To: Amber Mace, California Ocean Science Trust

From: Mary Gleason, Lead Marine Scientist, The Nature Conservancy

Date: November 25, 2008

Re: Central Coast Trawl Impact Study, External Science Review

At the request of the California Ocean Science Trust, The Nature Conservancy (TNC) convened an external science panel to review the study design for the Central Coast Trawl Impact Study, Task 3 of the Ocean Protection Council (OPC) Grant to TNC to support the Central Coast Groundfish Project. The external scientific review process was helpful and resulted in significant changes and improvements to the study design. A brief summary of the review process, major comments received from reviewers, and how comments were addressed in the study design is provided below.

REVIEW PROCESS:

The review process included an "internal" review by key partners in the project, who have already committed to being involved in the trawl impact study and have also committed resources to support the preliminary phases. These key partners include:

- Dr. James Lindholm, California State University, Monterey Bay
- Dr. Elizabeth Clarke, Northwest Fisheries Science Center, National Marine Fisheries Service
- Dr. Andrew DeVogelaere and Lisa Wooninck, Monterey Bay National Marine Sanctuary
- Dirk Rosen, Marine Applied Research and Exploration

An external science review panel was also convened to review and critique the study design. The external review process involved the following experts in ecology, fisheries management, and gear design:

- Dr. Phil Levin, Northwest Fisheries Science Center, National Marine Fisheries Service
- Dr. Nick Tolimieri, Northwest Fisheries Science Center, National Marine Fisheries Service
- Deb Vandenberg Wilson, California Department of Fish and Game
- Dr. Rick Starr, Moss Landing Marine Laboratory
- Dr. Chris Class, Northeast Consortium and University of New Hampshire
- Bob Hannah, Oregon Dept. of Fish and Wildlife

We provided the external science review panel with a draft of the study design document in early September and held a conference call on September 12, 2008 to discuss the design and the preliminary site prospecting cruise, which was conducted on September 16-23. Based on comments received and knowledge gained about the sites on the cruise, we revised the study design document and sent it again to the review panel in early October. We held another conference call on October 9, 2008 with most of the group and received additional input. We also got additional comments verbally from Rick Starr at a later date, as he was unable to attend prior conference calls. We then revised the study design document a third time and sent it around to the review panel for final review. At that point we heard from the review panel that they approved the simplified design and/or had only minor comments.

MAJOR REVIEW COMMENTS:

All of the reviewers found the study objectives to be compelling and considered the study to be much needed on the West Coast to increase our understanding of soft-bottom communities and to help inform management decisions.

Research Questions

The review panel agreed with the research questions and objectives and encouraged us to emphasize "recovery" as much as the "impacts" following trawling. The ecological objectives of understanding the effects of directed trawling on microhabitats, epifaunal invertebrates, infauna, and fish were considered important. The panel agreed that the study needed to be at least five years in duration to be able to measure any recovery. The panel was also interested in the effects of different intensities of trawling, different depths and habitats, and different gear types; however, the group agreed that sufficient replication is needed to be able to answer the questions posed that were deemed most important. Based on this input, we focused the final study design on fewer research objectives than initially proposed.

Site Selection

Initially we discussed with the review panel the potential to have the study conducted at two sites and/or two depth zones. Based on a prospecting cruise and more information about the area, we presented several other design options. Concern was raised about pseudo-replication or problems with north-south gradients or depth gradients in community response to trawling in many of the designs proposed. We also had to design the study around an undersea cable area, which all agreed could present problems if not avoided geographically in the design. An overall recommendation was that a better design should include at least 2 sites at 1 depth to increase spatial replication and help to get a clearer answer. Additionally, a better design could provide more options for analyzing the data. However, given the cable area and the differences in habitat north and south of the cable zone, this design was not feasible. For these reasons we focused the final study design on one site and one depth range (160-170m) off of Morro Bay.

Experimental Design and Replication

The comments on experimental design focused mostly on the level of replication needed to see effects in these soft-bottom communities, which typically show high levels of spatial and temporal variability. The review panel generally agreed that focusing the study on the different treatments and which one would expect to show the greatest difference, and maximizing replication in those treatments, would be best. Therefore, the final design focuses on comparing only trawl treatments with untrawled controls, rather than evaluating several different levels of trawling intensity. We agreed with the reviewers to conduct an analysis of trawl track data to determine a "typical" trawling intensity to employ.

To ensure appropriate design, reviewers recommended a random stratified approach to assigning plots to trawl or control status. To maximize replication, we agreed to conduct as many ROV transects and infaunal samples as is possibly feasible.

Further questions were raised over the feasibility of the fisherman being able to implement the trawl treatments, whether or not it is possible to do the trawling treatments in a smaller "box", as well as being able to follow the trawl tracks with the ROV (constraints of the equipment and boat type). We had discussions with the trawl fisherman to determine a feasible design.

Trawl Gear Used

There was a lengthy discussion of the most appropriate trawl gear to use in the study. Conventional trawl gear is declining in use on the West Coast and generally not advocated for, as it is considered very destructive. We had proposed using the modified "light footrope" trawl gear currently employed on the TNC vessel off Morro Bay as a less destructive gear type. We provided a better description of that gear to the reviewers and agreed to hire a gear designer to do an assessment of how typical that lighter gear is on the West Coast. Currently there are no studies of the impact and recovery of this type of lighter gear.

SUMMARY OF HOW STUDY DESIGN ADDRESSED MAJOR COMMENTS:

Many of the review comments were addressed by providing more explicit detail in the study design document or through further discussion with the reviewers. However, by the time the panel review process was completed, the study was significantly redesigned to be focused on fewer questions and to be simpler in experimental design. Based on concerns about the amount of replication needed to address spatial/temporal variability in these deep soft-bottom habitats and other confounding factors in these types of studies, we greatly simplified the study design. The design is now focused on the question of ecological impacts of trawling and differences in recovery patterns in intensely trawled plots vs. control plots at one site and one depth. This will give us the most power to actually measure a difference with the amount of replication we can realistically accomplish. The study will be a paired and randomized design of trawled and untrawled plots at one site. We will be measuring microhabitat, invertebrate, and fish responses to directed trawling and the recovery of seafloor communities.

We also identified the best site and depth (off Morro Bay on the continental shelf at 160-170m) at which to conduct this study, since we do not have the capacity to implement sufficient replication at more than one site. At this point, we don't have the capacity to address other questions, which we had initially posed, about the effect of several different intensities of trawling and different sites on impact and recovery of seafloor communities. This study may also be complemented by a study Dr. Liz Clarke (NMFS/NWFSC) may be launching next year at a deeper (400 meter) site off of Port San Luis that will address some similar questions about trawl impacts in a much different habitat.

We provided to the external review panel a description of the modified light-footrope trawl gear currently in use on the F/V South Bay and have agreed to have a trawl net gear designer (Sara Scanzer from Foul Weather Gear in Portland) assess this gear well before the directed trawling is implemented. This assessment will help to determine if this is the most appropriate gear to use for this study or if we should implement a different trawl gear design for the directed trawling.

We have been working with our local trawl fisherman on the appropriate size of the "trawl treatment" plots to ensure that he will be able to effectively trawl them and avoid the control plots. We also are working on the appropriate length of ROV transect and number of infaunal samples needed, given the level of variability found in the initial data from the prospecting cruise.

We will evaluate the historical trawl footprint data (in conjunction with NOAA partners) to determine the appropriate intensity of trawling to implement in the trawled plots. We will aim to implement a "typical" trawling intensity in the trawled plots (exact number of trawl events to be determined).

Overall, the external science review panel provided excellent comments and feedback. Based on their input, the final study design is simpler and more robust than the initial design.