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DOCUMENTATION FOR CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE'S ONBOARD SAMPLING OF THE ROCKFISH AND LINGCOD COMMERCIAL PASSENGER FISHING VESSEL INDUSTRY IN NORTHERN AND CENTRAL CALIFORNIA (1987-1998) AS A RELATIONAL DATABASE

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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Melissa H. Monk[1], Rebecca R. Miller[2,1], John Field[1], E.J. Dick[1], Deb Wilson-Vandenberg[3], and Paul Reilly[3]

[1] NOAA National Marine Fisheries Service, SWFSC Fisheries Ecology Division, 110 Shaffer Road, Santa Cruz, CA 95060

[2] University of California, Santa Cruz, Cooperative Institute for Marine Ecosystems and Climate (CIMEC), Award number NA15OAR 4320071, 110 Shaffer Road, Santa Cruz, CA 95060

[3] California Department of Fish and Wildlife, 20 Lower Ragsdale Drive, Monterey, CA 93940

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Documentation for California Department of Fish and Wildlife's Onboard Sampling of the Rockfish and Lingcod Commercial Passenger Fishing Vessel Industry in Northern and Central California (1987-1998) as a Relational Database

Contents

Abstract

This paper describes the relational database created for the California Department of Fish and Wildlife (CDFW) Onboard Sampling of the Rockfish and Lingcod Commercial Passenger Fishing Vessel (CPFV) Industry in Northern and Central California conducted from 1987-1998. The program surveyed the recreational CPFV fleet fishing out of 10 coastal counties (San Luis Obispo north to Del Norte) and three counties inside San Francisco Bay, representing 19 CPFV landing locations. From 1987 through 1998, technicians collected spatially-explicit catch and release records for 7,712 fishing stops during 2,256 observed trips. Presented herein is a brief description of the sampling program, an overview of the relational database, and quality control methods applied to the historical data. Data from the relational database are governed by confidentiality requirements and are available via permission from CDFW.

1 Introduction

1.1 Survey Background

The Onboard Sampling of the Rockfish and Lingcod Commercial Passenger Fishing Vessel Industry in Northern and Central California was part of California Department of Fish and Wildlife's (CDFW; formerly the California Department of Fish and Game (CDFG) at the time of this survey[1]) Central California Marine Sport Fish Project (henceforth Observer Program), which ran from April 1987 through December 1998 (Table 1). The goal of the program was to collect information on the recreational sector groundfish fishery by having technicians ride along during a trip to collect information on the fish encountered, including the number of each species kept and released and lengths of those fish kept. State budgetary restraints halted sampling from June 29, 1990 to August 8, 1991, and limited data were collected from May to June 1995 (data collected by the Marine Recreational Fisheries Statistics Survey (MRFSS) during these months). Also, a lack of technicians from August to October 1994 (due to contract restructuring) resulted in lower sample sizes during these three months (Wilson et al. 1996) (Table 2).

Technicians were hired through the Pacific States Marine Fisheries Commission (PSMFC) to conduct the sampling (Reilly et al. 1993) and were assigned to one of the following six port groups: 1) Eureka, Trinidad, and Crescent City (EK); 2) Fort Bragg (FB); 3) Bodega Bay and Dillon Beach (BB); 4) Princeton (HMB), Berkeley, Emeryville, and Sausalito (SF); 5) Santa Cruz and Monterey (MT); 6) San Simeon, Morro Bay, and Port San Luis (MB). Only two ports, Monterey and Santa Cruz, were sampled during the first year of the survey. Starting in 1988, the survey expanded to sample vessels from San Luis Obispo county to Mendocino County with regular sampling of Eureka (Humboldt County) and Crescent City (Del Norte County) beginning in 1993. Over the course of the Observer Program, 19 different ports were sampled (Figure 1). The majority of trips were sampled out of San Luis Obispo (28%) and Monterey (25%) counties (Table 3).

Technicians were given the list of known CPFV captains/owners that operated rockfish and Lingcod trips in a port complex. To schedule an observed trip, the technicians randomly selected a CPFV captain/owner to contact and asked if any upcoming trips were available. If one CPFV vessel did not have any available trips, the technician contacted the next boat on

[1]CDFW and CDFG are used interchangeably throughout this document. Some columns names retain the CDFG acronym, e.g., CDFGSP.

the list. The goal was for each technician to observe one trip in each successive 3-day block within a month (10 trips a month, approximately 5% of all trips), but was rarely achieved due to either weather or trip availability.

During an observed trip the technician selected a subset of anglers to observe at each fishing drift. A fishing drift is defined as the time from when the captain told anglers to begin fishing to when the captain told the anglers to end fishing. A fishing stop, as defined for this survey, is the aggregate of one or more fishing drifts. Drifts are assigned to the same fishing stop, if at each drift, the location of fishing was within the same CDFW Location Code (see the Location Table section for additional details). The catch was recorded at the aggregated level of fishing stop.

The Observer Program also collected lengths of encountered fishes. The technician measured the retained catch after fishing for the day ceased, hence the small number of measured discarded fish. If time allowed, the technician also measured fish caught by unobserved anglers. During the months MRFSS samplers conducted the survey (May and June 1995), fork lengths of fish were recorded, and not total length as prescribed by this survey (See the Lengths Table section for additional information). All of the lengths in the database are total lengths.

Technicians typically observed anglers at the vessel's stern. From July 1992 to July 1993, CDFG tested the assumption that the catch rate and species composition of fishes caught by anglers on various sections onboard the vessel were not significantly different, by having two technicians, one at the stern and one at the bow, simultaneously record catch and effort data (Wilson-Vandenberg et al. 1995). Species compositions and catch-per-angler-hour (CPAH) were compared between the stern and bow and no statistically significant differences were detected.

At the time the survey ended in 1998, CDFW did not have any regulations on the number of hooks per line or depth restrictions in the recreational fishery. Length restrictions in place during the time of the survey (and 1999) included the following described here. For Lingcod, a minimum size limit of 22 inches for Lingcod (established in 1981), which changed to 24 inches in 1999. In 1998 there were no minimum legal sizes for rockfish, Cabezon, or California Sheephead. Leopard Sharks had a 36-inch minimum size, California Barracuda had a 28-inch minimum size, and California halibut had a minimum size of 22 inches. In 1999, a 14-inch minimum size was implemented for Cabezon and a 12-inch minimum size was implemented for California Sheephead. The first hook regulations were enacted in 1999,

limiting anglers to one rod with a maximum of three hooks per line. Additional details of the survey and yearly summaries can be found in a series of CDFW Administrative Reports (Reilly et al. 1993, 1995, Wilson-Vandenberg et al. 1994, 1995, Wilson et al. 1996). All data for this survey (excluding fish lengths) were keypunched from the original datasheets by the NMFS SWFSC in 2014. The electronic form of the data previously available did not include specific fishing drift location information.

2 Relational Database

The Observer Program generated a large amount of data for each trip. We describe the data available from the survey as well as the relational database created to store and maintain the data. We transferred the data to a relational SQL database. The advantages of storing data in relational databases are many, including the ease of data retrieval and fine-scale control over data access. Microsoft SQL Server was selected as the database server because of the flexibility and reliability it offers. The data can be retrieved or queried from the database server and imported into any number of data processing programs for full analyses.

SQL provides the flexibility of assigning a datatype to each column; columns were assigned a datatype most appropriate for the information being stored, i.e., all date and time data are stored as either datetime or smalldatetime formats.

The database is organized into a set of four main tables that are related through a set of defined relationships (Figure 2). The four main tables contain the trip-level information (Boat Table), fishing stop and drift information (Location Table), observed catch (Catches Table), and fish lengths (Lengths Table). The database also contains ancillary look-up tables, which contain information related to the main tables such as scientific and common names of fish, and descriptions of codes used in the main tables. Each of the main tables is assigned an identifier column (or set of columns), which is known as the primary key. The primary key must be unique for each row in a table. Foreign keys create the relational aspect of the database and allow cross-referencing of data among tables. A foreign key creates a parent/child relationship between tables by identifying columns from one table that also appear in a second table. A table may have multiple foreign keys, and a hierarchy of tables can also be created. For instance, the Boat Table is a parent of the Location Table. The Boat Table contains broader information for the trip, and the Location Table has multiple entries for each location fished on a trip. The Catches Table is a child of both the Boat

Table and the Location Table, as it contains multiples entries of catch for each location on a trip.

The table descriptions below contain details for the majority of columns found in the database. Brief descriptions of all tables and columns can be found in Table 4. As a note, columns of database tables in the following text are referenced in capital letters bracketed by parentheses, e.g., (TRIP_ID), to aid a reader's ability to quickly reference data. In addition, blank copies of all Observer Program datasheets are provided in Appendix A.

2.1 Table Descriptions

2.1.1 Boat Table

The Boat Table contains trip-level information, including data pertaining to the vessel, landing, port, trip type, and number of eligible anglers. Each trip is assigned a unique trip assignment identification number (TRIP_ID). In the TRIP_ID column, the digits preceding the decimal point represent the consecutive number of the trips sampled by a given technician, and the digits after the decimal point represent the identification code assigned to the observing technician. The TRIP_ID number is also the primary key for the Boat Table and is the column that links the Boat Table to other tables containing trip information. In addition to being part of the trip identification number, the unique technician identifier can be found in the SAMPLER column.

Vessel participation in the Observer Program was voluntary. Every participating vessel was assigned a unique identification number (BOATNUM) and a total of 94 boats participated in the Observer Program. Only three charter boats with a license to carry a maximum of six passengers (six-packs, noted by a '1' in the SIXPACK column) were sampled by the Observer Program.

The number of paid anglers (PAID_ANGLERS) is the number of passengers who paid to fish, and the number of free anglers (FREE_ANGLERS) is the number of anglers who fished for free, including the captain and crew. The sum of paid and free anglers is the total number of eligible anglers onboard the vessel. The number of observed anglers (NUM_OBSERVABLE_ANGLERS) was also recorded, but not consistently through time. Possible values recorded in this column include the average number of anglers who fished on the trip, the maximum number of anglers observed at any one fishing stop, the total

number of unique anglers observed, or another value. We do not recommend using this column in any calculation of effort.

The time the vessel departed and returned to port (DEPART_TIME, RETURN_TIME) as well as port and landing codes (PORT, LANDING) can be found in the Boat Table. The port code corresponds to a port in the Port Look-Up Table (described in the Port Look-up Table Section). The three character landing code is not standardized and could change through time. In most cases the landing code is the three-letter code for the a single boat or a business in the case of multiple boats at the landing site. The trip type (TRPTYP) code corresponds to a code in the Trip Type Look-up table (luTRPTYP) and describes the length of the trip and whether it was a chartered trip, open, research, or crab combo trip. Since the data were keypunched in 2014, the Boat Table contains the initials of the person who key-punched the data (ENTERED_BY) and the initial of the person who checked for any data entry errors (CHECKED_BY). The Notes column (NOTES) contains any notes recorded by the technician for a specific fishing stop.

2.1.2 Location Table

The Location Table contains details pertaining to the specific fishing locations for the trips. The Location Table has a compound (multi-column) primary key of the trip identification number (TRIP_ID), fishing stop (FSHNG_STOP), and the drift number (DRIFT_NO) and is linked to the Boat Table and Catches Table. The Location Table also contains a unique identifier for each row (GIS_KEY) that allows data to easily be read into mapping software such as Esri's ArcGIS.

The location data was recorded at two different spatial levels; drifts (DRIFT_NO) and fishing stops (FSHNG_STOP). The drift is the finest resolution of data within a trip. A drift begins when the captain instructs "Lines Down" and ends when all anglers reel in their lines. A fishing stop (FSHNG_STOP) refers to the drifts that occurred consecutively and within the same fishing site, as defined by the fishing Location Codes (LOC_CODE, described in a section below). As a result, there could be multiple drifts (which may, or may not have location coordinates) within one fishing stop. The distinction between drifts and fishing stops is important because the catch data was recorded at each individual fishing drift, and then summed for all the drifts at the same fishing stop. Therefore, unless there is only one drift within a fishing stop, the catch cannot be assigned to an individual drift. The Location Table contains 21,295 records of fishing drifts within 7,712 fishing stops.

At the start of each drift, the technician (INTVUER, technician's initials) randomly selected a set of the eligible anglers (ANGLERS) to observe for the entire drift (OBSANG). A trip may have had more than one technician observing the trip, leading to a larger number of anglers observed per fishing drift (see the next section on Observed Anglers for more detail), although this was not the norm. From April 22, 1987 to July 9, 1992, the number of observed anglers was not recorded for each fishing stop/drift, but was recorded to the trip. We imputed the number of observed anglers for these trips, as described in Appendix B. This also allowed us to impute the number of observed anglers for trips after 1992, in the cases when the number of observed anglers was not recorded. The fishing stop/drift starting and ending times can be found in the original (STIME_ORIG and ETIME_ORIG as floating numbers) and the SQL smalldatetime formats (STIME, ETIME). The original time format is HHMM, which has been converted to a date format of YYYY-MMDD HH:MM:SS. There is only one trip, with two fishing drifts, with missing time information. The calculated time elapsed on a drift is also provided (FISHTIME) as well as the number of anglers hours (ANGHRS).

The minimum (MINDEPTH_ORIG) and maximum (MAXDEPTH_ORIG) bottom depths were either recorded in feet, meters or fathoms, and the original units are noted in the MINDEPTH_ORIG_UNITS and MAXDEPTH_ORIG_UNITS columns. All depths are also reported in fathoms (MINDEPTH_FM, MAXDEPTH_FM). Depth was sometimes recorded for each drift within a fishing stop, or there may be only one set of depths for a given fishing stop. For cases in which the minimum depth was greater than the maximum depth as recorded on the datasheets, the lesser of the two values was moved to the minimum depth column. Fishing drifts for which this occurred are denoted with code 4.1 in DEPTH_ERROR. The Fishing Type (FSHNGTYP) column contains the code related to whether the fishing occurred in lesser than or greater than 40 fm, and if they were fishing at the surface, bottom, or for bait. The Tackle column (TACKLE) provides a code describing the tackle used by the majority of anglers. The description of each code is in the Fishing Type Look-up Table and the Tackle Look-up, both described in the Ancillary Look-up Tables section.

The captain provided the technician with all coordinate location, whether latitude/longitude or Loran coordinates. The original coordinate format was recorded in the COORD_TYPE column as either 'LAT/LONG,' 'LORAN ONLY,' or 'BOTH' (indicating both Loran and latitude/longitude coordinates were recorded). If the captain denied the technician permission to record the fishing coordinates (latitude/longitude or Loran), the technician triangulated the location using a compass and bearings on land. Latitude/longitude coordinates were recorded for 3,954 fishing stops, and technicians recorded both latitude/longitude and Loran

coordinates for an additional 1,510 fishing stops. An additional 1,016 fishing stops contain only Loran coordinates. The CDFW Location Codes were recorded for at least one drift on 5,549 out of 7,712 (72%) of fishing stops.

Drift coordinates are available in both the original data format (when available) and in decimal degrees (FINAL_LONG, FINAL_LAT as the SQL float format; and START_LOC as the SQL geography format, which can be read directly into GIS software). There are a number of columns pertaining to the coordinate data, so that steps to convert Loran coordinates to latitude/longitude coordinates can be traced, as well as preserve the original format of degrees and minutes of the latitude/longitude entries. A full explanation of each column can be found in Table 4 and additional information on the conversion of coordinates in Appendix C. Notes specific to the final coordinate data are found in GISDAT_NOTE and any remaining errors in the final coordinate data are denoted by a coded 6 in the GISDAT column. An entry of 1 in the GISDAT column indicates that the authors believe the GIS data to be accurate and can be used for spatial analyses. A fishing drift with a code of 6 or NULL in the GISDAT column does not have reliable data and the CDFW Location Code should be used for spatial analyses.

Loran coordinates were converted to latitude/longitude using Andren software (Andren Software Company 2015) at the Southwest Fisheries Science Center. There is one fishing drift for which the start and end coordinates were recorded (all other fishing drifts have one set of recorded coordinates). Any of the location coordinate and depth columns preceded by "E," e.g., ELAT_DEG_ORIG, EMINDEPTH_ORIG, etc, pertain only to this drift. See Appendix C for additional details on the conversion of coordinate data.

A note regarding how the fishing stop/drift data were keypunched: In some instances multiple fishing drifts within a fishing stop at a single Location Code had the same recorded depth and coordinates on the original datasheets. When this occurred, the depth and coordinates were only keypunched for the first fishing drift within that fishing stop. For instance, if there were three drifts within fishing stop A and the datasheet with the same recorded depth and coordinates for all three drifts, the depth and coordinate data were only keypunched for drift #1, and left blank for drifts #2 and #3. This may eventually be corrected in the database, but has not been addressed at the time of publication.

2.1.2.1 CDFW Fishing Location Codes

CDFW developed Location Codes for specific fishing sites to facilitate analysis of fishing

effort, species composition, and length frequency information (see Section 2.1.2.1 for an example of the placement of fishing Location Codes near the Monterey Peninsula). The fishing Location Codes are arranged in ascending order from south to north along the California coast within the survey area. The original 188 fishing Location Codes were distributed evenly along the coast based upon historic CDFW ports and fishing blocks. In general, boundaries between Location Codes are perpendicular to the depth contours. A technician could propose a new fishing Location Code if fishing during an observed trip occurred outside the bounds of a current fishing Location Code. By the end of the survey, there were 459 Location Codes. A new Location Code was created if the fishing occurred in 1) less than 20 fm and greater than 0.5 nautical miles from any other Location Code, 2) between 20 and 40 fm and greater than 1.0 nautical mile away from any other Location Code, or 3) deeper than 40 fm and greater than 2.0 nautical miles from any other Location Code. The CDFW Location Code column (LOC_CODE) indicates at which fishing location the drifts and stop occurred. The location code(s) for each trip were determined after the trip was completed and the technician had plotted each drift on a nautical chart.

The details related to each Location Code, including the central latitude/longitude, and minimum and maximum depths covered by that Location Code can be found in the Location Code Look-up Table (luLOC_CODE), described in the Ancillary Look-up Tables section. It was possible for a drift to start within the area of one Location Code and drift into the area of another Location Code, especially in areas where numerous Location Codes were added over the years, e.g., Monterey Peninsula where there are more than 50 Location Codes and a large number of fishing stops. It is also possible that a fishing stop occurring earlier on in the survey, e.g., 1989, would have been assigned to a different fishing location code had it occurred later in the survey, after the addition of many more location codes, especially in high density fishing areas such as Monterey.

The details related to each fishing Location Code, including the Location Code's central latitude/longitude and minimum and maximum depths can be found in the Location Code Look-up Table (luLOC_CODE), described in the Ancillary Look-up Tables section. When referencing the Location Code Look-up Table (luLOC_CODE) remember that the Location Code names oftentimes referenced a landmark on shore, e.g., "Blue House", or "the fishing spot." These descriptions are anecdotal, and should not be used to change/edit Location Code assignments.

2.1.2.2 Assignment of CDFW location codes to reefs

A variety of newly available spatial data sources, including 2, 3, and 5 m bathymetry, substrate, lithology and Habitat Suitability geodatabase allowed us to identify individual reefs in nearshore waters of California. We then assigned each CDFW location code to a reef, and those methods are detailed here. To delineate reefs from Point Conception to the Oregon border we used a 2 m binary raster layer (3 m for Cordell Bank) for substrate, where 1 = rough, and 0 = smooth habitat (California Seafloor Mapping Project, data available from: http://seafloor.otterlabs.org/index.html). Rough and smooth substrate was identified by CSMP using two rugosity indices based upon bathymetric data, surface:planar area (SA:PA), and vector ruggedness measure (VRM). We considered areas identified as 'rough' to consist of rocky habitat, and refer to these areas as reefs. The authors specified names for each reef, often based on common geographic locations. For reefs named Asilomar, Cypress Point, Portuguese Ledge, and Point Joe only a portion of the reefs were mapped at the 2 m resolution. Therefore, to identify the remaining reefs, we used a 5 m resolution VRM dataset, where the VRM cutoff was greater than 0.001 (Young et al. 2010). For all reefs derived from either 2 m, 3 m or 5 m resolution, we applied a 5 m buffer around each reef habitat to ameliorate potential error in positional accuracy and all reefs with an area greater than or equal to 100 m^2 were included. We identified seven reefs outside of the 2 m layer that contained a significant number of CPFV fishing drifts, which we decided to include. Big Reef, Blunts Reef, Isle of St. James, Point Sur Deep, Sandhill Ledge, portions of San Gregario and Soap Bank reefs were located just outside of 2 m, 3 m and 5 m 'footprint', therefore for these reefs we used the 2005 Habitat Suitability Probability (HSP) geodatabase for China Rockfish (NMFS 2005). The HSP is a modeled output from Essential Fish Habitat geodatabase and is based upon habitat data, depth, and location, where input data are NMFS trawl datasets.

Reef systems were grouped and stratified by depth at a spatial scale relative to the more

reclusive nearshore rockfish species. If a reef was greater than ˜200 m from all other rocky reef habitat it was considered a different reef system. If a reef system has contiguous habitat (no channels greater than 200 m) it remained intact, no matter how large the reef (Figure 3). In a few instances some reefs were merged into 'super reefs.' The super reefs were created because drifts assigned to a single CDFW location code coincided with multiple reef systems. In other words, if drift coordinates spanned two reefs and we were unable to tell which reef was consistently fished for a given location code, we aggregated the reefs into super reefs. Both the original reef ID's (REEFID_orig) and aggregated super reef ID's (REEFID) are retained in the Reef Look-up Table (luREEF).

CDFW location codes and fishing drifts were assigned to the nearest reef using ArcGIS. We also calculated the distance (in meters) from the CDFW Location Code and fishing drift to the nearest reef (REEFDIST).

Whether or not the drift is within the high resolution bathymetric data is noted in the FOOTPRINT column (1=within the footprint). Also included in the Location Table is the nearest reef (REEFID) and the distance to that reef in meters. Depth in meters was derived for fishing stops/drifts with reliable coordinate data. If the fishing stop/drift was within the high (2m) resolution bathymetric data, the depth is reported in the GISDEPTH_2M column.

2.1.3 Catches Table

The Catches Table (named Catches Table in the database due to reserved words in SQL) contains records of all fish encountered (kept and discarded) by the observed anglers. The Catches Table has a compound primary key of trip identification number, fishing stop, and species code (TRIP_ID, FSHNG_STOP, CDFGSP). As mentioned above, the catch information was recorded at the level of fishing stop and not for each drift. The Catches Table contains 40,293 catch records, representing 312,784 fish (291,703 kept and 21,081 discarded). Retained catch is recorded in the KEPT column and the discarded column (DISCD) is the sum of the discarded alive, dead, and fate unknown columns (DISCDDEAD + DISCDALIV +DISCD_UNKNOWN). The kept fish column (KEPT) is the sum of the fish retained by the angler and fish retained for bait (KEPT_ANGLER + KEPT_BAIT). Species codes in the database are all CDFW species codes (CDFGSP). These can be related to the common names, scientific names, RecFIN species codes and ALPHA5 species codes in the Species Look-up Table (luSPECIES).

There were 107 species and 7 general categories, e.g., rockfish genus, skate family, unidentified fish, etc., encountered in the survey. Two species were encountered in over 50% of all drifts, Yellowtail Rockfish (*Sebastes flavidus*) in 55% and Blue Rockfish (*Sebastes mystinus*) in 51% of all drifts (Table 5). Seven other species, Lingcod (*Ophiodon elongatus*), Rosy Rockfish (*Sebastes rosaceus*), Canary Rockfish (*Sebastes pinniger*), Vermilion Rockfish (*Sebastes miniatus*), Starry Rockfish (*Sebastes constelatus*), Olive Rockfish (*Sebastes serranoides*), and Bocaccio (*Sebastes paucispinus*) were all observed in at least 25% of all drifts. Five additional species were observed in 10-25% of all drifts, Copper Rockfish (*Sebastes caurinus*), Gopher Rockfish (*Sebastes carnatus*), Widow Rockfish (*Sebastes entomelas*), Greenspotted Rockfish (*Sebastes chlorostictus*), and China Rockfish (*Sebastes nebulosus*). A summary of the number of fish kept, discarded and number of drifts encountered by CRFS District is also presented for all species in Table 5.

2.1.4 Lengths Table

The Lengths Table contains total length measurements (mm) for 330,229 kept and discarded (FISH_TL). Over 99% of the measured fish were kept (329,889 fish) and only 261 of the measured fish were discarded; of these, disposition was recorded for 76 Lingcod, 66 Blue Rockfish, and 43 Rosy Rockfish (Table 6). The disposition of the remaining 52 fish (Widow Rockfish, Lingcod and Yelloweye Rockfish) is unknown. Lengths of retained fish were measured after fishing for the day ceased, hence the low number of measured discarded fish. If time allowed, fish caught by unobserved anglers were also measured, explaining the greater number of fish measured than recorded in the Catches Table. It is not possible to discern whether a measured fish was caught by an observer or unobserved angler in the database.

In May and June 1995, MRFSS samplers collected data for the onboard observer program. MRFSS samplers measured fish fork lengths, whereas protocol for the onboard observer program is to measure total length. All fork lengths were converted to total lengths using regressions from Echeverria and Lenarz (1984). CDFW also used a Lingcod regression from their own data to convert fork length (FL) to total length (TL): TL = -14.21 + 1.0439 FL (Reilly et al. 1995). For other species in which fork length did not equal total length, and for which regressions did not exist, the length data were not entered in the database. The number of measured fish not entered in the database is unknown, as the length data were keypunched at a prior date.

Fish weights are provided in grams (Fdweight, for "fresh dead weight") for 36,165 fish, the

majority of which were retained fish. Weighing the fish was not in the survey protocol, and it is uncertain how the weights were calculated. The disposition of each measured fish is coded in the FATE column and a description of that code is in the Fate Look-up Table (luFATE). The columns SLOC and NLOC are the CDFW location codes for the most southern and northern locations that the species was encountered during a trip (CDFW location codes generally increase moving from south to north). If the length can be matched to a single location code, the same location code is entered in SLOC and NLOC. Therefore, if the species was only encountered at a single location code, the fish can be linked to a specific fishing stop. As a note, for purposes of this document, recorded lengths were not quality-controlled, and may contain errors.

Twenty-two species have more than 1000 recorded length measurements (Table 6). In general, the same species that were encountered at high frequencies also have highest number of recorded lengths. The survey collected 86,550 lengths of Blue Rockfish, and 68,626 lengths of Yellowtail Rockfish. For rockfish species with more than 100 recorded lengths (26 species), the lengths of the retained fish by 2 cm bins can be found in Tables 7-10. The length by 2 cm bins for 11 non-rockfish species can be found in Tables 11 and 12.

2.2 Ancillary (Look-up) Tables

The database contains ten ancillary tables containing information related to specific columns. The look-up tables in the database are for port information (luPORT), species information (luSPECIES), error code definitions (luERRORS), fish disposition (luFATE), fishing type (luFSHNGTYP), CDFG location code (luLOC_CODE), reef assignment (luREEF), tackle (luTACKLE), and trip type (luTRPTYP). The contents of each look-up table are described below.

2.2.1 Error Code Look-up Table

This table contains all of the possible error codes used in the database, which have the same meaning across columns and tables. The unique error codes used and their descriptions can be found in Table 13. See the Quality Control section for more information regarding the error codes and data quality monitoring.

2.2.2 Fate Look-up Table

The Fate Look-up Table (luFATE) contains the codes and descriptions for the disposition of a measured fish in the Lengths Table, e.g., kept by angler or for bait (Table 14).

2.2.3 Fishing Type Look-up Table

The Fishing Type Look-up Table (luFSHNGTYP) contains a code and description to the location of fishing in the Location Table, e.g., nearshore fishing at the surface (Table 15).

2.2.4 Location Code Look-up Table

The Location Code Look-up Table provides information related to a CDFW location code, including the descriptive site name, the latitude/longitude coordinates assigned to the location code, the minimum and maximum depth in fathoms of the site, and the date the location code was created. The location codes link to each fishing drift in the Location Table.

2.2.5 Port Look-up Table

The Port Look-up Table (luPORT) contains the port codes and names used for this program (Table 16). Note, these port codes are different than the current CRFS Onboard Observer Program codes.

2.2.6 Reef Look-up Table

The Reef Look-up Table links the CDFW location codes to reefs. The table includes the CDFW location code, the reef name (assigned by the authors) and three reef identification codes. In most cases, multiple location codes are mapped to the same reef.

The ReefID_ORIG column gives the original reef identification numbers, which were developed prior to matching reefs to CDFW identification codes. The ReefID_ORIG represents

the reefs at the finest scale, but may not match to a single CDFW location code. It is possible that the CDFW location code falls in smooth habitat, in which case it is not assigned to a reef.

To assign a CDFW location code to a reef we used the available coordinate information from all drifts with the same location code. We looked at the spread of the drifts with the same location code. In some cases, the drifts assigned to a single location code were spread across multiple reefs. If we could identify a single reef to which a location code belonged, we combined the reefs into super reefs. To document the super reefs, we documented the combined reefs in the SuperReef column. This new super reef was assigned a new reef identification code (ReefID). An example is, original reefs 3,13,20,77, and 79 were aggregated. This is denoted as 3.13.20.77.79 in the SuperReef column, and the new reef code is 134 in the ReefID column.

2.2.7 Species Look-up Table

All species in the Catch and Length Tables are assigned CDFGSP species codes (Table 17). The Species Look-up Table (luSPECIES) includes fields to link these codes to additional variables such as common name, scientific name, RecFIN assigned species codes, and the ALPHA5 species code.

The Species Look-up table includes reported maximum lengths from the following sources Eschmeyer (1983), Hart (1983), Love (1996), and Miller and Lea (1972).

2.2.8 Tackle Look-up Table

The Tackle Look-up Table (luTACKLE) includes the type of tackle used by the majority of anglers at a fishing stop, as noted in the Location Table (Table 18).

2.2.9 Trip Type Look-up Table

The Trip Type Look-up Table (luTRPTYP) contains information on the duration of the trip, and whether it was an Open, Chartered, Crab combo, or Research Trip (Table 19). This code can be found in the Boat Table.

3 Quality Control

The original datasheets were obtained from CDFW and keypunched at the NMFS SWFSC in 2014. The tables prior to any editing after upload to SQL Server remain in the database as separate tables preceded by 'xxx,' ex. xxxCATCH_DRIFT. Data for the Boat Table was extracted from the location keypunched data to create separate Boat and Location Tables. Comparisons can be made between the original data and the edited tables (Location and Catch). The Lengths Table had been previously keypunched in the database.

All suspicious data in the main tables have been checked against the original datasheets and corrected where possible. All of the changes made to the data thus far have been explicitly tracked and documented in the relational database so that revised records can be compared to the original data. Justification for each change in the database is also documented with error codes. For any column with edited data, an additional error code column was added to the database. For example, if an error was found in the species code column (CDFGSP), the column CDFGSP_Error was added to the database and contains the error code. Specific error codes have the same definition across tables and columns (Table 13). A description of error codes found in specific columns is available in the Error Code Look-up Table.

Six trips for which datasheets existed were not included in the final database due to either missing information or abandonment of trips due to weather (trips: 4.31, 227deletedtrip, 31.13deleted trip, 42.31deletedtrip, 44nonTrip1, and RBMdeletedtrip).

Acknowledgements

We would like to thank Amber Payne and Kristen Mattingly for keypunching the original datasheets and analyzing the original spatial information, which made this project possible. We thank Nick Grunloh for conducting the analyses to impute the number of observed anglers. We also thank Don Pearson for reviewing the document.

Tables

Table 1: Number of observed trips by year and county.

County	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
Del Norte	0	0	0	0	0	0	1	1	0	0	0	0	2
Humboldt	0	0	1	0	0	0	7	2	0	0	0	0	10
Mendocino	0	3	3	1	11	23	12	8	6	5	0	0	72
Sonoma	0	17	5	0	2	14	22	21	8	21	67	40	217
Marin	0	6	15	1	5	12	14	15	3	5	0	0	76
Contra Costa	0	0	0	0	0	0	0	0	0	0	8	1	9
Alameda	0	19	20	9	5	2	3	2	17	13	12	4	106
Santa Clara	0	0	4	0	0	0	0	0	0	0	0	0	4
San Francisco	0	0	0	0	0	0	0	0	1	0	0	0	1
San Mateo	0	27	30	15	9	26	31	28	42	30	29	31	298
Santa Cruz	5	9	47	13	10	36	34	35	24	18	15	10	256
Monterey	85	87	50	11	13	44	54	49	47	48	38	38	564
San Luis Obispo	0	42	55	24	31	73	70	76	68	79	75	48	641
Total	90	210	230	74	86	230	248	237	216	219	244	172	2256

Table 2: Number of observed trips by year and month.

Month	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
January	0	5	17	8	0	14	13	17	13	4	6	2	99
February	0	8	13	14	0	15	10	13	30	9	12	3	127
March	0	4	22	17	0	20	24	25	15	9	9	5	150
April	3	15	15	19	0	20	17	15	0	9	13	9	135
May	7	20	18	10	0	22	19	23	5	10	14	6	154
June	9	19	26	6	0	19	23	21	6	11	8	4	152
July	13	19	20	0	0	23	29	30	21	24	33	29	241
August	15	34	27	0	18	15	35	19	23	33	37	32	288
September	12	28	23	0	25	24	27	18	22	30	30	21	260
October	14	29	23	0	20	26	28	18	24	31	35	21	269
November	14	13	19	0	19	19	15	15	33	29	24	15	215
December	3	16	7	0	4	13	8	23	24	20	23	25	166
Total	90	210	230	74	86	230	248	237	216	219	244	172	2256

Table 3: Number of observed fishing drifts by year and county.

County	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
Del Norte	0	0	0	0	0	0	6	9	0	0	0	0	15
Humboldt	0	0	5	0	0	0	72	23	0	0	0	0	100
Mendocino	0	17	21	5	108	162	92	61	83	44	0	0	593
Sonoma	0	171	23	0	19	167	217	212	90	184	665	339	2087
Marin	0	60	163	11	52	113	178	191	23	68	0	0	859
Contra Costa	0	0	0	0	0	0	0	0	0	0	77	13	90
Alameda	0	129	157	73	27	9	41	27	220	195	87	43	1008
Santa Clara	0	0	32	0	0	0	0	0	0	0	0	0	32
San Francisco	0	0	0	0	0	0	0	0	21	0	0	0	21
San Mateo	0	249	240	112	71	181	287	238	477	318	223	204	2600
Santa Cruz	43	65	302	90	68	268	308	430	251	156	106	102	2189
Monterey	500	554	332	92	84	320	590	640	501	416	312	292	4633
San Luis Obispo	0	338	485	282	366	862	731	844	866	991	860	443	7068
Total	543	1583	1760	665	795	2082	2522	2675	2532	2372	2330	1436	21295

Table 4: Description of the tables and columns in the database.

Table Name	Column Name	Description
BOAT	BOATNUM	CDFW boat number
BOAT	CHECKED_BY	Initials of the person who checked the keyed data
BOAT	DEPART_TIME	Time the boat left the dock
BOAT	ENTERED_BY	Initials of the person who keypunched the data
BOAT	FREE_ANGLERS	Number of anglers who did not pay
BOAT	LANDING	First three letters of the company/boat operator
BOAT	LANDING_ERROR	Indicates an error in the LANDING column
BOAT	NOTES	Notes from the original datasheets for the trip
BOAT	NUM_OBSANG	Number of anglers whose fish are counted
BOAT	NUM_OBSANG_ERROR	Indicates error in NUM_OBSANG
BOAT	PAID_ANGLERS	Number of anglers who paid to go on the trip
BOAT	PAID_ANGLERS_ERROR	Indicates error in PAID_ANGLERS
BOAT	PORT	Three-digit port code of boat departure
BOAT	PORT_ERROR	Indicates error in PORT
BOAT	RETURN_TIME	Time the boat returned to the dock
BOAT	SAMPLER	Numeric sampler number
BOAT	SIXPACK	Sixpack vessel; yes=1
BOAT	TRIP_ID	Trip identification number; consecutive trip for a sampler and (after the decimal point) the unique two-digit code assigned to the sampler
BOAT	TRPDATE	Date of the trip
BOAT	TRPTRP_ERROR	Indicates an error in the TRPTYP column
BOAT	TRPTYP	Type of trip code
CATCHES	CDFGSP	CDFG species code
CATCHES	CDFGSP_ERROR	Indicates error in CDFGSP
CATCHES	DISCD	Total number of discarded fish
CATCHES	DISCD_ALIV	Number of fish discarded alive
CATCHES	DISCD_DEAD	Number of fish discarded dead
CATCHES	DISCD_UNKNOWN	Number of fish discarded with unknown fate
CATCHES	FSHNG_STOP	Alphabetic fishing stop
CATCHES	FSHNG_STOP_ERROR	Indicates error in FSHNG_STOP
CATCHES	KEPT	Total number of fish retained/kept
CATCHES	KEPT_ANGLER	Number of fish retained/kept by the angler
CATCHES	KEPT_BAIT	Number of fish retained/kept for bait
CATCHES	NUMENC	Total number of fish encountered
CATCHES	TRIP_ID	Trip identification number
LENGTHS	CDFGSP	CDFG species code
LENGTHS	CDFGSP_Error	Indicates error in CDFGSP
LENGTHS	FATE	Fish fate (e.g., kept, discarded, etc.)
LENGTHS	FdWeight	Fresh dead weight in grams
LENGTHS	FISH_TL	Fish total length in cm
LENGTHS	LengthID	Unique row identifier
LENGTHS	NLOC	Northern-most Location Code fish caught
LENGTHS	SLOC	Southern-most Location Code fish caught
LENGTHS	TRIP_ID	Trip identification number
LOCATION	ANGHRS	Angler hours
LOCATION	ANGLERS	Number of anglers fishing during the drift
LOCATION	ANGLERS_ERROR	Indicates error in ANGLERS

Continued on next page

Table 4: Description of the tables and columns in the database.

Table Name	Column Name	Description
LOCATION	ASSESS_AREA	Indicates if the drift occurred in central CA (between Pt. Conception and Cape Mendocino) or northern CA (north of Cape Mendocino)
LOCATION	CHECKED_BY	Initials of the person who checked the keyed data
LOCATION	COORD_TYPE	Coordinate data type; Lat/Long indicates only lat/long coordinates available, Loran indicates only Loran coordinates available, BOTH indicates both coordinate types available
LOCATION	DEPTH_ERROR	Indicates error in depth data
LOCATION	DRIFT_NO	Numeric drift number within a fishing stop
LOCATION	DRIFT_NO_ERROR	Indicates error in DRIFT_NO
LOCATION	ECOORD_TYPE	Same as COORD_TYPE for end location
LOCATION	EFINAL_LAT	Same as FINAL_LAT for end location
LOCATION	EFINAL_LONG	Same as FINAL_LONG for end location
LOCATION	ELAT_DECMIN_CONV	Same as LAT_DECMIN_CONV for end location
LOCATION	ELAT_DECMIN_ORIG	Same as LAT_DECMIN_ORIG for end location
LOCATION	ELAT_DEG_CONV	Same as ELAT_DEG_CONV for end location
LOCATION	ELAT_DEG_ORIG	Same as ELAT_DEG_ORIG for end location
LOCATION	ELATDD_LORAN	Same as LATDD_LORAN for end location
LOCATION	ELON_DECMIN_ORIG	Same as LON_DECMIN_ORIG for end location
LOCATION	ELONG_DEG_CONV	Same as LONG_DEG_CONV for end location
LOCATION	ELONG_DECMIN_CONV	Same as LONG_DECMIN_CONV for end loc.
LOCATION	ELONG_DEG_ORIG	Same as LONG_DEG_ORIG for end location
LOCATION	ELONGDD_LORAN	Same as LONGDD_LORAN for end location
LOCATION	EMAXDEPTH_CONV	End location maximum depth in fathoms
LOCATION	EMAXDEPTH_ORIG	Original end location maximum recorded depth
LOCATION	EMINDEPTH_CONV	End location minimum depth in fathoms
LOCATION	EMINDEPTH_ORIG	Original end location minimum recorded depth
LOCATION	ENTERED_BY	Initials of the person who entered the data
LOCATION	ETIME	Drift end time
LOCATION	ETIME_ORIG	Drift end time; original format
LOCATION	ETIME_ORIG_ERROR	Indicates error in ETIME_ORIG
LOCATION	FINAL_LAT	Final latitude in decimal degrees
LOCATION	FINAL_LONG	Final longitude in decimal degrees
LOCATION	FISHTIME	Minutes fished
LOCATION	Footprint	Drift within high resolution habitat?; yes=1
LOCATION	FSHNG_STOP	Alphabetic fishing stop
LOCATION	FSHNG_STOP_ERROR	Indicates error in FSHNG_STOP
LOCATION	FSHNGTYP	Fishing type
LOCATION	FSHNGTYP_ERROR	Indicates error in FSHNGTYP
LOCATION	GIS_KEY	Unique row identifier
LOCATION	GISDAT	GIS data are available for the drift?; yes=1
LOCATION	GISDAT_NOTE	Describes any GIS errors
LOCATION	GISDEPTH_2M	Depth derived from the 2 m bathymetry later
LOCATION	INTVUER	Sampler's initials
LOCATION	LAT_DECMIN_CONV	Latitude decimal minutes, if lat/long recorded
LOCATION	LAT_DECMIN_ORIG	Original keypunched latitude decimal minutes
LOCATION	LAT_DEG_CONV	Converted latitude degrees, if lat/long recorded
LOCATION	LAT_DEG_ORIG	Original keypunched latitude degrees
LOCATION	LATDD_LORAN	Latitude decimal degrees from Loran

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Table 4: Description of the tables and columns in the database.

Table Name	Column Name	Description
LOCATION	LOC_CODE	CDFW Location Code
LOCATION	LOC_CODE_NOTE	Note if Location Code missing or suspect
LOCATION	LOC_ERROR	Indicates error in coordinates
LOCATION	LONG_DECMIN_CONV	Converted longitude decimal minutes
LOCATION	LONG_DECMIN_ORIG	Original keypunched longitude decimal minutes
LOCATION	LONG_DEG_CONV	Converted longitude degrees, if lat/long recorded
LOCATION	LONG_DEG_ORIG	Original keypunched longitude degrees
LOCATION	LONGDD_LORAN	Longitude decimal degrees from Loran
LOCATION	LORAN1	Loran coordinate 1
LOCATION	LORAN2	Loran coordinate 2
LOCATION	MAXDEPTH_FM	Maximum recorded depth in fathoms
LOCATION	MAXDEPTH_ORIG	Original maximum recorded depth
LOCATION	MAXDEPTH_ORIG_UNITS	Units of the original maximum recorded depth
LOCATION	MINDEPTH_FM	Minimum recorded depth in fathoms
LOCATION	MINDEPTH_ORIG	Original minimum recorded depth
LOCATION	MINDEPTH_ORIG_UNITS	Units of the original minimum recorded depth
LOCATION	OBSANG	Number of observed anglers
LOCATION	OBSANG_ERROR	Indicates error in OBSANG
LOCATION	ReefDist	Distance in meters to the nearest reef
LOCATION	ReefID	Reef identification number of the nearest reef
LOCATION	START_LOC	Final location coordinates (geography data type)
LOCATION	STIME	Drift start time
LOCATION	STIME_ORIG	Drift start time; original format
LOCATION	STIME_ORIG_ERROR	Indicates error in STIME_ORIG
LOCATION	TACKLE	Numeric tackle code
LOCATION	TACKLE_ERROR	Indicates an error in the TACKLE column
LOCATION	TRIP_ID	Trip identification number
luFATE	FATE	Numeric fate code
luFATE	Fate_Description	Description of the fate code
luFATE	FATE_ID	Unique row identifier
luFSHNGTYP	40FM_cutoff	Indicates if fishing drift shallower (nearshore) or deeper (offshore) than 40 fm
luFSHNGTYP	Description	Fishing type descriptor (e.g., surface, bottom)
luFSHNGTYP	FSHNGTYP_Code	Numeric fishing type code
luLOC_CODE	DATTADDED	Date the location code created (YYMMDD)
luLOC_CODE	LAT	Location Code center latitude (Degrees, Min.)
luLOC_CODE	Lat_DD	Location Code center latitude (Decimal Degrees)
luLOC_CODE	LOC_CODE	CDFW fishing Location Code
luLOC_CODE	LONG	Location Code center longitude (Degrees, Min.)
luLOC_CODE	Long_DD	Location Code center longitude (Decimal Degrees)
luLOC_CODE	MAXFMS	Location Code maximum depth (fathoms)
luLOC_CODE	MINFMS	Location Code minimum depth (fathoms)
luLOC_CODE	SITE_NAME	Name assigned to the Location Code
luPORT	CNTY	U.S. FIPS County Code
luPORT	COUNTY	County name
luPORT	DISTRICT	Modern CRFS District code (county): 1 = South (San Diego-Los Angeles); 2= Channel (Ventura-Santa Barbara); 3 = Central (San Luis Obispo-Santa Cruz); 4 = Bay (San Mateo-Sonoma); 5 = Wine (Mendocino and N. to 40.10); 6 = Redwood (40.10 Humboldt-Del Norte)

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Table 4: Description of the tables and columns in the database.

Table Name	Column Name	Description
luPORT	PORT	Numeric port code
luPORT	Port_Order	Order of the port complex from north to south
luPORT	PORTCPLX	Three letter port complex
luPORT	PORTNAME	Port name
luREEF	LOC_CODE	CDFW Location Code
luREEF	Reef_Name	Reef name
luREEF	ReefID	Final super reef identification number
luREEF	ReefID_ORIG	Original reef identification number (finest scale)
luREEF	SuperReef	Lists original reefs grouped into "super reefs"
luSPECIES	A_FL	Intercept - fork length to weight regression
luSPECIES	A_FT	Intercept - fork to total length regression
luSPECIES	A_TL	Intercept - total length to weight regression
luSPECIES	ALPHA5	ALPHA5 species code
luSPECIES	B_FL	Slope - fork length to weight regression
luSPECIES	B_FT	Slope - fork to total length regression
luSPECIES	B_TL	Slope - total length to weight regression
luSPECIES	CDFGSP	CDFG Species Code
luSPECIES	CG	PFMC Group Code
luSPECIES	CG_NAME	PFMC Species Group
luSPECIES	COMMON	Species common name
luSPECIES	CSG	PFMC Super Group Code
luSPECIES	CSG_NAME	PFMC Species Super Group
luSPECIES	ESCH	Maximum Length (TL) in Eschmeyer et al. (1983)
luSPECIES	FAMILY	Family
luSPECIES	FMP_CODE	PFMC FMP Species
luSPECIES	GENUS	Genus
luSPECIES	GP_CODE	Code unknown
luSPECIES	GROUP1	MRFSS Species Group
luSPECIES	HART	Maximum Length (TL) in Hart (1973)
luSPECIES	LOVE	Maximum Length (TL) in Love (1996)
luSPECIES	MLEE	Maximum Length (TL) in Miller and Lea (1972)
luSPECIES	N_FL	F_len-wgt pairs available
luSPECIES	N2	Type 2 fish in Pacific MRFSS
luSPECIES	N3	Type 3 fish in Pacific MRFSS
luSPECIES	NAME	Comma Name
luSPECIES	NB_CNTY	Northern range county
luSPECIES	NB_ST	Northern range state
luSPECIES	NODC7	NODC V.7
luSPECIES	NODC8	NODC V.8
luSPECIES	ODFWSP	ODFW Species Code
luSPECIES	ORDER1	Order
luSPECIES	P1	Primarily targeted in Pacific MRFSS
luSPECIES	P2	Secondary targeted in Pacific MRFSS
luSPECIES	RECFINSP	RecFIN species code
luSPECIES	REG_GROUP	Regulations group
luSPECIES	REGION	Observed in Pacific MRFSS
luSPECIES	SB_CNTY	Southern range county
luSPECIES	SB_ST	Southern range state
luSPECIES	SCI_NAME	AFS Scientific Name
luSPECIES	SG_CODE	MRFSS Super Group Code

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Table 4: Description of the tables and columns in the database.

Table Name	Column Name	Description
luSPECIES	SP_CODE	MRFSS Species Code
luSPECIES	sp_pacfin	PacFIN species code
luSPECIES	sp_psbs	PSBS species code
luSPECIES	sp_wabds	WA BDS species code
luSPECIES	SPECIES	Species
luSPECIES	SUPER	MRFSS Species Super Group
luSPECIES	TSN	ITIS taxonomic Ser. Num.
luTACKLE	Description	Description of the tackle code
luTACKLE	Tackle_code	Numeric tackle code
luTRPTYP	Trip_Descr	Trip type code
luTRPTYP	TripType	Trip type descriptor (e.g., nearshore, offshore)

Table 5: Number of observed fish kept and returned during the program, and the number and percent of drifts encountered by species.

Common name	CDFGSP	Kept	Discarded	Num. drifts	% drifts
Yellowtail Rockfish	2318	54928	1650	4254	55.16
Blue Rockfish	2330	74358	7612	3982	51.63
Lingcod	2664	7583	4627	3269	42.39
Rosy Rockfish	2339	13816	1961	2956	38.33
Canary Rockfish	2335	10462	183	2562	33.22
Vermilion Rockfish	2329	7453	29	2085	27.04
Starry Rockfish	2311	6796	174	1956	25.36
Olive Rockfish	2344	10037	224	1954	25.34
Bocaccio	2334	10921	91	1937	25.12
Copper Rockfish	2308	5072	43	1658	21.50
Gopher Rockfish	2307	7035	447	1466	19.01
Widow Rockfish	2316	14827	280	1325	17.18
Greenspotted Rockfish	2309	6744	149	1171	15.19
China Rockfish	2331	1989	28	881	11.42
Yelloweye Rockfish	2340	1502	14	769	9.97
Pacific Sanddab	3001	2483	186	757	9.82
Greenstriped Rockfish	2315	3322	160	754	9.78
Brown Rockfish	2304	4671	128	726	9.41
Black Rockfish	2327	6410	515	674	8.74
Chub (Pacific) Mackerel	2209	3223	553	548	7.11
Chilipepper Rockfish	2320	27369	250	538	6.98
Speckled Rockfish	2333	1256	8	459	5.95
Flag Rockfish	2341	662	10	379	4.91
Squarespot Rockfish	2322	892	340	360	4.67
Kelp Greenling	2661	488	68	324	4.20
Quillback Rockfish	2326	574	20	282	3.66
Cabezon	2410	490	28	233	3.02
Jack Mackerel	2607	1003	56	194	2.52
Chinook Salmon	1105	170	93	182	2.36
Rosethorn Rockfish	2321	352	32	168	2.18
Rock Sole	3108	184	2	151	1.96
Pacific Hake	1303	1714	672	131	1.70
Petrale Sole	3103	216	3	118	1.53
Sablefish	2668	449	17	100	1.30
Kelp Rockfish	2303	264	17	90	1.17
Spiny Dogfish Shark	163	11	86	73	0.95
Black-And-Yellow Rockfish	2310	121	6	54	0.70
White Croaker	2509	43	51	52	0.67
Cowcod	2324	65	0	51	0.66
Rockfish Genus	2398	68	42	51	0.66

Continued on next page

Table 5: Number of observed fish kept and returned during the program, and the number and percent of drifts encountered by species.

Common name	CDFGSP	Kept	Discarded	Num. drifts	% drifts
Shortbelly Rockfish	2323	130	10	48	0.62
Calico Rockfish	2313	43	62	43	0.56
Stripetail Rockfish	2342	105	14	43	0.56
Pacific Sardine	1006	108	8	39	0.51
California Halibut	3005	41	7	32	0.41
Flatfish Order	3210	139	6	31	0.40
Treefish	2345	29	5	27	0.35
Bank Rockfish	2368	151	1	25	0.32
Lefteye Flounder Family	3000	507	4	25	0.32
Grass Rockfish	2337	49	9	22	0.29
Ocean Whitefish	2610	39	0	21	0.27
Swordspine Rockfish	2338	29	1	20	0.26
Blue Shark	137	4	18	19	0.25
Redstripe Rockfish	2336	26	2	18	0.23
Speckled Sanddab	3002	31	9	17	0.22
Halfbanded Rockfish	2343	24	13	16	0.21
Wolf-Eel	2679	13	1	14	0.18
Splitnose Rockfish	2314	24	0	13	0.17
Tiger Rockfish	2332	14	0	13	0.17
Coho Salmon	1103	7	7	12	0.16
California Lizardfish	1525	9	10	11	0.14
Greenblotched Rockfish	2363	8	0	8	0.10
Mexican Rockfish	2325	15	0	8	0.10
Jacksmelt	2692	4	4	7	0.09
California Sheephead	2633	6	0	6	0.08
Sculpin Family	2445	0	5	5	0.06
Pacific Barracuda	2720	28	0	4	0.05
Sarcastic Fringehead	2754	1	3	4	0.05
Senorita	2632	2	3	4	0.05
Monterey Spanish Mackerel	2212	5	0	3	0.04
Pacific Bonito	2210	3	0	3	0.04
Pacific Tomcod	1302	8	4	3	0.04
Sand Sole	3126	4	0	3	0.04
Unidentified (Sharks)	199	2	1	3	0.04
Walleye Surfperch	2110	4	0	3	0.04
Aurora Rockfish	2305	13	0	2	0.03
Brown Irish Lord	2406	0	2	2	0.03
Butter Sole	3107	2	0	2	0.03
Diamond Turbot	3106	2	0	2	0.03
English Sole	3120	2	0	2	0.03

Continued on next page

Table 5: Number of observed fish kept and returned during the program, and the number and percent of drifts encountered by species.

Common name	CDFGSP	Kept	Discarded	Num. drifts	% drifts
Pacific Halibut	3105	3	0	2	0.03
Sharpchin Rockfish	2349	2	0	2	0.03
Silvergray Rockfish	2306	26	0	2	0.03
Starry Skate	225	0	2	2	0.03
Big Skate	222	0	1	1	0.01
Blackgill Rockfish	2328	1	0	1	0.01
Blacksmith	2627	1	2	1	0.01
Brown Smoothhound	139	0	1	1	0.01
California Skate	223	0	1	1	0.01
Chameleon Rockfish	2365	1	0	1	0.01
Fantail Sole	3006	1	0	1	0.01
Herring Family	1002	1	0	1	0.01
Honeycomb Rockfish	2346	3	0	1	0.01
Juvenile Rockfish	2360	0	1	1	0.01
Longspine Combfish	2672	1	0	1	0.01
Pacific Sand Lance	2675	1	0	1	0.01
Painted Greenling	2665	1	0	1	0.01
Plainfin Midshipman	4032	0	1	1	0.01
Pygmy Rockfish	2348	0	1	1	0.01
Queenfish	2512	0	1	1	0.01
Red Brotula	1641	1	0	1	0.01
Rock Greenling	2663	0	1	1	0.01
Rubberlip Seaperch	2117	1	0	1	0.01
Shortfin Mako Shark	114	1	0	1	0.01
Skate Family	220	0	1	1	0.01
Soupfin Shark	134	1	0	1	0.01
Spotted Ratfish	300	1	0	1	0.01
Starry Flounder	3121	1	0	1	0.01
Striped Seaperch	2108	1	0	1	0.01
Thornback	211	0	2	1	0.01
Threadfin Sculpin	2412	0	1	1	0.01
White Seaperch	2116	0	1	1	0.01

Table 6: Number of fish measured by disposition (kept or discarded) in descending order of the number measured.

Common name	Kept	Discarded	Unknown fate	Total measured
Blue Rockfish	86484	66	0	86550
Yellowtail Rockfish	68620	6	0	68626
Chilipepper Rockfish	20243	2	0	20245
Widow Rockfish	15336	0	42	15378
Rosy Rockfish	14756	43	0	14799
Canary Rockfish	13840	0	0	13840
Olive Rockfish	13494	0	0	13494
Bocaccio	11751	2	0	11753
Vermilion Rockfish	9527	0	0	9527
Gopher Rockfish	9434	0	0	9434
Black Rockfish	8943	14	0	8957
Lingcod	8638	76	8	8722
Greenspotted Rockfish	8167	0	0	8167
Starry Rockfish	8138	10	0	8148
Copper Rockfish	6347	0	0	6347
Brown Rockfish	6227	0	0	6227
Greenstriped Rockfish	3204	9	0	3213
China Rockfish	2524	0	0	2524
Pacific Sanddab	2274	0	0	2274
Yelloweye Rockfish	1848	0	2	1850
Chub (Pacific) Mackerel	1609	2	0	1611
Speckled Rockfish	1535	0	0	1535
Flag Rockfish	772	0	0	772
Quillback Rockfish	753	0	0	753
Pacific Hake	698	7	0	705
Squarespot Rockfish	667	12	0	679
Kelp Greenling	570	2	0	572
Cabezon	561	1	0	562
Jack Mackerel	350	0	0	350
Rosethorn Rockfish	339	0	0	339
Kelp Rockfish	335	0	0	335
Sablefish	323	0	0	323
Rock Sole	208	0	0	208
Petrale Sole	201	0	0	201
Black And Yellow Rockfish	128	0	0	128
Bank Rockfish	112	0	0	112
Chinook Salmon	90	0	0	90
Cowcod	77	0	0	77
Stripetail Rockfish	76	1	0	77
Shortbelly Rockfish	74	0	0	74

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Table 6: Number of fish measured by disposition (kept or discarded) in descending order of the number measured.

Common name	Kept	Discarded	Unknown fate	Total measured
Ocean Whitefish	55	0	0	55
California Halibut	48	0	0	48
Treefish	46	0	0	46
White Croaker	45	0	0	45
Grass Rockfish	43	1	0	44
Pacific Barracuda	38	0	0	38
Halfbanded Rockfish	29	2	0	31
Rockfish Genus	31	0	0	31
Swordspine Rockfish	28	1	0	29
Redstripe Rockfish	28	0	0	28
Splitnose Rockfish	26	0	0	26
Flatfish Order	25	0	0	25
Lefteye Flounder Family	23	0	0	23
Calico Rockfish	19	0	0	19
Speckled Sanddab	17	0	0	17
Tiger Rockfish	17	0	0	17
Wolf-Eel	14	0	0	14
Pacific Tomcod	8	0	0	8
California Sheephead	7	0	0	7
Coho Salmon	6	1	0	7
Blue Shark	4	2	0	6
Greenblotched Rockfish	6	0	0	6
Pacific Halibut	6	0	0	6
Sand Sole	6	0	0	6
Spiny Dogfish Shark	6	0	0	6
Pacific Bonito	5	0	0	5
Blacksmith	4	0	0	4
Jacksmelt	4	0	0	4
Pacific Sardine	3	0	0	3
Rubberlip Seaperch	3	0	0	3
Aurora Rockfish	2	0	0	2
Butter Sole	2	0	0	2
Sharpchin Rockfish	2	0	0	2
Chameleon Rockfish	1	0	0	1
English Sole	1	0	0	1
Fantail Sole	1	0	0	1
Painted Greenling	1	0	0	1
Pink Rockfish	1	0	0	1
Red Brotula	1	0	0	1
Rock Greenling	0	1	0	1

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Table 6: Number of fish measured by disposition (kept or discarded) in descending order of the number measured.

Common name	Kept	Discarded	Unknown fate	Total measured
Shortfin Mako Shark	1	0	0	1
Soupfin Shark	1	0	0	1
Spotted Ratfish	1	0	0	1
Striped Seaperch	1	0	0	1

Table 7: Number of retained Bank, Black-and-Yellow, Black, Blue, Bocaccio, Brown and Canary Rockfish measured by 2 cm lengths bins, total length (TL).

Length	Bank	Black & Yellow	Black	Blue	Bocaccio	Brown	Canary
12-13	0	0	0	1	1	0	0
14-15	0	0	0	11	0	0	1
16-17	0	0	0	115	2	1	5
18-19	1	0	6	598	4	9	18
20-21	1	2	38	2459	16	35	86
22-23	1	3	182	6634	22	118	260
24-25	6	11	537	11779	36	249	547
26-27	16	38	1103	15173	74	458	928
28-29	14	33	1503	15961	129	701	1162
30-31	13	27	1572	13398	173	915	1511
32-33	11	12	1378	9549	327	955	1692
34-35	6	1	862	5384	398	865	1708
36-37	7	1	484	2918	403	723	1571
38-39	12	0	239	1478	434	523	1414
40-41	7	0	178	642	575	315	1054
42-43	11	0	204	271	668	190	617
44-45	3	0	185	77	794	98	343
46-47	2	0	205	22	1046	44	284
48-49	0	0	146	10	978	18	183
50-51	1	0	61	3	1047	7	137
52-53	0	0	34	1	919	3	124
54-55	0	0	21	0	775	0	90
56-57	0	0	5	0	622	0	57
58-59	0	0	0	0	505	0	18
60-61	0	0	0	0	425	0	23
62-63	0	0	0	0	364	0	5
64-65	0	0	0	0	331	0	1
66-67	0	0	0	0	232	0	0
68-69	0	0	0	0	123	0	1
70-71	0	0	0	0	129	0	0
72-73	0	0	0	0	88	0	0
74-75	0	0	0	0	52	0	0
76-77	0	0	0	0	31	0	0
78-79	0	0	0	0	23	0	0
80-81	0	0	0	0	0	0	0
82-83	0	0	0	0	3	0	0
84-85	0	0	0	0	0	0	0
86-87	0	0	0	0	1	0	0
88-89	0	0	0	0	1	0	0
Total	112	128	8943	86484	11751	6227	13840
Mean	34.04	28.69	32.60	29.11	49.68	33.59	35.35
Std. Dev.	6.52	2.66	6.05	4.31	10.15	5.18	6.75

Table 8: Number of retained Chilipepper, China, Copper, Flag, Gopher, Greenspotted, and Greenstriped Rockfish measured by 2 cm lengths bins, total length (TL).

Length	Chilipepper	China	Copper	Flag	Gopher	Greenspotted	Greenstriped
14-15	0	0	0	0	0	2	0
16-17	0	1	1	0	12	22	2
18-19	9	4	7	4	62	75	14
20-21	32	37	19	2	289	173	97
22-23	151	88	83	21	891	394	300
24-25	419	259	183	50	2143	568	627
26-27	930	518	275	81	2843	819	752
28-29	1825	647	429	116	2103	1014	703
30-31	2936	496	497	145	821	1104	447
32-33	3660	274	621	142	211	1066	198
34-35	3020	105	764	96	39	1030	51
36-37	2218	54	806	55	10	690	6
38-39	1727	28	739	35	5	585	4
40-41	1074	11	670	16	4	372	3
42-43	836	2	445	5	1	188	0
44-45	666	0	341	2	0	57	0
46-47	416	0	215	1	0	8	0
48-49	204	0	130	1	0	0	0
50-51	85	0	77	0	0	0	0
52-53	33	0	33	0	0	0	0
54-55	2	0	8	0	0	0	0
56-57	0	0	3	0	0	0	0
58-59	0	0	1	0	0	0	0
Total	20243	2524	6347	772	9434	8167	3204
Mean	34.91	29.32	36.75	31.68	26.95	31.93	27.61
Std. Dev.	5.35	3.41	6.30	4.38	2.72	5.51	3.17

Table 9: Number of retained Kelp, Olive, Quillback, Rosethorn, Rosy, and Speckled Rockfish measured by 2 cm lengths bins, total length (TL).

Length	Kelp	Olive	Quillback	Rosethorn	Rosy	Speckled
9-10	0	0	0	0	2	0
11-12	0	0	0	0	0	0
13-14	0	0	1	1	9	0
14-15	0	5	4	1	55	0
16-17	0	12	10	3	373	0
18-19	8	59	24	28	1644	0
20-21	22	191	59	68	3413	1
22-23	35	322	83	103	4294	4
24-25	69	538	125	96	3043	17
26-27	93	882	131	29	1348	47
28-29	74	1293	95	7	409	117
30-31	21	1670	70	2	119	198
32-33	9	1842	51	1	33	248
34-35	3	1962	48	0	10	245
36-37	1	1815	25	0	1	212
38-39	0	1346	18	0	1	185
40-41	0	867	4	0	0	169
42-43	0	403	4	0	0	54
44-45	0	145	0	0	2	28
46-47	0	83	0	0	0	6
48-49	0	32	0	0	0	2
50-51	0	9	1	0	0	2
52-53	0	6	0	0	0	0
54-55	0	3	0	0	0	0
56-57	0	5	0	0	0	0
58-59	0	1	0	0	0	0
60-61	0	3	0	0	0	0
Total	335	13494	753	339	14756	1535
Mean	30.60	37.76	31.65	23.32	23.0	35.32
Std. Dev.	3.11	5.43	5.24	2.56	2.8	4.51

Table 10: Number of retained Squarespot, Starry, Vermilion, Widow, Yelloweye, and Yellowtail Rockfish measured by 2 cm lengths bins, total length (TL).

Length	Squarespot	Starry	Vermilion	Widow	Yelloweye	Yellowtail
13-14	1	2	0	0	0	0
14-15	3	3	0	0	0	3
16-17	8	11	2	5	2	13
18-19	49	90	6	50	5	124
20-21	146	300	26	154	10	610
22-23	189	550	100	351	26	2086
24-25	149	849	243	811	44	4659
26-27	97	1110	427	1328	61	7454
28-29	20	1222	720	1778	77	8584
30-31	4	1257	818	1942	107	8745
32-33	1	1029	815	1948	113	7526
34-35	0	791	776	1650	134	6299
36-37	0	508	788	1310	129	5856
38-39	0	288	908	1166	155	5355
40-41	0	107	968	990	137	4184
42-43	0	18	832	748	143	2976
44-45	0	3	572	465	107	1986
46-47	0	0	454	252	106	1172
48-49	0	0	301	229	107	597
50-51	0	0	245	123	73	264
52-53	0	0	199	31	76	95
54-55	0	0	149	5	65	27
56-57	0	0	81	0	49	3
58-59	0	0	50	0	38	2
60-61	0	0	24	0	33	0
62-63	0	0	8	0	20	0
64-65	0	0	9	0	17	0
66-67	0	0	4	0	9	0
68-69	0	0	1	0	4	0
70-71	0	0	0	0	1	0
72-73	0	0	1	0	0	0
Total	667	8138	9527	15336	1848	68620
Mean	23.45	29.98	38.32	34.04	41.70	33.41
Std. Dev.	2.68	4.83	7.87	6.36	10.01	6.30

Table 11: Number of retained Pacific Hake, Chub Mackerel, Cabezon, Jack Mackerel, and Kelp Greenling measured by 2 cm lengths bins, total length (TL).

Length	Pacific Hake	Chub Mackerel	Cabezon	Jack Mackerel	Kelp Greenling
12-13	0	0	0	0	0
14-15	0	0	0	0	0
16-17	0	0	0	0	0
18-19	0	1	0	1	0
20-21	0	5	0	9	2
22-23	0	24	1	17	4
24-25	0	85	1	33	10
26-27	0	125	2	33	34
28-29	0	195	5	16	59
30-31	1	213	13	18	98
32-33	2	187	26	18	109
34-35	3	160	34	4	116
36-37	5	193	69	3	83
38-39	22	185	42	0	41
40-41	41	117	74	2	9
42-43	94	82	49	0	5
44-45	139	27	46	2	0
46-47	152	5	53	3	0
48-49	113	1	39	15	0
50-51	51	0	26	28	0
52-53	20	1	27	30	0
54-55	20	0	14	44	0
56-57	15	1	15	18	0
58-59	9	1	11	9	0
60-61	4	1	6	13	0
62-63	4	0	4	15	0
64-65	1	0	3	11	0
66-67	1	0	1	7	0
68-69	0	0	0	0	0
70-71	0	0	0	1	0
72-73	1	0	0	0	0
74-75	0	0	0	0	0
76-77	0	0	0	0	0
78-79	0	0	0	0	0
80-81	0	0	0	0	0
82-83	0	0	0	0	0
84-85	0	0	0	0	0
86-87	0	0	0	0	0
88-89	0	0	0	0	0
Total	698	1609	561	350	570
Mean	46.97	33.98	43.59	43.52	33.31
Std. Dev.	4.73	5.49	7.56	14.84	3.75

Table 12: Number of retained Lingcod, Sablefish, Pacific Sanddab, Petrale Sole, and Rock Sole measured by 2 cm lengths bins, total length (TL).

Length	Lingcod	Sablefish	Pacific Sanddab	Petrale Sole	Rock Sole
14-15	0	0	4	0	0
16-17	0	0	23	0	0
18-19	0	0	173	0	1
20-21	0	1	417	0	1
22-23	0	0	540	2	6
24-25	1	2	578	3	9
26-27	0	2	374	6	7
28-29	1	1	135	17	15
30-31	0	4	18	20	10
32-33	1	2	4	15	8
34-35	1	2	5	26	32
36-37	0	3	1	19	16
38-39	0	1	0	21	24
40-41	2	9	2	20	31
42-43	4	16	0	18	17
44-45	14	30	0	12	13
46-47	26	45	0	15	12
48-49	49	68	0	6	6
50-51	118	48	0	1	0
52-53	232	37	0	0	0
54-55	524	19	0	0	0
56-57	971	19	0	0	0
58-59	913	6	0	0	0
60-61	917	4	0	0	0
62-63	807	4	0	0	0
64-65	722	0	0	0	0
66-67	607	0	0	0	0
68-69	479	0	0	0	0
70-71	478	0	0	0	0
72-73	376	0	0	0	0
74-75	313	0	0	0	0
76-77	255	0	0	0	0
78-79	220	0	0	0	0
80-81	165	0	0	0	0
82-83	104	0	0	0	0
84-85	73	0	0	0	0
86-87	68	0	0	0	0
88-89	65	0	0	0	0
90-91	44	0	0	0	0
92-93	27	0	0	0	0
94-95	19	0	0	0	0
96-97	16	0	0	0	0
98-99	7	0	0	0	0
100+	19	0	0	0	0
Total	8638	323	2274	201	208
Mean	65.21	48.95	23.97	37.31	37.07
Std. Dev.	9.11	6.19	2.91	6.22	6.71

Table 13: Error code look-up table. The error codes are the same across all tables.

Error code	Description
1.1	Value was corrected; sampler error
1.2	Value was corrected; key entry error
2.0	Missing value added; value from data sheet
3.0	Value replaced with informed guess
3.3	Value replaced with informed guess; sampler error; based on other information
3.4	Value imputed
6.0	Offshore point, location code is OK; or point is on land but location code is OK
6.2	Both Loran and Lat/Long locations do not match location code (but Lat/Long appears to be better), use Location Code
6.4	Lat/Long $>$ 10 km from Location Code (LocCode on S. Side on Farallons), use Location Code
99.0	Value incorrect; true value unknown

Table 14: Fish fate look-up table for the Lengths table in the database.

Fate code	Description
1	NULL
B	Kept; Fish used as bait
D	Discarded; Release dead or died (eg: released alive and eaten by a bird)
F	Discarded; Life History write-up for Fish and Game
K	Kept; Fish kept by angler
L	Discarded; Looked, but could not determine fate
N	Discarded; Did not observe fate
S	Discarded; Released and survived
U	Discarded; Fate unknown

Table 15: Fishing type look-up table from the database.

Fishing type code	40 fm cutoff	Description
0	nearshore	No data
1	nearshore	surface
3	nearshore	bottom
5	nearshore	mix
6	nearshore	fishing for bait
7	offshore	surface
8	offshore	bottom
9	offshore	mix
10	NULL	other

Table 16: Port look-up table from the database, including only those ports sampled.

Port ID	Port Name	County	Port complex
201	Crescent City	Del Norte	CRS
220	Eureka	Humboldt	ERK
223	Fort Bragg	Mendocino	BRG
231	Trinidad	Humboldt	ERK
440	San Francisco	San Francisco	OSF
441	Dillon Beach	Marin	BDG
452	Half Moon Bay	San Mateo	OSF
454	San Jose	Santa Clara	OSF
464	Oakland	Alameda	OSF
469	Sausalito	Marin	OSF
472	Berkeley	Alameda	OSF
473	Bodega Bay	Sonoma	BDG
478	Richmond	Contra Costa	OSF
550	Monterey	Monterey	MNT
592	Moss Landing	Monterey	MNT
593	Santa Cruz	Santa Cruz	MNT
602	Avila/Port San Luis	San Luis Obispo	MRO
606	Morro Bay	San Luis Obispo	MRO
615	San Simeon	San Luis Obispo	MRO

Table 17: Species look-up table for the Catch and Lengths Tables, including only those species observed.

Common name	Scientific name	CDFGSP	RECFINSP
Aurora Rockfish	*Sebastes aurora*	2305	237
Bank Rockfish	*Sebastes rufus*	2368	282
Big Skate	*Raja binoculata*	222	66
Black-And-Yellow Rockfish	*Sebastes chrysomelas*	2310	268
Black Rockfish	*Sebastes melanops*	2327	253
Blackgill Rockfish	*Sebastes melanostomus*	2328	254
Blacksmith	*Chromis punctipinnis*	2627	525
Blue Rockfish	*Sebastes mystinus*	2330	256
Blue Shark	*Prionace glauca*	137	48
Bocaccio	*Sebastes paucispinis*	2334	259
Brown Irish Lord	*Hemilepidotus spinosus*	2406	348
Brown Rockfish	*Sebastes auriculatus*	2304	236
Brown Smoothhound	*Mustelus henlei*	139	42
Butter Sole	*Isopsetta isolepis*	3107	677
Cabezon	*Scorpaenichthys marmoratus*	2410	379
Calico Rockfish	*Sebastes dalli*	2313	272
California Halibut	*Paralichthys californicus*	3005	666
California Lizardfish	*Synodus lucioceps*	1525	145
California Sheephead	*Semicossyphus pulcher*	2633	541
California Skate	*Raja inornata*	223	67
Canary Rockfish	*Sebastes pinniger*	2335	260
Chameleon Rockfish	*Sebastes phillipsi*	2365	279
Chilipepper Rockfish	*Sebastes goodei*	2320	249
China Rockfish	*Sebastes nebulosus*	2331	257
Chinook Salmon	*Oncorhynchus tshawytscha*	1105	120
Chub (Pacific) Mackerel	*Scomber japonicus*	2209	638
Coho Salmon	*Oncorhynchus kisutch*	1103	118
Copper Rockfish	*Sebastes caurinus*	2308	241
Cowcod	*Sebastes levis*	2324	276
Diamond Turbot	*Pleuronicthys guttulatus*	3106	694
English Sole	*Parophrys vetulus*	3120	684
Fantail Sole	*Xystreurys liolepis*	3006	668
Flag Rockfish	*Sebastes rubrivinctus*	2341	281
Flatfish Order	*Pleuronectiformes*	3210	660
Gopher Rockfish	*Sebastes carnatus*	2307	288
Grass Rockfish	*Sebastes rastrelliger*	2337	280
Greenblotched Rockfish	*Sebastes rosenblatti*	2363	292
Greenspotted Rockfish	*Sebastes chlorostictus*	2309	270
Greenstriped Rockfish	*Sebastes elongatus*	2315	245
Halfbanded Rockfish	*Sebastes semicinctus*	2343	283

Continued on next page

Table 17: Species look-up table for the Catch and Lengths Tables, including only those species observed.

Common name	Scientific name	CDFGSP	RECFINSP
Herring Family	Clupeidae	1002	101
Honeycomb Rockfish	*Sebastes umbrosus*	2346	286
Jack Mackerel	*Trachurus symmetricus*	2607	462
Jacksmelt	*Atherinopsis californiensis*	2692	212
Juvenile Rockfish		2360	999
Kelp Greenling	*Hexagrammos decagrammus*	2661	303
Kelp Rockfish	*Sebastes atrovirens*	2303	269
Lefteye Flounder Family	Bothidae	3000	661
Lingcod	*Ophiodon elongatus*	2664	307
Longspine Combfish	*Zaniolepis latipinnis*	2672	309
Mexican Rockfish	*Sebastes macdonaldi*	2325	277
Monterey Spanish Mackerel	*Scomberomorus concolor*	2212	643
Ocean Whitefish	*Caulolatilus princeps*	2610	455
Olive Rockfish	*Sebastes serranoides*	2344	284
Pacific Barracuda	*Sphyraena argentea*	2720	534
Pacific Bonito	*Sarda chiliensis*	2210	637
Pacific Hake	*Merluccius productus*	1303	181
Pacific Halibut	*Hippoglossus stenolepis*	3105	693
Pacific Sand Lance	*Ammodytes hexapterus*	2675	610
Pacific Sanddab	*Citharichthys sordidus*	3001	663
Pacific Sardine	*Sardinops sagax*	1006	104
Pacific Tomcod	*Microgadus proximus*	1302	179
Painted Greenling	*Oxylebius pictus*	2665	315
Petrale Sole	*Eopsetta jordani*	3103	673
Plainfin Midshipman	*Porichthys notatus*	4032	165
Pygmy Rockfish	*Sebastes wilsoni*	2348	266
Queenfish	*Seriphus politus*	2512	494
Quillback Rockfish	*Sebastes maliger*	2326	252
Red Brotula	*Brosmophycis marginata*	1641	183
Redstripe Rockfish	*Sebastes proriger*	2336	261
Rock Greenling	*Hexagrammos lagocephalus*	2663	304
Rock Sole	*Lepidopsetta bilineatus*	3108	678
Rockfish Genus	*Sebastes*	2398	233
Rosethorn Rockfish	*Sebastes helvomaculatus*	2321	250
Rosy Rockfish	*Sebastes rosaceus*	2339	263
Rubberlip Seaperch	*Rhacochilus toxotes*	2117	516
Sablefish	*Anoplopoma fimbria*	2668	313
Sand Sole	*Psettichthys melanostictus*	3126	691
Sarcastic Fringehead	*Neoclinus blanchardi*	2754	565
Sculpin Family	Cottidae	2445	318

Continued on next page

Table 17: Species look-up table for the Catch and Lengths Tables, including only those species observed.

Common name	Scientific name	CDFGSP	RECFINSP
Senorita	*Oxyjulis californica*	2632	540
Sharpchin Rockfish	*Sebastes zacentrus*	2349	267
Shortbelly Rockfish	*Sebastes jordani*	2323	251
Shortfin Mako Shark	*Isurus oxyrinchus*	114	30
Silvergray Rockfish	*Sebastes brevispinis*	2306	239
Skate Family	Rajidae	220	64
Soupfin Shark	*Galeorhinus zyopterus*	134	37
Speckled Rockfish	*Sebastes ovalis*	2333	278
Speckled Sanddab	*Citharichthys stigmaeus*	3002	664
Spiny Dogfish Shark	*Squalus acanthias*	163	55
Splitnose Rockfish	*Sebastes diploproa*	2314	244
Spotted Ratfish	*Hydrolagus colliei*	300	86
Squarespot Rockfish	*Sebastes hopkinsi*	2322	275
Starry Flounder	*Platichthys stellatus*	3121	685
Starry Rockfish	*Sebastes constellatus*	2311	271
Starry Skate	*Raja stellulata*	225	73
Striped Seaperch	*Embiotoca lateralis*	2108	508
Stripetail Rockfish	*Sebastes saxicola*	2342	265
Swordspine Rockfish	*Sebastes ensifer*	2338	289
Thornback	*Platyrhinoidis triseriata*	211	61
Threadfin Sculpin	*Icelinus filamentosus*	2412	352
Tiger Rockfish	*Sebastes nigrocinctus*	2332	258
Treefish	*Sebastes serriceps*	2345	285
Unidentified (Sharks)		199	2
Vermilion Rockfish	*Sebastes miniatus*	2329	255
Walleye Surfperch	*Hyperprosopon argenteum*	2110	510
White Croaker	*Genyonemus lineatus*	2509	489
White Seaperch	*Phanerodon furcatus*	2116	513
Widow Rockfish	*Sebastes entomelas*	2316	247
Wolf-Eel	*Anarrhichthys ocellatus*	2679	555
Yelloweye Rockfish	*Sebastes ruberrimus*	2340	264
Yellowtail Rockfish	*Sebastes flavidus*	2318	248

Table 18: Tackle code look-up table from the database.

Tackle code	Description
51	Small beaded bait hooks
52	Hooks with yarn and no bait (e.g. wonder lures)
53	Hooks with yarn and bait
54	Hooks with yarn, mix of bait/no bait
55	Large barbed hook with bait (e.g. used for lingcod)
56	Large barbed hooks and no bait
57	Large barbed hooks, mix of bait/no bait
58	Stragglers
60	General hook and line
61	Light tackle (as defined by crew)
62	Mixed (light and heavy)

Table 19: Trip type look-up table for the Boat Table.

Trip type code	Description
11	3.00 to 7.49 hours, Morning, Open
15	3.00 to 7.49 hours, Morning, Chartered
21	3.00 to 7.49 hours, Afternoon, Open
25	3.00 to 7.49 hours, Afternoon, Chartered
31	7.50 to 11.49 hours, Open
35	7.50 to 11.49 hours, Chartered
37	7.50 to 11.49 hours, Crab combo
41	11.50 to 24 hours, Open
45	11.50 to 24 hours, Chartered
51	25 to 48 hours, Open
55	25 to 48 hours, Chartered
61	49-72 hours, Open
61	Possibly crab combo or 2-day trip
65	49-72 hours, Chartered
81	1 to 24 hours, Research
85	>24 hours, Research

Figures

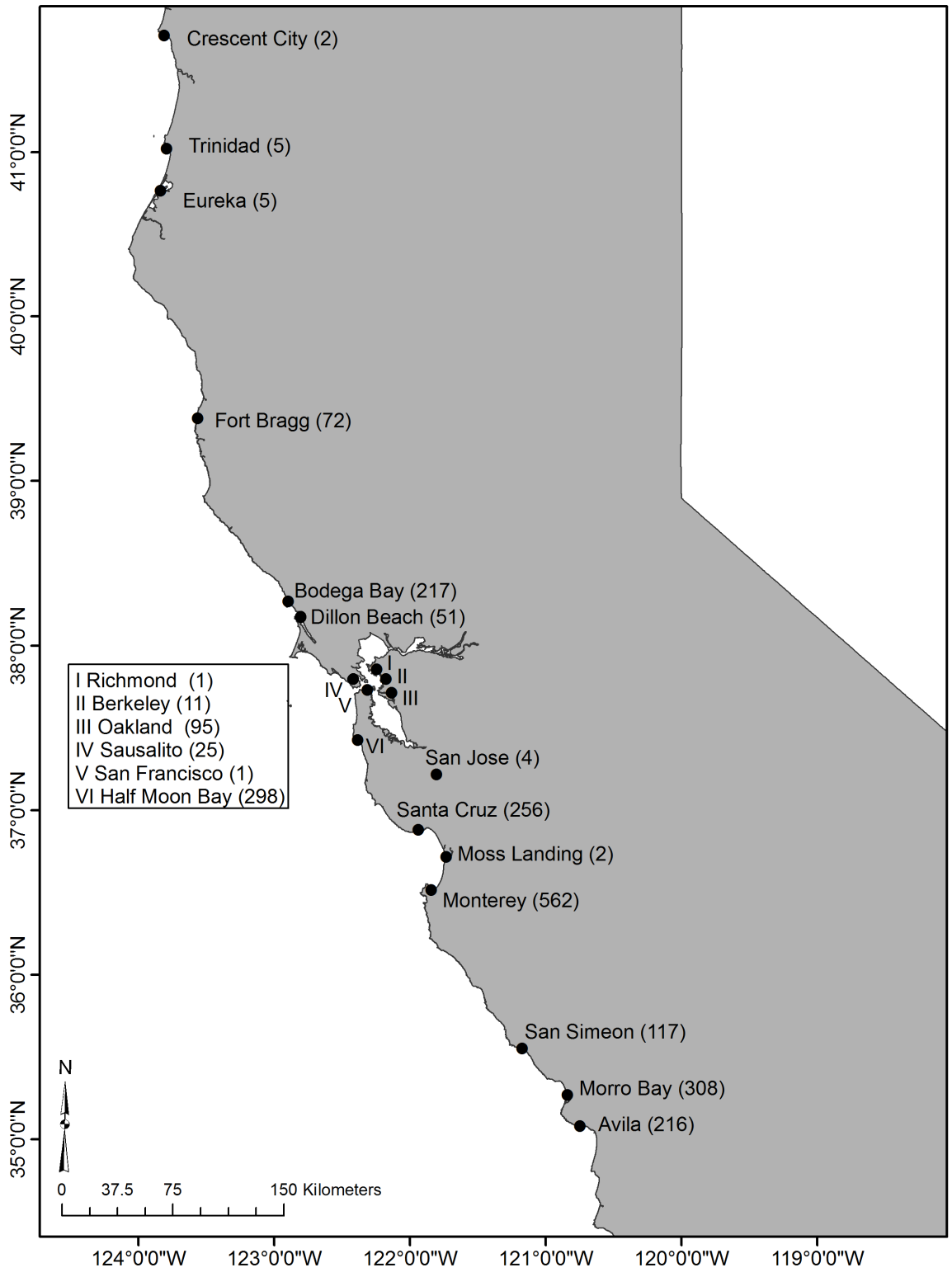


Figure 1: Map of the ports sampled and the number of trips sampled at each port in parentheses.

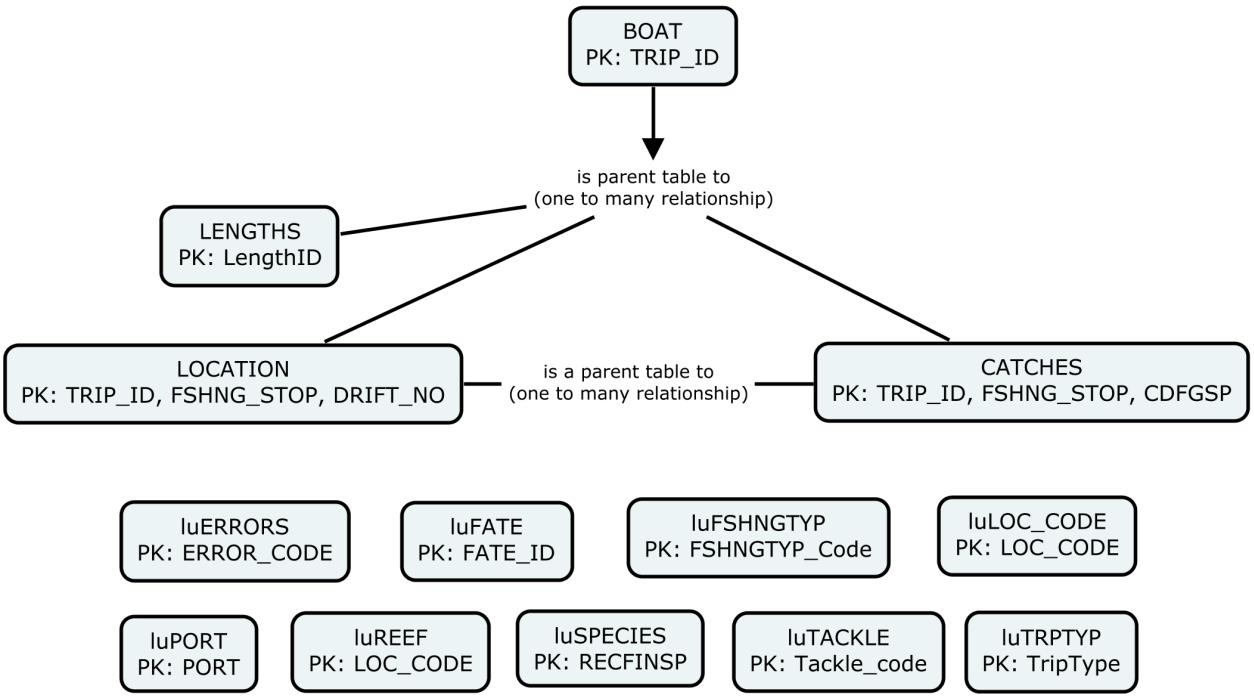


Figure 2: Diagram of the tables and their primary keys in the relational SQL database.

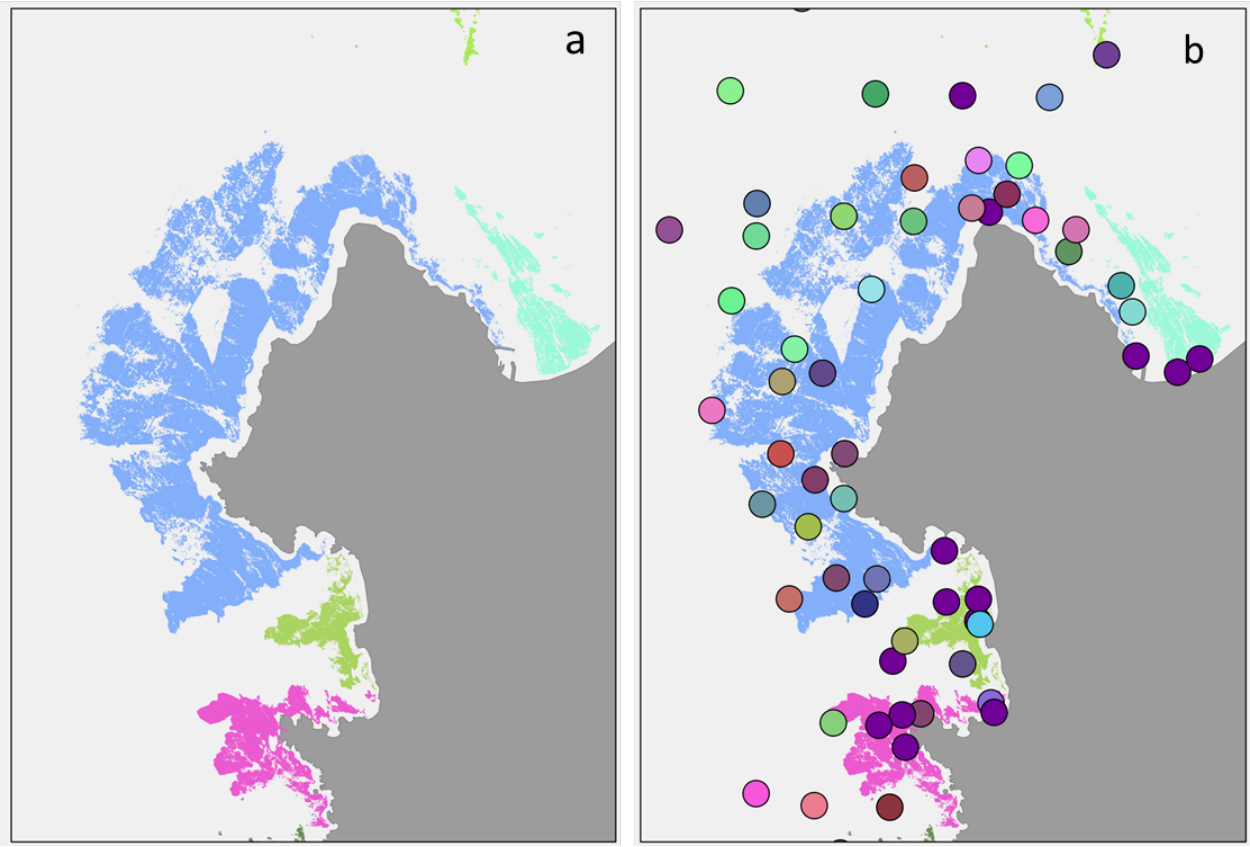
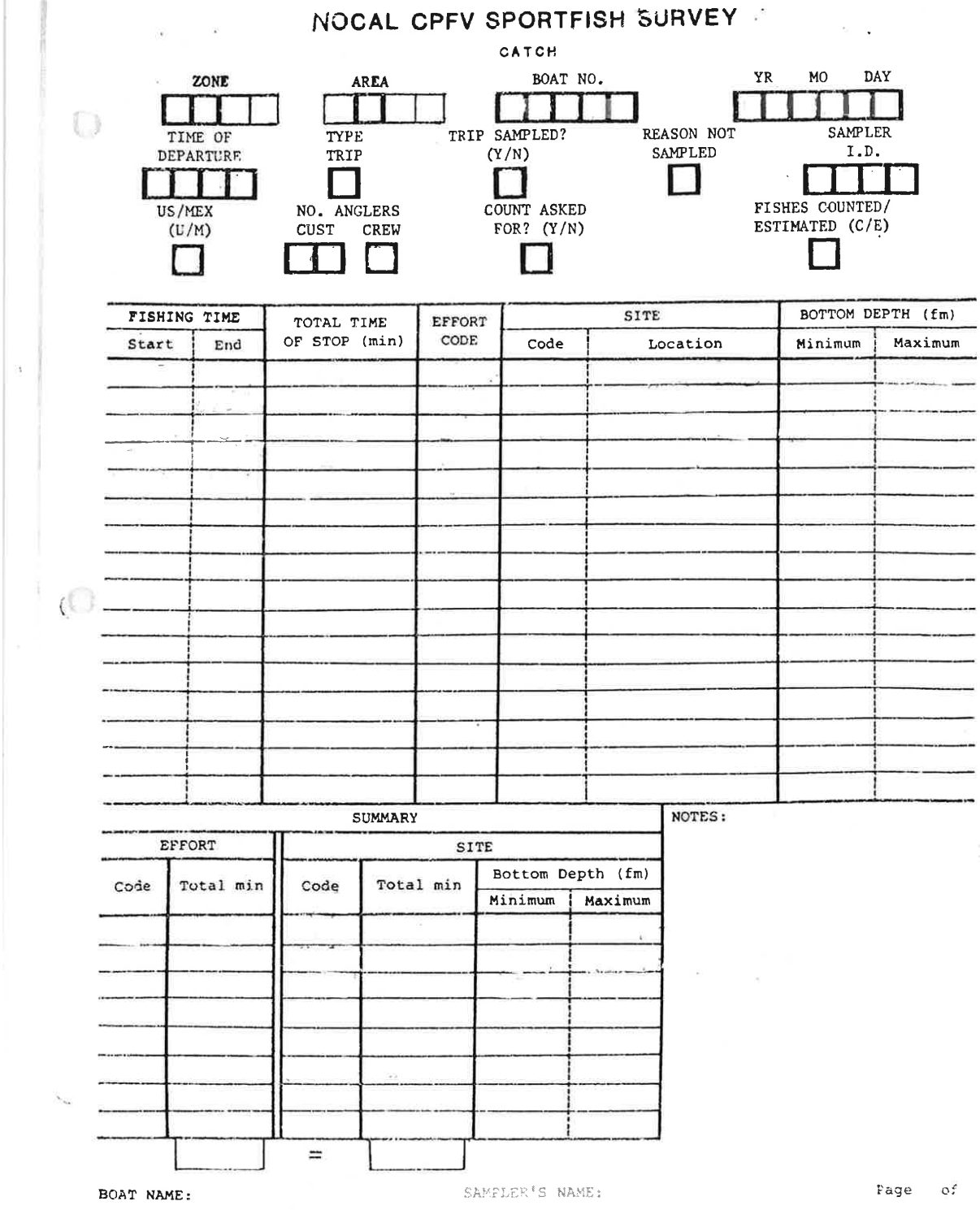


Figure 3: Map of the reefs near the Monterey peninsula in CA (a) and overlaid with the CDFW fishing location codes from the CDFW 1987-1998 onboard observer program (b). All fishing locations follow the confidentiality guidelines and were fished by at least three vessels during the study. The colors of the bubbles have no significance.

Appendix A. Data collection forms

The following pages include the data collection forms used for the survey. Three versions of the boat and location data form were used as the survey progressed. The catch and length data forms remained unchanged over the course of the survey.



NOCAL CPFV SPORTFISH SURVEY

CATCH

ZONE | AREA | BOAT NO. | YR MO DAY

TIME OF DEPARTURE | TYPE TRIP | TRIP SAMPLED? (Y/N) | REASON NOT SAMPLED | SAMPLER I.D.

US/MEX (U/M) | NO. ANGLERS CUST CREW | COUNT ASKED FOR? (Y/N) | FISHES COUNTED/ ESTIMATED (C/E)

FISHING TIME		TOTAL TIME OF STOP (min)	EFFORT CODE	SITE		BOTTOM DEPTH (fm)	
Start	End			Code	Location	Minimum	Maximum

SUMMARY

EFFORT		SITE			
				Bottom Depth (fm)	
Code	Total min	Code	Total min	Minimum	Maximum
	=				

NOTES:

BOAT NAME: SAMPLER'S NAME: Page of

Figure A1: Data collection form for the boat and drift location information, used from April 1987 - approximately January 1988 .

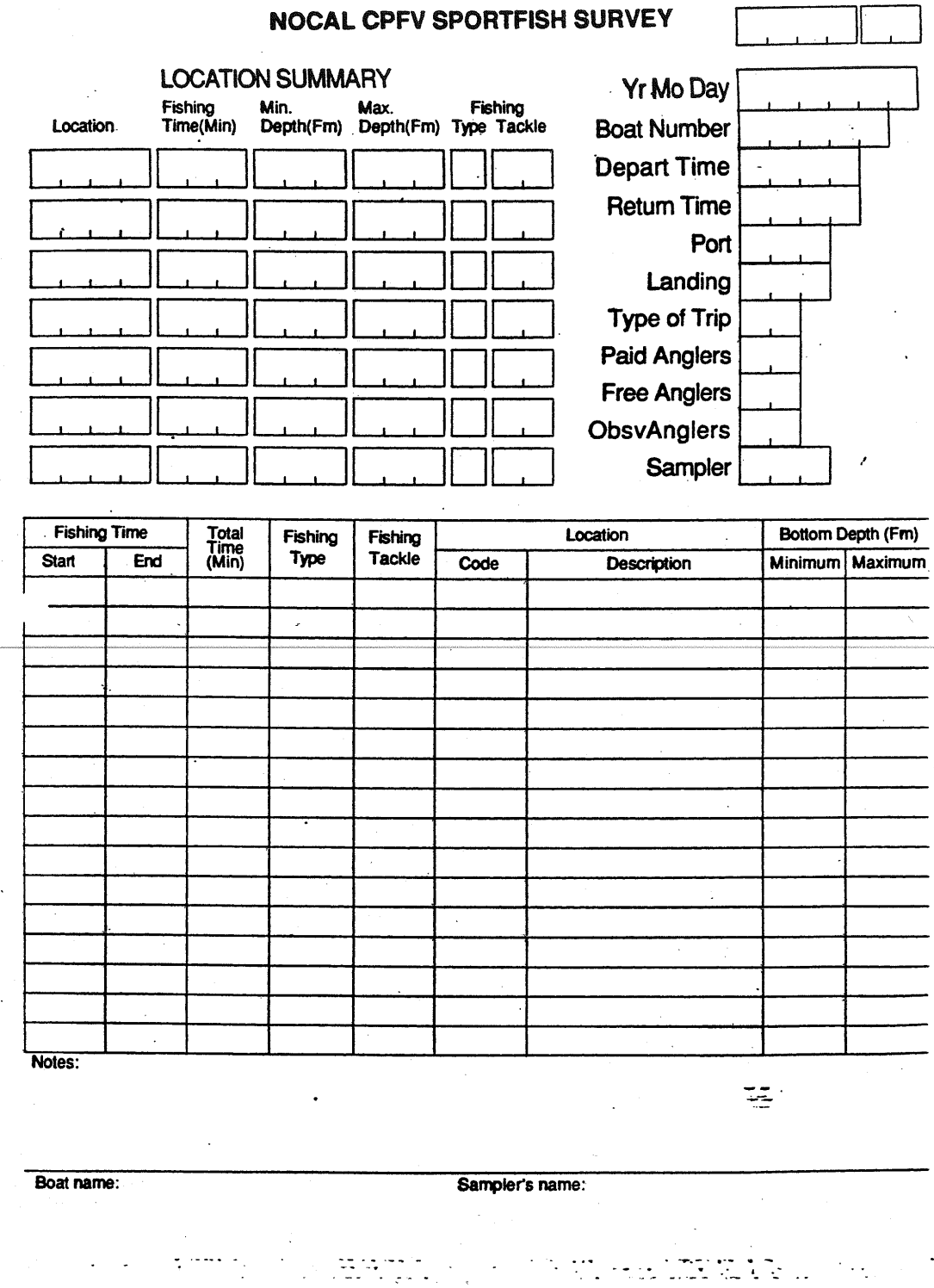
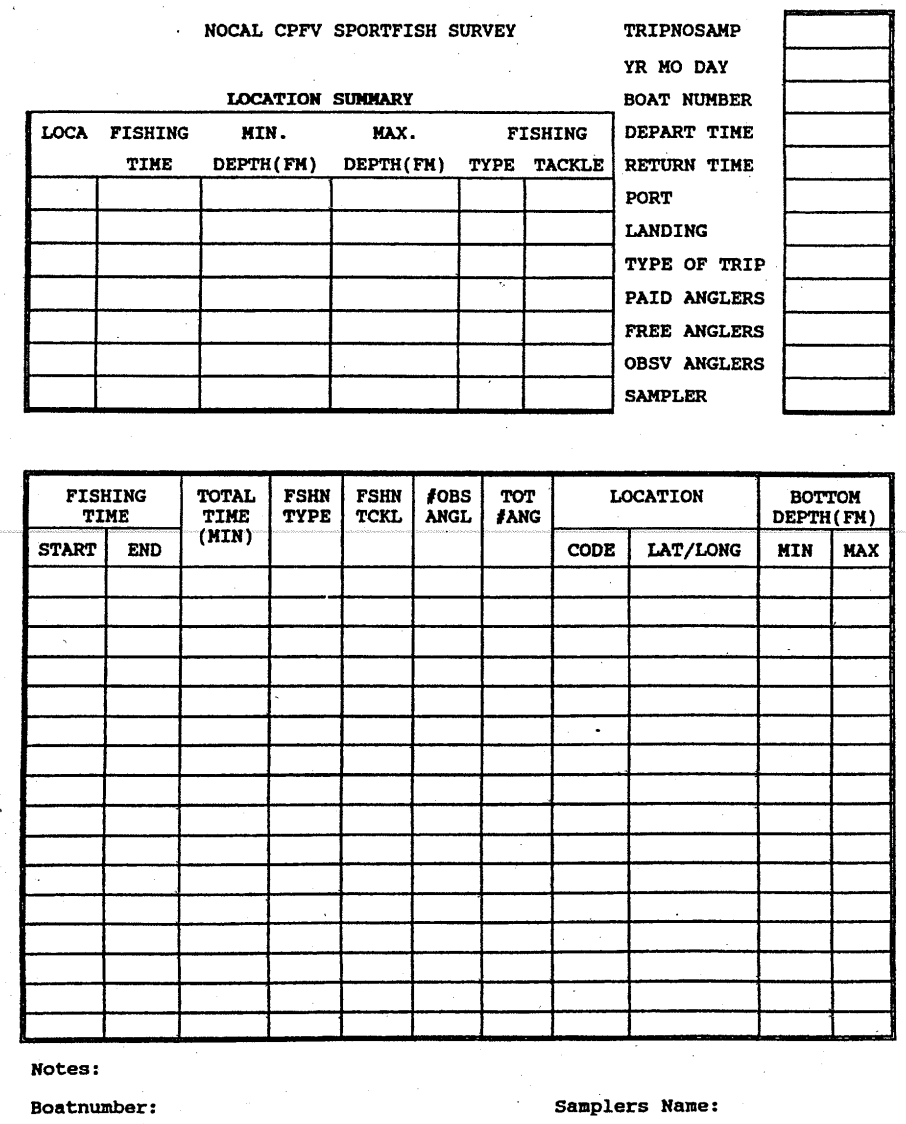


Figure A2: Data collection form for the boat and drift location information, used from approximately January 1988 - July 1992.



NOCAL CPFV SPORTFISH SURVEY

LOCATION SUMMARY

LOCA	FISHING TIME	MIN. DEPTH(FM)	MAX. DEPTH(FM)	FISHING TYPE	FISHING TACKLE

TRIPNOSAMP	
YR MO DAY	
BOAT NUMBER	
DEPART TIME	
RETURN TIME	
PORT	
LANDING	
TYPE OF TRIP	
PAID ANGLERS	
FREE ANGLERS	
OBSV ANGLERS	
SAMPLER	

FISHING TIME		TOTAL TIME (MIN)	FSHN TYPE	FSHN TCKL	#OBS ANGL	TOT #ANG	LOCATION		BOTTOM DEPTH(FM)	
START	END						CODE	LAT/LONG	MIN	MAX

Notes:

Boatnumber:

Samplers Name:

Figure A3: Data collection form for the boat and drift location information, used from approximately July 1992 - December 1998.

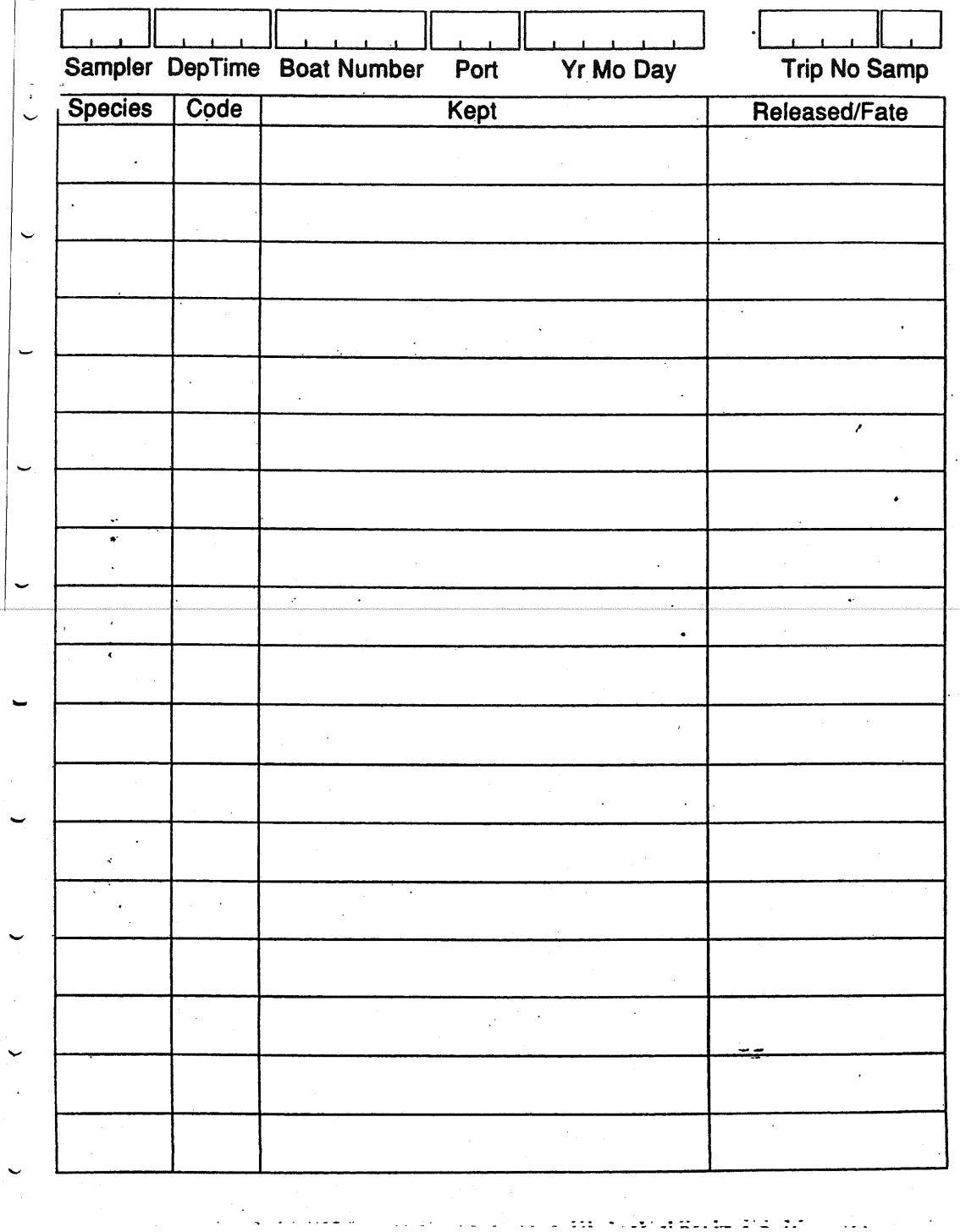


Figure A4: Data collection form for the catch information, used for the entire survey.

Sampler DepTime Boat Number Port Yr Mo Day Trip No Samp

South Location to North Location

SPECIES CODE FATE

SPECIES COMMON NAME

Length / Freq Length / Freq Length / Freq Length / Freq Length / Freq

SPECIES CODE FATE

SPECIES COMMON NAME

Length / Freq Length / Freq Length / Freq Length / Freq Length / Freq

SPECIES CODE FATE

SPECIES COMMON NAME

Length / Freq Length / Freq Length / Freq Length / Freq Length / Freq

SPECIES CODE FATE

SPECIES COMMON NAME

Length / Freq Length / Freq Length / Freq Length / Freq Length / Freq

SPECIES CODE FATE

SPECIES COMMON NAME

Length / Freq Length / Freq Length / Freq Length / Freq Length / Freq

Figure A5: Data collection form for the length information, used for the entire survey.

Appendix B. Imputation of Observed Anglers

The 1987-1998 CDFW onboard observer program did not record the number of anglers at a fishing stop from 4/22/87 until 7/9/92, although the number was recorded for the trip. The goal of this analysis is to impute the number of observed anglers in the initial period of the sampling program from the number of observed anglers and onboard anglers from the later years of the program.

The number of observed anglers at a fishing stop is a subset of the number of total number of anglers onboard the vessel (paid plus free anglers); a quantity which is consistently recorded throughout the entire dataset. We explored the possibility of using the total number of observed anglers onboard the vessel in the following analyses, but it was not recorded in a consistent manner through time, e.g., recorded as the maximum number of anglers observed at a fishing stop during the trip, a sum of the observed anglers at each fishing stop, or the average number of observed anglers at all fishings stops, etc.

We explored a binomial regression model to predict the mean number of observed anglers at a fishing stop from the number of total anglers, in the initial period of the data. Binomial regression models of this general form were considered in this analysis, as well as a sensitivity analysis among the other potential covariates available in the dataset. Among the potential predictor variables in this study, effects related to the interviewer, and trip date were considered for inclusion in the final model by pairwise comparison of fitted model AIC values as well as analysis of parameter significance.

Effects related to interviewer were found to be very significant, although due to the high turn-over rate of the interviewers in these data, interviewer specific effects are not useful for prediction here. However, the total number of interviewers onboard the vessel (one or two interviewers) was found to be strongly significant and was included in the final models as a categorical effect.

For imputing the observed number of observed anglers for the early period of the dataset it is important to motivate an assumption of stationarity in the number of observed anglers through time. Thus, trip date was considered for inclusion in the model to check for any possible significance through time. Given the number of total anglers, neither of the models considering temporal effects were able to demonstrate that the number of observed anglers varied significantly through time. All models which included temporal effects produced higher overall AIC values, thus supporting the assumption of stationarity in time.

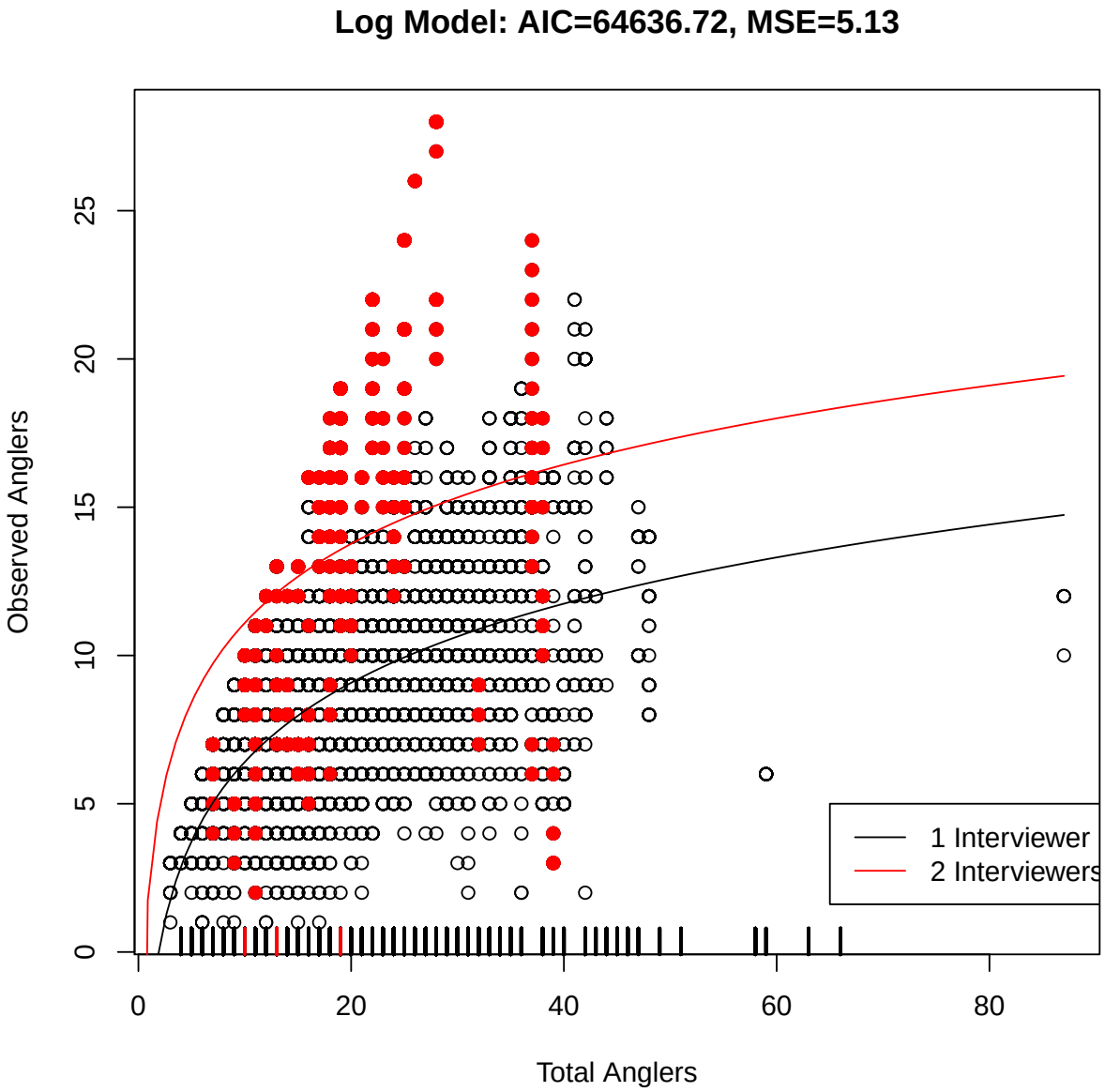


Figure B1: The number of observed anglers plotted as a function of the number of total anglers. The log-normal mean curves are plotted on the scale of the data, and colored to indicate if the data was collected in the presence of one or two interviewers. Additionally, a total anglers rug plot is included to show the total angler data for which the number of observed anglers needs to be imputed.

Log Model:

$$y_{ij} \sim \beta_{0j} + \beta_{1j} \log(x_{ij}) + \epsilon_{ij} \quad \epsilon_{ij} \sim N(0, \sigma_j) \tag{1}$$

Binomial Log Model:

$$y_{ij} \sim B\Big(N_{ij},\ \text{logit}\big(\beta_{0j} + \beta_{1j} \log(x_{ij})\big) \Big) \tag{2}$$

	`totAng`	`totAng + intNum`	`log(totAng) + intNum`
Normal	67387.29	65317.02	64636.72
Binomial	66099.40	63753.06	62498.83

The log model considers a typical normal linear model for each interviewer level, except it uses the log of the number of total anglers as a predictor rather than the raw numbers of total anglers (Figure B1). The log model has several nice features for prediction in this case. Firstly by regressing on the log of the total anglers it improves the correlation and relative homoscedasticity of the joint data and improves the accuracy of sensitivity analysis by improving the standard error estimates for each parameter. Secondly the log transformation introduces the expected mean prediction shape, by emphasizing order of magnitude differences in the total number of anglers. The binomial log model considers the observed angler counts as independent draws from a binomial given the know number of total anglers. The log transformation in the binomial case is justified over the traditional binomial glm for similar reasons as the normal log model, as well as simple AIC support of the transformation. All models and model selection criterion were computed using the standard `glm` function in the R software environment for statistical computing (R Development Core Team 2013).

The binomial log model was chosen for its low AIC value and reasonable mean predictions (Figure B2). Untransformed binomial models were considered, however they produce unreasonable observed angler predictions associated with the high numbers of total anglers. The log transformed Normal model provides mostly reasonable predictions, but is not supported

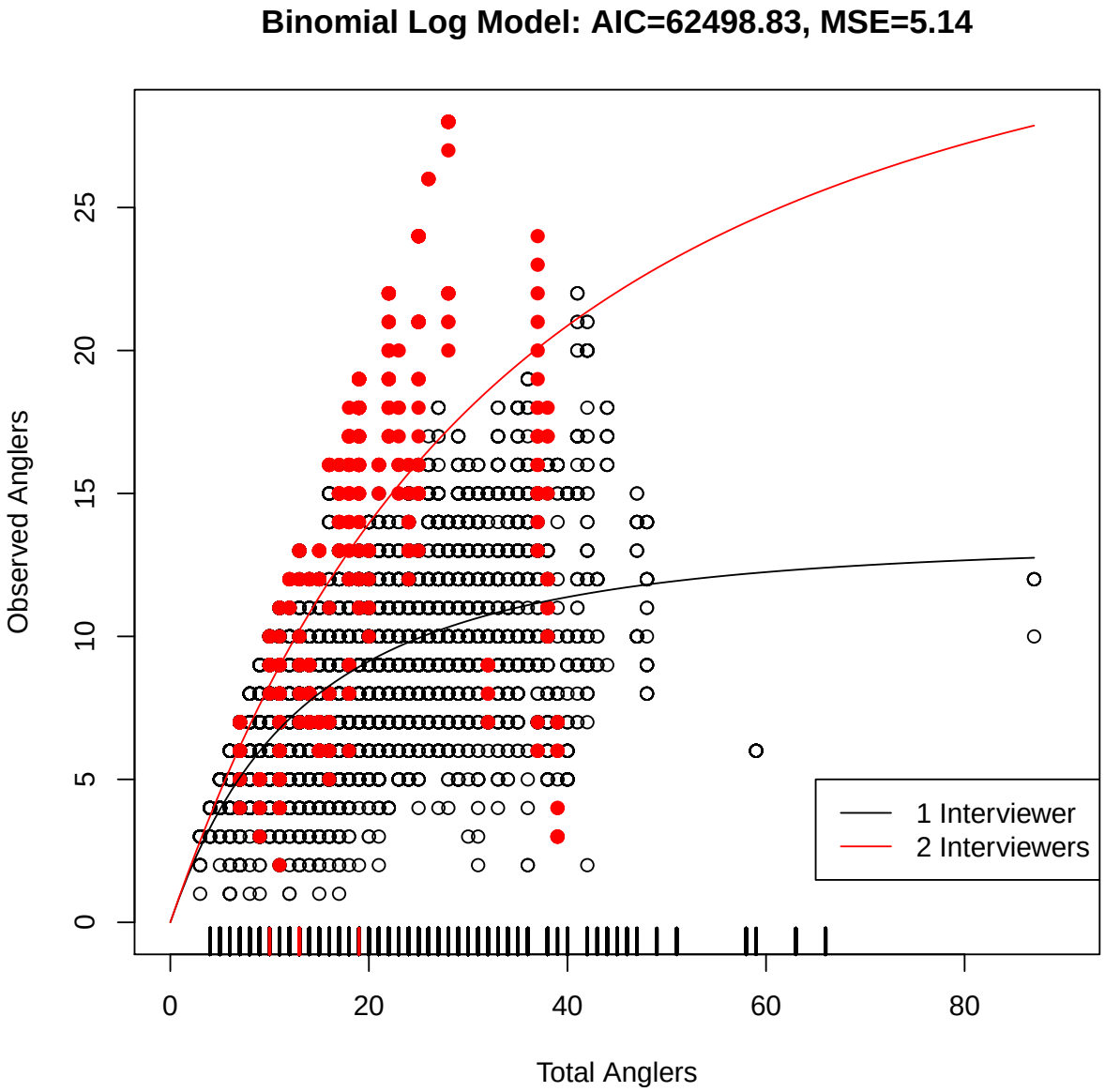


Figure B2: The number of observed anglers plotted as a function of the number of total anglers. The binomial mean curves are plotted on the scale of the data, and colored to indicate if the data was collected in the presence of one or two interviewers. Additionally, a total anglers rug plot is included to show the total angler data for which the number of observed anglers needs to be imputed.

by AIC when compared to the binomial models. Additionally transforms of Normal likelihood models have no distributional way of producing observed angler predictions which do not exceed the total number of anglers. If a Normal likelihood model were to gather AIC support, predictions may require truncation. At this point no additional predictors from this dataset were considered to be both sensitive and appropriate for use with prediction in this case.

Appendix C. Conversion of coordinate data

During the early years of data collection CDFW technicians recorded latitude/longitude, Loran Time Differences (TDs), and/or compass bearings for drifts during CPFV fishing trips. The coordinate data type column (COORD_TYPE) in the Location Table indicates the original coordinate type as recorded on the datasheet. There are three possible data entries, 1) a record with latitutde/longitude ('LAT/LONG'; 3,960 records), 2) a record with only Loran time differentials (LORAN); 1,019 records), or 3) a record containing BOTH latitutde/longidude and Loran time differentials ('BOTH'; 1,514 records). In all cases Loran time differentials were converted to latitude/longitude using Andren software package (Andren Software Company 2015).

In cases when both latitude/longitude and Loran time differentials were recorded, we plotted both sets of coordinates (with the Loran time differentials coverted to latitude/longitude), which oftentimes did not fall on top of one another.

Because there is no way to verify which set of coordinates is 'correct' we compared reef habitat and recorded and GIS derived depths to determine which location was more probable. Initial results indicated that the Loran coordinates are more reliable. The average distance between the converted Loran time differentials and the original latitude/longitude is 620 meters. Most of the converted Loran time differentials were northeast of the original latitude/longitude coordinates. However, two clusters of dirfts north of the Golden Gate Bridge had the opposite orientation, with the converted Loran time differentials falling southwest of the original latitude/longitude coordinates. Of the drifts for which we had two sets of coordinates, 24% of the drifts with Loran time differentials mapped onto a reef, whereas 16% of drifts with the original latitude/longitude coordinates mapped onto a reef.

We compared the recorded minimum and maximum depths to GIS derived depths using the 2 m resolution bathymetry layer as a metric for determining which of the two recorded coordinates may be more accurate. When compared to the depth derived from the 2 m bathymetery layer, the reported 'minimum depth' from the datasheet averaged 11 m deeper for the latitude/longitude coordinates and averaged 5 m deeper than the converted Loran time differentials. The reported 'maximum depth' averaged 6 m deeper for the latitude/longitude coordinates and averaged 1 m deeper for the converted Loran time differntials. In general, the converted Loran time differentials placed the drift coordinates in a location closer to the recorded depths and on the reefs. Therefore, we chose to use the converted Loran coordinates for analyses when both coordinate types were recorded.

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