Cruise Plan Report Final
March 7, 2010

This plan is for Seibel Leg 1 June 02- June 16.

Legs:
1. Seibel (chief scientist)
   May 26: Load ship in San Diego
   May 29: Depart San Diego
   June 02: Arrive Guaymas, pick up remaining science group
   June 03: Depart Guaymas
   June 16: Arrive Guaymas (*science crew disembark*)

2. Sweeney (chief scientist)
   June 17: Depart Guaymas
   TBD: Arrive Guaymas (*remaining science crew disembark*)
   TBD: Arrive La Paz (*remaining science crew disembark*)
   July 01: Arrive San Diego
   July 01-05: Off-load ship

Research Stations:

- Guaymas Basin.
  (27.25°N, 111.5°W).
- 2. Sta. Rosalia
  (27.25°N, 112° W)
- 3. Squid acoustic surveys

The submitted Mexican Clearance paperwork requests permission for:
“South-Central Gulf of California; area approximately bounded by Guaymas (28°N, 111°W), Pescadero Basin (24.5°N, 109.5°W), Santa Rosalia (27.3°N, 112.3°W) and San Pedro Martir Basin (28.5°N, 112.75°W). Exact locations will be dictated by the seasonal presence of jumbo squid. No work will be carried out on or near any islands.”
**Objective 1:** Capture squid for shipboard physiological experiments.

**Location:** Squids migrate May-June from Guaymas to Sta. Rosalia. They are diel vertical migrators, spending nighttime in near-surface waters and daytime near 300 meters depth.

**Method:** We will fish for squids by hook (jig) and line both during the day and at night with aft deck lights used to attract squids to the surface at night. Jigging will be carried out periodically throughout the cruise. Typically a jigging session of 1-2 hours is adequate.

Two small (3 x 5 x 2’deep) tanks will hold squids on aft deck prior to experiments (blue ovals in ship main deck diagram below). Seawater will run continuously through these tanks. We will also have a large reservoir tank for chilled seawater on the starboard deck (48” x 48”, Orange A in diagram) that will be cooled by a 1 HP (220V) chiller (Orange B in diagram). This system will recirculate water through two modified coolers (Orangange C in diagram) that will hold small squid in individual acrylic tubes.

Shipboard respirometry apparatus ranges from large tanks (200 gallon acrylic tank) to small chambers (10 ml) for hatchling squids. Temperature control requires chillers with high power requirements (see below).

**Objective 2:** Acoustic surveys of squid populations (Benoit-Bird)

A pole mount holding acoustic transducers will be deployed off the port side of the vessel (see attached photos) to allow observation of squid at depth during much of the cruise. The pole mount has been tested on the New Horizon has been tested on previous cruises to a maximum speed of 10 knots. However, acoustic surveys will be carried out at a vessel speed of approximately 5 knots. We anticipate the pole will remain deployed nearly continuously throughout the cruise unless a high transit speed is required or maintenance needs to be performed on the pole or transducers. Surveys will be conducted throughout the Gulf both during other operations and as planned, often repetitive transect lines.

Periodically, both day and night surveys will be interrupted to permit CTD casts to be taken within the survey area, to jig for squid to groundtruth acoustic, and to conduct focused zooplankton net tows. Because of cross-talk between acoustic instruments, we anticipate the need to secure the ship’s acoustic instrumentation including the ADCP, acoustic velocimeter, and likely echosounder. To facilitate safe navigation, we will work with the ship’s Resident Technician to provide a video feed from the scientific echosounders to the bridge. Acoustic instruments are powered by 2 sets of 3 deep cycle marine batteries. At any one time, one set of batteries will be running the instruments while one set is charging. The batteries are housed in water resistant boxes that can be tied to the deck just outside the lab and cabled to the topside instruments in the aft lab. A wire connected to the topside instruments will be trailed just beneath the surface, tied off the side of the vessel to provide a reference ground.
Objective 3: Tag, release and recovery of squids (Gilly). Freshly jigged squid will be tagged with several devices from the Zodiac vessel adjacent to the ship. This will facilitate release of the animals with minimal damage. Squid jigged from the main deck will be maneuvered to the Zodiac for tag deployments and release. Recovery of Crittercam units can be done from either the main vessel or the Zodiac using a VHF receiver and hand-held antenna. Recovery of pop-up satellite tags will be done from the main vessel utilizing radio direction-finding gear tuned to the Argos frequency. In both cases, tags are recovered from the water with dip-nets.

Objective 4: Midwater trawling for zooplankton.

Location: Trawls will be conducted between 100 and 1500 meters depth. We will transit from Guaymas port to the Guaymas basin where bottom depths in excess of 2000 meters can be found (see attached map).

Method: 3 square meter modified Tucker Trawl. The net is 30 meters long and is weighted by 1000 pounds of lead. The cod-end is 30 liters and so requires a crane to pull on board. The net is recovered using A-frame, wide-mouth blocks on both sides of A-frame (see photo), capstan through deck block. The net is tripped using MOCNESS-like electronics package run through a 0.68 conducting cable (see photo). We will require a res-tech capable of terminating the cable with the net electronics.

Objective 5: Diving Operations:

Method: A dive plan will be submitted to Scripps DSO, Christian MacDonald. We hope to perform both day and night dives about every other day (up to 10 dives over 14 days). Divers will enter the water via zodiac. A standard bluewater diving rig will be provided that conforms to AAUS safety standards. All divers are AAUS certified. Seibel has extensive experience leading bluewater diving and experience diving with the Humboldt squid, Dosidicus gigas. Using the methods we’ve developed (listed below), the squids pose no threat.

1. Weather conditions for night dive operations: wind speeds 15kts or less, with appropriate sea conditions.
2. Only those divers fully qualified in blue water night diving will participate (no trainees).
3. All divers will carry back-up dive lights.
4. The Zodiac will provide underwater lighting to the dive site/down line.
5. No chumming, fishing or discharge of ship's garbage within two miles of the dive site, and/or within four hours of dive operations, taking into account wind and currents conditions.
6. Initial night dive operations will start out conservatively, two science divers and one safety diver at a depth of 40 feet.
7. Maximum number of science divers is limited to four.
8. The safety diver should have a powerful light.
9. Maximum depth of safety limited to 50 feet.
10. Science divers to shorten tethers to 15 feet or less, depending upon the circumstances.
11. Science divers should keep a close watch on the safety diver (review line pulls, etc).
12. There should be no diver contact with squid, and divers should discourage the squid for contacting them, e.g., remove their tentacles if touched.
13. The dive should be aborted at the first sign of aggression with an agreed upon abort plan: divers facing outward and remain attached to the trapeze, surfacing together, the safety diver controls ascent.
14. Review abort plan with Zodiac, and the Zodiac should have experienced diver on board to assist.
15. All divers will carry underwater strobes, cyalume sticks, safety buoy/sausage and whistles.

<table>
<thead>
<tr>
<th>Lead Diver:</th>
<th>Brad Seibel</th>
<th>URI</th>
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</thead>
<tbody>
<tr>
<td>Divers:</td>
<td>Rui Rosa</td>
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<td>Stephanie Bush</td>
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<td>Trisha Towanda</td>
<td>URI</td>
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<tr>
<td></td>
<td>Jillian Schneider</td>
<td>URI</td>
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**Shipboard experiments:**

1. A large acrylic tank (3’ x 3’ x 6’) will be placed in the aft lab (red rectangle in ship main aft wet lab plan below and will be placed in a water-jacket tank connected to a chiller (see power requirements below). We will have heavy seawater requirements for this flow tank.

2. We will use compressed gases to change oxygen and CO₂ levels in seawater. We will require 5 bottles in the lab at any given time, 15 additional bottles stored on deck (Perhaps on 01 deck, not shown.

3. Acoustic transducers on pole mount (described above, objective 2) on port side forward on aft deck (green square) (see attached photos) To allow the pole to be deployed and recovered, we will need to use a portable davit with puller to lift the pole. Pole will be attached in San Diego.

4. A small RHIB or Zodiac is required to deploy tagged squids, recover tags and for bluewater SCUBA diving (possibly stored on the 02 deck?).

5. Diving will also require a compressor to refill tanks.

6. A large (3m² mouth) Tucker Trawl (yellow square) with MOCNESS-like electronics package will be deployed through the A-frame on the aft deck (described above). Deployment usually requires capstan, cherry-picker crane, and winch with. The net has a weight bar with 1000 lbs lead weight.

7. Squid jigging will be conducted each night (~9-12pm) along the starboard aft deck. Collected squids will be held in large chilled aquaria (blue circles) and in the coolers with recirculating chilled water (orange C).
8. We will use the cold-room for specimen and seawater storage. It should be held at about 10°C.

9. We will conduct CTD casts with dissolved oxygen sensor at least daily in the upper 1000 meters. We have low requirements for water samples. A rosette with the fewest and smallest go-flow bottles is sufficient.

10. Physiological experiments on restrained squid in a tank will be conducted in the Hydro Wet Lab. The tank will be held on a steel-frame table (24” x 36”, Orange D in diagram). A 110 V chiller will keep this system cold (Orange D in diagram). A support table for electronic instrumentation will also be required (Orange F in diagram). These behavioral experiments on living squid should be carried out in this space to minimize agitation of the squid by human traffic and to keep ambient lighting low.

11. STD Lab will be converted into a dark room for physiological experiments using polarized light. A small (2’ x 2’ x 2’) acrylic tank containing seawater will be held here.

Power Requirements:

Chillers (4)  
Aft lab: One - 1.75HP chillers 230V 60HZ 9.5RLA/52LRA amps.  
One - 1HP chiller 230V 60HZ 7.8RLA/43LRA amps

Deck One - 1.75HP chillers 230V 60HZ 9.5RLA/52LRA
<table>
<thead>
<tr>
<th>Participant full name</th>
<th>Cell phone</th>
<th>Arrival Port</th>
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Acoustic pole mount on New Horizon
MOCNESS setup for Tucker Trawl

Tucker Trawl with MOCNESS on New Horizon. Note side blocks on A-frame to lift weight bar using capstan
Tucker trawl WITHOUT Moc. Again, note side blocks on A-frame.
Termination Procedure for MOCNESS setup.

- Stainless Steel Wire
- Terminal
- Bare Wire - make solder connections here and then complete with underwater splice
- Conducing Cable with Insulation
- Split long or as needed
- Peel Ring
- Strand of Insulated Cable
- Mill w/ Crownhead
- Hose Clamp
- Seal with pumice tape prior to placing Crowhead (same for all holes)