Cruise Report for 2007 Untrawlable Bottom Project

Prepared by Michael Martin, Chris Rooper and Mark Zimmermann

Cruise ID: **OD0705** Vessel: ***R/V Oscar Dyson***

Cruise Dates: **4/11/2007 – 4/23/2007**

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Overview

Biennial trawl surveys conducted in the Gulf of Alaska by the National Marine Fisheries Service (NMFS) are a primary method of estimating and monitoring commercial groundfish abundance. These surveys follow a stratified random sampling design. A persistent problem in the accurate estimation of groundfish biomass using trawl surveys is the unknown (but presumed large) amount of the continental shelf that is not fishable with our standard survey bottom trawl gear. In the current biomass estimation process, catch data for each species is expanded across entire strata regardless of the proportion of untrawlable ground within the strata.

Current bottom trawl surveys in the Gulf of Alaska include substantial areas that cannot be sampled with standard survey trawls due to the excessively rough, hard, or steep seafloor. Many of these areas have been identified while searching for trawlable bottom during the standard trawl surveys, but these efforts suffer from two problems. First, since survey stations are defined by a 25 km^2 grid superimposed on the survey strata, the data collected to date do not afford sufficient granularity to examine trawlability on a fine scale. Another problem has been the subjective nature of the classification process for trawlability. Different observers, with varying levels of experience in overall bottom trawling and use of the survey net and using different acoustic systems, make subjective decisions as to whether or not there is a reasonable probability of collecting a trawl haul sample successfully at a particular station. Inevitably, this leads to inter-vessel and inter-annual differences in the results of this process. To address this problem, a more objective and fine-scale method of evaluating the trawlability of the bottom with respect to the standard survey net would be very desirable. The main impetus for this cruise was to evaluate the utility of acoustic and ancillary data in the development of a more objective method of determining bottom trawlability.

Objectives

The scientific objectives of the cruise were to:

1. Estimate critical angle (terrain slope) distinguishing trawlable from untrawlable bottom.
2. Evaluate a split beam echosounder's ability to measure slopes in both alongship and athwartship directions.
3. Investigate the effect of water depth on perception and measurement of slope.
4. Examine how the interplay between hardness and roughness affects trawlability.
5. Estimate a split beam echosounder's ability to detect hardness/roughness.
6. Evaluate the importance of heave, pitch, and roll data on acoustic data quality in the estimation of trawlability.

7. Evaluate how the use of multiple frequencies improves the estimation of trawlability

Vessel and Gear

All operations were conducted aboard the NOAA ship *Oscar Dyson*. Acoustic data were collected continuously along a series of transects with a Simrad ER60 echo integration system incorporating five centerboard-mounted transducers (18 kHz, 38 kHz, 70 kHz, 120 kHz, and 200 kHz). A drop camera system with strobe lighting was used for video validation of acoustic data.

Itinerary

April 10	Embark scientists in Ketchikan
April 11-12	Acoustic and camera work in Kasaan Bay
April 13	Transit to Glacier Bay/Iphigenia Bay acoustic transect
April 14-16	Acoustic work in Glacier Bay
April 17-23	Acoustic work in outside waters, transit to Kodiak

Study Areas

The areas studies included Kasaan Bay (near Ketchikan), Glacier Bay and selected areas previously investigated during the Gulf of Alaska biennial bottom trawl survey in outside waters between Iphigenia Bay and Kodiak (see Fig 1).

Study Design and Methods

There were two distinct portions of the cruise. The first portion of the cruise was conducted in the well-mapped waters of Kasaan and Glacier Bays. We chose these bays for their proximity to the cruise starting location, protection from swells and wind waves, and relatively shallow, diverse habitats revealed in highly detailed multibeam bathymetric data. Specific transects were chosen for study based on the local slope and bottom rugosity inferred from the bathymetric data. The vessel ran transects at different orientations with respect to known slopes, ranging from minor (< 1 degrees) to steep (>50 degrees). Transects were also run over bottom representing the full range of

roughness and hardness found in these bays. The drop camera was deployed along a transect in Kasaan Bay to visually examine the seafloor characteristics detected by the sonar data. Transects conducted in Glacier Bay intersected or followed several historical camera transects with published groundtruth habitats.

The second portion of the cruise was conducted in offshore waters where the NMFS Gulf of Alaska bottom trawl survey is conducted. The objective was to run acoustic transects over stations that were part of previous Gulf trawl surveys, especially those in marginally trawlable areas. During trawl surveys, the captains and chief scientists aboard the survey vessels attempt to trawl at several hundred randomly assigned locations. While bottom trawls can be conducted successfully at many of these sites with a minimum of searching, some attempts result in net damage or hang-ups, and some stations are searched and abandoned due to roughness, steepness, or hardness. When a station was determined to be untrawlable, the reason(s), along with the track of the search pattern, has been documented in a database. Utilizing this historical information, we created transects that followed previous tow paths and search patterns. Marginally trawlable areas were defined as areas where tows where attempted, but either unsuccessful or marginally successful due to interaction with the seafloor (hang-ups and net damage, primarily). These areas were of particular interest because they represent areas where the vessel captains and chief scientists believed there was a reasonable chance of success before the tow was attempted. Data were also collected along good performance tows when convenient.

Continuous data on vessel motion (heave, pitch, and roll) were collected throughout the cruise to allow evaluation of the effect of vessel motion on data quality in estimating trawlability. CTD casts were performed periodically in order to better estimate sound speed for the acoustic data analysis.

Results

Nearly the entire cruise time was spent conducting over 3,000 km of acoustic transects over areas of interest. All of the planned transects in Kasaan and Glacier Bay were completed. The remaining time was spent conducting acoustic transects over historical tow and search paths in offshore waters, while slowly transiting towards Kodiak. Altogether, over 50 GB of acoustic data were collected for analysis. We expect that these data will provide a rich source of information to meet the scientific objectives of the project. Data analysis will take place in the upcoming months. Vessel motion data were successfully collected throughout the cruise, as well. A total of 13 CTD casts were made. The camera work was very successful on the first deployment and outstanding video images were aquired of the seafloor, but the camera system subsequently failed and could not be repaired in the field.

Table 1: Summary of acoustic transects conducted, targets insonified, and related field work.

Location	Transect km	CTD casts	Camera paths	Bad/Marginal tows	Good tows	Abandoned stations
Kasaan Bay	341	2	2 new	0	0	0
Glacier Bay	495	3	5 historical	0	0	0
Offshore	2,444	8	4 historical	78	63	23

Scientific Personnel

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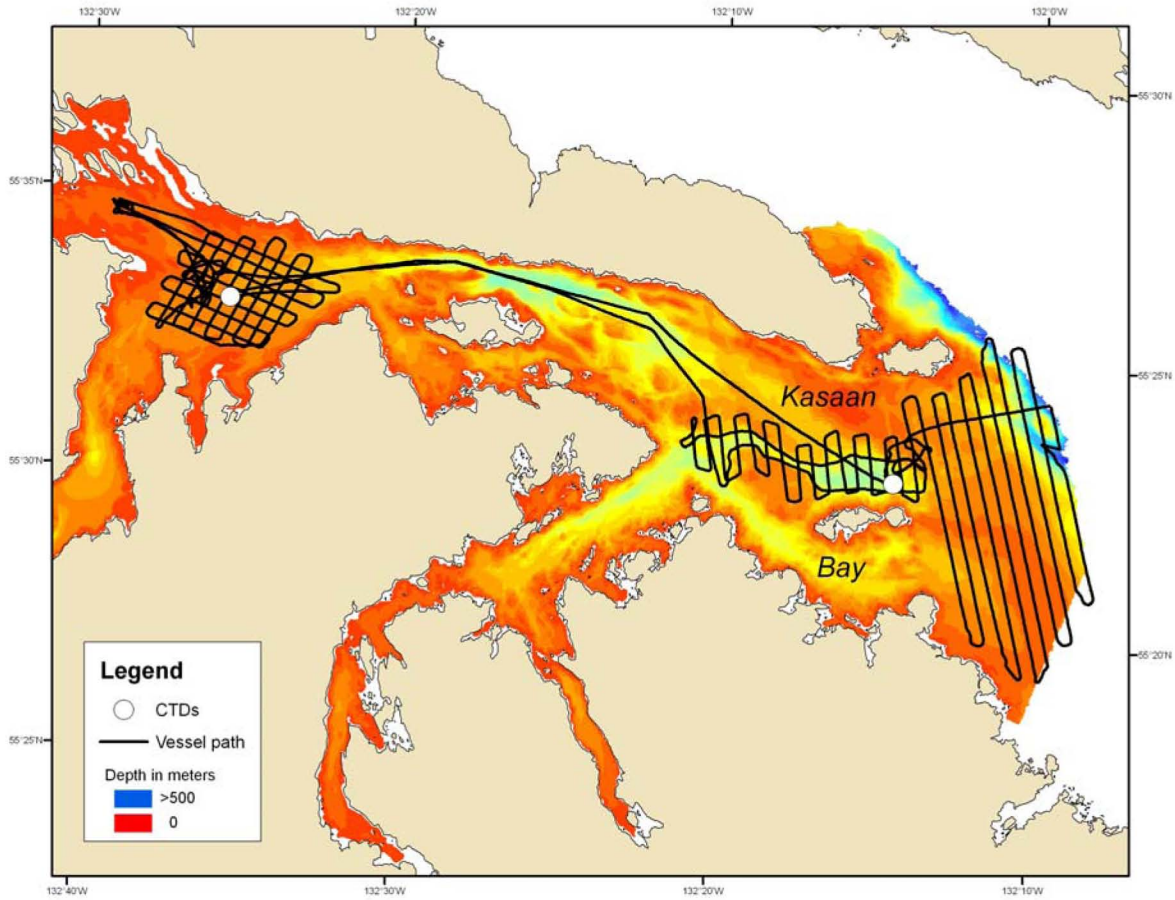

Figure 1. Transects completed in Kasaan Bay during cruise OD0705. White circles indicate CTD casts.

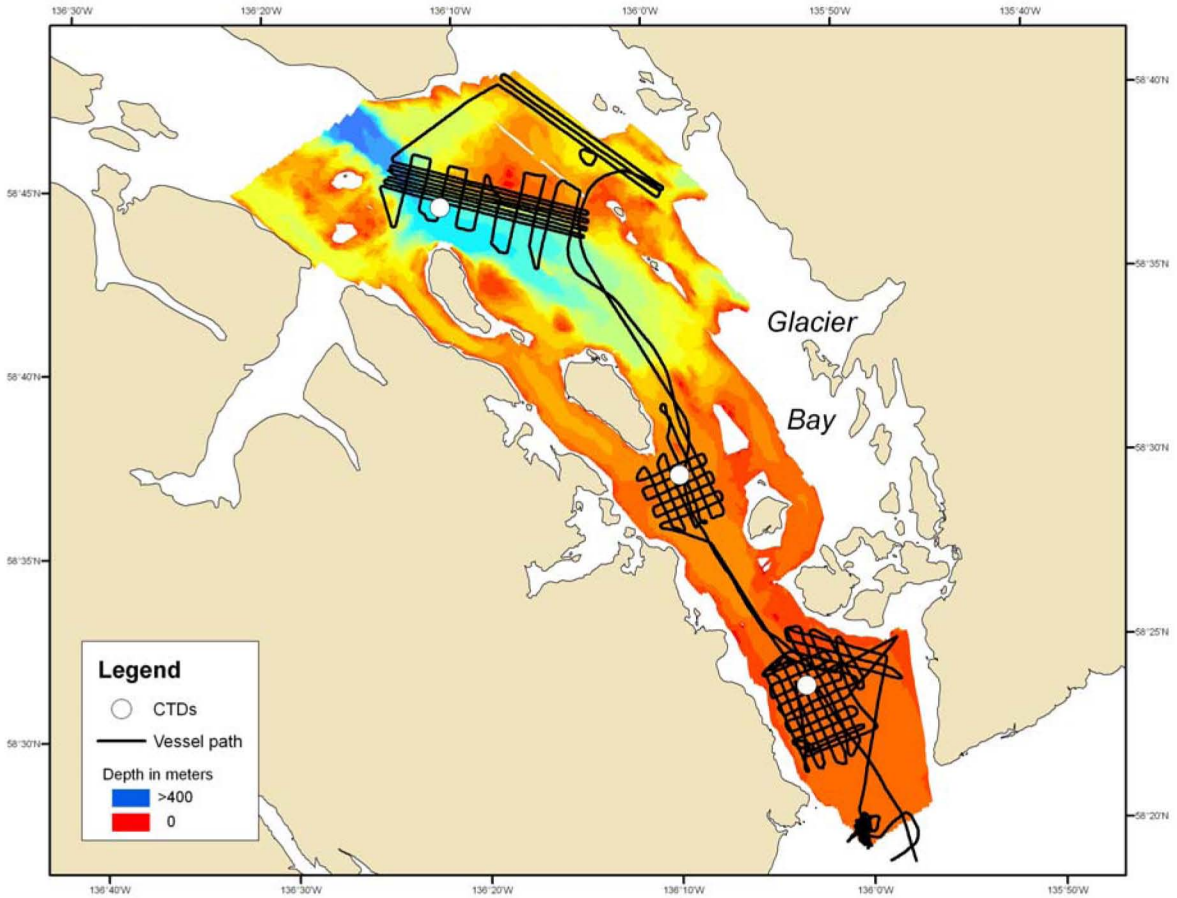

Figure 2. Transect completed in Glacier Bay during cruise OD0705. White circles indicate CTD casts.

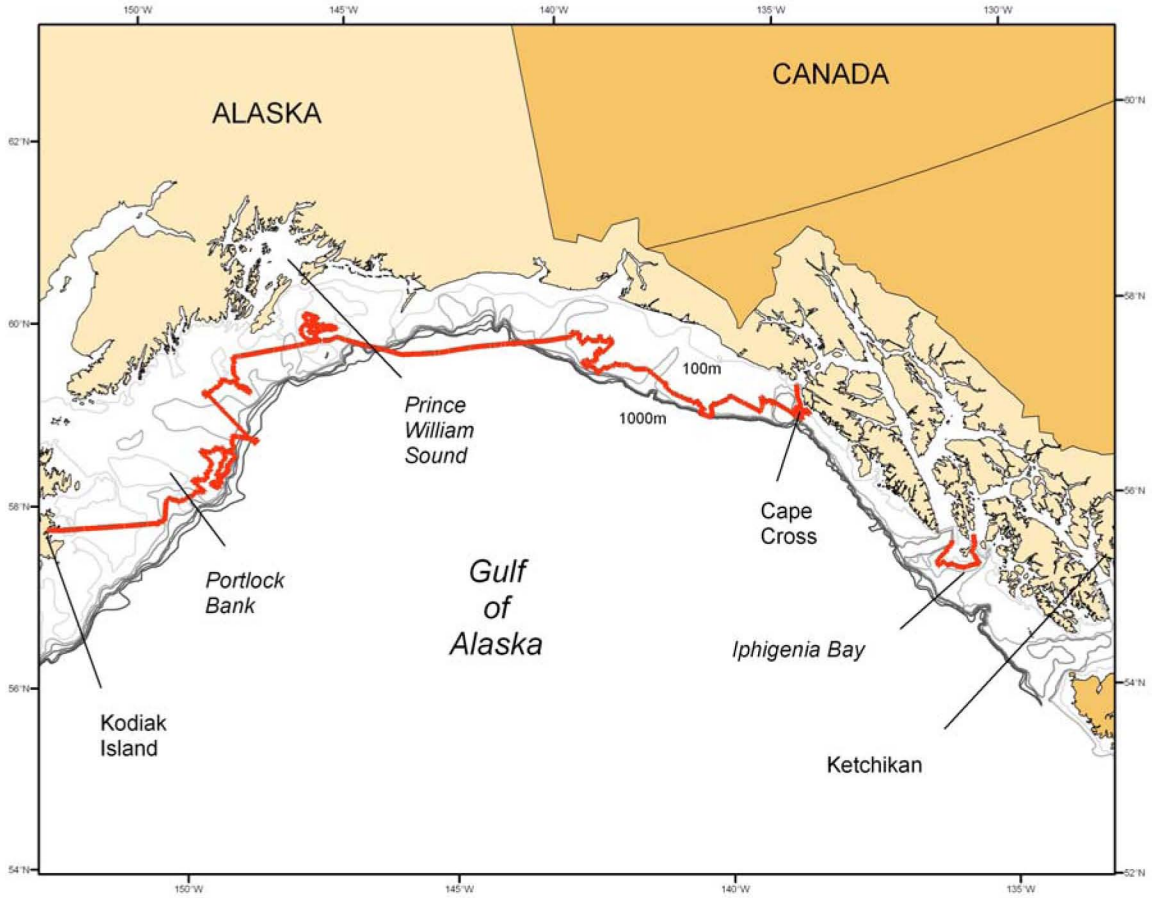

Figure 3. Transect completed in outside waters during cruise OD0705.

Figure 4. Drop camera configuration used on cruise OD0705.