

SR1815/CalCOFI 1810SR Cruise Instructions

Date Submitted: 09/5/2018

Platform: R/V *Sally Ride*

Project Number: UNOLS SR1815; CalCOFI 1810SR

Project Title: CalCOFI Survey

Project Dates: October 14-29, 2017

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I. Overview

A. Brief Summary and Project Period

Survey the distributions and abundances of pelagic fish stocks, their prey, and their biotic and abiotic environments in the area of the California Current between San Diego, California and Avila Beach, California during the period of fall 2018.

B. Operating Area

From San Diego, CA to Avila Beach, CA and out 300 nautical miles. Please refer to CalCOFI_1810SR_Predicted_75_Sta_Schedule.PDF for CalCOFI Line and Sta name, coordinates, and predicted order. Please note that station order may change due to weather or naval operations.

C. Summary of Objectives

Survey the distributions and abundances of pelagic fish stocks, their prey, and their biotic and abiotic environments in the area of the California Current between San Diego, California and Avila Beach, California.

I.C.1. Continuously sample multi-frequency acoustic backscatter using the Simrad EK80. The data will be used to estimate the distributions and abundances of coastal pelagic fishes (e.g., sardine, anchovy, and mackerel), and krill species.

I.C.2. Continuously sample sea-surface temperature, salinity, and chlorophyll-a using a thermosalinograph. These data will be used to estimate the physical oceanographic habitats for target species.

I.C.3. Continuously sample air temperature, barometric pressure, and wind speed and direction using an integrated weather station.

I.C.4. Sample profiles of seawater temperature, salinity, chlorophyll-a, nutrients, and phytoplankton using a CTD with water-sampling rosette and other instruments at prescribed stations. Measurements of extracted chlorophyll and phaeophytin will be obtained with a fluorometer. Primary production will be measured as C¹⁴ uptake in a six hour in situ incubation. Nutrients will be measured with an auto-analyzer. These data will be used to estimate primary productivity and the biotic and abiotic habitats for target species.

I.C.5. Sample the light intensity in the photic zone using a standard secchi disk once per day in conjunction with a daytime CTD station. These data will be used to interpret the measurements of primary production.

I.C.6. Sample plankton using a CalBOBL (CalCOFI Bongo Oblique) at prescribed stations. These data will be used to estimate the distributions and abundances of ichthyoplankton and zooplankton species.

I.C.7. Sample plankton using a Manta (neuston) net at prescribed stations. These data will be used to estimate the distributions and abundances of ichthyoplankton species.

I.C.8. Sample the vertically integrated abundance of fish eggs using a Pairovet net at prescribed stations. These data will be used to quantify the abundances and distributions of fish eggs.

I.C.9. Sample plankton using a PRPOOS (Planktonic Rate Processes in Oligotrophic Ocean Systems net) at all prescribed CalCOFI stations on lines 90.0, 86.7, 83.3 and 80.0 only. These data will be used in analyses by the LTER (Long Term Ecological Research) project.

I.C.10. Continuously observe, during daylight hours, marine mammals. These data will be used to estimate the distributions and abundances of marine mammals.

I.C.11. Deployment of four expendable wave measuring buoys at the offshore end of CalCOFI lines.

I.C.12. Radiosonde balloon releases conducted on a regular basis during CTD stations.

D. Participating Institutions

I.D.1 Scripps Institution of Oceanography (SIO)

I.D.2 Southwest Fisheries Science Center (SWFSC)

F. Administrative

1. Points of Contacts:

Chief Scientist: Daniel Schuller 858-822-0305, 9500 Gilman Dr, Dept 0206, La Jolla, CA, 92093 (dschuller@ucsd.edu)

Alternate: Jennifer Rodgers-Wolgast 858-534-2888, 9500 Gilman Dr, Dept 0206, La Jolla, CA, 92093 (jrwolgast@ucsd.edu)

2. Diplomatic Clearances N/A

3. Licenses and Permits

a. All marine mammal work is covered under a federal research permit NMFS Permit 727-1915 issued to Dr. John Hildebrand of SIO.

b. CDFW ON April 2, 2015 to NOAA-SWFSC-FRD-Cisco Werner (SC-12372)

II. Operations

A. Project Itinerary October 11 - 13: Load scientific gear Nimitz Marine Facilities (MarFac), Pt Loma

Oct 14 (Sunday) 0700: All cruise participants onboard

Oct 14 0800: Depart San Diego, CA

Oct 29 1600: Arrive San Diego, CA

Oct 30 0800: Unload RV Sally Ride at MarFac

Staging and De-staging

Staging for CalCOFI requires 3 days. Final de-staging will be conducted in San Diego, CA (MarFac).

We request 2 laboratory vans to be craned onto the afterdeck and secured in San Diego prior to departure. The dimension of the CalCOFI van is approximately 8x10x8 feet weighing 6500 lbs. Dimensions of GP van is approximately 8x20x8 feet weighing 8500 lbs. Power requirement is 110V.

We request 1 Seamac electric winch to be craned onto the afterdeck and secured in San Diego prior to departure. The dimension of the winch is 4.5x4.5 feet. Power requirement is 440V 3-phase.

B. Operations to be conducted

II.B.1. Underway Operations

II.B.1.a. Thermosalinograph sampling - The RV Sally Ride will provide and maintain a thermosalinograph (TSG), which is calibrated and in working order, for continuous measurement of surface water temperature and salinity.

II.B.1.b. Acoustics: Throughout the cruise, the EK80 echosounders will be operated at 38, 70, 120 and 200 kHz and interfaced to a data acquisition system to estimate small pelagic fish and krill biomasses between 10 and 750 m. An EK80 Adaptive Logging program (EAL) will be run continuously to detect the seabed depth and optimize the logging range while avoiding aliased seabed echoes ("false bottoms"). During daytime transit between stations, the ship will maintain a desired speed of 10 knots. The ship shall inform the Cruise Leader of any use of the vessel's sounders, as it interferes with the signals received on the EK80 that will be used continuously.

II.B.1.c. Acoustic hydrophone: During transit between most daylight stations, an acoustic hydrophone array will be towed from the stern at a distance of 300 meters with a deck loaded winch to record sounds from marine mammals. The winch is 440V 3-phase with a deck pattern of 4.5 by 4.5 feet. Upon approaching a station, two sonobuoys will be deployed one nautical mile prior to stopping for station work.

II.B.1.d. Expendable wave measuring drifter. Four expendable wave measuring drifters to be deployed at the offshore end of CalCOFI lines 93.3, 86.7, 80.0, 76.7. Drifters will be deployed by ship research or science technician as ship is coming up to speed steaming away from station.

II.B.2. Station Operations

Each standard station will include the following:

II.B.2.a. CTD/Rosette consisting of 24 10-liter hydrographic bottles will be lowered to approximately 515 meters (depth permitting) at each station to measure physical parameters and collect water at discrete depths for analysis of: salinity, nutrients, oxygen, chlorophyll, etc.

II.B.2.b. CalBOBL (CalCOFI Bongo Oblique): standard oblique plankton tow with 300 meters of wire out, depth permitting, using paired 505 μm mesh nets with 71 cm diameter openings. The technical requirements for this tow are: Descent wire rate of 50 meters per minute and an ascent wire rate of 20 meters per minute. All tows with ascending wire angles lower than 38° or higher than 51° in the final 100 meters of wire will be repeated. Additionally, a 45° wire angle should be closely maintained during the ascent and descent of the net frame. The port side sample will be preserved in buffered ethanol at every station.

II.B.2.c. Manta net (neuston) tow: using a 505 μm mesh net on a frame with a mouth area of 0.1333 m^2 . Tows are 15 minutes in duration at towing speed of approximately 1.5 - 2.0 knots. Wire angles should be kept between 15° and 25° .

II.B.2.d. Pairovet net: will be fished from 70 meters to the surface (depth permitting) using paired 25 cm diameter 150 μm mesh nets at all stations out to and including station 70.0. The technical requirements for Pairovet tows are: Descent rate of 70 meters per minute, a terminal depth time of 10 seconds and an ascent rate of 70 meters per minute. All tows with wire angles exceeding 15° during the ascent will be repeated.

II.B.2.e. A PRPOOS (Planktonic Rate Processes in Oligotrophic Ocean Systems) net will be taken on specific stations on line 90.0, 86.7, 83.3, and 80.0. These stations are occupied as part of the LTER (Long Term Ecological Research) project. The mesh of the PRPOOS net is 202 μm and the tow is a vertical cast up from 210 meters. The technical requirements for the PRPOOS tows are: Decent rate of 40 meters per minute, a terminal depth time of 20 seconds and an ascent rate of 50 meters per minute.

II.B.2.f. Primary productivity: at about 1100 hours on each day a primary productivity CTD cast consisting of six 10-liter hydrographic bottles (mounted on CTD frame) will be carried out. The cast arrangement will be determined by a Secchi disc observation. This cast will be in conjunction with an already scheduled station. The purpose of the cast is to collect water from six discrete depths for daily *in situ* productivity experiments. Measurements of extracted chlorophyll₁₄ and phaeophytin will be obtained with a fluorometer. Primary production will be measured as C uptake in a six hour *in situ* incubation. Nutrients will be measured with an auto-analyzer. All radioisotope work areas will be given a wipe test before the departure of the SIO technical staff.

II.B.2.g. A light meter (Secchi disk) will be used to measure the light intensity in the euphotic zone once a day with the primary productivity cast and all daytime stations.

II.B.2.h. Weather observations.

II.B.2.i. Radiosonde balloon releases to be conducted by science technicians.

II.B.3.a. Order of Operations for each standard station:

- 1) CTD to 515 meters with 24 bottle rosette (depth permitting).
- 2) Secchi disk (daylight stations only, Secchi will be first prior to CTD on Primary Productivity station of the day which is typically 0900-1100).
- 3) PRPOOS net tow (lines 90.0, 86.7, 83.3 and 80.0 only).
- 4) Pairovet net tow (on all lines out to station 70.0 but not to include near shore SCCOOS).
- 5) Manta net tow (on all stations except for near shore SCCOOS and stations after line 76.7).
- 6) Bongo net tow (on all stations).

II.B.4.a.

- 1) Vessel speeds are restricted on research cruises in part to reduce the risk of ship strikes with marine mammals. Transit speeds vary from 8-11 knots.
- 2) While underway:

We will have 2 marine mammal observers on the forward observation deck during all daylight transects.

We will have a marine mammal acoustician with a towed hydrophone. The hydrophone will be towed off the stern at a distance of 300 meters between daylight stations. The hydrophone will be deployed at a ship speed of 5 knots while leaving a station. Once deployed, ship can travel at full speed. **At 2 miles from daylight station arrival**, we request the bridge notify the observers so they can retrieve the hydrophone and prepare for station arrival. The hydrophone can be retrieved at ship's full speed. **At 1 mile prior to each daylight station** marine mammal observers will deploy 2 sonobuoys. The hydrophone will be retrieved at this time.

Communication will be open to bridge during all hydrophone deployments and retrievals.

C. Applicable Restrictions Conditions which preclude normal operations:

In the event of poor weather conditions, we will work with the ship's officers on developing the best strategy for completion of all stations safely.

We have replacement gear for most operations. Equipment failure should not impact our project.

III. Equipment

A. Equipment and Capabilities provided by the ship (itemized)

We request the following systems and their associated support services, sufficient consumables, back-up units, and on-site spares. All measurement instruments are assumed to have current calibrations and we request that all pertinent calibration information be included in the data package.

Starboard hydro winch with 3/8" cable for standard Bongo, Manta, Pairovet and PRPOOS tows

Starboard forward Kraken arm winch with EM cable for standard CTD casts

Starboard aft Kraken arm winch w/blocks to accommodate 0.375" cable

Wet lab refrigerator room set at $2^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($35^{\circ}\text{F} \pm 2^{\circ}\text{F}$)

-80°C (-40°C is acceptable if -80°C is unavailable) chest freezer in wet lab or dry lab

Knudsen 12 kHz depth recorder or comparable

Multifrequency EK80 transducers (ES38B, ES70-7C, ES120-7C, ES200-7C)

GPS feed to marine mammal observation deck GPS feed to main labs for use by scientists

110V power to science van on main deck

440V power to science winch on main deck

440V power to GP van on main deck

B. Equipment and Capabilities provided by the scientists (itemized)

37% Formalin (SWFSC) Ethanol (SWFSC)

Tris buffer (SWFSC)

Sodium borate (SWFSC)

30 cc and 50 cc syringes (SWFSC)

Cannulas (SWFSC)

Pint, quart and gallon jars (SWFSC)

Inside and outside labels (SWFSC)

CalCOFI net tow data sheets (SWFSC)

71 cm CalCOFI Bongo frames (SWFSC)

71 cm CalCOFI 505 μm mesh nets (SWFSC)

CalCOFI 150 μm Pairovet nets and codends (SWFSC)

CalCOFI Pairovet frames (SWFSC)

333 μm mesh codends (SWFSC)

Digital flowmeters (SWFSC) PRPOOS frames (SIO)

170 lb PRPOOS weight (SIO)

202 μm mesh PRPOOS nets and codends (SIO)

75 lb Bongo weight (SWFSC)

100 lb hydro weight (SWFSC)

CalCOFI Manta net frames (SWFSC)

60 cm CalCOFI 505 μm mesh Manta nets (SWFSC)

Standard CalCOFI tool boxes (SWFSC)

Bucket thermometers and holders (SIO)

Hand held inclinometer for Pairovet and Bongo tows (SWFSC)
Oxygen auto-titration rig with reagents (SIO)
Oxygen flasks (SIO)
Guildline Portasal (SIO)
Salinity bottles (SIO)
Standard sea water (SIO)
Data sheets for scheduled hydrographic work (SIO)
Weather observation sheets (SIO)
Primary productivity incubation rack (SIO)
14C and other chemicals for primary productivity work (SIO)
SBE911+ CTD unit with necessary sensors (SIO)
Turner fluorometer (SIO)
90% acetone and all supplies for chlorophyll extraction (SIO)
Nutrient auto analyzer (SIO)
Chemicals for all nutrient analyses (SIO)
Laptop computer running Matlab / EAL EK60 Adaptive software (SWFSC)
EK80 calibration apparatus (SWFSC)
Isotope van (SIO)
Winch for acoustic array (SIO)
Dissecting microscopes (SWFSC)
Sonobuoys (SIO)

V. Additional Projects

N/A

VI. Disposition of Data and Reports

A. Data Responsibilities

The Chief Scientist will receive all original data related to the project. The Chief Scientist will in turn furnish the Captain with a complete inventory listing of all data gathered by the scientific party, detailing types of operations and quantities of data prior to departing the ship **if requested**. All data gathered by the vessel's personnel that are desired by the Chief Scientist will be released to him, including supplementary data specimens and photos gathered by the scientific crew.

B. Pre and Post Project Meeting

Prior to departure, the Chief Scientist will conduct a meeting of the scientific party to train them in sample collection and inform them of project objectives. Some vessel protocols, e.g., meals, watches, etiquette, etc. will be presented by the ship's Resident Technician and/or First Mate.

VII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least seven days prior to the survey.

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientist. The Chief Scientist will work on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current make-up of the ship's complement. The Chief Scientist is responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Chief Scientist is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the project and at its conclusion prior to departing the ship.

B. Shipboard Safety

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. Steel-toed shoes are required to participate in any work dealing with suspended loads, including CTD deployments and recovery. The ship does not provide steel-toed boots. Hard hats are also required when working with suspended loads. Work vests are required when working near open railings and during small boat launch and recovery operations. Hard hats and work vests will be provided by the ship when required.

Appendices Appendix 1.a. Detailed list of Scripps Oceanography Chemicals and spill control plan.

Scripps Oceanography, CalCOFI Chemical Spill Kit List, *RV Sally Ride Nov 2016*

The main concern here is the 10 normal Sulfuric Acid which is secured to the bench in wooden box to prevent spill. We bring a 13.5 lbs bag of Baking soda to neutralize acid in the event of a spill. Our Radiation van has a spill kit that consists of 2 x 1/2 gallon of Safety Sorbent, the spill kits listed below were just ordered along with additional baking soda. In addition to the spill kit in the Rad van we bring 6 x 1/2gallon additional cartons of Safety Sorbent

<http://wyksorbents.com/anti-slip-safety-sorbent/> Safety Sorbent 8 x 1/2 gallon

(<http://wyksorbents.com/anti-slip-safety-sorbent/>)

Sodium Bicarbonate (Arm & Hammer baking soda)

2 x 13.5 lbs bag for Acid Spills

Portable Allwik Economy Spill Kit in Yellow Bag x2

(<http://www.fastenal.com/web/products/detail.ex?sku=1007705>)

Vinyl gloves 20+ boxes (50-100) count

Containment bags 3 rolls of 50 each

Roll paper towels 12 each.

Appendix 1.b. See separate Sta-Pos_CalCOFI_1810.PDF