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NOAA PROTOCOLS FOR FISHERIES ACOUSTICS SURVEYS AND RELATED SAMPLING
NOAA Fisheries Protocols For Sea Scallop Dredge Surveys - NEC

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NOAA Fisheries Protocols

For Sea Scallop Dredge Surveys

04-105-09-01-NEC

Northeast Fisheries Science Center

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Introduction

In response to the creation of the "NOAA Protocols for Groundfish Bottom Trawl Surveys of the Nation's Fishery Resources," the Assistant Administrator for NOAA Fisheries, Dr. William Hogarth, assigned the task of implementing national protocols for all surveys conducted by NOAA Fisheries which ultimately determines some type of population index or stock assessment analysis. Since the body of NOAA Fisheries work includes a multitude of surveys, the scope of the standardization was focused on those surveys which create guidelines that may impact the fishing public and industry in various ways. Whereas the original "National Trawl Survey Standardization Workshop" created only protocols specific to trawl surveys, specifically bottom trawls and midwater trawls without the use of a rigid frame, the protocols outlined in this document will encompass sampling protocols employed by NOAA Fisheries researchers unique to sea scallop dredge surveys.

Since the principal products of dredge surveys are fishery-independent indices of stock abundance used in stock assessment models, the essential feature of maintaining "consistency from one survey to the next" is that survey catchability (i.e., the relationship between true population abundance and the survey index) must remain stationary and therefore lack any time trend. For surveys that geographically encompass the target stock, stationarity in survey catchability can often be achieved by ensuring constancy in the sampling efficiency of the dredge, which, in turn, can be achieved by ensuring constancy in the construction and repair of the dredge and the procedures used in its operation. The protocols proposed in this report are therefore focused on these issues.

Currently, the Northeast Fisheries Science Center is the only Science Center conducting an annual standard sea scallop dredge survey. Therefore, at this time, it is unnecessary to distinguish between

national and regional scallop dredge protocols. It is NOAA Fisheries intent to maintain the over-arching theme through this document "to ensure that the methodology that is used currently is consistent over time". This document will provide the framework for national protocols if another Science Center were to adopt a scallop dredge survey. Interested parties should make a clear distinction between the label of scallop dredge and other types of dredges. A sea scallop dredge, specifically, is a towed steel frame with a ring bag attached behind the frame. When fished, it tends bottom at the surface sediment layer. Sea scallop dredges are not equipped with hydro-dynamic pumps to excavate below the surface layer like most clam dredges (Figure 1).

NOAA Fisheries Sea Scallop Dredge Survey Protocols

Length Measurement of Trawl Warp

Problem Statement

Sea scallop dredge surveys deploy only one dredge rigged to a single trawl warp (i.e. towing cable). This is due to the fact that the scallop dredge is a rigid towed body with only one tow point. There are no trawl doors or flexible panels. The scallop dredge survey does not have some of the standardization issues as the trawl surveys. For trawl surveys having two warps, consistency in the measurements of warp length is important for maintaining consistency in trawl performance in two distinct ways. First, the length of the warp relative to the water depth (i.e. scope ratio) influences door spread and other aspects of trawl geometry. Second, the length of the warp on one side of the vessel relative to that on the other side influences the symmetry of the trawl and, depending on the degree of net skew, potentially influences trawl efficiency by

affecting footrope contact with the bottom, head rope height, or fish herding. Dredge surveys have only the first issue to deal with in terms of effective bottom contact during the dredge haul. It is critical to have evenly spaced deployment markings on the trawl warp so that the appropriate amount of scope is set at the dredge haul depth.

Currently, during NOAA Fisheries scallop dredge surveys, warp length is determined statically by periodically measuring with electronic meters against warp marks at fixed increments. Current methods of measurement have inherent problems that can lead to inaccurate measurement. For example, differential warp length can result from inaccurate measurement and marking before a survey begins, from differential warp stretch and contraction of marked warps during a survey or from inaccuracy and slippage of metering devices. As a consequence, the proposed protocol uses the comparison of redundant measuring systems to detect differences in warp length beyond a tolerance level.

Protocol 1: Length measurement of trawl warp

For the single warp dredging system, two independently-calibrated measuring methods or devices shall be used, one of which will be in real time. Currently, NOAA Fisheries utilizes winch counter and physical paint marks as the two systems for warp measurement during survey dredge deployments. Due to fact that only one trawl warp is deployed there is no concern of a percent difference between warp markings. The NEFSC does not regularly charter sea scallop surveys aboard commercial vessels, but if the survey needs to be completed on a commercial vessel, the wire type and marking specifications shall be clearly stated to the contract vessel.

Specifications of the two warp measurement systems used on the scallop dredge survey will be included in an Operations Plan provided by the NEFSC to the officers and crew of the survey vessel.

Sub-protocols for specific warp measurement technologies

Protocol 1a: Physical warp markings

Physical marking of trawl warps generally involves spooling the wires off the drums and onto a flat surface to measure the wire intervals relative to a standard measurement tool (metal wire of known length and marked). The NOAA Fisheries standard for such measurements, for two wires, has been that both port and starboard wires will be measured and marked side-by-side to assure that the relative warp measurements between marks are exact. Even though scalloping requires only one warp, the spacing of marks on such a warp, details of marking method (fiber marks interwoven in wire rope strands or painting of marks), and the degree of tension on the wire will be specific to the Regional Sea Scallop Standard Survey protocols. Presently, the painted marks in the single trawling wire are spaced at 25 meter increments. These marks will be checked and re-calibrated at least annually prior to the scallop survey or whenever un-reconcilable discrepancies between warp intervals and a redundant measurement system persist during the survey.

Protocol 1b: In-line wire meters

In-line wire meters measure wire lengths directly using running line tensiometers or instrumented blocks over which the warp travels as it is payed out or retrieved. Such systems deflect the running wire by a known amount to facilitate measuring under tension and may be subject to deviations from true measurements due to wire slippage. These devices should be

calibrated using known lengths of wire at least annually, using manufacturer recommended procedures, with moving parts (bushings, sheaves, etc.) inspected and replaced, as required.

Protocol 1c: Block wire counters

Block wire counters are not used for the standard NEFSC sea scallop survey to measure trawl warps, real time.1

Protocol 1d: Geometric wire counters

Geometric wire counters are not used for the standard NEFSC sea scallop survey to measure trawl warps, real time.

Discussion

The proposed protocol requires that two independent warp measurements be reconciled when the differences in cumulative warp length varies from the metering system by +/- 5% at any scope value. The metering system should be set to zero when the scallop dredge is at the water surface. Periodic checking of physical marks on the ship and wire should be made versus the metering system. NOAA Fisheries recommends that the research vessel "end-for-end" the cable annually as well. Currently, throughout the survey, NEFSC compares physical marks to the metering system on each survey leg. A table of values with a differential of 5% additive along the wire is utilized to decide if there has been stretch. If stretch at any interval is detected that exceeds the 5% threshold, the research vessel must remark the wire, immediately (Regional Protocols).

Use of Auto-trawl Systems

Protocol 2: Auto-trawl systems

The Hugh R. Sharp, the UNOLS vessel that is used to conduct the NEFSC sea scallop survey, is not outfitted with an auto-trawl system. This application is not critical for sea scallop operations.

Survey Operational Procedures

Problem Statement

Standardization of station selection, gear deployment, dredging operations, and retrieval procedures are critical for maintaining consistency in survey catchability over time. Factors that can affect gear performance and catchablility of marine organisms include selection of tow location; speed during setting, towing, and retrieval of gear; determination of scope ratio; estimation and standardization of tow distance; tow direction; and minimum towable sea state. Written unambiguous protocols specifying these and other issues may affect survey consistency provide a mechanism for communication between scientific staff and the officers and crew of the research vessel which maintains continuity in procedures as personnel and vessels change overtime.

Protocol 3: Survey Operational Procedures

For the Groundfish Protocols, each Science Center was tasked with providing a written Operations Plan to their staff and the crew of the survey vessels that provides clear and unambiguous definitions of all procedures required to properly conduct trawl sampling. This process will be followed for the scallop protocols, as well. The Operations Plan will be discussed by the Chief Scientist and the vessel crew at the start of each survey and again when

crew changes occur. The Operations Plan may include, but is not limited to, the following issues:

a. Scope
b. Speed of tow
c. Duration or distance of a tow
d. Direction of tow
e. Location of sampling sites, and procedures to use if stations are suitable for towing
f. Criteria for determining the success of a tow and procedures to use if a tow was unsuccessful
g. Vessel and winch operation during trawl deployment and retrieval
h. Methodology for warp measurement and verification
i. Dredge construction plans, at-sea repair instructions and repair verification check-list
j. Defining responsibility (i.e. survey scientists or vessel crew) for decisions regarding various aspects of the operations

Dredge Construction and Repair

Problem Statement

Standardization of scallop dredge construction and repair is unquestionably the most critical element for survey standardization because, on NOAA Fisheries scallop surveys, standard scallop dredges are not simply devices to capture sea scallops but are scientific instruments used to sample scallop populations and, as such, must conform to higher levels of tolerance in their construction and repair than commercial scallop gear. The difference in the objectives of

commercial fishing and scientific sampling, and its concomitant effects on scallop dredge design and repair, are rarely appreciated and often have contributed to misunderstanding between NOAA Fisheries and the commercial scallop industry. This misunderstanding can directly impact scallop dredge survey standardization in two distinct ways. First, the NEFSC lacks the ability to completely build their own survey scallop dredges and must partially rely on commercial dredge manufacturers to supply commercially standard materials that are then assembled by NEFSC staff. Second, all members of the crew of NOAA Fisheries research vessels that make at-sea repairs to survey scallop dredges have gained their expertise from their past experience as commercial dredge fishers or trained on the scallop research vessel. The repair techniques used by commercial fishers, however, are typically those needed to return the gear to service as soon as possible rather than those needed to return it to service in the same condition as before damage. Because NOAA Fisheries scallop survey dredges are true scientific sampling instruments, the protocols considered in this section are designed so that scallop dredges are constructed and repaired with a level of detail needed to ensure, within specified tolerances, that the identical scallop dredge is used every sampling site on every cruise.

Protocol 4: Dredge Construction and Repair

Construction plans for each scallop dredge design will be maintained be each Science Center (NEFSC is the only Center, at this time, that conducts a standard scallop dredge survey) and included in the Operations Plan. The plans must include engineering drawings of the scallop dredge and supporting materials with a level of detail at least as specific as that in the ICES recommended standard (ICES C.M. 1989/B:44 Report of the Study Group on Net Drawing). In addition, each plan must contain a description of all materials used, and the quantities of these materials considered important for proper scallop dredge function.

A checklist will be developed for each scallop dredge design (presently one design) specifying the dimensions, and their tolerances, or other design features considered important for proper scallop dredge function. The checklist will be used to verify that each newly constructed or repaired scallop dredge is within operational tolerances before use.

Verification that scallop dredges are within operational tolerances will be conducted by members of the scientific staff of each Science Center (NEFSC) who are trained in scallop dredge construction and repair verification.

Methodology for at-sea dredge repairs will be specified in an Operations Plan and communicated by the Chief Scientist to the crew of the vessel at the start of each cruise. A scallop dredge repair checklist will be included in the Operations Plan and used by a member of the scientific staff to verify that the repaired scallop dredges are within operational tolerances.

At this point there is no need for a national training course in scallop dredge construction and repair, because there is only one Center conducting scallop dredge surveys. A regional training course will be developed in the future for the NEFSC.

Discussion

The intent of this protocol is to ensure that, through more exacting specification and verification. The dredges used in a survey will perform identically regardless of the circumstances under which the scallop dredge was constructed and repaired.

Changes to Regional Scallop Dredge Protocols

Protocol 5: Approval of Regional Dredge Protocols

Changes to scallop dredge survey operational protocols will be at the discretion of the appropriate Science Director who may approve of such changes directly or specify a peer review process to further evaluate the justification and impacts of the proposed changes.

Recommendations for Additional Work to Implement Protocols

Sea Scallop Standardization Working Group (SSSWG)

Recommend the creation of a Sea Scallop Standardization Working Group that will coordinate the development of national and regional standards and protocols, and share information to improve the precision and accuracy of such surveys. Information and technology would be exchanged among Science Centers facilitated by a National Marine Surveys Workshop, similar to those conducted periodically for stock assessments.

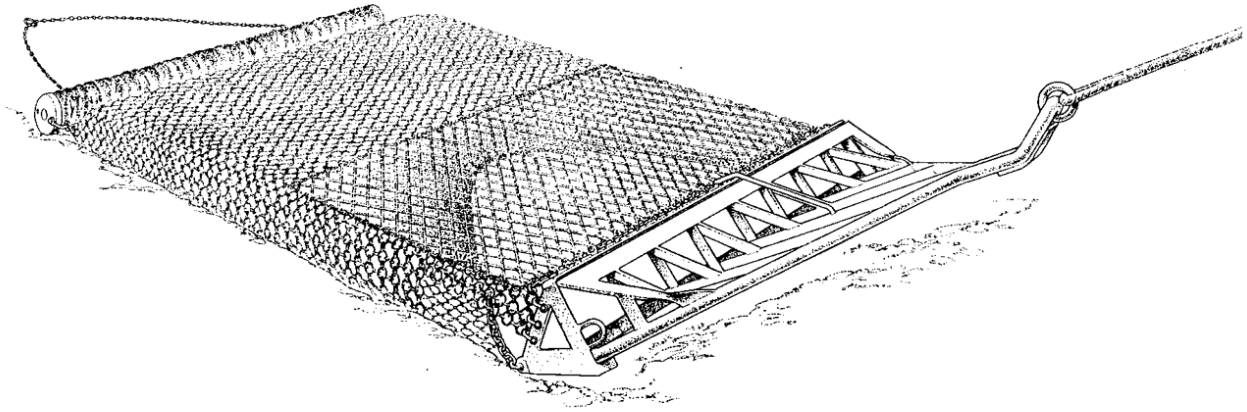
Regional Protocols

At present there is only one standardized sea scallop survey nationally conducted by the Northeast Fisheries Science Center in Woods Hole, Massachusetts. The items contained are specified in general terms for National Protocols to allow other Centers to adopt the approach developed by the NFSC. In the Regional section, the specific methodology used by the NEFSC is detailed in either a complete Field Operations Plan.

Appendix 1. Northeast Fisheries Science Center

Summer Sea Scallop Dredge Survey Regional Protocols

Figure 1: Standard Sea Scallop Dredge 2008 version



Specifications:

Apron (top)	32 rings x 16 rings
Bag (bottom)	32 rings x 18 rings
Front length	6'3" long (from eye to bag attachment)
Front width	8’ wide
Rings	2" x 5/16"
Sweep chain	69 links of 5/8" casehardened steel
Top twine	3.72" Stretched Mesh double nylon with 1½" Poly - 63" deep
Weight	2,000 lbs.
Liner	1 ½” polyethylene #21 twine (2.2 mm) (rtex 2299)