 3: If more fish than records, leave type 3 location boxes blank)

ANGLER SECTION

*A1. RESIDENCE: **What is your county of residence?** Out of state, code postal code of state. Foreign country, code country code. If county unknown, ask "**What city or town do you live in?"**
California County:——— _ _ _ (three letter code)
US State:——————— _ _ (two letter code)
Foreign Country:———— F_ _ (three letter code)
Refused to say:————— 999
Don't know:————————— 998

A2. ZIP CODE: **What is the ZIP Code of your residence?** (If zip unknown, ask "**What city or town do you live in?**")
Zip code: ——————— _ _ _ _ _ (5 digits)
Don't know: ————— 8
Refused to say: ————— 9

*A3. **What type of California fishing license are you using today, annual or daily?** (Under age anglers may have a license)
No License: ————— 0
Annual: ——————— 1
Daily: ——————— 2 (ask A4. **How many days?**)
Don't know: ————— 8
Refused to say: ————— 9

A5. OREGON WAVE EFFORT:
Not applicable: ————— 88

A6. DAYS SALTWATER SPORTFISHED: LAST 12 MO: **Not counting today, within the past 12 months, how many days have you gone 'salt water sport fin-fishing" in this state, or from a boat launched in this state?**
Don't know: ————— 998
Refused to say: ————— 999

A7. DAYS SALTWATER SPORTFISHED: LAST 2 MO: **Not counting today, how many days within the past two months?** (Cannot be more than in last 12 months)
Don't know: ————— 98
Refused to say: ————— 99

A8. FULL NAME: **In the event that my Supervisor wishes to verify that I have been conducting interviews here today, may I have your name and "a" contact phone number?**
Print FULL name clearly on line.

A9. GENDER (angler)
Male: ——————— 1
Female: ——————— 2

A10. A PHONE #: Print telephone number in boxes. Record any information about calling time, language, etc. in space above boxes.
No phone: ————— 0
Under age 16: ————— 7
Name and phone given:— Enter Tel #

Blank page

2005 CPFV Vessel Check Form - CRFS

Used to record vessel status. Data used to estimate potential bias.

Sampler Name:	Sampler ID	Year	Week

	Vessel name	Vessel ID*	Cnty	Site	Month / Day*	Time*	Docked'	Source	Activity	Sample	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

Vessel ID - Last 3 digits of Unique Number (6000**001**-6000**999**) **Month / Day** - Date of check **Time** - Time of Check (2400) **Docked** - Was vessel in slip? (1= Yes, 2= No 8= Don't Know)
Source - How was 'docked' determined? (1= Boat seen, 2= Asked agent, 3= Written Information, 4= Other, explain) **Activity** (if not docked) - 1= Passenger Fishing 2= Other Passenger Activity
3= Non Passenger Trip 4= Unknown Activity 8= Vessel docked (n/a) **Sample** - 1= Sampled Anglers 2= Not sampling 8= Unable to sample 9=Refused sampler * = Key Questions.

Vessel Checks - A comparison of vessel activity to responses from the charter telephone survey and an analysis of the selection of vessels for the sampling of catch is used to estimate potential bias. During weekly (Monday-Sunday) sampling and effort checks, CPFV vessel activity should be recorded when observed. Interviewers are required to have lists of vessels with locations, names and permit numbers for identification. Vessels that have been selected for the phone survey have a high priority for activity checks. All vessels with attempted or completed angler sampling are also recorded. Get complete details for sampler refusals. Get contact information and permit (DFG) number for unlisted boats.

CPFV Checks

Continued

	Vessel name	Vessel ID*	Cnty	Site	Month / Day*	Time*	Docked'	Source	Activity	Sample	Comments
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											

Vessel ID - Last 3 digits of Unique Number (6000**001**-6000**999**) **Month / Day** - Date of check **Time** - Time of Check (2400) **Docked** - Was vessel in slip? (1= Yes, 2= No 8= Don't Know)
Source - How was 'docked' determined? (1= Boat seen, 2= Asked agent, 3= Written Information, 4= Other, explain) **Activity** (if not docked) - 1= Passenger Fishing 2= Other Passenger Activity 3= Non Passenger Trip 4= Unknown Activity 8= Vessel docked (n/a) **Sample** - 1= Sampled Anglers 2= Not sampling 8= Unable to sample 9=Refused sampler ***** = Key Questions.

Vessel Checks - A comparison of vessel activity to responses from the charter telephone survey and an analysis of the selection of vessels for the sampling of catch is used to estimate potential bias. During weekly (Monday-Sunday) sampling and effort checks, CPFV vessel activity should be recorded when observed. Interviewers are required to have lists of vessels with locations, names and permit numbers for identification. Vessels that have been selected for the phone survey have a high priority for activity checks. All vessels with attempted or completed angler sampling are also recorded. Get complete details for sampler refusals. Get contact information and permit (DFG) number for unlisted boats.

CRFS ON-BOARD CPFV SAMPLING FORM

Sheet [ ] of [ ] 8/18/2006

[ ] Assign Stops: Spp:

[ ][ ][ ] Sampler=

[ ][ ][ ][ ][ ][ ][ ][ ] Date

[ ][ ][ ][ ][ ][ ] Boat #

=Boat

[ ][ ][ ] Cnty=

[ ][ ][ ] Site / Lndg=

[ ][ ][ ] Elg.Angs

[ ][ ] Trip Type=

[ ] Area =Capt

TrpTyp: 1=am1/2 2=pm1/2 3=mid1/2 4=twilight 5=3/4-1day 6=overnight, 7=other
Area: 1=US<3mi 2=US>3mi M=Mexico
Ftyp: 1=Drift 2=Stat 3=Anchor 4=Troll
Gfmt: 3=deg,min,sec 1=deg,min.100th/min

STOP#		1	2	3	4	5
START	Lat	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]
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END	Lat	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]
	Lon 1	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]
	Time	[ ][ ][ ][ ] Gfmt	[ ][ ][ ][ ] Gfmt	[ ][ ][ ][ ] Gfmt	[ ][ ][ ][ ] Gfmt	[ ][ ][ ][ ] Gfmt
	max | min Depths					
	max | min Temps					
	ObsAng	[ ][ ][ ] Ftyp	[ ][ ][ ] Ftyp	[ ][ ][ ] Ftyp	[ ][ ][ ] Ftyp	[ ][ ][ ] Ftyp
	1=Yes 0=No	[ ] Seal [ ] Movd	[ ] Seal [ ] Movd	[ ] Seal [ ] Movd	[ ] Seal [ ] Movd	[ ] Seal [ ] Movd
LOST	**G**ear **T**ime	[ ][ ] G [ ][ ] T	[ ][ ] G [ ][ ] T	[ ][ ] G [ ][ ] T	[ ][ ] G [ ][ ] T	[ ][ ] G [ ][ ] T
	Bait **F**ish	[ ][ ] B [ ][ ] F	[ ][ ] B [ ][ ] F	[ ][ ] B [ ][ ] F	[ ][ ] B [ ][ ] F	[ ][ ] B [ ][ ] F
1	KEPT					
	REL alive-dead					
2	KEPT					
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3	KEPT					
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BACK OF FORM

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CRFS ON-BOARD CPFV SAMPLING FORM - ADDITIONAL SHEET

Sheet ____ of ____ 8/18/2006

____ Assign Stops: Spp:

Sampler=

Date

STOP#

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	Lon 1																						
	Time																						
END	Lat																						
	Lon 1																						
	Time			Gfmt			Gfmt			Gfmt			Gfmt			Gfmt			Gfmt			Gfmt	
	max | min Depths																						
	max | min Temps																						
	ObsAng			Ftyp			Ftyp			Ftyp			Ftyp			Ftyp			Ftyp			Ftyp	
	1=Yes 0=No		Seal		Movd		Seal		Movd		Seal		Movd		Seal		Movd		Seal		Movd		
LOST	Gear Time		G		T		G		T		G		T		G		T		G		T		
	Bait Fish		B		F		B		F		B		F		B		F		B		F		

Ftyp: 1=Drift 2=Stat 3=Anchor 4=Troll

Gfmt: 3=deg,min,sec 1=deg,min,100th/min

#	SPECIES																						
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BACK OF ADDITITONAL SHEET

STOP#

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2	⁚	7	⁞⁞
3	⁚.	8	⁞⁞
	⁚⁚		⁞⁞
	⁞⁚		⁞⁞

Ftyp: 1=Drift 2=Stat
3=Anchor
4=Troll

Gfmt: 3=deg,min,sec
1=deg,min,100th/min

START	Lat																						
	Lon 1																						
	Time																						
END	Lat																						
	Lon 1																						
	Time				Gfmt				Gfmt				Gfmt				Gfmt				Gfmt		
	max | min Depths																						
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	ObsAng				Ftyp				Ftyp				Ftyp				Ftyp				Ftyp		
	1=Yes 0=No		Seal		Movd		Seal		Movd		Seal		Movd		Seal		Movd		Seal		Movd		
LOST	**G**ear **T**ime		G		T		G		T		G		T		G		T		G		T		
	Bait **F**ish		B		F		B		F		B		F		B		F		B		F		

#	SPECIES																						
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DISCARDED FISH

Pg # ____ of # ____

1. Interviewer ____

Year ____ Month ____ Day ____ 4. Date ____

2.*Subregion ____

<<Assign # ____
5.Vessel Name>>

TYPE 0 - EXAMINED DISCARDED CATCH MEASUREMENTS

	* Species	*Modex	*Areax	*Fork Len. (mm)	Weight (kg)	*Dispo	Sex	CPFV Stop #	
1									1
2									2
3									3
4									4
5									5
6									6
7									7
8									8
9									9
10									10
11									11
12									12
13									13
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24									24
25									25
26									26
27									27
28									28
29									29
30									30

* Dispo: What happened to the fish? - **0**=Retained by boat, **1**=Thrown back alive, **6**=Thrown back dead (includes bait)

MODEx - **1**=MM **2**=BB **6**=PC **7**=PR

AREAx - 1=Ocean < 3 miles **2**=Ocean > 3 miles **5**=Inland

Sex - 1=male **2**=female

Subregion - **1**=S.CA **2**=N.CA **3**=OR **4**=WA

18-Aug-2006

TYPE 0 - EXAMINED DISCARDED CATCH MEASUREMENTS

	* Species	*Modex	*Areax	*Fork Len. (mm)	Weight (kg)	*Dispo	Sex	CPFV Stop #	
31									31
32									32
33									33
34									34
35									35
36									36
37									37
38									38
39									39
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58									58
59									59
60									60

OCEAN SALMON PROJECT METHODOLOGY FOR ESTIMATING RECREATIONAL SALMON LANDINGS

April 2003

By

Melodie Palmer-Zwahlen and Allen Grover
Ocean Salmon Project
California Department of Fish and Game[1]

INTRODUCTION

This paper was prepared in response to a proposal of the West Coast states to develop their own marine recreational fishery sampling and estimation program. This is because of low confidence in the current methodology used by the Marine Recreational Fishery Statistics Survey (MRFSS) in estimating West Coast marine recreational fishery catches. The new program would be funded using resources provided by the National Marine Fisheries Service (NMFS) in support of the current or an augmented MRFSS program, additional resources provided by the member states, and, possibly, through redirection of existing sampling programs. One such on-going California program is the California Department of Fish and Game's (DFG's) Ocean Salmon Project (OSP), an operation that has provided recreational salmon landings information continuously since 1962. In the following we provide 1) a description of the OSP recreational fishery estimation program, and 2) a discussion of bias and possible estimation errors in the current program.

GOALS AND OBJECTIVES[2]

Goal Statement: To provide information necessary to sustainably manage California's ocean recreational salmon fishery and to meet biological and recovery goals for West Coast salmon populations

Recreation Fishery Sampling Objectives:

1) Provide recreation fishery landings estimates by time, area and fishery strata for inseason management and for developing annual salmon fishery management plans.
2) Sample 20% of all recreational fishery salmon landings to provide postseason estimates of the salmon catch by species, angler effort, and the contribution of coded wire tagged (CWT) fish for reporting to the Pacific States Marine Fisheries Commission (PSMFC) by December 15 of each year.
3) Collect other biological and recreational fishery information as necessary to manage the fishery.

DATA STRATIFICATION

Fishery Sectors. The OSP makes separate estimates for Commercial Passenger Fishing Vessels (CPFVs) and private boats (PBs). Past experience has shown that very few salmon are taken from shore. The possible exceptions in some years include Pacifica Pier, Moss Landing jetties, and Humboldt Bay South Jetty.

---

[1] Final document prepared April 1, 2003

[2] The OSP also samples the commercial salmon fishery for average weight data that are used to estimate numbers of fish landed based on pounds landed and reported on DFG fish tickets and to collect CWTs which are reported to the PSMFC; provides technical assistance to inland salmon programs; extract and decode CWTs collected at Central Valley hatcheries and in Central Valley salmon carcass surveys; and participate in technical meetings of the Pacific Fishery Management Council and the Klamath Fishery Management Council.

Port Area Estimates. The OSP has traditionally produced salmon landing estimates for five statistical areas: 1. Crescent City (Oregon border to Big Lagoon), 2. Eureka (Big Lagoon to Horse Mountain near Shelter Cove), 3. Fort Bragg (Horse Mountain to Point Arena), 4. San Francisco (Point Arena to Pigeon Point), and 5. Monterey (Pigeon Point to the U.S.-Mexico border). The estimates normally are for area of landing rather than area of catch; however because of the large statistical areas, relatively few recreationally caught salmon are landed outside of the port areas in which they were caught.

Sampling normally extends from Crescent City Harbor to Avila Beach. In some years when there is a southern shift in the distribution of salmon, sampling may be extended south to include Santa Barbara, Ventura and Oxnard ports.

Temporal Strata. The estimates are generated by half-month period; i.e., 1-15 and 16-end of month. The 2003 salmon season dates, during which salmon sampling will be conducted in the respective areas, are shown in Table 1. The numbers of full-time samplers (by personnel month) that are to be employed to sample the recreational catch by statistical area are shown in Table 2. Primary sampling sites by major port area and fishery are shown in Table 3.

Day Type Strata. PB landing estimates are further stratified by day type including: 1) regular week days and 2) weekend and holiday days. Recognized salmon season holidays include President's Day, Memorial Day, Independence Day, Labor Day, and Columbus Day.

DATA ELEMENTS AND MARKED SALMON SAMPLING

OSP samplers collect the following data from each sampled vessel:

1) Number of anglers (includes CPFV skipper and crew if they retain salmon)
2) Fishing method: troll, mooch, or both
3) Number of salmon landed by species
4) Number of Ad-clipped (marked) salmon by species
5) Number of coho (an endangered species) released
6) Number of sublegal chinook released
7) Number of salmon lost to pinnipeds

In recent years, the samplers have collected the following additional data from salmon and non-salmon PBs:

8) Number of rockfish landed
9) Number of halibut landed
10) Number of lingcod landed
11) Number of all other species landed
12) Number of anglers in non-salmon boats

Salmon trips are defined as those trips in which salmon was the target species for all or part of the day. A combination trip, on which several species including salmon may be targeted, is considered a salmon trip

All Ad-clipped salmon recovered in the sampling are measured in the field for fork length (to the nearest mm) and their heads removed for later CWT extraction and decoding in the lab.

COMMERCIAL PASSENGER FISHING VESSEL (CPFV) ESTIMATION PROGRAM

A two-stage program is used to estimate effort and landings by CPFVs. Total effort is determined by counting the actual number of CPFVs that targeted salmon each day of the season by port and area. Local employees (mostly field samplers**)** visit the landing areas or make phone calls to get these counts, which are usually made on the same day the fishing trip was conducted. Post season, OSP staff compare the counts to the submitted logbooks (which are required by law) and may adjust the counts upwards if more logs are returned for a given port-day than the number of boats counted during the season. The OSP does not depend on log returns to estimate total salmon fishing effort (or catch) because of the highly variable return

rate of these documents by individual skippers (average return rate has been about 75% in recent years, which is up from an average return rate of about 54% in the mid 1990s). However, there has been close agreement over the years between the salmon landings and angler effort observed by samplers in the field and the salmon landings and angler effort reported on submitted logs.

Sampling of completed CPFV salmon trips is conducted to estimate the various items (elements) of interest, explained above, and to recover marked salmon. Samplers are deployed to the major landing areas (see Table 1) with the intent of sampling 20% of the CPFV landings in each statistical area during each half-month time period. The number of landings made in each statistical area is used to gauge the number of boats to sample to achieve the 20% sampling objective. Note: The OSP only samples completed trips dockside and does not use at-sea sampling to estimate the total salmon catch, including released fish.

The sample-based estimator for individual items ($\hat{Y}$) in the CPFV fishery is:

$$(1) \qquad \hat{Y}_{ij} = N_{ij} \frac{\sum_k y_{ijk}}{n_{ij}},$$

where:

$\hat{Y}_{ij}$ = estimated total number of items in area *i*, time period *j*.

N_{ij} = total number of CPFV salmon trips taken in area *i*, time period *j*.

y_{ijk} = number of items sampled in area *i*, time period *j*, CPFV trip *k*.

n_{ij} = number of CPFVs sampled in area *i*, time period *j*.

Assuming the sampling of CPFV trips is at random without replacement in area i, time period j, the sampling variance of $\hat{Y}_{ij}$ is estimated as

$$(2) \qquad \hat{V}\left(\hat{Y}_{ij}\right) = N_{ij}^2 \left(1 - f_{ij}\right) \frac{s_{ij}^2}{n_{ij}},$$

with $f_{ij} = n_{ij} / N_{ij}$, the sampling fraction, and

$$s_{ij}^2 = \frac{1}{n_{ij} - 1} \left[\sum_k y_{ijk}^2 - \frac{1}{n_{ij}} \left(\sum_k y_{ijk} \right)^2 \right].$$

The estimated totals and variances are additive across strata so that, for example,

$$(3) \qquad \hat{Y} = \sum_i \sum_j \hat{Y}_{ij}, \text{ and } \hat{V}\left(\hat{Y}\right) = \sum_i \sum_j \hat{V}\left(\hat{Y}_{ij}\right).$$

PRIVATE BOAT FISHERY ESTIMATION PROGRAM

The OSP uses stratified random sampling to estimate salmon fishing effort and landings by private and rental boats (collectively referred to as private boats, PBs). The basic sampling unit is a sample area-day. The sample areas, grouped by statistical area, are shown in Table 1. One or two samplers are responsible

for determining 100% of the salmon fishing effort and catch made on each sample area-day. Sample area-days are drawn at random, without replacement, prior to each month in each area.

In some areas, the samplers are not able to contact and sample all returning PBs. In these instances, a count is made of missed PBs either as they pass by the sampler's vantage point or based on the number of empty boat trailers in parking areas at the end of the day. When making these counts, the sampler makes a judgment whether the missed boat was a fishing boat such as the presence of fishing gear on the observed boat or the type of boat trailer type. Sail boats or sail boat trailers, for example, generally are not counted as missed fishing boats. On these occasions, the number of items for that particular sampled area-day is estimated as:

$$\hat{y}_{ijkl} = T_{ijkl} \frac{z_{ijkl}}{t_{ijkl}}, \tag{4}$$

where:

$\hat{y}_{ijkl}$ = estimated total number of items in area *i*, time period *j*, day-type *k*, day *l*.

z_{ijkl} = number of items sampled in area *i*, time period *j*, day-type *k*, day *l*.

t_{ijkl} = number of boat-trips sampled in area *i*, time period *j*, day-type *k*, day *l*.

T_{ijkl} = total number of boat-trips in area *i*, time period *j*, day-type *k*, day *l*.

Several boat landing areas are not sampled by the OSP because of previous experience showing that very few salmon are landed at these areas. These areas are believed to account for less than 5% of the total skiff salmon effort and catch.

The sample-based estimator for individual items ($\hat{Y}$) in the PB fishery is:

$$\hat{Y}_{ijk} = N_{ijk} \frac{\sum_{l} \hat{y}_{ijkl}}{n_{ijk}}, \tag{5}$$

where:

$\hat{Y}_{ijk}$ = estimated total number of items in area *i*, time period *j*, day-type *k*.

N_{ijk} = total number of calendar days in area *i*, time period *j*, day-type *k*.

$\hat{y}_{ijkl}$ = (estimated) number of items in area *i*, time period *j*, day-type *k*, day *l*.

n_{ijk} = number of calendar days sampled in area *i*, time period *j*, day-type *k*.

Ignoring the variance introduced through estimation of y_{ijkl} by $\hat{y}_{ijkl}$ (typically $\hat{y}_{ijkl}$ within 10% of z_{ijkl}), the variance of $\hat{Y}_{ijk}$ is estimated as

$$\hat{V}\left(\hat{Y}_{ijk}\right) = N_{ijk}^2 \left(1 - f_{ijk}\right) \frac{s_{ijk}^2}{n_{ijk}}, \tag{6}$$

with $f_{ijk} = n_{ijk} / N_{ijk}$, the sampling fraction, and

$$s_{ijk}^2 = \frac{1}{n_{ijk}-1}\left[\sum_l \hat{y}_{ijkl}^2 - \frac{1}{n_{ijk}}\left(\sum_l \hat{y}_{ijkl}\right)^2\right].$$

Again, the estimated totals and variances are additive across strata so that, for example,

(7) $$\hat{Y} = \sum_i \sum_j \sum_k \hat{Y}_{ijk} \text{ , and } \hat{V}\left(\hat{Y}\right) = \sum_i \sum_j \sum_k \hat{V}\left(\hat{Y}_{ijk}\right).$$

DATA BASE OUTPUTS

The OSP provides current year recreational salmon data to the Regional Mark Informational System of the PSMFC by December 15 of each year. These data include estimates of recreational salmon landings by species, CWT group, statistical area, and half-month time period. They also input the species estimates to the Pacific Fishery Management Council (PFMC) for use by the Salmon Technical Team (STT) in producing the PFMC's Annual Review of West Coast Ocean Salmon Fisheries. CWT estimates from the Klamath basin are forwarded to the Klamath River Technical Advisory Team for use in the Klamath Ocean Harvest Model, a tool for analyzing fishing impacts of proposed ocean salmon fishing regulations for the ensuing season.

DISCUSSION: BIAS AND POTENTIAL SOURCES OF ERRORS

The OSP has not computed confidence intervals for its estimates in recent years. Typically, the 95% interval for total season catch recreational landings is + or – 10% of the estimate itself. This narrow range can be attributed to large sample size. By counting all CPFVs each day of the season, the OSP eliminates the need to estimate total CPFV effort. Post-season analysis is done to verify or correct the OSP in-season counts. The OSP has learned that they cannot depend on logbook returns to estimate total CPFV effort or catch as many skippers fail (or refuse) to complete and submit their logs.

The OSP is able to move quickly through the boats, both CPFV and PB, on each sample day in part because they limit the number of questions that anglers are asked. They also do not collect data specific for an individual angler. Collection of CWT heads and biological data is the most time consuming part of the overall OSP field sampling program.

The program has been in place since 1962 and the staff has learned how to make optimal use of their limited resources. The fact the OSP does not sample some areas where salmon may occasionally be landed is not believed to be an important source of underestimation of landed catch. However, no study has been conducted and reported to document the relative importance of these unsampled areas to the total salmon catch.

Another program strength is that the field samplers attempt to sample all landings at an assigned facility on sample days. This reduces the potential for bias associated with time of day landings are made. However, the assumption that the catch and effort by unsampled boats on a port-day are the same as sampled boats has not been verified. Unsampled boats are quite often boats moored at a private facility or that continue to fish after the sampler has gone home. It is questionable whether these missed anglers have the same motivation in fishing for salmon (or any other species) as those that take their boat in and out of the water on the same day.

Weather conditions are the single greatest source of variation in the PB data. Salmon catches can be relatively high in an area then fall off to zero or very low levels with the onset of inclement fishing conditions. The OSP has not attempted to do post-season stratification of the data to isolated "bad" and

"good" weather samples (however that would be defined). It is possible that published weather statistics (e.g., swell height or wind speed) could be used to do post-season weather stratification, but we can't be certain the resulting analysis would, in most cases, increase the precision of the estimates due to the increased stratification. There would also be the problem during some periods of the lack of samples for both weather strata.

Asking PB anglers for information on released or lost catch may be biased as it depends on the ability of anglers to accurately recall all the salmon encounters during the day and to differentiate the different salmon species in the released catch. Some fishermen may use the opportunity to complain about pinniped (primarily sea lion) encounters or fishery regulations that require them to release Chinook salmon below the minimum size and all coho salmon, an endangered species. This could result in exaggerated reporting by some individuals or deflated reporting by individuals wishing to downplay their incidental catches (for fear of more restrictive regulations).

Salmon are, by and large, landed on the same day they are caught; thus the OSP does not have to deal with the issue of sampling multiple-day trips. This is not to say that some fishermen do not on occasion catch and store salmon on their vessels for 2 or more days before landing their fish. Vessels that moor upstream from Rodeo near Carquinez Straight that make multiple day ocean fishing trips are not available to be sampled by OSP staff. Also, salmon are rarely taken at night; thus end-of-day sampling is efficient for examining all of the fish taken on a particular day of the season.

The OSP has begun to collect non-salmon landings data in recent years. This has been a trial program, and the additional sampling has not compromised their salmon sampling objectives. These data have not been analyzed as it is not clear how these data would be meaningful for the management of these other species.

Table 1. Season structure of 2003 ocean salmon recreational fishery (number of days open by port area and month)

Statistical	Month												
Port Area	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	Total
Crescent City					15 d	30 d	31 d	31 d	14 d				121 d
Eureka					15 d	30 d	31 d	31 d	14 d				121 d
Fort Bragg		14 d	31 d	30 d	31 d	30 d	31 d	31 d	30 d	31 d	16 d		275 d
San Francisco				19 d	31 d	30 d	31 d	31 d	30 d	31 d	15 d		218 d
Monterey			3 d	30 d	31 d	30 d	31 d	31 d	30 d				186 d
Total		14 d	34 d	79 d	123 d	150 d	155 d	155 d	118 d	62 d	31 d		921 d

Table 2. Budgeted sampler time by port area and month for 2003 ocean salmon recreational fishery.

Statistical	Month												
Port Area	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	Total
Crescent City					0.8 PM	1.0 PM	1.0 PM	1.0 PM	0.5 PM				4.3 PM
Eureka					1.5 PM	2.0 PM	2.0 PM	2.0 PM	1.0 PM				8.5 PM
Fort Bragg		0.5 PM	1.0 PM	1.0 PM	2.0 PM	2.0 PM	2.0 PM	2.0 PM	1.0 PM	1.0 PM	0.5 PM		13.0 PM
San Francisco				3.0 PM	4.5 PM	4.5 PM	4.5 PM	4.5 PM	4.5 PM	3.0 PM	1.0 PM		29.5 PM
Monterey			0.3 PM	3.0 PM	3.0 PM	3.0 PM	3.0 PM	1.5 PM	1.0 PM				14.8 PM
Total		0.5 PM	1.3 PM	7.0 PM	11.8 PM	12.5 PM	12.5 PM	11.0 PM	8.0 PM	4.0 PM	1.5 PM		70.1 PM

Table 3. Primary OSP sampling sites north of Pt Conception by major port area and fishery, 2003 season.

Major port	Private skiffs	CPFVs	Commercial
Crescent City			
Crescent City launch ramp	X		
Crescent City docks	X	X	X
Eureka			
Trinidad Hoist	X		
Trinidad docks	X	X	X
Eureka	X	X	X
Field's Landing	X		
Fort Bragg			
Shelter Cove	X	X	X
Fort Bragg/Noyo	X	X	X
San Francisco			
Bodega Bay/Westside	X	X	X
Sausalito	X	X	X
Berkeley/Emeryville	X	X	
San Francisco Wharf		X	X
Princeton	X	X	X
Monterey			
Santa Cruz	X	X	X
Moss Landing	X	X	X
Monterey	X	X	X
Morro Bay	X	X	X
Avila Beach	X	X	X
Total # of sites:	17	15	14

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RECREATIONAL FISHERIES INFORMATION NETWORK
PACIFIC STATES MARINE FISHERIES COMMISSION
205 SE SPOKANE STREET, PORTLAND, OREGON 97202
PHONE (503) 595-3100 FAX (503) 595-3232

May 30, 2006

«REP_1ST» «REP_LAST»
«VSL_NAME»
«REP_ADDR»
«REP_CTY» «REP_ST» «REP_ZIP»

Dear «REP_1ST»:

We have drawn a 10% random sample of charter and party boats in California and you have been selected to report your saltwater fishing activity for the week of **June 5 - June 11, 2006**. Because of the randomness of the sample draw, some boats may be drawn more than once in a 2-month sampling period while others may not be drawn at all. We need your response every time you're selected in order to maintain the accuracy of the study.

The enclosed trip log is provided for your convenience for recording your fishing activity. You will be contacted by telephone and asked to provide the information indicated on this form. Phone calls will begin on Monday, June 12 and continue through the week, or until we reach you. If you are not contacted for this information by June 14, or if you would prefer to do so, you can fax the completed forms to CIC Research at **888/714-9846** or call CIC to report your information at **888/274-7838**. CIC Research is the independent marketing research firm conducting the survey for PSMFC.

We appreciate your participation and support of this important study. If you have any questions, please feel free to contact CIC Research toll free at (888) 274-7838 or myself at 503/595-3100.

Sincerely,
Russell G. Porter
Field Programs Administrator

COHO CHARTERS Westport Charters

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CHARTER BOAT/PARTY BOAT WEEKLY TELEPHONE SURVEY FORM

Week 23

VESSEL NAME – «VSL_NAME»

VESSEL NUMBER - «VSL_ID»

FOR WEEK – June 5 through June 11, 2006

Number of CPFV Trips:

Number of CPFV Saltwater Finfish Trips:

TRIP #	DATE Month/ Day	LENGTH OF TRIP ½ day ¾ day 1 day 1 ½ day 2 day 2 ½ day 3 day, etc.	MODE OF PAY-MENT (Saltwater Fishing Trips Only) 1. Charter 2. Party 3. Other (specify)	TRIP TYPE 1. Freshwater 2. Salmon 3. Groundfish 4. Pelagics 5. Freelance 6. Shellfish Only 7. Shellfish & Finfish 8. Whales/Birds 9. Scuba 10. Burial 11. Other(specify)	NUMBER OF PAYING PASSEN-GERS (Saltwater Fishing Trips Only)	NUMBER OF ANGLERS (Saltwater Fishing Trips Only)	NUMBER OF CAPTAIN & CREW WHO FISHED & KEPT THE FISH THEY CAUGHT (Saltwater Fishing Trips Only)	COUNTY OF DEPARTURE (Saltwater Fishing Trips Only)	NAME OF MARINA, RAMP, OR LANDING (Saltwater Fishing Trips Only)	PRIMARY AREA FISHED (Saltwater Fishing Trips Only) 1. Ocean/ open bay 2. Enclosed bay 3. River	DISTANCE FROM SHORE (Ocean/Open Bay Saltwater Fishing Trips Only) 1. 3 Miles or less 2. 3 to 200 miles 3. more than 200 miles	MEXICAN WATERS (Saltwater Fishing Trips Only) 1. yes 2. no	TIME TRIP BEGAN (Military time)	TIME TRIP ENDED (Military time)	HOURS FISHED (Saltwater Fishing Trips Only) (to the nearest half hour)
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															

☐ Did not take any trips with paying passengers during the above survey week

CIC Research, 8361 Vickers Street, San Diego, CA 92111, Phone 888/274-7838, Fax 888/714-9846

INSTRUCTIONS FOR FILLING IN FORM

We are providing this form so that you can see what fishing effort information we will ask you to supply in a telephone interview. You may choose to use this form to document your fishing activity for the vessel and week designated on this form. We will contact you by phone sometime during the week after the fishing activity occurred. Please help us to accurately represent your industry by reporting your information. If you have any questions, please call 888/637-6378.

Note: This form should be filled out for the week designated on the front of this form only.

Number of CPFV Trips – The total number of trips with paying passengers during the specified week.

Number of Saltwater CPFV Finfish Trips – The total number of saltwater fishing trips with paying passengers that targeted or caught finfish during the specified week.

Trip - The sequential number of the trip taken that week beginning on Monday.

Date - The date of the trip (month/day).

Length of Trip – Record whether it was a ½-day, ¾-day, full-day, or multi-day trip. If "multi-day", record number of days.

Mode of Payment - The mode by which passengers paid for the trip as defined below.

Charter Trip - A recreational trip with paying passengers who hired the vessel as a group.
Party Boat Trip - A recreational trip with paying passengers who paid on a per-individual basis.
Other Trip - A trip with no paying passengers (commercial, private, fishing for bait, fueling).

Type of Trip - The primary type of recreational activity for the trip.

Freshwater – Freshwater fishing **Shellfish Only** – Saltwater fishing for shellfish **Shellfish/Finfish** – Saltwater fishing for shellfish & finfish **Salmon** – Saltwater fishing for salmon
Groundfish – Saltwater fishing for groundfish **Pelagic Species** – Saltwater fishing for tunas, billfishes, dorado or yellowtail **Other** – Saltwater fishing for other species
Whales - Whale watching **Birds** – Bird watching **Scuba** – Scuba diving **Burial** – Burial at sea

Number of Paying Passengers - The number of passengers who paid for the trip.

Number of Anglers – (Only asked for saltwater fishing trips.) The number of passengers who fished (including non-paying anglers, but excluding captain and crew).

Number of Captain and Crew Members Who Fished – The number of captain and crew members who fished for themselves and kept the fish they caught.

County of Departure – The name of the county from which the trip originated.

Name of Marina, Ramp, or Landing - The name of the marina, ramp, or landing from which the trip originated.

Primary Area Fished – (Only asked for saltwater fishing trips.) The primary area of fishing as defined below.

Ocean, Open Bay - Fishing in offshore waters or **open** Bay.
Enclosed Bay - Fishing in semi-enclosed or enclosed embayment.
River - Saltwater fishing in rivers.

Distance From Shore – (Only asked if fishing occurred in the Ocean or Open Bay.) The distance from shore where fishing primarily took place as defined below.

3 miles or less - Fishing from the shore out to 3 miles. **3 to 200 miles** - Fishing between 3 and 200 miles out from shore. **More than 200 miles** – Fishing more than 200 miles out from shore.

Mexican Waters – (Only asked if fishing occurred in the Ocean or Open Bay.) Record whether the boat fished in Mexican waters during this trip.

Time Trip Started - Time of day vessel departed the dock or ramp for the fishing trip, in military time to the nearest half-hour.

Time Trip Ended - Time of day vessel arrived back at the dock or ramp, in military time, to the nearest half-hour.

Hours Fished - (Only asked for saltwater fishing trips.) The amount of time spent actively fishing with gear in the water to the nearest half-hour.

☐ **Did not take any trips with paying passengers in the above survey week.** If you did not take any trips with paying passengers during the designated survey week, please check this box on the front of form and leave remainder of form blank.

CIC Research, 8361 Vickers Street, San Diego, CA 92111, Phone 888/274-7838, Fax 888/714-9846

D-3 PCPS Telephone Survey Questions – missing at this time

California Charter & Party Boat Study

Survey Contact Results

2001-2005 - Preliminary

Southern California	2001		2002		2003		2004		2005		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Logs completed	455	36.5	472	44.2	421	42.8	375	34.4	373	26.1	2,096	36.0
No contact	198	15.9	86	8.1	83	8.4	80	7.3	185*	12.9	632	10.9
Refusals	206	16.5	210	19.7	266	27.0	385	35.3	524	36.7	1,591	27.3
Inactive	221	17.7	265	24.8	189	19.2	177	16.2	288	20.2	1,140	19.6
Ineligible	167	13.4	34	3.2	26	2.6	74	6.8	59	4.1	360	6.2
Total	1,247	100.0	1,067	100.0	985	100.0	1,091	100.0	1,429	100.0	5,819	100.0

Northern California	2001		2002		2003		2004		2005		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Logs completed	239	31.2	268	43.4	191	35.4	183	31.0	225	18.1	1,106	29.5
No contact	87	11.3	34	5.5	21	3.9	32	5.4	147*	11.8	321	8.6
Refusals	163	21.2	145	23.5	164	30.4	192	32.5	372	30.0	1,036	27.6
Inactive	114	14.9	140	22.7	127	23.6	139	23.6	385	31.0	905	24.1
Ineligible	164	21.4	30	4.9	36	6.7	44	7.5	76	6.1	350	9.3
Steve's Pilot Study	--	--	--	--	--	--	--	--	36	3.0	36	0.9
Total	767	100.0	617	100.0	539	100.0	590	100.0	1,241	100.0	3,754	100.0

*Includes some unresolved calls from Wave 6.

Survey Completion Rates: Logs Completed vs. Refusals

Southern California	2001		2002		2003		2004		2005		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Logs completed	455	68.8	472	69.2	421	61.3	375	49.3	373	41.6	2,096	56.8
Refusals	206	31.2	210	30.8	266	38.7	385	50.7	524	58.4	1,591	43.2
Total	661	100.0	682	100.0	687	100.0	760	100.0	897	100.0	3,687	100.0

Northern California	2001		2002		2003		2004		2005		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Logs completed	239	59.5	268	64.9	191	53.8	183	48.8	225	37.7	1,106	51.6
Refusals	163	40.5	145	35.1	164	46.2	192	51.2	372	62.3	1,036	48.4
Total	402	100.0	413	100.0	355	100.0	375	100.0	597	100.0	2,142	100.0

California Charter & Party Boat Study
Survey Contact Results
2004 Annual

Southern California	Wave 1		Wave 2		Wave 3		Wave 4		Wave 5		Wave 6		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Logs Collected	32	32.3	51	33.3	72	36.0	89	41.2	83	38.4	48	23.2	375	34.4
No contact	7	7.0	11	7.2	22	11.0	19	8.8	10	4.6	11	5.3	80	7.3
Refusal – Initial*	25	25.3	26	17.0	13	6.5	28	13.0	34	15.8	31	15.0	157	14.4
Refusal – Subsequent**	11	11.1	32	20.9	37	18.5	34	15.7	40	18.5	32	15.4	186	17.0
Refusal – Soft[#] (PNR)	1	1.0	3	2.0	15	7.5	14	6.5	4	1.9	5	2.4	42	3.9
Inactive***	15	15.2	20	13.1	22	11.0	13	6.0	35	16.2	72	34.8	177	16.2
Ineligible-soft****	5	5.1	7	4.5	7	3.5	9	4.2	8	3.7	6	2.9	42	3.9
Ineligible-hard*****	3	3.0	3	2.0	12	6.0	10	4.6	2	0.9	2	1.0	32	2.9
Total	**99**	**100.0**	**153**	**100.0**	**200**	**100.0**	**216**	**100.0**	**216**	**100.0**	**207**	**100.0**	**1091**	**100.0**

Northern California	Wave 1		Wave 2		Wave 3		Wave 4		Wave 5		Wave 6		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Logs Collected	12	26.7	23	25.6	43	41.3	53	45.3	40	34.2	12	10.3	183	31.0
No contact	4	8.9	4	4.5	6	5.8	12	10.3	4	3.4	2	1.7	32	5.4
Refusal – Initial*	8	17.8	9	10.0	7	6.7	11	9.4	17	14.5	22	18.8	74	12.5
Refusal – Subsequent**	13	28.9	20	22.2	20	19.2	12	10.3	17	14.5	12	10.2	94	15.9
Refusal – Soft[#] (PNR)	0	--	4	4.4	6	5.8	4	3.4	1	0.9	9	7.7	24	4.1
Inactive***	6	13.3	29	32.2	5	4.8	13	11.1	31	26.5	55	47.0	139	23.6
Ineligible-soft****	1	2.2	0	--	3	2.9	8	6.8	6	5.1	3	2.6	21	3.6
Ineligible-hard*****	1	2.2	1	1.1	14	13.5	4	3.4	1	0.9	2	1.7	23	3.9
Total	**45**	**100.0**	**90**	**100.0**	**104**	**100.0**	**117**	**100.0**	**117**	**100.0**	**117**	**100.0**	**590**	**100.0**

*Respondent refused upon first contact
**Respondent initially agreed but in later calls has refused
***Inactive includes boats out of season, as well as boats in dry dock, out of commission for a year, etc.
****Ineligible-soft consists mostly of boats which are for sale or have sold which we cannot locate with the information we have.
*****Ineligible-hard consists of boats which are freshwater, dive only, private, moved out of state, duplicates of existing boats, etc.
[#]Soft refusals consist mostly of respondents who, when called, promise to fax their forms and then never do.

California Charter & Party Boat Study

Survey Contact Results

2005 Annual - Preliminary

Southern California	Wave 1		Wave 2		Wave 3		Wave 4		Wave 5		Wave 6[@]		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Logs Collected	41	19.0	82	33.9	87	34.5	74	33.0	61	25.2	28	11.1	373	26.1
In progress	--	--	--	--	--	--	--	--	--	--	45	17.8	45	3.1
No contact	13	6.0	16	6.6	26	10.3	38	17.0	47	19.4	0	--	140	9.8
Refusal – Initial*	34	15.7	29	12.0	36	14.3	33	14.7	48	19.8	43	17.1	223	15.6
Refusal – Subsequent**	40	18.5	40	16.5	56	22.2	41	18.3	31	12.8	42	16.7	250	17.5
Refusal – Soft[#] (PNR)	2	1.0	4	1.6	16	6.4	17	7.6	10	3.7	2	0.8	51	3.6
Inactive***	76	35.2	59	24.4	26	10.3	8	3.6	39	16.1	80	31.7	288	20.2
Ineligible-soft****	7	3.2	7	2.9	4	1.6	8	3.6	3	1.3	7	2.8	36	2.5
Ineligible-hard*****	3	1.4	5	2.1	1	0.4	5	2.2	4	1.7	5	2.0	23	1.6
Total	**216**	**100.0**	**242**	**100.0**	**252**	**100.0**	**224**	**100.0**	**243**	**100.0**	**252**	**100.0**	**1429**	**100.0**

Northern California	Wave 1		Wave 2		Wave 3		Wave 4		Wave 5		Wave 6[@]		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Logs Collected	17	8.8	41	20.6	76	32.5	49	25.5	32	14.7	10	4.8	225	18.2
In progress	--	--	--	--	--	--	--	--	--	--	20	9.7	20	1.6
No contact	4	2.1	8	4.0	47	20.1	37	19.3	31	14.3	0	--	127	10.2
Refusal – Initial*	22	11.5	19	9.6	27	11.5	21	10.9	28	12.9	32	15.5	149	12.0
Refusal – Subsequent**	24	12.5	27	13.6	29	12.4	36	18.8	22	10.1	32	15.5	170	13.7
Refusal – Soft[#] (PNR)	4	2.1	17	8.5	14	6.0	12	6.2	2	0.9	4	1.9	53	4.3
Inactive***	108	56.2	80	40.2	22	9.4	13	6.8	56	25.8	106	51.2	385	31.0
Ineligible-soft****	5	2.65	4	2.0	4	1.7	14	7.3	1	0.5	3	1.4	31	2.5
Ineligible-hard*****	8	4.2	3	1.5	15	6.4	10	5.2	9	4.2	0	--	45	3.6
Steve's Pilot Study	--	--	--	--	--	--	--	--	36	16.6	--	--	36	2.9
Total	**192**	**100.0**	**199**	**100.0**	**234**	**100.0**	**192**	**100.0**	**217**	**100.0**	**207**	**100.0**	**1241**	**100.0**

*Respondent refused upon first contact

**Respondent initially agreed but in later calls has refused

[@]Wave 6 numbers are preliminary

***Inactive includes boats out of season, as well as boats in dry dock, out of commission for a year, etc.

****Ineligible-soft consists mostly of boats which are for sale or have sold which we cannot locate with the information we have.

*****Ineligible-hard consists of boats which are freshwater, dive only, private, moved out of state, duplicates of existing boats, etc.

[#]Soft refusals consist mostly of respondents who, when called, promise to fax their forms but never do so.

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CENTRAL AND NORTHERN CALIFORNIA

SERIAL #02 N- 397701

VESSEL NAME

PORT OF LANDING

VESSEL ID NUMBER

PORT CODE

MONTH DAY YEAR

DAY OF WEEK (MUST ALSO FILL IN DATE BOXES)

DAY

TRIP TYPE

☐ MULTI-DAY ☐ SINGLE DAY

TARGET SPECIES

- ☐ SALMON
- ☐ ROCKFISHES
- ☐ LINGCOD
- ☐ STRIPED BASS
- ☐ STURGEON
- ☐ SHARKS
- ☐ TUNA
- ☐ POTLUCK
- ☐ MISC. BAY OR ESTUARY

FISHING METHOD

- ☐ TROLLING
- ☐ MOOCHING
- ☐ ANCHORED
- ☐ DRIFTING
- ☐ DIVING
- ☐ LIGHT TACKLE

BAIT

BAIT	LIVE	DEAD
ANCHOVIES	☐	☐
SARDINES	☐	☐
SQUID	☐	☐
OTHER	☐	☐

BIRD INTERACTION

☐ YES ☐ NO

DEPARTURE TIME

RETURN TIME

HOURS & MINUTES FISHED

NUMBER OF FISHERS

BLOCK WHERE MOST FISH CAUGHT

DEPTH (FEET)

SEA SURFACE TEMPERATURE

SPECIES	NUMBER KEPT	NUMBER THROWN BACK	LOST TO SEALS
ALBACORE 005			
CHINOOK SALMON 302			
COHO 304 SALMON	X X X		
LINGCOD 195			
CABEZON 261			
KELP GREENLING 290			
BLUE ROCKFISH 665			
BOCACCIO ROCKFISH 253			
CANARY ROCKFISH 247			
COPPER ROCKFISH 655			
COWCOD ROCKFISH 245			
GOPHER ROCKFISH 263			
YELLOWEYE ROCKFISH 265			
UNSPECIFIED ROCKFISH 250			

SPECIES	NUMBER KEPT	NUMBER THROWN BACK	LOST TO SEALS
PACIFIC MACKEREL 051			
JACK MACKEREL 055			
HALIBUT, CA 222			
OTHER FLATFISH 230			
STRIPED BASS 335			
STURGEON 470			
WHITE CROAKER 435			
LEOPARD SHARK 153			
DUNGENESS CRAB 800			
ROCK SCALLOP 718			
_____			
_____			
_____			
_____			

OPERATOR'S NAME (PRINT)

OPERATOR'S SIGNATURE

F&G 623 (12/02)

ORIGINAL = DEPT. OF FISH & GAME COPY *** DUPLICATE = SKIPPER'S COPY

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STATISTICAL METHODS

EFFORT ESTIMATION
Vessel Directory Telephone / Intercept

The Vessel Directory Telephone Survey data was used to estimate the total numbers of angler fishing trips on charter boats and headboats included in the sample frame. Estimates of the numbers of boat and angler fishing trips were stratified by two-month wave and sampling week. In addition, angler trip data was post-stratified by primary area fished to directly estimate angler trips at the area level of stratification without using data from the MRFSS Intercept Survey. For each sampling week, the number of angler fishing trips on boats in the sample frame was independently estimated for each of the three primary areas of fishing. For the purpose of estimating total angler trips, we assumed simple random cluster sampling where each boat comprised a cluster of boat trips that were completely sampled. Point estimates of the numbers of boat trips and angler trips and the variances of those point estimates were calculated using the appropriate equations for estimation of a population total under simple random cluster sampling (Sarndal et al, 1992, p.129). Total angler or boat trips that fished primarily in a given area were calculated separately for charter boats and headboats in each week by pi-expansion of the trips reported for sampled boats as follows:

$$\hat{t}_{F_a} = \frac{N_F}{n_F} \sum_{s_b} t_{F_{a_b}} \quad ,$$

where $\hat{t}_{F_a}$ = the pi-estimator of the number of angler or boat trips taken primarily in area *a* on vessels in the sample frame *F*,

N_F = the total number of vessels in the sample frame,

n_F = the total number of sampled vessels for which effort data was supplied by respondents,

$t_{F_{a_b}}$ = the total number of angler or boat trips reported by representatives of boat *b* as having fished primarily in area *a.*

This estimation method assumes simple random sampling of the vessels in the frame each week, and it assumes that mean reported fishing effort does not differ between non-respondent vessel representatives and respondent vessel representatives. For the purpose of comparing estimates to MRFSS estimates for different two-month periods, the VDTS estimates of effort in a particular wave were summed across weeks which included days in that wave to obtain separate effort estimates for each two-month wave.

The variance of the pi-estimator of angler fishing trips in each boat type/wave/area stratum was estimated under the assumption of simple random cluster sampling as follows:

$$\hat{V}\left(\hat{t}_{F_a}\right) = N_F^2 \frac{\left(1-\left(n_F / N_F\right)\right)}{n_F} S^2_{t_{F_{a_i}}} \quad ,$$

where $\hat{V}\left(\hat{t}_{F_a}\right)$ = the estimated variance of the pi-estimator of the number of angler trips taken on vessels in the sample frame,

$S^2_{t_{F_{a_i}}}$ = the sample variance among boats in the total number of anglers who fished during the week.

Estimated variances of total angler fishing trip estimates were summed across strata to get estimated variances for higher level strata.

Sample data from the MRFSS Intercept Survey were used to estimate a ratio which could be used to adjust angler trip estimates for a given MRFSS two-month sampling wave to account for trips by anglers fishing from chartered boats not included in the VDTS sample frame. The VDTS frame undercoverage correction ratio was estimated independently as follows:

$$\hat{R}_U = \frac{1}{\hat{p}_F} = \frac{n_{I_s}}{n_{IF_s}} \quad ,$$

where $\hat{R}_U$ = the estimated undercoverage correction ratio for the vessel-directory sample frame,

$\hat{p}_F$ = the estimated proportion of angler trips that fished from boats included in the vessel-directory sample frame,

n_{IF_s} = the number of angler trips intercepted by the MRFSS Intercept Survey that occurred on chartered boats included in the vessel-directory sample frame,

n_{I_s} = the total number of angler trips intercepted.

The variance of the estimated undercoverage correction ratio was estimated using the delta method as follows:

$$\hat{V}\left(\hat{R}_U\right) = \hat{V}\left(1/\hat{p}_F\right) = \frac{\left(1-\hat{p}_F\right)}{n_{I_s}\hat{p}_F^3} \quad ,$$

where $\hat{V}\left(\hat{R}_U\right)$ = the estimated variance of the undercoverage correction ratio

$\hat{p}_{F_{\backslash}} / \hat{p}_F\right)$ = the estimated variance of the inverse of the estimated proportion .

The estimated correction ratio for each state/wave/mode/area stratum was applied to the appropriate estimate of angler trips from chartered boats included in the sample frame to get an

estimate of total angler trips from chartered boats as follows:

$$\hat{t}_{R_a} = \hat{R}_U \sum_w \hat{t}_{F_a} \quad ,$$

where $\hat{t}_{R_a}$ = the estimator of the total number of fishing trips taken in area *a* by anglers on chartered boats,

$\hat{R}_U$ = the estimated undercoverage correction ratio,

$\hat{t}_{F_{a_w}}$ = the pi-estimator of the number of angler fishing trips taken on sample frame boats in area *a* during week *w*,

The accuracy of this estimator of total angler trips depends on the accuracy of the self-reported data collected by the VDTS. The variance of this estimator of total trips was estimated using Goodman's formula for the estimated variance of a product of two independent random variables (Goodman, 1960) as follows:

$$\hat{V}\left(\hat{t}_{R_a}\right) = \hat{t}_{F_a}^2 \hat{V}\left(\hat{R}_U\right) + \hat{V}\left(\hat{t}_{F_a}\right) \hat{R}_U^2 - \hat{V}\left(\hat{t}_{F_a}\right) \hat{V}\left(\hat{R}_U\right) \quad ,$$

Under the assumption of independence, variance estimates for different boat type/wave/area strata were summed to get variance estimates at a given higher stratum level.

R_{APBT} Estimates of the mean number of anglers per boat trip were calculated for both charter boat and headboats using the appropriate equations for estimation of a population ratio under simple random cluster sampling (Sarndal et al, 1992). The ratio of the number of anglers to the number of boat trips, , was estimated for each sampling week as follows:

$$\hat{R}_{APBT_a} = \frac{\hat{t}_{AF_a}}{\hat{t}_{BF_a}} \quad ,$$

$\hat{R}_{APBT_a}$ where = the estimator of the mean number of angler trips per boat trip in area *a*,

$\hat{t}_{AF_a}$ = the pi-estimator of the number of angler trips taken on sample frame boats in area *a*, and

$\hat{t}_{BF_a}$ = the pi-estimator of the number of boat trips taken on sample frame boats in area *a*.

The variance of this estimated ratio was approximated for each week as follows:

$$\hat{V}\left(\hat{R}_{APBT_a}\right) = \frac{1}{\left(\frac{\hat{t}_{BF_a}}{N_b}\right)^2}\left(\frac{\left(1-n_b/N_b\right)}{n_b}\right)\left(S_A^2 + \hat{R}_{APBT}^2 S_B^2 - 2\hat{R}_{APBT} S_{AB}\right) \quad ,$$

$\hat{V}\left(\hat{R}_{APBT_a}\right)$ where = the approximated variance of the estimated ratio,

S_A^2 = the variance of the number of angler trips among sampled boats,

S_B^2 = the variance of the number of boat trips among sampled boats, and

S_{AB} = the covariance of the number of angler trips and the number of boat trips among sampled boats.

To get estimates of the mean number of angler trips per boat trip for different two-month waves, the ratio of the estimated wave totals for angler trips and boat trips was calculated. The variance of the wave level estimates was approximated using the delta method as follows:

$$\hat{V}\left(\hat{R}_{APBT_a}\right) = \frac{1}{\hat{t}_{BF}^2}\left(\hat{V}\left(\hat{t}_{AF}\right) + \frac{\hat{t}_{AF}^2 \hat{V}\left(\hat{t}_{BF}\right)}{\hat{t}_{BF}^2} - 2\frac{\hat{t}_{AF}}{\hat{t}_{BF}}\hat{C}\left(\hat{t}_{AF}, \hat{t}_{BF}\right)\right) \quad ,$$

$\hat{C}\left(\hat{t}_{AF}, \hat{t}_{BF}\right)$ where = the covariance of the estimated wave totals of angler trips and boat trips.

Effort Reporting Errors

Data collected by the independent Vessel Effort Validation Survey (VEVS) was used to estimate changes needed to correct errors in the reporting of boat trips by boat representatives responding to either the VDTS or the logbook census. Reporting error corrections were estimated on the basis of differences between the reported and observed activity for a given boat on a given day. If a vessel representative reported that the boat did not take and direct

observation by a VEVS sampler confirmed that the boat was in its slip, then an error correction of “0" was recorded. If the vessel representative reported that the boat did not take a trip and the VEVS observer determined that the boat was out fishing with paying passengers, then an error correction of “+1" was recorded for that day. If the vessel representative reported that the boat took a trip and the VEVS observer determined that the boat was out fishing with paying passengers, then an error correction of “0" was recorded. If the vessel representative reported that the boat took a trip and the VEVS observer determined that the boat was actually in its slip all day, then an error correction of “-1" was recorded.

For the validation of trips reported in response to the VDTS, the reported time of return of the trip and the reported number of fishing hours were used to determine whether or not a VEVS observer was present at an appropriate time to determine whether or not the trip actually occurred. The reported number of fishing hours was subtracted from the reported time of return of the trip to determine an approximate time of departure. This time was then compared with the recorded time that the boat was observed in or out of its slip by a VEVS observer. If the VEVS observer visited and observed the boat in its slip before the estimated time of departure for the reported trip, then this observation was not used in the estimates of VDTS reporting error.

Since the time of return of each trip was not included in logbook reports, estimates of logbook reporting errors assumed that VEVS observations always occurred at an appropriate time of day to verify whether or not a reported trip actually occurred. To the extent that assumption does not hold true, then some cases when boats were observed “in” at the wrong time to invalidate a reported trip would be incorrectly interpreted as evidence of an over-reporting error. Therefore, the resulting estimates of logbook reporting errors may be slightly biased toward over-reporting. In order to evaluate the possible bias caused by this assumption, estimates of VDTS reporting errors were also calculated without eliminating observations on the basis of time comparisons. This also allowed comparisons of logbook and VDTS reporting error estimates based on the same interpretations of VEVS observations.

VEVS observers occasionally made more than one dockside observation of a given boat on a given day. If more than one VEVS observation was made, only one observation was used to determine whether or not a reporting error occurred. If all observations for the day matched, then just one of those observations was used. If successive observations for the same day did not match, then priority was given to observations that confirmed that a boat was out of its slip on the given day, and among those observations priority was given to observations that confirmed that the boat was fishing with paying passengers. When more than one observation was made of a boat in its slip on a given day, then the estimated time of departure of a VDTS-reported trip for that day was compared to the time of each VEVS observation to determine if at least one occurred at an appropriate time to determine that the reported trip did not actually occur on that day.

For the purpose of estimating the total reporting error correction needed, the validation sampling of boats and days for which effort data was reported on either the VDTS or the logbook census was treated like two-stage cluster sampling, where a cluster of boats was selected in the first stage and a cluster of dates were randomly selected for dockside observations of each selected reporting boat in the second stage. The total reporting error

correction needed for each wave was estimated using the formula for a pi-estimator of a population total under two-stage cluster sampling as follows:

$$\hat{t}_{E_g} = \frac{N_b}{n_b} \sum_b N_d \left(\frac{\sum_{S_d} y_{E_i}}{n_d} \right)$$

$\hat{t}_{E_g}$ where = the estimated reporting error correction for boat trips in wave *g*,

N_b = the total number of boats potentially reporting for wave *g*,

n_b = the number of boats validated in wave *g*,

y_{E_i} = the recorded error correction (+1, 0, or -1) recorded for boat *b* on day *d* of wave *g*,

= the total number of days in wave *g*.

n_d = the number of days on which reported effort was validated for boat *b* in wave *g*,

This estimation method is based on the simplifying assumption that boats selected for the VDTS were randomly sampled each week by the VEVS and that all boats submitting logbook reports were randomly sampled throughout each wave. The variances of the pi-estimators of the reporting error corrections needed were estimated as follows:

$$\hat{V}\left(\hat{t}_{E_g}\right) = N_b^2 \frac{\left(1 - \left(n_b / N_b\right)\right)}{n_b} S^2_{\hat{t}_{E_b}} + \frac{N_b}{n_b} \sum N_d^2 \frac{\left(1 - \left(n_d / N_d\right)\right)}{n_d} S^2_{y_{E_d}},$$

where = the estimated variance of the estimated total reporting error correction for wave *g*,

$S^2_{\hat{t}_{E_b}}$ = the variance of the estimated error correction among boats during wave *g*, and

$\hat{V}\left(\hat{t}_{E_g}\right)$ = the variance of the recorded error correction among sampled days for boat *b* .

$S^2_{\hat{t}_{E_b}}$ The variance of the estimated error correction among boats, , was calculated as follows:

$S^2_{y_{E_d}}$

$$S^2_{\hat{t}} = \frac{\sum_b \left[\hat{t}_{E_d} - \frac{\sum_b \hat{t}_{E_d}}{n_b} \right]^2}{\sum_d \left(y_{E_i} - 1 \right)} \quad \text{where} \quad \hat{t}_{E_d} = N_d \frac{\sum_d y_{E_i}}{n_d} \; .$$

Due to the relatively small sample sizes for the validation survey, reporting error estimates were made at an annual level, and the estimated annual error correction was used to calculate a "reporting error correction ratio" which was used to correct estimates for each wave. This approach assumes that errors in the reporting of the number of boat trips vary among waves in proportion to the number of trips reported. Annual estimates of boat trips were corrected for estimated reporting errors by summing estimated error corrections across all six waves and adding the total correction to the annual total of boat trips reported in the logbook or estimated from the VDTS as follows:

$$\hat{t} = \hat{t}_R + \hat{t}_E = \sum_g \hat{t}_{R_g} + \sum_g \hat{t}_{E_g} \; ,$$

where $\hat{t}$ = the corrected annual estimated number of boat trips,
$\hat{t}_R$ = the estimated annual number of boat trips based on the VDTS or logbook, and
$\hat{t}_E$ = the estimated annual reporting error correction for the VDTS or logbook.

The appropriate reporting error correction ratio for the VDTS or the logbook was calculated as follows:

$$\hat{R}_E = \frac{\hat{t}}{\hat{t}_R} \; .$$

The variance in the estimated reporting error adjustment ratio was estimated using the delta method as follows:

$$\hat{V}\left(\hat{R}_E\right) = \left[\frac{\left(\sum_g \hat{V}\left(\hat{t}_g\right) \right)}{\left(\sum_g \hat{t}_{R_g} \right)^2} \right] + \left[\frac{\left(\sum_g \hat{t}_g \right)^2 \left(\sum_g \hat{V}\left(\hat{t}_{R_g}\right) \right)}{\left(\sum_g \hat{t}_{R_g} \right)^4} \right] - \left[2 \left(\frac{\sum_g \hat{t}_g}{\sum_g \hat{t}_{R_g}} \right) C\left(\hat{t}_g, \hat{t}_{R_g}\right) \right] \; ,$$

$\smile\left(\hat{t}_g, \hat{t}_{R_g}\right)$ where = the covariance of the estimated reporting error and the corrected estimate of total boat trips among waves.

The estimated reporting error correction ratio could be applied to the wave estimates of angler trips from the VDTS to get un-biased estimates of total angler trips from charter boats or headboats as follows:

$$\hat{t}_a = \hat{R}_E \times \hat{t}_{R_a} \ ,$$

$\hat{t}_a$ where = the un-biased estimator of the total number of fishing trips taken in area *a* by anglers in a given wave,

$\hat{R}_E$ = the estimated reporting error correction ratio,

$\hat{t}_{R_a}$ = the pi-estimator of the number of angler fishing trips taken in area *a* during a given wave,

The logbook counts could be corrected in the same manner using the estimated reporting error correction ratio for the logbook. These estimators would be less biased since corrections would have been made for consistent reporting errors. The variance of these estimators of total trips could be estimated using Goodman's formula for the estimated variance of a product of two independent random variables (Goodman, 1960) as follows:

$$\hat{V}\left(\hat{t}\right) = \hat{t}^2 \ \hat{V}\left(\hat{R}_E\right) + \hat{V}\left(\hat{t}\right) \hat{R}_E^2 - \hat{V}\left(\hat{t}\right) \hat{V}\left(\hat{R}_E\right) \ ,$$

Since the logbook counts were assumed to be complete reports with no variance, the calculation of the estimated variance for corrected logbook estimates would be simplified as follows:

$$\hat{V}\left(\hat{t}\right) = \hat{t}^2 \ \hat{V}\left(\hat{R}_E\right) \quad .$$

Differences between Logbook and VDTS Reports of Effort

The effort data reported in telephone interviews were compared with the effort data reported by VDTS respondents in their logbooks using a paired comparisons design. Paired comparisons *t*-tests were used to test the following null hypotheses:

(1) the mean difference in number of boat trips reported in telephone interviews and in submitted logbooks by VDTS respondents is zero, and

(2) the mean difference in number of angler trips reported in telephone interviews and in submitted logbooks by VDTS respondents is zero.

Rejection of either of these hypotheses would lead to the conclusion that respondents reported more trips in response to one survey than they did in response to the other survey. The paired comparisons were performed separately for each vessel type and wave of data collection.

In addition, data reported in logbooks by VDTS respondents were substituted for data reported in telephone interviews, and estimates of effort were calculated using the methods described above for the VDTS. Therefore, logbook data were used for all boats in the weekly VDTS samples whose representatives were successfully contacted and interviewed by phone. This allowed a comparison of weekly effort estimates based on telephone survey sampling with weekly effort estimates based on corresponding samples of logbook reports. "Logbook sampling estimates" of total boat trips, total angler trips, and mean number of angler per boat trip were produced independently for each week, boat type, and reported primary area of fishing. Comparisons of VDTS estimates and logbook sampling estimates allowed assessment of possible differences between telephone and logbook reporting in both total effort and the distribution of effort by primary area of fishing.

Telephone Non-Respondents vs. Telephone Respondents

In order to evaluate possible non-response biases in effort estimates based on VDTS sampling, comparisons were made between VDTS respondents and VDTS non-respondents in the mean number of trips they reported in logbooks. ANOVA was used to test the following null hypotheses:

(1) the mean number of boat trips reported in logbooks by VDTS respondents was equal to the mean number of boat trips reported in logbooks by VDTS non-respondents, and

(2) the mean number of angler trips reported in logbooks by VDTS respondents was equal to the mean number of angler trips reported in logbooks by VDTS non-respondents.

Rejection of either of these hypotheses would lead to the conclusion that VDTS respondents and VDTS non-respondents differed in their mean reported effort. The comparisons of respondent mean effort with non-respondents mean effort were performed separately for each vessel type and wave of data collection.

In addition, data reported in logbooks by both VDTS respondents and VDTS non-respondents were used to calculate estimates of effort which could be compared with estimates based solely on logbook reports by VDTS respondents. These estimates based on logbook reports by all boats selected for the VDTS were also calculated using the methods described above for the VDTS. In this case, logbook data were substituted for VDTS non-respondents as well as for VDTS respondents in each weekly VDTS sample. In other words, logbook effort data were included for boats in each weekly VDTS sample whose representatives either could not be contacted for a telephone interview or refused to provide information when contacted. Comparison of these "full-response" logbook sampling estimates with those based solely on substituted logbook data for VDTS respondents provided another means for evaluating the effects of excluding VDTS non-respondents from the samples used for VDTS effort estimates.

MEAN CATCH PER UNIT EFFORT ESTIMATION

Logbook

Mean catch per angler trip was calculated for each taxonomic category and catch type by dividing the total count of angler trips into the total count of fish caught. Catch was categorized as either “catch removed” or “catch released alive” for the purpose of matching the catch categories used for the traditional MRFSS intercept survey. Because some headboat operators completed and submitted old logbook forms during the first couple of months of data collection, their reports did not divide “discarded catch” into “live releases” and “dead releases”. Therefore, for these reports the proportion of discards in each of the released catch categories had to be estimated based on the proportions obtained from separated data submitted by other headboat operators for the same time period. Catches landed, used for bait, or released dead were all combined as “catch removed”.

Intercept Survey

The traditional MRFSS methods were used to calculate Intercept Survey estimates of mean catch per trip in this study. The MRFSS traditionally uses catch data collected by the Intercept Survey to produce estimates of catch per unit effort (CPUE) that are stratified by species, catch type, and primary area of fishing. Since the area of fishing was not known in advance, intercepted angler trips were post-stratified by primary area fished for the purpose of calculating CPUE as the number of fish caught per angler trip. For each fish species, catch was separated into three different catch types – A, B1, and B2 – and independent estimates of CPUE are calculated for each catch type. Due to differences in the way the data was collected for catch types A and B, different methods are used to generate estimates of mean CPUE for the two general catch types.

Due to the difficulty that anglers often have in separating out their own individual catches when they return from a boat fishing trip, intercept survey interviewers were allowed to record the total Type A (observed) catch of a group of anglers when they interview one or more anglers in that group. When a “group catch” was recorded, the interviewer also determined and recorded the number of anglers who contributed to that catch. If the interviewed angler was able to separate his/her own Type A catch from the catch of others, then his/her individual catch was recorded and the number of contributors was recorded as “1". Interviewed anglers were always asked to report only their own individual catches of Type B fish, hence group catches were never recorded for the unobserved catch types B1 (reported removals) and B2 (reported catch released alive).

The sampling of angler trips for Type A catches was treated as simple random cluster sampling, where angler trips were randomly sampled in clusters, or groups, and catch was sampled for all trips within each sampled cluster. The mean number of Type A fish caught per angler fishing trip was estimated as the ratio of the number of fish to the number of contributors using the equation for estimation of a population ratio under simple random cluster sampling (Sarndal et al, 1992). This ratio was estimated as the ratio of the sum over all groups of the recorded Type A catches to the sum over all groups of the recorded contributors to those catches as follows:

$$\hat{R}_{FA_a} = \frac{\sum_s f_{A_a}}{\sum_s t_{A_a}}$$

$\hat{R}_{FA_a}$ where = the estimated mean number of fish caught per angler trip in area *a* based on Type A catch data alone,

$f_{A_{a_i}}$ = the Type A catch recorded for group *i* of angler trips primarily fishing in area *a,*

$t_{A_{a_i}}$ = the total number of angler trips contributing to the sampled Type A catch recorded for group *i* of angler trips primarily fishing in area *a*.

The estimated variance of this ratio estimator of mean Type A catch per trip was calculated as follows:

$$\hat{V}\left(\hat{R}_{FA_a}\right) = \frac{1}{\bar{t}^2_{A_a}}\left(S^2_{f_{A_a}} + \hat{R}^2_{FA_a} S^2_{t_{A_a}} - 2\hat{R}_{FA_a} S_{f_{A_a} t_{A_a}}\right)$$

$\hat{V}\left(\hat{R}_{FA_a}\right)$ where = the estimated variance of the estimated mean catch per angler trip primarily fishing in area *a* based on Type A catch,

$\bar{t}_{A_a}$ = the sample mean of the number of contributors to Type A catch among sampled groups of angler trips that primarily fished in area *a*,

$S^2_{f_{A_a}}$ = the sample variance of Type A catch among sampled groups of angler trips that primarily fished in area *a*,

$S^2_{t_{A_a}}$ = the sample variance of the number of contributors to Type A catch among sampled groups of angler trips that primarily fished in area *a*,

$S_{f_{A_a} t_{A_a}}$ = the sample covariance of Type A catch and contributors among sampled groups of angler trips that primarily fished in area *a*,

The sampling of angler trips for Type B catches (B1 and B2) was treated as simple random sampling of the catch of individual angler trips. The mean number of Type B1 or B2 fish caught per angler fishing trip was estimated as follows:

$$\hat{R}_{FB_a} = \frac{\sum_s f_{B_{a_k}}}{n_{I_a}} ,$$

$\hat{R}_{FB_a}$ where = the estimated mean number of fish of species *j* caught per angler trip based on Type B1 or B2 catch data alone,

$f_{B_{a_k}}$ = the sampled Type B catch recorded for angler trip *k* that fished primarily in area *a*,

n_{I_B} = the total number of sampled angler trips for Type B catch that fished primarily in area *a*,

The estimated variance of the mean CPUE estimator based on Type B1 or B2 catch was calculated as follows:

$$\hat{V}\left(\hat{R}_{FB_a}\right) = \frac{S^2_{f_{B_a}}}{n_{I_a}} ,$$

$\hat{V}\left(\hat{R}_{FB_a}\right)$ where = the estimated variance of the estimated mean Type B catch per angler trip that fished primarily in area *a*,

$S^2_{f_{B_a}}$ = the sample variance of Type B catch per angler trip that fished primarily in area *a* .

Catch per trip estimates based on the A and B1 catch types were summed to estimate mean removals (fish landed, used for bait, or thrown back dead) per angler trip. Because estimates of mean catch per trip based on different catch types were estimated independently from the intercept survey samples, estimated variances for the A and B type catch per trip estimates were summed to estimate the variance of the estimated mean number of fish removed per trip.

CATCH ESTIMATION

Logbook

The logbook data collections were treated as complete reports of catch by the charter boat and headboat fisheries in South Carolina. Total reported catches were obtained for different taxonomic categories of finfish by summing the counts reported in individual boat trip records. A distinction was made between two different catch types – removals and live releases. Therefore, the numbers of fish removed from the resource and the numbers of fish caught and released alive were tallied separately. Removals included fish that were landed, used for bait, or released dead.

Estimates Based on Intercept CPUE

The MRFSS traditionally uses the estimated number of angler trips and the estimate mean catch per trip for each state/wave/mode/area stratum to calculate an estimate of total catch. The same methods were used in this study to estimate total catch from various estimators of total effort and mean catch per unit effort. The total catch of any given species was estimated independently for each of the three catch types. Total catch was always estimated as follows:

$$\hat{f}_{A_a} = \hat{R}_{FA_a} \times \hat{t}_a \ ,$$

where $\hat{f}_{A_a}$ = the estimated total number of fish caught in a given area,

$\hat{R}_{FA_a}$ = the estimated catch per angler trip in a given area, and

$\hat{t}_a$ = the estimated total number of angler trips in a given area.

Whenever necessary, the total angler catch of any given species in numbers of fish was estimated by summing total catch estimates across catch types. The total number of fish killed, or removed from the population, was estimated by summing the total catch estimates for the A and B1 catch types. The total number of fish caught and released alive, or returned to the population, was estimated as the total catch estimate for the B2 catch type.

The variances of the total catch estimators based on the different catch types were estimated using Goodman's formula as follows:

$$\hat{V}\left(\hat{f}_{A_a}\right) = \left(\hat{R}^2_{FA_a} \times \hat{V}\left(\hat{t}_a\right)\right) + \left(\hat{V}\left(\hat{R}_{FA_a}\right) \times \hat{t}^2_a\right) - \left(\hat{V}\left(\hat{R}_{FA_a}\right) \times \hat{V}\left(\hat{t}_a\right)\right) \ ,$$

where $\hat{V}\left(\hat{f}_{A_a}\right)$ = the estimated variance of the total catch estimator for a given area *a*.

The estimated variances were summed across catch types to get estimates of the variances of the estimators of total catch (A+B1+B2) and total removals (A + B1).

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CRFS sample sites and clusters by district, county, and fishing mode (based on July 2006 schedules)

District	County	BB Clusters	BB Sites	MM Clusters	MM Sites	PR2 Clusters	PR2 Sites	PR1 Sites	PC Sites	Total Clusters	Total Sites
1 South District											
	Los Angeles	6	14	6	17	3	5	3	7	25	46
	Orange	3	10	4	11	2	3	2	3	14	29
	San Diego	6	22	4	11	6	14	3	7	26	57
	total	15	46	14	39	11	22	8	17	65	132
2 Channel District											
	Ventura	4	12	2	10			2	3	11	27
	Santa Barbara	4	15	1	3	1	2	1	2	9	23
	total	8	27	3	13	1	2	3	5	20	50
3 Central District											
	Monterey	5	16	2	7	2	4	2	3	14	32
	San Luis Obispo	4	12	2	6	1	1	2	2	11	23
	Santa Cruz	5	13	2	6	2	2	1	2	12	24
	total	14	41	6	19	5	7	5	7	37	79
4 San Francisco District											
	Marin*					3	4	1		4	5
	San Mateo*					2	3	1		3	4
	SF Bay counties	21	96	19	54	7	9	1	9	57	169
	total	21	96	19	54	12	16	3	9	64	178
5 Wine District											
	Mendocino	3	14	3	7	3	8	1	4	14	34
	Sonoma	4	22	2	3	2	4	1	4	13	34
	total	7	36	5	10	5	12	2	8	27	68
6 Redwood District											
	Del Norte	2	8	1	6			2	1	6	17
	Humboldt	5	23	5	13	3	8	5	8	26	57
	total	7	31	6	19	3	8	7	9	32	74
	State Total	**72**	**277**	**53**	**154**	**37**	**67**	**28**	**55**	**245**	**581**

* - Marin and San Mateo included in SF Bay counties for BB, MM, and PC modes