

DRAFT Scallop Survey Guiding Principles

July 2022

Background

The Scallop Survey Working Group (SSWG) recommended that the Council and Northeast Fisheries Science Center (NEFSC) adopt Scallop Survey Guiding Principles to inform survey-related decision-making, RSA priorities and program adaptations, and future science and management efforts and advice. The Guiding Principles were developed to ensure adequate survey coverage, sampling intensity, frequency, and sampling types needed to generate data products to support annual scallop management, while maintaining flexibility in the system to continue the provision of independent estimates from survey partners. This is intended to be a living document that provides guidance for surveys and data products for long-term use. The guidance may be considered and applied to align with SSWG recommendations related to survey coordination, data standardization, and impacts from offshore wind energy development. The Council, Scallop Plan Development Team (PDT), and NEFSC will determine appropriate implementation and administrative oversight related to the guidelines.

Survey Coverage:

- The entire scallop resource and fishery footprint should be surveyed annually. The overall resource survey will consist of multiple survey partners, including the NEFSC and RSA-funded organizations, using dredge and optical tools. The primary objective of these surveys is to provide length frequencies, abundance, and biomass estimates that are used by the Scallop PDT.
- Specific resource areas (e.g., rotational management areas, areas of identified recruitment, areas with anomalous biology or mortality, and areas of importance to the fishery) should be covered with redundant surveys that use different sampling technologies (e.g., optical and dredge) to provide multiple independent estimates of abundance, biomass, and density.
- Areas outside of the currently known scallop resource and fishery footprint should be surveyed regularly on a longer-term time step, as informed by the Scallop PDT, scallop survey partners, and the scallop fishing industry.
- The Northern Gulf of Maine management area and Gulf of Maine resource area should be included in regular survey coverage.
- Efforts should be made to match appropriate sampling tools, designs, and methods with specific conditions of survey areas (e.g., habitat type, gear conflict regions, wind farm areas).
- Survey coverage determination should consider areas of current and future offshore wind energy development.

Sampling Intensity and Frequency

- Underlying conditions of survey areas should be considered to determine required sampling levels (e.g., life cycle of rotational management areas, recruitment and cohort tracking, scallop abundance and density, scallop condition factor, disease and predator prevalence).
- Surveys should be conducted on multiple spatial scales with higher sampling intensity (i.e., fine-scale allocation of sampling locations) directed to priority areas.

- Image annotation rates by area for HabCam surveys should be identified prior to the start of surveys.
- Sampling objectives should be considered in both the pre-survey planning phase (e.g., optical track allocation, dredge sampling locations within strata, importance of multiple survey methodologies), as well as post-survey analysis phase (e.g., estimates of precision, accuracy, and bias).

Types of Sampling

- Samples required from all resource and fishery areas include scallop counts, measurements, and biological samples (e.g., meat and gonad weight, reproductive state, sex, disease documentation, and meat quality).
- Collection of additional biological and environmental information should be conducted opportunistically, and efforts should be made to increase utilization of data products that are not directly applied to scallop science and management (e.g., ecosystem monitoring, habitat types, predator abundance and distribution, etc.).

Data Analysis

- Analysis of survey data should generate data products to support annual scallop management for each SAMS/survey area, as identified by the Scallop PDT, including:
 - Biomass, abundance, density
 - Average meat weight (gonad weight, if applicable)
 - Length frequency
- Data analysis should be based on criteria defined by the Scallop PDT (e.g., area-specific SH:MW equations, defined size classes for pre-recruit, recruit, and adult scallops, dredge efficiency estimates).
- The process for HabCam surveys to check for autocorrelated data for model-based estimation methods includes:
 - Aggregate the annotated data by 750m segments
 - Calculate Moran's I statistics for only the positive aggregated data points for each area to check whether the data are spatially autocorrelated using reviewed methods (e.g., ArcGIS, QGIS, R function in Moran.I in library ape)
 - If data are spatially autocorrelated ($p < 0.05$), complete analysis and submit data
 - If data are not spatially autocorrelated ($p > 0.05$), review potential reasons for the lack of correlation with NEFSC and Council staff (e.g., too few images were annotated, or spatial structure is absent)
 - In the absence of autocorrelation, the PDT will determine appropriate methods to generate biomass estimates (e.g., stratified mean estimation [Chang et al., 2017](#)).

Data Delivery

- Survey data products must be available by early August of the year in which the survey is conducted.
- Survey data delivery format should follow guidelines for standardization as defined by the Scallop PDT.
- "Raw" survey data from all survey partners should be made accessible upon request.

<i>Topic</i>	<i>Guidelines</i>
<i>Survey Coverage</i>	<ul style="list-style-type: none"> • The entire scallop resource and fishery footprint should be surveyed annually. The overall resource survey will consist of multiple survey partners, including the NEFSC and RSA-funded organizations, using dredge and optical tools. The primary objective of these surveys is to provide length frequencies, abundance, and biomass estimates that are used by the Scallop PDT. • Specific resource areas (e.g., rotational management areas, areas of identified recruitment, areas with anomalous biology or mortality, and areas of importance to the fishery) should be covered with redundant surveys that use different sampling technologies (e.g., optical and dredge) to provide multiple independent estimates of abundance, biomass, and density. • Areas outside of the currently known scallop resource and fishery footprint should be surveyed regularly on a longer-term time step, as informed by the Scallop PDT, scallop survey partners, and the fishing industry. • The Northern Gulf of Maine management area and Gulf of Maine resource area should be included in regular survey coverage. • Efforts should be made to match appropriate sampling tools, designs, and methods with specific conditions of survey areas (e.g., habitat type, gear conflict regions, wind farm areas). • Survey coverage determination should consider areas of current and future offshore wind energy development.
<i>Sampling Intensity and Frequency</i>	<ul style="list-style-type: none"> • Underlying conditions of survey areas should be considered to determine required sampling levels (e.g., life cycle of rotational management areas, recruitment and cohort tracking, scallop abundance and density, scallop condition factor, disease and predator prevalence). • Surveys should be conducted on multiple spatial scales with higher sampling intensity (i.e., fine-scale allocation of sampling locations) directed to priority areas. • Image annotation rates by area for HabCam surveys should be identified prior to the start of surveys. • Sampling objectives should be considered in both the pre-survey planning phase (e.g., optical track allocation, dredge sampling locations within strata, importance of multiple survey methodologies), as well as post-survey analysis phase (e.g., estimates of precision, accuracy, and bias).

<p><i>Types of Sampling</i></p>	<ul style="list-style-type: none"> • Samples required from all survey areas include scallop counts, measurements, and biological samples (e.g., meat and gonad weight, reproductive state, sex, disease documentation, and meat quality). • Collection of additional biological and environmental information should be conducted opportunistically, and efforts should be made to increase utilization of data products that are not directly applied to scallop science and management (e.g., ecosystem monitoring, habitat types, predator abundance and distribution, etc.).
<p><i>Data Products</i></p>	<ul style="list-style-type: none"> • Analysis of survey data should generate data products to support annual scallop management for each SAMS/survey area, as identified by the Scallop PDT, including: <ul style="list-style-type: none"> ○ Biomass, abundance, density ○ Average meat weight (gonad weight, if applicable) ○ Length frequency • Data analysis should be based on criteria defined by the Scallop PDT (e.g., area-specific SH:MW equations, defined size classes for pre-recruit, recruit, and adult scallops, dredge efficiency estimates). • The process for HabCam surveys to check for autocorrelated data for model-based estimation methods includes: <ul style="list-style-type: none"> ○ Aggregate the annotated data by 750m segments ○ Calculate Moran’s I statistics for only the positive aggregated data points for each area to check whether the data are spatially autocorrelated using reviewed methods (e.g., ArcGIS, QGIS, R function in Moran.I in library ape) ○ If data are spatially autocorrelated ($p < 0.05$), complete analysis and submit data ○ If data are not spatially autocorrelated ($p > 0.05$), review potential reasons for the lack of correlation with NEFSC and Council staff (e.g., too few images were annotated, or spatial structure is absent) ○ In the absence of autocorrelation, the Scallop PDT will determine appropriate methods to generate biomass estimates (e.g., stratified mean estimation Chang et al., 2017).
<p><i>Data Delivery</i></p>	<ul style="list-style-type: none"> • Survey data products must be available by early August of the year in which the survey is conducted. • Survey data delivery format should follow guidelines for standardization as defined by the Scallop PDT. • “Raw” survey data from all survey partners should be made accessible upon request.