US Atlantic Sea Scallop

MSC Fishery Assessment Report

Public Certification Report

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October 11th, 2018

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Glossary

ABC	Acceptable Biological Catch
ACE	Annual Catch Entitlements
ACL	Annual catch limit
AMs	Accountability measures
ASAP	Age Structured Assessment Program
B	Biomass
BMSY	Biomass calculated for Maximum Sustainable Yield
CAB	Conformity Assessment Body
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DAS	Days at Sea
DFO	Fisheries and Oceans Canada
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
ETP	Endangered, Threatened or Protected species
F	Fishing Mortality
FAO	Food and Agriculture Organization of the United Nations
FCM	Fisheries Certification Methodology
FG	Fixed Gear
FLIM	Limit Reference Point for Fishing Mortality
FMP	Fisheries Management Plan
Fmsy	Fishing mortality that can produce maximum sustainable yield (MSY)
FREF	Fishing Mortality Reference Point
GAO	Government Accounting Office
GARFO	Greater Atlantic Regional Fisheries Office
GARM	Groundfish Assessment Review Meeting
GB	Georges Bank
GC	General Category
GOM	Gulf of Maine
GOMAC	Gulf of Maine Advisory Committee
GN	Gillnet
HAPC	Habitat Area of Particular Concern
HL	Handline
IFMP	Integrated Fisheries Management Plan
IFQ	Individual Fishing Quota
ITQ	Individual Transferable Quota
Kg	kilogram
LA	Limited Access
LAGC	Limited Access General Category
Lb.	Pound, equivalent to roughly 2.2 kg
LL	Longline
LMOT	Large Mesh Otter Trawl
LOA	Length Over-All
LPUE	Landings per unit of fishing effort

M	Million (lbs.)
MA	Mid-Atlantic
MAB	Mid-Atlantic Bight
MAFMC	Mid-Atlantic Fishery Management Council
MG	Mobile Gear
MOU	Memorandum of Understanding
MSC	Marine Stewardship Council
MSE	Management Strategy Evaluation
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSP	Maximum Spawning Potential
mt	metric ton, 1000 kg or 2204.62 pounds
NAFO	Northwest Atlantic Fisheries Organization
NEMSFMP	Northeast Multispecies Fisheries Management Plan
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NGOM	Northern Gulf of Maine
nm	nautical mile
NMFS	National Marine Fisheries Service
NOAA	Natonal Oceanic and Atmospheric Administration
OFL	Over-Fishing Level
P1, P2, P3	MSC's Guiding Principles
PA	Precautionary Approach
PI	Performance Indicator
RV	Research Vessel
SBRM	Standardized Bycatch Reporting Methodology
SCS	SCS Global Services
SI	Scoring Issue
SMAST	School for Marine Science and Technology at University of Massachusetts
SSB	Spawning Stock Biomass
SSBMSY	Spawning Stock Biomass for Maximum Sustainable Yield
t and mt	metric ton
TAC	Total Allowable Catch
TMGC	Transboundary Management Guidance Committee
TRAC	Trans-boundary Resources Assessment Committee
VIMS	Virginia Institute of Marine Science
VPA	Virtual Population Analysis
VMS	Vessel Monitoring System
VTR	Vessel Trip Report
WHOI	Woods Hole Oceanographic Institution
WWF	World Wildlife Fund

1. Executive Summary

This report presents the Marine Stewardship Council (MSC) assessment of the Atlantic Sea Scallop (*Placopecten magellanicus*) fishery, harvested by scallop dredges in federal waters of the US Exclusive Economic Zone (EEZ) in the Northwest Atlantic, considered to be a single Unit of Assessment (UoA). For more details of the fishery see Section 3.2 Overview of the Fishery of this report. This report refers to the UoA (Table 1) more simply as the scallop fishery. For more details on the scope of the UoA and UoC see Section 3.1 of this report. SCS Global Services (SCS), an MSC-accredited, independent, third-party conformity assessment body, conducted the assessment and prepared the findings following the MSC Certification Requirements (CR) v1.3 (2013) and the process and guidance to the FCR v2.0 (2014). The assessment team evaluated the fishery against the default version of the Default Assessment Tree from v1.3.

Table 1. Unit of Certification(s) and Unit of Assessment(s)

Stock/Species (FCR V2.0 7.4.7.1)	Method of Capture (FCR V2.0 7.4.7.2)	Fishing fleet (FCR V2.0 7.4.7.3)
Atlantic sea scallop (*Placopecten magellanicus*)	New Bedford style scallop dredges	Vessels holding a federal sea scallop permit in the Limited Access fleet (permit categories: LA 2,3, 4, 5 and 6) and the Limited Access General Category fleet (permit categories: LAGC A and B) fishing in federal waters.

1.1 Fishery Operations Overview

The Atlantic sea scallop is one of the most valuable fisheries in the United States. The primary range for the Atlantic sea scallop fishery extends from the Mid-Atlantic to the US/Canada border. North of Cape Cod, concentrations of sea scallops generally occur in shallow water less than 40 meters. South of Cape Cod and on Georges Bank, sea scallops typically occur at depths between 25 and 200 m, with commercial concentrations generally between 35 and 100 m.

The scallop fishery uses predominantly paired or single scallop dredges and to a lesser extent trawl. Only vessels using dredges are included in the Unit of Assessment (UoA). The federal scallop fishery is organized primarily in the large-scale scallop fishery that operate as the Limited Access (LA) fleet and the small-scale vessels that operate under the Limited Access General Category (LAGC) fleet. All vessels that land sea scallops from federal waters must have a federal sea scallop permit. There are 11 limited access sea scallop permit types, only seven of these permit types are included in the UoA.

Sea scallop crews are limited to seven when fishing in open areas. Larger vessels fishing in access areas with a trip limit may take additional crew, usually 1 or 2. Smaller vessels generally fish with 2-4 crew. All vessels in the UoA operate in federal waters within the US EEZ between North Carolina and the Canadian boundary. New Bedford, Massachusetts is the top port for scallop landings followed by Cape May, New Jersey. The fleet fishes primarily for Atlantic sea scallops

1.2 Assessment Overview

The team selected to undertake the assessment includes four team members that collectively meet the requirements for MSC assessment teams. These are:

- Gabriela Anhalzer, Team Leader
- Dr. Gonzalo Macho, Principle 1 Expert
- Mr. Rohan Smith, Principle 2 Expert
- Mr. Richard Allen, Principle 3 Expert

The team met with fishery representatives, scientists and stakeholders in Newburyport, Gloucester, Woods Hole, and New Bedford, all in Massachusetts, on January 18th to 20th, 2018. Information was provided by fishery managers, fisheries scientists, and fishery participants. The Client representative provided the assessment team with supporting documents. The original announcement for the assessment indicated that the Risk based framework (RBF) would not need to be used and this was confirmed from information provided prior to and during the site visit. The re-assessment proceeded without the RBF.

Stakeholders were notified of the onsite visit, invited to speak with the team regarding any concerns and time was scheduled during the onsite to meet with stakeholders. No stakeholder comments were received by the assessment team.

Peer Review of the assessment was conducted by the MSC Peer Review College. Based on the peer review score was changed in PI 1.2.2 SIb from SG100 to SG80, making overall score for PI 1.2.2 decrease from 100 to 85. A score in PI 2 was also modified, but this was on account of an oversight in calculating the final score for the PI Table (PI 2.4.2). A response to peer review comments is provided in Appendix 2 Peer Review Reports).

The report was submitted to MSC for Public Comment to the MSC website on June 28, 2018, with the public comment period closing on August 2, 2018.

No comments were received from stakeholders, aside from a Technical Oversight report from MSC, to which the CAB responded and made additional modifications to the report as appropriate, principally in the Traceability section (See Table 33). The positive certification determination has been finalized, and with the posting of the Final Report commences the 15 working day objection period

1.3 Summary of Findings

In this report, we provide detailed rationales for scores presented for each of the Performance Indicators (PIs) under Principle 1 (Stock status and Harvest strategy), Principle 2 (Ecosystem Impact) and Principle 3 (Governance, Policy and Management system) of the MSC Standard, which support the re-assessment that the fishery is recommended for certification. No PIs failed to reach the minimum Scoring Guidepost (SG) of 60, and the average scores for the three Principles remained above SG80). The team issued one condition for PI 3.2.3 that did not meet SG80 level and closed the three conditions for Principle 2 carried over from the first full assessment (See Appendix 8: Condition

Tables and Justifications). A Client Action Plan, detailed in Appendix 1.2., was produced to meet the condition.

In this report we provide the rationales for all scores proposed, which support the assessment that the fishery is recommended for re-certification.

Principle 1

In Principle 1 all PIs received scores above SG80, with the majority of scores at SG100.

The Atlantic sea scallop resource is considered healthy; the stock is not overfished and overfishing was not occurring as of 2017. Additionally, after a period of very high fishing mortality during the mid-1980's and early-1990's, management measures curbed F and the stock responded positively. The overall impact of management on this resource has been positive from a biological perspective, with biomass increasing dramatically between 1994-2004, where it has remained fairly stable or increased. Currently biomass levels compared to reference points (BMSY) are at all-time highs thanks to very high recruitment events and a comprehensive management strategy and solid harvest control rules. Fishing mortality is lower than ever and well below reference points (FMSY).

The fishery has a precautionary harvest strategy in place designed to account for the spatial distribution of sea scallops andis responsive to the state of the stock. All the components of the harvest strategy (monitoring, stock assessment, harvest control rules and management actions) are solid and aligned. The only weak point is the North Gulf of Maine (NGOM) since this region is data-poor relative to the rest of the scallop resource, is not included within the assessment model, and there are no biological reference points set.

Principle 2

In Principle 2, the reassessment identified none of the PIs received scores under SG80. Scallops are the only retained species in the UoA fishery.

Strengths identified in the fishery included:

- Good observer coverage and reporting across operation areas of the fishery.
- Quantifiable information on bycatch species, including fish and benthic invertebrates, that demonstrates the successful targeting of high density scallop areas with no other retained species and low levels of bycatch (<5%).
- Scallop dredge gear technical modifications including use of chain mats at dredge mouth, and implementation of turtle deflector device (TTD) to reduce interactions and incidental catch of sea turtles, as well as large items of the benthic ecology, such as rocks, or epifauna.
- There are no recent recorded interactions with Endangered Threatened or Protected (ETP) species listed under the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), or Vulnerable Marine Ecosystems (VME) designation.
- Listing/identification and quantification of all species from the benthic ecology is recorded in the fishery and used to support management decisions, such as closed area where Essential Fish Habitat (EFH) or Habitat Area of Particular Concern (HAPC) are identified by observers.

- Before and after interaction of the scallop dredge fishery with seabed ecology/habitat communities is known through ongoing research, through benthic acoustics and digital imagery monitoring (side scan sonar/bathymetry, drop-cam/hab-cam/stereo-cam). The recovery of the seabed habitats and communities and sandy sediments following dredging is predicted to occur in about 10 years (Collie et. al. 2005)
- Good communication of fishers and use of cartography tools including bathymetry maps to target areas of high scallop density facilitating minimum contact with seabed habitat ecology/communities
- Implementation of ecosystem based management including spatially closed areas considered with regards to protection of Habitat Management Area (HMA), EFH and HAPC
- Improved accountability measure management for species of concern such as yellowtail flounder, windowpane flounder, and winter flounder through use of proactive and reactively adjusted Accountability Measures based on final estimates of catch; where management allowances facilitate LAGC NGOM vessels to declare a state water trip; and catch on those trips would not count against the NGOM hard-TAC.
- From an outcome approach; the ecological communities of the fishery are well adapted to frequent natural disturbance by currents, tides, storms, and re-suspension of sediment, such as those inhabiting soft mud/sand/ sandy gravel sediments; and therefore identified by scientific research to demonstrate relatively short-lived effects to scallop dredge. In addition, though benthic communities densities vary between scallop dredged areas and closed areas, there is evidence of no loss of species identify in current studies.

Weaknesses identified in the fishery along with recommendations to the Client Group; includes:

- Observed bycatch species such as skates, are grouped in their catch quantification rather than identified at species levels which would enhance management interventions where required.

Recommendations for P2

- Client encouraged to work with respective national fisheries management authority to improve accuracy of catch/bycatch composition data from being indicative to accurate.
- Client encouraged to work with the commercial fishing industry and respective fisheries management authority to improve frequency and accuracy of recording interaction with species listed under the ESA, MMPA, and VME, perhaps within VTR or other fishing record system.
- Client encouraged to work with the commercial fishing industry, Observer program, and respective fisheries management authority to improve accuracy of identity (species or taxa level) for invertebrate catch/bycatch composition data from being indicative to accurate, as well as to include location (GPS/VMS) coordinates with catch/bycatch records; which could provide higher resolution local and finer scale interpretation of the spatial interaction (overlap) of the fishery and invertebrates catch/bycatch species; and to facilitate targeted management interventions for VME bycatch invertebrate species (VME - sponges or corals).

Principle 3

In Principle 3 PI 3.2.3 scored under SG80, requiring a condition. Overall, the sea scallop fishery has a robust fishery management system with a well-understood decision-making process that is transparent and open to input from all interested parties. The fishery-specific management program entails continuous review and science inputs that are quickly incorporated into the management of the fishery. Management is precautionary and industry participates in gathering information to improve the management of the fishery. The addition of the Limited Access General Category (LAGC) fleet to the UoA required consideration of two NEFMC reports on the performance of the LAGC IFQ fleet. (NEFMC 2014b, NEFMC 2017c) The 2014 Performance Review found that "a segment of the [LAGC IFQ] fishery is not complying with the pre-landing reporting requirement through VMS potentially compromising effective monitoring and enforcement of the program." The 2017 program review found that compliance had improved over time, but the team was not able to determine whether violations of the reporting requirement had resulted in enforcement actions and sanctions or any other reason for the improvement in compliance. The NEFMC has made monitoring and catch accounting a priority for 2018 and the Council's Sea Scallop Committee is actively working on this issue, indicating the Council's concern. Based on these facts, the team scored PI 3.2.3 SI a and 3.2.3 SI b at 60, requiring a condition.

The first part of the condition related to PI 3.2.3 SI a requires that the fishery provide evidence that the monitoring, control and surveillance system has demonstrated an ability to enforce relevant management measures, strategies, and/or rules. The second part of the condition related to PI 3.2.3 SI b requires the fishery to provide evidence that sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.

2. Authorship and Peer Reviewers

2.1 Audit Team

The surveillance team consisted of Ms. Gabriela Anhalzer, Dr. Macho Gonzalo, Dr. Rohan Smith, and Dr. Richard Allen. Assessment team experience and qualification summaries were provided in the assessment announcement and here:

Ms. Gabriela Anhalzer— SCS Global Services, Project Coordinator, Sustainable Seafood, Team Lead.

Gabriela Anhalzer received a Masters degree in coastal environmental management from Duke University. Ms. Anhalzer has several years of experience in marine conservation and fisheries, she has worked as an independent consultant conducting evaluations of fishery improvement projects and as a fisheries policy and stakeholder specialist. She has also worked as an associated researcher in Latin America for sea turtle population studies, sea bird census, and supporting stakeholder engagement in participatory management of marine protected areas. Ms. Anhalzer has provided technical support for numerous MSC assessment and possess a comprehensive understanding of MSC fisheries standard and stages; meeting MSC's team leader qualifications and competency criteria. Ms. Anhalzer has received ISO 9001 auditor training, has completed the MSC training and has affirmed she has no conflict of interest.

Dr. Gonzalo Macho, Principle 1

Gonzalo Macho has a background as a marine ecology and fishery scientist (1998 - ongoing), as a fishery practitioner on shellfish for a Fisher´s guild and the Regional Fisheries Authority of Galicia, Spain (2007-2008), and as an independent consultant in fisheries & marine ecology (2011 - ongoing). He holds a BSc (1997), MSc (2000) and a PhD (2006) in Marine Sciences from the Univ. of Vigo (Spain) and has done postdoctoral research (2008-2015) at the Univ. of Washington (Seattle, USA), CENPAT-CONICET (Puerto Madryn, Argentina) and the Univ. of South Carolina (Columbia, USA). He has published over 20 papers in SCI peer-reviewed journals, another 20 technical reports and has participated in more than 25 national and international scientific projects on population dynamics of shellfish resources (razor clams, cockles, gooseneck barnacle, clams & sea urchins), fisheries management and governance (octopus, razor clams, gooseneck barnacle, scallops, abalones, pelagic and deep-sea fishes in Argentina, Chile, Spain, Portugal and EU), reform of the EU common fisheries policy, marine socio-ecological systems and climate change impacts on marine invertebrates. Gonzalo has worked since 2014 as an assessor on 11 MSC certifications (4 Full Assessments, 3 Annual Surveillances, 1 Peer review and 3 Pre-assessments) within Europe, USA and Latin America since 2015, acting as Team member on P1, 2 and 3 and as peer-reviewer. In 2018 Gonzalo has also completed the MSC Fishery Team Leader training and joined the MSC Peer Review College.

Mr. Rohan Smith – Principle 2

Rohan Smith is a fisheries industry technical and management analyst with qualifications in Aquaculture and Fisheries Management (BSc University of Portsmouth/Sparsholt College), as well as Marine Science, Fisheries and Technology (MSc North Atlantic Fisheries College). He has conducted research evaluating impacts of different fishing activities on marine environments, including vulnerable marine ecosystems in inshore and offshore (24nm) waters of England. He has developed models and approaches that are used to evaluate interactions of fishing and marine ecosystems. His work also includes development of integrated sustainable fisheries management plans for Small Island Fisheries of the Caribbean (Montserrat). During this period he participated in research to gather data on mapping of fishing activity, collating catch composition, recording baseline habitat characterisation, reviewing current fishing and ocean policies, as well as readiness of these fisheries to demonstrate sustainability by pre-assessment against the Marine Stewardship Council (MSC) Fisheries sustainability standard. He has participated in MSC full assessments and Surveillance assessments for; Shetland Island Scallop, Canada Atlantic Halibut, Atlanto Scandian Herring, West of Scotland Herring, North Sea herring, and Northeast Atlantic Mackerel, contributing in capacities across Team Member, Lead Assessor, and Principle 2 expert.

Dr. Richard Allen – Principle 3

Richard Allen has 45 years of experience as a commercial fisherman, a representative of commercial fishermen, a fishery consultant, fishery conservationist, and as an active participant in the fishery management system, providing him with the ability to effectively communicate with the client and other stakeholders. Allen holds an Associate in Science degree in Fisheries and Marine Technology, a Bachelor of Science degree in Natural Resource Development and a Master of Marine Affairs degree. Allen has substantial depth of experience in local fishery context and country: he was a member of the New England Fishery Management Council from 1986 through 1995, and was a commissioner on the Atlantic States Marine Fisheries Commission from 1986 through 1997. Allen also has conducted numerous fishery assessments and onsite surveillance audits for finfish and shellfish fisheries in the US in the last 5 years and is deeply familiar with the MSC standard and relevant auditing techniques. Allen has completed the MSC version 2.0 team leader training in 2016, including the traceability module, and has proven competencies as described in Annex PC1 to serve as a team leader. Mr. Richard Allen has affirmed he has no conflict of interest.

2.2 Peer Reviewers

Peer Review College

The Peer Review Draft Report, incorporating the client action plan and conditions, scores, weightings and a draft determination was sent on June 4th, 2018 to the MSC Peer Review College.

The peer reviewer comments, incorporated in this report were addressed by the assessment team, the team responses to those comments are also included (See Appendix 2 Peer Review Reports

On account of the peer review one score was changed in PI 1.2.2 SIb from SG100 to SG80, making overall score for PI 1.2.2 decrease from 100 to 85.

SCS obtained confirmation from the Peer Review College that the proposed peer reviewers did not have any conflicts of interest in relation to the US Atlantic Scallops fishery and that the competencies of the peer reviewers match the required competencies. The MSC's Peer Review College compiled a shortlist of potential peer reviewers to undertake the peer review for the US Atlantic sea scallop fishery. Two peer reviewers were selected from the following list:

- Andy Hough
- Bryce Stewart
- Gerald Ennis
- Jose Peiro Crespo

A summary of their experience and qualifications is included on the Proposed peer reviewers Announcement. Further details of their experience are available on request by email to the Peer Review College .

3. Description of the Fishery

3.1 Unit(s) of Assessment (UoA) and Scope of Certification Sought

3.1.1 UoA and Proposed Unit of Certification (UoC)- Considered Final as Published in the Public Certification Report

The Unit of Assessment includes the Atlantic Sea Scallop (*Placopecten magellanicus*) stock caught by the US federally permitted vessels that sell their catch to members of the American Scallop Association, using dredges and fishing within the federal waters of the US EEZ between the US-Canada boundary and North Carolina.

This fishery has been found to meet scope requirements (FCR v2.0 7.4) for MSC fishery assessments as it

Does not operate under a controversial unilateral exemption to an international agreement, use destructive fishing practices, does not target amphibians, birds, reptiles or mammals and is not overwhelmed by dispute. (FCR 7.4.1.1, 7.4.1.2, 7.4.1.3, 7.4.2)

The fishery does not engage in shark finning, has mechanisms for resolving disputes (FCR 7.4.2.1), and has not previously failed assessment or had a certificate withdrawn.

Is not an enhanced fishery, is not based on an introduced species, and does not represent an inseparable or practically inseparable species (FCR 7.4.3, 7.4.4, 7.4.13-15)

Does not overlap with another MSC certified or applicant fishery (7.4.16),

And does not include an entity successfully prosecuted for violating forced labor laws (7.4.1.4)

The Unit of Assessment, the Unit of Certification, and eligible fishers have been clearly defined, traceability risks characterized, and the client has provided a clear indication of their position relative to certificate sharing (7.4.6-7.4.12).

Table 2. Unit of Assessment (UoA) and Unit of Certification (UoC).

Units of Assessment: Defined as the species, gear, and fleet assessed	
UoA: Species & Stock (FCR V2.0 7.4.7.1)	Atlantic Sea Scallop (*Placopecten magellanicus*) occurring in U.S. federal waters
UoA: Gear Type (FCR V2.0 7.4.7.2)	New Bedford style scallop dredges
UoA: Vessels (FCR V2.0 7.4.7.3)	Vessels holding a federal sea scallop permit in the Limited Access Fleet (permit categories: LA 2,3, 4, 5 and 6) and the Limited Access General Category Fleet (permit categories: LAGC A and B) (See Table 4).
Further information: Geographic Area	US federal waters of the EEZ between the US-Canada boundary and North Carolina
Further information: Management System	New England Fishery Management Council and the US National Marine Fisheries Service
Unit of Certification: Defined as the vessels allowed to use the MSC ecolabel for catch from the Unit of Assessment (defined as the species, location and gear assessed against the MSC standard).	
Client Group	American Scallop Association The following entities are currently covered by the certificate as client group members: 1. Atlantic Capes Fisheries, Inc. 2. Blue Harvest Fisheries, LLC 3. Chesapeake Bay Packing, LLC 4. Eastern Fisheries, Inc. 5. Lund's Fisheries, Inc. 6. Marder Trawling, Inc. 7. North Coast Seafoods Corp. 8. Northern Wind, Inc. 9. Oceans Fleet Fisheries, Inc. 10. Raw Sea Foods, Inc. 11. Seatrade International Co., LLC 12. Wanchese Fish Company, Inc.
Fishers in the UoC for the chosen stock	Vessels holding a federal sea scallop permit in the Limited Access Fleet (permit categories: LA 2,3, 4, 5 and 6) and the Limited Access General Category Fleet (IFQ and NGOM permit categories) that sell their catch to members of the client group
Other Eligible Fishers that may join the certificate for the chosen stock	Other eligible fishers include vessels from the same LA and LAGC permit categories as the vessels in the UoA that fish in federal waters, whose catch is not received and processed by the client group members.

UoA: Stock Structure Considerations:

According to Amendment 10 to the Scallop Fisheries Management Plan (FMP) all scallops in the US EEZ belong to a single biological stock, likely composed of smaller regional meta-populations. The National Marine Fisheries Service (NMFS) manages the majority of fishery occurring in federal waters as a single stock with two-joint main regional components (Georges Bank and Mid-Atlantic). The Gulf of Maine, a significantly smaller component, is also managed as part of the federal fishery and subject to the Scallop FMP, but is considered a third independent regional component.

A very small proportion of the scallop population in the US is also found within state waters, primarily in Maine (ME) and Massachusetts (MA). The federal component of the scallop management unit is managed independently from the populations occurring in state waters. However, the federal fishery does take into account the connections with the adjacent states (MA and ME) which represent the majority of catch in state waters. NMFS has determined that Maine and Massachusetts's scallop fishery restrictions are as restrictive as Federal scallop fishing regulations and that they do not jeopardize the biomass and fishing mortality and effort limit objectives of the FMP.

There is also some evidence that the stocks of sea scallops in Canadian and US waters are genetically linked. However, the fisheries on either side of the boundary are assessed and managed separately because after settlement the stocks do not move. Although Canadian scallops on Georges Bank contribute to recruitment in US waters, there is sufficient spawning capacity in US waters that this source of recruitment plays a minor role in determining the productivity of the entire resource; moreover, since sea scallops are relatively sedentary in the adult stage also implies that Canadian management does not affect the achievement of optimum yield from adult scallops in US waters.

There is no conclusive determination of the level of the metapopulation structure and the connectivity matrices between all scallops subpopulations. However, with the compilation of information from genetic studies and larval dispersal the team agreed that the US stock unit may be considered as a population with partial isolation (Stock Structure B as per Table G2) or of moderate connectivity (Stock Structure C).

The UoA for this re-assessment is the Atlantic sea scallops in the US federal EZZ waters, as based on the scope of the NMFS management structure, and does not include the sea scallop fishery occurring in state waters or in Canadian waters. Given the stock structure of the overall metapopulation, the team concluded that the harvest strategy employed by the Scallops FMP is appropriate to independently manage the unit stock occurring in US’s federal waters.

Detailed information on stock structure and why the NMFS management approach is considered appropriate is provided in Section 3.3.2 Biology.

3.1.2 Total Allowable Catch (TAC) and Catch Data

Table 3. TAC and Catch Data for sea scallops captured by scallop New Bedford dredges. (data are given in metric tons [mt]) (Source: TAC data was get from FW28 from NOAA, 2017, and Catch data from GARFO-NMFS-NOAA at https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticseascallop.html).

TAC	**Year***	2017	**Amount**	46,737 mt
UoA share of TAC	**Year**	2017	**Amount**	43,167 mt
UoC share of total TAC	**Year**	2017	**Amount**	43,167 mt**
Total meat weight catch by UoC	**Year (most recent)**	2017	**Amount**	21,455 mt
	Year (second most recent)	2016	**Amount**	16,203 mt

* The fishing year for management measures is March 1 to February 28.
** Days fished (*i.e* days-at-sea) are assigned rather than a quota.

3.1.3 Scope of Assessment in Relation to Enhanced Fisheries

There is no evidence of enhancement in this fishery.

3.1.4 Scope of Assessment in Relation to Introduced Species Based Fisheries (ISBF)

There is no evidence of introduced species in this fishery.

3.2 Overview of the Fishery

3.2.1 Location and Seasonality of the Fishery

The Atlantic sea scallop (*Placopecten magellacnicus*) is the scallop species supporting the largest wild scallop fishery in the world. This species is fished inshore and offshore in Canada and US, and the offshore US dredge fishery is the largest fishery of all.

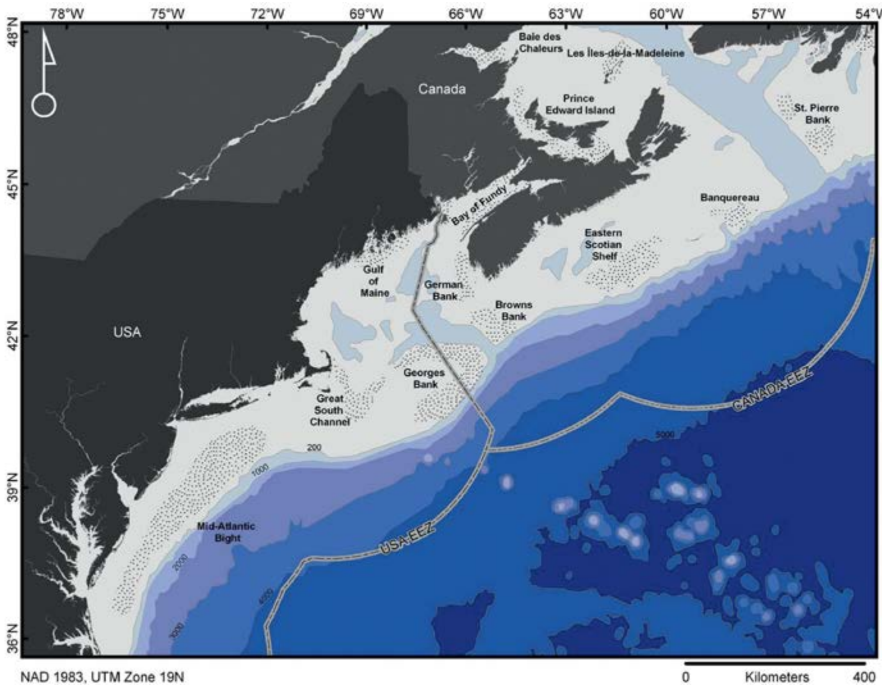


Figure 1. Map of US and Canadian scallop fishing grounds; stippled regions depict persistent scallop aggregations and areas of commercial fishing activity (Source: Stokesbury et al. 2016).

The Atlantic sea scallops, is a bivalve mollusk, that inhabit depths between 18 and 110 m on the continental shelf in the northwest Atlantic Ocean from Pistolet Bay, Newfoundland and the north shore of the Gulf of St. Lawrence to the south until Cape Hatteras, North Carolina (Blyth-Skyrme et al. 2015) (Figure 1), mainly on sand and gravel sediments where bottom temperatures remain below 20°C (68°F) (Hart 2006). The National Marine Fisheries Service manages all but the Gulf of Maine stocks as a single unit.

The scallop fishery operates year-round. The fishing year for management measures is March 1 to February 28, but most of the catches are done at the beginning of the fishing season, in the spring and summer months; around 70% of the catches were done before September in the 2016-17 and 2017-18 fishing seasons,

Figure 2. Monthly scallops landings of the LA fleet during the last two fishing seasons (from March to February) (Source: own elaboration with data from GARFO-NMFS-NOAA at https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticseascallop.html).

while during winter less than 10% of the scallops are captured (Figure 3).

3.2.2 History, Organization and User Rights of the Fishery

In the late 19th and early 20th century, the sea scallop fishery primarily exploited nearshore beds in the Gulf of Maine, although some trawl fishing for sea scallops may have occurred in the Middle Atlantic Bight (Smith 1891, Merrill 1960). In the late 1920s and 1930s landings increased as offshore scallop dredges began to fish off Long Island and on Georges Bank (Peters 1978, Serchuk et al. 1979). Landings markedly increased after World War II and since then, peaks in landings have occurred in the early 1960s, late 1970s, early 1990s, and in the period starting in 2000; each of these peaks was associated with one or more strong year-classes (Hart & Rago 2006). The development of the sea scallop fishery fits a pattern seen in many fisheries; 1) from the late 19th century to the 1960s, there was gradually increasing exploitation of an underutilized resource, followed by 2) a period from the 1970s through the mid-1990s characterized by increasingly severe overfishing (Figure 3) (Hart & Rago 2006). Until mid-90s the fishery was operated under an open access regime; during all this decades, periods of strong recruitment and high catch rates encouraged existing vessels to fish more days with larger crew sizes and attracted new entrants into the fishery, leading to subsequent declines in sea scallop biomass and catch rates (Hart & Rago 2006).

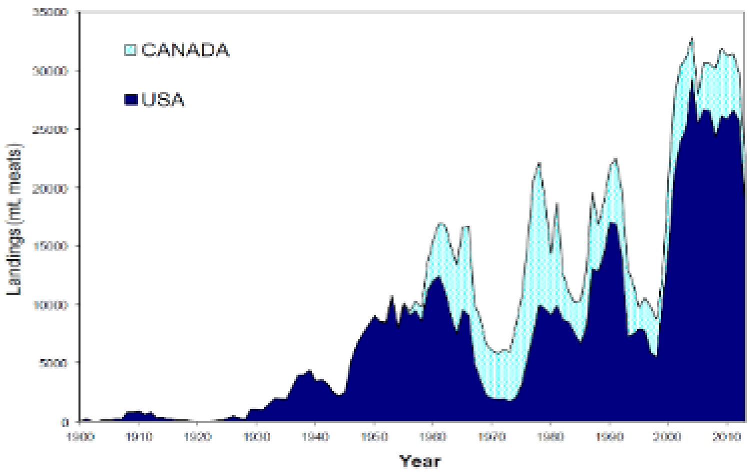


Figure 3. USA and Canadian historical sea scallop landings in NAFO areas 5-6 (North Carolina to Georges Bank). (Source: NEFSC 2014).

The sea scallop fishery in Canada followed a similar pattern and, as fishing increased after World War II, Canadian boats moved increasingly offshore onto Georges Bank and other offshore banks so that, by 1954, landings by the Canadian offshore fleet exceeded those of the inshore fleet for the first time (Bourne, 1964). With Canadian effort on Georges Bank mainly on the very productive Northern Edge and Peak, by 1965, 75% of the annual removals from Georges Bank were taken by the Canadian fleet (Caddy 1989).

Although the very high exploitation levels in Georges Bank during the 1960's and early 1970's was mainly due to foreign factory trawlers, when the foreign fleet were excluded by the declarations of 200-nmi EEZ by the USA and Canada in 1977, the fishing effort in the scallop fisheries increased (McDermott et al. 2017). The competitive fishery on Georges Bank by US and Canadian boats required a joint management regime, set up under the auspices of the International Commission for the Northwest Atlantic Fisheries (ICNAF). This continued to operate with very limited success until 1984 when the International Court of Justice in The Hague adjudicated on a boundary line (the so-called Hague line) separating the exclusive fishing grounds of the two countries and restricted the US, and

Canadian offshore fleets to their respective national zones (Aldous et al. 2013). Nevertheless, this separation did not stop overfishing in either country in the short term.

Following the adoption of a 200-mile Fisheries Conservation Zone by the US Government on March 1, 1977 (Hollick 1977), the New England Fisheries Management Council (NEFMC) and the Mid-Atlantic Fisheries Management Council (MAFMC) implemented the first Atlantic Sea Scallop Fishery Management Plan (FMP) in May 1982 (NEFMC, 1982) "[…] to restore adult scallop stocks and reduce year-to-year fluctuations in stock abundance caused by variations in recruitment (NEFMC 2003). Nevertheless, this FMP could not prevent another population decline since the fishery was still under an open access regime. US sea scallop effort on Georges Bank peaked at over 22,000 fishing days in 1991, when fishing mortality was about 1.7 per year, resulting in a collapse in landings and biomass in the mid 1990's, as it also happens in the Canadian side (Figure 1) (Hart & Rago 2006; McDermott et al. 2017).

Effort controls and reduction in fishing mortality were implemented through Amendment 4 (1994), nevertheless this did not prevent the fishery from being officially declared as overfished in October 1997 (NEFMC 1998). Following this collapse, more effort controls and reduction in fishing mortality were implemented to the US Atlantic Sea Scallop FMP through Amendment 7 (1998). This Amendment also established a 10-year rebuilding program for reaching MSY based on effort controls and measures to increase the size of scallops caught such as a rotational area strategy, which combined with area closures originally imposed to protect groundfish, contributed to rebuilding the resource and fishery to sustainable levels. The four distinct sets of measures that were enacted around 1994 each had a role in the recovery of the sea scallop resource and fishery. Gear restrictions improved selectivity and modestly reduced growth overfishing (Brust et al. 1996). The limited access and effort reduction measures reduced effort and fishing mortality by about 50% and were the most important factors in reducing overfishing in the open portions of the resource (Hart & Rago 2006). Since 1998, when new area closures were established, total commercial landings and revenue nearly tripled without increasing the fishing mortality rate (NEFMC 2003).

Approved in 2004, Amendment 10 introduced a "long-term, comprehensive program to manage the sea scallop fishery through an area rotation management program to maximize scallop yield" (NMFS 2004). Under the rotation program, the Council temporarily closes areas with large concentrations of fast-growing, small scallops to fishing (Figure 4). The remaining areas open for access (i.e., "access areas") utilized primarily by the vessels from the large-scale scallop fishery that operate as the **Limited Access (LA) fleet**. The LA fleet harvests scallops in open areas under a days-at-sea (DAS) allocation per year (NOAA/GARFO n.d.)

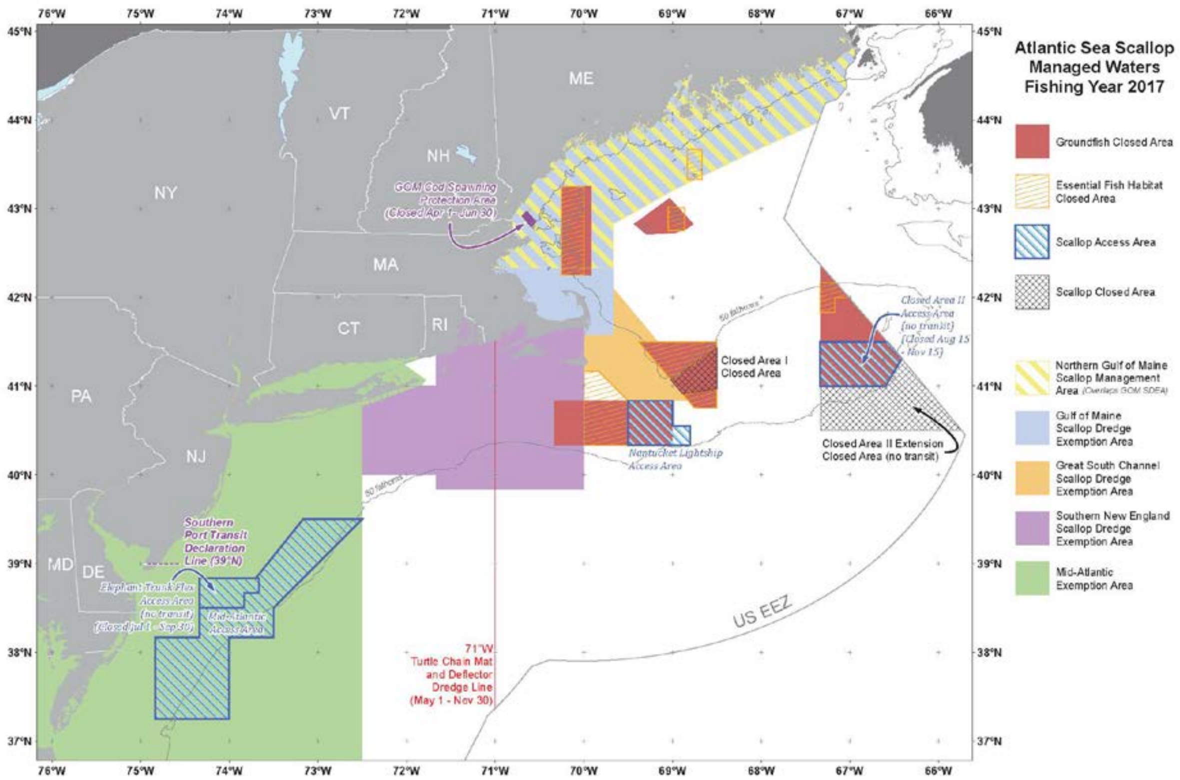


Figure 4. Management Areas for Scallops Fishery for 2017 fishing year as of the publication of this report. Reproduced from NOAA/GARFO nd. The LA fishes in the 'Scallop Access Areas'. Scallop fishing by LAGC IFQ vessels occurs in exemption areas within the open areas.

Permits are also awarded as part of the **Limited Access General Category (LAGC) fleet** to vessels fishing in non-scallop fisheries to catch scallops as incidental catch and for small-scale vessels in the scallop fishery. Amendment 11, approved in 2008, established specific allocations for the LAGC fleet, including a limited access program with individual fishing quotas (IFQs) (NMFS 2008). In the IFQ fleet vessels are allocated a yearly IFQ allocation which may be leased or permanently transferred among the IFQ fleet and may be fished throughout the fishing year. Most of the scallop fishing by LAGC IFQ vessels occurs in specific exemption areas within the open areas. A number of IFQ fleet-wide trips are allocated for the access areas, landings from these trips are still applied against their IFQ allocations (NOAA/GARFO nd). The IFQ vessels makes the primary component of the LAGC fleet (Table 4). Amendment 11 also established

Table 4. Federal sea scallop permits issued in 2016 by category (NOAA/GARFO n.d.) For a description of the permit types included in the UoA see Table 26

Permit Category	Description	Permits issued	Part of UoA
LA 2	**Full-Time**	**248**	**Yes**
LA 3	**Part-Time**	**2**	**Yes**
LA 4	**Occasional**	**0**	**Yes**
LA 5	**Full-Time Small Dredge**	**51**	**Yes**
LA 6	**Part-Time Small Dredge**	**30**	**Yes**
LA 7	Full-Time – Auth. to use trawl net	11	No
LA 8	Part-Time – Auth.to use trawl net	0	No
LA 9	Occasional – Auth. to use trawl net	0	No
LAGC A	**Individual Fishing Quota**	**258**	**Yes**
LAGC B	**Northern Gulf of Maine**	**99**	**Yes**
LAGC C	Incidental Catch	242	No

the Northern Gulf of Maine Management Area (NGOM), which permitted vessels in the LAGC fleet to fish in the NGOM area exclusively (NMFS 2008).

Trips of the LA fleet are generally multiple days, up to two weeks, and go farther offshore than vessels in the LAGC fleet.

3.2.3 Description of Fishing Practices: Gear

The commercial fishery for sea scallops is conducted primarily using the New Bedford style scallop dredges. Some scallop fishing is done with otter trawls in the Mid-Atlantic, under Incidental catch permits and a small fraction of the catch in inshore beds of the Gulf of Maine comes from divers (Figure 6). During the period 2000-2013, 95.6% of the landings were from dredges, 3.4% from trawlers and only 1.0% from diving (own elaboration based on data from table B4.1, NEFSC 2014). Only the product harvested using New Bedford style scallop dredges is included in the UoA. A description of the dredge operation is reproduced here from the "Observer Operations Manual 2016" (NEFSC 2016a):

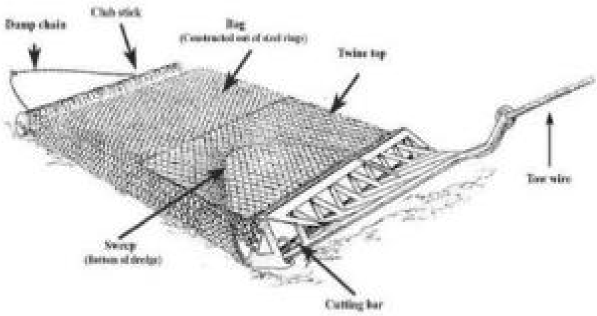


Figure 5. New Bedford style scallop dredge. Reproduced from NEFSC 2016a

> The major dredge components include a dredge frame, dredge shoes, pressure plate, cutting bar, chain sweep, chain bag, and a twine top mesh panel that allows fish bycatch escapement. Dredge ring sizes and twine top meshes must meet minimum sizes as specified by regulations. Many vessels deploy two scallop dredges to fish at the same time, with one on each side of the vessel. The maximum dredge width is also regulated; typically maximum width is a combined 31 feet for LA vessels and 10.5 feet for LAGC vessels, or vessels in the small dredge program. The traditional dredge frame is called a New Bedford style dredge. These dredges have multiple bale bars supporting the dredge; when fishing in hard bottom substrates, they will often be rigged with tickler and rock chains. These chains crisscross the opening of the chain bag in order to keep large boulders out of out of the dredge, and to stir up the bottom to increase catch.

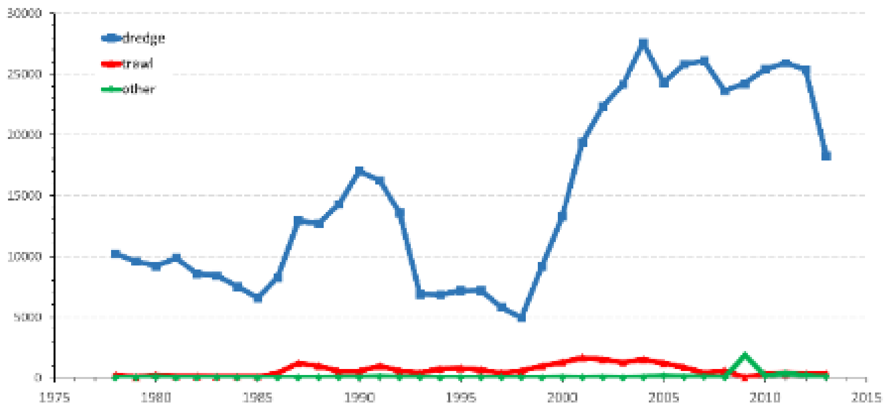


Figure 6. Historical US scallop landings (mt meats), by gear type (Source: own elaboration based on data from table B4.1, NEFSC 2014).

3.3 Principle One: Target Species Background

3.3.1 Atlantic Sea Scallop

Taxonomic Classification

Class: Bivalvia
Order: Ostreoida
Family: Pectinidae
Genus: *Placopecten*
Species: *magellanicus*

3.3.2 Biology

Life cycle

The following information was gleaned from Hart and Chute (2004), Naidu and Robert (2006) and NEFSC (2014). The life cycle of the sea scallop is depicted in Figure 6. Sea scallops are broadcast spawners with separate sexes that reach maturity at about age 2 (~40-75 mm shell height -SH), but gamete production is limited until age 4, since individuals younger than 4 years may contribute little to total egg production because fecundity increases rapidly with age. A major annual spawning period occurs during late summer to fall (August to October) although spring or early summer spawning can also occur. Larvae stages (trochophore, straight hinge and pediveliger) are planktonic for 5-8 weeks and transported influenced by the flow of currents before settling to the bottom.

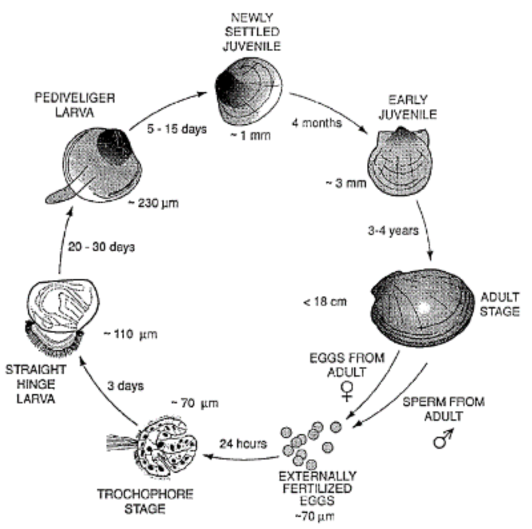


Figure 6. Generalized life cycle of the sea scallop (Source: Stewart and Arnold, 1994).

Growth rates are highly variable, depending on location and years, and are positively correlated with temperature and food supply and negatively correlated with depth, latitude and age. Scallops fully recruit to the NEFSC lined dredge survey at 40 mm SH, and to the current commercial fishery at around 90-105 mm SH when scallops are 4-5 years old. Sea scallops of 200 mm SH and individuals as old as 29 years old (although most live to approximately age 14) have been found in unexploited populations.

Distribution range and Fishing grounds

Sea scallops (*P. magellanicus*) can be found on the continental shelf of the northwest Atlantic from Pistolet Bay, Newfoundland and the north shore of the Gulf of St. Lawrence to the South until Cape Hatteras, North Carolina (Blyth-Skyrme et al. 2015) (Figure 7). The cold Labrador current and its junction with the Gulf Stream in the region of Cape Hatteras marks its southern limit (Brand, 2006).

Sea scallops seem to be vulnerable to high temperatures above 20 °C and larvae also appear to be sensitive to temperatures above 19 °C; this sensitivity to high temperature seems to limit the southern range, and on the other extreme, the northern range appears to be limited by delayed maturation and/or insignificant scallop sets (NEFMC 2003).

Scallop species have a highly aggregated (i.e., contagious) spatial distribution within their geographical range, and therefore, there are only a limited number of major areas within the geographic range of each species where the population is sufficiently abundant to support a commercial fishery. Such areas are usually referred as 'grounds' and are generally widely separated by areas that are environmentally unsuitable for the species (Brand 2006). Following Brand (2006), within each ground, there is usually some regions, typically of an area of several km^2, where scallop abundance is higher than elsewhere, which are referred to as 'beds'. Beds may be permanent aggregations, precise in their location and separated by clearly demarked areas that are unsuitable for scallops, or they may be temporary aggregations that vary in their location from year to year, resulting from an uneven settlement or early survival. Finally, within each bed, the distribution of scallops may be aggregated into 'patches'; the scale of which is generally measured in terms of tens or hundreds of m^2.

In the case of sea scallop, fishing grounds are being fished inshore and offshore along all its distribution range in US and Canada (Figure 7). The major aggregations that support commercial fisheries are the offshore populations on the Mid-Atlantic Shelf (US), Georges Bank (US/Canada) and to a lesser extent the Canadian banks of Browns Bank, German Bank, Lurcher Shoals, Grand Manan, Sable Island, Middle Ground, Banquereau Bank and St Pierre Bank (Serchuk et al. 1982; Hart and Chute 2004; Naidu and Robert 2006). Several inshore populations in coastal bays and estuaries also support important fisheries along the coast of Maine (US) and in the Bay of Fundy and southern Gulf of St Lawrence in Canada. Within these grounds, the highest concentration of many permanent sea scallop beds appears to correspond to areas of suitable temperatures, food availability, substrate, and where physical oceanographic features such as fronts and gyres may keep larval stages in the vicinity of the spawning population (Hart & Chute, 2004). Other occasional and irregular beds usually depend on settlers coming from the permanent beds (Figure 7).

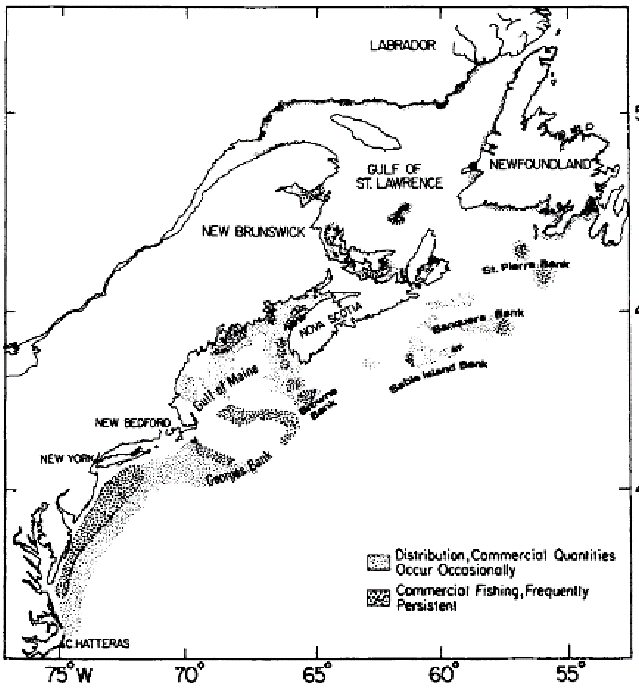


Figure 7. Sea scallop distribution range from Cape Hatteras (NC, USA) to Newfoundland and Labrador (Canada), showing the sporadic and permanent fishing grounds/beds (Source: Brand, 2006).

Sea scallop Stock structure (Metapopulations)

Most sessile and sedentary invertebrates and algae (mainly kelps, corals, mollusks, echinoderms, lobsters, crabs, and octopus) are structured as meta-populations (Defeo & Cansado 2015). Regarding scallops, Orensanz et al. (2016), in an extensive review, state that all scallop stocks are spatially structured as meta-populations in which local benthic populations (however defined) of sedentary individuals are connected with each other through the dispersal of pelagic larvae. Orensaz et al. (2016) considered three broadly defined scales and their relationship with the spatial distribution of the scallops:

> -*Macroscale*, relative to patterns of connectivity between components of a meta-population
>
> -*Mesoscale*, meaningful for the description and analysis of changes in the abundance and spread of populations.
>
> -*Microscale*, the scale of individual neighbourhoods, the arenas where the density-dependent processes that regulate recruitment to benthic stocks operate.
>
> Roughly, in the case of scallops, typical metric scales are in the order of metres and tens of metres for the microscale, kilometres for the mesoscale, and tens to hundreds of kilometres for the macroscale. The words 'site', 'bed', and 'ground' are used loosely, for regions commensurate with micro-, meso-, and macroscale processes, respectively. A 'fishing ground' is typically occupied by a meta-population. Beds within a ground are more or less discrete areas with high (fishable) density. Within beds, individuals are contagiously distributed, with a large fraction of them concentrated in patches of relatively high density. Scallop fishing grounds and beds are identified by name in most scallop fisheries. Sites are small partitions of the bottom (in the order of tens of square metre), commensurate with the typical experimental sites of ecologists. [The concept of site of these authors is equivalent as the concept of patch from Brand (2006) mentioned in the previous section on the sea scallop fishing grounds].

The metapopulation operates at the macroscale level (10s-100s km) of the fishing grounds, while the subpopulations (or local populations) operates at the mesoscale level (1-10 km) of the beds and the site or patches at a microscale level (meters) of neighborhoods. These scales have to be taken as a flexible reference, but not as a fixed rule, and can strongly vary case by case.

The conceptual metapopulation model has been implicit in scallop population dynamics for a long time; Fairbridge (1953) already mentioned "more or less clearly delimited sub-populations" for the Australian scallop in Tasmania. Orensanz et al. (2016) described basic patterns of metapopulation structure illustrated with many scallop examples using different species in many areas of the world; including the Tehuelche scallop in Patagonia, Australian scallop from Bass Strait, king scallop in Ireland and the English Channel, bay scallop in North Carolina, Peruvian scallop from north Chile and Peru, and Patagonian scallop in Argentina.

Regarding sea scallops, we are not aware of any in-depth analysis on the spatial structure along its entire distribution range in NW Atlantic where a precise identification of the metapopulation structure and sub-populations associated were given, with connectivity matrices between them detailing the source-sink dynamics. Nevertheless, there is an immense amount of information available, enough for determining the structure of the unit stock of sea scallops following Table G2 (FCR & Guidance v2.0, G7.4.7 – G7.4.9). To do this and for supporting the unit stock identified in the UoA, along this section we will go through the following topics:

1) Sea scallop biological spatial structure
    a. Life cycle differences between populations
    b. Genetic studies
    c. Larval dispersal and Source-sink dynamics
2) Stock response to management measures

1) Sea scallop biological spatial structure

a. Life cycle differences between populations

Variability in growth rates and timing of reproduction are apparent, but variations (induced, for example, by depth) within areas typically exceed differences between areas (NEFMC 2003).

Considerable differences in the growth pattern of scallops are evident for different populations of scallops; on an extensive comparison between areas, Naidu (1969) already reported that scallops from more northern latitudes generally have larger L_∞ values; conversely, K values, usually, are smaller. Some of the highest growth rates have been observed on Georges Bank and in Port au Port Bay, while scallops from the Gulf of St. Lawrence generally have slower growth rates than Gulf of Maine and Bay of Fundy scallops (Hart & Chute 2004). In the NEFSC (2014) report von Bertalanffy growth parameters were estimated for Georges Bank and Mid-Atlantic regions in different years, finding in general higher growth constants (k) and lower asymptotic length (L_∞) in Mid-Atlantic, coinciding with previous works (Hart & Chute 2009). Growth rates are positively correlated with temperature and food supply and negatively correlated with depth, latitude and, age (Harris & Stokesbury 2006, Hart & Chute 2009).

Differences between populations have also been found on reproductive timing and output. Fecundity is higher in sea scallops towards the South, but also in shallower areas (associated with higher food supply and temperatures), and variation along a depth gradient on a microgeographic scale may be as great or greater than the variation on a latitudinal scale (MacDonald et al. 1987, Barber et al. 1988, MacDonald and Thompson 1985a, b, 1988). An annual spawning cycle in autumn is typical in North populations like in Newfoundland (MacDonald & Thompson 1986) whereas semiannual (spring and autumn) spawning is characteristic of the Mid-Atlantic Bight (DuPaul et al. 1989). In Georges Bank, it is generally assumed that spawning occurs in the autumn, but semiannual spawning has also been observed on the Northeast Peak and Closed Areas I & II (DiBacco et al. 1995, Thompson et al. 2014) and has been suggested on the Southern Flank (Almeida et al. 1994, Sarro & Stokesbury 2009). In the Gulf of Maine semiannual spawning has also been found (Hart & Chute 2004). Moreover, in general, the spring spawn is often strong in the Mid-Atlantic Bight, but on Georges Bank and Gulf of Maine fall spawning is dominant (DuPaul et al. 1989, Almeida et al. 1994, Dibacco et al. 1995, Hart & Chute 2004, Thompson et al. 2014).

Georges Bank and Mid-Atlantic sea scallop populations also show differences in mortality; Hart et al. (2013) estimated M as 0.16 in Georges Bank and 0.2 in Mid-Atlantic sea scallops. But natural mortality in sea scallops also depends on other factors like age and depth (Dickie 1955, NEFSC 2014).

b. *Genetic studies*

Although phenotypic differences, as we have seen above (see section a) Life cycle differences between populations), abound throughout the geographic range of sea scallops, genetic distances appear to be relatively small (Naidu & Robert 2006). This is consistent with the fact that this species has several traits (it is dioecious, relatively long-lived, iteroparous with high fecundity, externally fertilizes gametes through broadcast spawning and has a long-lived passive larval dispersal stage) commonly associated with panmixia (mating is random within the entire metapopulation) or weak genetic structure. On the other hand, the basically sedentary nature of the adult, genetically determined population-specific larval behavior patterns, and significant phenotypic divergence are suggestive of population subdivision (Kenchington et al. 2006).

Geneticists have tried to clarify the spatial population structure of the sea scallop using different techniques. Beaumont & Zouros (1991) did the first genetic study (8 sites were sampled from the middle portion of the species' range −Bay of Fundy, Atlantic coast of Nova Scotia and Georges Bank− and surveyed with five polymorphic allozyme loci) finding a weak differentiation due to gene flow. Although, they also suggested that the populations could not be considered a single randomly mating unit due to significant differentiation in allele frequencies at one of the five loci.

Several years later, Kenchington et al. (2006) in a much more comprehensive study (12 sea scallop beds sampled from throughout the species' range from Newfoundland to New Jersey and assessed with the microsatellite nuclear DNA markers) (Figure 8) found high levels of genetic diversity between populations. The authors rejected the panmixia and proposed an alternative hypothesis; the genetic structure is somewhat consistent with a model of isolation by distance, where continuous migration connects all populations, but the rate of gene flow is greatest between neighboring populations. Very relevant conclusions can be extracted from this work regarding the structure of the population:

- Main grouping found with populations that are not significantly different within each group, were: North Canada group (populations in the Gulf of St. Lawrence and Newfoundland) and South Canada group (Bay of Fundy, Browns Bank, and Canadian Georges Bank).

- Great South Channel (Georges Bank US) was alone in its individual group, significantly differentiated from all other populations, even different from the Canadian portions of Georges Bank, two sites separated by only 300 km.

- Populations in the South Canada group may represent a loosely connected metapopulation; from a fisheries perspective, each of these populations may be predominantly self-recruiting and demonstrate relatively different dynamics and life history traits, but have a similar genetic composition since a relatively low level of gene flow is sufficient to prevent divergence. New Jersey population position was unclear, related to the South Canada group, but only if Georges Bank (Canada) was excluded from that group.

- Authors concluded that the geographic patterns of genetic variation in the sea scallop are primarily determined by currents promoting the retention (Georges US) or mixing of larvae (South Canada group), and that the broader separation of North and South Canada regions is imposed by a major oceanographic boundary in the south- west Nova Scotia area, acting as a barrier to the flow of water from the Scotian Shelf into the Gulf of Maine.

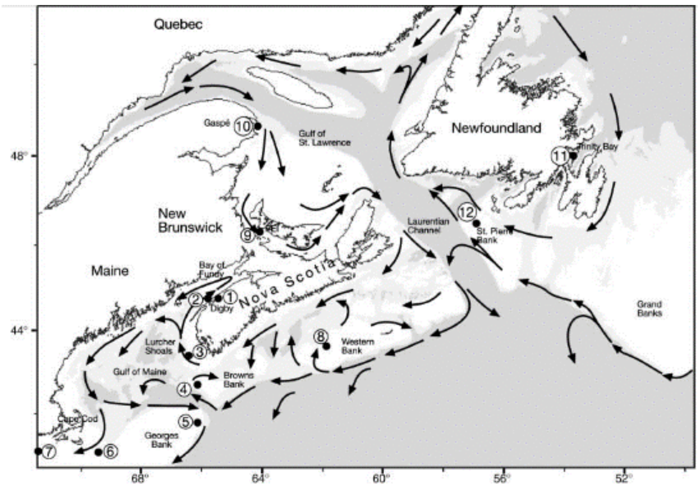


Figure 8. Approximate location of the 12 scallop sites, indicated by a shaded circle and number. Annual mean currents are indicated by arrows (Source: Kenchington et al. 2006).

Very recently, Van Wyngaarden et al. (2017) used restriction-site-associated DNA sequencing to examine dispersal and realized connectivity in the sea scallop from 12 locations from Newfoundland to the Mid-Atlantic (but only two US locations were selected; the Gulf of Maine and Mid-Atlantic Bight). The authors found a significant but weak population structure along the range separating sampling locations into two distinct groups with significant isolation; north and south of Nova Scotia (Canada), suggesting restricted dispersal (300-600 km per generation) compared to the species range (>2000 km) and that dispersal and effective connectivity differ. These observations support the hypothesis that limited effective dispersal structures scallop populations along eastern North America.

Most of the genetic studies have been done with sea scallops collected from offshore sites, but Owen & Rawson (2013) studied several inshore sites in the Gulf of Maine finding complex patterns of genetic differentiation among inshore beds. A break between populations in the western and eastern Gulf of Maine was found, suggesting that the Eastern Maine Coastal Current limits dispersal between beds of sea scallops in these two regions. Moreover, authors observed little genetic differentiation between the population in the western Gulf of Maine and the US portion of Georges Bank.

Taken together, the results from the above genetic studies suggest that both limited dispersal and selection associated with local adaptation across the species range may spatially structure scallop populations, despite high potential for gene flow (Van Wyngaarden et al. 2018). The drivers behind this spatial structure are also known. Van Wyngaarden et al. (2018) identified minimum and average winter temperatures as the most important variables describing genetic variation among populations of sea scallops from Newfoundland to Mid Atlantic Bight, indicating that overwinter survival may strongly influence the structure of these populations. These findings support the hypothesis of latitudinal structuring driven predominantly by ocean temperature, as it was previously suggested. The authors also identified minimum salinity as another potential structuring force, although to a lesser extent and affecting fewer populations than temperature changes over the range of the species.

The comprehensive genetic studies done so far along the entire distribution range of sea scallops (Beaumont & Zouros 1991, Kenchington et al. 2006, Van Wyngaarden et al. 2017) were strongly biased towards Canadian sites. The CAB has not found any in-depth genetic analysis of sea scallops including several US beds to understand the population structure of US populations but, larval dispersal studies has been done and can clarify the degree of connectivity between US populations.

c. Larval dispersal & Source-sink dynamics

The general assumption that recruitment to scallop populations is derived mainly from larvae transported, often large distances, from surrounding areas is based on little evidence (Brand 2006). These questions have been discussed in detail by Sinclair et al. (1985), who reviewed the available evidence for several species including sea scallops. Sinclair et al. (1985) concluded that the major fishing grounds are relatively few, precise in their geographical location and have been persistent in these locations for very long periods, all of which, they believe, strongly implies that the populations on these grounds are self-sustaining. In the same way, Brand (2006) analyzing the main scallop fisheries in the world found that hydrographic modelling has generally predicted potential larval dispersal pathways and recruitment links, and these models show that scallop fisheries are likely self-sustaining. Sinclair et al. (1985) also pointed out that many of the scallop aggregations are found in areas with tidally-induced oceanographic features, relatively persistent gyres or characterized by two-layer circulation, all of which could provide mechanisms for larval retention.

Focusing on the NW Atlantic scallop populations, despite all the studies done, ultimately, the scale of dispersal and connectivity in this species remains unresolved along its entire range of distribution (Van Wyngaarden et al. 2017). Nevertheless, besides the uncertainties, there is a general understanding of the subunits of the US stock and the connectivity between populations. It has been considered that the US sea scallop stock is likely composed of smaller regional meta-populations with some movement of larvae. Georges Bank (GB), Mid-Atlantic Bight (MAB), Southern New England Shelf (NES), and the Gulf of Maine (GOM) are the agreed regional components based on survey data, fishery patterns, and other information (NEFSC 2004).

Moreover, it has also been generally understood that sea scallop spat that settles in the MAB derive from NES. Those that settle on the NES were likely spawned on GB (NEFSC 2004), following a downstream larval transport due to the general southward circulation pattern along the continental shelf in this area (Tremblay et al. 1994; Gilbert et al. 2010; Tian et al. 2009). While there have been a number of studies modelling sea scallop larval transport on Georges Bank (Tremblay et al. 1994; Tian et al. 2009a; Gilbert et al. 2010) and only one that evaluated transport of larvae from Georges Bank to the Mid-Atlantic (Tian et al. 2009b), no published studies have modelled transport within the Mid-Atlantic. For filling these gaps, two projects are currently running on larval sources and connectivity within the Mid-Atlantic (Dvora Hart, personal communication, January 19th, 2018) and on quantifying the connectivity between GB and MAB (Changsheng Chen, personal communication, January 19th, 2018).

Of the four regional components, Georges Bank is thought to be the largest self-sustaining sea scallop population, owing to a residual clockwise gyre (see Posgay 1950, Tremblay et al. 1994). There are three major scallop aggregations on GB (Great South Channel, Southern Flank in US and Northeast Peak in Canada), which are typically considered as distinct subpopulations (Figure 9) (Gilbert et al. 2010). Good year classes on GB are associated with tight autumnal gyres that tend to retain larvae on the bank and poorer year classes are associated with loose gyres (Posgay 1950). The GSC subpopulation is the most retentive, receiving larvae spawned in the two other subpopulations, as well as retaining locally spawned larvae (Tremblay et al. 1994). This exchange was quantified some years later; models predicted that 83% of larvae settled in the GSC were spawned on GB (Southern Flank and Northeast Peak), and 46% of larvae settled on GB were spawned in the GSC on average from

1995 to 2005 (Tian et al. 2009). In contrast, local retention of larvae spawned in the Northeast Peak and Southern Flank subpopulations is negligible, and they rely mainly on input of the larvae spawned in the GSC (Tremblay et al. 1994; Tian et al. 2009). This general pattern has been found to be affected by when the spawning events happen, in spring or autumn. Spring-spawned larvae could follow different dispersal patterns than autumn-spawned larvae, since residual stream patterns result in relatively low recirculation on GB in the winter and spring months, with the strongest recirculation occurring in September/October (Naimie et al. 1994). Seasonal variability in recirculation may lead to lower larval retention (c. 20%) and greater loss to downstream locations (c. 30%) in spring versus autumn on Georges Bank (Gilbert et al. 2010). Therefore, autumn spawning may contribute significantly to local recruitment, whereas spring spawning could supply larvae to southern regions such as the Mid-Atlantic Bight (Thompson et al. 2014). Tremblay et al. (1994) modeled larval scallop distribution in this area and suggest populations in the vicinity of Georges (Can) and Georges (US) are strongly coupled and can mix in a single generation, although they acknowledge that self-recruitment is possible for both areas. See Figure 9 for a schematic representation of the connectivity of GB subpopulations based on spawning seasonality.

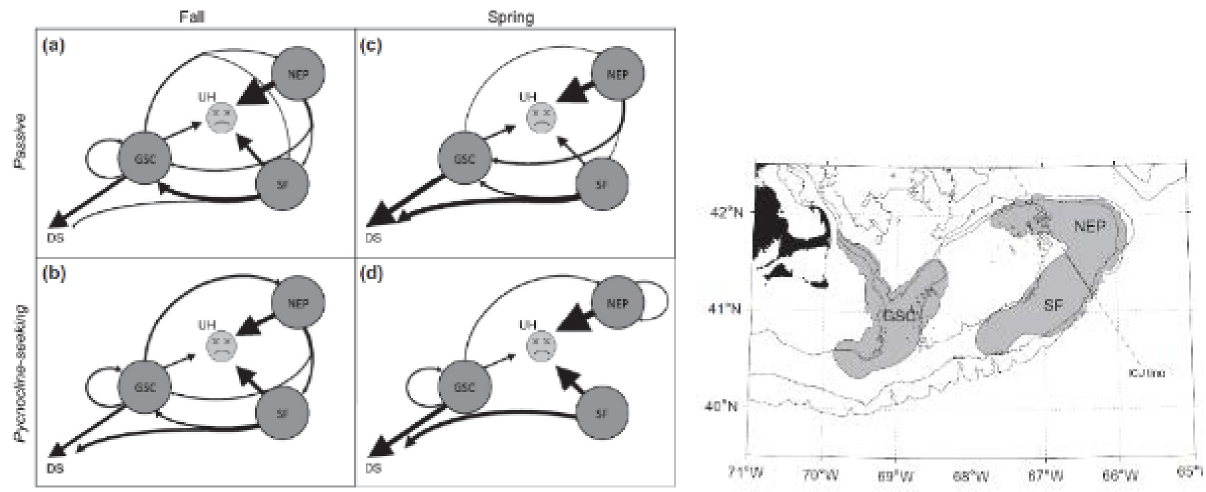


Figure 9. Map location and schematic diagrams of model-estimated connectivity among GB subpopulations (Great South Channel (GSC) and Southern Flank (SF) in US and Northeast Peak (NEP) in Canada). UH stands for unsuitable habitat and DS for downstream. Arrows illustrate the transport of particles among the subpopulations with the thickness of the arrow proportional to the corresponding connection fraction (Source: Gilbert et al. 2010).

The hypothesis of a connection between the scallops metapopulations of GB and MAB was only recently confirmed (Tian et al. 2009). Through a hindcast model authors found that in 1998, 2001, 2004, and 2005, a large amount of larvae drifted southward along the shelf break to the MAB, and, as well, that a considerable number of larvae (20-26%) drifted into the deep waters of the GOM interior in 1997 and 2002. Gilbert et al. (2010) suggested that GB larvae, mainly from Southern Flank and Great South Channel, are the prime candidates for supplying scallop populations along the NES and MAB, supporting the role of GB as sources. Both works support the role of GB, not only as a self-sustaining population but also as a source for the MAB population.

Fluxes of larvae from GB to other populations have been identified, but on the contrary, primary outside sources of larvae to GB have not been identified. The Scotian Shelf and Bay of Fundy in Canada are unlikely sources of larvae, northward transport from MAB and/or NES has not been found, and given their size relative to the GB area population, scallop aggregations in the GOM are likely secondary in importance (Tremblay et al. 1994).

Deepwater sea scallop populations are suggested not to be self-sustaining but depend instead on sporadic recruitment from populations in shallower water (Shumway and Schick 1987), behaving mainly as sink populations. According to Brand (2006), this fact is supported by several findings: 1) reduced food availability with increasing depth (19 to 31 m) was considered to be a primary factor limiting growth, reproductive output and reproductive effort of sea scallops, 2) in the Gulf of Maine very deep populations (170-180 m) have also greatly reduced shell and tissue growth, compared with populations in shallower waters, and 3) lower fecundities in deep populations have also been found.

Putting together all the information regarding the biological spatial structure of sea scallops that we have reviewed above (lifecycle differences, genetic studies, and larval dispersal), we cannot obtain a comprehensive understanding of the level of the metapopulation structure and the connectivity matrices between all subpopulations. But, the level of information is enough to get a general understanding on the spatial structure and the source-sink dynamics to clarify the structure of the unit stock according to Table G2 (FCR & Guidance v2.0). When considering the whole distribution range of the sea scallops, the US stock unit can be considered as a population with partial isolation (Stock Structure B) or moderate connectivity (Stock Structure C) from the Canadian populations.

The US scallop populations are genetically and oceanographically almost disconnected entirely from inshore waters population of the Bay of Fundy (Owen & Rawson 2013), and from the offshore populations from North Canada (Newfoundland and Gulf of Saint Lawrence) (Kenchington et al. 2006, Van Wyngaarden et al. 2017). South Canada populations (the Bay of Fundy, Browns Bank and Canadian Georges Bank) are suggested to represent a loosely connected metapopulation (where each of the populations may be predominantly self-recruiting). The only relevant connectivity between Canadian and US population would be in GB since Northeast Peak (Canada) and the US components (Great South Channel and Southern Flank) can exchange a relevant amount of larvae. Albeit the connectivity it is not so strong as expected by the close distance Self-recruitment in each of the three subpopulations is also possible (Tremblay et al. 1994, Gilbert et al. 2010), and the Great South Channel population is genetically significantly differentiated from the Canadian portions of Georges Bank (Kenchington et al. 2006). Moreover, the relative contribution of Canadian larvae to US scallop aggregations decreased after the establishment of Closed Areas I and II in GB (Davies et al. 2015).

Despite the described pattern, only a weak, but significant, genetic population structure has been found (Van Wyngaarden et al. 2017). It should be taken into account that a very low level of gene flow (one migrant per generation) is sufficient to prevent population diverging due to drift (Frankham et al. 2010).

2) Stock response to management measures

In October 1997, the Secretary of Commerce notified the NEFMC that sea scallops were overfished (NEFMC 1998) after many years of intensive fishing. Effort controls and reduction in fishing mortality were already implemented through Amendment 4 (1994), although it could not prevent that the fishery collapsed. Through Amendment 7 (1998) a 10-year rebuilding program for reaching MSY was implemented. Management actions were based on effort controls (reduction in DAS) and measures to increase the size of scallops caught such as a rotational area strategy (a system for closing and opening areas to improve yield per recruit. See section “3.3.4 Management: Harvest strategy” for a detailed description of the area rotation system and the four types of areas considered for management purposes; open areas, closed areas, areas temporarily closed and access areas) (Figure 10). The management measures were so successful that the NMFS declared in 2002, in the middle of the rebuilding program, the Georges Bank and Mid-Atlantic scallop resource as rebuilt (NEFMC 2003). This history of success has been deeply studied in the scientific literature as a worldwide example in fisheries management, since the beginning of being implemented (Hart 2001, 2002, 2005, 2009, 2011, Gell & Roberts 2003, Hart & Rago 2006, Murawski 2006, Valderrama & Anderson 2007, Kaplan et al. 2010, Davies et al 2015).

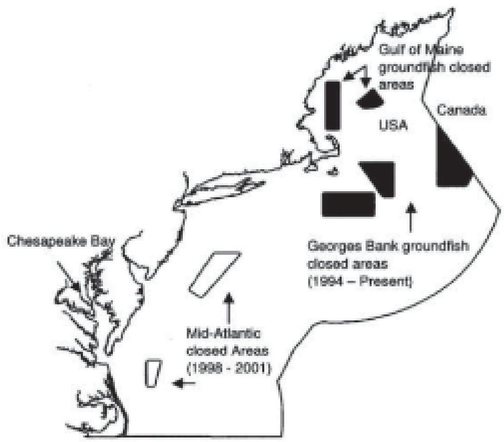


Figure 10. Sea scallops´ and groundfish closed areas based on Amendments 4 & 7. (Source: Valderrama & Anderson 2007, Davies et al. 2015).

The main management measures adopted through Amendment 4 (1994) & 7 (1998) (Table 5) were:

- Three areas on Georges Bank (in the Great Southern Channel and on the southern New England Shelf) were closed (17 000 km^2 in total) to scallop and groundfish fishing in December 1994 to help protect depleted groundfish resources.
- In April 1998, two areas in the Mid-Atlantic Bight were closed to scallop fishing for three years in order to protect high concentrations of juvenile scallops.
- A per-vessel allocation of DAS was set. Full-time vessel would be allocated 120 DAS for the 1999 fishing year and implement subsequent DAS reductions designed to rebuild the scallop within 10 years.
- Crew size was limited to a maximum of 9 persons in 1994 and reduced again to 7 in 1995.

Table 5. Summary of sea scallop management history 1982-2009

Period	Days at sea#	Minimum Ring Size	Minimum Twine Top	Maximum Crew Size	GB Closures	GB Access Areas	MA Closures	MA Access Areas
1982-1993	N/A	N/A	N/A	N/A	0	0	0	0
1994	204	3"-3.25"	5.5"	9	3	0	0	0
1995	182	3.25"	5.5"	7	3	0	0	0
1996	182	3.5"	5.5"	7	3	0	0	0
1997	164	3.5"	5.5"	7	3	0	0	0
1998	142	3.5"	5.5"	7	3	0	2	0
1999	120	3.5"	5.5"	7	3	1	2	0
2000	120	3.5"	8"	7	3	3	2	0
2001	120	3.5"	8"	7	3	1	0	2
2002	120	3.5"	8"	7	3	0	0	2
2003	120	3.5"	8"	7	3	0	0	2
2004	42*	3.5"	8"	7	3	2	1	1
2005	40*	4"	10"	7	3	2	1	1
2006	52*	4"	10"	7	3	2	1	1
2007	51*	4"	10"	7	3	2	1	2
2008	35*	4"	10"	7	3	1	2	1
2009	37*	4"	10"	7	3	1	1	2

Full-time permit
*Does not include access area trips; for each year between 2005-2009, full-time vessels were allocated 5 access area trips, with trip limits of 18,000 lbs meats.

It is clear that the Georges Bank closures were effective in rapidly increasing sea scallop abundance and biomass within these areas (Hart 2005). The scallop populations in these areas increased dramatically, by a factor of 4 by 1996, by a factor of 9 by 1998, and by a factor of 18 by 2000 (Murawski et al. 2000, Hart & Rago 2006). Closed area biomass in 2004 was about 31 times greater than in 1994, while abundance increased about nine times during that period. Abundance outside closed areas in 2004 was about five times its 1994 value (Hart 2005). It is known that GB was rebuilt very fast. Since effort reduction measures (days-at-sea reductions and crew size limitations) and gear restrictions (implemented gradually in the US sea scallop fishery since 1994), reduced fishing mortality and shifted the selectivity of the fishery toward larger animals, it would be expected to increase scallop biomass and abundance (Hart 2005). Therefore, increases in these numbers outside closed areas cannot necessarily be attributed only to the closures (Hart 2005). However, the increase in scallop populations did not significantly improve the recruitment of the GB (recruitment is defined as the number of scallops that grow to 2-year-old per year). In contrast to the GB, strong recruitment and increases in scallop population have been observed in the MAB since 1998 (Hart & Rago 2006). Subsequently, scallop landings from the MAB increased considerably, from 2891 mt in 1998 to 24 497 mt in 2004 (NEFSC 2007). The increases in the Mid-Atlantic Bight are due to a combination of increased recruitment, reduced fishing mortality, and the closure of an area south of Hudson Canyon for a three year (1998-2001) period (NEFSC 2004).

The exchange of adult scallops between a closed area and outside it is negligible, so any putative contribution of the closed areas to the improved conditions outside would be from increased recruitment (Hart 2005). Provisional results from a project currently running shows that it appears that the closures in the Mid-Atlantic have increased recruitment "downstream" of them (Dvora Hart, personal communication, January 19th, 2018).

Benefits in the larval settlement have also been observed from closures. Results showed that order of magnitude increases in larval settlement in GB after closure was facilitated by increases in size-dependent egg production inside and dispersal from Closed Areas I and II, but not on Nantucket

Lightship Closed Area (Davies et al. 2015). These authors also found that that scallop adult abundance, egg production and connectivity within and among closed areas and the areas outside increased after a suite of management strategies were implemented on the Bank in 1994. Hart et al. (2013) found as well that recruitment of Georges Bank sea scallops was slightly higher after the closures than before.

Closed areas are strongly supported in the literature. Scallop fisheries appear to be particularly suitable for the use of closed areas (Beukers-Stewart et al.2005), in common with a growing number of studies (e.g. Mosquera et al. 2000, Halpern and Warner 2002, Gell and Roberts 2003), which demonstrated that closed area protection results in increases in the density and mean age and size of exploited species. This approach has been proposed or is being used for many sessile and sedentary species like abalone, corals, sea urchins, and several species of scallops (Hart 2002).

Recognizing the relevance of the management measures (mainly by reducing fishing mortality and the establishment of the rotational closures) in the US sea scallops rebuilding case, it is also generally recognized the role played on this by the recruitment pulses. Before the 90s, sporadic large recruitment events temporarily increased landings but also encouraged higher overall fishing effort and thereby contributed to the long-term declines in resource abundance, since when recruitment declined the high fishing mortality quickly reduced biomass and LPUE (Hart & Rago 2006). After mid-90s, the area rotation system took advantage of those pulses by closing recruited areas for several years. Several recruitment pulses since the mid-90s (2003, 2008, 2012 and 2014 in Mid-Atlantic Bight, 2007-2009 and specially 2014 in Georges Bank and 2009 in the Gulf of Maine) have helped in rebuilding the fishery (Stokesbury et al. 2016). While there may not be a complete understanding of the biological impetus or ecosystem components that drive such anomalous events, there have been significant insights gained on how to manage recruitment events to maintain a sustainable scallop fishery. If recruitment events can be identified and small scallops are protected through management actions, the scallop fisheries have the potential to maintain or even increase their landings and remain some of the most successful examples of rebuilt fisheries in the world (Stokesbury et al. 2016).

From the information provided above it is very clear that the US stock in all areas studied was responsive to the management measures implemented, limiting this way the effect of other nearby scallop stocks.

Habitat

Scallops have a highly aggregated (i.e. contagious) spatial distribution within their geographical range, structured in beds within the fishing grounds that can be either sporadic (varying from year to year) or permanent (fairly precise in their location and separated by clearly demarked unsuitable areas) (Brand 2006).

Sea scallops typically occur at depths ranging from around 10-100 m but it also occurs in shallower water (as shallow as 2m) in the northern part of its range (Maine coast and Canada) (Naidu & Anderson, 1984, Hart & Chute 2004). P. magellanicus is a cold-water species with a temperature optimum of about 10°C (Posgay, 1953) and an upper lethal temperature from 20-24°C (Dickie, 1958). Its occurrence is restricted to waters with a maximum temperature of less than 20°C, so therefore, towards the southern end of its geographical range it is found in much deeper waters, usually in excess of 55m (Bourne, 1964). Although sea scallops are not common at depths greater than about 110 m, some populations have been observed in very deep waters (c. 175 m) in the Gulf of Maine (Hart & Chute 2004), while the record has been found as deep as 384 m (Merrill, 1959).

Regarding the type of substrate, sea scallops are generally found in seabed areas with firm sand, gravel, shells and cobble substrate and are typically abundant in areas with low levels of inorganic suspended particulates (fine clay size particles) (Hart & Chute, 2004). Such bottom substrates typically occur in areas of strong current flow (Brand, 2006). Although it is able to tolerate some silt or mud in the substrate, these areas are generally associated with low abundance and slow growth rates (Brand, 2006). This habitat preference could be related to its need to reduce clearance rate as particle concentration increases, which makes P. magellanicus a species not well suited to feed at high concentrations of low quality seston (Bacon et al. 1998). Although for settlers the kind of substrate is similar than for adults, it is also relevant the presence of branching animals (e.g. hydroids, bryozoans and sponges) and plants that permit attachment of the pediveliger larvae and juveniles (Hart & Chute, 2004)

Reproduction, Settlement and Recruitment

The sexes in sea scallops are separate. Mature gametes have been observed in females as young as one year and scallops have been reported to spawn during their second year, however, significant egg production may not occur until age 4 (85-90 mm SH) since fecundity is directly and exponentially related to shell height and maximum egg production is not reached until several years after maturity (Hart & Chute, 2004). Comparing adult stages, several factors affects the reproductive performance of sea scallops, latitude and depth between them. Gonad output (egg number) is greater in scallops from shallow water (10-20 m), where the food supply is typically greater and temperatures higher than in scallops from deep water (170-180 m) (MacDonald et al. 1987; Barber et al. 1988). There is evidence of latitudinal differences in fecundity. MacDonald and Thompson (1988) found that scallops from New Jersey were more fecund that those from locations further north, although variation along a depth gradient on a microgeographic scale may be as great or greater than variation on a latitudinal scale (MacDonald and Thompson 1985a, b; 1988). It is estimated that female scallops can produce 1-270 million eggs per individual for animals between 40-160 mm SH); by age 4 (85-90 mm) a female will release about two million eggs, although this is strongly variable since a 100 mm SH individual can also produce 50 million eggs (Langton et al. 1987, Hart & Chute 2004).

Sea scallops beds generally spawn synchronously in a short time, going from completely ripe to completely spent in less than a week, although dribble spawning (spawning extends over a period of several weeks) has also been reported (Hart & Chute 2004). Differences in breeding and spawning events between grounds have been described for many scallop species including *P.magellanicus* (Brand 2006). For sea scallops spawning generally occurs in late summer or early autumn (August to October) throughout their range (but timing of spawning can vary with latitude, starting in summer in southern areas and in fall in the northern areas), although spring or early summer spawns and minor "dribble" spawns may also occur at other times (Hart & Chute 2004). A biannual spawning cycle on the Mid-Atlantic shelf has been reported south of the Hudson Canyon, with spawning occurring both in the spring and fall, but North of the Hudson Canyon there is generally a single annual spawning event starting in late summer or early fall, however, there are also some reports of biannual spawning (spring and fall) in the Gulf of Maine and Georges Bank (observed on the Northeast Peak and Closed

Areas I & II and suggested on the Southern Flank), with the fall spawning being dominant (DiBacco et al. 1995, Hart & Chute 2004, Thompson et al. 2014). The spring spawn is often strong in the Mid-Atlantic Bight (DuPaul et al. 1989), but on Georges Bank it is less substantial, although it may be increasing in strength with warmer winter water temperatures (Almeida et al. 1994, Dibacco et al. 1995, Thompson et al. 2014).

The first two larval stages of the sea scallop, trochophore and veliger, are pelagic. The larvae remain planktonic for some 4-7 weeks, depending on temperature and food supply, drifting with water currents, but can also move independently on a small scale mainly due to vertical upward swimming and sinking (Hart & Chute 2004). Larvae then develop a foot and byssus gland and enter the pediveliger stage, searching the seabed for somewhere suitable to settle. Pediveligers can delay settlement for up to a month until a suitable substrate is encountered (Culliney, 1974). Pediveligers show preference for settling on shell fragments and small pebbles and also on ing algae and invertebrates like hydroids, bryozoan and on amphipod tubes (Hart & Chute 2004). Spat settlement varies with depth and water turbulence: numbers of spat generally increase with increasing depth, but this relationship is less evident with increasing water turbulence (Pearce et al. 1998). Juvenile scallops (5-12 mm shell height) leave the original substrate on which they have settled and attach themselves by byssus to shells and bottom debris (Dow and Baird 1960).

Settlement is assumed to occur by mid-December on Georges Bank although maximum larval settlement in Passamaquoddy Bay (Canada) occurs in late September (Thouzeau et al. 1991; Hart & Chute 2004).

Recruitment in sea scallops has been historically very variable among space and time. In scallops and other sedentary invertebrates recruitment is driven by inputs of settling larvae and post-settlement mortality. Events and stages involved in the recruitment process include gonadal maturation of spawners, spawning, fertilization, larval survival and dispersal, settlement and post-settlement growth, and survival (Le Pennec et al. 2003). Moreover, larval dispersal and settlement are strongly dependent on hydrographic conditions in marine invertebrates, including scallops (Orensanz et al 2016). In the case of sea scallops, there appears to be a regular recruitment of between 20% and 35% on Georges Bank and in the Mid-Atlantic Bight annually, but occasionally there is a vast recruitment event that more than doubles the entire stock; such events were observed in 2003 in the Mid-Atlantic Bight (12 billion scallops although many of them died between 2003 and 2004), in 2009 in the Gulf of Maine, and most recently in the summer of 2014 on Georges and Browns Banks (Figure 11) (Stokesbury et al. 2016). The depletion of the large number of small scallops in the Mid-Atlantic Bight observed in 2003, and poor recruitment from 2009 to 2011 lead to a reduction in abundance, however, a strong recruitment in 2012 replenished the stock to

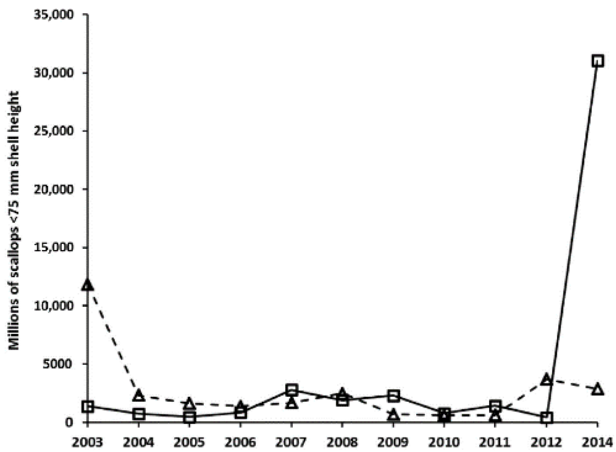


Figure 11. Recruitment of sea scallops (75 mm SH) for the Georges Bank (solid line) and Mid-Atlantic Bight (dashed line) US stock from 2003 to 2014 (Source: Stokesbury et al. 2016).

approximately 5 billion individuals. In 2014, another extreme recruitment event occurred along the southern flank of Georges Bank with numbers above 32 billion; likewise, strong recruitment was observed on the Canadian portion of Georges Bank, especially on Browns Bank (Stokesbury et al. 2016).

Juvenile sea scallops retain the ability to secrete a byssus for several years; maximum size for frequent byssal attachment is about 110 mm (5-6 years) (Caddy 1972). As adults, scallop movement is very restricted and there is little evidence of seasonal or directed movement patterns (Posgay 1964), although tagged scallops have been recaptured as much as 50 km from their origin (Melvin et al. 1965). While swimming, young scallops can be carried long distances downstream by currents but there is no evidence of mass migrations in this or any other scallop species (Stokesbury & Himmelman 1996, Hart & Chute 2004, Brand 2006). Some movement may be oriented along the path of prevailing currents, such as around the gyre of Georges Bank. Scallops on the Mid-Atlantic shelf appear to move upslope with age, possibly allowing some scallops in the closed Hudson Canyon area to become available to the fishery (NEFMC 2003).

Growth and Natural mortality

Sea scallop growth can be inferred using visible “rings” laid down on the shell as annual marks (Chute et al. 2012). Differences in growth rates between grounds have been reported for many scallop species including P. magellanicus, and there are also frequently differences in population size- and age-structure that arise partly from differences in the regularity of recruitment (Brand, 2006). Adult growth rates in sea scallops show considerable variation among populations; some of the highest growth rates have been observed on Georges Bank and in Port-au- Port Bay, while scallops from the Gulf of St. Lawrence generally have slower growth rates than Gulf of Maine and Bay of Fundy scallops (Hart & Chute 2004). In the NEFSC (2014) report von Bertalanffy growth parameter were estimated for Georges Bank and Mid-Atlantic regions in different years, finding in general higher growth constants (k) and lower asymptotic length ($L\infty$) in Mid-Atlantic.

Growth rates are positively correlated with temperature and food supply and negatively correlated with depth, latitude and age (Harris & Stokesbury 2006). Growth rates are related to clearance rates, which depends on several environmental parameters like water temperature, algal metabolites & seston concentration (MacDonald & Ward, 2009). Unlike other bivalves as mussels and clams, P. magellanicus reduce clearance rate as particle concentration increased and had the ability to reject poorer quality particles, concluding that *P. magellanicus* is not well suited to feed at high concentrations of low quality seston (Bacon et al. 1998). Feeding performance has implications in many life cycle parameters like growth and reproductive output. In general, seems clear that food and temperature are the two primary environmental factors affecting growth in nature, and in the case of sea scallops, growth appears to be more dependent on food availability than on temperature, and it has even been suggested that sea scallop growth may be virtually independent of temperature if sufficient food is available (MacDonald and Thompson, 1986).

Mortality is one of the most difficult parameters to estimate, and it has been rarely possible to make any quantitative assessment of the natural mortality rates for sea scallops, but of the few estimates available, most involve predation on adult scallop stocks by large predatory starfish (Brand 2006).

Dickie and Medcof (1963) suggested that many of the sudden mass mortalities (up to 80% of recent mortality compared to the total catch) of sea scallops that have been reported on beds at intermediate or shallow depths in the south-western Gulf of St Lawrence result from perturbations to the position of the thermocline which subject scallops to sudden large changes in temperature. These may be of sufficient extent and duration to be the direct cause of death but, more often, thermal shock increases mortality indirectly by inhibiting the scallop's normal escape reactions and making them more vulnerable to predation. Authors also found that these higher than usual mortalities were generally associated with an unusual abundance of predators, especially the starfish, Asterias vulgaris. Merrill and Posgay (1964) estimated a natural mortality rate of M = 0.1 in Georges Bank. Brand (2006) reviewed several studies in Georges Bank and other grounds and confirmed that the rate of natural mortality was generally low, in the region of 10-15% (M = 0.10-0.16). Recently, Hart et al. (2013) using the CASA sea scallop model estimated M as 0.16 in Georges Bank and 0.2 in Mid-Atlantic sea scallops (no direct estimate of M is available for Mid-Atlantic, so it was estimated based on the ratio of the growth coefficient K to M, which is generally regarded as a life history invariant that should be approximately constant for similar organisms).

But natural mortality in sea scallops also depends on other factors like age and depth. Natural mortality of very old scallops was estimated to be about 1.5 times that of younger scallops (NEFSC 2014). Moreover, the rate of natural mortality was found to depend on depth; for the same bed in the Bay of Fundy mortality was relatively constant from year to year, with average values of 4.5%, 13.8% and 15.7% for three groups of beds in progressively deeper waters (Dickie 1955).

Climate Change impacts

Impacts of climate change on sea scallops have been reviewed in a Vulnerability Assessment of fish and invertebrates to Climate Change on the Northeast U.S. Continental Shelf (Hare et al 2016). Main considerations extracted from this report regarding sea scallops are:

- Overall Climate Vulnerability Rank: High (100% certainty from bootstrap analysis).
- Climate Exposure: High. Two exposure factors contributed to this score: Ocean Surface Temperature (3.9) and Ocean Acidification (4.0). All life stages of Atlantic Sea Scallop use marine habitats.
- Biological Sensitivity: High. Two sensitivity attributes scored above 3.0: Sensitivity to Ocean Acidification (4.0) and Adult Mobility (3.7). Atlantic Sea Scallops form calcium carbonate shell and adults are sessile, but capable of small-scale movements (meters).
- Distributional Vulnerability Rank: Moderate (83% certainty from bootstrap analysis).
- Directional Effect in the Northeast U.S. Shelf: The effect of climate change on Atlantic Sea Scallop on the Northeast U.S. Shelf is very likely to be negative (>95% certainty in expert scores). Ocean acidification will likely negatively impact molluscs, including Atlantic Sea Scallop. Warming may also reduce habitat and increase vulnerability to predation which will reduce productivity and cause distributions to shift northwards and into deeper waters.
- Climate Effects on Abundance and Distribution: Using a coupled biogeochemical, population, bioeconomic model, Cooley et al. (2015) indicated that yields may decrease in the Atlantic Sea Scallop fishery as adult growth slows under ocean acidification. There are no studies on the effects of ocean acidification on Atlantic Sea Scallops specifically, but work with other molluscs suggest negative effects (Ries et al., 2009; Talmage and Gobler, 2010). Predation of juvenile Atlantic Sea Scallops was higher at higher temperatures (Barbeau and Scheibling, 1994). Recruitment of Atlantic Sea Scallops in shallow water is likely decreased owing to higher temperatures and recruitment in offshore waters is likely

decreased because of temperature related overlap with an important predator species Astropecten americanus. Increased temperatures may lead to lower recruitment and thus negatively affect population productivity.

Historical Landings

The Atlantic sea scallop (*P. magellacnicus*) US dredge fishery is the largest wild scallop fishery in the world and throughout history it has been subject to large fluctuations in landings. During 1900-1950 the fishery was developing and landings fluctuated from nothing to 9 thousand mt (Figure 12). During the following decades and until its collapse in the 90s, landings still had large fluctuations between 2.4 and 17.5 thousand mt (Figure 12). As of 1994, a set of measures were implemented, but the fishery was anyway formally declared overfished in 1997 (NEFMC 1998). Amendment 7 was implemented during 1998 with more stringent limitations intended to rebuild the stocks within ten years. A combination of the closures, effort reduction, gear and crew restrictions led to a rapid increase in biomass (Hart and Rago 2006), and sea scallops were officially rebuilt by 2001, leading to an increase in the commercial landings (around 25 thousand mt) and revenue (around $400 millions USD) during the 2000s that nearly tripled the ones observed in the 90s. In the 2010s decade, landings and revenue were kept at similar high levels but a relevant drop in 2014-15.

These fluctuations in landings associated with the large and natural fluctuations in biomass, was for Caddy (1989) suggestive of a strong environmental influence and led him to describe sea scallop fisheries as cyclical, irregular or spasmodic. Orensanz et al. (2016) refined this distinction for several scallop fisheries in the world and considered that the US sea scallop fishery does not fall in the "spasmodic stock" category, as other scallop fisheries do (the Japanese scallop stock of Mutsu Bay in Japan, the saucer scallop stock of Shark Bay in Western Australia and the Peruvian scallop in south Perú and northern Chile), but in the "irregular stocks" category.

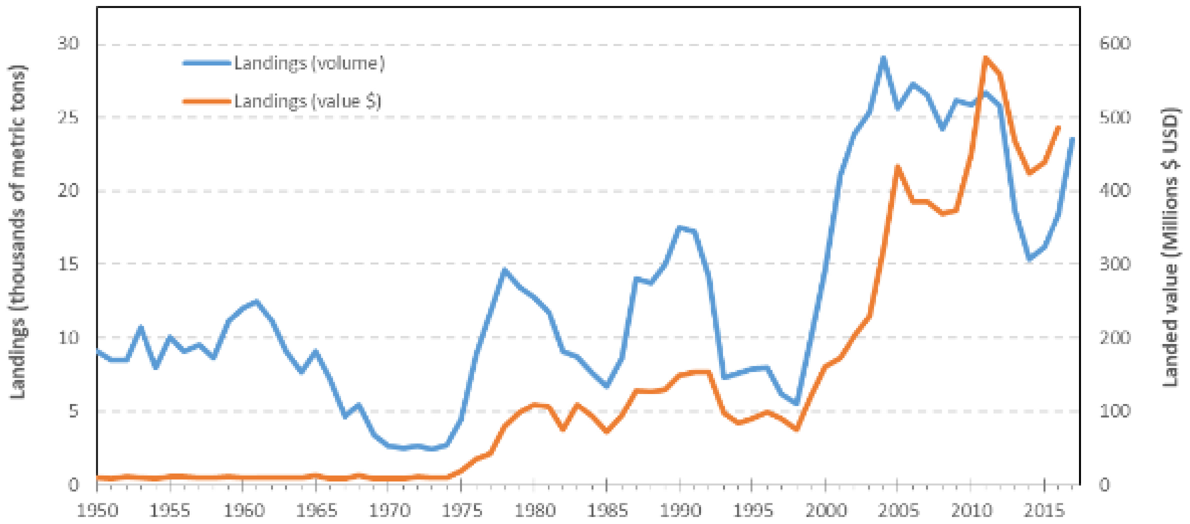


Figure 12. Scallop landings (metric tons) and landed value (millions $ USD) from 1970 to 2017. (Source: own elaboration with 1970-2016 data from NOAA, Commercial Fishery Statistics; www.st.nmfs.noaa.gov/commercial-fisheries/) (2017 data point is not consolidated data from GARFO-NMFS-NOAA at: https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticseascallop.html.

Dealer data (landings) have been reported by market categories (under 10 meats per pound, 10- 20 meats per pound, 20-30 meats per pound etc) since 1998 (Figure 12). These data also indicate a trend towards larger sea scallops in landings in recent years. While nearly half the landings in 1998 were in the smaller market categories (more than 30 meats per pound), 75% or more of recent landings were below 20 count and about 99% were below 30 count (NEFSC 2014).

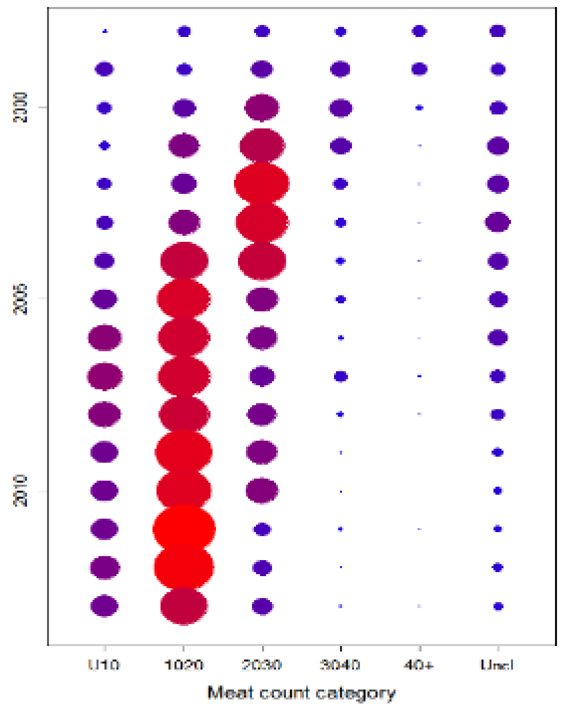


Figure 13. Landings by commercial meat count category (U10 = less than 10 meats per lb, 1020 = between 10-20 meats per pound, 2030 = between 20-30 meats per pound, 40+ = over 40 meats per pound, and Uncl = unclassified). The areas of the bubbles are proportional to landings. (Source: NEFSC 2014).

A close look to the landings between 2009-2016 by permit category is available at the report "Framework 29 to the Scallop FMP" and reproduced here (NEFMC 2018a) (Figure 13):

> During the period from fishing year 2009 to 2016, the scallop landings ranged from about 32 to 56 million pounds. The recovery of the scallop resource and consequent increase in landings and revenues was striking given that average scallop landings per year were below 16 million pounds during the 1994-1998 fishing years. However, the landings from the Northeast sea scallop fishery fell to 38.2 million pounds in 2013 fishing year and to 31.7 million pounds in the 2014 fishing year for the first time since 2001. In 2016, landing increased to about 40.8 million pounds.
>
> The increase in the abundance of scallops coupled with higher scallop prices increased the profitability of fishing for scallops by the general category vessels especially after 2002 fishing year. As a result, general category landings increased from less than 0.4 million pounds during the 1994-1998 fishing years to more than 4 million pounds during the fishing years 2005-2009, peaking at 7 million pounds in 2005 or 13.5% of the total scallop landings. The landings by the general category vessels declined after 2009 as a result of the Amendment 11 implementation that restricts TAC for the limited access general category fishery to 5.5% of the total ACL. The landings by limited access general category fishery including by IFQ, NGOM and incidental permits, declined to about 3.9 million lb. in 2016.

Landings in 2017 between both fleets (not shown in Figure 13) went back to 51,8 million pounds (GARFO-NMFS-NOAA at: https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticseascallop.html).

Figure 14. Scallop landings by permit category and fishing year (dealer data) (Source: from FW 29 – NEFMC 2018a)

Regarding the relevance of the different fishing grounds, landings from the Georges Bank and the Mid-Atlantic regions have dominated the fishery. Nevertheless, the sea scallop fishing industry was initially developed based on nearshore beds in the Gulf of Maine, although it quickly moved to the offshore grounds of the Mid-Atlantic first, and then to Georges Bank (Smith 1891, Merrill 1960, Peters 1978, Serchuk et al. 1979). A description of the historical (1964-2013) landing by region (Georges Bank, Mid-Atlantic, Gulf of Maine and Southern New England) is reproduced here from the “Assessment Report of the 59th Northeast Regional Stock Assessment Workshop” (NEFSC 2014) (Figure 14):

> US Georges Bank landings had peaks during the early 1960’s, around 1980 and 1990, but declined precipitously during 1993 and remained low through 1998. Landings during 1999-2004 were fairly steady, averaging almost 5000 mt annually, and then increased in 2005-2006, primarily due to reopening of portions of the groundfish closed areas to scallop fishing. Landings increased again in 2012-2013, mainly due to shift of “open” effort from the Mid-Atlantic to Georges Bank.
>
> Prior to the mid-1980s, Mid-Atlantic landings were generally lower than those on Georges Bank. Mid-Atlantic landings during 1962-1982 averaged less than 1800 mt per year. An upward trend in both recruitment and landings has been evident in the Mid-Atlantic since the mid-eighties. Landings peaked in 2004 at 24,494 mt and declined after 2011, reflecting the poor 2007-2009 year classes there and concomitant effort shifts onto Georges Bank.
>
> Landings from other areas (Gulf of Maine and Southern New England) are minor in comparison. Gulf of Maine landings were less than 1% of the total US sea scallop landings in most recent years. Maximum landings in the Gulf of Maine were 1,614 mt on 1980 and were always below 500 mt between 2000-2013. Landings from Southern New England peaked in 2004-2006 up to 2,047 mt but has been historically below 500 mt.

Checking at more recent years, about 65% of landings during 2003-2012 were from the Mid-Atlantic region, 32% from Georges Bank, 2% from Southern New England and under 1% from the Gulf of Maine (the proportion from the Mid-Atlantic was higher than in earlier periods), nevertheless, a shift in the fishery towards Georges Bank occurred again in 2013, when 64% of the landings were from Georges Bank, 32% from the Mid- Atlantic, 2% from Southern New England and 3% from the Gulf of Maine (NEFSC 2014).

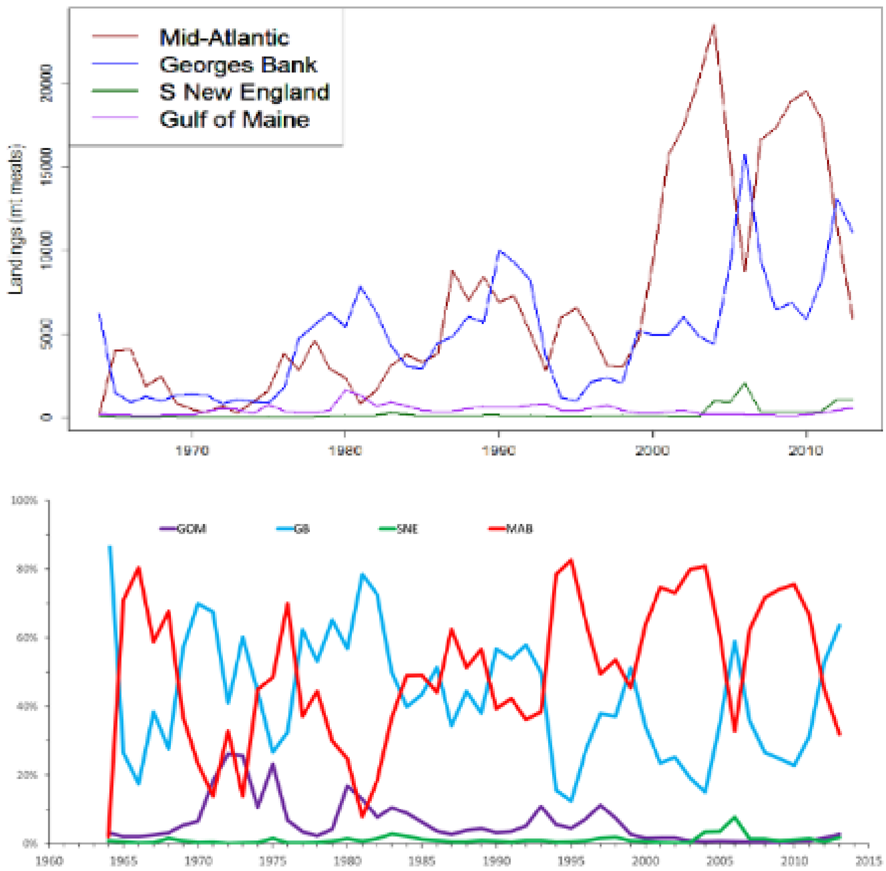


Figure 15. US sea scallop landings during 1964-2013, by region in absolute number (top) and in percentage (down). (Source: Top: NEFSC 2014; down: own elaboration based on data from NEFSC 2014).

Landings per unit effort (LPUE, Figure 15) was computed as landings per day fished (days fished represent the time in days that gear was fishing). LPUE shows a general downward trend from the beginning of the time series to around 1998, with occasional spikes upward due to strong recruitment events. LPUE increased considerably since then as the stock recovered; LPUE has a positive trend in both fishing grounds, and have risen since the 90s to historically high levels.

The scallop fishery operates year-round with the duration of the season limited by the Enterprise Allocation and the overall total allowable catch. The fishing year for management measures is March 1 to February 28, but most of the catches are done at the beginning of the fishing season, in the spring and summer months; around 70% of the catches were done before September in the 2016-17 and 2017-18 fishing seasons, while during winter less than 10% of the scallops are captured (Figure 16).

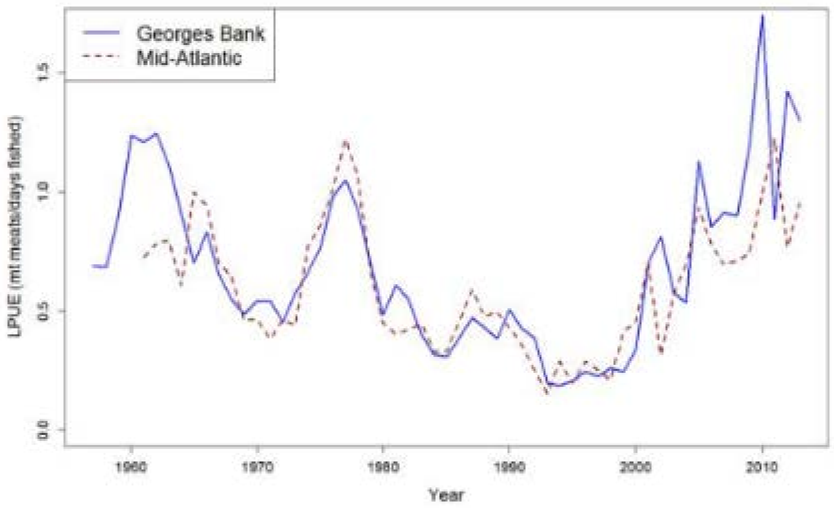


Figure 16. Landings per unit effort (LPUE) on GBK and the MAB, excluding access area trips. (Source: NEFSC 2014).

3.3.3 Stock assessment

For assessment purposes the US sea scallop stock is divided into Georges Bank (GBK), Mid-Atlantic Bight (MAB), Southern New England Shelf (NES), and Gulf of Maine regional components based on survey data, fishery patterns, and other information (NEFSC 2014) (Figure 17). However, NES is considered to be part of the GBK region for assessment modeling purposes. In this section we will describe the stock assessment for the regions of MAB and GBK (NES included). See section 3.3.6 for an assessment of sea scallops in the Northern Gulf of Maine federal management area. The information for this section collected from NEFSC 2014 and NEFMC 2018a if no other reference is stated.

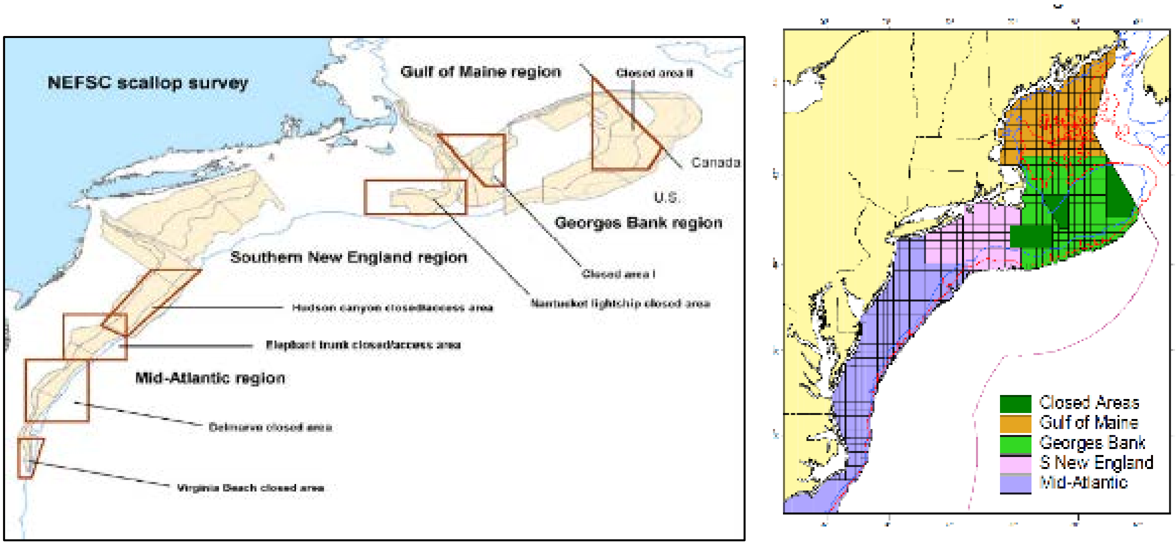


Figure 17. Stock assessment and management areas for sea scallops in US waters (Source: map on the right: NEFMC 2003; map on the left: NEFMC 2014a).

Sea scallops in U.S. waters have been assessed using forward projecting size-structured models since 2007. Fishing mortality, biomass and recruitment are estimated using a version of the CASA (Catch-At-Size Analysis) model based loosely on Sullivan et al. (1990). Forecasts are done using the SAMS (Scallop Area Management Simulator) model, which models the scallop fishery and population on a relatively fine regional scale, in order to help understand the effects of area management such as closing and reopening areas to fishing. CASA is the estimation model and SAMS is the operating model. Reference points are calculated using the SYM model (Stochastic Yield Model, Hart 2013). All of these models were specifically developed for use with sea scallops in this stock.

Stock assessment model

A catch-at-size-analysis (CASA, Sullivan et al 1990) is used in the US sea scallop fishery as the primary stock assessment estimation model since 2007. CASA is a spatially explicit, forward projecting and size-structured estimation model (CASA) used for estimations of biomass, fishing mortality and recruitment. CASA is entirely length-based with population dynamic calculations in terms of the number of individuals in each length group during each year. Age is almost completely irrelevant in model calculations. Unlike many other length-based stock assessment approaches, CASA is a dynamic, non-equilibrium model based on a forward simulation approach. CASA uses commercial catches (retained and discarded, and the shell heights of each of them), shell height/meat weight data, and growth increment to model transitions between shell height classes over annual time intervals.

In the last stock assessment workshop (2014), three CASA models were used: one for the open portions of GBK, another one for the closed portion of GBK (this was the first time GBK was split in two stock assessment), and a third one for the whole MAB. This split in GBK is based on the work of Hart et al. (2013) using both actual data and simulations; authors concluded that splitting GBK into open and closed areas gives more stable and likely more precise results. Finally, biomass, abundance, recruitment and fishable mean abundance were estimated for the whole stock by adding estimates for the MAB and GBK open and closed.

CASA incorporates a very wide range of data with parameter estimation based on maximum likelihood. CASA integrates fishery-independent information (dredge and video surveys) with commercial catch (landings and discards), landings per unit effort and fishery shell height composition. The input data from the long (in terms of years), large (in terms of area surveyed) and high quality independent dredge and video surveys is one of the strengths of the model. For these surveys the data are well characterized and there has been a very rigorous examination of sources of uncertainty and calibration issues (NEFSC, 2010). Discard data in the form of discarded biomass in each year or a discard rate for each year is used in the model, although this data is more problematic; there are no data on discards before 1992 and observer coverage of discards was low until 2003. Total mortality of discarded scallops (including mortality on deck) is uncertain but has been estimated as 20% in the 2010 assessment. In the current model (as in SAW 2014) discards have the same selectivity as landed catch and size composition data for discards are not included in the input file. One relevant issue of the model is that discard rates in CASA are defined by the ratio of discards to landings (d/L). The model will be modified in the future to model discards and landing separately, and to use size composition data for discards (NEFSC 2014). CASA assumes a natural mortality M= 0.16 (M = 0.24 for the plus group) for GBK and M=0.2 (M = 0.3 for the plus group), for the MAB.

For a detailed description of the model see TOR 4 and Appendix B9 from NEFSC (2014) report.

In order to evaluate the CASA model performance, several approaches have been taken for better describe the uncertainties in the assessment; comparisons with expanded survey data (empirical analysis), retrospective and sensitivity analyses as well as likelihood profiles.

Empirical analysis: the empirical assessment used simple techniques to estimate sea scallop stock abundance, biomass and fishing mortality in the MAB, GBK and combined stock areas. The purpose was to evaluate the accuracy of CASA estimates as independently as possible (survey swept-area abundance data used were the best available estimates of total 40+ mm stock abundance and considered reliable). Empirical and CASA model estimates of abundance and fishing mortality show similar trends in all regions; CASA models estimates were generally lower than empirical abundance estimates, while fishing mortality show the inverse pattern with CASA estimates generally higher than empirical (see Appendix 6 Supporting information P1). All three CASA models (GBK open, GBK closed and MAB) were run from 1975-2013. The models appeared to give good estimation for some years, but estimates of abundance and biomass had poor diagnostics in years associated with very strong year classes (Figure 18). Explorations were made in incorporating density-dependent mortality on juvenile scallops into the CASA model in order to better model the population dynamics of large year classes, and initial results appear to be promising.

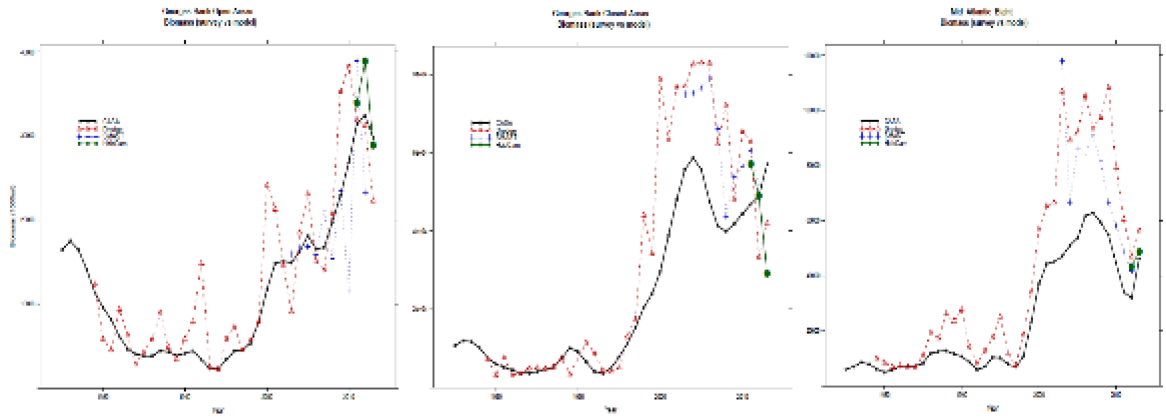


Figure 18. Comparison of CASA model estimated biomass with estimates from the dredge survey, SMAST large camera survey and HabCam. (Source NEFSC 2014).

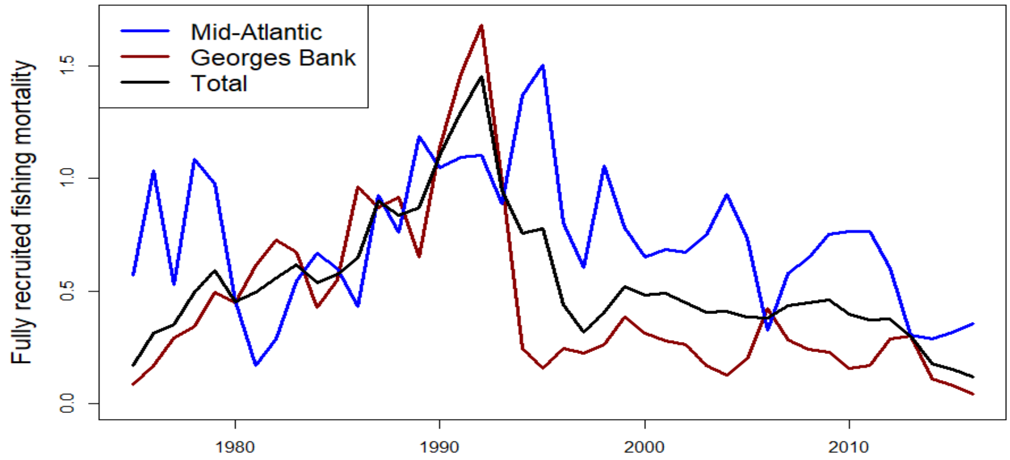
Historical retrospective analysis: The current CASA model estimates can be compared to those from the last two benchmark assessments (SARC-45/NEFSC 2007 and SARC-50/NEFSC 2010), and also updates of the SARC-50 model configurations through 2011 and 2012. While the estimates have been fairly stable, there has been a tendency for biomass and recruitment to be revised downward, and fishing mortality upward over time (see Appendix 6 Supporting information P1).

Sensitivity analyses: to test the sensitivity of the model outputs to key assumptions, CASA model runs were conducted with alternative assumptions regarding natural mortality, survey priors and incidental mortality. Variations in M had little effect on GBK Open and MAB runs, but a stronger effect on GBK Closed runs, (especially in the first years after the closures). The assumed level of incidental mortality (0.2 in GBK and 0.1 in MAB) had little effect on model estimates of biomass. See graphs in Appendix 6 Supporting information P1.

Likelihood profile analysis: likelihood profiles were constructed for natural mortality with plus group natural mortality fixed at 1.5x that of smaller scallops. For both Georges Bank open and closed, total -log likelihood was minimized at about M = 0.22. For Mid-Atlantic sea scallops, the total –log likelihood was minimized near the assumed M = 0.2. Effects on stock estimates were evaluated by sensitivity analysis (see Appendix 6 Supporting information P1).

The most recent estimates from CASA model show:

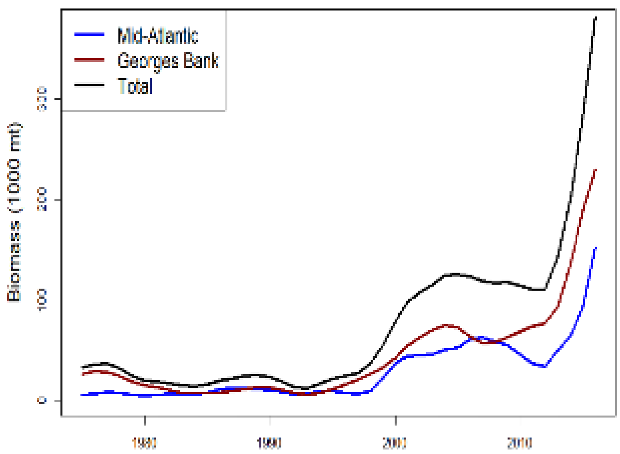
Strong biomass increments in the most recent years (a first rise from mid-90s to mid-2000s and an exponential rise in the last 5 years) in both regions in open and closed areas (

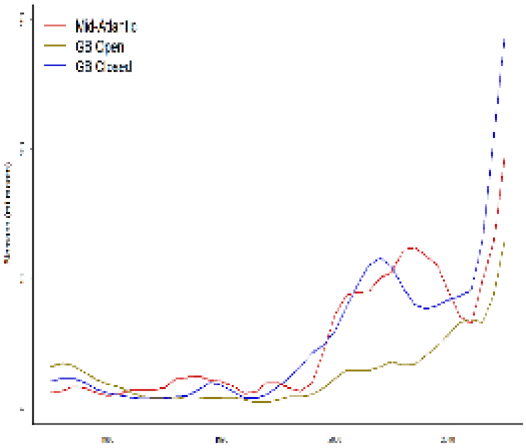


- Figure 19).

- A decrease of the fishing mortality (F) since the 90s for both regions and an overall F_{16} = 0.12, the lowest fishing mortality in the historic series since 1975 (Figure 19).

- A regular recruitment every year with occasional vast recruitment events in both regions. Estimates of recruitment n the period 1975-2010 have an upward trend in Georges Bank but no clear pattern is observed in the Mid-Atlantic Bight. See graphs of the CASA estimates of recruitment on “Appendix 6 Supporting information P1”.





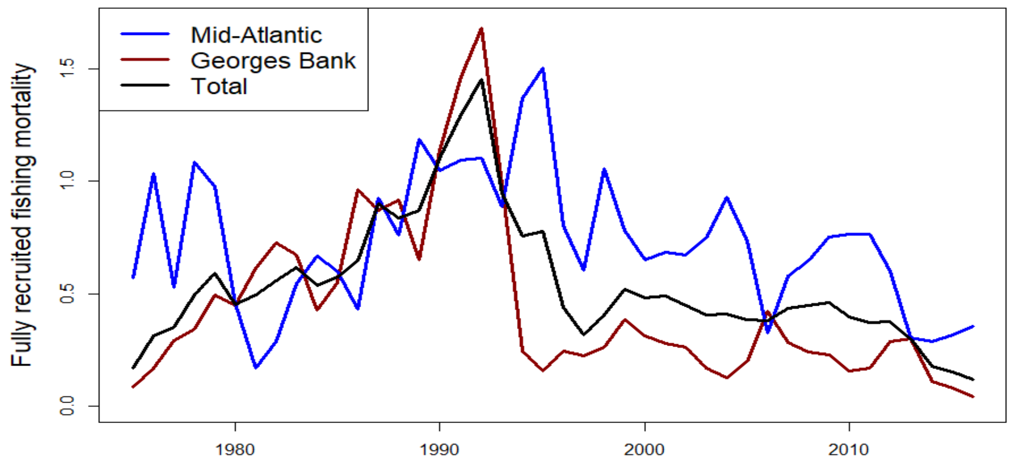


Figure 19. CASA model estimates of biomass (top left) and fishing mortality (down) for Georges Bank, Mid-Atlantic region, and overall from 1975 to 2016 (Source: FW29 - NEFMC, 2018) and estimates of biomass (top right) for the MAB and Georges Bank open and closed areas separated (Dvora Hart, personal communication). A measure of the dispersion of this CASA estimates are given on "Appendix 6 Supporting information P1".

Biological reference points

The SYM (Stochastic Yield Model) is used to estimate reference points. This model explicitly takes into account parameter uncertainty, including key uncertainties in natural mortality and stock-recruit relationships, when estimating maximal sustainable yield (MSY) and the associated biomass and fishing mortality reference points B_{MSY} and F_{MSY}.

But before 2010 (SARC50), per recruit reference points F_{MAX} and B_{MAX} were used as proxies for F_{MSY} and B_{MSY} in assessments. F_{MAX} was the fishing mortality rate for fully recruited scallops that generates maximum yield-per-recruit. B_{MAX} was defined as the product of BPR_{MAX} (biomass per recruit at $F= F_{MAX}$ from yield-per-recruit analysis) and median numbers of recruits. As selectivity has shifted to larger scallops (due to the increase in dredge ring size to 4-inches and targeting of older scallops in the access areas), yield per recruit curves have become increasingly flat, particularly in the Mid-Atlantic, making per-recruit reference points unstable. Additionally, recruitment has been stronger during the recent period when biomass has been high, suggesting that spawner-recruit relationships should be included. Finally, risk-based reference points are needed to calculate Acceptable Catch Levels/Allowable Biological Catch (ACLs/ABCs) and target fishing mortalities.

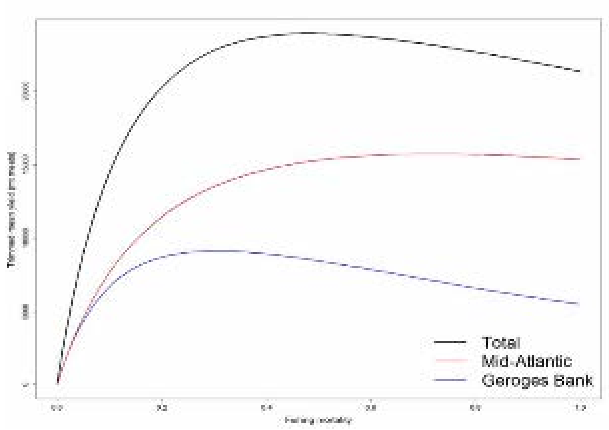


Figure 20. Trimmed mean yield as a function of fishing mortality for GBK, the MAB, and combined areas. F_{MSY} reference points are estimated at points where the (trimmed mean) yield curve peaks. (Source: NEFSC 2014).

To address all these issues, the SARC-50 assessment introduced a stochastic model (SYM – Stochastic Yield Model; Hart 2013) for calculating reference points and their uncertainty. It uses Monte-Carlo simulations to propagate the uncertainty in per recruit and stock-recruit calculations while calculating yield curves. B_{MSY} and F_{MSY} reference points are estimated at points where the (trimmed mean) yield curve peaks (Figure 20). The SYM approach treats both the per-recruit and the stock-recruit relationships as being uncertain, and takes this uncertainty into account (see stock-recruit relationships and probability distributions for the reference points in "Appendix 6 Supporting information P1"). Uncertainty in natural mortality is also considered in the model. Although the SYM model is separate from CASA (model used for estimation of biomass, fishing mortality and recruitment), efforts were made to make the two models as compatible as possible; growth was modelled using the same stochastic growth matrices used in the CASA model for the most recent period.

Per recruit calculations depend on a number of parameters that each carry a level of uncertainty (see NEFSC 2014 for details):

1) Shell height/meat weight parameters a and b. Data was collected from the NEFSC dredge biomass surveys (not from the observer program). A generalized linear mixed model (GLMM) with a log link is used to predict meat weight using shell height, depth, density and latitude for each subarea in GBK and the MAB.

2) Natural mortality rate M. M is estimated using the formula of Merrill and Posgay (1964).

3) Fishery selectivity parameters α and β. Fishery selectivity was estimated using an ascending logistic curve.

4) The cull size of the catch and the fraction of discards that survive. Sea scallops that are caught but are less than 90 mm are assumed to be discarded, based on observer data. discard mortality was simulated as a gamma distribution, with a mean of 0.2 and a standard deviation of 0.15, reflecting the high uncertainty in this parameter.

5) The level of incidental fishing mortality, i.e., non-catch mortality caused by fishing. Because of the considerable uncertainty in these numbers, incidental mortality was simulated here with a gamma distribution with these means and coefficients of variation of 0.75.

Stock-recruit relationships: Beverton-Holt stock-recruit curves were fitted to spawning stock and recruitment estimates from basecase CASA model runs.

Table 6. Previous (SARC-50) and revised (SARC-59) reference points for sea scallops (Source: NEFSC 2010, 2014).

	SARC-50			SARC-59		
Reference point	GBK	MAB	Whole stock	GBK	MAB	Whole stock
F_{MSY}	0.21	0.47	0.38	0.30	0.74	0.48
B_{TARGET}=B_{MSY} (mt, meats)	41,468	86,330	125,358	46,000	47,500	96,480
$B_{THRESHOLD}$=1/2 B_{MSY} (mt, meats)	20,734	43,165	62,679	23,000	23,750	48,240
MSY (mt, meats)	6,410	19,040	24,975	9,148	15,737	23,798

SYM model results (Reference points): Trimmed mean yield curves have a maximum at F_{MSY} = 0.3 on Georges Bank, and F_{MSY} = 0.74 in the Mid-Atlantic, with corresponding MSY values of 9,148 and 15,737 mt meats, respectively. Trimmed mean estimates for the combined stock are F_{MSY} = 0.48, MSY =23,798 mt, and B_{MSY} = 96,480 mt. These new reference points compared to the ones obtained in the previous 2010 assessment are shown in Table 6.

Biomass estimates

Due to the sedentary nature of sea scallops and the spatial management (area rotation and long-term closures), fishing mortality can vary considerably in space (Hart 2001), which make biomass projections very difficult if this is not taken into account. To deal with this issue, the Scallop Area Management Simulator (SAMS) has been used in this fishery since 1999. SAMS takes the results from all available surveys combined to project estimates of scallop biomass and recruitment on an annual basis.

Scallop surveys

A scallop survey using a lined scallop dredge and a random-stratified design has been conducted by NEFSC every year since 1979 on GBK and the MAB. A video drop camera survey is also conducted annually since 2003 on GBK and the MAB, using a systematic grid design. A towed camera HabCam survey was also used for the first time during 2011-2013 on GBK and 2012-2013 in the MAB; since then HabCams are used annually. Dredge surveys are the primary sampling tools and use a modified commercial gear. The efficiency of dredge sampling has been estimated, using the HabCam towed camera system, as 0.41 on sand and 0.27 on gravel/cobble habitats (Appendix B4 from NEFSC 2014). The video survey use quadrat techniques based on SCUBA diving studies that could provide spatially explicit, accurate, precise, absolute estimates of sea scallop density and size distributions (Stokesbury et al. 2016). HabCam is the latest technology and its use has been expanded by several groups (SMAST, WHOI, NEFSC and the Coonamessett Farm Foundation -CFF) in scallop surveys in more and more subareas every year. HabCam is towed behind a vessel, taking rapid-fire photographs of the sea bottom. Besides scallops, the video and HabCam also gives information on groundfish, epibenthic megafauna and benthic infauna and substrate characteristics.

For consistency, all methodologies have been compared between them (e.g. Figure 21) and several studies have been done in improving the methodology for analyzing the surveys (e.g. Chang et al. 2016, 2017). Drop camera surveys generally shows biomass and abundance somewhat less than the expanded dredge survey. Paired tows experiments have been done for comparing dredge catches to densities observed using the HabCam towed camera system; biomass and abundance estimates from HabCam were similar to those from the dredge.

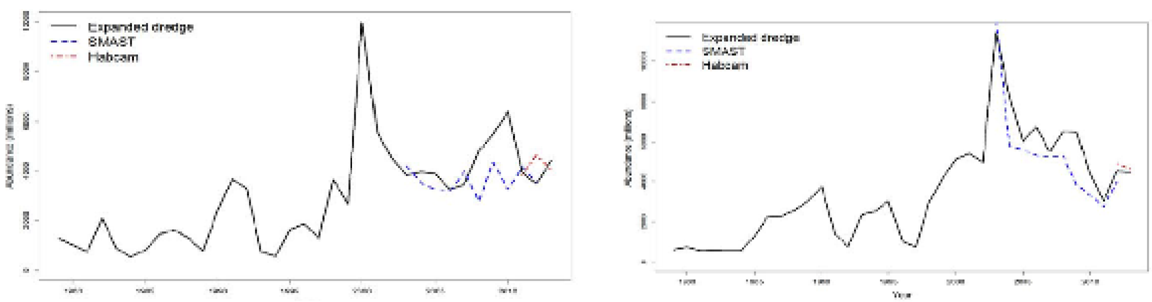


Figure 21. Comparison of dredge, SMAST video and HabCam survey abundance estimates for Georges Bank (left) and Mid-Atlantic (right). (Source: NEFSC 2014)

For surveying purposes, Georges Bank region is divided in 13 subareas (three in open areas: South Channel, Northern Edge, Southern Flank, two adaptive rotational areas: Nantuket Lightship Extension and Closed Area II Extension, and seven in groundfish closed areas: CA-I access and no access, CA-II access and no access, Nantucket Lightship no access, access north, access south deep and access south shallow) and the Mid-Atlantic region in 8 subareas (Virginia, Delmarva, Elephant Trunk open, Elephant Trunk closed, Hudson Canyon South, New York Bight, Long Island, Inshore Mid-Atlantic). In the last survey done in 2017, the Atlantic sea scallop resource was surveyed by the following groups/methods: the VIMS dredge survey of the Mid-Atlantic Bight, Nantucket Lightship Area, and Closed Area II; the SMAST drop camera broad scale survey of Georges Bank and the Mid-Atlantic with high-resolution surveys in the Elephant Trunk, Closed Area I Access Area, and Closed Area II Access Area and extension; the WHOI HabCam survey of Closed Area II North and adjacent open-area; the CFF HabCam survey of Nantucket Lightship; and the NEFSC dredge survey of Georges Bank and HabCam survey of Georges Bank and the Mid-Atlantic. Combining all, the 21 subareas of GBK and the MAB were surveyed by the three methods, and the mean density of the three was taken for each subarea.

Data collected from these surveys have been useful in estimating localized scallop abundance (Figure 22), size distribution, recruitment, and exploitable biomass. Dredge surveys are also used to get shell height and meat weight information on each subarea and parameters on this relationship are estimated. Moreover, SH:MW samples were used to construct a model to predict meat weight based on a suite of potential covariates (i.e. shell height, depth, sub area, sex, disease, etc.). Biomass and shell height frequencies are projected with SAMS for the next 2 years from the survey using different mortalities and growth parameters.

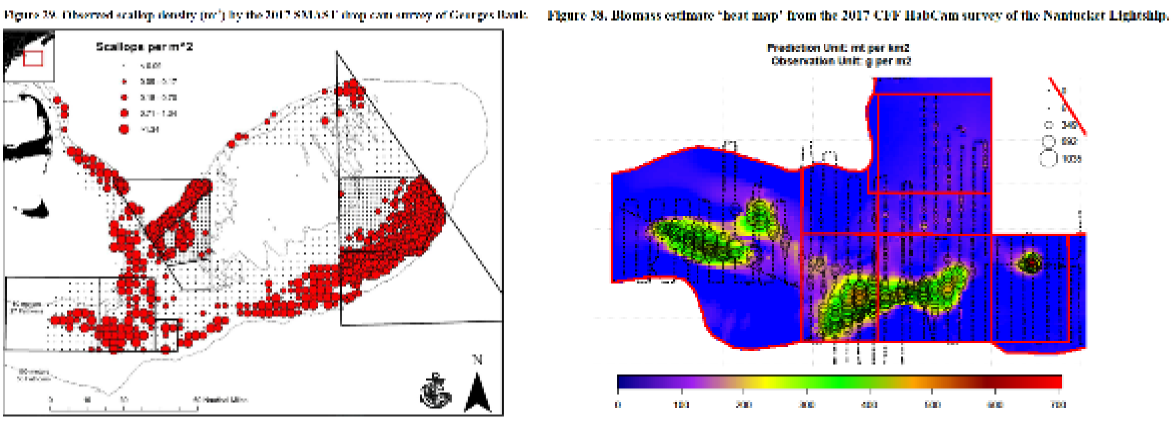


Figure 22. Examples of output maps from drop camera and HabCam in 2017 surveys. (Source: NEFMC 2018a).

Main conclusion from the 2017 surveys based on FW29 report (NEFMC 2018a) are:

> *Highlights of the 2017 survey included the identification of high densities of 5 year-old scallops in the NLS and NLS-Ext, and 5 year-old scallops in the Hudson Canyon (HCS) SAMS area. As noted by other survey groups, scallops in deeper water of NLS-AC-S appeared to be growing very slowly. The ET seemed to be holding considerable biomass, with particularly high density aggregations of scallops observed in ET-closed. Patches of high-density 7 year-old scallops were observed in the northern portion of CAI by both HabCam and the survey dredge; additionally, some clappers and large sea stars (Asterias spp.) were observed in the northern portion of CAI. Densities of scallops observed in CL2-S-AC suggest that this area may hold sufficient biomass to support an access area trip in FY2018. It was noted that scallops in CL2-S-Ext should mostly be ≥ 102 mm in the coming year. Except for moderate recruitment seen along the northern edge, little recruitment was evident across the resource. Overall, HabCam and survey dredge findings suggested open-area exploitable biomass to be moderate at best.*

Scallop Area Management Simulator (SAMS)

SAMS is a spatially explicit forecasting model that simulates size-based population dynamics in order to project the stock biomass and forecast landings for the two regions (Georges Bank and the Mid-Atlantic) and 16 subareas; each area can be set for rotational or long-term closure, so all combinations are possible by subarea. SAMS works on a relatively fine spatial scale in order to model effects such as closures and re-openings of areas for informing managers on the implications of alternatives when implementing the area rotation system (see Harvest Strategy section for more info on the spatial management). Projections used to manage the US sea scallop fishery are carried out by the NEFMC Scallop Plan Development Team while evaluating potential management measures. SAMS has been designed to be consistent with CASA (the stock assessment model).

Growth is modeled in SAMS and CASA in a similar manner, except that each subarea of GBK and MAB in SAMS has its own stochastic growth transition matrix derived from the shell increments collected in that area. Mortality and recruitment are also specific for each subarea. Projected recruitment is modeled stochastically with the mean and covariance for recruitment in each area matching that observed in NEFSC dredge survey time series. Fishing mortality can either be explicitly specified in each subarea, or calculated using a simple fleet dynamics model that assumes fishing effort is proportional to estimated LPUE.

For a detailed description of the SAMS model and example simulations see Appendix B10 from NEFSC (2014) report.

3.3.4 Management

The Atlantic Sea Scallop Fishery Management Plan (FMP) management unit consists of the Atlantic sea scallop, throughout its range in waters under the jurisdiction of the United States, although the FMP does not regulate scallop fishing in state waters. Management is based on four regional components: Georges Bank (GBK), Mid-Atlantic Bight (MAB), Southern New England Shelf (NES), and North Gulf of Maine. In this section we will describe the general harvest strategy and the harvest control rule for the regions of MAB and GBK (NES included). Since the Northern Gulf of Maine is managed separately from the rest of the Atlantic sea scallop stock, we have dedicated a specific section to this area; see section 3.3.6 for the harvest strategy in NGOM.

Harvest Strategy

The sea scallop fishery in the US EEZ is managed under the Atlantic Sea Scallop Fishery Management Plan (FMP) which was implemented on 1982. From 1982 to 1994, the primary management control was a minimum average meat weight requirement for landings. Amendment 4 to the FMP, implemented in 1994, changed the management strategy from meat count regulation to limited access combined with effort control and gear regulations; LA permits were issued to vessels with a history in the fishery and no new permits have been issued since. Incremental restrictions were made on days-at-sea (DAS) (from over 200 in 1994 to 31 in open areas in 2014), minimum ring size (from 76 mm in 1994 to 102 mm since 2004), minimum size of the twine top mesh (from 6” to 10” since 2004) and crew limits (from no limit to 7 since 1995) (NEFSC 2014). In addition to these measures, Amendment 4 also stablished in 1994 three large areas on Georges Bank and Nantucket Shoals closed to groundfish and scallop fishing, but a formal spatial management was not established until a decade after.

The area rotation system was formally introduced in 2004 through Amendment 10 (NEFMC 2003), although before 2004 there were already a number of ad hoc area management measures (closed areas established in GBK in 1994 and in MAB in 1998 and reopening of those areas or portions in 1999 and 2001). The concept is that areas that circumscribe beds of small sea scallops close before the scallops begin experiencing fishing mortality (from either non-catch mortality from gear damage, discarding, or landing) and then the areas re-open for fishing when the scallops are larger, boosting meat yield and yield-per-recruit (NEFMC 2003). Amendment 10 formalized an area based management system, with provisions and criteria for new rotational closures, and separate allocations (DAS or TACs) for reopening closed areas (rotational areas) and general open areas. The three GBK closed areas were divided into access areas, where fishing is periodically permitted, and long-term closures, where no scallop fishing is permitted. The main objective of the area rotation management system is to protect small scallops from capture by commercial fishing until the scallops reach a more optimum size, by selectively closing areas to fishing for short to medium durations.

There are four types of areas in this rotation system:

1) **open areas**: where scallop fishing can occur using DAS (for LA fleet) or IFQ (for GC fleet).

2) **closed areas**: areas completely closed to scallop fishing year-round to reduce impacts on EFH and/or groundfish mortality.

3) **areas temporarily closed**: areas closed to scallop vessels to protect small scallops until re-opening is decided in the future when scallops reach a larger size.

4) **access areas**: areas temporarily open to very restricted levels of scallop fishing. When scallop vessels are fishing in these areas they are limited in terms of total removal (vessels are allocated a number of trips with corresponding trip limits) and sometimes season.

Amendment 10 detailed the guidelines that would be applied for closing and re-opening areas (Table 7). Framework adjustments would then be used to actually implement the closures and allocate access in re-opened areas. In theory, an area would close when the expected increase in exploitable biomass in the absence of fishing mortality exceeds 30% per year, and re-open to fishing when the annual increase in the absence of fishing mortality is less than 15% per year. This process of closing and re-opening boosts scallop meat yield and yield per recruit, so area rotation allows for differences in fishing mortality targets to catch scallops at higher than normal rates by using a time averaged fishing mortality so the average for an area since the beginning of the last closure is equal to the resource-wide fishing mortality target. Once the high concentrations of scallops in an *access area* have been fished down, the Council may decide to close the area again if it appears that the resource will rebound in a few years after protecting any small scallops that may be there, or the Council could convert the area back to an *open area*.

Table 7. General management structure for area rotation as implemented by Amendment 10 (Source: NEFMC 2018a).

Area type	Criteria for rotation area management consideration	General management rules	Who may fish
Closed rotation	Rate of biomass growth exceeds 30% per year if closed.	No scallop fishing allowed Scallop limited access and general category vessels may transit closed rotation areas provided fishing gear is properly stowed. Scallop bycatch must be returned intact to the water in the general location of capture.	Any vessel may fish with gear other than a scallop dredge or scallop trawl Zero scallop possession limit
Re-opened controlled access	A previously closed rotation area where the rate of biomass growth is less than 15% per year if closure continues. Status expires when time averaged mortality increases to average the resource-wide target, i.e. as defined by the Council by setting the annual mortality targets for a re-opened area.	Fishing mortality target set by framework adjustment subject to guidelines determined by time averaging since the beginning of the most recent closure. Maximum number of limited access trips will be determined from permit activity, scallop possession limits, and TACs associated with the time-average annual fishing mortality target. Transfers of scallops at sea would be prohibited	Limited access vessels may fish for scallops only on authorized trips. Vessels with general category permits will be allowed to target scallops or retain scallop incidental catch, with a 400 pounds scallop possession limit in accordance with general category rules.
Open	Scallop resource does not meet criteria to be classified as a closed rotation or re-opened controlled access area	Limited access vessels may target scallops on an open area day-at-sea General category vessels may target sea scallops with dredges or trawls under existing rules. Transfers of scallops at sea would be prohibited	All vessels may fish for scallops and other species under applicable rules.

In order to understand how this area rotation system is implemented, an example was given in Amendment 10 (if more detailed information is needed please see section "5.1.3 Area Rotation" from Amendment 10 document - NEFMC 2003):

> *For example, after a closure period of three years and a planned re-open period of another three years, the time-averaged fishing mortality target is 0.4 [i.e. 0.2 times 6 years divided by 3 years (the total period as a re-opened area)]. A useful variation on this calculation (and one that is risk adverse and reduces variability in landings) is to catch scallops at less than 0.4 in the first re-opened year, at 0.4 in the second year, and higher than 0.4 in the third (and last) re-opened year. The first year might be fished at a rate of 80% of the time averaged target (or F=0.32), the second year at 100% (F=0.40), and the third year at 120% (F=0.48; see table).*
>
> *In the example below, whether or not the annual fishing mortality target increases with time, the time-averaged fishing mortality declines to the norm in the seventh year (i.e. F=0.20). Also, in the seventh year (or whenever the time averaged fishing mortality target increases to the stock-wide target), the fishing area becomes reclassified as an "open" fishing area under general scallop fishing rules and under most of the strategies below, there would be no area specific limits or a hard TAC.*
>
> *Variations on the above example include the length of the closure, the length of the recently reopened period, and the "ramping" strategy applied to the annual mortality targets in the re-opened areas.*

The following table shows how this would work: example of ramped fishing mortality targets for re-opened areas, compared to mortality targets with no rotation and simple rotation with constant fishing mortality targets when re-opened.

YEAR	Year N	1	2	3	4	5	6	7 to N	1	All
No rotation	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Status	Open	Closed	Closed	Closed	Re-opened	Re-opened	Re-opened	Open	Closed	Average
Simple rotation	0.20	0.00	0.00	0.00	0.40	0.40	0.40	0.20	0.00	0.20
Ramped rotation	0.20	0.00	0.00	0.00	0.32	0.40	0.48	0.20	0.00	0.20

On January 3rd, 2018 the Omnibus Essential Fish Habitat Amendment 2 (OHA2), was partially approved which modified the boundaries of essential fish habitat and groundfish closures in the Gulf of Maine, Southern New England, and Georges Bank. The modification and(or) removal of essential fish habitat and groundfish closure areas on Georges Bank and Southern New England expanded the area which can be accessed by the scallop fishery (NEFMC 2018a).

The current rotational management areas approved in FW29 and FW28 are shown in Figure 23 to exemplify adaptations in rotational management over one year and to illustrate how the boundaries of scallop rotational areas have changed following the partial approval of OHA2.

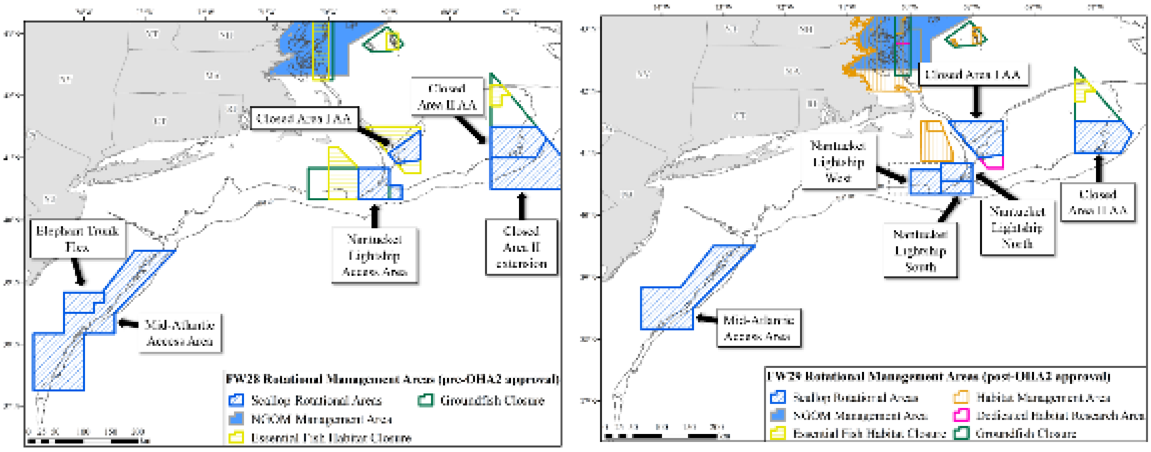


Figure 23. Scallop rotational management areas approved in FW28 and FW29 (Source: NEFMC 2018a).

Other current harvest measures in the fishery includes:

- Minimum shell height: 3.5 inches (8.9 cm).
- Days-at-sea (DAS): DAS allocations is determined by distributing the portion of the LA ACT set, as reduced by access area allocations, and dividing that amount among vessels in the form of DAS calculated by applying estimates of open area landings per unit effort (LPUE) projected through the specifications or framework adjustment processes used to set annual allocations.
- Possession & Trip Limits: scallop possession limits vary by permit and area. LA vessels fishing under a DAS in open areas are not subject to a possession limit, but in an access area the possession limit dependent on their permit category (Full-time: 18,000 lb/trip, Part-time: 14,400 lb/trip).
- Other Allowed Species Possession Limits: limits vary for different fleets (LA and LAGC), area type (open area or access area) and the species (Atlantic cod, haddock, yellowtail flounder and monkfish).

- Gear restrictions: maximum dredge width (31 ft for LA), minimum mesh size (10 inch), minimum ring size (4 inch)

Harvest Control Rule (HCR)

The sea scallop fishery has a pre-agreed harvest control (HCR) rule that directly sets the effort (DAS derived from an Annual Catch Target) based on the available annual exploitable biomass.

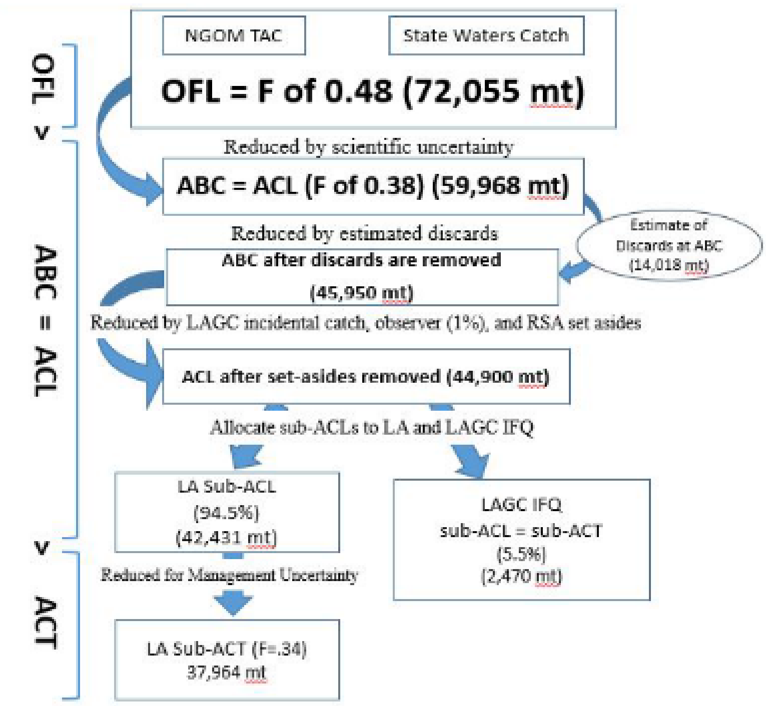


Figure 24. OFL/ABC flowchart as example of how these values are set in the scallop FMP (using the FW29 preferred alternative) (Source: NEFMC 2018a).

The current HCR was established in Amendment 15 in 2011. This amendment set up a method for accounting for all catch in the scallop fishery and included designations of Overfishing Limit (OFL), ABC, ACLs, and Annual Catch Targets (ACT) for the scallop fishery, as well as scallop catch for the Northern Gulf of Maine (NGOM), incidental, and state waters catch components of the scallop fishery.

The exploitable biomass (including an assessment of discard and incidental mortality) is determined annually based on surveyed biomass that its projected forward. To this biomass a fishing mortality reference point is applied to get the OFL and the rest of the catch limits are derived after until getting an ACT. This ACT is finally converted in DAS. FW29 (NEFMC 2018a) described the steps of this process as follow (see Figure 24 for a flowchart):

The OFL is specified as the level of landings and associated fishing mortality rate (F) that, above which, overfishing is occurring. SARC 59 approved an OFL equivalent to F = 0.48. To account for scientific uncertainty, ABC is set at a level with an associated F that has a 25-percent probability of exceeding the F associated with OFL (i.e., a 75-percent probability of being below the F associated with the OFL). The ACL is equal to the ABC in the Scallop FMP. SARC 59 determined that the F associated with the ABC/ACL is 0.38. Set-asides for observer and RSA are removed from the ABC (1% of the ABC/ACL and 567 mt respectively). After those set-asides are removed, the remaining available catch is divided between the LA and LAGC fisheries into two sub-ACLs: 94.5% for the LA fishery sub-ACL, and 5.5% for the LAGC fishery sub-ACL. Amendment 15 established ACTs for each component in order to account for management uncertainty. For the LA fleet, the ACT will have an associated F that has a 25-percent chance of exceeding ABC. The major sources of management uncertainty in the LA fishery are carryover provisions including the 10 DAS carryover *provision, and the ability to fish unused access area allocation within the first 60 days of the following fishing year. The F associated with the LA ACT is F = 0.34 (SARC 59). For the LAGC fleet, the ACT will be set equal to the LAGC fleet's sub-ACL, since this component is quota managed and is presumed to have less management uncertainty. The fishery specifications allocated to the fishery may be set at an F rate lower than the ACT, but fishery specifications may not exceed this level. For example, the Council's preferred alternative for FY 2018 specifications is anticipated to result in an overall F=0.175.*

Finally, catch from the NGOM is established at the ABC/ACL level, but is not subtracted from the ABC/ACL. Since the NGOM portion of the scallop fishery is not part of the scallop assessment, the catch will be added and specified as a separate Total Allowable Catch (TAC), in addition to ABC/ACL.

3.3.5 Information & Monitoring

The system around the sea scallop fishery regularly collects a great amount of information. Besides the official monitoring focused on the fishery management, there is a great panoply of scientific institutions, NGO and government agencies, that produces information that could be relevant to the harvest strategy, in the short and long-term. In this section we will comment on this information along with the fishery monitoring.

Regarding the fishery monitoring, a key element supporting this is the Research Set-Aside (RSA) program from the NEFMC in collaboration with the NEFSC-NOAA (https://www.nefsc.noaa.gov/coopresearch/rsa_program.html). Typically, the Councils reserves 1.25 million pounds of scallops per year. This generates approximately $15 million; of which approximately $3 million supports research projects. RSA projects are selected through a competitive grants process, with priorities established by the Council. Important information supporting applied research is collected through this program, which facilitates fishery management decisions and the harvest strategy by improved understanding of stock status as well as scallop fishing interactions with commonly encountered species. For the current projects call 2018-2019 the main focus of research in the scallop RSA program is industry-based surveys of access areas (highest priority), scallop meat quality research including impacts of diseases, life cycle, distribution, density dependence, area rotation and natural mortality (high priority), bycatch research (high priority), interaction with turtles (medium priority) and scallop biology projects aimed at understanding recruitment processes (reproduction, timing of spawning, larval and early post-settlement stages), growth patterns and meat and gonad weight (medium priority), and other set of topics of less priority. NEFSC-NOAA considers that the scallop RSA Program has a demonstrated track record for supporting applied research that supports fishery management decisions and improving stock assessments (NEFSC https://www.nefsc.noaa.gov/coopresearch/rsa_program.html).

Besides RSA program, information on a variety of topics are also collected from NEFSC and NEFMC monitoring and other external projects from scientific institutions:

Stock abundance and productivity.

Stock abundance is based on a combination of annual NEFSC dredge surveys and annual industry-based surveys (RSA). The following information was gleaned from NEFMC (2018) and NEFSC (2014). A scallop survey using a lined scallop dredge and a random-stratified design has been conducted by NEFSC every year since 1979 on GBK and the MAB. A video drop camera survey is also conducted annually since 2003 on GBK and the MAB, using a systematic grid design. A towed camera *HabCam* survey was also used for the first time during 2011-2013 on GBK and 2012-2013 in the MAB; since then *HabCams* are used annually. In the NGOM the scallops' surveys are more irregular; dredge surveys have been conducted by Maine Department of Marine Resources/University of Maine in 2002, 2006, 2010, 2012, 2016 and 2017, and drop camera surveys were conducted by the School for Marine Science and Technology (University of Massachusetts Dartmouth) in 2009, 2010, 2011, 2013, 2014, 2015 and 2017. Data collected from these surveys have been useful in estimating localized scallop abundance, size distribution, recruitment, and exploitable biomass. Biomass and shell height frequencies are projected for the next 2 years from the survey using different mortalities and growth parameters. Most of these projects are part of the RSA program.

There is an extended amount of information on the life cycle and productivity (age and size at maturity, fecundity, reproductive cycle…) of sea scallops in US waters (see section 3.3.2 Biology). This information has a high spatial and temporal resolution and is regularly collected and published by different research projects from scientific institutions and also from NOAA staff. Patterns of seasonality in weight of the meats and gonads, and timing of spawning is followed. Annual meat weight anomalies used to adjust mean body weight of individual scallops in the fishery and to compute catch numbers were substantially improved and shell height-meat weight relationships based on survey data were updated. (NEFSC 2014). In order to represent growth when fishing mortality was high in the CASA models, archived shells from 1988 and 1993 were used to estimate growth matrices (NEFSC 2014). Besides the monitoring, there are several projects that regularly study sea scallops´ life cycle.

Information relevant to the long-term UoA-specific management system is also collected on the relationships between chlorophyll and scallop recruitment potentially useful for stock projections and assessment modeling (Appendix B7, NEFSC 2014). On this appendix it is highlighted that preliminary analyses of remote sensing and scallop dredge data suggest that recruitment to the yearling stage is influenced by summer phytoplankton bloom activity. The results of this analysis are encouraging and indicate further work developing techniques for predicting regional recruitment patterns based on chlorophyll concentrations is warranted. Such predictions are at spatial scales of interest to managers (e.g. rotational management areas) and might be used to improve management and profitability of the fishery.

Stock structure.

Many projects have worked in the recent years on the population structure of sea scallops from different angles (genetics, ocean hydrodynamics, larval dispersal and connectivity,…). The topics and information provided in the form or reports and scientific publications is large and has been reviewed in section 3.3.2 Biology. These projects are fundamental for adapting the spatial management to the biological spatial structure of the stock.

Fleet composition & harbor distribution.

There are 11 federal sea scallop permit categories. The categories with the largest number of participants are the Limited Access (LA) full time fleet with 248 permits issued in 2016 and the Limited Access General Category (LAGC) IFQ fleet with 258 permits issued in 2016 (see P3 for a detailed information on fleet permits). The NEFMC establishes the limited access general category permits (Individual Fishing Quota, Northern Gulf of Maine, and incidental) in 2008. The Greater Atlantic Region Permit Office issues fishing vessel, dealer, and commercial operator permits and fishing authorizations for fisheries along the Atlantic Coast. All Federal scallop permits require an active Vessel Monitoring System (VMS) unit (see P3 for more information). FW29 (NEFMC 2018a) provides an analysis of the trends in permits by permit plan and category for the period 2009-2015; the fishery is primarily full-time, with a small number of part-time permits. There are no occasional permits left in the fishery since 2009 because these were converted to part-time small dredge. Of these permits, the majority is dredge vessels, with a small number of full-time small dredge and full-time trawl permit holders.

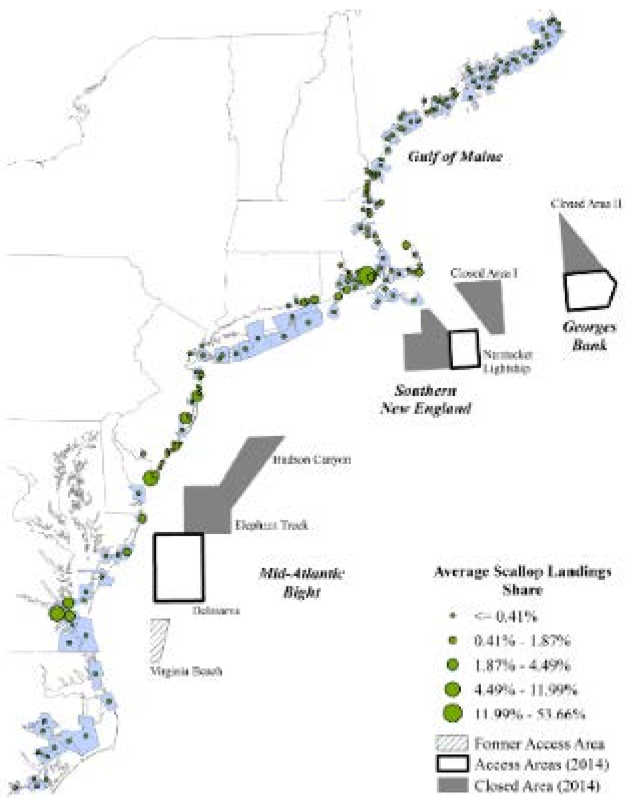


Figure 25. Sea scallop landings concentration by port, averaged over the 1996-2014 (Source: Lee et al. 2017).

A work on the concentration of the scallop fleet has been recently published. Lee et al. (2017) described the regional pattern of concentration within ports over time and revealed large changes from year to year in the geographic concentration of the scallop industry, which is likely to be related to natural variability of the environment and regulations enacted by fisheries managers in response to the variability of the environment. Authors found relatively consistent patterns of spatial association of port-level scallop catch throughout our time series; a few ports that consistently land large amounts of scallops are interspersed among large tracts of the Northeast coast that land minimal amounts of scallops (Figure 25).

Fishery removals.

The National Marine Fisheries Service (NMFS), through its regional branch, GARFO, monitors the landings of the sea scallop fishery. All Federal scallop permits must use vessel monitoring systems – VMS (a satellite communications system used to monitor fishing activities) and a pre-landing reporting through VMS is required. Weekly landings reports are available at: https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticseascallop.html. GARFO announces all relevant information on management measures and decision related to the fishery mainly through the *Scallop bulletins* and the *Federal Registers Actions*, like closures of NGOM Scallop Management Area when TAC has been reached. Real-time information on commercial fishery landings are also collected through the SAFIS electronic data collection system managed by the Atlantic Coastal Cooperative Statistics Program (ACCSP; http://www.accsp.org/safis), which is a cooperative state-federal program that designs, implements, and conducts marine fisheries statistics data collection programs and integrates those data into a single data management system that will meet the needs of fishery managers, scientists, and fishermen. The NEFMC and NOAA are partners of this program since 1995. Scallop removals as discards from other fisheries are also monitored through NEFOP observer program.

Rotation.

The implementation of closed and rotation areas has been subject to a strong analysis in order to assess its impact on scallop abundance, biomass and recruitment of nearby areas and regions. In section *3.3.2 Biology: Sea scallop Stock structure (Metapopulations)* we have reviewed the amount of information available. In order to implement the rotation area closures there is a monitoring in place to collect and analyze the information needed to decide when an area gets closed and when re-opened. Identification of appropriate closure areas would be based on either a combination of NMFS survey (NOAA monitoring) and industry-based surveys (from RSA program). All closed blocks will be surveyed annually to determine current biomass, size composition and growth rates. NMFS receives the data and calculates the "annual potential increase" of the scallops in each closed rotation area. If a block gets re-opening, a TAC will be set and transformed to DAS, based on survey estimates. Amendment 10 introduced area rotation and includes a detailed set of criteria or guidelines that would be applied for closing and re-opening areas (NEFMC 2003).

Species, habitats and ecosystem.

Information on these topics, relevant to the sea scallop fishery harvest strategy is collected (we will briefly here comment on some monitoring program, but see P2 section for more details). The fishery has an Industry Funded Scallop (IFS) Observer Program (NEFOP - Northeast Fisheries Observer Program) that it was initiated in 2006 and it is still currently managed by the NEFSC (www.nefsc.noaa.gov/fsb/scallop/). This program NOAA Ecosystem Science platform (https://www.st.nmfs.noaa.gov/ecosystems/index) coordinates cooperation (industry and scientist as well as transboundary) for marine ecosystem research. Wide ranging relevant information is covered by various components of this program (Integrated Ecosystem Assessment, Fisheries, Climate Change, LME, Global plankton database, Habitat science…). Locally and regionally, all available information is considered and translated into regional fisheries management plans, such as the scallop FMP by the NEFMC. Moreover, The Northwest Atlantic Marine Ecoregional Assessment (http://www.conservationgateway.org) is a project run by The Nature Conservancy that synthesized comprehensive data on species distributions, geology, oceanography, chemistry, biology and social science to create maps and other tools that reveal conservation priorities and inform management decisions to help sustain coastal and marine ecosystems. The goal of this program is produce a baseline of scientific information on the distribution and status of key habitats and species, and a map and report of priority conservation areas for the region's marine biodiversity.

Socio-economics & LPUE.

Economic and social information is collected for the scallop fishery including trends in landings, revenues, prices and foreign trade. This information is collected and yearly analyzed by the NEFMC discriminating vessels by permit category. Trends in landings, prices, revenues, allocations, effort, LPUE, meat count, size composition and price by scallop market category are shown on frameworks. See FW 29 for updated information (NEFMC 2018a).

LPUE (amount of landings per DAS) is probably the most relevant information collected in terms of the harvest strategy since is dependent on the scallop abundance and catch rate (but also depends on the crew shucking capacity at sea). The NEFMC Fishery Data for Stock Assessment Working Group is exploring how this indicator can be used to inform stock abundance.

The fishery has developed its own economic model for the estimation of prices, costs, profits and national benefits, as it is described in FW 29 (NEFMC 2018a). The economic model includes an ex-vessel price equation, a cost function and a set of equations describing the consumer and producer surpluses. The ex-vessel price equation is used in the simulation of the ex-vessel prices, revenues, and consumer surplus along with the landings and average meat count from biological projections. The cost function is used for projecting harvest costs and thereby for estimating the producer benefits as measured by the producer surplus. The set of equations also includes the definition of the consumer surplus, producer surplus, profits to vessels, and total economic benefits.

Environmental information & Climate Change impact.

NOAA's National Centers for Environmental Information (https://www.ncei.noaa.gov/) monitors and assess the state of the climate in near real-time, providing decision-makers at all levels of the public and private sectors with comprehensive atmospheric, coastal, oceanic, and geophysical data and information with trends and variability. All kind of temporal and spatial scales are given and future projections are made. A Northwest Atlantic Regional Climatology is one of the products of the NOAA-NCEI intended to provide an improved oceanographic foundation and reference for multi-disciplinary studies of the NWA, including fisheries. NWA is also part of the NOAA-wide Sustained Marine Ecosystem in Changing Climate (SMECC) Project.

Information on the impact of climate change on sea scallops is available and could be taken into account in the future on the harvest strategy. An Integrated assessment model for the sea scallop fishery has been built, with participation of NEFSC staff, for dealing with ocean acidification and warming (Cooley et al. 20015). The model numerically simulates oceanographic, population dynamic, and socioeconomic relationships for the fishery. The model indicates that sea scallop harvests could decline substantially by 2050 under RCP 8.5 CO_2 emissions and current harvest rules, assuming that ocean acidification affects sea scallop by decreasing recruitment and slowing growth, and that ocean warming increases growth.

In a recent Northeast Fish and Shellfish Climate Vulnerability Assessment (Hare et al. 2016), sea scallops were considered to have a high biological sensitivity to climate change, a high climate exposure and a moderate potential change of species distribution. This is a work done by NOAA NMFS scientists and the report states that results will inform research and management activities related to understanding and adapting marine fisheries management and conservation to climate change and decadal variability.

3.3.6 NGOM: Stock assessment and management

The information for this section on NGOM was all collected from NEFMC 2018a and NEFSC 2014, if no other reference is stated.

The Northern Gulf of Maine (NGOM) scallop management area is an area in federal waters north of 42°20' N. lat. and within the boundaries of the Gulf of Maine Scallop Dredge Exemption Area. As the sea scallop fishery in NGOM occurs in federal waters, it is managed by the NEFMC (Figure 25). The NGOM resource and associated fishery are locally important but amount to a small portion of the total stock and less than 0.5% of total landings in the period 2008-2017. The fishery is managed by a TAC independently of the rest of the EEZ sea scallop stock. Management of the NGOM fishery does not involve biological reference points as targets or thresholds.

The NGOM management area was established in 2008 through Amendment 11 (NEFMC 2008) by creating a separate limited entry program for general category fishing in the area. The area is managed under an annual total allowable catch (TAC) and a daily possession limit of 90.7 kg. Scallop dredge ring size must be greater than 102 mm, but there are currently no regulations regarding shell size (as in Maine state waters) or meat count. Since the creation of the NGOM management area, LA vessels have seldom fished within the current NGOM bounds prior to FY2016. In Amendment 11 the Council did not recommend additional restrictions on LA vessels fishing in NGOM because “the improved management and abundance of scallops in the major resource areas on GBK and in the MAB has made access to NGOM scallops less important for the limited access boats and general category boats from other regions. As a result, a separate management program for scallops in the NGOM is unlikely to have any impact on these vessels”. The Council explained the rationale for modifying management measures in the NGOM through Framework 29 with the following problem statement:

> Recent high landings and unknown biomass in the NGOM Scallop Management Area underscore the critical need to initiate surveys and develop additional tools to better manage the area and fully understand total removals.

FY2016 marked a high point in landings by all permit types fishing in NGOM, collectively totaling over 173 mt, when it was usually less than 5mt. In 2017 landings peaked to 736 mt (Figure 26), mostly due to LA fleet, and the area was repentantly closed although the LAGC fleet did not reached the TAC approved. Since LA fleet did not have a TAC for the area and were harvesting under DAS, the NMFS-NOAA decided to close the area under a great controversy. Total landings from the NGOM by the limited access fleet that far exceeded the total allowable catch (TAC) for the limited access general category (LAGC) fleet. The Council felt that this was inconsistent with the goals of the NGOM management program. LAGC vessels have different reporting requirements than LA vessels when fishing in this area. LAGC vessels declare into the NGOM management area through VM and landings are calculated using dealer reports for declared trips. LA vessels operate under a DAS as if in an open area of the fishery and removals from the NGOM management area for FY 2016 were estimated using point-location VTR reports; this method of estimating LA removals from the NGOM has proven difficult as LA vessels can fish both inside and outside the NGOM in the same trip.

During 2017 options were developed by the NEFMC PDT for splitting the NGOM TAC using a hybrid approach between the LA and LAGC components. The NGOM TAC was finally set and split temporarily through Framework 29, however, a permanent division in the NGOM TAC between fishery components would likely require an Amendment.

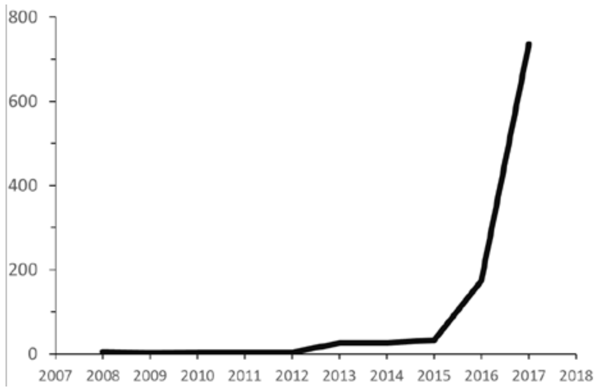


Figure 26. Recent NGOM landings. (Source: own elaboration based on data from NEFMC 2018a)

NGOM surveys:

The NGOM management area is data limited relative to Georges Bank and the Mid-Atlantic. Dredge surveys have been conducted by Maine Department of Marine Resources/University of Maine in 2002, 2006, 2010, 2012, and 2016. Coverage of this survey has varied each year and recently has focused mostly on areas with known aggregations of scallops commonly targeted in the NGOM. Additional drop camera surveys were conducted by the SMAST in 2009, 2010, 2011, 2013, 2014, 2015 and 2017. In 2017 scallop density found in Stellwagen Bank was similar to what would be seen on GBK. Total biomass on Stellwagen Bank was estimated to be roughly 459 mt and biomass on southern Jeffreys Ledge was estimated to be roughly 152 mt.

2018 TAC setting:

SAMS model was used to project exploitable biomass within the management area for setting the FY2018 NGOM TAC. SAMS takes the most recent survey data and growth information to predict size frequencies for the following year. The SAMS model also considers fishing mortality (F), natural mortality (M), and recruitment. There are no reference points for the Gulf of Maine or NGOM management area, so GB reference point of 0.3 could serve as a reasonable estimate for F_{MSY}, at least in the short term. The 2018 NGOM TAC was calculated based on the projected 2018 exploitable biomass of southern Jeffreys Ledge and Stellwagen because these are the parts of the NGOM that are expected to be fished in 2018. A TAC of 90.7 mt was approved for FY2018, using a precautionary F=0.2.

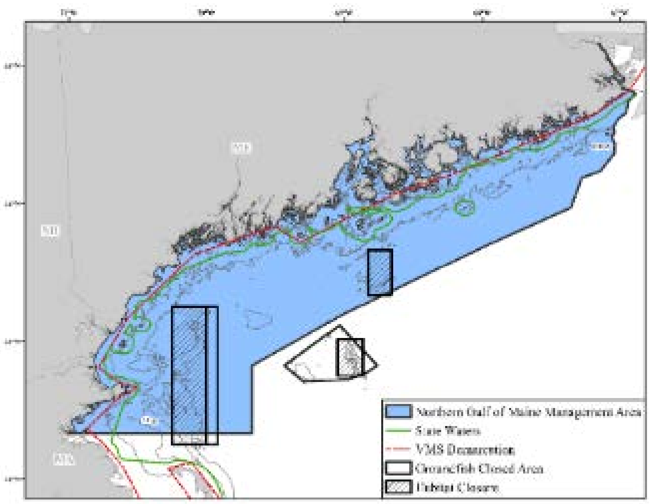


Figure 27. Northern Gulf of Maine Management Area

TAC split

On FW29 a TAC split was approved. The NGOM TAC for the LAGC component was set at 70,000 lb (32 mt) from fishing year 2008 through fishing year 2016. Using this as a basis, the Council recommended that the first 70,000 lb (32 mt) of the NGOM TAC should be allocated to the LAGC fleet, and that any remaining pounds should be split equally between the LAGC and limited access fleets. Each fleet would operate independently under its own portion of the TAC. For 2018 this split allocated 61.2 mt to the LAGC fleet and 29.5 mt to LA. LA fleet would be prohibited from accessing the NGOM while participating in the DAS program. LA share of the NGOM TAC would be available through RSA compensation fishing only.

In the NGOM region there are no Area Rotation Plan in place for scallops, but a couple of habitat closures and groundfish closed areas are set within the region.

3.3.7 Other fisheries affecting the target stock

All commercial fishery removals from the US sea scallop stock are monitored and recorded, while the distance from land and exposed nature of the fishery area mean that the stocks are not harvested by recreational fishermen. There is some evidence that the stocks of sea scallops in Canadian and US waters are genetically linked but the fisheries on either side of the boundary are assessed and managed separately because after settlement the stocks do not move. Influence on the unit stock defined in the UoA for the US Atlantic sea scallop fishery can only come from the Canadian sea scallops´ populations (offshore and inshore) and from US State waters populations.

Because scallops are not very mobile when adults, the primary effect of the Canadian stock in US stock, is by means of recruits that were spawned in Canada and settle in the US part of GB. This mainly affects the scallop resource on the Northern Edge, Southern Flank and the Great South Channel, although self-recruitment is also possible for both sides of GB (Naidu 1991, Tremblay et al. (1994) Gilbert et al. 2010, Davies et al 2014). Although Canadian scallops on Georges Bank contribute to recruitment in US waters, there is sufficient spawning capacity in US waters that this source of recruitment plays a minor role in determining the productivity of the entire resource; moreover, since sea scallops are relatively sedentary in the adult stage also implies that Canadian management does not affect the achievement of optimum yield from adult scallops in US waters (NEFMC 2003).

Moreover, both, the offshore and inshore sea scallops´ fisheries are MSC certified since 2010 and 2013 respectively. The inshore Bay of Fundy fishery has recently been re-certified showing a healthy and well managed fishery (P1 scored 93 and P3 scored 92) (Dignan et al. 2018). The Eastern Canada offshore fishery was also re-certified in 2015 showing as well a healthy and well managed fishery (P1 scored 91 and P3 scored 92), and in particular for the Georges Bank population there is a high degree of certainty that the stock has been fluctuating around, or over, its target reference point in recent years (the current biomass is 3 times the BMSY) (Blyth-Skyrme et al. 2015).

The US management unit also includes populations found within state waters, primarily in Maine (ME) and Massachusetts (MA). Landings from state waters are estimated to be less than 2% of overall scallop catch in the US (NEFMC (2016b). Maine and Massachusetts account for approximately >85% of catch in state waters. Fishing for sea scallops within state waters is not subject to regulation under the FMP except for vessels holding a Federal scallop permit that are allowed to fish in state waters under the “State Waters Exemption” program, currently covering only Maine and Massachusetts. As part of the “State Waters Exemption” program, NMFS conducted a review of the scallop conservation programs of these two states and determined, via the publication of a Final Rule (25th of October 2017) that: “Both Maine and Massachusetts's scallop fishery restrictions are as restrictive as Federal scallop fishing regulations and this exemption will not jeopardize the biomass and fishing mortality and effort limit objectives of the FMP. Allowing for this NGOM exemption will have no impact on the effectiveness of Federal management measures for the scallop fishery overall…" (NMFS 2017b.)

The proportion of the scallop resource in US State waters is very small compared to the total stock in GB, its closest region, therefore scallop aggregations in the GOM are likely secondary in importance and it does not affect recruitment (Tremblay et al. 1994). State regulations therefore do not jeopardize the capacity of the stock to produce MSY (NEFMC 2003).

Moreover, the three stock units (inshore Canada, offshore Canada and offshore US) has been clearly responsive to the management measures applied in each management system.

The Atlantic sea scallops in the US federal EZZ waters, as defined in the UoA, is a metapopulation, but considered a unit stock and therefore managed as an independent unit. The CAB considers that the results of the assessment and the impact of the management measures do not differ significantly from what they would be in the case of a truly independent stock (FCR & Guidance v2.0, G7.4.7 – G7.4.9).

We therefore consider that the UoA stock unit is properly defined as Atlantic Sea Scallop (*Placopecten magellanicus*) on US federal waters of the EEZ between the US-Canada boundary and North Carolina.

3.3.8 Key Low Trophic Level Considerations

Since Atlantic sea scallop is a filter feeding, and therefore it is low down in the food-web, and it is preyed by numerous predators, we have evaluated for classification as "key low trophic level (LTL)" according to the MSC standard, although bivalves are not listed in Box SA1 (FCR Annex SA 2.2.9).

Scallops, like other bivalves, are filter feeders, that, due to its living mode laying down on the benthic floor, take advantage of particulate matter for food from both pelagic and benthic origin. This opportunistic behavior allows them to feed on any available organisms or material in the immediate habitat, so their diet depends on where they live. Sea scallops feed on phytoplankton, microscopic zooplankton, re-suspended benthic diatoms and considerable organic detritus and bacteria from the bottom of the water column (Shumway et al., 1987). Nevertheless, their diet changes depending on where they live (in shallow water scallops (*c.* 20m) benthic and pelagic food species were equally represented in gut contents, while in scallops from deep water populations (*c.* 180m) benthic species outnumbered pelagic ones) and the season the year, primarily reflecting the consumption of the phytoplankton species most abundant during bloom conditions (Shumway et al. 1987). The trophic level for *P. magellanicus* has been estimated between 2-2.19 (http://www.sealifebase.org; accessed on 2018-04-05).

Sea scallops have numerous predators after being settled, but the predation level it is known to decreases with shell height (Stokesbury and Himmelman 1995). According to Hart & Chute (2004) the principal predators are starfish, crabs, lobsters, and various bottom feeding fish species (including Atlantic cod, American plaice, wolfish, ocean pout, sculpins, winter flounder and yellowtail flounder). Nevertheless, these animals prey particularly on smaller scallops and individuals >70 mm shell height are rarely preyed upon (Aldous et al. 2013), and in the case of rock crabs and lobsters, even large individuals, are unable to prey on sea scallops larger than 70 mm shell height (Elner & Jamieson 1979).

Moreover, the Atlantic sea scallop stock is currently exploited at a very low fishing rate several times below the F at MSY (F_{2016}= 0.12 and F_{MSY}=0.48), which considerably reduces the risk of any potential ecosystem impact of this scallop fishery.

Based on the information above, there is no evidence that *P. magellanicus* “holds a key role in the ecosystem”, following the MSC consideration on trophic position, since it does not meet the criteria and sub-criteria listed in CB2.3.13 (CR v1.3), and therefore it is not considered as a key LTL stock for this assessment.

3.4 Principle Two: Ecosystem Background

All species that are affected by the fishery and that are not part of the Unit of Certification (UoC) are considered under Principle 2. This includes species that are retained for sale or personal use (assessed under Performance Indicator 2.1), bycatch species that are discarded (Performance Indicator 2.2), and species that are considered endangered, threatened or protected by the government in question or are listed by the Convention of International Trade of Endangered Species (CITES) (Performance Indicator 2.3). This section contains an evaluation of the total impact of the fishery on all components in P2 and includes both observed and unobserved fishing mortality. Unobserved mortality may occur from illegal, unregulated or unreported (IUU) fishing, biota that are injured and subsequently die as a result of coming in contact with fishing gear, ghost fishing, waste, or biota that are stressed and die as a result of attempting to avoid being caught by fishing gear. This section also considers impacts on marine habitats (Performance Indicator 2.4) and the ecosystem more broadly (Performance Indicator 2.5).

3.4.1 Harmonization

To ensure that the cumulative impact of all MSC fisheries is within sustainable limits, a Unit of Assessment (UoA) assessed against standard V2.0 may need to consider the combined impact of itself and other overlapping UoAs. This determination will include other UoAs assessed against earlier versions of the CR (e.g., V1.3). UoAs assessed using default trees prior to CR v2.0 would not have to make this evaluation.

Cumulative matters for Principle 2 is not applicable for this fishery as the assessment was conducted on v1.3 of the assessment tree.

3.4.2 Observer Programs

According to NOAA (https://www.nefsc.noaa.gov/fsb/scallop/) an Industry Funded Scallop (IFS) Observer Program (NEFOP - Northeast Fisheries Observer Program) was initiated by the National Marine Fisheries Service in 2006 and continues to this date (2018)*:*

> Observer coverage is required in the scallop fishery (dredge and trawl gears) to monitor the bycatch of finfish, collect biological information to inform stock assessments, and to monitor any interactions of the scallop fishery with endangered or threatened species, such as sea turtles. IFS Observers collect a full suite of fishery dependent data to document total catch, discards, biological samples, interactions with protected species.

In the report of Wigley and Tholke (2017), at-sea observer coverage was considered to correspond with the spatial and temporal patterns of fishing activities, for the periods of July 2015 to June 2016; as well as the expected coverage needed for April 2017 to March 2018.

Within the New England (NE)/ Massachusetts (MA) area scallop dredge fishery number and percentage of at-sea observer fishing are present in Table 8, and at-sea observers' days in Table 9. Total observed trips ranged between 37-104 (9%-60%); while at-sea observer days ranged between 72 -1002 (or 9%-63%). It is interpreted that average at-sea observer coverage in the fishery is >32%. For the period of April 2017 to February 2018 (time of preparing this report), a similar level of at-sea observer coverage was identified in the fishery (https://www.nefsc.noaa.gov/fsb/scallop/).

NEFOP employ sea-going observers which are trained according to an applicable dedicated program are evaluated to be technically qualified for the related duties before any deployment in the fishery[1] (). A Standardized Bycatch Reporting Methodology (SBRM) was used to document (kept and discard) estimation of 14 federally managed fish and invertebrate species - including sea scallops (Wigley et al. 2007). Discard estimates are not considered definitive, but indicative of where discarding occurred among commercial fleets and for which species groups. However, the at-sea observers' days needed to achieve a precision-based performance standard (30% coefficient of variation of the discard estimate) was prepared using a broad range of data sources (NEFOP, Vessel Trip Record/logbook - VTR, Northeast Fisheries Science Center – NEFSC - commercial landings database, and the National Oceanic and Atmospheric Administration Marine Recreational Information Program – MRIP – database), and a standardized protocol to account for the importance of the discarded species relative to the amount of discards by each fleet and total fishing mortality. Further details with regards to reported by-catch are presented in section 4.4.3 of this report.

Table 8. Number and Percentage of Northeast Fisheries Observer Program (NEFOP) and Vessel Trip Report (VTR) trips, by fleet and calendar quarter (Q) based on July 2015 through June 2016 data. (Source: Wigley and Tholke 2017).

Number Trips Observed July 2015 through June 2016			NEFOP					VTR				
Access Area	Trip Category	Region	Q3	Q4	Q1	Q2	Total	Q3	Q4	Q1	Q2	Total
AA	GEN	MA	28	1	3	58	90	655	19	15	1361	2050
AA	GEN	NE	0	0	0	37	37	4	9	1	416	430
AA	LIM	MA	18	14	3	32	67	178	118	32	219	547
AA	LIM	NE	26	21	6	35	88	232	181	35	177	625
Open	GEN	MA	22	20	29	9	80	734	390	347	407	1878
Open	GEN	NE	23	19	32	17	91	554	508	1028	816	2906
Open	LIM	MA	11	2	6	21	40	152	61	57	179	449
Open	LIM	NE	27	8	24	45	104	297	101	181	354	933

Percent of Number Trips Observed July 2015 through June 2016			NEFOP (32% average trips across the fishery)				
Access Area	Trip Category	Region	Q3	Q4	Q1	Q2	Total
AA	GEN	MA	4%	5%	20%	4%	34%
AA	GEN	NE	0%	0%	0%	9%	9%
AA	LIM	MA	10%	12%	9%	15%	46%
AA	LIM	NE	11%	12%	17%	20%	60%
Open	GEN	MA	3%	5%	8%	2%	19%
Open	GEN	NE	4%	4%	3%	2%	13%
Open	LIM	MA	7%	3%	11%	12%	33%
Open	LIM	NE	9%	8%	13%	13%	43%

[1] https://www.nefsc.noaa.gov/fsb/program/Observer_Qualifications.pdf
https://www.nefsc.noaa.gov/fsb/training/

Table 9. Number and Percentage of Northeast Fisheries Observer Program (NEFOP) and Vessel Trip Report (VTR) at-sea days, by fleet and calendar quarter (Q) based on July 2015 through June 2016 data. (Source: Wigley and Tholke 2017)

Number At-Sea Days Observed July 2015 through June 2016			NEFOP					VTR				
Access Area	Trip Category	Region	Q3	Q4	Q1	Q2	Total	Q3	Q4	Q1	Q2	Total
AA	GEN	MA	49	3	7	116	175	1104	46	42	2602	3794
AA	GEN	NE	0	0	0	72	72	12	26	3	808	849
AA	LIM	MA	115	99	21	280	515	1177	848	207	1767	3999
AA	LIM	NE	185	152	57	300	694	1657	1364	278	1481	4780
Open	GEN	MA	38	43	64	16	161	1452	921	801	755	3929
Open	GEN	NE	39	38	60	30	167	880	797	1413	1154	4244
Open	LIM	MA	116	19	42	238	415	1416	411	338	1831	3996
Open	LIM	NE	259	84	193	466	1002	2908	786	1498	3688	8880

Percent of Number At-Sea Days Observed July 2015 through June 2016			NEFOP (34% average at-sea days across the fishery)				
Access Area	Trip Category	Region	Q3	Q4	Q1	Q2	Total
AA	GEN	MA	4%	7%	17%	4%	32%
AA	GEN	NE	0%	0%	0%	9%	9%
AA	LIM	MA	10%	12%	10%	16%	47%
AA	LIM	NE	11%	11%	21%	20%	63%
Open	GEN	MA	3%	5%	8%	2%	17%
Open	GEN	NE	4%	5%	4%	3%	16%
Open	LIM	MA	8%	5%	12%	13%	38%
Open	LIM	NE	9%	11%	13%	13%	45%

3.4.3 Overview of Non-target Catch

The analysis for P2 is made considering that the UoA and the UoC are the same and composed by the commercial US Northeastern New Bedford style scallop dredge fleet.

Retained species

These are species retained due to their commercial value or due to management rules controlling discard of catch. When these species are commercially important they tend to be harvested under some management regime, sometimes there are also available reference points.

Bycatch species

Bycatch species are those that have been taken incidentally and are returned to the water, usually because they have no commercial value. Bycatch species are also considered to be all species that are out of scope of the standard (birds/ mammals/ reptiles/ amphibians) and that are not ETP species. These types of species could in some cases represent incidental catches that are undesired but somewhat unavoidable in the fishery. Given the often unmanaged status of these species, there are unlikely to be reference points for biomass or fishing mortality in place, as well as a general lack of data availability.

Main and Minor species

For Retained and Bycatch species, species may be considered “Main” based on either resilience/vulnerability or catch volume. Species that are not “Main” are Minor. Main and Minor species must meet different Performance Indicators (PIs) in P2.

- Resilience/vulnerability: If the species is considered "less resilient" and it is ≥ 2% of the catch, then it is considered Main, otherwise it is considered Minor.
- Catch volume: If the species is not considered "less resilient" and it is ≥ 5% of the catch, then it is considered Main, otherwise, it is considered Minor.

Resilience/vulnerability: If the species is considered "less resilient" and it is ≥ 2% of the catch, then it is considered Main, otherwise it is considered Minor.

Following SA3.4.2.2 (MSC CR v2.0) one or both of the following criteria were used to determine whether a species should be classified as ‘Less resilient’:

i. The productivity of the species indicates that it is intrinsically of low resilience, for instance, if determined by the productivity part of a PSA that it has a score equivalent to low or medium productivity; or

ii. Even if its intrinsic resilience is high, the existing knowledge of the species indicates that its resilience has been lowered due to anthropogenic or natural changes to its life-history.

Resilience is assessed based on the species “life history characteristics and the risk to the stock from anthropogenic activities, not the actual impact of the UoA on the stock. The latter is assessed instead under the respective Outcome PIs.”

In addition, the productivity part of the PSA may be used as both a precautionary and robust method of quickly determining the intrinsic resilience of a species, in cases where it scores either low or medium productivity (MSC CR V2.0 GSA3.4.2.2)

Designation of species

The Standardized Bycatch Reporting Methodology (SBRM) annual report (https://www.nefsc.noaa.gov/fsb/SBRM/) and the Northeast Fisheries Observer Program (NEFOP) database (https://www.nefsc.noaa.gov/fsb/) were used to provide information on P2 species which are considered under the non-target catch, and are similar to catch composition of the initial assessment (2013), and previous surveillance audits (2014 -2017).

Retained catch of scallops accounted for 93% of the UoA catch, or 86% of the overall retained catch after removing undersize scallops. Aside from scallops no other species were classified as “retained” species following the MSC FCR SA3.1.3.1 criteria. Although for some species a small proportion of catch was retained (i.e., monkfish, skate, fluke, winter flounder, surfclam) the proportions of retained catch were minimal relative to discarded volumes, thus all species were classified as “bycatch” (Table 10. The skate complex accounted for >5% of catch of the UoA, leading to its classification as “main”. The second species in term of volume was monkfish (1.2%), classified as minor bycatch .The remaining species were all below the 2% volume threshold and classified as “minor”. With regards to skates and monkfish; they may be discarded for various reasons. For example, smaller individuals may not be marketable, fishermen may have insufficient quota, or some species are listed as prohibited species that must be returned to the sea.

A number of invertebrate specimens were also recorded by NEFOP (Table 11) with invertebrate taxa similar to that observer for the region by Clark et al., (2010). Scallop dominated the recorded specimen, followed by groups belonging to Clypeasteroida (sand dollar, 27%), Asteroidea (starfish, 2%), and Porifera (sponges, 0.44%), all of which are considered common to resilient benthic communities (benthic fauna) of the ecoregion, and are not currently considered to be at any ecological vulnerability or risk. Bycatch of coral related specimen was 0% (Wigley and Tholke 2017).

Table 10. SBRM 2017 Report Data (2015-2016) for Gear Type: Scallop Dredges, Data in lb. (Source: https://www.nefsc.noaa.gov/fsb/SBRM/)

Common Name	Scientific Name	Sum of Total	Sum of Kept	Sum of Discarded	Sum of CV	% UoA	MSC Category	Retained	Discarded
Sea Scallop	*Placopecten magellanicus*	319,131,003	297,865,300	21,265,703	1.61	93%	Target P1	86%	6%
Skate Complex	*Rajidae*	18,513,874	34,430	18,479,444	1.07	5.4%	Main	0.0%	5.4%
Monkfish	*Lophius americanus*	4,914,669	613,093	4,301,575	1.04	1.4%	Minor	0.2%	1.2%
Fluke	*Paralichthys dentatus*	567,025	34,279	532,746	1.80	0.2%	Minor	0.0%	0.2%
WindowPane Flounder	*Scophthalmus aquosus*	282,093	-	282,093	2.00	0.1%	Minor	0.0%	0.1%
Winter Flounder	*Pseudopleuronectes americanus*	258,842	1,494	257,348	1.88	0.1%	Minor	0.0%	0.1%
Spiny Dogfish	*Squalus acanthias*	199,940	-	199,940	2.90	0.1%	Minor	0.0%	0.1%
Red Hake	*Urophycis chuss*	174,731	-	174,731	2.85	0.1%	Minor	0.0%	0.1%
Yellowtail flounder	*Limanda ferruginea*	131,117	5	131,112	4.77	0.0%	Minor	0.0%	0.0%
SCOQ - Surfclam / Ocean quahog	*Spisula solidissima / Arctica islandica*	43,878	10,690	33,188	4.48	0.0%	Minor	0.0%	0.0%
Witch Flounder	*Glyptocephalus cynoglossus*	39,834	642	39,192	4.08	0.0%	Minor	0.0%	0.0%
American Plaice	*Hippoglossoides platessoides*	37,771	30	37,741	3.33	0.0%	Minor	0.0%	0.0%
Silver Hake	*Merluccius bilinearis*	32,499	3	32,496	2.54	0.0%	Minor	0.0%	0.0%
Haddock	*Melanogrammus aeglefinus*	18,513	-	18,513	3.00	0.0%	Minor	0.0%	0.0%
Atlantic Cod	*Gadus morhua*	17,223	249	16,974	2.47	0.0%	Minor	0.0%	0.0%
Longfin inshore squid	*Doryteuthis (Amerigo) pealeii*	10,523	117	10,406	3.43	0.0%	Minor	0.0%	0.0%
BLACK SEA BASS	*Centropristis striata*	9,357	157	9,200	2.43	0.0%	Minor	0.0%	0.0%
Ocean Pout	*Zoarces americanus*	3,950	-	3,950	3.42	0.0%	Minor	0.0%	0.0%
Scup	*Stenotomus chrysops*	3,805	14	3,791	3.94	0.0%	Minor	0.0%	0.0%
Atlantic Wolfish	*Anarhichas lupus*	3,635	-	3,635	0.35	0.0%	Minor	0.0%	0.0%
White Hake	*Urophycis tenuis*	2,228	-	2,228	3.41	0.0%	Minor	0.0%	0.0%
N shortfin squid	*Illex illecebrosus*	1,127	-	1,127	6.41	0.0%	Minor	0.0%	0.0%
Atlantic Halibut	*Hippoglossus hippoglossus*	746	140	606	1.27	0.0%	Minor	0.0%	0.0%
Offshore Hake	*Merluccius albidus*	464	-	464	2.87	0.0%	Minor	0.0%	0.0%
Butterfish	*Peprilus triacanthus*	242	-	242	3.31	0.0%	Minor	0.0%	0.0%
Red Deepsea Crab	*Chaceon quinquedens*	229	-	229	2.86	0.0%	Minor	0.0%	0.0%
Atlantic Mackerel	*Scomber scombrus*	150	-	150	3.90	0.0%	Minor	0.0%	0.0%
Pollock	*Pollachius virens*	110	-	110	1.87	0.0%	Minor	0.0%	0.0%
Redfish	*Sebastes fasciatus*	58	-	58	1.76	0.0%	Minor	0.0%	0.0%
Atlantic Herring	*Clupea harengus*	25	-	25	1.38	0.0%	Minor	0.0%	0.0%
Grand Total		**344,399,661**	**298,560,643**	**45,839,017**	**82.42**			**87%**	**13%**

Table 11. Bycatch discarded specimens (Source: Wigley and Tholke 2017).

Sum of weight (lb) observed								
Benthic speciemens	2015	2016	2017	Grand Total	2015	2016	2017	Grand Total
ANEMONE, NK	91	16	24	132	0.00%	0.00%	0.00%	0.00%
CLAM, NK	4,280	3,564	3,351	11,196	0.08%	0.04%	0.05%	0.05%
CLAM, SURF	23	183	12	219	0.00%	0.00%	0.00%	0.00%
CORAL, SOFT, NK	0	1	29	30	0.00%	0.00%	0.00%	0.00%
CORAL, STONY, NK	2	3	0	5	0.00%	0.00%	0.00%	0.00%
CRAB, BLUE	0	3	24	26	0.00%	0.00%	0.00%	0.00%
CRAB, CANCER, NK	846	2,853	272	3,971	0.02%	0.04%	0.00%	0.02%
CRAB, DEEPSEA,RED	12	1	3	17	0.00%	0.00%	0.00%	0.00%
CRAB, HERMIT, NK	8,045	8,570	12,427	29,042	0.15%	0.11%	0.17%	0.14%
CRAB, HORSESHOE	6,675	69,950	9,061	85,686	0.13%	0.88%	0.12%	0.42%
CRAB, JONAH	13,778	32,437	25,827	72,043	0.26%	0.41%	0.35%	0.35%
CRAB, LADY	466	2,191	13	2,670	0.01%	0.03%	0.00%	0.01%
CRAB, NORTHERN STONE	22	46	0	69	0.00%	0.00%	0.00%	0.00%
CRAB, ROCK	19,239	33,174	17,091	69,503	0.37%	0.42%	0.23%	0.34%
CRAB, SNOW	0	336	0	336	0.00%	0.00%	0.00%	0.00%
CRAB, SPIDER, NK	8	6	24	37	0.00%	0.00%	0.00%	0.00%
CRAB, TRUE, NK	1	738	11	750	0.00%	0.01%	0.00%	0.00%
INVERTEBRATE, NK	24	263	242	528	0.00%	0.00%	0.00%	0.00%
JELLYFISH, NK	3	305	1	309	0.00%	0.00%	0.00%	0.00%
LOBSTER, AMERICAN	2,559	3,454	6,682	12,695	0.05%	0.04%	0.09%	0.06%
MOLLUSK, NK	15	1	0	16	0.00%	0.00%	0.00%	0.00%
MUSSEL, NK	1,187	15,560	9,945	26,692	0.02%	0.20%	0.14%	0.13%
OCTOPUS, NK	7	43	4	55	0.00%	0.00%	0.00%	0.00%
OYSTER, COMMON	1	20	6	27	0.00%	0.00%	0.00%	0.00%
QUAHOG, HARD SHELL CLAM	0	30	0	30	0.00%	0.00%	0.00%	0.00%
SAND DOLLAR	1,823,924	2,038,194	1,753,640	5,615,758	34.73%	25.65%	24.07%	27.42%
SCALLOP, BAY	0	0	0	1	0.00%	0.00%	0.00%	0.00%
SCALLOP, ICELANDIC	269	1	0	270	0.01%	0.00%	0.00%	0.00%
SCALLOP, NK	0	1	0	1	0.00%	0.00%	0.00%	0.00%
SCALLOP, SEA	3,175,216	5,507,244	5,299,972	13,982,431	60.46%	69.32%	72.73%	68.26%
SEA CUCUMBER, NK	186	468	926	1,580	0.00%	0.01%	0.01%	0.01%
SEA URCHIN, NK	536	920	1,646	3,102	0.01%	0.01%	0.02%	0.02%
SHRIMP, NK	1	1	0	2	0.00%	0.00%	0.00%	0.00%
SHRIMP, PANDALID (NORTHERN)	0	0	0	0	0.00%	0.00%	0.00%	0.00%
SNAIL, MOONSHELL, NK	1,221	1,429	4,334	6,983	0.02%	0.02%	0.06%	0.03%
SNAIL, NK	5,122	4,988	5,942	16,052	0.10%	0.06%	0.08%	0.08%
SPONGE, NK	66,017	11,356	13,099	90,473	1.26%	0.14%	0.18%	0.44%
SQUID, ATL LONG-FIN	388	1,858	479	2,725	0.01%	0.02%	0.01%	0.01%
SQUID, NK	3	2	1	6	0.00%	0.00%	0.00%	0.00%
SQUID, SHORT-FIN	44	79	856	979	0.00%	0.00%	0.01%	0.00%
STARFISH, BRITTLE,NK	17,861	4,575	1,253	23,689	0.34%	0.06%	0.02%	0.12%
STARFISH, SEASTAR,NK	98,659	194,271	115,564	408,494	1.88%	2.45%	1.59%	1.99%
WHELK, CHANNELED (SMOOTH)	12	1	0	13	0.00%	0.00%	0.00%	0.00%
WHELK, KNOBBED	0	0	104	104	0.00%	0.00%	0.00%	0.00%
WHELK, NK, CONCH	3,974	4,478	1,200	9,653	0.08%	0.06%	0.02%	0.05%
WHELK, TRUE UNC	537	817	1,665	3,019	0.01%	0.01%	0.02%	0.01%
WORM, NK	328	656	957	1,940	0.01%	0.01%	0.01%	0.01%

3.4.4 Bycatch Species

Skate Complex

Skate complex is considered a main bycatch for this assessment. The grouping accounts for 5.4% of discarded bycatch and is likely to be made up of species such as: little skate (*Leucoraja erinacea*), Winter Skate (*L. ocellata*), Barndoor Skate (*Dipturus laevis*), Thorny Skate (*Amblyraja radiata*), Smooth Skate (*Malacoraja senta*), Clearnose Skate (*Raja eglanteria*), and Rosette Skate (*L. garmani*). In the scallop fishery the three most commonly captured skate species are little skate; winter skate and barndoor skate, consequently these three species were categorized as “main” within the skate complex (Knotek et al., 2018). The remaining skate species are classified as “minor’. For the three main skate species (winter, little, barndoor) and three of the minor skate species (clearnose, rosette skate, smooth) they are not considered overfished nor is overfishing occurring (Table 12). Out of the skate complex only thorny skate is considered overfished, for this species there is a rebuilding program in place.

The biology and life history traits of skates, includes low fecundity, delayed age at maturity and long generation time, making them relatively vulnerable to extinction. However, the impact of the fishery on skates is limited by (limiting of fishing effort in harvest strategies) the relative small overlap of the fishery in relation to the wider known spatial common to the combined skate populations. Spatially, skates are common in water <150m in depth and are prefer sand or gravel type bottoms, which are also preferred by scallops, making them vulnerable to scallop dredgers (McPhie et. al., 2009; Sameoto and Glass, 2012).

Winter, little and bandoor skates are managed as part of a skate complex under the New England Fishery Management Council’s Skate Fishery Management Plan. The proposed overfishing definitions included in the northeast skate FMP proposes establish fishing mortality thresholds for all seven skate species based on a percentage decline in the NEFSC trawl survey. The status of skate overfishing is determined based on a rate of change in the three year moving average from NEFSC Groundfish Survey biomass. Overfished definition for both Little and Winter skate is “When the 3-year moving average of the spring survey mean weight per tow is less than one-half of the 75th percentile of the mean weight per tow observed in the spring trawl survey from the selected reference time series.” (NEFSC 2016b, NMFS 2017a, NEFMC 2017a).

Table 12. Overfishing Definition Reference Points and status for winter skate, little skate and bandoor skate (Modified from Northeast Skate Complex)

Skate Species	B/BMSY or B/BMSY Proxy	Biomass Threshold (kg/tow)	Biomass (2016) (kg/tow)	Overfished/Overfishing
Winter	5.66	2.83	5.35	No/No
Little	6.15	3.07	5.64	No/No
Bandoor	1.59	0.78	1.59	No/No

Winter skate are considered to have the highest discard survival rate in the scallop dredge fishery (45.4% mortality), followed by little skate (62.7% mortality) and lastly barndoor skates appear to be the most susceptible to fishing (99.9% mortality) (Knotek et al., 2018).

Winter Skate (Big Skate)

Winter Skate (*Leucoraja ocellata*) occurs from the south coast of Newfoundland and the southern Gulf of St. Lawrence to Cape Hatteras Its center of abundance is on Georges Bank and in the northern section of the Mid-Atlantic Bight (Packer et.al. 2003a). As with all skates (Rajiformes), Winter Skates lay benthic, leathery egg cases, usually two at a time. Incubation extends over several weeks (Musick and Ellis 2005). Egg deposition occurs during summer and fall off Nova Scotia and probably in the Gulf of Maine as well. Egg deposition continues into December and January off southern New England. Winter skates are one of the larger skates in the Gulf of Maine, with a maximum known size of 150 cm TL size and age at maturity is ca. 78 cm and seven years (Packer et al. 2003). Winter Skate is not overfished nor is overfishing occurring (NEFSC 2016b, NMFS 2017a, NEFMC 2017a).

Little Skate

Little Skate (*Leocoraja erinaces*): (formerly *Raja erinacea*), occurs from Nova Scotia to Cape Hatteras and is one of the dominant members of the demersal fish community of the northwest Atlantic (Bigelow and Schroeder 1953, McEachran and Musick 1975). Its center of abundance is in the northern section of the Mid- Atlantic Bight and on Georges Bank, where it is found year-round over almost the entire range of temperatures recorded for those areas (McEachran and Musick 1975). The egg cases are laid in pairs. Development takes 6-12 months depending on water temperature. Maximum observed length from NEFSC surveys was 62 cm TL, and length and age at maturity were estimated at 50 cm TL and 4 years (Packer et al. 2003b). Skate landings have two components, one focused on larger skates to cut wings, and the other focused on small skates for bait in other fisheries. Little skate are not overfished nor is overfishing occurring (NEFSC 2016b, NMFS 2017a, NEFMC 2017a).

Monkfish (*Lophius americanus*)

Monkfish accounted for 1.2% of discarded bycatch and is considered minor bycatch species for this assessment.

The biology and life history trait of monkfish include, medium level fecundity, fast-growing, cannibalistic and widely distributed in the Northwest Atlantic from the Grand Banks and northern Gulf of St Lawrence, Canada, to the east coast of Florida. They migrate inshore and offshore during their life stages, however are common to soft sediment bottom (sand/mud/gravel) at depths of 50m-1000m (Johnson, et. al., 2008).

The current monkfish FMP is designed to stop overfishing and rebuild the stocks through a number of measures, including limiting the number of vessels with access to the fishery, allocating days-at-sea to those vessels, and setting trip limits. Currently (2017/2018), the monkfish resource is neither overfished nor has overfishing occurring (https://www.nefmc.org/management-plans/monkfish).

Table 13. Overfishing Definition Reference Points and status for Monkfish (Modified from https://www.greateratlantic.fisheries.noaa.gov/sustainable/species/monkfish/index.html=

Stock	Overfishing?	Overfishing Definition	Overfished?	Overfished Definition	Rebuilding Program Progress	F/F_{MSY}	Fishing Mortality Rate (F)	B/B_{MSY} or B/B_{MSY}Proxy	Biomass
Monkfish Northern	No	When F exceeds $F_{THRESHOLD}$, which is set equal to	No	When total stock biomass is	None, declared rebuilt	.44	.10	1.29	66,062 mt

		F_{MAX}, which is currently estimated at F=0.43		less than 1/2 Bmax					

Yellowtail Flounder (*Pleuronectes ferruginea)*

Yellowtail flounder was classified as "main" retained in the first assessment of this fishery. At re-assessment the team found that the volume for this species is <0.1%, consequently it is now classified as "minor". "According to the 2015 stock assessment, the Southern New England/Mid-Atlantic stock of yellowtail flounder is overfished and is subject to overfishing"[2]. The risk to the stock from anthropogenic activities is one of the criteria used to determine whether a species should be classified as "Less resilient". If the species is considered "less resilient" and it is ≥ 2% of the catch, then it is considered Main. Because the volume of catch for yellow tail flounder is <2% it is classified as minor.

Invertebrates

Scallop dredges are known to have a relatively high level of impact and bycatch of benthic species including invertebrates, when they overlap with the fishery (Kaiser et al., 2006). Bycatch invertebrate data when aggregated with catch composition data from the NEFOP data, and evaluated, indicated much lower levels of fishery interaction with regards to; small scallop (3.85%), sand dollar (1.37%), and negligible (0.002%) for sponge. These invertebrate interactions can be understood to be similar to the situation during the initial assessment (Aldous et. al., 2013), and provides the reminder of the importance of recognizing that - the US scallop fishery has been going on for 100 years, so those organisms that are common on regularly fished scallop grounds have life history characteristics which enable them to, cope with the levels of disturbance or recover from disturbance caused by scallop dredging. Unlike commercially important species, it is difficult to assess whether bycatch invertebrates are within biologically based limits due to a lack of data. However, it is reasonable to infer, that on some seabed types the ongoing use of New Bedford dredges maintains the benthos in an altered state such that robust animals (e.g. scallops and some starfish) or fast-growing organisms (e.g. some sponges and tunicates) are favored (Marino II et al., 2007).

Atlantic sea scallops are found in the Northwest Atlantic Ocean, from Newfoundland to Cape Hatteras, North Carolina (https://www.fisheries.noaa.gov/species/atlantic-sea-scallop). Reduced annual scallop fishery effort is indentified from VMS data, indicating reduced footprint of the fishery. An appropriate update on scallop biology and stock status is provided in section 4.3 (Principle 1 - the Target Species).

Sand dollar is robust and resilient species, commonly found at various depths in sandy areas of Northwest Atlantic Ocean. Fecundity is considered high. The sexes are separate and reproduction is by broadcast spawning/fertilization of gametes. Larvae metamorphose through several stages before the skeleton or test begins to form, at which point they become benthic. Smaller crustacean larvae, copepods, diatoms, algae or detritus are the main food during the different life stages. Few natural predators, such as ocean pouts and sunflower starfish are known to eat mature sand dollar, while larvae are eaten by various filter feeding species. Asexual reproduction (cloning mechanism) is its

[2] https://www.fisheries.noaa.gov/species/yellowtail-flounder; https://www.nefsc.noaa.gov/publications/crd/crd1717/

known resilience feature to recovery from predation or interaction with bottom fishing gear (Fenstermacher, 2001; Vaughn and Strathmann 2008).

Sponges (phylum Porifera), are characterized as being soft-bodied, sessile, emerging from hard marine substrates areas from tidal zones to depths >50m. They are identified with high fecundity through both sexual and asexual reproductive mechanism, which also facilitates their recovery when impacted by environmental or anthropogenic pressures (Hourigan et. al., 2017). Sponges are identified as vulnerable marine ecosystems - VME (FAO, 2009) due to their structural complexity which supports various benthic ecosystems of fish and invertebrates. Aggregations of sponge can range from small patches to dense grouping. In certain temperate areas astrophorid sponge grounds are identified on gravel and sandy bottom of depths ranging 150m-1700m. At these depths, there is an unlikely overlap and encounter with the scallop fishery which typically operate at depths <100m.

In addition, based on the low discard quantity identified for these species, they are considered to be assessed as minor bycatch of this assessment.

Management

Management of all principal P2 species falls under the same stringent management system as for the P1 species. The Magnuson-Stevens Fishery Conservation and Management Act (MSA) is the primary law governing marine fisheries management in U.S. federal waters. Primary objective and overarching functions include cooperating with the fishing industry, to:

- Prevent overfishing.
- Rebuild overfished stocks.
- Increase long-term economic and social benefits.
- Ensure a safe and sustainable supply of seafood (https://www.fisheries.noaa.gov/topic/laws-policies#magnuson-stevens-act).
- In federal waters, retained species are managed by the Mid-Atlantic or New England Fishery Management Councils under various fishery management plans (FMPs).

Commercial permits are required to possess, land, or sell managed species. The primary management tool is the specification of an annual catch limit (ACL). The ACL is determined through periodic stock assessments conducted at Northeast Regional Stock Assessment Workshops (SAW). “SAW” is a formal scientific peer review process for evaluating and presenting stock assessment results to managers. The SAW protocol is used to prepare and review assessments for fish and invertebrate stocks in the offshore US waters of the northwest Atlantic.

Assessments are prepared by SAW working groups (federally led assessments) or Atlantic States Maine Fisheries Commission technical assessment committees (state led assessments) and peer reviewed by an independent panel of stock assessment experts called the Stock Assessment Review Committee or “SARC”. The SAW/SARC process began in 1985. The SARC panel may accept or reject an assessment. Final SAW documents include a Stock Assessment Report, a Stock Assessment Summary Report and the SARC panelist reports. Final SAW assessment reports are published by the NEFSC online at http://www.nefsc.noaa.gov/publications/ and http://www.nefsc.noaa.gov/nefsc/saw/.

Under the Magnuson-Stevens Act, the Annual Catch Limit (ACL) must be set less than or equal to the Acceptable Biological Catch (ABC) (to account for management uncertainty), which must be set less than or equal to the Overfishing Level (OFL) (to account for any scientific uncertainty in the stocks. Quotas are derived from the recommendations of the Council's Scientific and Statistical Committee (SSC) for Acceptable Biological Catch (ABC), and how various components of fishing mortality are handled by the various FMPs.

NOAA Fisheries National Bycatch Reduction Strategy and particularly, the Bycatch Reduction Engineering Program (https://www.fisheries.noaa.gov/national/bycatch/bycatch-reduction-engineering-program), which is a facility funded (to the tune of USD$24million for the 2018 fiscal period) towards bycatch reduction research and addressing conservation issues for a variety of species, including groundfish, shellfish, sharks, sea turtles, and other marine mammals, along the US Atlantic East coast

With regards to management under the Atlantic Sea Scallop Fishery Management Plan; managers determine a total allowable catch for the scallop fishery based on estimates of the scallop population. They allocate this catch amount to different groups of the fishery, depending on their permit type and historical catch, through days-at-sea and number of trips to special access areas. Other management measures include:

- Limits on crew size.
- Areas closed to scallop dredging to allow young scallops to grow large and reproduce, and to reduce bycatch of non-targeted species.
- Vessels harvesting scallops must use vessel monitoring systems – VMS (a satellite communications system used to monitor fishing activities).
- Vessels must participate in the at-sea observer program and record quantity of catch as well as discard in vessel trip records –VTR, and facilitate reconciliation of dealer/sales data with VTR.
- Individual Fishing Quotas (IFQs), a type of catch share program, for Limited Access General Category permit holders, and daily catch limits.
- Trans-boundary joint surveys and management arrangements between US and Canada facilitate the broader Gulf of Maine area (GOMA), - in the south by the United States and in the north by Canada - stocks and ecosystem components. For example, joint management and surveys of shared conservation and commercial interest (Nye et. al., 2010).

For fisheries, such as the sea scallop fishery in the Gulf of Maine which operates in both federal and state waters, management is typically by the State of Maine through gear and seasonal restrictions and rotational closures (this fishery primarily occurs in state waters). However the federal component of the fishery is managed through daily catch limits and gear restrictions (https://www.fisheries.noaa.gov/species/atlantic-sea-scallop).

Information

Previous assessment of information and data protocol for fisheries operating in the US Northeastern marine waters was updated in Matoe et al., (2016); which states that;

> […] the primary responsibility for the collection of fishery dependent information from commercial fishery operations for most federally managed species from Maine through Virginia lies with The Fisheries Data Services Division (FDSD) in the Northeast Region of NMFS. For some species this responsibility extends throughout the entire range of the commercial fisheries on the Atlantic and Gulf coasts of the United States. In addition, the FDSD has responsibility for establishing quality standards for fisheries dependent data collections that are managed by the Northeast Regional Office, improving the quality of fishery dependent data and the collection of biological information from commercial catches.

When considered on a functional level, fishery dependent information in the fishery include commercial and biological data collected under the Northeast Region SBRM (30% CV) of the discard estimate, in order to ensure that the effectiveness of the Northeast Region SBRM can be measured, tracked, and utilized to effectively allocate the appropriate number of observer sea days. The Northeast Fisheries Observer Program (NEFOP) protocols for observed trips include appropriate fishery dependent information (commercial and biological) which serves to facilitate evaluation and management of the fisheries.

Additional important data and information sources used by the SBRM protocol include:

- Northeast Fisheries Observer Program3 (NEFOP) database.
- Observed hauls with a 'complete' sampling protocol: includes species weights for both kept and discarded portions of all species in the catch.
- Vessel Trip Report (VTR; including logbooks from the surfclam (*Spisula solidissima*) and ocean quahog (*Arctica islandica*) fishery) database.
- Northeast Fisheries Science Center (NEFSC) commercial landings database.
- National Oceanic and Atmospheric Administration Marine Recreational Information Program (MRIP) database.
- Dealer/sales data, VMS data (Wigley & Tholke 2017).

Important information supporting applied research, which also facilitates fishery management decisions and improved understanding of stock status as well as scallop fishing interactions with commonly encountered species, continues to be supported by the New England and Mid-Atlantic Fishery Management Councils, Research Set-Aside (RSA) funded programs. Typically, the Councils reserves 1.25 million pounds of scallops per year. This generates approximately $15 million; of which approximately $3 million supports research projects. Current research focus and priorities (through to 2019) includes:

- Sea scallop: industry-based surveys of access areas, bycatch reduction, loggerhead sea turtle population information and bycatch avoidance.
- Monkfish: life history, stock definition, ecological significance, bycatch and discard, trawl and gillnet gear technologies to improve selectivity and reduce discard (https://www.nefsc.noaa.gov/coopresearch/rsa_program.html). For monkfish RSA; the Councils reserves 500 RSA days-at-sea per year. This generates approximately $1.75 million; of which approximately $300,000 supports research projects.

In addition, the FDSD acquires data through mandatory reporting programs to provide timely and accurate landings and effort data on the federally regulated fisheries in the northeast for in-season management and analysis. Tasks include dockside collection of catch data, biological samples from commercial fishing trips, and producing finished data products to support fisheries management and scientific analyses (https://www.fisheries.noaa.gov/topic/population-assessments).

The manage responsibilities of NMFS also includes the authority to close fisheries should quotas be exceeded. In addition each FMP includes Accountability Measures – AM- that may be invoked to offset any overages (over catch that exceed the permit) from previous years.

3.4.5 Endangered, Threatened and Protected (ETP) Species

According to MSC methodology, ETP species are defined as those that are recognized as such by national legislation and/or binding international agreement (e.g. CITES) to which the jurisdictions controlling the fishery under assessment are party. Species that appear exclusively on non-binding lists such as IUCN Red List, OSPAR or that are only the subject of intergovernmental recognition (such as FAO International Plans of Action) and that are not included under national legislation or binding international agreement are not considered as ETP under MSC protocols.

ETP species that has being recorded with regards to the potential to be incidentally captured by scallop dredge fishery in the US mid-Atlantic is loggerhead sea turtles (*Caretta caretta).* In 2012, this species was no longer considered to be at-risk from the US Mid-Atlantic scallop dredge fishery (NMFS 2012, Patel 2017).

Management

The Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA), provides national legislation for protection of ETP species in U.S North Eastern marine areas (https://www.fisheries.noaa.gov/topic/laws-policies#endangered-species-act).

A responsibility of NOAA fisheries includes cooperating as well as guiding regional science and management entities with regards to appropriate programs for implementation, in compliance with the ESA, for overall protection of endangered and threatened marine and anadromous species.

In the process of delivering the ESA primary purpose - to protect and recover imperil species and the ecosystems upon which they depend – NOAA management actions for ESA listed species includes:

- Designation of critical habitat for the conservation of species (under section 4 of the ESA).
- Monitor and evaluate species status (under section 4 of the ESA).
- Develop and implements recovery plans for listed species (under section 4 of the ESA).
- Consult on federal actions that may affect a listed species, or its designated critical habitat, to minimize possible adverse effects (under section 7 of the ESA).
- Provide grants to states (under section 6 of the ESA) and grants to tribes for species conservation.
- Enter into bilateral and multilateral agreements with other nations to encourage conservation of listed species (under section 8 of the ESA).
- Investigates violations of the ESA (under section 9 of the ESA).
- Cooperate with non-federal partners to develop conservation plans, safe harbor agreements, and candidate conservation agreements with assurances for the long-term conservation of species (under section 10 of the ESA).
- Authorize research to learn more about protected species (under section 10 of the ESA).
- Designate experimental populations of listed species to further the conservation and recovery of those species (under section 10 of the ESA).

The MMPA provides protection to all marine mammals in the US EEZ. Implementing responsibilities is coordinated by NOAA fisheries centers and Marine Mammal Commission. The MMPA prohibits the "take" of marine mammals, with certain exceptions, including special cases for subsistence, scientific research, and permits authorizing incidental take of marine mammals to commercial fishing operations (https://www.fisheries.noaa.gov/topic/laws-policies#marine-mammal-protection-act).

All protected marine species recognized by the US ESA and MMPA are reviewed and updated with regards to relative changes, by way of status reports from NOAA, Northeast Fisheries Science Centre (https://www.nefsc.noaa.gov/ecosys/ecosystem-status-report/protected-species.html). These reviews represent Biological Opinion (BO) for protected species, as required under the ESA (Office of Protected Resources - Sea Turtle BO 2016 - https://repository.library.noaa.gov/view/noaa/14858; https://doi.org/10.7289/V5S75DH7). This formal review facilitate evaluation of any impact of fisheries on protected species (ETPs), as well as measure effectiveness of implemented protocols, and to take corrective or remedial actions where appropriate, such as for species or population recovery, or delisting where population is no longer at risk.

Information

Capture fisheries have the potential to interact with Endangered, Threatened or Protected species where factors such as; gear type, frequency of use, duration of deployment, spatial, and temporal footprint overlap with and ETP species profile.

The NMFS Office of Protected Species collects and analyses data on interactions between fisheries and ETP species using data primarily from commercial fisheries (observer programs (NEFOP) and Vessel Trip Reports (VTR)), scientific surveys at sea, standings onshore, and necropsy report. These data sources are reviewed annually to revise the listing of at-risk species, and based on the levels of threat to the conservation of a species or population, resources are allocated for additional at sea observer coverage for fisheries that are considered a risk to ETP species.

For the scallop fishery, any lethal interactions (but not sighting) with regards to protected species are required to be reported in Vessel Trip Report (VTR) and Observers reports. The assessment team did not receive evidence that the VTRs are used in a consistent manner to record information on interaction with ETP species. According to the SBRM annual report covering 2017 periods and discussions with representative from NEFOP, during the site visit, there was no report of the scallop dredge fishery interaction with protected species recognized under the Endangered Species Act (ESA) or Marine Mammal Protection Act (MMPA), (Wigley and Tholke 2017).

Sea Turtles

In the initial assessment interaction between sea scallop fishery and sea turtles is indicated. According 2016 work reported by the Atlantic Marine Assessment Program for Protected Species (AMAPPS), over 2,060 individuals from 4 sea turtle species, were recorded during at-sea surveys, in particular, the most frequently detected turtle was the loggerhead turtle (*Caretta caretta*), with about 1,000 individuals that ranged from 26°N – 41°N mostly in waters on the continental shelf (https://www.nefsc.noaa.gov/psb/AMAPPS/).

Though historical records indicated that scallop gear is expected to catch an estimated average of 140 loggerhead sea turtles each year, with 47% incidental sea turtle injury or mortality (NMFS 2012, Patel 2017); with introductions and use of modified New England Scallop dredge - some vessels were equipped with chain mats and turtle deflector dredges designed to exclude turtles from being captured in the dredge bag – and, which are considered to be structurally stronger, and designed to reduce bycatch or the incidental capture and retention of sea turtles, skates and flatfish species, thereby facilitating higher likelihood of reduced to no sea turtle incidental capture or injury (https://www.nefsc.noaa.gov/coopresearch/pdfs/FR06-0258.pdf; Smolowitz and Weeks, 2008)).

The loggerhead sea turtle was originally listed as threatened throughout its range in 1978. In 2011, NMFS published a final rule to list nine separate Northwest Atlantic Ocean Distinct Population Segment (DPSs) under the ESA with four listed as threatened (i.e., Northwest Atlantic Ocean, South Atlantic Ocean, Southeast Indo-Pacific Ocean, and Southwest Indian Ocean DPSs). In 2012 the BO by NMFS indicated this species (DPS) was not at risk by Atlantic sea scallop dredge fishery;

> *According to the Biological Opinion (Opinion) issued by NMFS on July 12, 2012, the agency has determined that species not likely to be affected by the Atlantic Sea Scallop FMP or by the operation of the fishery include the shortnose sturgeon, the Gulf of Maine distinct population segment (DPS) of Atlantic salmon, hawksbill sea turtles, and the following whales: North Atlantic right, humpback, fin, sei, blue, and sperm whales, all of which are listed as endangered species under the ESA. NMFS also concluded that the continued authorization of the sea scallop fishery would not have any adverse impacts on cetacean prey, and that it would not affect the oceanographic conditions that are conducive for calving and nursing of large cetaceans.*

Murray (2015), estimated the interaction (observed and unobserved) between scallop dredge fishing and loggerhead sea turtles in the mid-Atlantic over the period of 2009-2014 (also include 2001-2008 data). This evaluation identified that;

> *The average annual observable turtle interactions in the Mid-Atlantic scallop dredge fishery plus unobserved, quantifiable interactions was 22 loggerheads per year*

(coefficient of variation= 0.73, 95% confidence interval: 4-67), 9-19 of which were lethal. The 22 interactions equate to 2 adult equivalents per year and 1-2 adult equivalent mortalities. Estimated interactions in the fishery have decreased relative to 2001-2008, and the utility of observers as a monitoring tool for turtle interactions in the fishery appears to be decreasing.

Important and relevant points of this report on interaction is consistent with the 2017 SBRM report and stakeholders discussion during the site visit, which indicated no interaction with sea turtles from the mid-Atlantic scallop dredge fishery since introduction of turtle deflector dredges (TDDs) with chain mats in 2013. Some unobserved interaction are likely particularly to animals making contact with different sections of the gear, however are not lethally injured or carried to the surface for immediate observation (Murray 2015). The RSA program fund ongoing research which through a tag and tracking method where over 50,000 days of monitoring is conducted, are providing updated information of turtle populations levels in the US Mid-Atlantic region as well as any observer mortality and injuries from fishing (including scallop dredge fishing (Patel 2016). In addition research by NOAA resulted in the conclusion that the scallop fishery is likely to be within national and international requirements for the protection of turtles and that the known direct effects of this fishery are unlikely to create unacceptable impacts to them, yet there are high degrees of uncertainty. Further research; involve the use of quantitative assessment of the potential removals and unobserved mortalities to jeopardize the continued existence of the US Atlantic Ocean population of loggerhead sea turtles. A population viability analysis (PVA) was used to estimate quasi-extinction likelihoods under conditions with and without fishery effects. The results suggest that the annual removal of loggerhead sea turtles in the US fisheries for Atlantic sea scallops, though detectable, does not significantly change the calculated risk of extinction of the population of adult female Western North Atlantic loggerheads over the next 100 years (Merrick and Haas 2008).

Typically, Loggerhead turtles (*Caretta caretta*) and Atlantic sea scallops (*Placopecten magellanicus*) overlap seasonally in the US Mid-Atlantic region stretching from Cape Cod to southern Virginia when turtles migrate to the area to forage. Breeding/nesting areas are typical warmer waters along the U.S. Coast from southern Virginia to Alabama. According to the most recent status review, subpopulations occurring in the Northwest Atlantic, the Peninsular Florida and Northern U.S. units support the greatest numbers of nesting females (over 10,000 for the Peninsular Florida unit and over 1,000 for the Northern U.S. unit). However, during the 20 year period of 1989-2008, a 26% was observed in the Peninsular Florida nesting subpopulation, which represents approximately 87% of all nesting effort in the Northwest Atlantic Ocean DPS. Interactions and likely impact from fishery operating bottom trawl, sink gillnets, hook and line gear, and bottom longline in the Northeast Multispecies Fishery; as well as from operations of the military, offshore energy, aggregates dredging, vessel traffic, and other marine exploration activities is documented by Richards (2007); Further background information on the distribution, biology and status of sea turtle species can be found in NMFS (2016; https://doi.org/10.7289/V5S75DH7).

3.4.6 Habitat Impacts

Outcome

The Northwest Atlantic Marine Ecoregional Assessment (Geene et al., 2010) is among various documentation providing a general and in certain cases, a detail description of distributions of benthic community as well as seabed sediments, and fauna of the ecoregion (particularly from Gulf of Maine, through Southern New England and into the Mid Atlantic Bight). Over 90,000 km^2 of the region seabed area - benthic fauna and substrates - were mapped using data from grab sampling, drop camera, towed camera, and acoustics surveys (mutibeam bathymetry) with findings that are considered at suitable resolution for supporting identification and protection of vulnerable benthic ecology, as well as marine spatial planning (Bethoney, 2017).

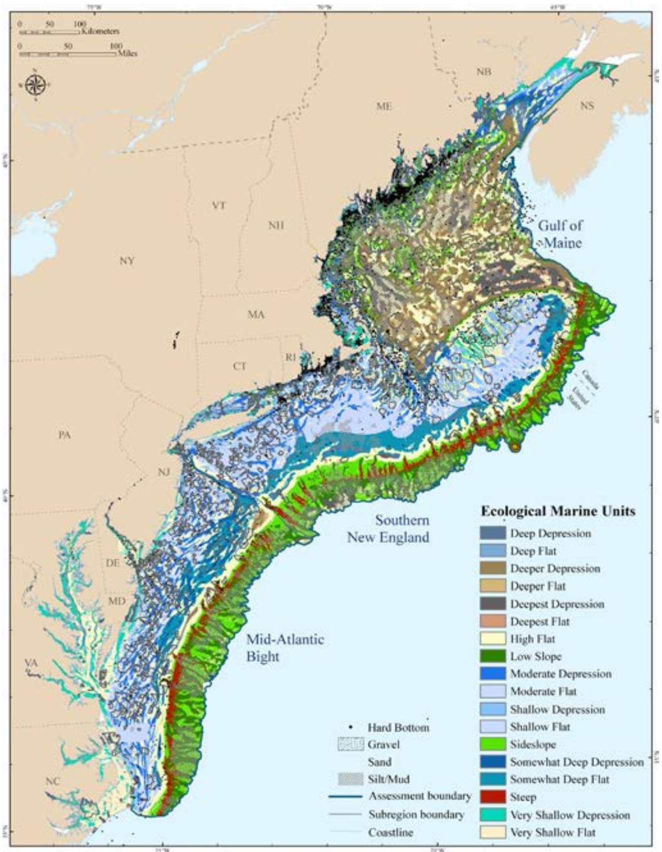


Figure 28. Sediment profile and benthic topography - Northwest Atlantic (Greene, et al., 2010)

Benthic topography of the area (Figure 28) is well known and continues to be updated through partnership research within the scallop fishery set-a-side program funding. For example, through ongoing work such as high resolution video mapping of the benthic ecology and communities of the Georges Bank and Mid – Atlantic (Stokesbury, 2004); Photographic and side scan sonar images obtained during the surveys formed the basis for the assessment of Before – After – Control- Impact (BACI) evaluation of the scallop fishery interaction with benthic communities and ecology of the ecoregion (Trembanis et al., 2014; Gallagher, 2016).

The spatial area of operation of the scallop fleet is mapped through a national ongoing process using VMS – vessel monitoring system data, which is compulsory for all fleet participating in the fishery. VMS data (2016-2017 -Figure 29) also provides opportunities to identify any areas of changes (increased/decreased) in fishing effort, as well as any participation of the fishery in closed or restricted area (Galuardi, 2017).

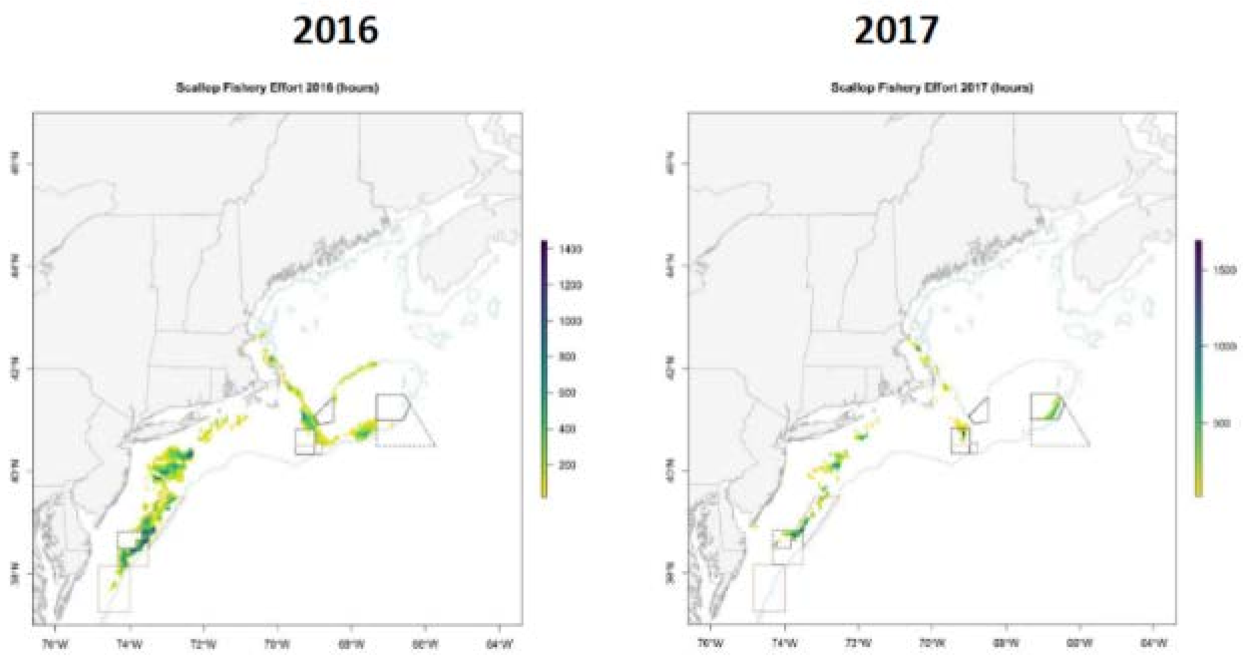


Figure 29. Scallop fishery fishing effort 2016-17. (Source: Galuardi, 2017)

Among the important information from the region ecological characterisation, is the recognition and use of a combination of relevant data set – bathymetry, sediment grain size, sediment texture, salinity, bottom temperature, topographic features, and tidal current – based on facts that benthic community distribution are closely related to these ocean factors. For example, temperature is correlated with the community composition of benthic macroinvertebrates; substrate type is correlated with community composition and abundance of both the invertebrates and demersal fish habitat complexity, as well as correlated with species composition, diversity, and richness; and depth as well as tidal regime (strength) is correlated with abundance, richness, and benthic community composition (Greene et. al., 2010).

Commonly Encountered Habitat Types

Between fall 2007 and spring 2010 the NEFMC Habitat Plan Development Team (PDT) developed the Swept Area Seabed Impact (SASI) to support the development of the Omnibus EFH Amendment 2. The SASI approach is used to estimate the magnitude, location, and duration of adverse effects across gears types and FMPs in order to evaluate the cumulative impacts of alternatives to minimize adverse effects. The SASI approach consists of five components: (1) Vulnerability Assessment, (2) SASI Model, (3) Local Indicators of Spatial Association (LISA) Analysis, (4) Cost-efficiency Analysis, and (5) Area Closure Analysis. To read more about the methodology of the SASI model See Omnibus Habitat Amendment 2.

The SASI model characterizes top ten geological and biological features according to sediment type. These three characterizations (sediment, geological and biotic features) align with the MSC definition for benthic habitat characteristics for assessment (SA3.13.2). Low and high energy environments in the SASI model are inferred from shear stress computations based on modelled velocity and a depth based estimate of bottom roughness (NEFMC 2011).

	High Energy		Low energy	
	Geological features (modify 50% of A)	*Biological features (modify 50% of A)*	*Geological features (modify 50% of A)*	*Biological features (modify 50% of A)*
Mud	Biogenic burrows, biogenic depressions, sediments	Cerianthid burrowing anemones, hydroids, mussels, tube-dwelling amphipods	Biogenic burrows, biogenic depressions, sediments	Cerianthid burrowing anemones, sea pens, hydroids, mussels, tube-dwelling amphipods
Sand	Biogenic burrows, biogenic depressions, sediments, bedforms, shell deposits	Cerianthid burrowing anemones, tube-dwelling amphipods, ascidians, hydroids, *Filograna implexa*, sponges, mussels, scallops	Biogenic burrows, biogenic depressions, sediments, shell deposits	Cerianthid burrowing anemones, sea pens, tube-dwelling amphipods, ascidians, hydroids, *Filograna implexa*, sponges, mussels, scallops
Granule-pebble	Scattered granule-pebble, granule-pebble pavement, shell deposits	Actinarian anemones, cerianthid burrowing anemones, ascidians, brachiopods, bryozoans, hydroids, macroalgae, *Filograna implexa*, other tube-dwelling polychaetes, sponges, mussels, scallops	Scattered granule-pebble, shell deposits	Actinarian anemones, cerianthid burrowing anemones, ascidians, brachiopods, bryozoans, hydroids, *Filograna implexa*, other tube-dwelling polychaetes, sponges, mussels, scallops
Cobble	Scattered cobble, piled cobble, cobble pavement	Actinarian anemones, ascidians, brachiopods, bryozoans, hydroids, macroalgae, *Filograna implexa*, other tube-dwelling polychaetes, sponges, mussels	Scattered cobble, piled cobble	Actinarian anemones, ascidians, brachiopods, bryozoans, hydroids, *Filograna implexa*, other tube-dwelling polychaetes, sponges, mussels
Boulder	Scattered boulder, piled boulder	Actinarian anemones, ascidians, brachiopods, bryozoans, hydroids, macroalgae, *Filograna implexa*, other tube-dwelling polychaetes, sponges, scallops, mussels	Scattered boulder, piled boulder	Actinarian anemones, ascidians, brachiopods, bryozoans, hydroids, *Filograna implexa*, other tube-dwelling polychaetes, sponges, scallops, mussels

Figure 30. Ten habitat types identified in the Vulnerability Assessment. (From NEFMC 2011)

The vulnerability[3] assessment reviewed relevant habitat impacts literature to Northeast U.S. to organize seabed features (e.g. sponges, biogenic burrows, bed forms, etc.) according to susceptibility[4]

[3] Vulnerability "represents the extent to which the effects of fishing gear on a feature are adverse. 'Vulnerability' is defined as the combination of how susceptible the feature is to a gear effect and how quickly it can recover following the fishing impact (NEFMC 2011)

[4] Susceptibility : "the percentage of total habitat features encountered by fishing gear during a hypothetical single pass fishing event that have their functional value reduced (NEFMC 2011)

(initial effect by single pass of fishing gear) and recovery[5] values. A value of 10 years was selected as the potential recovery times for the features incorporated in the SASI model, which may be an underestimate of the recovery for some features.

To examine distribution of vulnerable seafloor habitats, seabed features were inferred to occur in particular combinations of seafloor substrate (mud, sand, granule-pebble, cobble or boulder) and seafloor energy (high or low). The susceptibility and recovery of each 'seabed feature-gear-substrate-energy' combination was scored on a 0-3 scale**.** The vulnerability assessment identified low-energy granule-pebble, cobble- and boulder-dominated habitats as being the most vulnerable to fishing impacts on account of the recovery time.

Sea scallop, are typically found at depths of 10m -100m, on coarser sand and gravel substrates where tidal currents are strong, and facilitates filter feeding as well as reproduction and larval distribution. The fishery is reported to operate at depths of <100m and typically over sandy or gravel sediment where highest catch is possible through minimum effort. Employing highly generalized spatial fishing distribution information derived from observer reports and VTRs, the SASI model indicates that the dominant substrates assumed to be fishable to the scallop fishery are mud and sand substrates in high energy environments (Table 14). Areas with high potential vulnerability to scallop dredges (granule-pebble, cobble and boulder substrates in low energy environments) represented <20% of the distribution of areas assumed to be fishable by scallop dredges (NEFMC 2011). These vulnerable areas are found between Cape Cod, deeper areas of the

Table 14. Distribution of dominant substrates, by energy environment, within the areas assumed to be fishable by scallop dredges, according to maximum depth thresholds. Reproduced from NEFMC 2011

Substrate	Low Energy	High Energy
Mud	25.8%	15.1%
Sand	54.8%	53.0%
Granule- pebble	15.1%	22.9%
Cobble	3.2%	7.0%
Boulder	0.7%	2.1%
Total area (km^2)	22,648	119,982

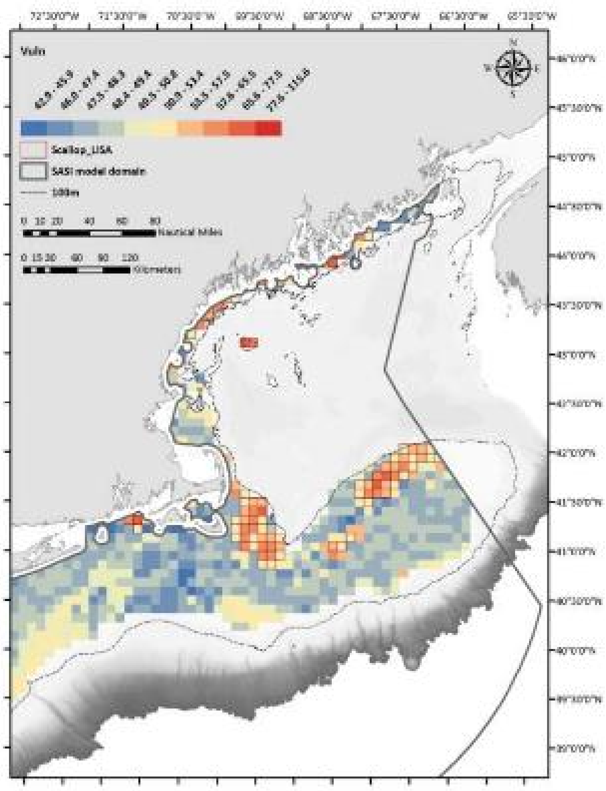


Figure 31. SASI model estimate of seabed habitat vulnerability to adverse effects from scallop dredge gears (blue=low vulnerability, red=high vulnerability). Clusters of high vulnerability grids are outlined in red. Reproduced from OHA2 FEIS – Volume 1 Affected Environment (NEFMC 2016)

[5] Recovery: "the time in years that would be required for the functional value of that unit of habitat to be restored" Recovery does not necessarily mean a restoration of the exact same features, but that after recovery the habitat would have the same functional value. (NEFMC 2011)

Great South Cannel, a small area in central Georges Bank, the northeastern flank of Georges Bank and the Platts Bank in the Gulf of Maine (NEFMC 2016).

Estimates of realized adverse effects, which consider the magnitude and distribution of fishing efforts with vulnerable habitats indicate that adverse effects from the limited access scallops fishery occurs around the edges of Georges Bank, in the southwestern Gulf of Maine and throughout the Mid-Atlantic Bight. For the general category adverse effects have an more inshore distribution. The results indicate that adverse effects of the scallops fishery appear to have declined after the mid-2000s on account of decline in overall effort levels in the fishery (NEFMC 2016).

Biological Features

According to Greene et at., (2010), over 2000 species across 13 phyla, are identified making up the diversity of the benthic habitats typical to the Northwest Atlantic (Table 15). The profile of benthic specimens encountered in the fishery is report through the SBRM (), as well as from independent scientific research by Bethoney (2017). Sea feather (*Pennatula aculeata*) and soft coral (*Alcyonacea spp.)* were typically to habitat areas with depressions, and high flats and slopes, in deep water (143 - 233 m) mostly on silt and fine sand, but substrate is variable (Greene et. al., 2010).

According to the SASI model the top biological features (>10%) in the assumed fishable areas for scallop dredges included, in low energy environments: hydroids (12 %), *Modiolus* (12 %), cerianthid burrowing anemones (11.5%), tube-dwelling amphibpods (9.7%), and sea pen corals (9.37). In high energyenvironments, top biological features included: hydroids and *Modiolus* (10.8% each), and ~9% distribution of polychaetes, sponges, cerianthid burrowing anemones, ascidians, and *Placopecten magellanicus* (NEFMC 2011).

Table 15. Benthic species common to the Northwest Atlantic (Greene et al., 2010).

Phyla (13)	Diversity profile	
arthropods (crabs, lobsters, shrimp, barnacles)	622	27%
mollusks (clams, scallops, squid, limpets, sea slugs, snails)	650	29%
annelids (sea worms)	547	24%
echinoderms (sea stars, sea urchins, sea cucumbers, sand dollars)	195	9%
bryozoans (crusts, bryozoans)	141	6%
cnidarians (corals, anemones)	58	3%
sipunculas (peanut worms)	29	1%
chordates (sea squirts)	21	1%
poriferans (sponges)	6	0.26%
chaetognathans (arrow worms)	3	0.13%
brachiopods (lamp shells)	2	0.09%
nemerteans (ribbon worms)	1	0.04%
ctenophores (comb jellies)	1	0.04%
Grouped	*2276*	*100%*

Within the ecoregion, species that are considered less resilient due to their fragility or biological traits, such as slow growth rate and long living, includes sponges and corals. These are typically considered within the group of vulnerable marine ecosystem (VME). Though negligible interactions with sponges are reported, there is no reported interaction of the fishery with coral aggregations (SBRM Report 2015-2017; Bethoney 2017).

	Antipatharia		Scleractinia		Zoanthidea		Octocorallia		Stylasteridae	
	2007	2016	2007	2016	2007	2016	2007	2016	2007	2016
Northeast U.S.	0	1	16	17	0	0	37	47	0	0
Southeast U.S.	2	14	57	77	0	0	42	92	7	15
Gulf of Mexico	17	28	47	72	0	0	44	118	8	9
U.S. Caribbean	9	13	42	45	0	0	23	43	14	14
U.S. West Coast	3	7	17	19	0	0	39	80	4	6
Alaska	10	8	8	9	0	0	45	58	12	23
Hawaii	20	21	53	54	0	1	93	104	4	4
Gross Totals	61	92	237	293	0	1	323	542	49	71
Corrected Totals	45	60	151	163	0	1	247	385	42	53
New taxa since 2007		15		12		1		138		11

Figure 32. US marine areas - Numbers of coral species by region between 2007 and 2016, with indication of increase known numbers and status, particularly due to protected status. (Source: Hourigan et. al., 2017).

Both sponges and corals habitats have become areas of increase focus for research largely due to their ecological value, contributing to structurally complex seabed communities with important functions in marine ecosystem (Hourigan et. al., 2017). Over 9,575 species of marine sponges are listed, and are considered more diverse than corals, yet less listed systematically due to lower concerns and focus of resources. On a regional scale, coral (and sponge) habitat areas of particular concern are established to provide protection from fishing impacts. Approximately 662 coral species are known (Figure 32). However, further research is identified to be needed in order to understand their status and management requirement (beyond the precautionary approach).

Along the North-eastern Georges Bank, troughs of coarser gravel (granule-pebble and cobble) substrate are observed to support sponge aggregations. The faunal zone on the hard-substrate habitat slopes (>300m depth) of Georges Bank and southern New England are known to support dense concentrations of coral, sea pens (Omnibus EFH Amendment DEIS 2014). Both areas are unique, however common to strong tidal currents as well as periodic wave actions during storms, which can be inferred that species experiencing these conditions, are likely to improve their resilience to benthic disturbance.

Additional supporting information for Habitat Impacts can be found in Appendix 5 Supporting Information P1

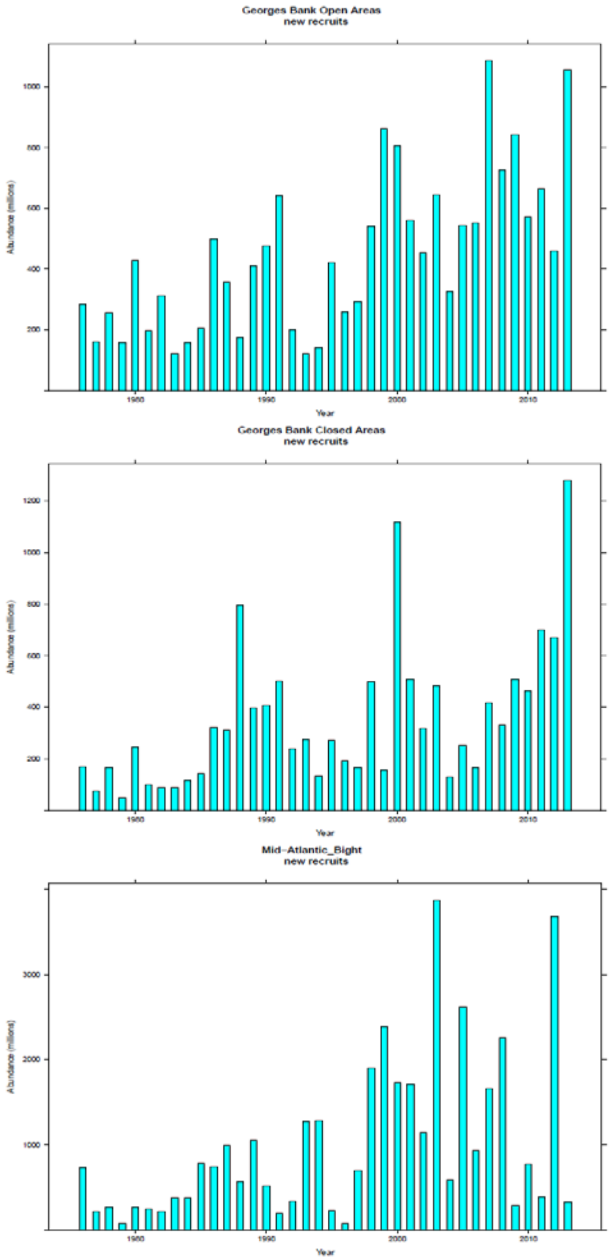
Appendix 6.1: CASA model estimates and standard errors for July 1 abundance and biomass (40+mm SH), and fully recruited fishing mortality for George Bank open, GB closed, GB total, Mid-Atlantic Bight and Total (GB and MAB combined). (Source: 59th SAW report - NEFSC 2014).

	Georges Bank Open						Georges Bank Closed						Georges Bank Total					
Year	Abund	SE	Biomass	SE	F	SE	Abund	SE	Biomass	SE	F	SE	Abund	SE	Biomass	SE	F	SE
	(millions)		(mt)				(millions)		(mt)				(millions)		(mt)			
1975	969	37	16322	622	0.08	0.01	537	23	10625	461	0.09	0.01	1507	623	26946	622	0.09	0.01
1976	1023	35	17449	666	0.19	0.01	601	23	11952	478	0.14	0.01	1624	667	29401	666	0.17	0.01
1977	859	32	16389	634	0.30	0.02	502	20	11651	464	0.28	0.02	1361	635	28040	634	0.29	0.02
1978	752	27	14047	567	0.34	0.02	460	18	10155	412	0.34	0.02	1212	568	24202	567	0.34	0.03
1979	602	24	11299	482	0.45	0.03	312	15	7504	353	0.58	0.04	914	483	18803	482	0.50	0.04
1980	678	25	9484	394	0.43	0.03	359	17	5948	291	0.49	0.04	1037	395	15432	394	0.45	0.03
1981	575	22	8118	313	0.63	0.04	299	15	5160	265	0.58	0.04	875	314	13279	313	0.61	0.05
1982	500	19	6080	249	0.87	0.06	241	15	4371	276	0.49	0.04	741	250	10451	249	0.73	0.06
1983	358	17	4632	230	0.74	0.05	206	18	3667	314	0.56	0.04	565	231	8298	230	0.67	0.05
1984	314	18	3978	244	0.54	0.03	230	21	3682	352	0.26	0.02	543	245	7660	244	0.43	0.04
1985	334	21	3792	257	0.61	0.04	265	26	4034	408	0.47	0.03	598	258	7827	257	0.54	0.05
1986	490	26	3676	239	1.19	0.08	392	35	4551	433	0.72	0.05	883	240	8227	239	0.95	0.09
1987	524	25	4389	239	0.84	0.05	440	45	5005	541	0.89	0.06	964	240	9394	239	0.86	0.08
1988	393	23	4233	270	0.95	0.06	804	62	7335	605	0.87	0.06	1197	271	11568	270	0.91	0.14
1989	451	26	3803	266	0.98	0.06	816	57	10092	728	0.52	0.04	1268	267	13895	266	0.65	0.09
1990	535	26	4033	229	1.21	0.08	674	44	9074	570	1.10	0.08	1209	230	13108	229	1.13	0.13
1991	634	26	4293	188	1.49	0.10	583	30	6445	313	1.44	0.10	1217	190	10738	188	1.46	0.14
1992	376	15	3366	135	1.69	0.11	352	24	4070	269	1.70	0.12	728	136	7435	135	1.69	0.16
1993	222	11	2270	119	1.13	0.07	343	34	3633	368	0.92	0.07	564	120	5903	119	1.02	0.13
1994	220	14	2200	143	0.53	0.03	351	37	4890	546	0.13	0.01	571	143	7090	143	0.26	0.04
1995	440	19	3278	166	0.55	0.04	522	44	7743	726	0.00	0.00	962	167	11022	166	0.17	0.04
1996	466	20	4369	196	0.77	0.05	629	48	11235	905	0.00	0.00	1095	197	15603	196	0.26	0.05
1997	451	22	4456	225	0.81	0.05	691	52	15342	1142	0.00	0.00	1142	226	19798	225	0.24	0.05
1998	637	33	5260	259	0.67	0.04	1014	64	20416	1347	0.00	0.00	1651	261	25676	259	0.30	0.04
1999	1015	44	7770	325	0.90	0.06	988	65	23875	1552	0.20	0.01	2003	328	31645	325	0.44	0.06
2000	1306	45	11600	404	0.60	0.04	1687	86	29443	1689	0.15	0.01	2993	406	41043	404	0.35	0.04
2001	1328	42	14741	468	0.59	0.04	1900	84	38707	1881	0.03	0.002	3229	469	53448	468	0.31	0.04
2002	1174	39	15006	478	0.65	0.04	1918	80	47889	2063	0.00	0.00	3092	480	62895	478	0.29	0.04
2003	1210	37	14775	481	0.53	0.03	2058	79	55666	2216	0.00	0.00	3268	482	70441	481	0.19	0.03
2004	1149	37	16192	521	0.27	0.02	1860	72	58707	2292	0.07	0.005	3008	523	74899	521	0.14	0.02
2005	1257	43	18019	576	0.34	0.02	1676	70	55653	2303	0.15	0.01	2933	577	73672	576	0.21	0.03
2006	1213	47	16459	558	0.85	0.05	1380	66	47466	2251	0.25	0.02	2593	560	63925	558	0.44	0.06
2007	1562	61	16564	605	0.60	0.04	1359	72	41169	2219	0.16	0.01	2921	608	57733	605	0.30	0.04
2008	1694	73	19653	800	0.57	0.04	1376	77	39837	2245	0.07	0.005	3070	803	59489	800	0.25	0.04
2009	1838	91	22826	1101	0.48	0.03	1565	89	41774	2358	0.05	0.004	3403	1105	64600	1101	0.24	0.03
2010	1862	105	26747	1485	0.24	0.01	1689	101	44361	2558	0.09	0.01	3551	1488	71109	1485	0.16	0.02
2011	1994	127	31320	1924	0.17	0.01	1928	127	46717	2908	0.18	0.01	3923	1928	78037	1924	0.17	0.02
2012	1871	140	32374	2400	0.36	0.02	2077	154	48792	3423	0.21	0.02	3948	2404	81166	2400	0.29	0.03
2013	2006	211	29533	2834	0.54	0.03	2756	251	56926	4275	0.06	0.00	4762	2842	86460	2834	0.30	0.04

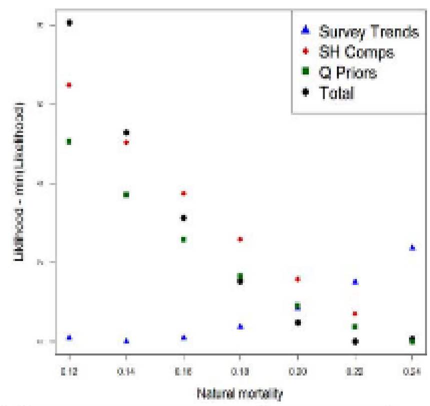
Appendix 6.1 continued:

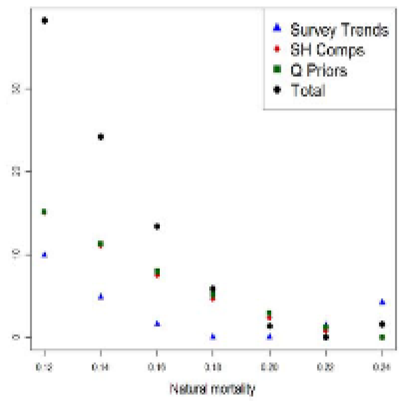
			Mid-Atlantic						Total			
Year	Abund	SE	Biomass	SE	F	SE	Abund	SE	Biomass	SE	F	SE
	(millions)		(mt)				(millions)		(mt)			
1975	516	26	5890	305	0.56	0.05	2023	50	32837	832	0.17	0.02
1976	632	22	6709	355	1.02	0.10	2256	47	36110	893	0.31	0.03
1977	644	21	8372	307	0.53	0.05	2004	43	36412	844	0.35	0.03
1978	496	15	7821	246	1.07	0.10	1708	36	32023	743	0.49	0.04
1979	328	10	6108	194	0.97	0.09	1241	30	24911	628	0.59	0.04
1980	318	10	4820	172	0.46	0.04	1355	32	20252	519	0.45	0.03
1981	417	12	5601	192	0.17	0.02	1292	30	18880	453	0.50	0.04
1982	473	14	6912	226	0.29	0.03	1215	28	17363	435	0.56	0.04
1983	528	15	7093	236	0.56	0.05	1092	29	15391	455	0.62	0.05
1984	573	18	7021	249	0.68	0.07	1116	33	14681	496	0.54	0.05
1985	799	24	8002	286	0.61	0.06	1397	41	15829	561	0.58	0.05
1986	1087	32	11482	382	0.44	0.04	1969	54	19708	625	0.65	0.05
1987	1270	37	12113	393	0.93	0.09	2234	63	21506	711	0.90	0.08
1988	1230	40	12613	445	0.77	0.07	2427	77	24181	798	0.84	0.07
1989	1212	35	11149	368	1.20	0.12	2480	72	25044	858	0.87	0.08
1990	1097	30	10541	326	1.06	0.10	2306	60	23649	695	1.10	0.09
1991	735	21	8520	263	1.10	0.11	1952	45	19258	450	1.30	0.10
1992	515	18	5733	213	1.12	0.11	1242	34	13168	369	1.47	0.11
1993	941	35	6381	257	0.90	0.09	1505	50	12284	464	0.97	0.08
1994	1405	59	9885	465	1.38	0.13	1976	71	16975	731	0.78	0.10
1995	1044	30	10031	306	1.51	0.15	2007	57	21052	805	0.81	0.11
1996	583	18	7737	246	0.81	0.08	1678	55	23340	958	0.46	0.05
1997	649	25	6606	257	0.61	0.06	1790	62	26404	1191	0.33	0.03
1998	1484	49	9934	364	1.08	0.10	3135	87	35610	1419	0.46	0.04
1999	2655	74	22092	691	0.80	0.08	4658	108	53736	1730	0.57	0.05
2000	3275	84	36301	1025	0.66	0.06	6268	128	77344	2016	0.51	0.06
2001	3355	80	43631	1155	0.69	0.07	6583	123	97079	2257	0.51	0.06
2002	3076	73	44862	1165	0.68	0.07	6168	115	107757	2417	0.47	0.05
2003	3991	87	45517	1109	0.75	0.07	7259	124	115958	2524	0.43	0.05
2004	3801	88	50849	1198	0.93	0.09	6809	120	125748	2638	0.43	0.06
2005	3790	92	52694	1334	0.80	0.08	6723	123	126366	2723	0.41	0.04
2006	3856	99	61284	1650	0.35	0.03	6449	128	125209	2846	0.40	0.03
2007	3681	92	62298	1673	0.62	0.06	6602	132	120031	2844	0.46	0.05
2008	3879	88	58561	1504	0.70	0.07	6948	138	118050	2818	0.47	0.06
2009	3209	74	54706	1272	0.82	0.08	6612	147	119306	2897	0.49	0.06
2010	2343	61	44283	1215	0.85	0.08	5894	158	115392	3197	0.43	0.05
2011	1675	57	33973	1159	0.87	0.08	5598	188	112010	3674	0.39	0.05
2012	2808	134	30516	1468	0.74	0.07	6756	248	111682	4431	0.40	0.03
2013	3253	182	46101	2649	0.39	0.04	8014	375	132561	5772	0.32	0.03

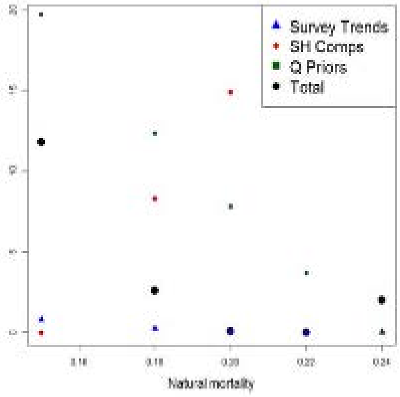
Appendix 6.2: CASA model estimated recruitment for Georges Bank (open and close areas) and the Mid-Atlantic Bight. (Source: 59th SAW report - NEFSC 2014).



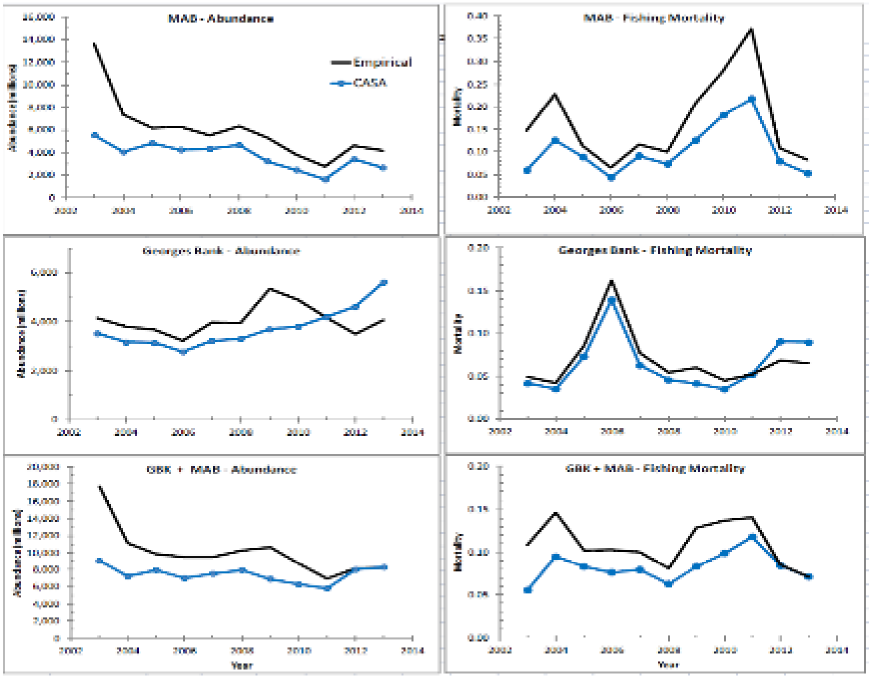
Appendix 6.3: Likelihood profiles over the assumed natural mortality for all but the largest size bin for (left) Georges Bank Open, (middle) Georges Bank Closed and (right) Mid-Atlantic sea scallops. (Source: 59th SAW report - NEFSC 2014).


Survey Trends
SH Comps
Q Priors
Total
Likelihood - min(Likelihood)
Natural mortality

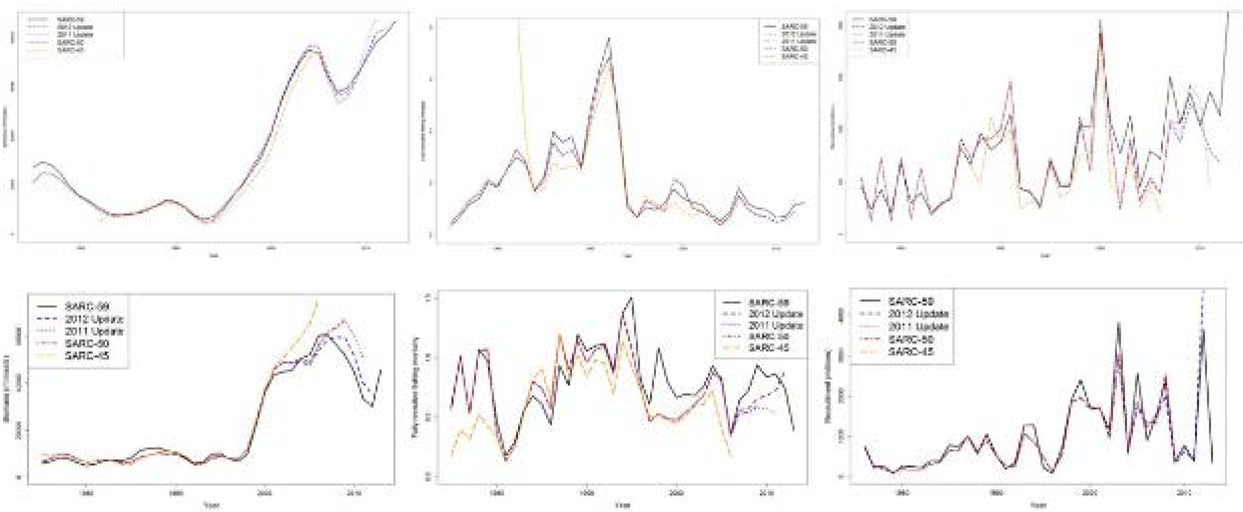

Survey Trends
SH Comps
Q Priors
Total
Natural mortality


Survey Trends
SH Comps
Q Priors
Total
Natural mortality

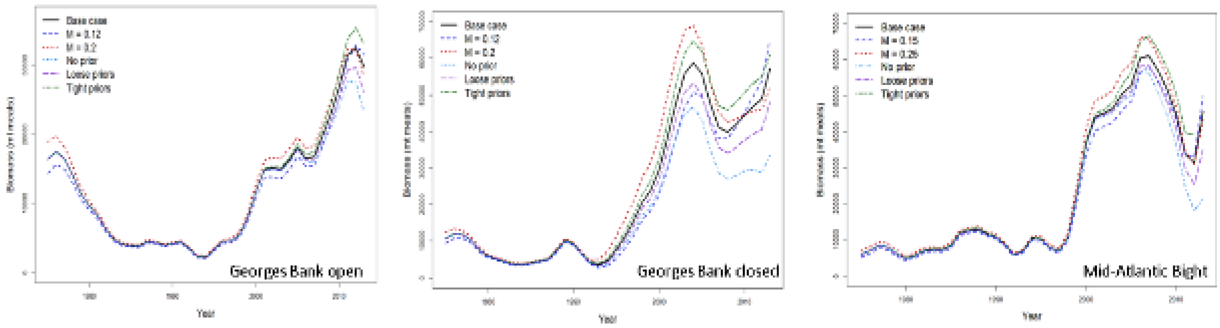
Appendix 6.4: Abundance (left) and fishing mortality estimates (right) from the empirical method and the CASA model during 2003-2013 for the Georges Bank (top), Mid-Atlantic (middle) and combined (bottom) regions. (Source: 59th SAW report - NEFSC 2014).



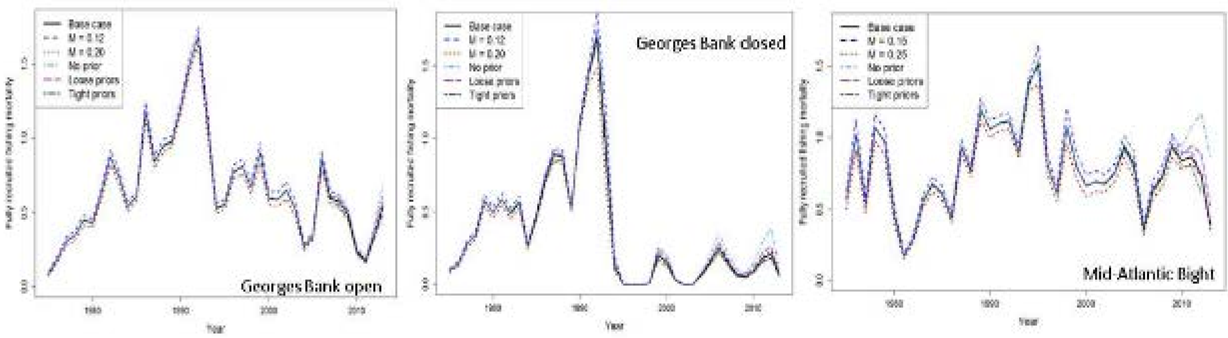
Appendix 6.5: Comparison of current CASA model estimates of biomass (left), fishing mortality (middle), and recruitment (right) to previous CASA model estimates for Georges Bank (top) and the Mid-Atlantic (bottom) sea scallops. (Source: 59th SAW report - NEFSC 2014).



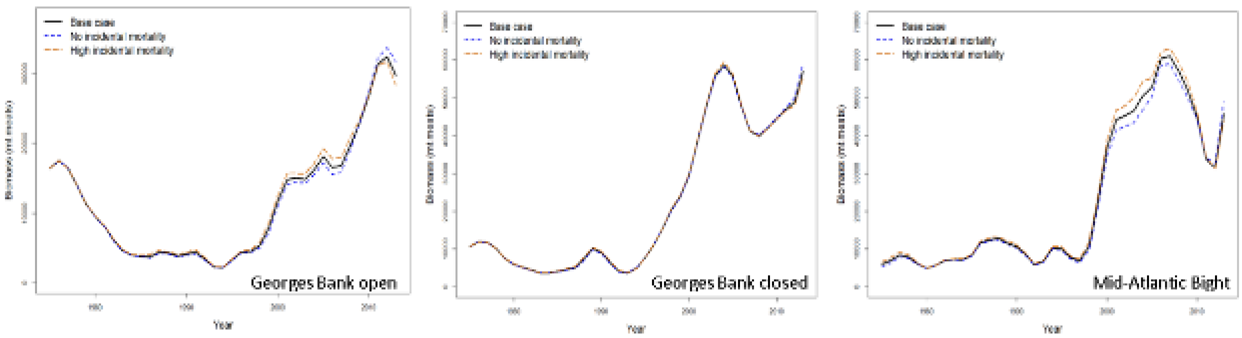
Appendix 6.6: Sensitivity of estimated biomass to assumptions about natural mortality and survey efficiency priors in CASA models for Georges Bank open (left), Georges Bank closed (middle), and the Mid-Atlantic Bight (right). (Source: 59th SAW report - NEFSC 2014).



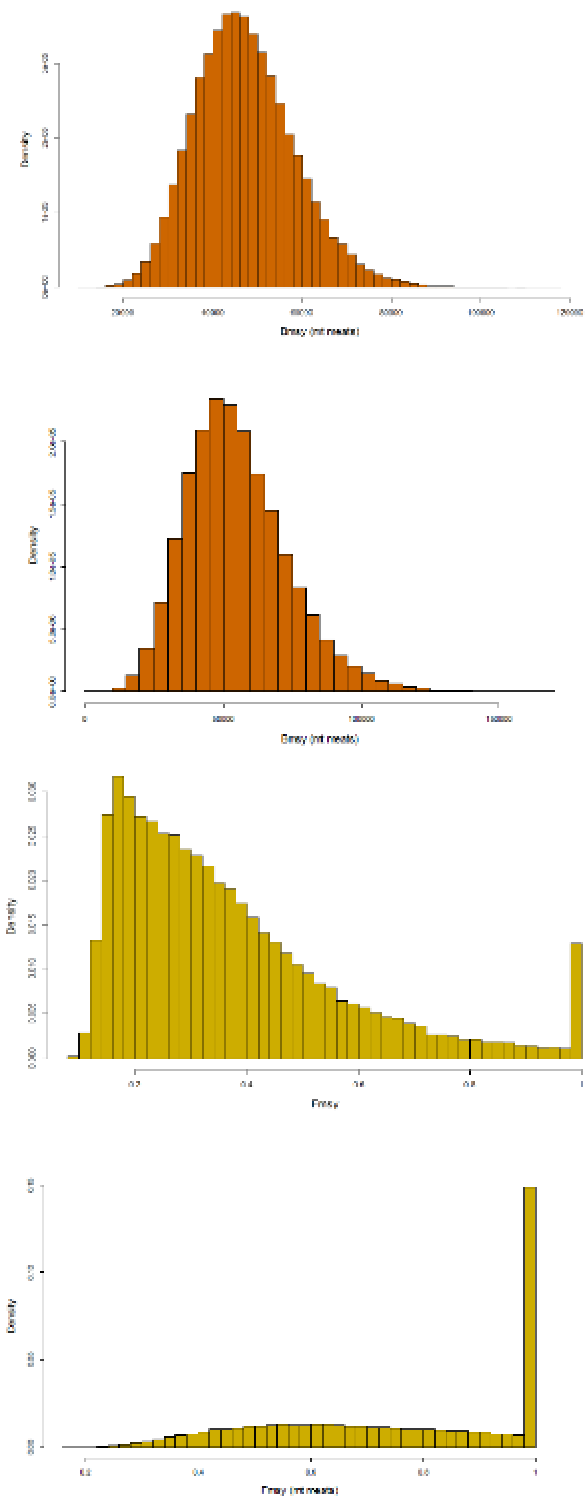
Appendix 6.7: Sensitivity of estimated fishing mortality to assumptions regarding natural mortality and survey efficiency priors in CASA models for Georges Bank open (left), Georges Bank closed (middle), and the Mid-Atlantic Bight (right). (Source: 59th SAW report - NEFSC 2014).



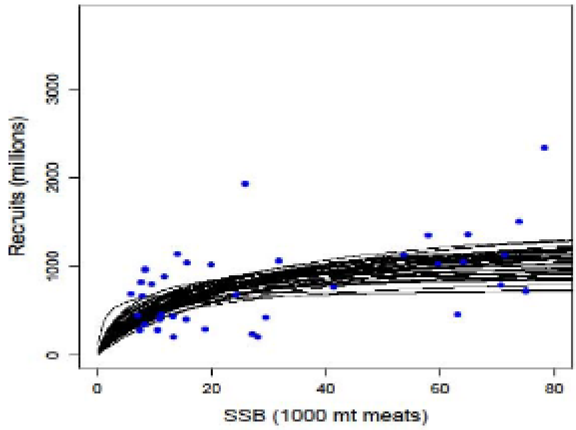
Appendix 6.8: Sensitivity of estimated biomass to assumptions regarding incidental fishing mortality in CASA models for Georges Bank open (left), Georges Bank closed (middle), and the Mid-Atlantic Bight (right). (Source: 59th SAW report - NEFSC 2014).

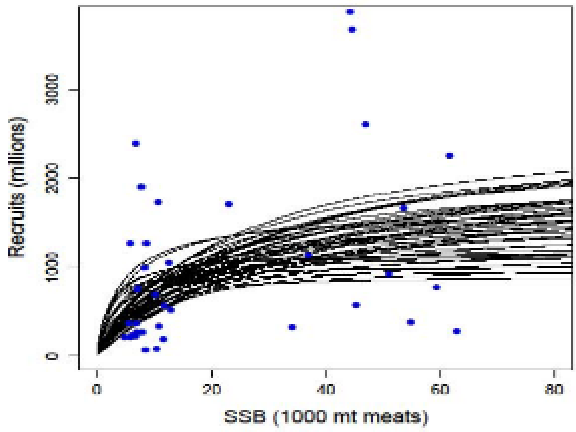


Appendix 6.9: Probability distributions for BMSY in the Georges Bank (top left) and Mid-Atlantic (bottom left) and for FMSY in the Georges Bank (top right) and Mid-Atlantic (bottom right) regions. (Source: 59th SAW report - NEFSC 2014).



Appendix 6.10: Stock-recruit relationships for Georges Bank (left) and the Mid-Atlantic (right) showing spawner-recruit estimates from the CASA model (blue dots) and 50 example fitted Beverton-Holt curves. (Source: 59th SAW report - NEFSC 2014).





Appendix 7 Supporting Information P2.

Management

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) there is a formal framework in place for federally managed fisheries to evaluate and manage the impact of fisheries on habitat. Habitat conservation in the Greater Atlantic is driven by the requirements to identify and conserve Essential Fish Habitat (EFH) for all federally managed species. Additionally, Marine Protected Areas (MPAs) are also used as a tool to conserve important biodiversity hotspots and provide protection to spawning aggregations of important species for fisheries.

The MSFCMA defines EFH as the waters and substrate necessary for fish for spawning, breeding, feeding or growth to maturity. The waters are defined as the associated physical, chemical, and biological properties. Substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities. Adverse effect refers to “direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH.” (50 CFR 600.810(a)). EFH that merit special attention because of the importance of their ecological function, sensitivity to degradation, the level of stress that they are subject or the rarity of the habitat type are categorized as Habitat areas of particular concern (HAPCs).

The EFH mandate has provisions in place which require each Fisheries Management Plans (FMPs) to describe and identify Essential Fish Habitat (EFH) and the adverse effects on EFH. Based on these management councils can set Habitat protections (such as gear restrictions, area closures and effort reductions) on individual FMPs or across all FMPs. The NEFMC has used year-round area closures as a tool to minimize adverse effects from fishing on habitat. Current regulations in place to minimize the adverse effect of bottom trawls and dredges on EFH include (NEFMC 2011):

- gear restrictions, including the inshore Gulf of Maine roller gear restriction;
- establishment of habitat closed areas in the multispecies and scallop FMPs;
- establishment of groundfish mortality closed areas (with associated gear restrictions), which are assumed to provide incidental benefits to EFH; and
- reductions in area swept over time (via reductions in effort and/or increased use of rotational management that provides for the same or greater harvest with less area swept).

In 2016 the New England Fishery Management Council (NEFMC) published the Draft of the Omnibus Essential Fish Habitat Amendment 2 (OHA2). Prior to this amendment efforts to minimize adverse effects of NEFMC fisheries had been developed and implemented mostly for each FMPs individually. The amendment was developed to fulfill the essential fish habitat requirements of the MSA and integrate habitat management measures across all NEFMC-managed fisheries. The principal objectives of the EFH Amendment are to review and revision of the EFH designations (Purpose A), identify habitats where adverse impacts should be minimized (Purpose B) and "identify other actions to encourage conservation and enhancement of such habitat" (Purpose C). The amendment also includes two purposes specific to groundfish management: "to improve protection for juvenile groundfish and their habitats" (Purpose D) and "to identify seasonal closed areas in the Northeast Multispecies FMP that would reduce impacts on spawning groundfish and on the spawning activity of key groundfish species" (Purpose E) (NEFMC 2016).

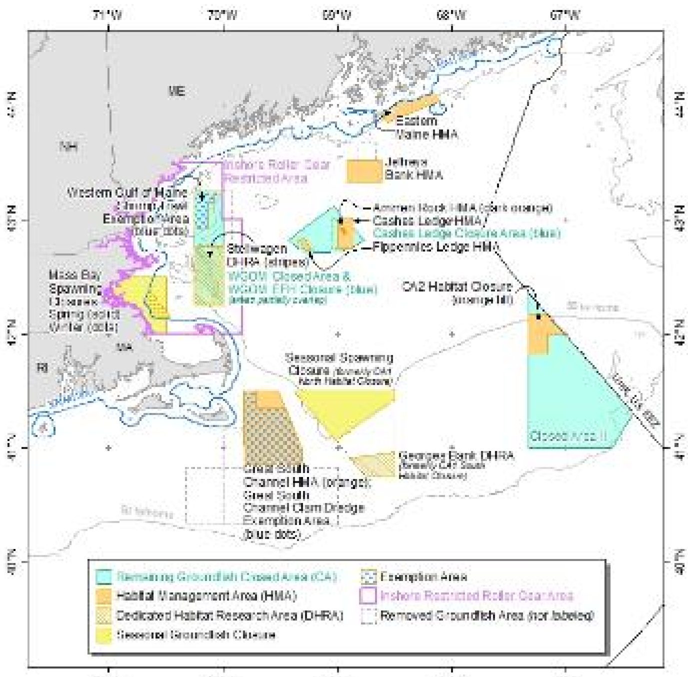


Figure 33. The Omnibus Essential Fish Habitat Amendment; Changes to Year-Round and Seasonal Closure Areas[6]

On April 9, 2018 NMFS published a final rule for the Omnibus Habitat Amendment (83 FR 15240).All of the Council's recommendations for EFH designations were approved. NMFS did not approve all the Habitat Management Measures proposed by the Council (Figure 33). Approved Habitat Management Measures, pertinent to the scallops fishery, included: removal of the Closed Area I Habitat and Groundfish Closure Area designations and remove the Nantucket Lightship Habitat and Groundfish

[6] https://www.greateratlantic.fisheries.noaa.gov/nr/2018/April/18oa2frphlApr3.html

Closure Area designations. New Habitat Management Area (HMA) closed to mobile bottom-tending gear were also established including the Fippennies Ledge HMA, and the Great South Channel HMA. The Council's proposal recommended on Georges Bank removing habitat closures of Closed areas I and II and replacing them with Georges Shoal 2 HMA closed to bottom-tending gear. Though NMFS did approve the removal of Closed Area I, on account that:

> The Council's recommended areas on Georges Bank do not sufficiently address the impact of limited access scallop dredging on the highly vulnerable habitat within the Closed Area II Habitat Closure Area. Overall, the changes the Council recommended to Closed Area II and eastern Georges Bank are inconsistent with the Amendment's goals and objectives of improving juvenile groundfish habitat protection and the requirements of the Magnuson-Stevens Act to minimize the adverse effects of fishing to the extent practicable.

Additional benthic habitat management measures are established via the scallop rotational management areas. With the opening of new areas via the Omnibus Habitat Amendment the Council "anticipated to reduce overall area swept because fishing effort would be directed on areas where less fishing time is needed to reach access area trip limits"[7] (DRAFT Framework 29, 2017). Framework 29 to the Scallop FMP published on April 2018 reverted some areas previously managed in scallop rotational management program back to open areas (Delmarva portion of the MAAA, the Nantucket Lightship Extension, and the Closed Area 2 Extension). With the approval of the Omnibus Habitat Amendment FW 29 opened access to Closed Area I and Nantucket Lightship-West. The northern portion of Nantucket Lightship was closed, allocating these trips to the Nantucket Lightship—South (NLS–S) area. These measures are parts of the habitat management area framework which are subjected to ongoing monitoring for effectiveness, as well as 10 yearly review and modifications.

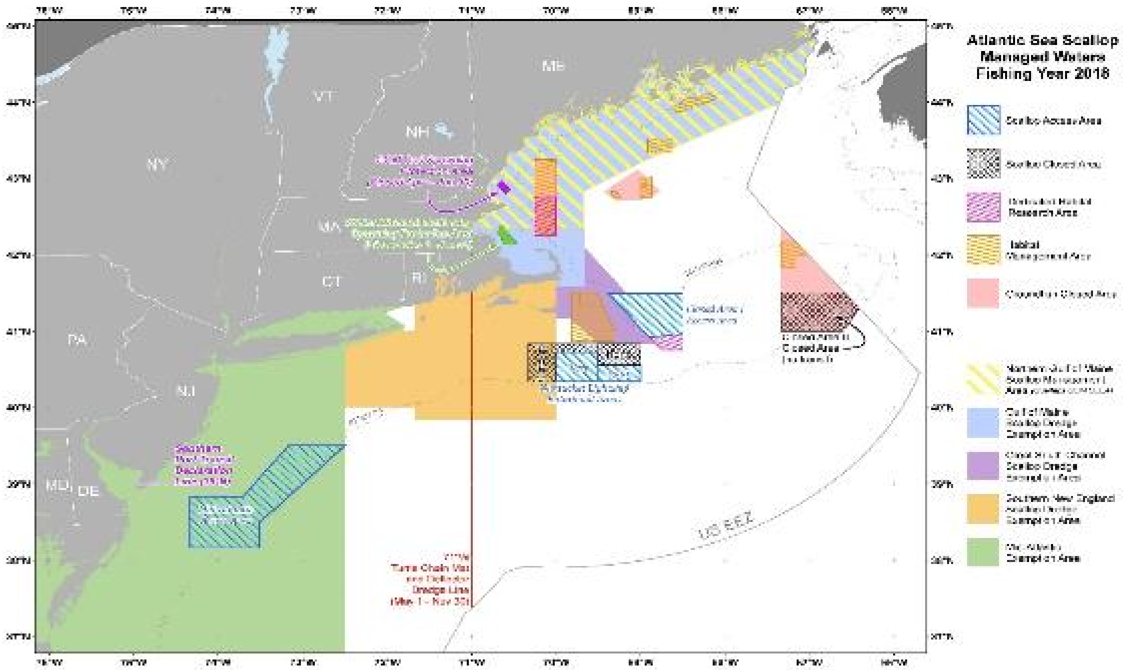


Figure 34. Chart of Scallop Management Areas for FY 2018 (https://www.greateratlantic.fisheries.noaa.gov/sustainable/species/scallop/)

[7] http://s3.amazonaws.com/nefmc.org/Doc-3.-Scallop-FW29-Draft-Action-Plan-v3.pdf

Vulnerable Marine Ecosystems

Internationally, the United Nations General Assembly resolutions (UNGA Resolutions 61/105, 64/72, and 66/68) have identified coldwater coral habitats as vulnerable marine ecosystems in need of protection from significant adverse impacts of mobile bottom fishing. Also, sponge aggregations are recognized by OSPAR to be Species and Habitats that are threatened and/or declining.

Regionally and nationally, through the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the National Marine Sanctuaries Act, coral and sponge habitats are provided protected. The 2010, NOAA Strategic Plan for Deep-Sea Coral and Sponge Ecosystems, identifies goals, objectives, and approaches to guide NOAA's research, management, and international cooperation activities on deep-sea coral and sponge ecosystems.

Regionally and locally, the New England and Mid- Atlantic Fishery Management Councils have moved forward on plans for deep-sea coral habitat protection, especially those for the submarine canyons and the Gulf of Maine. This action led to the creation of the 99,000 km^2 Frank R. Lautenberg Deep-Sea Coral Protection Area in the Mid-Atlantic, and was a major factor behind creation of the Northeast Canyons and Seamounts Marine National Monument. The New England Fishery Management Council has proposed new deep-sea coral protections areas (Hourigan et al., 2017).

In June of 2017, the NEFMC (the Council) adopted coral protection zones for the Gulf of Maine; which is planned to includes areas (600m depth and broad zone) of the continental slope and canyons south of Georges Bank, that are closed to closed to all bottom-tending gear. Additionally, protection is established for four seamounts and 20 deep-sea canyons, from bottom tending fishing gear (Bachman, 2018).

Bycatch of any sponge and coral are monitored (by NEFOB) and interventions take place where required under the NMFS National Bycatch Reduction Strategy, which includes objectives to identify areas of high bycatch of corals and sponges; to work with regional Fishery Management Councils and the fishing industry to close these areas to high-bycatch gears as called for in the Strategic Plan for Coral and Sponge Ecosystems; and to collect better data on coral bycatch and post-interaction mortality (Hourigan, et. al., 2017).

Information

Sufficient information on the benthic community continues to be collected, including sponges and corals. NOAA fisheries research vessels conducting deep-sea coral and sponge research in U.S. waters. These and other vessels conduct systematic (where possible) mapping of the seafloor and at higher resolution, using multibeam sonar. Also, improvements to remotely-operated vehicles (ROVs), autonomous underwater vehicles (AUVs) and other equipment, such as tow camera, have all functioned to increase spatial reach and quality of data (Hourigan, et. al., 2017).

Information with regards to scallop fishery interaction is collected through the SBRM program by NEFOB. In addition, industry funded specific projects are approved annually with a focus on improving information on the interaction of the scallop fishery on benthic ecology. For example, the ongoing project to monitoring and to characterize the impact of intense dredges fishing on the benthic marine community in the Nantucket Lightship Closed Area.

3.4.7 Ecosystem Impacts

The impact (direct and indirect/associate) of the UoA scallop dredge fishery on the wider marine ecosystem structure and function of the Northwest Atlantic are known. The marine ecoregional assessment of the Northwest Atlantic species, habitats and ecosystem provide important collated information on multiple species and their habitats; maps and data on concentrations of high biodiversity, and critical species specific areas for refuge, forage, and spawning; and spatial understanding of interactions from human use, such as, fishing, shipping traffic, aggregate dredging, energy and ports development (Greene, et. al., 2010). In cooperation with NMFS, the NEFMC in 2014, prepared an Environmental Impact Statement report which evaluated impact from the UoA scallop fishery on benthic communities and connected ecosystem. Spatial operations on the UoA scallop fishery are within the US Large Marine Ecosystem (LME), which is provided ongoing monitoring - through NOAA Ecosystem Science Program (https://www.st.nmfs.noaa.gov/ecosystems/index).

Status

The Northwest Atlantic supports a diverse marine ecosystem driven by circulation of cold nutrient rich water from the north (Labrador Current) and warm southern water (Gulf Stream). Mixing of these water occur down to 50m - 100m depth, in addition to fresh water run-off from land, - entering the ecosystem via bays, - also influences the nutrient, salinity and productivity of the ecosystem. For instance, sea surface temperature is lower in the Southern New England and Georges Bank areas compared to Nantucket Shoals and Mid-Atlantic Bight. Also, seasonal temperature difference and ocean shelf topography influences circulation pattern as well as areas of stratification which support productions of phytoplankton and zooplankton (Greene et. al., 2010).

Sea surface temperature, nutrient levels, phytoplankton (chlorophyll) and zooplankton densities are important predictors of benthic fauna in the Gulf of Maine, Southern NE, and Mid-Atlantic; together providing indication of mixing patterns and food supply to the benthos (Pitcher et. al., 2012; Greene et. al., 2010). Complex trophic relationships (energy availability in the food web) of the ecosystem function to sustain biological growth and reproduction; which are typically modeled using multi-parameter baseline food web data. High densities of phytoplankton provide a rich food source for higher trophic levels in the ecosystem. Within the food web, phytoplankton being food for zooplankton, support commercially and ecologically important species and fisheries (benthic communities, demersal fish, pelagic fish, seabirds and other large marine mammals). For instance, the shelf-slope break and the deep waters of the Gulf of Maine are observed with lower phytoplankton (chlorophyll a), compared to higher levels observed in coastal areas and bays, as well as upwelling continental shelf areas - Georges Bank and Nantucket Shoals. Representative levels of zooplankton (copepod - prey for certain shellfish, fish, jellyfish, and baleen whales) are dominant seasonally - high (>1ml/m^3) zooplankton levels are observed in spring and summer compared to autumn and winter (<0.2ml/m^3) – which are consistent with presence/absence or species abundance of the marine ecoregion. Fundamentally, a rich diversity of marine biodiversity is supported in the region by a dynamic Northwest Atlantic production ecosystem (Hourigan, et. al., 2017).

Over 95% of retained catch in the fishery are scallop, while proportion of discarded bycatch are variable and low (SBRM 2017). Scallop larvae are prey for filter feeders and planktonic carnivores, while predators of juvenile and adult scallops include Atlantic cod, wolffish, sculpins, American plaice, crabs, lobsters and sea stars (Hart and Chute, 2004). Updated stock status (2018) of fisheries managed by the NEFMC indicated approximately 8 of 35 stocks that are experiencing overfished pressures. However, all relevant stocks are managed with appropriately considered rebuilding program and no loss of species or stock which are key to trophic (prey-predator relationship) are identified, and therefore the UoA fishery in this context is not likely to disrupts overall balance of the ecosystem. (NEFMC 2018b).

Ecosystem components and status of marine mammals, sea turtles, and sea birds are not reported to be negatively impacted by the UoA scallop dredge fishery, and population status of these taxa are regularly updated (https://www.st.nmfs.noaa.gov/protected-species-science/Assessments-and-Taxa/marine-mammals).

Invasive species such as Didemnum tunicate is identified in Georges Bank fishing grounds, extensive studies have not being completed, however, it is known to smoother benthic organism and seabed habitats as well as to overgrow scallops, mussels, other sessile species, and gravel potentially restricting access to seabed breed grounds or larvae settlement, and creating a barrier between demersal fish and prey items including worms and bivalves is an invasive tunicate that smothers benthic (Bullard et al. 2007; Kaplan et. al., 2017). Though demersal fisheries might not introduce these species, they are likely to contribute to their distribution when encountered in their footprint of operation.

Management

Spatially, from the Gulf of Maine through to the Mid-Atlantic Bight, the UoA scallop dredge fishery has being in operation for over 100 years, utilizing various ecosystem based management measures, including rotational access areas, closed access, MPA, and fishing gear bycatch reduction modifications. NOAA in cooperation with regional Fisheries Management Council promotes the adoption of an ecosystem-based approach throughout its broad-ocean and coastal stewardship, science, and service programs. The goal of ecosystem-based management is to maintain ecosystems in a healthy, productive, and resilient condition so they can provide the services humans want and need (https://www.st.nmfs.noaa.gov/ecosystems/ebfm/index). These programs, continue to improve information about the complex relationships with regards to marine species, their habitats, and the wider connected marine ecosystem, in order to best manage the living marine resources, achieve sustainable fisheries, and meet the mandates of the Magnuson-Stevens Act, Endangered Species Act, Marine Mammal Protection Act, and other important habitat-related legislation (https://www.st.nmfs.noaa.gov/ecosystems/habitat/index). For instance, components of the recently (2018) approved - New England Fishery Management Council's Omnibus Essential Fish Habitat Amendment 2 (FW29) – provides ecosystem and economic, as well as wider marine biodiversity management. Fishing access was only approved to areas where available information indicated low likelihood of any negative impact on the biodiversity of the ecological community (such as; loss of species, or major changes in species evenness and dominance), (Bullard, 2018).

Information

Regionally, NOAA facilitates an Ecosystem Science platform which coordinates cooperation (industry and scientist as well as transboundary) for marine ecosystem research. Wide ranging relevant information is covered by various components of this program (https://www.st.nmfs.noaa.gov/ecosystems/index); which include:

- Integrated Ecosystem Assessment Program;
- Fisheries And The Environment;
- Climate impacts on marine ecosystems;
- Ocean acidification;
- Habitat science and assessments;
- Arctic Science;
- Global plankton database;
- Large Marine Ecosystem Program;
- Ecosystem-Based Fisheries Management;
- Bycatch Science and Management;

Locally and regionally, all available information are considered and translated into regional fisheries management plans, such as those by the NEFMC (https://www.nefmc.org/management-plans) for scallop fishery and the wider connected marine ecosystem:

> NEFMC proposes rules for fishermen operating in federal waters in the Northeast. There are nine separate fishery management plans (FMPs) in effect that apply to 28 marine and one anadromous species, providing specific conservation management actions on Essential Fish Habitat (EFH), Habitat Area of Particular Concern (HAPC), as well as vulnerability or species at risk.

Ongoing information from scheduled; NMFS multi-species bottom trawl survey, NEFOB and bycatch reports, VTR, VMS, marine mammals and turtles surveys, recreational fishery surveys, oceanographic surveys, and adhoc Environmental Impact Statement (EIA), all together provide important information for better understanding and managing the ecosystem components of ecoregion according the EBFM approaches.

3.5 Principle Three: Management System Background

3.5.1 Area of Operation and Relevant Jurisdictions

The UoA encompasses the sea scallop resource in the US EEZ and federally permitted vessels fishing with scallop dredges in US federal waters of the EEZ between the US-Canada boundary and North Carolina. The federal-waters sea scallop fishery is under the jurisdiction of the US federal government and is managed by the New England Fishery Management Council (NEFMC) and the US National Marine Fisheries Service (NMFS) under the primary authority of the MSFCMA. FMPs must also comply with additional laws and executive orders.

The sea scallop resource is shared with Canada but there is no cooperative management system. Both independent management systems have demonstrated their capability to achieve the objectives of MSC Principles 1 and 2.

3.5.2 Fleet Types and Categories Participating in the Fishery

There are 11 federal sea scallop permit categories. The categories with the largest number of participants are the Limited Access (LA) full time fleet with 248 permits issued in 2016 and the Limited Access General Category (LAGC) IFQ fleet with 258 permits issued in 2016.

Limited access full-time, part-time, and occasional vessel permit categories have been in place since 1994. Allocations for part-time and occasional scallop vessels are set at 40 percent and 8.33 percent of the full-time allocations, respectively. The Council established the limited access general category permits (Individual Fishing Quota, Northern Gulf of Maine, and incidental) in 2008. All Federal scallop permits require an active Vessel Monitoring System (VMS) unit. (https://www.greateratlantic.fisheries.noaa.gov/sustainable/species/scallop/)

Table 16. Permit types

Permit Category	Description	Permits issued in 2016
LA 2	Full-Time	248
LA 3	Part-Time	2
LA 4	Occasional	0
LA 5	Full-Time Small Dredge	51
LA 6	Part-Time Small Dredge	30
LA 7	Full-Time - Authorized to use trawl net	11
LA 8	Part-Time - Authorized to use trawl net	0
LA 9	Occasional - Authorized to use trawl net	0
LAGC A	Individual Fishing Quota	258
LAGC B	Northern Gulf of Maine	99
LAGC C	Incidental Catch	242

3.5.3 National Level Management

Federal fisheries in the United States are managed under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), which includes ten national standards for fishery management and prescribes the structure and procedures to be followed by the regional fishery management councils. The ten national standards can be considered as explicit and clear long term objectives that guide decision-making and are consistent with the MSC Principles and Criteria and the precautionary approach. The 10 national standards under MSFCMA state that "conservation and management measures shall:

1. Prevent overfishing while achieving optimum yield.
2. Be based upon the best scientific information available.
3. Manage individual stocks as a unit throughout their range, to the extent practicable; interrelated stocks shall be managed as a unit or in close coordination.
4. Not discriminate between residents of different states; any allocation of privileges must be fair and equitable.
5. Where practicable, promote efficiency, except that no such measure shall have economic allocation as its sole purpose.
6. Take into account and allow for variations among and contingencies in fisheries, fishery resources, and catches.
7. Minimize costs and avoid duplications, where practicable.
8. Take into account the importance of fishery resources to fishing communities to provide for the sustained participation of, and minimize adverse impacts to, such communities (consistent with conservation requirements).
9. Minimize bycatch or mortality from bycatch.
10. Promote safety of human life at sea.

NMFS also develops and publishes National Standard Guidelines that further interpret and explain the requirements created by the ten national standards (USOFR 2018).

The MSFCMA also created eight regional fishery management councils (councils) responsible for the fisheries that require conservation and management in their region. The councils are composed of both voting and non-voting members representing the commercial fishing, recreational fishing, environmental, academic, and government interests. Under the MSFCMA, councils are required to:

1. Develop and amend Fishery Management Plans
2. Convene committees and advisory panels and conduct public meetings
3. Develop research priorities in conjunction with a Scientific and Statistical Committee
4. Select fishery management options
5. Set annual catch limits based on best available science
6. Develop and implement rebuilding plans

The US Congress periodically reviews the national fishery management system and adds or changes provisions in the MSFCMA. The councils and NMFS then take action to bring FMPs into conformity with the new provisions in the law. In 2007, new specific requirements to end and prevent overfishing, including annual catch limits (ACLs) and accountability measures (AMs) were included in Amendments to the MSFCMA. ACLs and AMs were required for all fisheries by fishing year 2010 if overfishing was occurring, and they were required for all other fisheries by fishing year 2011. The Council approved this action in 2010 so that measures establishing ACLs were implemented for the start of the 2011-fishing year.

Decision Making Processes

Under the MSFCMA, fisheries management plans contain legal requirements that are codified in the Code of Federal Regulations (NOAA NMFS 2016). NMFS has legal responsibility for implementing FMPs developed under the MSFCMA, and can be subject to lawsuits, during which the public "administrative record" (the basis for decision making—including everything in the public record on all fisheries related issues) is used to demonstrate how NMFS made its decisions. NMFS also has legal responsibility for reviewing and approving (or not) FMPs, implementing and enforcing regulations, and administering supporting programs. This legal framework requires decision-makers to consider a range of alternatives and their impacts as well as their compliance with the ten National Standards. As part of the process, NMFS publishes a "Notice of Proposed Rule-making" that invites comments from the public. When a final rule is published, NMFS routinely includes all comments received on proposed rules and the NMFS response to those comments.

Council actions must also conform to the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), the Administrative Procedures Act (APA), the Paperwork Reduction Act (PRA), the Coastal Zone Management Act (CZMA), the National Environmental Policy Act (NEPA), the Regulatory Flexibility Act (RFA), The Information Quality Act (IQA), Regulatory Impact Review (RIR), and various Executive Orders. These laws and executive orders help ensure that in developing an amendment, the councils consider the full range of alternatives and their expected impacts on the marine environment, living marine resources, and the affected human communities. FMPs and amendments are published as an integrated document that contains all required elements of the action as required by NEPA and information to ensure consistency with other applicable laws and executive orders.

The Council process is fully public and there are regular opportunities for public involvement. The roles and responsibilities of the respective Councils, their committees and staff, and the regional NMFS science centers are clear and understood by all relevant parties.

Roles and Responsibilities

The following agencies and groups are components of the fishery management system for the US Atlantic sea scallop fishery:

National Marine Fisheries Service (NMFS or NOAA Fisheries) – NMFS is a component of NOAA, which is part of the US Department of Commerce. The Secretary of Commerce is the final approving authority for FMPs and amendments; final approving authority for annual quotas; and the authority for issuance of administrative rules implementing management decisions. NMFS is the operational agency that performs these functions.

Northeast Fisheries Science Center (NEFSC/Woods Hole) – NEFSC is part of NOAA NMFS and is responsible for at sea surveys of all federally managed species, estimating volume of biomass, age/length relationships, recruitment, etc.; responsible for periodic formal (peer reviewed) stock assessments, evaluating all characteristics of the biomass, based on the at sea surveys, and providing projections of future volume of biomass under varying hypothetical harvest scenarios, all for the use of regulators in setting quotas.

New England Fisheries Management Council (NEFMC) – The NEFMC is the entity responsible under the MSFCMA for the development of management measures for fisheries in the northeastern US through the initiation, development, and approval of FMPs and all amendments to FMPs, as well as the setting of annual quotas for all managed species (see website www.NEFMC.org).

Scientific and Statistical Committee ("SSC") of the NEFMC – The MSFCMA requires each fishery management council to establish a Scientific and Statistical Committee. The NEFMC SSC is a group of approximately 15 scientists and academics required by the MSFCMA to review annual reports from the NEFMC staff and NEFSC regarding the status of the stocks, and then to set the ABC ("Acceptable Biological Catch") for each stock. The ABC is the maximum level at which the NEFMC may set the harvest quota each year. The SSC additionally recommends improvements for the assessments and notes parameters – such as biological reference points – that they believe need further study.

Northeast Regional Coordinating Council (NRCC) –The NRCC is a joint committee consisting of partners in the fishery management system that is intended to enhance coordination among partners concerning process-related issues, data needs, and stock assessments; or serve as a mechanism to facilitate management negotiations, such as the Transboundary Management Guidance Committee (TMGC). (http://www.nefmc.org/committees/northeast-regional-coordinating-council-nrcc)

Stock Assessment Review Committee (SARC) – The SARC provides a high-level review of all stock assessments that are produced by stock assessment workshops (SAW). Together the process is referred to as the SAW-SARC process.

Vessel Monitoring System/Enforcement Committee – Oversight Committees are made up of subsets of Council members who are responsible for developing or modifying the Council's management plan measures, or adding important new considerations to a plan. Committee meetings are often held over periods of a year or more while members debate, refine and formalize recommendations for consideration by the full Council. The Vessel Monitoring System/Enforcement Committee focuses on those issues (http://www.nefmc.org/committees/vessel-monitoring-system-enforcement)

Enforcement Advisory Panel – Provides support and input to the Vessel Monitoring System/Enforcement Committee.

Research Steering Committee – The Research Steering Committee fosters collaborations between fishermen and scientists and advises on Council research priorities to achieve this outcome. (http://www.nefmc.org/committees/research-steering-committee)

Observer Policy Committee – The Observer Committee has most recently focused on the continued development of the NMFS-led omnibus Industry-Funded Monitoring Amendment as its top priority. The term "observers" refers to the at-sea monitors that are responsible for collecting data on bycatch. (http://www.nefmc.org/committees/observer-policy-committee)

Habitat Committee – The Habitat Committee of the NEFMC is a 12-member committee that includes representatives of the NEFMC, ASMFC, and NMFS. The Habitat Committee advises the NEFMC on habitat issues.

Risk Policy Working Group (RPWG) – The Risk Policy Working Group works on the development of a risk policy to serve as guidance for ABC (acceptable biological catch) control rules and annual catch limits (ACLs) for Council-managed species. The RPWG also works on a Risk Policy Statement for adoption by the Council and provides guidance to the Council on baseline conditions related to overfishing definitions, ABC control rules, and harvest control rules in Council-managed FMPs. Working Groups (WGs) meet on an ad hoc basis to explore and address specific issues that are forwarded to the Council for approval. The NEFMC at its June 2016 meeting voted unanimously to accept the Risk Policy Road Map developed by the RPWG. The work of this group has now been concluded and there are no plans to meet again in the near future. (https://www.nefmc.org/committees/abc-control-rule-working-group)

Fishery-Specific Management

All decisions about management of the sea scallop fishery are guided by and incorporate the requirements of federal law described above. Longer-term actions that result in new measures and/or strategies to achieve the long-term fishery objectives (i.e. changes to the management system) are accomplished through amendments to the FMP. Annual decision-making processes that may result in measures to meet the short-term fishery objectives are driven by the control rules contained in the FMP. The sea scallop fishery utilizes adaptive management. Management measures such as closed areas and quotas are reviewed, analyzed, and modified on an annual basis. Updated descriptions of management measures and areas can be found at: https://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=b2216bfb844c401ea603c9eecd02b5f8.

Objectives for the Fishery

The FMP for Atlantic Sea Scallops was initially implemented on May 15, 1982. The objectives of the plan are:

1) to restore adult stock abundance and age distribution;
2) to increase yield per recruit for each stock;
3) to evaluate plan research, development and enforcement costs; and
4) to minimize adverse environmental impacts on sea scallops.

Amendment 11 was developed to control capacity and mortality in the general category scallop fishery. In order to achieve this goal, the Council identified the following list of objectives:

1) Allocate a portion of the total available scallop harvest to the general category scallop fishery.

2) Establish criteria to qualify a number of vessels for a limited entry general category permit.
3) Develop measures to prevent the limited entry general category fishery from exceeding their allocation.
4) Develop measures to address incidental catch of scallops while fishing for other species.

Short-term objectives for the sea scallop fishery and other northeastern US fisheries take the form of "annual specifications." Annual specifications set a total allowable catch for the target species, and catch limits for by-catch species.

The scallop fishery is subject to sub-annual catch limits (sub-ACLs) for four flatfish stocks. The Council uses accountability measures (AMs) to prevent or react to ACL overages and prevent overfishing. "Proactive" AMs are designed to avoid overages, while "reactive" AMs are triggered once an overage occurs. Framework 29 contains a new AM for northern windowpane flounder, as well as modified AMs for Georges Bank yellowtail flounder and Southern New England/Mid-Atlantic yellowtail. The Council took action through this framework to streamline all of the reactive flatfish AMs in the scallop fishery and make them consistent with the current AM for southern windowpane flounder.

If an AM is triggered, scallopers will need to use modified dredges – configured with a five-row apron with a 1.5:1 maximum hanging ratio – to fish in designated GRA areas.

The duration of an AM is dependent on the magnitude of a sub-ACL overage as follows:

- Small AMs – These are triggered if a quota overage is greater than 0% but less than 20%; and
- Large AMs – These are triggered when overages exceeds 20% of the sub-ACL for a flatfish stock.

The Council approved identical reactive AMs for northern windowpane flounder and Georges Bank yellowtail flounder. The Council took this step so that if an AM is triggered for either stock, the action will reduce the impacts of scallop fishing on both flatfish stocks. The reactive AMs for the scallop fishery are described as follows:

Northern windowpane flounder and Georges Bank yellowtail flounder:

- Small AM: If triggered, modified dredges will need to be used for six weeks from November 16 through December 31 in Closed Area II and the Closed Area II Extension; and
- Large AM: If triggered, modified dredges will need to be used year-round in Closed Area II and the Closed Area II Extension

The Council already has taken many steps to reduce flatfish bycatch in the scallop fishery, including: prohibiting possession of flatfish; requiring that dredges be constructed with a maximum of seven rows in the apron and 10" twine tops to allow flatfish escapement; and seasonally closing the Scallop Closed Area II access area from August 15 through November 15 to protect yellowtail flounder and windowpane flounder.

Fisheries Regulations to Meet Objectives

From 1982 through 1993 the principal management tool in place was an average “meat count” restriction, which prescribed the maximum number of scallop “meats” that could comprise a pound of harvested and shucked scallops. (Repetto 2001)

In 1993 the NEFMC adopted Amendment 4 to the Sea Scallop FMP. Amendment 4 limited access to the fishery based on historical participation. The Council attempted to avoid any significant increase in effort by allocating days at sea to categories of vessels that corresponded with their historical levels of participation.

In addition, Amendment 4 contained the following measures:

- Crew size limitations – maximum crew of nine (later reduced to seven); vessels that qualified under the 10.5 foot dredge exemption were restricted to a maximum crew of five.
- Shucking and sorting machines were prohibited;
- A 3 ½ inch minimum shell height was established for unshucked scallops.
- A 400 pound scallop meat trip limit was established for vessels fishing for scallops that did not qualify for a LA permit.
- Controls to enhance escapement of small scallops and by-catch were made through the following provisions:
- All scallop dredges were required to use at least 3 1/4” rings in year one and two of the plan and 3.5” minimum ring size thereafter.
- Prohibition on chafing gear or cookies on the top of a dredge (to prevent obstruction of escapement of small scallops and bycatch).
- Prohibition on the use of more than two links to hold rings together (to prevent obstruction of escapement of small scallops and bycatch).

Continuing adjustments to the sea scallop FMP have been made since 1994, as follows:

Framework 1, August 17, 1994

This framework adjustment temporarily adjusts the maximum crew limit, re-designates the fishing year for sea scallop to commencing on March 1 each year, and refines existing gear requirements.

Framework 2, November 16, 1994

This rule implements an exemption from Federal gear regulations for vessels when fishing in state waters under a state scallop management program.

Framework 3, December 4, 1995

This rule implements framework adjustments that revise a provision in each of the FMPs that requires all permit applicants to own a fishing vessel at the time they apply for or renew a limited access permit.

Framework 4, May 1, 1995

This framework adjustment temporarily adjusts the maximum crew limit on certain vessels participating in the scallop fishery from nine to seven through February 29, 1996.

Framework 5, July 31, 1995

This rule implements measures that prohibit limited access vessels, fishing under the days-at-sea (DAS) program, from using trawl nets, with the exception of vessels that have not used a scallop dredge since January 1, 1988, to the present, and requires all dredges to have a minimum number of rows of steel rings extending from the ‘‘after end’’ to the club stick.

Framework 6, August 9, 1995

This action modifies a demarcation line in the current regulations that is used to monitor vessel activity. The intent of this action is to enhance enforcement capability.

Framework 7, March 11, 1996

This framework adjustment permanently reduces the maximum crew-size from nine to seven.

Amendment 5, July 11, 1996

The final rule closes a 9 square mile (23.31 km2) site to transiting and fishing with other than hand gear for an 18-month period to allow for the conduct of a NMFS sponsored sea scallop aquaculture research project, provides for exemptions from the closure for vessels using certain gear types and for vessels participating in the project, and provides for temporary exemptions for vessels participating in the project from certain fishing regulations that might inhibit or prevent their performing any activity necessary for project operations.

Framework 8, July 19, 1996

This rule expands the qualification criteria for limited access vessels fishing under the scallop days-at-sea (DAS) program to use trawl nets to include vessels with an engine of no greater than 450 horsepower that have used a scallop dredge on no more than 10 trips from January 1, 1988, through December 31, 1994.

Amendment 6, February 10, 1997

Amendment 6 provides a framework abbreviated rulemaking process to address gear conflicts in the New England and Mid-Atlantic regions.

Framework 9, August 13, 1997

These regulations exempt limited access and general category permit holders fishing exclusively under the State Waters Exemption Program (Exemption Program) from the 400 lb (181.44 kg) trip limit.

Framework 10, August 28, 1998

These regulations extend the closure of a 9 mi2 (23.31 km2) site to transiting and fishing with other than hand gear for an 18-month period to allow for the conduct of a NMFS-sponsored sea scallop aquaculture research project.

Amendment 7, October 7, 1998

Amendment 7 final regulations reduce the fishing mortality rate in the Atlantic sea scallop fishery to eliminate overfishing and to rebuild the biomass in accordance with the requirements of the Sustainable Fisheries Act.

Amendment 9, October 9, 1998

The amendments describe and identify EFH for the specified fisheries, discuss measures to address the effects of fishing on EFH, and identify other actions for the conservation and enhancement of EFH. Atlantic Salmon Amendment 1 also discusses a definition for overfishing and establishes an aquaculture framework adjustment process for Atlantic salmon.

Amendment 8, March 22, 1999

These amendments implement regulations to achieve regulatory consistency on vessel permitting for FMPs which have limited access permits issued by the Northeast Region of the NMFS.

Framework 11, June 15, 1999

This final rule creates a 1999 seasonal Georges Bank Sea Scallop Exemption Area (Exemption Area) in and adjacent to Closed Area II and includes the following primary measures for vessels fishing in the Exemption Area:

Framework 12, March 1, 2000

The intent of Framework Adjustment 12 and these final regulations is to adjust the limited access scallop days-at-sea (DAS) allocations for the fishing year March 1, 2000, through February 28, 2001.

Framework 13, June 15, 2000

This final rule implements the 2000 Sea Scallop Exemption Program (Exemption Program), creates Sea Scallop Exemption Areas (Exemption Areas) in portions of multispecies Closed Area I (CA I), Closed Area II (CA II), and the Nantucket Lightship Closed Area (NLCA) and includes the following management measures:

Framework 14, May 1, 2001

This final rule implements management measures for the 2001 and 2002 fishing years, including a days-at-sea (DAS) adjustment, a Sea Scallop Area Access Program (Area Access Program) for two areas that have been closed to scallop fishing in the Mid-Atlantic, and a 50–bu (17.62 hectoliters (hl)) possession restriction of in-shell scallops on vessels shoreward of the vessel monitoring system (VMS) demarcation line.

Framework 15, March 1, 2003

NMFS issues this final rule to implement Framework 15 to the Atlantic Sea Scallop Fishery Management Plan (FMP) developed by the New England Fishery Management Council (Council).

Amendment 11, September 24, 2004

Amendment 11 was developed by the Council to control the capacity of the open access general category fleet. Amendment 11 establishes a new management program for the general category scallop fishery, including a limited access program with individual fishing quotas (IFQs) for qualified general category vessels, a specific allocation for general category fisheries, and other measures to improve management of the general category scallop fishery.

Framework 16, November 2, 2004

The Joint Frameworks establish Scallop Access Areas within Northeast (NE) multispecies Closed Area I (CAI), Closed Area II (CAII), and the Nantucket Lightship Closed Area (NLCA).

Framework 17, October 21, 2005

Framework 17 requires that vessels issued a general category scallop permit and that intend to land over 40 lb (18.14 kg) of shucked, or 5 bu (176.2 L) of in-shell scallops, install and operate vessel monitoring systems (VMS).

Framework 18, June 15, 2006

Scallop fishery specifications for 2006 and 2007 (open area days-at-sea (DAS) and Scallop Access Area trip allocations); scallop Area Rotation Program adjustments; and revisions to management measures that would improve administration of the FMP. In addition, a seasonal closure of the Elephant Trunk Access Area (ETAA) is implemented to reduce potential interactions between the scallop fishery and sea turtles, and to reduce finfish and scallop bycatch mortality.

Amendment 12, June 1, 2007

Implements approved management measures contained in the Standardized Bycatch Reporting Methodology (SBRM) Omnibus Amendment (SBRM Amendment) to the Fishery Management Plans (FMPs) of the Northeast Region

Amendment 13, June 12, 2007

Amendment 13 was developed to permanently re-activate the industry-funded observer program in the Scallop FMP through a scallop total allowable catch (TAC) and days-at-sea (DAS) set-aside program that helps vessel owners defray the cost of carrying observers. The following observer program management measures are implemented by this rule: Requirements for becoming an approved observer service provider; observer certification and decertification criteria; and notification requirements for vessel owners and/or operators. This action also requires scallop vessel owners, operators, or vessel managers to procure certified fishery observers for specified scallop fishing trips from an approved observer service provider. Additionally, this action allows adjustments to the observer program to be done through framework action.

Framework 20, December 24, 2007

This action maintains the trip allocations and possession limits established the interim measures that were enacted by NMFS on June 21, 2007, for the Elephant Trunk Access Area (ETAA) in 2007 to reduce the potential for overfishing the Atlantic sea scallop (scallop) resource and excessive scallop mortality.

Framework 19, June 1, 2008

Framework 19 was developed to achieve the following management measures for the scallop fishery: Limited access scallop fishery specifications for 2008 and 2009 (open area days-at-sea (DAS) and Sea Scallop Access Area (access area) trip allocations).

Framework 21, June 28, 2010

Framework 21 specifies the following management measures for the 2010 scallop fishery: Total allowable catch (TAC); open area days-at-sea (DAS) and Sea Scallop Access Area (access area) trip allocations; DAS adjustments if an access area yellowtail flounder (YTF) TAC is caught;

Amendment 15, July 22, 2011

Amendment 15 was developed primarily to implement annual catch limits (ACLs) and accountability measures (AMs) to bring the Scallop FMP into compliance with requirements of the MSA as reauthorized in 2007. Amendment 15 includes additional measures recommended by the Council, including: A revision of the overfishing definition (OFD); modification of the essential fish habitat (EFH) closed areas under the Scallop FMP; adjustments to measures for the Limited Access General Category (LAGC) individual fishing quota (IFQ) fishery; adjustments to the scallop research set-aside (RSA) program; and additions to the list of measures that can be adjusted by framework adjustments. NMFS has disapproved a provision that would have allocated additional scallop catch to the LAGC fleet because it was not consistent with National Standard 1 and the ACL requirement of the MSA.

Framework 22, August 1, 2011

The specifications in Framework 22 are based on, and are being implemented in conjunction with, the management measures in Amendment 15 to the FMP (Amendment 15) that establish the process for setting annual catch limits (ACLs) and accountability measures (AMs) to bring the FMP into compliance with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

Framework 23, May 7, 2012

Framework 23 minimizes impacts on sea turtles through the requirement of a turtle deflector dredge; improve the effectiveness of the scallop fishery's accountability measures related to the yellowtail flounder annual catch limits; adjust the limited access general category Northern Gulf of Maine management program; and modify the scallop vessel monitoring system trip notification procedures to improve flexibility for the scallop fleet.

Framework 24, May 20, 2013

Framework 24 sets specifications for the Atlantic sea scallop fishery for the 2013 fishing year, including days-at-sea allocations, individual fishing quotas, and sea scallop access area trip allocations.

Framework 25, April 17, 2014

Framework 25 sets specifications for the Atlantic sea scallop fishery for fishing year 2014, including days-at-sea allocations, individual fishing quotas, and sea scallop access area trip allocations.

Framework 26, April 21, 2015

Framework 26 sets fishing specifications for 2015, including catch limits, days-at sea allocations, individual fishing quotas, and sea scallop access area trip allocations.

Amendment 16, June 30, 2015

This action establishes standards of precision for bycatch estimation for all Northeast Region fisheries.

Framework 27, May 4, 2016

Framework 27 sets specifications for the scallop fishery for fishing year 2016, including days-at-sea allocations, individual fishing quotas, and sea scallop access area trip allocations; creates a new rotational closed area south of Closed Area 2 to protect small scallops; opens the northern portion of the Nantucket Lightship Access Area to the Limited Access General Category fleet; transfers 19 percent of the Limited Access General Category access area trips from the Mid-Atlantic Access Area to the northern portion of the Nantucket Lightship Access Area; and implements an accountability measure to the fishing year 2016 Northern Gulf of Maine Total Allowable Catch as a result of a fishing year 2015 catch overage.

Amendment 19, November 3, 2016

Amendment 19 establishes a specifications process outside of the current framework adjustment process and adjusts the start of the scallop fishing year from March 1 to April 1.

Framework 28, March 27, 2017

Framework 28: Sets specifications for the scallop fishery for fishing year 2017; revises the way we allocate catch to the limited access general category individual fishing quota fleet to reflect the spatial management of the scallop fishery; and implements a 50-bushel shell stock possession limit for limited access vessels inshore of the days-at-sea demarcation line north of 42° 20′ N. lat.

Framework 29, Under Development (approved by NEFMC Dec. 7, 2017)

The framework includes specifications for the 2018 scallop fishing year as well as default specifications for 2019. It also includes actions related to Closed Area I carryover pounds, the Northern Gulf of Maine Management Area, and flatfish accountability measures, among others. Framework 29 splits the NGOM TAC between the LA and LAGC components of the fishery with the first 70,000 pounds going to the LAGC fishery and the remainder split 50/50 between the LA and LAGC components. The framework stipulates that the LA portion of the TAC would be available for RSA compensation fishing only. Priority will be given to RSA projects that involve research in the NGOM.

Research Plan

The Magnuson-Stevens Reauthorization Act of 2006 requires each regional fishery management council to develop a five-year research priority plan (MSFCMA 1996). The NEFMC's Plan Development Teams, species committees, Scientific and Statistical Committee, and the full Council review and update the Council's Research Priorities and Data Needs document periodically, most recently revising the priorities for 2017-2021 in January 2018 (NEFMC 2018g).

Under the heading "Population Dynamics," the Council has prioritized research on the natural mortality of scallops, including all sources of non-harvest mortality such as predation, disease, and incidental mortality.

The Council also prioritized the following research areas for sea scallop fishery management:

1. Research to elucidate modes of infection, transmission and distribution of scallop diseases and parasites that may adversely impact scallop health, meat quality and reproductive viability. Special attention should be directed to conditions that may result in modifications to the scallop rotational area management strategy to maximize yield.

2. Evaluation of ways to control predation on scallops.

3. Research to address potential implications of spat collection, seeding and relocation of scallops for enhancement purposes in light of unknown impacts of diseases and parasites.

4. Research that investigates the factors affecting fishing power and estimates of how they relate to projections of landings per unit of effort.

5. Research related to identifying the major sources of management uncertainty and measuring their potential effects on future fishery allocations.

In addition to research priorities focused on habitat in general, the Council established the following FMP-Specific Habitat Research for the sea scallop fishery:

1. Characterize habitats within scallop fishing grounds, including:

    a. Video and/or photo transects of the seafloor before and after scallop fishing commences.

    b. Identification of nursery and over-wintering habitats of species vulnerable to habitat alteration by scallop fishing.

    c. Studies that evaluate habitat recovery following impact with scallop dredges or trawls.

    d. Studies that examine fine scale fishing effort distributions in relation to fine scale habitat distribution.

e. Studies that directly support evaluation of present and candidate habitat management areas and Habitat Areas of Particular Concern to assess whether these areas are accomplishing their stated purposes and to assist in better defining the complex ecosystem processes that occur in these areas.

2. Evaluate long-term or chronic effects of scallop fishing on marine resource productivity.

3. Identify and evaluate methods to reduce the habitat impacts of scallop fishing, including studies that evaluate variability in scallop dredge efficiency across habitats, times, areas.

The Council also prioritized a number of ecosystem-related research priorities.

With regard to endangered, threatened, and protected species, the Council prioritized the identification of "hot spots" within the scallop fishery using data on observed take of sea turtles and other suitable information (e.g., data on observed turtle interactions for other fisheries or fishery surveys in the area where the scallop fishery operates). For all fisheries, the Council established a priority to “develop gear modifications or fishing techniques that may be used to reduce or eliminate the threat of sea turtle interactions without unacceptable reductions in target retention…”

Under the heading “Socioeconomics,” the Council made it a priority to “Evaluate the social and economic impacts and consequences of the area rotation program of the scallop fishery, including evaluation of potential distributional effects as well as impacts on other fisheries.”

The Council priorities also include research to “Investigate the existence value of deep-sea corals and evaluate tradeoffs between coral protection and fishing.”

The Council’s Research Priorities are operationalized through a variety of mechanisms, including research by the NEFSC, universities, and multiple cooperative efforts between fishermen and scientists, particularly through the NMFS Cooperative Research Program and the Sea Scallop Research Set-Aside program (NEFSC 2018). The Scallop Research Set-Aside, or RSA program, was formally included in the Atlantic Sea Scallop Fishery Management Plan in 1999. The program has evolved over time, but currently about 2% of the total projected scallop catch is “set-aside” to fund research projects that support scallop management. It has funded more than 80 scallop specific research projects since 2000, and the program expands each year.

At least biennially, the Council recommends specific research priorities that are to be used for a Scallop RSA funding announcement. The Scallop Plan Development Team (PDT) and Scallop Advisory Panel provide specific input about needed research priorities through the NEFMC Scallop Oversight Committee, and the Committee’s recommendations are then considered and approved by the full Council. The Council’s decision forms the basis for the federal funding opportunity and administered by NOAA Fisheries.

RSA research has proven successful in solving challenges facing the scallop fishery and scallop fishery managers. RSA research investigated gear modifications to reduce finfish by-catch when that was a concern in newly opened areas. Other RSA projects investigated sea turtle behavior and gear modifications to reduce the impacts of sea scallop fishing on sea turtles. RSA funding supports intensive resource surveys of scallop access areas to identify appropriate harvest levels and to identify concentrations of small scallops to protect (NEFSC 2018).

Council research needs are guided by the Research Steering Committee, the Research Set-Aside Program Review Panel, the Ecosystem-Based Fishery Management Committee, the Scientific and Statistical Committee, and the species committees.

Access Rights

Amendment 4 defined three limited access vessel categories.

To qualify for a full-time vessel permit, vessels must have averaged at least 150 days at sea (any 24 hour period or fraction thereof) annually, directed for scallops during the period 1985-1990 as recorded in the NMFS weighout files.

To qualify for a part-time scallop permit, vessels must have averaged more than 37 but less than 150 days at sea annually, during the qualifying years.

To qualify for an occasional scallop permit, vessels must have averaged 37 days at sea or less annually.

Each vessel in a category was allocated the same number of days. During the 1985-1990 period, the 403 qualifying vessels had the following annual averages: 18 days at sea for the 113 occasional vessels; 87 days at sea for the 100 part-time vessels; 216 days at sea for 190 full-time vessels.

Amendment 4 allowed vessels to move up one permit category if they limited themselves to a dredge width of 10.5-feet and a crew of five including the vessel operator.

Amendment 4 also created an open access permit category (General Category or GC) for vessels landing less than 400 pounds of sea scallops per trip. This provision was aimed at letting small boats enter the sea scallop fishery on an opportunistic basis but there were no vessel size limitations on the open access fishery. Limited access permit holders were allowed to fish under the General Category rules after they had used their DAS allocations.

As the sea scallop resource rebounded under the strict effort control restrictions on the limited access fleet, additional boats of all sizes were attracted to the General Category sea scallop fishery. This uncontrolled increase in landings by the GC eroded the benefits of the effort control program to which the LA fleet was subjected. Amendment 11 was adopted in 2004 to control the capacity of the open access general category fleet. Amendment 11 established a limited access program for the GC with individual fishing quotas (IFQs) for qualified general category vessels. Amendment 11 also created a specific allocation of the TAC for general category vessels. Framework 17 required limited access general category (LAGC) vessels to carry VMS.

Review and Audit of the Management Plan

Fishery management councils are required by law to:

> "Review on a continuing basis, and revise as appropriate, the assessments and specifications contained in each fishery management plan for each fishery within its geographical area with regard to: (1) The present and probable future condition of the fishery; (2) The maximum sustainable yield from the fishery; (3) The optimum yield from the fishery…"

The Sea Scallop FMP undergoes essentially continuous review in response to issues that are brought to the NEFMC through multiple channels. Most importantly, the NEFSC provides stock assessment advice to the Council. At the request of the Council and the Sea Scallop Oversight Committee, the Scallop Plan Development Team (PDT) develops measures to respond to conditions in the fishery. Annual specifications for catch limits and effort allocations are adopted through framework actions, which are intended to expedite the administrative process for adaptive measures that have been fully analyzed in FMP amendments.

The process for setting annual specifications follows the following general form:

a. Survey data from open areas is projected forward (assuming growth, natural mortality (M), and fishery removals in Year 1, etc) to calculate open area exploitable biomass (scallops that are large enough to be harvested) for year 2.

b. A target F rate for open area fishing is set, usually equal to or less than F=0.48, and the harvest associated with this fishing mortality in Y2 is calculated.

c. To calculate DAS for full-time LA vessels, the calculated LA open area landings are divided by projected landings per day times the total number of LA vessels.

In 2014 the Sea Scallop PDT presented a Performance Evaluation of the LAGC IFQ Fishery as a precursor to the five-year review of all Limited Access Privilege Programs (LAPPs) required by the MSFCMA. The PDT also reviewed multiple frameworks for evaluating FMPs that were under development at the time, noting that in January 2012 the Council approved a Draft FMP Performance Evaluation process, which included a range of indicators that could be used to evaluate fishery management performance.

The PDT reported on other efforts underway to identify potential performance variables in the NE region as well as nationally. NMFS social scientists have compiled a list of performance variables that could be used for FMP tracking. In addition, NMFS plans to advance a nationwide set of fishery performance measures, as compared to FMP performance measures, beginning in 2012. This will begin with catch share fisheries using readily available data and will be expanded to include other fisheries and data in the future. In addition, MRAG Americas has developed a proposal for catch share system performance evaluation (MRAG Americas 2011).

The Draft FMP Performance Evaluation document approved by the Council incorporated all these sources and summarized a list of potential performance evaluation variables. The list balances the number of variables tracked with the time that is needed to compile and present the information recognizing the need for cost effectiveness and minimizing workload impacts.

3.1.2.1 Generic FMP Performance variables

1. Biological

a. Fishing mortality rate / target fishing mortality rate

b. Biomass / Biomass target

2. Economic

a. Catch as a percentage of ACL

b. Discards

i. Target species – use rate from NMFS NERO for ACL calculation

ii. Protected Resources – no estimate by FMP

c. Revenue from fishery

d. Revenue per active permit holder

e. Percentage of gross revenue taken by top 20% of permit

f. Net revenue per permit (if available, only available for few fisheries)

g. Number of active vessels

h. Number of inactive vessels

i. Average age of active vessels

3. Fleet Diversity

a. Number of vessels in fishery

i. Under 30 feet

ii. 30-50 feet

iii. 50-75 feet

iv. Over 75 feet

b. Landings revenue by port

c. Landing in weight by port28

d. Number of ports in which FMP species are landed

e. Number of days fished by port

4. Safety

a. Fishing Vessel Casualty Rate

i. Per 100,000 hours fished (groundfish, scallop) – time intensive

ii. Per 1,000 days fished ?

iii. Working with USCG on best indicator

5. Governance

a. Ratio of actual vs. planned time for amendment or framework

b. Time needed to incorporate new assessment data into FMP

c. Time needed to respond to new conditions, e.g. changes in the fishery or requests from stakeholders

d. Number of advisory panel meetings

e. Public input metric to gauge how stakeholders feel their input is being heard and used.

i. Use web based survey tool, e.g. Survey Monkey, and note cards to allow people to comment in an anonymous, non-intimidating way.

ii. Questions to be developed

The MSFCMA requirement to conduct a five-year review of fisheries managed with individual fishing quotas applies to the LAGC IFQ fleet. The IFQ program was implemented March 1, 2010. In 2014, in preparation for the five year review, the NEFMC Sea Scallop PDT prepared a performance evaluation of the LAGC IFQ fishery. The review included performance indicators for four overall subjects: biological performance, economic performance, safety and enforcement, and governance.

Within the report the PDT has highlighted three overall "PDT Findings" and general conclusions about the trends in the fishery to date. The three findings are related to: 1) the IFQ carryover provision; 2) extensive data issues in terms of tracking ownership, quota leasing and transfers throughout the year, etc.; and 3) a segment of the fishery is not complying with the prelanding reporting requirement through VMS potentially compromising effective monitoring and enforcement of the program. (http://s3.amazonaws.com/nefmc.org/Final-LAGC-IFQ-Report_July2014.pdf)

Some of the important conclusions from the report are summarized below.

Biological:

- This IFQ and sub-ACL program has been effective at controlling mortality and preventing overfishing from the general category fishery, about 95% of the sub-ACL has been harvested each year. The overall impact of this fishery on bycatch is relatively small.
- **Economic:**
- The results of this three-year report showed that fleet wide trends in the economic performance measures for LAGC IFQ fishery were positive since the implementation of the IFQ program in the 2010 fishing year. There have been substantial increases in the inflation adjusted estimates of total scallop revenue (by 48%), of total producer surplus or net revenues (by 54%) in the 2012 fishing year from the levels in the 2010 fishing year. These changes were largely due to the favorable scallop resource conditions, which resulted in an increase of the ACL for the LAGC IFQ fishery scallop fishery by 25% in the 2011 and 33% in the 2012 accompanied by a rise in the ex-vessel prices to over $10 per pound scallops during the same years.
- There have been major changes, however, in terms of trends in effort and distribution of net revenues from the LAGC fishery as a result of the measures of the IFQ program, which allowed the flexibility to fishermen to either permanently or temporarily transfer their quota to/from other vessels and owners. This created economic incentives for many owners with relatively smaller allocations to earn income by leasing out their shares, while providing opportunity to the active owners with more sizeable allocations to increase their landings and revenues by leasing or buying quota from others.
- As a result, the effort was consolidated in fewer vessels and owners, with the number of active vessels down from 154 in 2010 to 129 in 2012 and the numbers of active owners (vessel affiliations) down from about 127 in 2010 to 107 in the 2012 fishing year. During the same years, the lease and quota prices increased substantially, increasing the share in total net revenue of the owners who lease out their IFQ and decreasing for those owners who actively

participate in the fishery and lease-in from others. There have been some shifts in the geographical distribution of participation and leasing activity with Massachusetts becoming the main state with net leasing of IFQ from other states since the 2010 fishing year. Favorable resource conditions and the existence of permit banks were the main reasons for this trend.

- The same trends in consolidation indicated that the estimated employment (CREW*DAS) declined by 3.7% in the 2012 fishing year from the levels in the 2010 fishing year. However, crew shares for the individuals who are employed in the fishery were estimated to have increased by as much as 51% in the 2012 fishing year as a result of the overall increase in the gross scallop revenue since the 2010 fishing year.
- Although the LAGC IFQ fleet is diverse in terms of net revenues from scallop fishing and leasing activity, net revenues were highly concentrated among the top earning groups. About 8 to 10 top owners earned about 25% of the total net revenue during 2010-2012 fishing years, while about 146 owners in 2010 and 132 owners in 2012 (in the bottom 25% of net revenue distribution) earned about 25% of the net revenue. The Gini coefficients for the net revenues were above 0.65 for 2010 to 2012 fishing years. This is mostly due to the unequal distribution of allocations in 2010, with Gini coefficients exceeding 0.63 during the same years.
  - **Safety and Enforcement**
- Overall, there have been very few documented issues related to safety and enforcement of the IFQ program. However, the level of enforcement presence overall seems to be very limited. Therefore, it is difficult to evaluate the performance of this variable with limited information.
  - **Governance**
- For the most part the goals and objectives identified in Amendment 11 that established this ITQ program are being met. In addition, there is adequate representation for the general category fishery in the process and modifications to the program are being made in a timely way.

In June 2017 the NEFMC published a five-year review of the LAGC IFQ program. The scope of the program review was informed by the MSFCMA guidance, NOAA Fisheries Guidance for Conducting Review of Catch Share Programs, NOAA Fisheries Catch Share Policy, and the goals and objectives of Amendment 11. The Council’s Scientific and Statistical Committee (SSC), Scallop Advisory Panel, and Scallop Committee also provided input on the scope of the report. A formal technical work group consisted of staff from the Northeast Fisheries Science Center (NEFSC), Greater Atlantic Regional Fisheries Office (GARFO), and Council. The report considers “baseline” information from fishing years (FY) 2007 – 2009 when appropriate, and focuses analyses over the six year period from FY 2010 – FY 2015. In accordance with guidance documents and the goals of Amendment 11, the program review addressed the following questions:

Has the LAGC IFQ Fishery:

1. Resulted in benefits to the Nation, including the evaluation of biological, economic, and social criteria in such decision making?
2. Preserved the ability for vessels to participate in the general category fishery at different levels? Has the IFQ program prevented excessive shares?
3. Controlled capacity, controlled mortality, and promoted fishery conservation and management?

4. Promoted safety, compliance, and enforcement?

LAGC IFQ Five-Year Review Conclusions

Net economic benefits to the nation, as measured by producer surplus, were positive relative to a baseline period of three years (2007-2009) before implementation of Amendment 11, and since the start of the program period in 2010.

The report concludes that the opportunity for stakeholders to participate in the fishery at varying levels has been preserved. The capacity of the general category fleet has been reduced without reducing overall performance of the fleet (in terms of landings and revenue).

Quota allocations among LAGC IFQ affiliations were unequally distributed both in 2010 and 2015, although in 2015, concentration appears to have become more equal. In 2010, 90% of the affiliations held 57% of the quota, with remaining 10% held 43%. In 2015, 90% held 64% while the rest of the 10% held 36% of the IFQ allocations (NEFMC 2017c).

Although the distribution of quota remains unequal, an analysis of market concentration based on the Herfindahl-Hirschman index (HHI) indicated that the market for quota shares in the IFQ fishery is competitive. The concentration of quota in the LAGC IFQ fishery is far below the potential limits sets set by the caps on ownership and vessel quotas. Those caps probably contributed in preventing further consolidation of ownership in the LAGC IFQ fishery. At a 5% share cap, the smallest possible number of affiliates would be 20, but in 2015, there were 192 affiliates, which is 9.6 times that of the level the share cap would allow.

Based on six years of information, the sub-ACLs and IFQs in place are controlling mortality from this component of the fishery. Over 85% of the total sub-ACL for the LAGC IFQ fishery was harvested annually during the program review period. The IFQ component has fished within its sub-ACL after the implementation of up to 15% carryover pounds. From a biological perspective this IFQ and sub-ACL management program has been effective at controlling mortality and preventing overfishing.

The number of IFQ MRIs (unique vessel identifier) with quota overages declined from 2012 to 2015, as did the overage total. IFQ overages made up a small percentage of the total allocated IFQ quota in all years examined. Compliance with VMS reporting requirements has generally improved during the IFQ program period from 2010 – 2015.

While VMS pre-land compliance has improved, the total number of offloads that are monitored remains very low (<1% of total trips).

Monitoring, Control, and Surveillance

The National Marine Fisheries Service (NMFS) and the United States Coast Guard (USCG) share responsibility for the enforcement of fishing laws and regulations by US vessels. NMFS has partnership agreements with states that enable state enforcement personnel to enforce federal fishery regulations. These agencies have land-based and seagoing enforcement officers and a complete system of monitoring, control and surveillance (MCS) for the sea scallop fishery, including:

- At-sea surveillance by patrol vessels and fixed-wing aircraft;
- Prescribed on-board observer coverage with protocols to monitor catch, species, etc;
- Unannounced dockside monitoring of landings;
- Submission of vessel fishing log books (vessel trip reports);
- Catch and Effort database to track catch against allocations;
- Electronic vessel monitoring systems (VMS) on each vessel;
- And, potential catch seizure and significant fines and loss of fishing privileges for violations of regulations.

There is an explicit and statutory sanction framework that is applied for violations of fishery regulations. Sanctions for violations in the Northeast Region of the US are listed in 50 CFR 600.740:

"The Magnuson-Stevens Act provides four basic enforcement remedies for violations, in ascending order of severity, as follows:

(1) Issuance of a citation (a type of warning), usually at the scene of the offense (see 15 CFR part 904, subpart E).

(2) Assessment by the Administrator of a civil money penalty.

(3) For certain violations, judicial forfeiture action against the vessel and its catch.

(4) Criminal prosecution of the owner or operator for some offenses. It shall be the policy of NMFS to enforce vigorously and equitably the provisions of the Magnuson-Stevens Act by utilizing that form or combination of authorized remedies best suited in a particular case to this end.

Other than assaults on fishery officers, violations of federal fishery regulations are treated as civil cases, using a "preponderance of the evidence" rule. Cases are adjudicated by administrative law judges."

Table 17provides information on fishing vessel boardings conducted by units from the USCG First District together with resulting violations and the observed compliance rate. The data is not specific to the sea scallop fishery and many categories of violations are common to multiple fisheries, making it impossible to determine the compliance rate for a specific fishery. When a violation is found, the USCG refers the matter to the NOAA Office of General Counsel.

The assessment team interviewed individuals from the NOAA Office of Law Enforcement and Office of General Counsel Enforcement Section during the 3rd annual surveillance in June 2017. OGC can deal with violations in multiple ways, depending on the severity of the violation and other circumstances. Violations may be administrative in nature, such as failure to carry a federal permit on board, or may be more serious, such as a closed area violation or possession of prohibited species. Violators may be offered a summary settlement for small violations (essentially a ticket) or are referred for investigation and prosecution if a larger issue or a repeat offender. NOAA OGC publishes a list of enforcement actions on its web site on a quarterly basis but the information is not often sufficient to determine in which fishery the violation occurred. Information on settled cases illustrates that sanctions are meaningful and would be expected to be effective in bringing about compliance.

Charged cases have had a NOVA and/or NOPS and/or written warning issued and served. NOVA stands for Notice of Violation and Assessment and NOPS stands for Notice of Permit Sanction. NOVAs, NOPSs, and written warnings contain the Agency's allegations of violations by the respondent(s). In response to receiving a NOVA, NOPS, or written warning, a respondent may challenge those allegations through means set forth in NOAA's civil procedure regulations found at 15 C.F.R. Part 904.

NOAA OLE and OGC personnel characterized the sea scallop fishery as being generally in compliance with the regulations. Enforcement staff does not believe that there is any systematic non-compliance in the groundfish fishery.

Specifically with regard to the LAGC IFQ fishery, the Performance Evaluation conducted by the Scallop PDT in 2014 found that: "Overall, there have been very few documented issues related to safety and enforcement of the IFQ program. However, the level of enforcement presence overall seems to be very limited. Therefore, it is difficult to evaluate the performance of this variable with limited information."

Data compiled by the Scallop PDT indicated that: "There have been over 60 enforcement related incidents with scallop vessels in the NE region between January 2010 and June 25 2013. About half of those involve LAGC IFQ vessels. And another two dozen involve vessels without a scallop permit. These data do NOT include incidents that are currently under investigation.

Of the 30 or so incidents involving LAGC IFQ vessels, only 5 resulted in a violation. Most had to do with observer program requirements (19/30 incidents) and less were related to specific scallop IFQ regulations such as exceeding the possession limit or fishing in closed areas. There has been a drop in enforcement incidents for IFQ vessels from 2010 to 2012, but that may be related to the level of enforcement presence and not necessarily improved compliance."

The PDT concluded that: "There has been a very limited number of violations for LAGC IFQ vessels since 2010. About 30 incidents overall and only 5 resulted in violations. Less than a handful of these incidents related to the IFQ program specifically, most had to do with observer program requirements. There has been a small decline in the overall number of incidents, but that may be related to the level of enforcement presence and not necessarily improved compliance."

Vessels on a LAGC IFQ trip are required to submit a pre-landing notification to NMFS through VMS six hours prior to landing. The estimated catch, time and location of landing are required. VMS staff at the Regional Office analyzed the level of compliance with this regulation.

The PDT found that: "Based on these data, a segment of the LAGC IFQ fishery is not complying with the VMS prelanding requirement (about 30 vessels each year are not sending in prelanding notifications at all).

Table 17. Fishing vessel boarding's conducted by units from the First Coast Guard District with resulting violations and the observed compliance rate from October 2014 through December 2017. Compiled from periodic USCG briefings presented to the New England Fishery Management Council and accessed at: https://www.nefmc.org/council-meetings.

First Coast Guard District Enforcement Reports to FMCs (source: https://www.nefmc.org/council-			
	FV Boardings	Violations	Observed Complaince Rate
Oct 1, 2014-Sep 2015	1363	43	97%
Oct 1-Dec 2015	212	9	96%
Dec 1, 2015-Jan 2016	179	4	98%
Feb 1-Apr 2016	152	3	98%
Apr 1-Jun 2016	179	7	96%
Sep 1- Nov 2016	260	14	95%
Nov 1, 2016-Jan 2017	227	14	94%
Apr 1-Jun 2017	290	7	98%
Jun 1-Sept 2017	291	25	89%
Sep 1- Dec 2017	375	8	98%
39 Months	3468	134	96%

While most vessels are in compliance, since a subset are not reporting at all this reduces the overall capability for NMFS to effectively monitor and enforce this IFQ program." (NEFMC 2014b)

A more recent five-year review of the LAGC IFQ program found that compliance with VMS reporting requirements has generally improved during the IFQ program period from 2010 – 2015 and that while VMS pre-land compliance has improved, the total number of offloads that are monitored remains very low (<1% of total trips).

In response to the issues raised in the LAGC program review, the NEFMC prioritized monitoring and catch accounting for work in 2018 (J Peros personal communication). The Council staff prepared background information for the Council's Sea Scallop Advisory Panel and Sea Scallop Committee for their meetings in March 2018. At its March 22, 2018 meeting the Scallop Committee passed motions for consideration by the Council in April 2018. The motions recommended that the Council send a letter to NMFS with specific recommendations to the agency to address compliance issues. The final version of the motions will be available with Council documents for the April meeting in Mystic and will be posted on the NEFMC.org website.

3.5.4 Recognized Interest Groups

Table 18. Recognized Interest Groups

Organization	Address/Location	Contact
Downeast Groundfish Fishermen's Association	Stonington, ME	Aaron Dority
Maine Coast Fishermen's Association	14 Maine Street, Suite 412 G/H, Box 40, Brunswick, Maine	Ben Martens
School for Marine Science and Technology (SMAST)	University of Massachusetts	Dr. Kevin D.E. Stokesbury
New England Fisheries Management Council	50 Water Street, Mill 2 • Newburyport, Massachusetts 01950	Jonathon Peros
Oceana	Wayland, MA	Gib Brogan
Conservation Law Foundation	Boston, MA	Patrick Lyons
American Scallop Association, Inc.	Dartmouth, MA	Ross Paasche
Downeast Dayboat Scallops	Maine	Togue Brawn

Arrangements for On-going Consultations

Ongoing consultations are an inherent part of the US federal fishery management system. Advisory panels bring stakeholder representatives together to discuss issues confronting the fishery and to make recommendations to the Sea Scallop Committee, which considers input from the Advisory Panel and other stakeholders in framing recommendations to the NEFMC.

Planned Education and Training for Interest Groups

No education and training for interest groups is planned.

Non-fishery Uses or Activities and Arrangements for Liaison and Coordination

US Atlantic fisheries share the ocean with a multitude of other uses. At the present time the primary potentially conflicting use of the ocean in the UoA is the development of offshore wind farms for electricity generation. Representatives of the fisheries meet with representatives of other uses on a continuing basis outside the formal fishery management system and occasionally in a fishery management setting.

4. Evaluation Procedure

4.1 Harmonized Fishery Assessment

For this assessment, harmonization is required as follows:

Principle 1: No harmonization is required for P1, as there are no other MSC certified fisheries that target the target stock as defined in the UoA.

Principle 2: No other certified fishery overlaps with the New Bedford scallop dredge employed in this fishery.

Principle 3: The US Atlantic Sea Scallop Fishery (this fishery); US Atlantic Spiny Dogfish Fishery; US Atlantic Surfclam and Ocean Quahog Fishery; US Acadian Redfish, Haddock, and Pollock Otter Trawl; Gulf of Maine and Georges Bank Haddock, Pollock, and Redfish; US Atlantic Longfin Inshore Squid Bottom Trawl

Table 19. Fisheries in the MSC System Considered for Harmonization.

	Fishery	Status	Principles for Harmonization	Conformity Assessment Body
1	US Atlantic Sea Scallop	Certified 19 Dec 2013	P3 (3.1.1-3.1.3)	SCS Global
2	US Atlantic Spiny Dogfish	Certified 2012, Suspended February 19, 2015, Re-instated May 28, 2015, Undergoing Reassessment	P3 (3.1.1-3.1.3)	SCS Global
3	US Atlantic Surfclam and Ocean Quahog	Certified 16 December 2016	P3 (3.1.1-3.1.3)	SCS Global
4	US Acadian Redfish, Haddock, and Pollock Otter Trawl	Certified July 2016	P3 (3.1.1-3.1.3)	SAI Global
5	US Gulf of Maine and Georges Bank Haddock, Pollock, and Redfish	Under Assessment	P3 (3.1.1-3.1.3)	Acoura
6	US Atlantic Longfin Inshore Squid Bottom Trawl	Under Assessment	P3 (3.1.1-3.1.3)	SCS Global

Table 20. Alignment of Scores for Harmonization

PI	Fishery 1	Fishery 2	Fishery 3	Fishery 4	Fishery 5	Fishery 6
PI 3.1.1	100	100	100	95	100	100
PI 3.1.2	100	100	100	100	100	100
PI 3.1.3	100	100	100	100	100	100

Comment

All of the relevant P3 scores for the harmonized fishery are consistent except for a score of 95 on PI 3.1.1 given to the US Acadian Redfish, Haddock, and Pollock Fishery by SAI Global in 2016. SAI Global gave the management system a score of 80 for "Legal Rights." The rationale provided in the US Acadian Redfish, Haddock and Pollock

PCR would seem to support SG 100. The only apparent difference between the SG 80 and SG 100 for the legal rights guideline is the requirement for a “mechanism to formally commit to” as compared to “a mechanism to observe.” The SCS assessment team asserts that the only mechanism to observe the legal rights is a provision in a fishery management plan that would also constitute a formal commitment. We score the US Atlantic Sea Scallop Fishery as 100 on all the SIs for PI 3.1.1.

4.2 Previous assessments

The fishery was first certified to the MSC requirements in December 2013 using the default assessment tree MSC Fisheries Assessment Methodology (FAM) (V 1.3). The fishery full assessment and certification was conducted by Intertek Moody who also performed the first surveillance audit. The client fishery transferred the Certificate to SAI Global who undertook the 2nd surveillance audits. The fishery transferred to SCS Global Services on 2016, who undertook the third and fourth surveillance audit and re-assessment.

At re-assessment the UoA was expanded to include some of the permit types in the General Category (See Section 3.1 Unit(s) of Assessment (UoA) and Scope of Certification Sought)

The fishery originally received four conditions in the 2012 full assessment; all pertaining to Principle 2 requirements (See Table 21).

Table 21. Summary of Previous Assessment Conditions

Condition	PI (s)	Year closed	Justification
1	2.2.3	Closed (Surveillance 2, 2016)	The assessment team also concludes that the information collected in preparation of the Omnibus Amendment has also met the requirement of the third milestone for the second annual audit and the milestone for the third annual audit since there is sufficient information collected on the main bycatch species to estimate outcome status with respect to biologically based limits, thereby meeting the second scoring issue of SG80.
2	2.4.1	Closed, Re-Assessment	See Condition 2. PI 2.4.1
3	2.4.2	Closed, Re-Assessment	See Condition 3. PI 2.4.2
4	2.5.1	Closed, Re-Assessment	See Condition 4. PI 2.5.1

4.3 Assessment Methodologies

This assessment was conducted by SCS Global Services, an accredited MSC certification body. The fishery was assessed using the MSC Certification Requirements Version 1.3, January 14 2013 and the reporting template used in this report is also V1.3. The default assessment tree was used without adjustments. The CAB has confirmed with MSC Fisheries Assessment Managers that the release of V2.0 FCR (April 1, 2015) and V2.1 GCR (Sept 1, 2015) are not binding for this fishery until during full assessment. The fishery will be subject to these updated process requirements (FCR 2.0 and GCR 2.1 or more up to date versions thereof) at the time of any next surveillance. The fishery will remain Part C of V1.3 of the Certification Requirements for all performance requirements (PISGs) for the five year duration of the certificate cycle, should the fishery be found capable of scoring at a level that confers certification.

4.4 Evaluation Processes and Techniques

4.4.1 Site Visits

The assessment team selected visit sites and interviewees based on information needed to assess management operations of the unit of assessment. The client group and other relevant stakeholders helped identify and contact fisheries management, research, compliance, and habitat protection personnel and agency representatives. Before the site visit and meetings were conducted, an audit plan was provided to the client and relevant stakeholders.

Table 22. Audit Plan: Key Meetings and Locations

Thursday January 18, Day 1 - Gloucester, MA			
MSC PIs/Clauses	**Session**	**Relevant Participants**	**Location**
Clause 7.4	SCS's opening meeting with client to review: - Status of open conditions - Changes fishing operations, traceability, management issues, etc. Determination of scope of UoA for re-assessment	American Scallop Association Representative(s)	Holiday Inn, Peabody MA Meeting Room
Principle 1, 2 & 3	Review: -FMP -Amendments -Changes to Harvest Strategy -Habitat	Jonathon Peros, NEFMC Alyson Pitts, NEFMC Michelle Bachman, NEFMC	NEFMC Office Newburyport, MA
Principle 3: PI 3.1.1, 3.1.2, 3.1.3, 3.2.1, 3.2.2	Meeting with Management agency personnel: *Fisheries Management Legal Framework* *Organizational structure* *Permitting/Licensing* *Consultation Systems* *Fishery Objectives: Management Plan* *Consultation processes*	NMFS GARFO: Travis Ford, SFD; Shannah Jaburek, SFD	GARFO office Gloucester, MA
Principle 2	Meeting with Fisheries Research and observer program personnel: *Marine Protected Areas, Habitat Considerations* *Research on Ecosystem Impacts*	NMFS staff: -David Stevenson, Marine Habitat Resource Specialist	GARFO office

Friday January 19, Day 2 - New Bedford & Woods Hole, MA			
MSC PIs/Clauses	**Session**	**Relevant Participants**	**Location**
Principle 2:	Meeting with Fisheries Research personnel to review: - Habitat and ecosystem considerations	Scott Gallager, Woods Hole Oceanographic Institution	WHOI Marine Research Facility

Principle 2:	Review: -ETP interactions and impacts - Bycatch surveys and reduction efforts	- David Rudders, VIMS (phone) - Chad Keith, NEFSC, Industry Funded Scallop Observer Program	Northeast Fisheries Science Center, Woods Hole, MA
Principle 1: PI 1.1.1, 1.2.4, 1.2.1, 1.2.2	Review: -Stock status of target species - Uncertainty and adequacy of the stock status. - Surveys Harvest Strategy and Control Rules	-Dvora Hart, NEFSC	Northeast Fisheries Science Center,
Principle 1: PI 1.1.1, 1.2.4, 1.2.1, 1.2.2	Review: -Stock status of target species - Uncertainty and adequacy of the stock status. - Surveys - Harvest Strategy and Control Rules	- Changsheng Chen, SMAST - Dave Bethoney, SMAST	SMAST lab New Bedford, MA

In addition to the meetings and attendees list above (Section 4.4.1), consultations have included large numbers of phone and email exchanges. A number of key organizations were contacted in advance of the fishery's formal entry into public full assessment by the team leader, by phone. SCS also worked with in advance of the fishery entering full assessment to compile an extensive stakeholder list used for emailing announcements and assessment progress to stakeholders.

Prior to the onsite meeting, as well as following the onsite meeting, no written or verbal stakeholder comments were received.

4.4.2 Evaluation Techniques

Documentation and Information Gathering

One of the most critical aspects of the MSC certification process is ensuring that the assessment team gets a complete and thorough grounding in all aspects of the fishery under evaluation. In even the smallest fishery, the assessment team typically needs documentation in all areas of the fishery from the status of stocks, to ecosystem impacts, through management processes and procedures.

Under the MSC program, it is the responsibility of the applying organizations or individuals to provide the information required proving the fishery or fisheries comply with the MSC standards. It is also the responsibility of the applicants to ensure that the assessment team has access to any and all scientists, managers, and fishers that the assessment team identifies as necessary to interview in its effort to properly understand the functions associated with the management of the fishery. Last, it is the responsibility of the assessment team to make contact with stakeholders that are known to be interested, or actively engaged in issues associated with fisheries in the same geographic location.

Information for the assessed was gathered from stakeholder comments prior to the onsite visit (and after), and via the meetings during the onsite visit. Before the site visit and meetings were conducted, an audit plan was provided to the client and relevant stakeholders. The assessment team visited agency offices including Woods Hole and GARFO and also visited the client's representative office.

Scoring and Report Development Process

1. **Onsite Visit:** Scoring was initiated during the 3 day site visit that took place on January 2018 and completed iteratively through phone calls, emails and skype teleconferences between January and May 2018.

2. **Client Draft:** Rationales and associated background was developed by respectively assigned assessment team members, and then cross read by team members and SCS staff for production of the client draft report. Scoring was completed by consensus through this review process and team meetings by phone and email. The fishery received a total of 1 conditions within 1 performance indicators. The team finalized scoring and submitted the Client Draft in May 2018.

3. **Peer Review:** Based on comments from peer reviewers the team modified content related to Principle 2adjusting the following score for PI 1.2.2 from 100 to 85. Additionally background information and Appendix for Principle 1 information was also included. These changes were then submitted to the client to review prior to the publication of the PCDR. The PCDR was submitted to MSC June 28, 2018 and subject to a 30 day stakeholder comment period that terminated on August 2, 2018.

4. **Stakeholder Comment on PCDR:** No stakeholder comments were received, except for a Technical Oversight from MSC for the traceability section, which was modified accordingly. These changes were approved by the client prior to the publication of the Final report. The report was submitted to MSC for publication on August 15th, 2018.

5. **Objection Period:** No stakeholder comments were received.

Scoring Methodology

The assessment team followed guidelines in MSC FCR v2.0 Section 7.10 “Scoring the fishery”. Scoring in the MSC system occurs via an Analytical Hierarchy Process and uses decision rules and weighted averages to produce Principle Level scores. There are 28 Performance Indicators (PIs), each with one or more Scoring Issues (SIs). Each of the scoring issues are considered at the 60, 80, and 100 scoring guidepost levels. The decision rule described in Table 23 determines the Performance Indicator score, which must always be in an increment of 5. If there are multiple ‘elements[8]’ under consideration (e.g. multiple main primary species), each element is scored individually for each relevant PI, then a single PI score is generated using the same set of decision rules described in Table 23.

Table 23. Decision Rule for Calculating Performance Indicator Scores based on Scoring Issues, and for Calculating Performance Indicator Scores in Cases of Multiple Scoring Elements. (Adapted from MSC FCRV2.0 Table 4)

Score	Combination of individual SIs at the PI level, and/or combining multiple element PI scores into a single PI score.
<60	Any scoring element/SI within a PI which fails to reach SG60 shall not be assigned a score as this is a pre-condition to certification.
60	All elements (as scored at the PI level) or SIs meet SG60 and only SG60.

[8] MSC FCRV2.0 7.10.7: In Principle 1 or 2, the team shall score PIs comprised of differing scoring elements (species or habitats) that comprise part of a component affected by the UoA.

65	All elements/SIs meet SG60; a few achieve higher performance, at or exceeding SG80, but most do not meet SG80.
70	All elements/SIs meet SG60; half* achieve higher performance, at or exceeding SG80, but some do not meet SG80 and require intervention action to make sure they get there.
75	All elements/SIs meet SG60; most achieve higher performance, at or exceeding SG80; only a few fail to achieve SG80 and require intervention action.
80	All elements/SIs meet SG80, and only SG80.
85	All elements/SIs meet SG80; a few achieve higher performance, but most do not meet SG100.
90	All elements/SIs meet SG80; half achieve higher performance at SG100, but some do not.
95	All elements/SIs meet SG80; most achieve higher performance at SG100, and only a few fail to achieve SG100.
100	All elements/SIs meet SG100.

**MSC FCRV2.0 uses the word 'some' instead of half. SCS considers 'half' a clearer description of the methodology utilized.*

When calculating the Principal Indicator scores based on the results of the Scoring Issues (SI), SCS interprets the terms in the Table 2 as following:

- **Few:** Less than half. Ex: if there are a total of three SIs, one SI out of 3 is considered few.
- **Some:** Equal to half. Ex: if there are a total of four SIs, two SIs out of 4 is considered some.
- **Most:** More than half. Ex: if there are a total of three SIs, two SIs out of 3 is considered most.

Elements evaluated in the scoring of the fishery are as follows:

Table 24. Scoring elements

Component	Scoring elements	Main/Not main	Data-deficient or not
Bycatch species	Skate Complex	Main	Not
Bycatch species	All minor bycatch Species. See Table 10 and Table 11	Minor	Some yes, some no

The MSC provides a mandatory Excel template that facilitates the calculation of Principle level scores. Within the Excel template (and provided in Section 6.2) PIs are organized into components, where each PI within a component is weighted equally (**PI weight**), where the sum of PI weights per component equals 1. Multiple components make up each Principle, and components are likewise weighted (evenly, except in Principle 1) (**Component weight**), where the sum of component weights per Principle equals 1. The PI weight within the component multiplied by the component weight within the Principle provides a weight for each PI within the Principle (**PI weight * Component weight= PI Principle weight**). Each PI score is then multiplied by its weight within the Principle (**PI Principle weight**), and all weighted PI values are summed to generate a Principle level score, reported to the nearest one decimal place in accordance with MSC FCRV2.0 (7.10.3)

The decision rule for MSC certification is based on the resulting Principle level scores and is as follows:

- No PIs score below 60
- The aggregate score for each Principle, rounded to the nearest whole number, is 80 or above
-

5. Traceability

5.1 Eligibility Date

The actual eligibility date is July 3rd, 2018, this is the date of the release of the Public Comment Draft Report. The traceability and segregation systems that are required to ensure the separation of any certified product from non-certified product are believed to be already in place for the client fleet. The client has been informed of the CoC requirements for under-assessment product.

At present, the fishery does use the blue MSC ecolabel on product.

5.2 Traceability within the Fishery

A description of the tracking and tracing across the main stages of the supply chain within the fishery that would allow products sold as MSC certified to be traced back to the UoC are described in Table 25. The factors that may lead to risks of non-certified fish being mixed with certified fish prior to entering Chain of Custody are described in Table 26. For each risk factor, there is description of whether the risk factor is relevant for the fishery, and if so, a description of the relevant existing regulatory or fishery management controls that provide mitigation measures.

Overall the management systems in place are considered robust as they relate to traceability, principally because of the requirement for federally-permitted vessels to complete the Vessel Trip Report (VTR) and the relevant information captured in this form. In order for the fishery to demonstrate provenance certain information from the VTR needs to be passed on to point at which Chain of Custody starts, for more details on the required information See Section 5.3 Eligibility to Enter Further Chains of Custody.

Table 25. Main stages of the supply chain and relevant tracking and tracing at each step.

Stage	Information Captured
Pre-capture	Document: Scallop declaration. Vessels participating in the Scallop Access Area Program must comply with the trip declaration requirements (See Figure 35). This form requires LAGC-permitted vessels to declare what area they will fish in: Regular access trip, Special Access Trip, Northern Gulf of Maine (NGOM federal, NGOM state only) and gear (dredge or trawl). For the Limited Access permit it also requires information on the area that fishing will occur.
Capture of product	Document: Fishing Vessel Trip Report (VTR) The owner/operator of a vessel with a federal permit for Atlantic sea scallop is required to submit VTRs monthly. VTRs are required, whether the vessel is fishing in state or federal waters. Each VRT has a serial number unique to each trip. For a form of the VRT see Figure 36. The VTR includes the following information:

	• VTR serial number • Vessel name and USCG or State Registration • NMFS Vessel Permit Number • Date and Time Sailed/ Landed • Gear: Gear Code, Gear Characteristics, soak time • Area (Chart Area, latitude, longitude). • Species code: code of each species caught. Protected species mush also be reported in the VTR. • Kept/discarded: hail weight (pounds) of each kept/discarded species • Dealer NMFS dealer permit number and date of sale • Offloading port. A vessel needs to complete a new VTR each time it changes: chart area (inshore or offshore), gear type, mesh/ring size. A partial copy of the VTR with the following information is passed on to the federal dealer to whom the vessels sells their catch: • VTR serial number • Vessel name and registration • NMFS Vessel Permit Number • Date and Time Sailed • Date and Time Landed Copies of fishing log reports must be kept on board the vessel and available for review for at least 1 year, and must be retained for a total of 3 years after the date the fish were last possessed, landed, and sold.
On-board processing	All scallops are shucked at sea and landed fresh. There are no at-sea transfers of scallops between vessels.
Pre-Landing	**Document**: **Scallop Pre-Landing Notification** LACG IFQ and NGOM vessels must send a Vessel Monitoring System (VMS) Scallop Pre-Landing Notification form at least 6 hours before arrival on the way back to port, or immediately after fishing ends if less than 6 hours before arrival. For an example of a form see Figure 35 Forms must include the:

	• Operator's permit number; • VTR serial number recorded from that trip's VTR; • Estimated Amount of scallop meats and/or bushels to be landed; • Estimated time and date of arrival in port; • Port City and State at which the scallops will be landed; and • Whether any scallops were caught in the NGOM.
Product Unloading	Document: Dealer Report Federally permitted vessels may only sell their catch of federally managed species to federally permitted dealers. A dealer means any person who receives fish for commercial purposes (other than solely for transport on land). Transfer of product to a dealer is not considered purchase of fish/change of ownership. Receipt for commercial purposes involves material handling of fish to add value to the product. Purchase of fish involves the transfer of funds and receipts. One of the permitted wholesale dealers is the Whaling City Seafood Display Auction in New Bedford, Massachusetts. A list of dealer permits can be found here: https://www.greateratlantic.fisheries.noaa.gov/aps/permits/data/index.html All seafood dealers permitted by NOAA Fisheries Service Greater Atlantic Region with reporting requirements must report trip-level reports for all species purchases on a weekly basis to NOAA Fisheries Service. Each trip dealer report must include: • Dealer name and permit number • Vessel name and permit number or hull number (state registration or USCG documentation number) • Date of purchase or receipt • Vessel Trip Report Serial Number • Amount of each species • Port and state where the fish were landed Points of Landing The main port for scallop landings is New Bedford, MA, followed by Cape May and Newport News. The greatest number of limited access vessels have New Bedford in MA and Cape May in NJ as their home port, while general category vessels are more evenly distributed and their home ports also include Point Judith, RI, Gloucester, MA, Boston, MA, and Barnegat Light, NJ. Any registered dealer with a federal scallop permit may receive eligible product.
Product Transport	**Document: Bill of Lading** is issued by a transporter of goods and usually contains: the date of shipping, name of the carrier/transporter, the name and address of the sender and the receiver, product quantity, product description (may include lot number or a VTR unique code)

Product sale and first change of ownership	**Document: Purchase Order/Invoice:** These documents at the point of first change of ownership typically include, at a minimum: product description, date, name of seller and buyer.

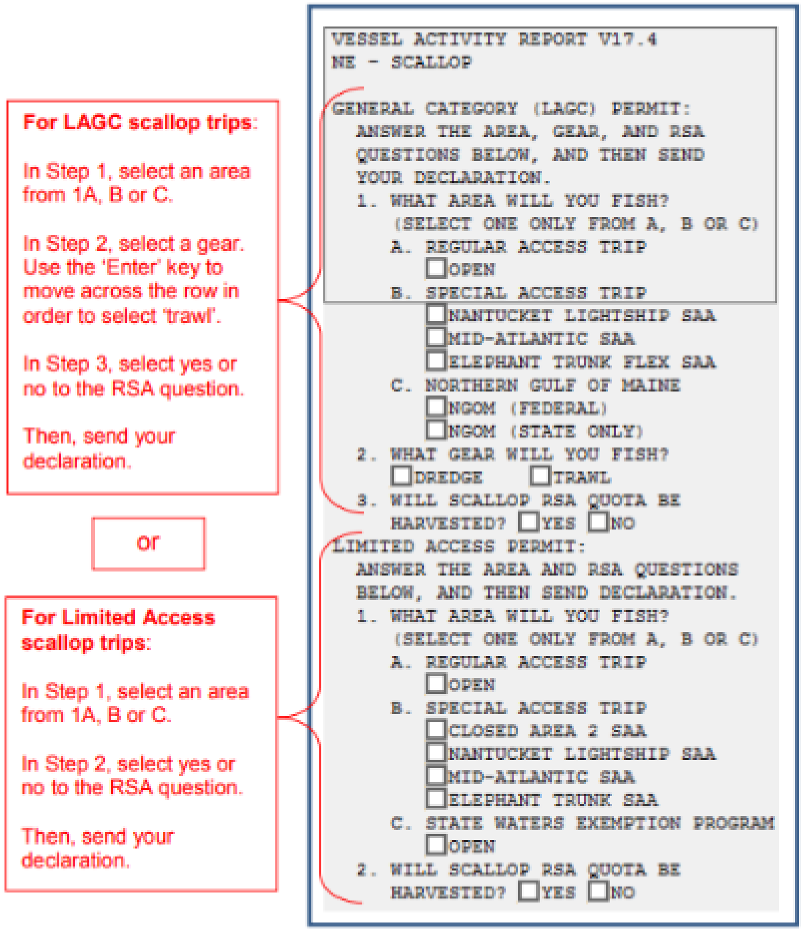


Figure 35. Example of Scallop declaration. Reproduced from NOAA 2017a.

FISHING VESSEL TRIP REPORT

NOAA Form No. 88-30
OMB No. 0648-0212
Expires 6/30/2019

VTR Serial Number: 12345678

1. Vessel Name	2. USCG Documentation or State Registration	3. NMFS Vessel Permit Number

4. Date and Time Sailed	5. Date and Time Landed
Date: ____ / ____ / ____ (MM DD YY) Military Time: ____ : ____ (HH MM)	Date: ____ / ____ / ____ (MM DD YY) Military Time: ____ : ____ (HH MM)

6. Trip Type – check one box and record the number of crew including the captain. Party/Charter must also include the number of anglers.

☐ Commercial: # of Crew ______ ☐ Private Recreational – Private use of a federally permitted vessel # of Anglers ______ ☐ Party: # of Crew ______ # of Anglers ______ ☐ Charter: # of Crew ______ # of Anglers ______

COMPLETE A NEW FORM FOR EACH DIFFERENT CHART AREA, GEAR TYPE OR MESH/RING SIZE USED ON A TRIP.

7. Gear Code	8. Mesh/Ring Size	9. Gear Quantity	10. Gear Size	11. Fishing Depth (Fathoms)	12. Number of Hauls

13. Chart Area	14. Latitude	15. Longitude	16. Tow / Soak Time
	____ : ____ DEGREES MINUTES	____ : ____ DEGREES MINUTES	____ : ____ HOURS MINUTES

17. Species Code	18. Kept	19. Discarded	20. Dealer Permit Number	21. Dealer Name	22. Date Sold MM/DD/YY	23. Offloading Port for each species City	State

Figure 36. Copy of Vessel Trip Report.

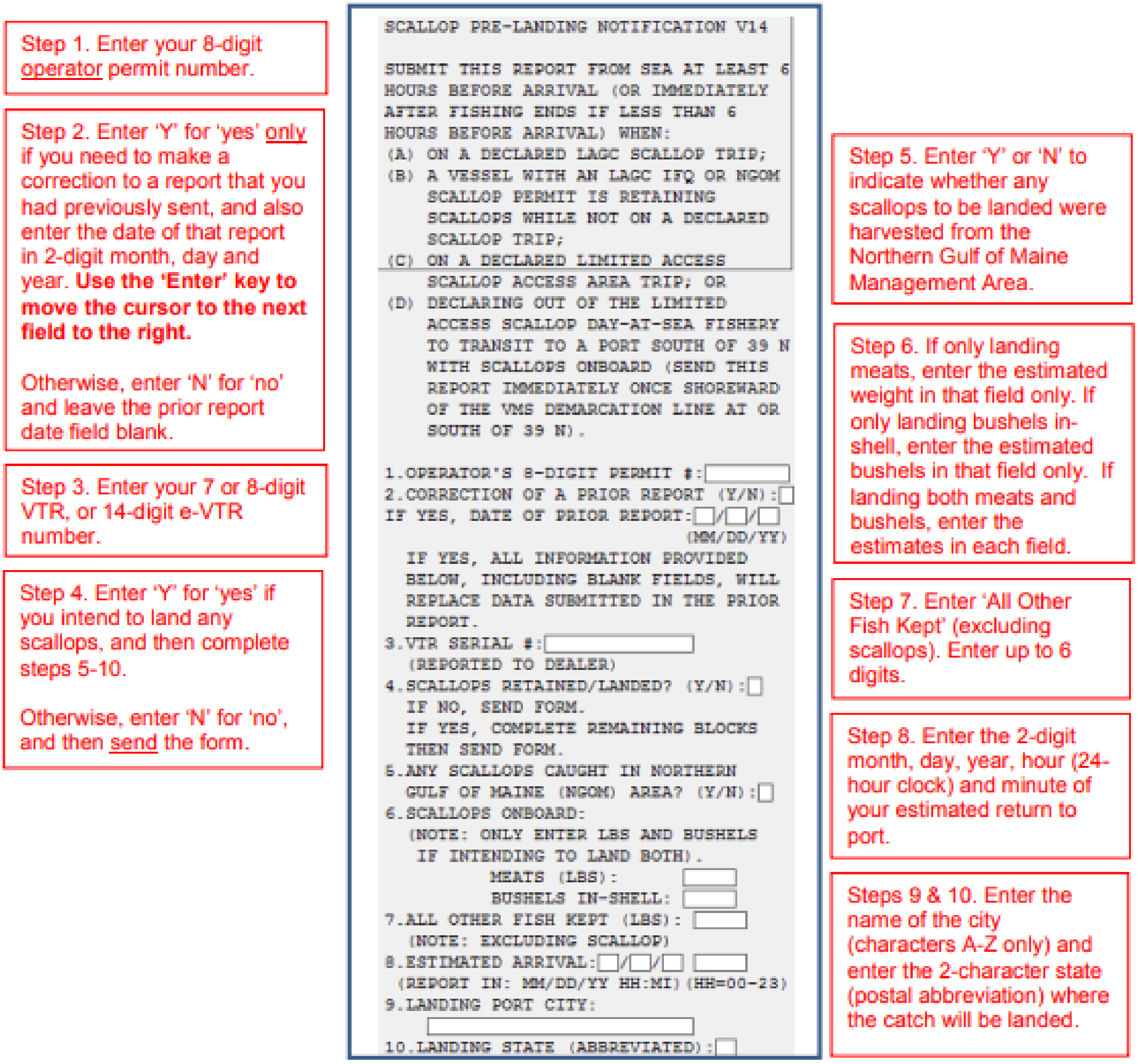


Figure 37. Example of VMS Scallop Pre-Landing Notification. Reproduced from NOAA 2017a

Table 26. Traceability Factors within the Fishery:

Traceability Factor	Description of risk factor if present. Where applicable, a description of relevant mitigation measures or traceability systems (this can include the role of existing regulatory or fishery management controls)
Potential for non-certified gear/s to be used within the fishery	There are federal scallop permit categories that allow the use of otter trawl to target sea scallops and that are NOT part of the UoA: Category C LAGC permits are for vessels permitted to land and sell up to 40 pounds of scallop meat per trip while fishing for other species. There are 242 permits under this category as of 2016. For this category allocated an overall 0.5% of the total projected annual scallop catch. Category 7 LA permit authorizes to use trawl net for full-time vessels. There are 51 permits under this category as of 2016.

	Category 8 LA permit authorizes to use trawl net for part-time vessels. There are zero permits under this category as of 2016. Category 9 LA permit authorizes to use trawl net for occasional vessels. There are zero permits under this category as of 2016. Existing regulatory or fishery management controls: the amount of catch allowed for these permit categories is relatively small. All vessels under these categories are required to complete their VTR which includes information on gear type used. Because some individually-permitted vessels hold both a limited access and a limited access general category permit[9], the NMFS Vessel Permit Number is not sufficient to determine the permit category for the trip and information on gear type is necessary to assure provenance back to the UoC.
Potential for vessels from the UoC to fish outside the UoC or in different geographical areas (on the same trips or different trips)	The UoC extends only to federal waters. As noted previously, individually-permitted vessels may hold permits for several fisheries, including both federal and state permits. There is in place an "State Waters Exemption" rule (NMFS 2017a) for the scallop fishery, which allows some federal permit holders to also fish for scallop in the Maine and Massachusetts state waters.[10]. Additionally, smaller vessels fishing in the federal waters of the Northern Gulf of Maine (NGOM) are part of the UoC. However, once the TAC for the NGOM area is reached, these vessels can continue to fish in state waters, which is not part of the UoC. Potential Risk: A vessel in "State Waters Exemption" or NGOM Program fishes in both state and federal waters on a same trip. The risks of an exempt vessel from fishing in state and federal waters in the same trip is very low a vessel issued any a federal scallop permit is required to complete a VTR for every fishing trip, whether the vessel is fishing in state or federal waters. The VTR form includes information on fishing area and a vessel needs to complete a new VTR each time it changes chart area (inshore or offshore). This information allows tracing product back to the UoC. Inaccurate reporting of catch by statistical area may occur as a result of underreporting the number of statistical areas fished. This can be mitigated via verification with VMS data and data collected by at-sea fisheries observers. As noted, on PI 3.2.3 reporting of fishers is an important component. *Potential Risks (2) A vessel fishing in the NGOM area also fishes in Program fishes in both state and federal waters on a same trip:*
Potential for vessels outside of the UoC or client group fishing the same stock	As result of permit structure there is no risk that vessels outside of the UoC fishing the scallop stock in federal waters.

[9]Code of Federal Regulations: 648.4(a)(2) (I)Limited access permit restrictions. A vessel may be issued a limited access scallop permit in only one category during a fishing year.

[10] This exemption allows vessels holding both a Massachusetts or Maine state scallop permit and a LAGC-IFQ or LAGC NGOM permit to be allowed to continue fishing in their respective state waters once the federal Total Allowable Catch for the NGOM has been fully harvested. There are four IFQ-permitted vessels with Maine state-waters permits. There are 12 vessels LAGC IFQ and NGOM-federally permitted vessels that also hold a Massachusetts state-waters permit. Out of which only six fish in federal waters. There are 35 vessels with NGOM-federally permitted vessels that have Maine as their home port state, and thus are presumed to also hold a Maine state-waters permit.

Risks of mixing between certified and non-certified catch during storage, transport, or handling activities (including transport at sea and on land, points of landing, and sales at auction)	Federally permitted vessels cannot sell to non-federally permitted dealers. However, because federally permitted dealers (including audit house and processing plants) may receive product from state licensed vessels or from trawl vessels there is a risk of mixing of product from the UoC with non-certified catch from either vessels using trawl gear or fishing in state waters. Existing regulatory or fishery management controls: as noted previously the VTR requirements provide information on gear type and fishing areas, which provide the information that allows to trace product back to the UoC.
Risks of mixing between certified and non-certified catch during processing activities (at-sea and/or before subsequent Chain of Custody)	Not an applicable risk because processing activities do not take place at sea.
Risks of mixing between certified and non-certified catch during transhipment	Not an applicable risk because transshipment activities do not take place at sea.
Any other risks of substitution between fish from the UoC (certified catch) and fish from outside this unit (non-certified catch) before subsequent Chain of Custody is required	No other risk of substitution beyond the ones identified above.

5.3 Eligibility to Enter Further Chains of Custody

The team has concluded and determined that the product originating from the UoC will be eligible to enter further certified chains of custody and be sold as MSC certified or carry the MSC ecolabel. The first point of sale (change of ownership) occurs at the sale of product (transfer of funds and receipts) from a vessel from the UoA to one of the processing plants or federally-permitted dealers that are part of the ASA client group.

If a member of the client group buys the product directly from a vessel, either at a client group facility or at a remote offloading site, the change of ownership then takes place when the product is offloaded from the vessel and Chain of Custody commences at that point.

In the case of product purchased from a UoA vessel by a federally-licensed dealer[11] that is not a member of the client group, and the product is subsequently sold to a member of the client group, the fishery certificate will cover such dealer in this trading operation, such that CoC will begin at the point of change of ownership to a member of the client group. The assessment team considers that interim dealer operations described above may be included in the scope of the fishery certificate on the basis that transfer of product to a dealer is considered receipt of fish for commercial purposes and not purchase of fish/change of ownership. Receipt for commercial purposes involves material handling of fish to add value to the product; while purchase of fish involves the transfer of funds and receipts.

As described on Table 26 there is small volume of product caught by vessels outside the UoA (trawlers or fishing in state waters) which may also be landed at the same landing points as the product originating from the UoA, leading to a minor risk of mixing. The client group is responsible for demonstrating provenance to the UoC, i.e. that the scallop was caught by vessel that is within the scope of the UoA and that meets the following criteria in order to enter Chain of Custody:

Sourced from a vessel holding one of the following permits (*NOTE not all permits are part of the UoA See Table 27*) AND a trip in federal waters

- Category 2 LA permit
- Category 3 LA permit
- Category 4 LA permit
- Category 5 LA permit
- Category 6 LA permit
- Category A LAGC permit
- Category B LAGC permit

The product may **ONLY** enter Chain of Custody when the client group members are able to demonstrate provenance to vessels in the permitted permit categories and from federal/offshore waters. Because the copy of the VTR provided to the dealer includes only basic operational information, in order for the client group to demonstrate provenance of product to the UoA, information should also be provided on gear and fishing area,

[11] Eligible product may be landed at any licensed dealer with a permit for Scallop. The New Bedford Auction House is considered a permitted dealer. A current list of dealers may be found on the GARFO Dealer Permit website: https://www.greateratlantic.fisheries.noaa.gov/aps/permits/data/index.html.

this may include an alternative complete copy of the VTR (e.g. one labeled for dockside monitoring) or a screenshot of the electronic VMS reports.

Table 27. Gear Codes in the UoA for the scallop fishery (NOAA 2018a).

Code (from VTR Field #7)	Gear Description
Part of the UoA	
DRS*	Standard scallop dredge
DSC*	Standard scallop dredge with chain mat
DTS*	Scallop turtle deflector dredge
DTC*	Scallop turtle deflector dredge with chain mat
Not part of the UoA	
OTT	Otter trawls (OTF) that are joined together in a "Twin Trawl" configuration.
TTS	Used for otter trawls, shrimp (OTS) that are joined together in a "Twin Trawl" configuration

- * All of these are considered to be "New Bedford style scallop dredges"

5.4 Eligibility of Inseparable or Practicably Inseparable (IPI) stock(s) to Enter Further Chains of Custody

No IPI stocks were identified.

6. Evaluation Results

6.1 Principle Level Scores

Table 28. Final Principle Scores

Final Principle Scores	
Principle	**Score**
Principle 1 – Target Species	96.3
Principle 2 – Ecosystem	87.7
Principle 3 – Management System	96.0

6.3 Summary of PI Level Scores

Table 29. Summary of Performance Indicator Scores and Associated Weights Used to Calculate Principle Scores.

Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in	Score
				Either		
Outcome	0.5	1.1.1	Stock status	0.5	0.25	100
		1.1.2	Reference points	0.5	0.25	100
		1.1.3	Stock rebuilding			
Management	0.5	1.2.1	Harvest strategy	0.25	0.125	100
		1.2.2	Harvest control rules & tools	0.25	0.125	85
		1.2.3	Information & monitoring	0.25	0.125	85
		1.2.4	Assessment of stock status	0.25	0.125	100
Retained species	0.2	2.1.1	Outcome	0.333	0.0667	100
		2.1.2	Management	0.333	0.0667	100
		2.1.3	Information	0.333	0.0667	100
Bycatch species	0.2	2.2.1	Outcome	0.333	0.0667	80
		2.2.2	Management	0.333	0.0667	100
		2.2.3	Information	0.333	0.0667	80
ETP species	0.2	2.3.1	Outcome	0.333	0.0667	80
		2.3.2	Management	0.333	0.0667	85
		2.3.3	Information	0.333	0.0667	80
Habitats	0.2	2.4.1	Outcome	0.333	0.0667	80
		2.4.2	Management	0.333	0.0667	85
		2.4.3	Information	0.333	0.0667	80
Ecosystem	0.2	2.5.1	Outcome	0.333	0.0667	80
		2.5.2	Management	0.333	0.0667	90
		2.5.3	Information	0.333	0.0667	95
Governance and policy	0.5	3.1.1	Legal & customary framework	0.25	0.125	100
		3.1.2	Consultation, roles &	0.25	0.125	100
		3.1.3	Long term objectives	0.25	0.125	100
		3.1.4	Incentives for sustainable fishing	0.25	0.125	100
Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2	0.1	100
		3.2.2	Decision making processes	0.2	0.1	100
		3.2.3	Compliance & enforcement	0.2	0.1	70
		3.2.4	Research plan	0.2	0.1	100
		3.2.5	Management performance	0.2	0.1	90

Scoring comparison to initial assessment and SA (2013-2018) and rationale where there are changes 2018

Principle 2

Principle 2, summary principle level score: 88

Table 30: Principle 2, PI level scores, at the re-assessment in 2018 (Source: Assessment Team)

Component	Performance Indicator (PI)		IA/SA Score	RA Score	Change Reason
Retain species	2.1.1	Outcome	80	100	No main retain species in 2018
	2.1.2	Management strategy	95	100	No main retain species in 2018
	2.1.3	Information/ Monitoring	90	100	No main retain species in 2018
Bycatch species	2.2.1	Outcome	80	80	N/A
	2.2.2	Management strategy	90	100	Updated spatial management and reductions in bycatch species
	2.2.3	Information/ Monitoring	75/ 80	80	Winter Flounder is no longer overfished/overfishing. It is not a main bycatch species in SBRM 2018. Stock assessment report available for groundfish managed species.
ETP species	2.3.1	Outcome	90	80	N/A
	2.3.2	Management strategy	90	85	N/A
	2.3.3	Information strategy	80	80	N/A
Habitats	2.4.1	Outcome	60	80	Recovery of benthic habitat species identified in SBRM and observer coverage is known (<10yrs). Local scale overlap, footprint and habitat encountered in the fishery is known from quantification of bycatch.
	2.4.2	Management strategy	70/	85	Updated spatial management to rotational closed-access areas options through the approved EFH-Omnibus amendment 2-FW29. Mandatory use of VMS of the fleet, and fishers utilise cartography tools including bathymetry maps to target areas of high scallop density facilitating minimum contact with seabed habitat ecology/communities
	2.4.3	Information	90	80	N/A
Ecosystem	2.5.1	Outcome	60	80	Risks and impact to key ecosystem elements are known. Recovery of benthic habitat communities identified in SBRM and observer coverage is known (<10yrs). Local scale overlap, footprint and habitat encountered in the fishery is known from quantification of bycatch.
	2.5.2	Management	80	90	N/A
	2.5.3	Information	95	95	N/A

The re-scored PIs for the closed conditions carried over from the initial full assessment can be found in Appendix 8: Condition Tables and Justifications.

6.4 Summary of Conditions

Table 31. Summary of Conditions

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/NA)
1	By the fourth surveillance the fishery provides evidence to demonstrate that: (a) A monitoring, control and surveillance system has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules. AND (b) Sanctions to deal with non-compliance are consistently applied and thought to provide effective deterrence.	PI 3.2.3	No

6.5 Recommendations

Principle 2

- The Client encouraged to work with
    1. Respective national fisheries management authority to improve accuracy of catch/bycatch composition data from being indicative to accurate.
    2. the commercial fishing industry and respective fisheries management authority to improve frequency and accuracy of recording interaction with species listed under the ESA, MMPA, and VME, perhaps within VTR or other fishing record system.
    3. commercial fishing industry, Observer program, and respective fisheries management authority to improve accuracy of identity (species or taxa level) for invertebrate catch/bycatch composition data from being indicative to accurate, as well as to include location (GPS/VMS) coordinates with catch/bycatch records; which could provide higher resolution local and finer scale interpretation of the spatial interaction (overlap) of the fishery and invertebrates catch/bycatch species; and to facilitate targeted management interventions for VME bycatch invertebrate species (VME - sponges or corals).

6.6 Determination, Formal Conclusion and Agreement

With the information available, the US Sea Scallop fishery meets the minimum requirements for being awarded certification which includes meeting the SG60 for all Performance Indicators and an average score of 80 or greater for all three Principle scores. The team discussed the merits and shortfalls of the fishery and by consensus recommended certification for the fishery.

In accordance with MSC Certification Requirements, the report was made open to objection by interested parties for a period of 15 working days from publication of the Final Report with the positive certification determination. Please see the Final Report Stakeholder Announcement on the MSC website for the announcement detailing the objection period and dates: https://fisheries.msc.org/en/fisheries/us-atlantic-sea-scallop/@@assessments. No objections were received. The SCS Certification Board reviewed the report, Performance Indicator rationales, peer reviews and stakeholder comments and agreed with the Assessment

Team's recommendation to re-certify the fishery. The certificate will be awarded after the Public Certification Report is posted to the MSC website.

7. References

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8. Appendices

Appendix 1. Scoring and Rationales

Performance Indicator Scores and Rationale

Principle 1

Evaluation Table for PI 1.1.1

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	Guide post	It is likely that the stock is above the point where recruitment would be impaired.	It is highly likely that the stock is above the point where recruitment would be impaired.	There is a high degree of certainty that the stock is above the point where recruitment would be impaired.
	Met?	Y	Y	Y
	Justification	Sea scallops (*P. magellanicus*), are benthic macroinvertebrates that inhabit depths generally between 18 and 110 m on the continental shelf of the northwest Atlantic from Newfoundland and the Gulf of St. Lawrence (Canada) to Cape Hatteras (North Carolina, US). Sea scallops have a highly aggregated spatial distribution within their geographical range. Areas were abundance is sufficient to support a commercial fishery are known as “fishing grounds,” and within each fishing ground there is usually some regions where the abundance is higher than elsewhere, which are referred to as 'beds'. The primary US fishing grounds are on the Mid-Atlantic Bight (MAB) and Georges Bank (GBK) and to a much lesser extent on the Gulf of Maine (GOM) and Southern New England Shelf (NES). During the period 2000-2013, 64%, 33%, 2% and 1% of the landings were from MAB, GBK, NES, and GOM, respectively. Management is based on these four regional components; however, NES is considered to be part of the GBK region for assessment modeling purposes. According to Amendment 10 of the Atlantic Sea Scallop Fishery Management Plan, all sea scallops in the US EEZ belong to a single stock. Biologically, the sea scallops US stock is structured as a metapopulation. The four regional components (MAB, GBK, GOM, and NES) are coupled to a great extent with the biological stock structure (See Section 3.3.2 Biology: sea scallop stock structure – metapopulations). The metapopulation operates at the macroscale level (10s-100s km) of the fishing grounds, while the subpopulations (or local populations) operates at the mesoscale level (1-10 km) of the beds. Each regional component, but NES, can be considered one metapopulation with several subpopulations in each. In the case of NES, it is not clear if it can be viewed as another metapopulation, therefore, the management decision of joining it with GBK for assessment modeling purposes it is following the biological stock structure. The North Gulf of Maine (NGOM) scallop management area is an area in the GOM in federal waters, which is part of the UoA. The rest of the GOM is not part of the UoA. Although all sea scallops in the US EEZ are managed as a single stock, assessments focus on two regional components; GBK (including NES) and MAB, accounting for 99% of the landing in the period 2000-2013. A stochastic yield model (SYM) is used since SARC-50 (2010) to estimate reference points for each of the two regional components, and afterward, results are combined for the stock as a whole. The NGOM (<0.5% of the UoA landings in the period 2008-2017; NEFSC 2014) is data-poor relative to the rest of the scallop resource and is not included		

		within the assessment model. There are no reference points for this area, although a TAC for LA and LAGC fleets has been set for 2018 for the first time (NOAA 2018). A forward projecting size-structured estimation model (CASA) was used for estimation of biomass, fishing mortality and recruitment. Growth in the model was based on growth increment data from shell growth ring analysis. Three models were used, one each for the open and closed portions of GBK, and a model for the MAB. Reference points and their uncertainty are calculated for GBK, MAB and the whole stock using the SYM model (Stochastic Yield Model), which was specially developed for use with sea scallops (NEFSC 2014). The SYM model combines per-recruit calculations with stock-recruit relationships to estimate yield curves. It uses Monte-Carlo simulations to propagate the uncertainty in per recruit and stock-recruit calculations while calculating yield curves. Uncertainty in natural mortality is also considered in the model. Although the SYM model is separate from CASA (model used for estimation of biomass, fishing mortality and recruitment), efforts were made to make the two models as compatible as possible (NEFSC 2014). B_{MSY} and F_{MSY} reference points are estimated at points where the (trimmed mean) yield curve peaks (see section 3.3.3 Stock Assessment: Reference points). Trimmed mean yield curves have a maximum at F_{MSY} = 0.3 on GBK, and F_{MSY} = 0.74 in the MAB, with corresponding MSY values of 9,148 and 15,737 mt meats. Estimates for the combined stock are F_{MSY}= 0.48, MSY=23,798 mt, and B_{MSY} = 96,480 mt. The current reference point value F_{MSY} is 0.48 (NEFSC 2014). The estimated fishing mortality for the whole stock in 2016 was 0.12 (NEFMC 2018a), which is 4 times below the F_{MSY} reference point. Therefore, overfishing was not occurring in 2016. Same results are reached when looking at each of the two populations separately; in GBK F2016/ F_{MSY}= 0.30 and MAB the ratio is 0.47. Thus, overfishing is not occurring in neither of the two populations. The F for the whole stock, GBK and MAB have been below the F reference points since approximately 2005 (see section 3.3.3 Stock Assessment: Reference points). Based on SYM model results from the last SARC report, there is only about a 12% chance that F_{MSY} is below 0.32 for the whole stock (NEFSC 2014). F2015 was 0.16 well below F_{MSY} even taken into account the uncertainty in estimating the parameters. Moreover, landings per unit effort (LPUE) have increased considerably since the mid-90s as the stock recovered; LPUE has a positive trend in GBK and MAB, and have risen to historically high levels in the most recent years (see section 3.3.2 Biology: Historical Landings). Another relevant circumstance is that ~40% of the productive scallop grounds on GBK and Nantucket Shoals were closed to both groundfish and scallop gear during most of the time since 1994. Portions of the closed areas have been reopened to limited fishing during 1999-2000 and since 2004. In the MAB, there have been four rotational scallop areas that are generally closed for 2-3 years and then reopened to allow harvesting. The areas are closed again after observations of strong recruitment until the small scallops grow to fishable size. This measure leaves a significant proportion of the spawning biomass out of being fished. Based on the above results we consider that for the whole stock and the population of GBK and MAB there is a high degree of certainty that the stock is above the point where recruitment would be impaired. NGOM is the area of the GOM that falls in federal waters. There are no formal reference points derived for the NGOM. Landings in the NGOM are low relative to the rest of the scallop stock. NGOM was surveyed in 2016 and 2017 and a harvestable density similar to what would be seen on GBK has been found (NEFMC 2018a). Dvora Hart suggested that the GB reference point of 0.3 could serve as a reasonable estimate for F_{MSY} in the NGOM. We believe this is an adequate and precautionary interpretation since Maine's state fishery is also managed under F_{MSY} = 0.3 and has found it to be an accurate estimate, and this level of harvest has allowed for sustained fishing and area rotation (NEFMC 2018a). 2018 exploitable biomass was estimated at approximately 461 mt. The 2018 NGOM TAC was estimated at a conservative level using a F_{TARGET} of 0.18, which is less than 70% of the F_{MSY} in GBK. It is important to note that, although there are no reference points for NGOM; 1) NGOM landings represents <0.5% in the period 2008-2017, 2) NGOM biomass is not taken into account for calculating the whole stock biomass, 3) NGOM stock status seems to be healthy (based on 2016 survey, biomass in the area has increased substantially since the area was last surveyed in 2012), 4) Only a fraction

		of the NGOM was surveyed, so it is expected that the real exploitable biomass was higher than the estimated 461 mt, 5) NGOM TAC is set on a very precautionary F=0.18 based only on the surveyed areas when it is expected that F_{MSY} for the area could be around 0.3 and 6) Based on the 2018 TAC approved for NGOM (90.7 mt) and the ACT approved for the rest of the UoA fishing grounds (40,434 mt) (NEFMC 2018a), NGOM represents only 0.2% of expected landings. Based on the above we consider that there is a high degree of certainty that the UoA unit stock is above the point where recruitment would be impaired, and therefore SG100 is meet.		
b	**Guide post**		The stock is at or fluctuating around its target reference point.	There is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years.
	Met?		Y	Y
	Justification	Adding to all the rationale given in SIa, we will focus here on the second reference point $B_{TARGET} = B_{MSY}$. According to the Amendment 10 overfishing definition (NEFMC 2003), sea scallops are overfished when the survey biomass index for the whole stock falls below ½ B_{TARGET}, with B_{TARGET} set equal to B_{MSY}. According to FW29, the estimated combined stock biomass in 2016 was 381,957 mt, which is four times above B_{MSY} reference point value and almost 8 times the $B_{THRESHOLD}$= ½ B_{MSY}. Thus, the stock is not overfished based on either criterion. Same results are reached when looking at each of the two populations separately; in GBK current stock status is 4.9 times over relative target reference point, and 3.3 in MAB. Thus, none of the two populations are overfished. It can be concluded that the chances that the stock is overfished is very small, probably less than 1% (NEFSC 2014). Moreover, the whole stock biomass has been fluctuating above its target reference point since the early 2000s. GBK population has been as well fluctuating above its target reference point since the early 2000s, and since 2013 in MAB (see section 3.3.3 Stock Assessment: Reference points). Based on the above, and taking into account all the particularities of the NGOM presented in SIa, we consider that there is a high degree of certainty that the UoA stock unit has been fluctuating around its target reference point, or has been above its target reference point, over recent years, and therefore SG100 is meet.		
References		NEFSC 2014, NOAA 2018, NEFMC 2018a		

Stock Status relative to Reference Points			
	Type of reference point	**Value of reference point**	**Current stock status relative to reference point (Year 2016)**
Target reference point	WHOLE STOCK F_{MSY}	0.48	0.12/F_{MSY}= 0.25
	GBK F_{MSY}	0.30	0.09/ F_{MSY}= 0.30
	MAB F_{MSY}	0.74	0.35/ F_{MSY}= 0.47
	WHOLE STOCK B_{TARGET}=B_{MSY}	96,480 (mt, meats)	381,957/B_{MSY}= 4.0
	GBK B_{TARGET}=B_{MSY}	46,000 (mt, meats)	225,000/B_{MSY}= 4.9
	MAB B_{TARGET}=B_{MSY}	47,500 (mt, meats)	155,000/B_{MSY}= 3.3

Limit reference point	WHOLE STOCK $B_{THRESHOLD}$= ½ B_{MSY} GBK $B_{THRESHOLD}$= ½ B_{MSY} MAB $B_{THRESHOLD}$= ½ B_{MSY}	48,240 (mt, meats) 23,000 (mt, meats) 23750 (mt, meats)	381,957/ ½ B_{MSY}= 7.9 225,000/½ B_{MSY}= 9.8 155,000/½ B_{MSY}= 6.5	
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.1.2

<table>
<tr><td colspan="2">PI 1.1.2</td><td colspan="3">Limit and target reference points are appropriate for the stock</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td>Guidepost</td><td>Generic limit and target reference points are based on justifiable and reasonable practice appropriate for the species category.</td><td>Reference points are appropriate for the stock and can be estimated.</td><td></td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td></td></tr>
<tr><td>Justification</td><td colspan="3">Reference points, limits and targets, and their uncertainty, are calculated for GBK, MAB and the whole UoA stock using the SYM model (Stochastic Yield Model); those fishing grounds account for 99% of the landing in the period 2000-2013. Target reference points are B_{MSY} and F_{MSY} and limit reference point is ½ B_{MSY}.

Reference points are appropriate for the stock. The management regional components (MAB, GBK, GOM and NES) are coupled to a great extent with the biological stock structure of sea scallops, and there are not only reference points for the whole stock unit, but also for the GBK and MAB components, were 99% of the fishery takes place. In the assessments previous to 2010, F_{MAX} and B_{MAX} were used as proxies for F_{MSY} and B_{MSY} (NEFSC, 2014). However, with the recent increase in selectivity in the fishery, yield per recruit curves have become increasingly flat making F_{MAX} more difficult to estimate and sensitive to small changes in parameters (NEFSC 2014). The 2010 assessment used the Stochastic Yield Model (SYM) to make direct estimates of F_{MSY} and B_{MSY}. This is a great improvement on previous assessments as SYM includes information on uncertainty among the parameters and incorporates stock-recruitment relationships (see “Appendix 6 Supporting Information P1” for stock-recruitment relationships in GBK and MAB).

In order to estimate the reference points a comprehensive set of information is monitored every year on the life cycle of sea scallops and the fishery performance with a great spatial heterogeneity, and therefore different life cycles parameters, natural mortality, recruitment estimates, … are used for different areas, giving a robustness to the estimations. Moreover, probability distribution of the reference points is also given.

For estimating the reference points, per recruit calculations are known to depend on a number of parameters that each carry a level of uncertainty. All these parameters are collected (NEFSC 2014):
1) Shell height/meat weight parameters a and b
2) Natural mortality rate M
3) Fishery selectivity parameters α and β
4) The cull size of the catch and the fraction of discards that survive
5) The level of incidental fishing mortality, i.e., non-catch mortality caused by fishing.

SYM and CASA models are continuously updated for status determination and development of new reference points as in 2010, 2014 and 2018 at the Stock Assessment Workshop. Therefore, this is considered the best available science to set MSY in order to prevent overfishing.

The reference points are appropriate for the stock and can be estimated (see Appendix 6 Supporting Information P1 for a graph of the probability distribution of the reference points). The use of these reference points have a demonstrated history of reducing harvest levels when the resource collapsed in middle 90s, which in combination with other</td></tr>
</table>

		management measure, brought the fishery to their best records in term of biomass in this last years. The fishery therefore meets the SG80.		
b	**Guidepost**		The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity.	The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity following consideration of precautionary issues.
	Met?		Y	Y
	Justification	The limit reference point is set at ½ B_{MSY}, is considered to be precautionary and above the level at which there is appreciable risk of impairing reproductive capacity. It is clear from the history of the fishery that the reference points used allowed for a rise in abundance, biomass and recruitment in the fishery spread around all the fishing grounds (NEFMC 2018). We therefore consider that SG 100 is meet.		
c	**Guidepost**		The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome.	The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.
	Met?		Y	Y
	Justification	The target reference point is set at B_{MSY} and takes into account biological and management uncertainties and ecological role of the stock. A constant monitoring of information and re-examination of the parameters and reference points is done. This constant re-examination allowing not only updated information but also more and more spatial structure of that information, in consonance with the biology of the species, supports the application of a precautionary approach as required by SG100. It should not be forgotten that ~40% of the productive scallop grounds on GBK and Nantucket Shoals were closed to both groundfish and scallop gear during most of the time since 1994. Portions of the closed areas have been reopened to limited fishing during 1999-2000 and since 2004. In the MAB, there have been four rotational scallop areas that are generally closed for 2-3 years, and then reopened to allow harvesting. The areas are closed again after observations of strong recruitment until the small scallops grow to fishable size. This measure leaves a big proportion of the spawning biomass out of being fished. Protection of the scallop resource in closed and rotation areas should therefore have the additional benefit of ensuring that potential recruitment in open areas is preserved. This seems to be truth since there is a robust set of papers that prove how the system of rotational closures that has evolved in the MAB and GBK region have 1) improved yield-per-recruit, 2) allowed the buildup of spawning biomass, and 3) contributed to increased recruitment directly downstream (see section 3.3.2 Biology: sea scallop stock structure – 2 Stock response to management measures). The SYM (Stochastic Yield Model) is used to estimate reference points. This model explicitly takes into account parameter uncertainty, including key uncertainties in natural mortality		

		and stock-recruit relationships, when estimating maximal sustainable yield (MSY) and the associated biomass and fishing mortality reference points B_{MSY} and F_{MSY}. SYM uses Monte-Carlo simulations to propagate the uncertainty in per recruit and stock-recruit calculations while calculating yield curves (NEFSC 2014). Growth is modelled using stochastic growth matrices and per recruit calculations depend on a number of parameters (see Si a) that each carry a level of uncertainty. Taking into account uncertainty (instead of relying solely on point estimates) is the basis of a precautionary approach. Moreover, the current status of the fishery in 2017 with a biomass four times over the B_{MSY} and a fishing mortality four times below the F_{MSY} demonstrates the high level of precautionary management in this fishery. Based on the above, the fishery meets all the SG100 requirements.		
d	**Guidepost**		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.	
	Met?		Not relevant	
	Justification	Sea scallop, *Placopecten magellanicus*, is not considered to be a key low trophic level species, as it does not meet the criteria set out in paragraph CB2.3.13 of the MSC Certification Requirements v1.3. See section 3.3.7 Key Low Trophic Level Considerations for a rationale supporting this consideration.		
References		NEFSC 2014, NEFMC 2018a		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.1.3

PI 1.1.3		Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Where stocks are depleted rebuilding strategies, which have a reasonable expectation of success, are in place.		Where stocks are depleted, strategies are demonstrated to be rebuilding stocks continuously and there is strong evidence that rebuilding will be complete within the specified timeframe.
	Met?	(Y/N)		(Y/N)
	Justification	NA		
b	**Guidepost**	A rebuilding timeframe is specified for the depleted stock that is the shorter of 30 years or 3 times its generation time. For cases where 3 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	A rebuilding timeframe is specified for the depleted stock that is the shorter of 20 years or 2 times its generation time. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	The shortest practicable rebuilding timeframe is specified which does not exceed one generation time for the depleted stock.
	Met?	(Y/N)	(Y/N)	(Y/N)
	Justification	NA		
c	**Guidepost**	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within a specified timeframe.	There is evidence that they are rebuilding stocks, or it is highly likely based on simulation modelling or previous performance that they will be able to rebuild the stock within a specified timeframe.	
	Met?	(Y/N)	(Y/N)	
	Justification	NA		
References		[List any references here]		
OVERALL PERFORMANCE INDICATOR SCORE:				
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.1

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.	The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points.
	Met?	Y	Y	Y
	Justification	The management of this fishery is based on assessing the two major components of the stock (GBK and MAB independently, and then combined to evaluate the stock as a whole. The Canadian stocks, offshore and inshore, are both also MSC certified, but the approach is different and the stock is separated into several scallops' production-fishing areas which are assessed separately and an annual TAC is set for each area. Both approaches have shown robust rebuilding of the Canadian and US stocks in the last 15-20 years. US offshore components seem to be more connected than the Canadian offshore stock units which are mainly self-recruiting (Blyth-Skyrme et al. 2015). Based on Tian et al. (2009a) when two or more fishery stocks are connected, as are sea scallops on GB and in the MAB, a global management plan considering both stocks, as in the US scallop fishery, can be more efficient than those targeting a single stock. The harvest strategy is the combination of monitoring, stock assessment, harvest control rules and management actions or tools. All these elements work together in the fishery to keep the sea scallop stock at levels consistent with reference points. The harvest control rule, the area rotation system and the procedure for setting the reference points are responsive to the state of the stock and are adapted based on pre-agreed rules. The monitoring is extensive and collects all kind of fishery dependent and fishery independent information which is analyzed and presented annually at the Council (see SI c for more information). A dynamic, spatially explicit, size-based stock assessment model (CASA) is used to estimate biomass, abundance and fishing mortality for the GBK and MAB components of the fishery and these are then combined to assess the stock as a whole. CASA uses commercial landings, commercial kept and discarded shell heights from port and sea sampling, shell height/meat weight data and growth increment data from analysis of shell growth rings to model transitions between shell height classes over annual time intervals. The model is then tuned using the data from the independent surveys. The area rotation plan is fundamental in the management of this fishery. The system monitors the status of several areas to check if any of the criteria for rotation area management is met in any area. If so, a closure or re-opening is proposed. A set of measures and tools (effort controls such as the DAS and trip allocations; trip catch limits, restrictions on crew size; gear restrictions on dredge ring size and twine top mesh size) are also part of the harvest strategy and are followed for implementing strategies under Principles 1 or 2. The harvest control rule allows adjusting catches (projected landings) to current exploitable biomass; annual resource survey information and stock assessment projections of growth and mortality are used to set annual harvest allocations. ACT is calculated based on the projections and the target reference points after a set of considerations and precautionary		

		steps. This ACT is finally transformed into DAS, which are easily enforced. The harvest control is therefore designed to achieve stock management objectives reflected in the target and limit reference points. In P1.1.1 table we have demonstrated that it has actually succeeded on this, keeping the scallop stock in a very healthy state, thanks to the rest of the management measures (mainly the area rotation system) used for implementing this strategy. Based on the above, we consider that the harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points, therefore, SG100 is met.		
b	**Guidepost**	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	Y	Y	Y
	Justification	The status of the stock is well above the target levels. Fishing mortality for the whole stock has been below the F_{TARGET} (F_{MSY}) reference points since approximately 2005 (in 2016 F was 4 times below F_{TARGET}) and the stock biomass has been fluctuating above B_{TARGET} (B_{MSY}) reference point since the early 2000s (in 2016 B was four times higher than B_{TARGET}). The current stock status is the best evidence showing that the harvest strategy is achieving its objectives relative to maintain stocks at target levels. The area rotation plan allows the fishery targeting to areas of high density of scallop (therefore >95% of the catch is scallops) with low quantities of incidental bycatch species (<5%). Along the years, the performance of the harvest strategy has been fully evaluated on a non-stop process, and changes have been approved and implemented when considered necessary through framework adjustments to management measures and amendments. The PDT has to prepare a Stock Assessment and Fishery Evaluation (SAFE) Report at least every two years that provides the information and analysis needed to evaluate potential management adjustments. The stock assessment is reviewed every 3-4 years (2004, 2007, 2010, 2014 and 2018) during the Northeast Regional Stock Assessment Workshops (SAW) followed by independent experts from the Stock Assessment Review Committee (SARC). SARC does research recommendations that are followed up and incorporated in the assessment as possible. Based on the above we consider that the performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels, therefore SG100 is met.		
c	**Guidepost**	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Y		
	Justification	The monitoring is extensive and collects all kind of fishery dependent and fishery independent information which is analyzed and presented annually at the Council. Independent surveys (NMFS survey and industry-based surveys from the RSA program) are done every year for determining the exploitable biomass. These surveys are also used in the area rotation system to decide when an area gets closed and when re-opened. The rotation system is aimed to protect sets of juvenile scallops when detected by the surveys. If juveniles are detected the area is closed for a number of years until the areas re-open when scallops are larger, producing more yield-per-recruit. Except for the access areas within the groundfish closed areas on Georges Bank, all other scallop rotational areas have flexible		

		boundaries, this allows extensions and closed areas like the Closed Area II extensions that have been closed for the past two years to protect juvenile scallops. Rotational closures are much more likely to improve scallop yield than permanently closed areas, by increasing yield per recruit in addition to possible benefits from increased fertilized egg production (Hart 2005). Fishery dependent data is also monitored; effort, landings, LPUE, discard and incidental mortality are monitored and analyzed every year. Life cycle information is also monitored. Patterns of seasonality in weight of the meats and gonads, and timing of spawning is followed. Shell height-meat weight relationships based on survey data and growth rates are regularly updated in each of the GBK (13 subareas) and MAB (8) subareas (NEFSC 2014). Estimates are growth are used for the estimation of OFL and ACL. A monitoring is in place and it expected to determine whether the harvest strategy is working, therefore SG60 is met.		
d	**Guidepost**			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			Y
	Justification	The harvest strategy has been periodically reviewed and improved as necessary through framework adjustments to management measures and amendments. Many changes were done in order to improve the management and adjust to the stock status. We will cite here the main one, but see P3 section *3.5.3 National Level Management: Fisheries Regulations to Meet Objectives* for a full description. - 1994 - Amendment 4: crew size limited to nine persons (later reduced to seven) and shucking and sorting machines were prohibited. Georges Bank closed areas to scallop and groundfish fishing to help protect depleted groundfish resources. - 1998 - Amendment 7: final regulations reduce the fishing mortality rate in the Atlantic sea scallop fishery to eliminate overfishing and to rebuild the biomass in accordance with the requirements of the Sustainable Fisheries Act. Closed to scallop fishing inn MAB in order to protect high concentrations of juvenile scallops. - 2001 - Framework 14: Sea Scallop Area Access Program - 2004 - Amendment 11: new management program for the GC scallop fishery, including a new program for LAGC IFQ - 2004 - Framework 16: Scallop Access Areas within Northeast (NE) multispecies Closed Area I (CAI), Closed Area II (CAII), and the Nantucket Lightship Closed Area (NLCA). - 2005 - Framework 17: vessel monitoring systems (VMS). - 2006 - Framework 18: seasonal closure of the Elephant Trunk Access Area (ETAA) is implemented to reduce potential interactions between the scallop fishery and sea turtles, and to reduce finfish and scallop bycatch mortality. - 2007 - Amendment 12: Standardized Bycatch Reporting Methodology (SBRM) Omnibus Amendment (SBRM Amendment) implementation. - 2011 - Amendment 15: implement annual catch limits (ACLs) and accountability measures (AMs) to bring the Scallop FMP into compliance with requirements of the Magnuson-Stevens Act as reauthorized in 2007. - 2012 - Framework 23: minimizes impacts on sea turtles through the requirement of a turtle deflector dredge. - 2014 - Framework 25: sets specifications for the Atlantic sea scallop fishery for fishing year 2014, including DAS allocations, individual fishing quotas, and sea scallop access area trip allocations. - 2017 - Framework 29: splits of the NGOM TAC between the LA and LAGC components.		

		From this resume it is clear that the harvest strategy has been periodically reviewed regarding several different topics and improved as necessary, therefore SG 100 is met.		
e	**Guidepost**	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
	Justification	Sharks are not the target species in this fishery, therefore SI e is not relevant.		
References		Tian et al. 2009a, Blyth-Skyrme et al. 2015		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.2

<table>
<tr><td colspan="2">PI 1.2.2</td><td colspan="3">There are well defined and effective harvest control rules in place</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td>Guidepost</td><td>Generally understood harvest rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached.</td><td>Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.</td><td></td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td></td></tr>
<tr><td>Justification</td><td colspan="3">There is a well-defined set of harvest controls in the US sea scallop fishery that are consistent with the harvest strategy: effort controls such as the DAS and trip allocations; trip catch limits, restrictions on crew size (which limits on-board processing power); gear restrictions on dredge ring size and twine top mesh size; area rotation, and the most important one, setting the annual catch target (ACT) for the LA fleet and the sub-Annual Catch Limit (sub-ACL) for the LAGC fleet.

The LA fleet harvests scallops in open areas under a days-at-sea (DAS) allocation per year. To set DAS the calculated LA open area landings are divided by projected landings per day times the total number of LA vessels. There is a Limited Access allocations and trip possession limits for Scallop Access Areas (Closed Area I (CAI), Nantucket Lightship–South (NLS-S), Nantucket Lightship–West (NLS-W), and Mid-Atlantic Access Areas (MAAA). Allocations for all of the access areas (108,000 lb for LA vessels full time and 43,200 for LA part-time) could be taken in as many trips as needed, so long as the vessels do not exceed the possession limit (18,000 lb for full-time LA and 14,400 lb for part-time LA) on each trip. The LAGC IFQ fishery is allocated a fleet wide total number of access area trips in the CAI, NLS-S, NLS-W and MAAA. Crew size and mesh size were two measures used during the 90s to limit the effort in the fishery, and are fixed since 2005 in 7 persons as maximum crew size and 10” minimum twin top (see subsection Stock response to management measures in section 3.3.2 Biology: Sea scallop Stock structure).

Amendment 10 (NEFMC 2003) introduced area rotation: areas that contain beds of small scallops are closed before the scallops experience fishing mortality, then the areas re-open when scallops are larger. Which areas should close, for how long, and at what level they should be fished, were described and analyzed in Amendment 10. An area would close when the expected increase in exploitable biomass in the absence of fishing mortality exceeds 30% per year, and re-open to fishing when the annual increase in the absence of fishing mortality is less than 15% per year.

For setting the ACT and sub-ACL, an Overfishing Limit (OFL) (threshold reference point) is calculated every year using the fishing mortality rate associated with OFL (F_{MSY} the mortality above which overfishing is occurring) and calculated in the last stock assessment (current OFL from SAW-SARC 2014 is F=0.48) and the estimates of the available biomass. OFL is equivalent to the catch associated with an overall fishing mortality rate of 0.48. The ACT is derived from the Annual Catch Limit (ABC) (set at F=0.38). The scallop fishery catch limits are derived from the annual determination of the exploitable biomass surveys (combination of NMFS survey (NOAA monitoring) and industry-based surveys from RSA program). The ACT is therefore linked to the biomass available and changes every year. The ACT is finally transformed into DAS; DAS allocations are determined by distributing the portion of the limited access ACT (as reduced by access area allocations), and dividing that amount among vessels in the form of DAS calculated by applying estimates of open area landings per unit</td></tr>
</table>

		effort (LPUE) projected through the specifications or framework adjustment processes used to set annual allocations. This harvest control rule allowed to adjust F to current exploitable biomass. Moreover, the fishery has two kinds of closed areas: 1) areas completely closed to scallop fishing year-round to reduce impacts on EFH and/or groundfish mortality 2) areas temporarily closed (rotational areas) to scallop vessels to protect small scallops until a future date In the NGOM the HCR is different. The NGOM TAC is specified separately from the ACL for the directed scallop fishery (LA and LAGC). Because resource in the NGOM is currently not incorporated in the overall assessment of the scallop resource, the TAC for this area is treated separately as long as it is within the overall OFL for the resource. The NGOM 2018 TAC was set by applying a fishing mortality rate of F = 0.18 using only the projected exploitable biomass (based on 2017 surveys) on Jeffreys Ledge and Stellwagen Bank (this is where the bulk of the fishing in the NGOM will take place) for fishing years 2018 and 2019. Therefore, applying a precautionary approach, a portion of the NGOM biomass is not taken into account for setting the TAC. Although no reference points are set for this area, it is thought that F=0.3 could serve as a reasonable estimate for F_{MSY} (NEFMC 2018a), therefore using an F=0.18 for setting the TAC is a very precautionary approach (80% of F_{MSY} is generally considered a precautionary approach). This TAC is then exploited between LAGC and LA fleet. Each fleet would operate independently under its own portion of the TAC. The NGOM management area would remain open for each component until their TAC is projected to be harvested, even if the other component has reached its TAC (NEFMC 2018a). LAGC operates in the NGOM under the same rules as outside, but the LA fleet since 2018 cannot fish in the NGOM while participating in the DAS program; the LA share of the NGOM TAC is available through RSA compensation fishing only. Moreover, all NGOM trips should take place exclusively in the NGOM, which would allow the Council and NMFS to fully understand total removals from the area. Other relevant harvest control measures in the NGOM are the groundfish closed areas and the habitat closures (see Figure 27 from section 3.3.6 NGOM). Based on the above, we consider that well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached, therefore SG80 is met.		
b	**Guidepost**		The selection of the harvest control rules takes into account the main uncertainties.	The design of the harvest control rules takes into account a wide range of uncertainties.
	Met?		Y	N
	Justification	The main uncertainties of the harvest strategy and the harvest control rule are the unpredictability of recruitment, the mortality of post-recruits (primarily due to predation, discard and incidental mortality), and variations in scallop growth and condition. All these factors, mainly recruitment and predation events, can vary considerably, both spatially and from year to year. The annual biomass and abundance surveys are therefore fundamental to keep track of this variability. Other factors as discards and incidental mortality are also annually assessed. The information derived is used in the harvest control rule. FW29 clearly specifies the uncertainties in the harvest control rule (see section *3.3.4 Management: Harvest Control Rule* for a OFL/ABC flowchart as example of how catch limit value are set in the scallop FMP). To account for scientific uncertainty, ABC is set at a level with an associated F that has a 25-percent probability of exceeding the F associated with OFL (i.e., a 75-percent probability of being below the F associated with the OFL). Applying the scientific uncertainty ABC=ACL is set from the OFL. The ACL is then reduced based on estimated discards and its associated uncertainty. Incidental catch uncertainty is also taken into account in the next step. ACL is then split between fleets: LA sub-ACL and LAGC IFQ sub-		

		ACL. In the last step LA sub-ACL is reduced based on management uncertainty to get sub-ACT. To account for management uncertainty, the ACT has an associated F that has a 25-percent chance of exceeding ACL. Scientific uncertainty relies on parameter uncertainty, including key uncertainties in natural mortality and stock-recruit relationships. The major sources of management uncertainty in the LA fishery are carryover provisions (including the 10 DAS carryover provision), and the ability to fish unused access area allocation within the first 60 days of the following fishing year (NEFMC, 2018a). US sea scallop's assessment uses forward projecting size-structured models. CASA model estimates fishing mortality, biomass and recruitment. SAMS model the scallop fishery and population for forecasting on a relatively fine regional scale, in order to help understand the effects of area management such as closing and reopening areas to fishing. Finally, SYM model estimates reference points. All these three models take into account a great amount of information and incorporates many sources of uncertainty in their parameters (see section 3.3.3 Stock assessment). Results from model performance analysis (measures of dispersion of the biomass and fishing mortality estimates, sensitivity analyses and likelihood profiles) related to the uncertainties in the assessment can be found in the "Appendix 6 Supporting information P1". One of the most unpredictable factor is recruitment. In the last SAW-SARC59 workshop promising results were shown. A tentative relationship was found between food supply (phytoplankton) and recruitment in MAB. Additionally, the spatio-temporal distribution of the sea star *Astropecten americanus*, one of the main juvenile sea scallop, appear to correlate to the spatio-temporal patterns of scallop recruitment (NEFSC 2014). Moreover, for sea scallops, there is no evidence of a clear stock-recruitment relationship (Stokesbury et al. 2016). Connectivity between the banks and the potential contribution of Canadian stocks can contribute to the uncertainties relating to stock structure. The available evidence from hydrodynamics, larval distribution and population genetic studies, supports the spatial management based on the regional components (MAB, GBK, GOM) that it is coupled to a great extent with the biological stock structure of sea scallops. Although GBK is predominantly self-sustaining MAB and GOM are subject from sporadic pulses of recruitment from outside the region although uncertainty on this connectivity is still relevant. But, whatever the origin of the larvae it will be manifest in the subsequent recruitment, and it will be assessed in the annual biomass and abundance surveys. Thus, uncertainty due to connectivity between the banks is assessed as a (probably small) component of recruitment variability. Several uncertainties related to the metapopulation structure remains unsolved (e.g. it is not clear if NES region can be viewed as another metapopulation or is part of the BGK metapopulation, the relative contribution of larvae from GBK Canada to GBK US, there is a lack of genetic studies within US scallop sites, …). (for a more detailed information on this see section "3.3.2 Biology: Stock structure - Metapopulation) It is also not totally understood the reasons for some sudden mass mortalities observed, but it has been suggested to be related to predation (e.g. starfish) and temperature or a synergy between both (Dickie and Medcof 1996, Brand 2006), or even to incidental fishing mortality (Stokesbury et al. 2011), although this was very controversial (Hart and Shank 2011). Climate change mainly due to temperature increase and ocean acidification is expected to have a negative impact on Atlantic sea scallops; slower growth under ocean acidification, higher predation of juveniles at higher temperatures, reduction of habitat due to warming, shift towards northwards and into deeper waters (Hare et al 2016). But, so far, many of this predictions remains unsolved since there is a lack of studies. The design of the harvest control rules takes into account the main uncertainties, therefore SG80 is met, but not a wide range of uncertainties are considered (climate change effects, massive mortality events, metapopulation structure), and there is no evidence (e.g. through

		simulation testing) that the HCRs are robust to all these uncertainties, therefore SG 100 is not met.		
c	**Guidepost**	There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.
	Met?	Y	Y	Y
	Justification	The current exploitation levels for the whole stock (2016 is the lasts year available) are well below the reference points. Fishing mortality is four times below the F at MSY (F_{2016}=0.12 when F_{MSY}=0.48) and biomass in 2016 is 381,957 mt, four times more than the biomass at MSY (96,480 mt). When looking separately to the MAB and GBK values, results are similar (see Stock status relative to reference points section on PI 1.1.1 table). This low fishing mortality and high biomass has been behaving like this for several years (see section 3.3.3 Stock Assessment: Reference points): - fishing mortality for the whole stock, GBK and MAB regions have been below the F reference points since approximately 2005 - the biomass for the whole stock has been fluctuating above its target reference point since the early 2000s. GBK population has been as well fluctuating above its target reference point since the early 2000s, and since 2013 in MAB There is clear evidences that shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules, therefore SG100 is met.		
References		Brand 2006, Dickie and Medcof 1996, Hare et al 2016, Hart and Shank 2011, NEFMC 2003, NEFSC 2014, NEFMC 2018a, Stokesbury et al. 2011, 2016		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.3

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Y	Y	Y
	Justification	There is very good information available on stock structure, productivity, fleet composition, stock abundance and fishery removals for all management units of the fishery. We will give a summary here but see section *3.3.5 Information & Monitoring* for a complete description of the comprehensive range of information available that is directly and indirectly (more related to the long-term) to the harvest strategy and management system. The system around the sea scallop fishery regularly collects a great amount of information. Besides the official monitoring focused on the fishery management, there is a great panoply of scientific institutions, NGOs and government agencies… that produces information that could be relevant to the harvest strategy, in the short and long-term. Stock abundance and fishery removals are regularly and systematically monitored (see SIb for detailed information). Regarding the fishery monitoring, a key element supporting this is the Research Set-Aside (RSA) program from the NEFMC in collaboration with the NEFSC-NOAA which funded with approximately $3 million per year for supporting research projects (https://www.nefsc.noaa.gov/coopresearch/rsa_program.html). Important information supporting applied research is collected through this program, which facilitates fishery management decisions and the harvest strategy by improved understanding of stock status as well as scallop fishing interactions with commonly encountered species. Main focus of research in the scallop RSA program is industry-based surveys of access areas (highest priority), scallop meat quality research including impacts of diseases, life cycle, distribution, density dependence, area rotation and natural mortality (high priority), bycatch research (high priority), interaction with turtles (medium priority) and scallop biology projects aimed at understanding recruitment processes (reproduction, timing of spawning, larval and early post-settlement stages), growth patterns and meat and gonad weight (medium priority), NEFSC-NOAA considers that the scallop RSA Program has a demonstrated track record for supporting applied research that supports fishery management decisions and improving stock assessments. Many projects have worked on the sea scallop stock structure in the recent years from different angles (genetics, ocean hydrodynamics, larval dispersal and connectivity…). A lot it is known but there are still some gaps of information mostly concerning the larval dispersal and populations connectivity in the MAB. These projects are fundamental for adapting the spatial management to the biological spatial structure of the stock. All aspects of the biology of sea scallops are well documented and information is available on the details of population biology and life cycle dynamics throughout the entire US unit stock. Fleet composition is monitored by NEFMC. The Greater Atlantic Region Permit Office issues fishing vessel, dealer, and commercial operator permits and fishing authorizations for fisheries along the Atlantic Coast. FW29 (NEFMC 2018a) provides an analysis of the trends in permits by permit plan and category for the period 2009-2015.		

		The National Marine Fisheries Service (NMFS), through its regional branch, GARFO, monitors the landings of the sea scallop fishery. All Federal scallop permits must use vessel monitoring systems – VMS (a satellite communications system used to monitor fishing activities) and a pre-landing reporting through VMS is required. Weekly landings reports are available at: https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticseascallop.html. The implementation of closed and rotation areas has been subject to a strong analysis in order to assess its impact on scallop abundance, biomass and recruitment of nearby areas and regions. In section 3.3.2 Biology: Sea scallop Stock structure (Metapopulations) we have reviewed the amount of information available. In order to implement the rotation area closures there is a monitoring in place to collect and analyze the information needed to decide when an area gets closed and when re-opened. Identification of appropriate closure areas would be based on either a combination of NMFS survey (NOAA monitoring) and industry-based surveys (from RSA program). Information on the species, habitats and ecosystem impacted by the fishery relevant to the sea scallop fishery harvest strategy is collected. The fishery has an Industry Funded Scallop (IFS) Observer Program (NEFOP - Northeast Fisheries Observer Program) that monitors scallop fleet (dredge and trawl gears) bycatch (fish and invertebrates), collect biological information to inform stock assessments (total catch, discards and biological samples), monitor any interactions of the scallop fishery with ETP species, benthic community and also collect economic variables and gear configuration. Moreover, The Northwest Atlantic Marine Ecoregional Assessment (http://www.conservationgateway.org) is a project run by The Nature Conservancy that synthesized comprehensive data on species distributions, geology, oceanography, chemistry, biology and social science to create maps and other tools that reveal conservation priorities and inform management decisions. Economic and social information is collected for the scallop fishery including trends in landings, revenues, prices and foreign trade. This information is collected and yearly analyzed by the NEFMC discriminating vessels by permit category. Trends in landings, prices, revenues, allocations, effort, LPUE, meat count, size composition and price by scallop market category are shown on frameworks. See FW 29 for updated information (NEFMC 2018a). Information on the impact of climate change on sea scallops is available and could be taken into account in the future on the harvest strategy. An Integrated assessment model for the sea scallop fishery has been built, with participation of NEFSC staff, for dealing with ocean acidification and warming (Cooley et al. 20015). In a recent Northeast Fish and Shellfish Climate Vulnerability Assessment (Hare et al. 2016), sea scallops were considered to have a high biological sensitivity to climate change, a high climate exposure and a moderate potential change of species distribution. This is a work done by NOAA NMFS scientists and the report states that results will inform research and management activities related to understanding and adapting marine fisheries management and conservation to climate change and decadal variability. Based on the above we consider that a comprehensive range of information including some that may not be directly related to the current harvest strategy, is available, and therefore SG 100 is meet.		
b	**Guidepost**	Stock abundance and fishery removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Y	Y	N

	Justification	All of the data sets used by the harvest control rules in the stock assessment model are monitored with high frequency and a high degree of certainty. Amendment 15 established a method for accounting for all catch in the scallop fishery and included designations of Overfishing Limit (OFL), Acceptable Biological Catch (ABC), Annual Catch Limit (ACL), and Annual Catch Targets (ACT) for the scallop fishery, as well as scallop catch for the Northern Gulf of Maine (NGOM), incidental, and state waters catch components of the scallop fishery. The scallop fishery assessment determines every year the exploitable biomass, including an assessment of discard and incidental mortality (mortality of scallops resulting from interaction, but not capture, in the scallop fishery). In order to determine the exploitable biomass a monitoring on the stock abundance is done based on a combination of NMFS surveys and industry-based surveys funded through RSA. A scallop survey using a lined scallop dredge and a random-stratified design has been conducted by NEFSC every year since 1979 on GBK and the MAB. A drop camera survey is also conducted annually since 2003 on GBK and the MAB, using a systematic grid design. A towed camera HabCam survey was also used for the first time during 2011-2013 on GBK and 2012-2013 in the MAB; since then HabCams are used annually. In the last 2017 all sea scallop areas were surveyed with the three different methods (dredges, drop camera and HabCam); GBK is divided in 12 areas, MAB is divided in 9 areas and NGOM in 7 areas. Data collected from these surveys have been useful in estimating localized scallop abundance, size distribution, recruitment, and exploitable biomass. Biomass and shell height frequencies are projected with SAMS for the next 2 years from the survey using different mortalities and growth parameters. Overall removals are estimated from landings, discards, incidental mortality, and natural mortality. The National Marine Fisheries Service (NMFS), through its regional branch, GARFO, monitors the landings of the sea scallop fishery. All Federal scallop permits must use vessel monitoring systems – VMS (a satellite communications system used to monitor fishing activities) and a pre-landing reporting through VMS is required. Weekly landings reports are available at: https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticseascallop.html. Vessels are required to report landings after each trip, and dealers are required to report landings each week. Incidental fishing mortality (mortality of scallops that interact with the gear but are not caught) is highly uncertain; incidental fishing mortality on small scallops was estimated as 0.2 times fully recruited fishing mortality on Georges Bank, and 0.1 times fully recruited fishing mortality in the Mid-Atlantic (NEFSC 2014). Sea scallops are sometimes discarded on directed scallop trips because they are too small to be economically profitable to shuck, or because of high-grading, particularly during access area trips. Total discard mortality of discarded scallops (including mortality on deck) is uncertain but has been estimated as 20% in previous assessments. However, discard mortality may be higher in the MAB during the summer due to high water and deck temperatures, and likely strongly depends in both regions on fishing practices. Natural mortality for all but the largest size group was estimated at 0.16 for GBK and 0.2 for the MAB. Nevertheless, there is no direct estimate of M available for the MAB, so it was estimated based on the ratio of the growth coefficient K to M, which is generally regarded as a life history invariant that should be approximately constant for similar organisms. There is also uncertainty in the status of the NGOM since there are no reference points for the region and more research should probably be needed in order to clarify connectivity between populations, mainly in the MAB, and the influence of the Canadian stocks. The harvest control rule stablished several buffers to set the Annual Catch Target (ACT) from the OFL. SARC 59 approved an OFL equivalent to F = 0.48, but to account for scientific uncertainty, ABC is set at a level with an associated F that has a 25-percent probability of exceeding the F associated with OFL, so F=0.38. The catch associated to ABC (=ACL) is reduced by an estimation of discards, incidental catch, observer and RSA set asides. And the obtained sub-ACL is again reduced for the LA fleet for management uncertainty. We considered that stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and several indicators are

		available and monitored with sufficient frequency to support the harvest control rule. Therefore, SG80 is met. But, not all information required by the harvest control rule is monitored with high frequency and a high degree of certainty (e.g. incidental fishing mortality, discards, natural mortality, NGOM), therefore, SG100 is not met.		
c	**Guidepost**		There is good information on all other fishery removals from the stock.	
	Met?		Y	
	Justification	There is observer coverage for other fisheries that may catch scallops as bycatch and information on discard rates is recorded through the observer program. The observers program for northeastern US fisheries (run by NEFSC) uses a Standardized Bycatch Reporting Methodology (SBRM) (https://www.nefsc.noaa.gov/fsb/SBRM/) to assess the amount and type of bycatch. Last report was delivered in 2017 (Wigley and Tholke 2017) Annual reports are available, including observer sea-day allocations and discard estimations. The SBRM monitors the amount of sea scallops kept and discarded from several gears: longline, handline, otter trawl, scallop trawl, shrimp trawls, gillnets, purse seine, scallop dredge, pot and traps and others. Only trawls and scallop dredge has relevant sea scallop removals, although all are monitored and taken into account in the harvest control rule. Scallop dredges are the main gear type in all regions (95.6% of all landings in the period 2000-2013 based on Table B4.1 of SAW-SAR59 Report – NEFSC 2014), although some scallop fishing is done with otter trawls (3.4%), mainly in the MAB, and a small fraction of the catch in the Gulf of Maine comes from divers. Recreational catch is negligible (NEFSC 2014). We consider that there is good information on all other fishery removals from the stock, and therefore, SG80 is met.		
References		NEFSC 2014, Cooley et al. 20015, Wigley and Tholke 2017, NEFMC 2018a		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.4

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost		The assessment is appropriate for the stock and for the harvest control rule.	The assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery.
	Met?		Y	Y
	Justification	In the US, there has been a great deal of research on the stock assessment of sea scallops, which is considered one of the best assessments in the nation (Stokesbury et al. 2016). Sea scallops in U.S. waters have been assessed using forward projecting size-structured models since 2007. Fishing mortality, biomass and recruitment are estimated using a version of the CASA (Catch-At-Size Analysis) model based on Sullivan et al. (1990). Forecasts are done using the SAMS (Scallop Area Management Simulator) model, which models the scallop fishery and population on a relatively fine regional scale, in order to help understand the effects of area management such as closing and reopening areas to fishing. Reference points are calculated using the SYM model (Stochastic Yield Model, Hart 2013). All of these models were specifically developed for use with sea scallops. CASA is a forward projecting size-structured estimation model, used for estimating the biomass, fishing mortality and recruitment dynamic in MAB, GBK and NES and their uncertainty (although at the end NES is considered to be part of the GBK region for assessment modeling purposes). The model is strongly spatially explicit which is a must in order to incorporate the spatial heterogeneity of sea scallops along the US distribution range. In section “3.3.2 Biology” we have reviewed the variability in growth, mortality, recruitment, reproductive output, reproductive period, longevity, … and other life history traits. This variability is usually driven by latitude, depth, food availability, habitat, hydrographic conditions, … The CASA model captures much of this variability by allowing different mortalities depending on the regional component (M=0.16 in GBK and M=0.20 in MAB, and M for the plus group is most likely about 1.5 times that of smaller scallops), different shell height/meat weight relationships and regional differences of von Bertalanffy growth parameter (GBK, MAB, but also discriminating in GBK between closed and open areas). In 2016 CASA model was updated including survey and commercial data (Dvora Hart, personal communication, January 19th, 2018). In the line of capturing more variability, explorations were also made in incorporating density-dependent mortality on juvenile scallops into the CASA model in order to better model the population dynamics of large year classes (NEFSC 2014), since density-dependent processes in scallop metapopulations and particularly in sea scallops are likely to be significant during benthic stages (Orensanz et al. 2016). Besides the inputs we have mentioned above, CASA also needs the information of scallop’s density from the independent surveys to estimate the fishing mortality, biomass and recruitment. CASA performed well in simulation testing using the SAMS model as the operating model (Hart et al. 2013). Using simulated and real data, Hart et al. (2013) concluded that splitting Georges Bank into open and closed areas gave more stable and likely more precise results, probably. All three CASA models (GBK open, GBK closed and MAB) were run from 1975-2013. The assessment is appropriate for the stock and for the HCR. Casa outputs (mainly B and F) are compared with the reference points calculated from the SYM (Stochastic Yield Model) (F_{MSY} and B_{MSY}), for the whole stock and also for GBK and MAB. The SYM explicitly takes into		

		account parameter uncertainty, including key uncertainties in natural mortality and stock-recruit relationships. There is one component of the ecology of sea scallops that it can be argued that CASA and SYM are not taking into account; the possible impact of the Canadian populations (especially the one on GBK Canada). Under certain circumstances this contribution could be relevant (Gilbert et al. 2010). Nevertheless, as we reviewed on section "3.3.6 Other fisheries affecting the target stock", the impact of GBK Canada can be relevant depending on the hydrographic conditions and the contribution of the spring and fall spawning event. Because scallops are not very mobile when adults, the primary effect of the Canadian stock in US stock, is by means of recruits that were spawned in Canada and settle in the US part of GB. Nevertheless, a key aspect to understand this effect comes from the fact that sea scallops are relatively sedentary in the adult stage therefore it implies that Canadian management does not affect the achievement of optimum yield from adult scallops in US waters (NEFMC 2003). Moreover, SYM is a per-recruit model, it combines per-recruit calculations with stock-recruit relationships in order to estimate yield curves. Yield per recruit models estimates the expected lifetime yield and biomass from a cohort subjected to varying levels of fishing mortality, therefore the analysis starts once the scallops have settled, regardless of where they come from. We consider that based on the above the assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery, and therefore gets SG100.		
b	**Guidepost**	The assessment estimates stock status relative to reference points.		
	Met?	Y		
	Justification	CASA estimates Biomass and Fishing mortality for the whole stock, for GBK and for MAB, and can be directly compared with SYM model (Stochastic Yield Model) which also estimates reference points as F_{MSY}, B_{MSY} and ½ B_{MSY}. Moreover, although the SYM model is separate from CASA, efforts were made to make the two models as compatible as possible.		
c	**Guidepost**	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	Y	Y	Y
	Justification	The sea scallop assessment incorporates description of uncertainties in sources of data, and results (including but not limited to estimates of fishing mortality, recruitment, biomass, and status reference points) (see "Appendix 6 Supporting information P1"). The annual assessment using CASA model determines current stock status with a measure of the dispersion that account for uncertainty in data and estimations (abundance, biomass and fishing mortality) (Appendix 6.1). In order to evaluate the CASA model performance, several approaches have been taken for better describe the uncertainties in the assessment; comparisons with expanded survey data (empirical analysis), retrospective and sensitivity analyses as well as likelihood profiles. CASA models estimates are conservative; generally, CASA estimated abundance is lower than empirical abundance estimates (Appendix 6.4), while fishing mortality show the inverse pattern with CASA estimates generally higher than empirical. To test the sensitivity of the model outputs to key assumptions, CASA model runs were conducted with alternative assumptions regarding natural mortality, survey priors and incidental mortality (Appendix 6.6 and 6.7); variations in M had little effect on GBK Open and MAB runs, but a stronger effect on GBK Closed runs. The assumed level of incidental		

		mortality (0.2 in GBK and 0.1 in MAB) had little effect on model estimates of biomass. Finally, likelihood profile analysis was constructed for natural mortality (Appendix 6.3). CASA model estimates biomass and fishing mortality in relation to the reference points obtained from SYM model. SYM model uses Monte-Carlo simulations to propagate the uncertainty in per recruit and stock-recruit calculations while calculating yield curves (NEFSC 2014). The per-recruit calculations depend on a number of parameters (for details see section 3.3.3 Stock assessment: Biological reference points) that each carry a level of uncertainty. Probability distributions of the reference points estimates for B_{MSY} and F_{MSY} are available (see Appendix 6.9 Supporting Information P1). The harvest control rule also accounts for scientific uncertainty (associated with various parameters of the scallop resource assessments. To deal with this ABC is set at a level with an associated F that has a 25-percent probability of exceeding the F associated with OFL (i.e., a 75-percent probability of being below the F associated with the OFL) and management uncertainty (major sources of management uncertainty are carryover provisions including the 10 DAS carryover provision, and the ability to fish unused access area allocation within the first 60 days of the following fishing year). As shown above, the assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way, therefore SG100 is met.		
d	**Guidepost**			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			Y
	Justification	CASA model has been tested and shown to be robust. Outputs of abundance from CASA are tested with the independent surveys. It performed well in simulation testing using the SAMS model as the operating model (NEFSC 2014; Hart et al. 2013). An additional and simpler "empirical" modeling approach was used for comparison to CASA results. The models appeared to give good estimation for some years, but in the GBK closed and MAB models, estimates of abundance and biomass had poor diagnostics in years associated with very strong year classes. The current CASA model estimates from SARC59 (2014) can be compared to those from the last two benchmark assessments (SARC45 in 2007 and SARC 50 in 2010), and also updates of the SARC-50 model configurations through 2011 and 2012. While the estimates have been fairly stable, there has been a tendency for biomass and recruitment to be revised downward, and fishing mortality upward over time. CASA is not a metapopulation stock recruitment model. Those models are very complex to put in place in practice since have a great complexity, and there are usually big gaps of information for connecting the components. In this sea scallops' fishery, several metapopulations (in a broader sense) should be nested, and so far, there is probably not enough information to have matrices of connectivity between all metapopulations, and with subpopulations in each metapopulation. Nevertheless, in a project currently running on larval sources and connectivity within the Mid-Atlantic (Dvora Hart, personal communication, January 19th, 2018) the possibility of a metapopulation stock-recruitment model would be at superficially explored. Alternative hypotheses and assessment approaches have been rigorously explored: 1) internally by the NMFS-NOAA team in charge of the stock assessment and in collaboration with NEFMC Scientific and Statistical Committee (SSC), which serves as the primary scientific and technical advisory body to the Council and is made up of scientists that are independent of the Council. The result of that is the yearly improvements in the CASA, SYM and SAMS models. Moreover, the NEFMC has also a Fishery Data for Stock Assessment Working Group which explore the topic of how fishery dependent data (mainly CPUE and LPUE) can be used to inform stock abundance.		

		2) every 3-4 years (2004, 2007, 2010, 2014 and 2018) during the Northeast Regional Stock Assessment Workshops (SAW) reviewed by independent experts from the Stock Assessment Review Committee (SARC). SARC does research recommendations that are followed up and incorporated in the assessment as possible. Based on the above it is clear that the model is robust, and alternative hypotheses and assessment approaches have been rigorously explored, therefore SG100 is meet.		
e	**Guidepost**		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		Y	Y
	Justification	The US Atlantic sea scallop FMP is internally peer review annually by NMFS-NOAA through the Fish Stock Sustainability Index (FSSI) which provides a comprehensive indication of the sustainability of US fisheries using information across multiple stock status factors. Under this scheme the sea scallop FMP has a total of 4 points (maximum score a stock may have) (NMFS-NOAA, https://www.fisheries.noaa.gov/national/population-assessments/status-us-fisheries, accessed on 2018-04-05). Much more rigorously are the reviews done during the Stock Assessment Workshops (2004, 2007, 2010, 2014 and 2018). The Northeast Regional Stock Assessment Workshop (SAW) process has three parts (NEFSC 2014): 1) preparation of stock assessments by the SAW Working Groups. 2) peer review of the assessments by a panel of outside experts (Stock Assessment Review Committee - SARC) who judge the adequacy of the assessment as a basis for providing scientific advice to managers. Research recommendations are done by SARC on every SAW, and progress is followed on the next SAW. 3) a presentation of the results and reports to the NEFMC. Starting with SAW-39 (2004), the process was revised in two fundamental ways. First, the Stock Assessment Review Committee (SARC) became smaller panel with panelists provided by the Independent System for Peer Review (Center of Independent Experts, CIE; https://www.st.nmfs.noaa.gov/science-quality-assurance/cie-peer-reviews/index). Second, the SARC provides little management advice. Instead, Council and Commission teams (e.g., Plan Development Teams, Monitoring and Technical Committees, Science and Statistical Committee) formulate management advice, after an assessment has been accepted by the SARC. Starting with SAW-45 (2007) the SARC chairs were from external agencies, but not from the CIE. Starting with SAW-48 (2010), SARC chairs are from the NEFMC Science and Statistical Committee (SSC), and not from the CIE. Also at this time, some assessment Terms of Reference were revised to provide additional science support to the SSCs, as the SSC's are required to make annual ABC recommendations to the fishery management councils. SAW-59 (2014) uses *HabCam* surveys for the first time and GBK were assessed using separate CASA models for open and closed areas, instead of one model for the whole GBK as before. Last workshop SAW-65 (2018) was a very comprehensive one, and took place during three separated weeks in February, March and May 2018. SAW-65 report was not available by the time this assessment was done. Based on the internal and external regular peer reviews on the assessment, SG100 is meet.		
References		NEFSC 2014, Stokesbury et al. 2016, Orensanz et al. 2016		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Principle 2

Evaluation Table for PI 2.1.1

PI 2.1.1		The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Main retained species are likely to be within biologically based limits (if not, go to scoring issue c below).	Main retained species are highly likely to be within biologically based limits (if not, go to scoring issue c below).	There is a high degree of certainty that retained species are within biologically based limits and fluctuating around their target reference points.
	Met?	Y	Y	Y
	Justification	No retained species are identified based on the data from the Standardized Bycatch Reporting Methodology (SBRM) (2017) report on catch composition of the fishery. Although for some species a small proportion of catch was retained (i.e., monkfish, skate, fluke, winter flounder, surf clam) the proportions of retained catch were minimal relative to discarded volumes. Thus all species were classified as bycatch and dealt with in the bycatch scoring tables. If during the period of certification, the proportions of retained and discarded volumes for bycatch species were to change, then this PI would have to be reassessed. Since the UoA has no impact on this component it receives a score of 100 under the Outcome PI (CB3.2.1MSC CR v1.3)		
b	Guide post			Target reference points are defined for retained species.
	Met?			Y
	Justifica tion	At present, the team did not identify any retained species in the scallop dredge fishery. Since the UoA has no impact on this component, it receives a score of 100 under the Outcome PI (CB3.2.1MSC CR v1.3)		
c	Guidepost	If main retained species are outside the limits there are measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding of the depleted species.	If main retained species are outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding.	
	Met?	Y	Y	
	Justific ation	At present, the team did not identify any retained species in the scallop dredge fishery. Since the UoA has no impact on this component, it receives a score of 100 under the Outcome PI (CB3.2.1MSC CR v1.3)		

PI 2.1.1		The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species		
d	Guidepost	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery.		
	Met?	Y		
	Justification	At present, the team did not identify any retained species in the scallop dredge fishery. Since the UoA has no impact on this component, it receives a score of 100 under the Outcome PI (CB3.2.1MSC CR v1.3)		
References		Wigley S. E., and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. Source: http://www.nefsc.noaa.gov/publications/. NEFMC: https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticseascallop.html. NEFSC-NEFOP: https://www.nefsc.noaa.gov/fsb/SBRM/		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				**N/A**

Evaluation Table for PI 2.1.2

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary, that are expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing retained species.
	Met?	Y	Y	Y
	Justification	Based on the information provided by the SBRM (2017) report on catch composition, the team did not identify any retained species in the scallop dredge fishery. If during the period of certification, the proportions of retained and discarded volumes for bycatch species were to change, then this PI would need to be reassessed. Federally managed retained species, including scallops, are administered by the Mid-Atlantic or New England Fishery Management Councils under various Fishery Management Plans (FMPs). All federal FMPs are required to comply with the 10 U.S. National Standards for fisheries management, as mandated by the Magnuson-Stevens Fishery Conservation and Management Act. The National Standards outline measures which include principles to prevent overfishing, rebuild overfished stocks and follow best scientific information available. To support the management measures of federally managed species information on the catch and discards of federally managed species is gathered by the onboard NMFS Fisheries Observers program. Additionally, catch data, and biological information is obtained from commercial catches. Based on the information available periodic assessments are prepared by the Northeast Regional Stock Assessment Workshops (SAW) working groups and presented for formal scientific peer review process before presenting stock assessment results to managers. The periodic stock assessments are used to specify an annual catch limit (ACL) for managed species, which are set to be less than or equal to the Acceptable Biological Catch (ABC) (to account for management uncertainty). ABCs, in turn, must be set less than or equal to the Overfishing Level (OFL) (to account for any scientific uncertainty in the stock). Based on the recommendations of the Council's Scientific and Statistical Committee (SSC) for ABC; quotas are derived and also how the various FMPs handle various components of fishing mortality. Commercial permits are required to possess, land, or sell managed species and measures are implemented via the FMPS to reduce catch, including closed seasonal areas, gear modifications, etc. There is a cohesive and strategic arrangement comprising monitoring (SBRM, NEFOP, and other fishery dependent sources) and evaluations by the SAW working groups, resulting in management measures (FMP Amendments and fishery specifications) that are designed to manage the federally managed species following the explicit goals laid out in the U.S. National Standard Guidelines requirements for FMP. This cohesive arrangement meets the MSC definition of a strategy achieving a score of SG100.		
b	Guidepost	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or	There is some objective basis for confidence that the partial strategy will work, based on some information directly	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.

		comparison with similar fisheries/species).	about the fishery and/or species involved.	
	Met?	Y	Y	Y
	Justification	No retained species are identified from the SBRM (2017) report on catch composition of the fishery. 'Retained' species would be subject to the same management strategy as 'bycatch' species. The rationale for PI 2.2.2 for management of bycatch species, helps illustrate the likelihood that the management strategy, described in SIa of this PI, would also work for any potential retained species. There is evidence that the federal strategy has been successful in recovering several bycatch species caught by the scallops fishery, including; winter flounder (Georges Bank), windowpane flounder haddock, pollock, and thorny skates. There is information directly about the fishery providing a high level of confidence that the strategy will work. The Council has several steps taken to reduce flatfish bycatch in the scallop fishery, including: fishery prohibiting possession of flatfish; requiring that dredges be constructed with a maximum of seven rows in the apron and 10" twine tops to allow flatfish escapement; and seasonally closing the Scallop Closed Area II access area from August 15 through November 15 to protect yellowtail flounder and windowpane flounder. Currently, the scallops fishery is assigned a proportion of the sub-annual catch limit (sub-ACL) of yellowtail flounder. Bycatch of yellowtail flounder in the scallops fishery has decreased and by 2017 the scallop fishery caught only 10% of its allocation of yellowtail flounder, resulting in an adjustment of the allocation towards the groundfish fishery. Therefore, the management system can be said to have been tested and demonstrated an ability to produce measures targeted to address issues identified through monitoring and evaluation for bycatch species. The SG100 is met.		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	Y
	Justification	No main retained species are identified from the SBRM (2017) report on catch composition of the fishery. Fundamentally, the fishery is managed using various measures to reduce bycatch, including; quota allocation, commercial fishing permit/license, closed and rotational access areas options and reporting of catch interactions through VTR, and dealer reported landings (sales/trade) record reconciliation with VTR, as well as at-sea observer program. There examples of the scallops fishery system reacting to non-target species impact concerns identified through monitoring and evaluation (see SIb above), and available information based on the achieved observer coverage. At the present time, there are considered to be no retained species in the UoA scallop dredge fishery, and the fishery scores 100 for this SI.		
d	**Guidepost**			There is some evidence that the strategy is achieving its overall objective.
	Met?			Y

	Justification	No main retained species are identified from the SBRM (2017) report on catch composition of the fishery. There is evidence that these measures are in place and implemented successfully, as evidenced by successful rebuilding of some federally managed stocks and the implementation of rebuilding plans and measures for those that are overfished and/or for which overfishing is occurring. The operation of the observer program, and the inclusion of management measures for those species with high bycatch and/or vulnerable status demonstrates that the strategy is achieving is achieving its overall objectives. The fishery scores 100 for this SI.		
e	**Guidepost**	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Y	Y	Y
	Justification	Sharks must be landed with fins attached to the carcass by law (NMFS HMS 2017). In 2010 Congress passed the Shark Conservation Act (SCA), which requires that all sharks landed in the United States be brought to shore with their fins naturally attached. As part of SCA NOAA created regulations for its implementation. The NMFS Office of Law Enforcement (OLE) conducts inspections to enforcing the Shark Finning Prohibition Act (SFPA) of 2000 and implement the ensuing regulations. The observer program also monitors compliance with the 2000 Shark Finning Prohibition Act.		
References		Wigley S. E., and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. Source: http://www.nefsc.noaa.gov/publications/. NEFMC. Scallop Fishing Year 2018. https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticseascallop.html. NEFSC-NEFOP: https://www.nefsc.noaa.gov/fsb/SBRM/		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				**N/A**

Evaluation Table for PI 2.1.3

PI 2.1.3		**Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Qualitative information is available on the amount of main retained species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery.	Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of affected populations.

<table>
<tr><td colspan="2">PI 2.1.3</td><td colspan="3">Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species</td></tr>
<tr><td></td><td>Met?</td><td>Y</td><td>Y</td><td>Y</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">No main retained species are identified from the SBRM (2017) report on catch composition of the fishery.
Fundamentally, scientific and industry information are used to manage the fishery, which included sources such as bycatch reduction monitoring, multi-species stock surveys and stock assessments, quota, fishing permit, VMS, EIA statements, closed and rotational access areas and reporting of catch interactions through VTR, dealer reported landings (sales/trade) record reconciliation with VTR, as well as at-sea observer program.
The current information system in place is believed to have the capacity to provide accurate and verifiable information for retained species.
At the present time, there are considered to be no retained species in the UoA scallop dredge fishery, and the fishery scores 100 for this SI.</td></tr>
<tr><td>b</td><td>Guidepost</td><td>Information is adequate to qualitatively assess outcome status with respect to biologically based limits.</td><td>Information is sufficient to estimate outcome status with respect to biologically based limits.</td><td>Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.</td></tr>
<tr><td></td><td>Met?</td><td>Y</td><td>Y</td><td>Y</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">No main retained species are identified from the SBRM (2017) report on catch composition of the fishery.
Information continues to be collected on catches for all retained species through the NMFS Observer and Vessel Trip reporting, and Port Sampling programs (Wigley et al. 2016) coordinated by the Fisheries Data Services Division (FDSD) in the Northeast Region of NMFS (NMFS FDSD 2016). Catch data for main species is then to the compared to the ABC to assess fishery performance (MAFMC, 2016, 2017b).
The current information system in place is believed to have the capacity to provide sufficient information to estimate for federally managed fisheries the outcome status and compare it to its' ABC enabling to assess fishery performance.
If all retained species are federally managed, the SG100 would be met.
At the present time, there are considered to be no retained species in the UoA scallop dredge fishery, and the fishery scores 100 for this SI.</td></tr>
<tr><td>c</td><td>Guidepost</td><td>Information is adequate to support measures to manage main retained species.</td><td>Information is adequate to support a partial strategy to manage main retained species.</td><td>Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.</td></tr>
<tr><td></td><td>Met?</td><td>Y</td><td>Y</td><td>Y</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">No main retained species are identified from the SBRM (2017) report on catch composition of the fishery.
All main primary species are federally managed and are subject to the monitoring under the SBRM, and are also subject to direct stock assessment and fishery management plans under the MAFMC or NEFMC. This information is adequate to support a strategy and to evaluate whether the strategy is achieving its objective.
At the present time, there are considered to be no retained species in the UoA scallop dredge fishery, and the fishery scores 100 for this SI.</td></tr>
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PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species		
d	Guidepost		Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator score or the operation of the fishery or the effectiveness of the strategy)	Monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species.
	Met?		Y	Y
	Justification	No main retained species are identified from the SBRM (2017) report on catch composition of the fishery. The monitoring of federally managed species that are retained is conducted in sufficient detail to assess ongoing mortalities. At the present time, there are considered to be no retained species in the UoA scallop dredge fishery, and the fishery scores 100 for this SI.		
References		Wigley S. E., and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. Source: http://www.nefsc.noaa.gov/publications/. NEFMC: https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticseascallop.html. NEFSC-NEFOP: https://www.nefsc.noaa.gov/fsb/SBRM/		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				**N/A**

Evaluation Table for PI 2.2.1

PI 2.2.1		The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	Main bycatch species are likely to be within biologically based limits (if not, go to scoring issue b below).	Main bycatch species are highly likely to be within biologically based limits (if not, go to scoring issue b below).	There is a high degree of certainty that bycatch species are within biologically based limits.
	Met?	Y	Y	N
	Justification	*Skate Complex (main)* Skate complex is considered a main bycatch for this assessment. The grouping accounts for 5.4% of discarded bycatch. The three mostly commonly captured skate species in the scallop fishery are little skate (*Leucoraja erinacea*), winter skate (*L. ocellata*) and barndoor skate (*Dipturus laevis*). According to the 2016 NE Skate Stock Status Update (Sosobee et al., 2017):		

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- For winter skate, the 2014-2016 NEFSC autumn average biomass index of 6.65 kg/tow is above the biomass threshold reference point (2.83 kg/tow) and above the BMSY proxy (5.66 kg/tow).
- For little skate, the 2015-2017 NEFSC spring average biomass index of 5.49 kg/tow is above the biomass threshold reference point (3.07 kg/tow) but below the BMSY proxy (6.15 kg/tow)
- For barndoor skate, the 2014-2016 NEFSC autumn average survey biomass index of 1.60 kg/tow is above the biomass threshold reference point (0.78 kg/tow) and the BMSY proxy (1.57 kg/tow).

All three skate species are not considered overfished and overfishing is not occurring, meeting SG80.

Minor Species

There are close to 30 federally managed species identified in the SBMR, which are classified as minor bycatch species (Table 10). There are also a number of invertebrate species also classified as minor bycatch species (Table 11). Aside from monkfish with 1.4% volume of the UoA, the remaining minor bycatch species are <0.2% of catch of the UoA.

Species categorized as ‘minor’ automatically achieve SG80, and are only required to meet requirements at the 100 SG levels. Since there were a high number of ‘minor’ species, the team elected not to score minor species at SG100 as individuals, but instead used an ‘all or none’ approach to scoring. If any of the minor species, didn’t achieve 100, then all of the minor species stay at SG80.

The minor species selected was yellowtail flounder (YTF) on account of the status of the stocks of this species. Overall yellowtail flounder (YTF) discarded volumes are negligible (<0.1%) relative to the overall volume of the UoA, making this species a minor. All three stocks of yellowtail flounder (1. Southern New England/Mid-Atlantic, 2. Cape Cod/Gulf of Maine, and 3. Georges Bank) are considered to be overfished and subject to overfishing.

According to the 2017 stock assessment, for the Southern New England/Mid-Atlantic stock of yellowtail flounder “spawning stock biomass (SSB) in 2016 was estimated to be 157 (mt) which is 8% of the biomass target”. For the Cape Cod/Gulf of Maine stock SSB in 2016 was estimated to be 1,191 (mt) which is 26% of the biomass target. For the Gorges Bank Stock status is considered unknown due to a lack of biological reference points associated with the empirical approach but the stock condition is considered poor. Rebuilding plans are in place for Cape Cod/Gulf of Maine and Georges Bank, and is being developed for the Southern New England/Mid-Atlantic stock. Because the three yellowtail flounder stocks are not within biologically based limits, all minor retained species fail to meet SG100.

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<tr><td rowspan="3">b</td><td>Guidepost</td><td>If main bycatch species are outside biologically based limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding.</td><td>If main bycatch species are outside biologically based limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.</td><td></td></tr>
<tr><td>Met?</td><td>NA</td><td>NA</td><td></td></tr>
<tr><td>Justification</td><td colspan="3">Main bycatch are within biologically based limits, this scoring issue is not scored.</td></tr>
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c	**Guidepost**	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the bycatch species to be outside biologically based limits or hindering recovery.		
	Met?	Y		
	Justification	For the main and minor bycatch species that are managed through FMPs, most of these species have scientifically based biological reference points, and are within those limits. For those species without biological reference points there is catch accounting. For those minor species that are not federally managed biological reference points are not developed and the status is poorly known (i.e. invertebrate species). However, there are measures and practices in place expected to ensure that the fishery is not causing these minor bycatch species to be outside biologically based limits. The main practice in place is the gear type, which according to catch accounting (measure) results in negligible volumes of catch of minor bycatch species that are not federally managed.		
References		NEFMC.2018d. Skates Plan Overview (https://www.nefmc.org/management-plans/skates). NEFMC. 2018c. Monkfish Plan Overview.Available at: https://www.nefmc.org/management-plans/monkfish). NEFMC.2018b. Status, Assessment and Management Information for NEFMC Managed Fisheries March 29, 2018 – (http://s3.amazonaws.com/nefmc.org/180328-Status-Assessment-and-Mgt-Info-2018.pdf). Wigley S. E., and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. Source: http://www.nefsc.noaa.gov/publications/.		

OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	**NA**

Evaluation Table for PI 2.2.2

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary, that are expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing and minimizing bycatch.
	Met?	Y	Y	Y
	Justification	There are a number of measures in place to contribute to the management of all non-target species in the UoA, in alignment with the national strategy for bycatch management in US fisheries. Fishery Management Plans contemplate bycatch effects of existing and planned conservation and management measures, meeting the U.S. National Standard Guidelines requirements for FMPs to include considerations to reduce bycatch. Federally managed retained species, including scallops, are administered by the Mid-Atlantic or New England Fishery Management Councils under various Fishery Management Plans (FMPs). All federal FMPs are required to comply with the 10 U.S. National Standards for fisheries management, as mandated by the Magnuson-Stevens Fishery Conservation and Management Act. The National Standards outline measures which include principles to prevent overfishing, rebuild overfished stocks and follow best scientific information available. To support the management measures of federally managed species information on the catch and discards of federally managed species is gathered by the onboard NMFS Fisheries Observers program. The Northeast Fisheries Observer Program directs trips to collect information onboard vessels, based on a number of days per fleet determined in evaluation according to the standardized bycatch reporting methodology (SBRM) Amendment. Additionally, catch data, and biological information is obtained from commercial catches. Based on the information available periodic assessments are prepared by the Northeast Regional Stock Assessment Workshops (SAW) working groups and presented for formal scientific peer review process before presenting stock assessment results to managers. The periodic stock assessments are used to specify an annual catch limit (ACL) for managed species, which are set to be less than or equal to the Acceptable Biological Catch (ABC) (to account for management uncertainty). ABCs, in turn, must be set less than or equal to the Overfishing Level (OFL) (to account for any scientific uncertainty in the stock). Based on the recommendations of the Council's Scientific and Statistical Committee (SSC) for ABC; quotas are derived and also how the various FMPs handle various components of fishing mortality. Commercial permits are required to possess, land, or sell managed species and measures are implemented via the FMPS to reduce catch, including closed seasonal areas, gear modifications, etc. NOAA Fisheries National Bycatch Reduction Strategy and particularly, the Bycatch Reduction Engineering Program, also facilitates bycatch reduction in the fishery. In addition, the RSA program fund research specifically designed to gather data on impact of scallop dredge fishing on all bycatch species, as well as to support technical and management measures for reducing such impacts. Technical gear modifications such as use of large diameter belly-rings as well as providing upper sections of the dredge bag for fish escapement. The NEFOB is		

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considered a component measure of the bycatch reduction strategy. Independent information from this program is evaluated to identify bycatch levels and the need for management interventions, such in-season closed areas or quota adjustment.
Additionally, strategies of rotational and access areas fishery management options, as well as fishing gear selectively for harvest size scallop, provides the UoA scallop fishers with a regime (management protocol) which facilitates areas of high densities of scallop to be fished/targeted therefore, comparatively reducing levels of interaction with bycatch discard species. Annual quota/IFQ and commercial fishing permits which constitutes the scallop harvest strategy and control rules (see PI 1.2.1, PI1.2.2, PI 1.2.3) can be considered as contributing to the partial strategy for management of all bycatch species. The consequential reduction of fishing to focus areas of high densities of scallop also contributes towards reduced bycatch of discarded invertebrates. The profile of invertebrates can be understood to be common in the fishery for over its many (+100) years of operation.
Bycatch estimates from the observer program are used to compile and publish the National Bycatch Report. Stocks of all fish and invertebrate stocks managed under the MSA that meet the following criteria: have high bycatch levels, are important to management, and/or for which there are stock status concerns are designated as key stocks.
For federally manages species there is a cohesive and strategic arrangement comprising monitoring (SBRM, NEFOP, and other fishery dependent sources) and resulting management measures (FMP Amendments and fishery specifications) that are designed to manage the federally managed species in accordance with the explicit goals laid out in the U.S. National Standard Guidelines requirements for FMP, meeting the SG100.
For non-federally managed species there is in place monitoring of bycatch via the observer program, which results in management actions according to the impact of the fishery.
This meets the MSC definition of a strategy, the SG100 is met.
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<tr><td rowspan="3">b</td><td>Guidepost</td><td>The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).</td><td>There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.</td><td>Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>Y</td></tr>
<tr><td>Justification</td><td colspan="3">
There is an objective basis for confidence that the strategy for federally managed species is working primarily on the basis of the stock status of the main species. For non-federally managed species, there is monitoring in place that should provide sufficient information to support additional management action where needed, and the lack of prevalence of non-federally-managed species in significant volume in the fishery provides confidence that the strategy as focused on federally managed species is appropriate and will work.
Additionally, periodic review of recommendations such as those reviewed for rotational and access areas options (Omnibus Amendments) are evaluated in detail before relevant approvals are made, which are based on best available scientific evidence such as EIA reports, scientific research/surveys, and observer at-sea monitoring, these constitute testing of the NEFMC management strategies for the scallop fishery and associated demersal fisheries.
There is evidence that the federal strategy has been successful in recovering several bycatch species caught by the scallops fishery, including; winter flounder (Georges Bank), windowpane flounder haddock, pollock, and thorny skates. There is information directly about the fishery providing a high level of confidence that the strategy will work. The Council has several steps taken to reduce flatfish bycatch in the scallop fishery, including: fishery prohibiting possession of flatfish; requiring that dredges be constructed with a maximum of seven rows in the apron and 10” twine tops to allow flatfish escapement; and seasonally closing the Scallop Closed Area II access area from August 15 through November 15 to protect yellowtail flounder and windowpane flounder. Currently, the scallop fishery is
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		assigned a proportion of the sub-annual catch limit (sub-ACL) of yellowtail flounder. Bycatch of yellowtail flounder in the scallop fishery has decreased and by 2017 the scallop fishery caught only 10% of its allocation of yellowtail flounder, resulting in an adjustment of the allocation towards the groundfish fishery. Therefore, the management system can be said to have been tested and demonstrated an ability to produce measures targeted to address issues identified through monitoring and evaluation for bycatch species. The SG100 is met.		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	Y
	Justification	At-sea observer participation in the various areas of the fishery and throughout the season is >30%, which provided good corroboration of the performance of the management components (such as bycatch gear modification and targeting high scallop density areas) of the fishery; and conducting bycatch identification, quantities recording, and checking compliance with commercial permits, licensed, quota (VTR – trip limits) and other species encountered. In addition VMS monitoring confirms the regional and local operation scale of the fishery as well as compliance with access area management protocols. SG 100 is met.		
d	**Guidepost**			There is some evidence that the strategy is achieving its overall objective.
	Met?			Y
	Justification	The profile of bycatch discarded species is low with commercial size scallop making up over 95% of the catch in the UoA fishery. Combined with fishery management strategies of rotational and access areas, as well as permit and quota measures, and the successfully implemented scallop harvest strategy (see PI1.2.1, PI1.2.2, PI1.2.3) and good levels of compliance with management requirements (see PI3.2.3); it can be said that the strategy is achieving its overall objectives. Fish stocks have achieved their rebuilding targets under these strategies; for example Windowpane flounder that was overfished, is declared rebuilt in the 2017 stock assessment. SG 100 is met.		
References		NEFMC.2018d. Skates Plan Overview (https://www.nefmc.org/management-plans/skates NEFMC. 2018c. Monkfish Plan Overview.Available at: https://www.nefmc.org/management-plans/monkfish). NEFMC.2018b. Status, Assessment and Management Information for NEFMC Managed Fisheries March 29, 2018 – (http://s3.amazonaws.com/nefmc.org/180328-Status-Assessment-and-Mgt-Info-2018.pdf). NOAA: Fisheries National Bycatch Reduction Strategy and Bycatch Reduction Engineering Program (https://www.fisheries.noaa.gov/national/bycatch/bycatch-reduction-engineering-program) Wigley S. E., and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. Source: http://www.nefsc.noaa.gov/publications/ Ellis, J. R., McCully Phillips, S. R. and Poisson, F. (2017). A review of capture and post-release mortality of elasmobranchs. J Fish Biol, 90: 653–722. doi:10.1111/jfb.13197 (Source: http://archimer.ifremer.fr/doc/00358/46902/46980.pdf).		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				**N/A**

Evaluation Table for PI 2.2.3

PI 2.2.3		Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Qualitative information is available on the amount of main bycatch species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main bycatch species taken by the fishery.	Accurate and verifiable information is available on the catch of all bycatch species and the consequences for the status of affected populations.
	Met?	Y	Y	N
	Justification	Qualitative information and some quantitative information are available on the amount of main bycatch species taken by the fishery. NEFOB cooperate with commercial fishers to deliver the bycatch data collection program for the fishery. This is an ongoing industry-funded observer program (funded under the Scallop RSA –quota allocations). Observers are requested to record all species caught. Weights are recorded for all species of fish and larger invertebrates observed, and the number and length are also measured for some groundfish species. Observer coverage (observed trips and days-at-sea) ranged from 9% - 60% across all access and open areas. Annual observer coverage is planned with 30% CV, to represent the geographic activity of the fleet. For the three main skate bycatch species, studies are conducted to assess species-specific condition and discard mortality rate in the scallop fishery. Including the northern Gulf of Maine, sea scallops surveys are conducted annually, providing quantitative data of demersal species commonly caught in the fishery. In addition, the Research Set-Aside programs various relevant annual projects which include quantities data on the distribution of commercial species caught in the fishery. SG 80 is met. Consistent annual collection of data in the northern Gulf of Maine, as well as other Banks; and improved accuracy of species identified (rather than indicative) couple GPS coordinates of main bycatch in the observer reports would be needed to achieve a higher score.		
b	**Guidepost**	Information is adequate to broadly understand outcome status with respect to biologically based limits	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty.
	Met?	Y	Y	N
	Justification	Information is sufficient to estimate outcome status with respect to biologically based limits. The use of VMS is compulsory in the fishery which provides data for monitoring fishing location and efforts. NEFOB cooperate with commercial fishers to deliver the bycatch data collection program for the fishery. Bycatch fish and invertebrates are quantified and VTR, as well as data from scallops RSA surveys, to assess biological status of commercially targeted species. SG 80 is met. Information continues to be collected on catches for all retained species through the NMFS Observer and Vessel Trip reporting, and Port Sampling programs (Wigley et al. 2016) coordinated by the Fisheries Data Services Division (FDSD) in the Northeast Region of NMFS (NMFS FDSD 2016). Catch data for main species is then to the compared to the ABC to assess fishery performance (MAFMC, 2016, 2017b).		

<table>
<tr><td></td><td></td><td colspan="3">The current information system in place is believed to have the capacity to provide sufficient information to estimate for federally managed fisheries the outcome status and compare it to its' ABC enabling to assess fishery performance.
Because there is not sufficient information to quantitatively estimate outcome status for all species, particularly minor and non-federally managed species, the SG100 is not met.
Full stock assessments would be required to be undertaken for all species taken as bycatch in the fishery in order to achieve a higher score.</td></tr>
<tr><td rowspan="3">c</td><td>Guidepost</td><td>Information is adequate to support measures to manage bycatch.</td><td>Information is adequate to support a partial strategy to manage main bycatch species.</td><td>Information is adequate to support a strategy to manage bycatch species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>N</td></tr>
<tr><td>Justification</td><td colspan="3">Information is adequate to support a partial strategy to manage main bycatch species.
VMS information is use to understand and map the distribution of fishing effort, and VTR along with observer data provides quantification of scallops and bycatch species, with over 95% of the catch being scallop, indicating effectiveness of the bycatch strategy. Ongoing scallop research and surveys under the RSA funded programs also provides data for conducting stock assessment of commercial species, and harvest strategies such as quota and ABC. SG 80 is met.
Information /data would be required to be collected to species level for stocks such as skates and full stock assessment conducted for all species taken in the fishery, for a higher score to be achieved.</td></tr>
<tr><td rowspan="3">d</td><td>Guidepost</td><td></td><td>Sufficient data continue to be collected to detect any increase in risk to main bycatch species (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectively of the strategy).</td><td>Monitoring of bycatch data is conducted in sufficient detail to assess ongoing mortalities to all bycatch species.</td></tr>
<tr><td>Met?</td><td></td><td>Y</td><td>N</td></tr>
<tr><td>Justification</td><td colspan="3">Sufficient data continue to be collected to detect any increase in risk to main bycatch species.
Fishing location and effort are monitored from VMS which would make apparent any fishing in areas that are likely to contribute to higher bycatch. Observer coverage (observed trips and days-at-sea) ranged from 9% - 60% across all access and open areas of the fishery. Annual observer coverage is planned with 30% CV, to represent the geographic activity of the fleet, as well as recording bycatch data in the fishery which would make apparent changes in quantity of bycatch, or at-risk bycatch species. SG 80 is met.
Information /data would be required to be collected to species level for stocks such as skates and full stock assessment conducted for all species taken in the fishery, and additional information on discard mortality for all species, for a higher score to be achieved.</td></tr>
<tr><td colspan="2">References</td><td colspan="3">NOAA. 2017b. NOAA Fisheries Adds Gulf of Maine Scallop Survey. Available at: https://www.greateratlantic.fisheries.noaa.gov/mediacenter/2017/06/02_gomscallopsurvey.html
NEFMC. 2015a. Summary Report of the Review of Sea Scallop Survey Methodologies and Their Integration for Stock Assessment and Fishery Management http://s3.amazonaws.com/nefmc.org/Scallop-surveys-review-Summary-report_April-91.pdf</td></tr>
</table>

	Wigley S. E., and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. Source: http://www.nefsc.noaa.gov/publications/ NEFMC.2018b. Status, Assessment and Management Information for NEFMC Managed Fisheries March 29, 2018 – (http://s3.amazonaws.com/nefmc.org/180328-Status-Assessment-and-Mgt-Info-2018.pdf).

OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	**N/A**

Evaluation Table for PI 2.3.1

PI 2.3.1		**The fishery meets national and international requirements for the protection of ETP species** **The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species.	The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species.	There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species.
	Met?	Y	Y	N
	Justification	The only ETP species identified are loggerhead sea turtles. The Endangered Species Act (ESA) defines the Incidental Take Statements (ITSs)[12] for sea turtles. The scallop gear is expected to have incidental catch of an estimated average of 140 loggerhead sea turtles each year. Currently the scallop fishery has no incidental catch of sea turtles recorded. The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species. Annual monitoring and assessment of the distribution of fishing effort (VMS and Observer data) in the Mid-Atlantic scallop dredge fishery during the period of known sea turtle overlap (May through November) is conducted to ensure that there are no increases in the likelihood of interactions with sea turtles that may result from increased effort. The fishery sea scallop dredge is designed with chain mats at mouth of the gear, and turtle deflection devices to reduce injuries or death to sea turtles. Annual monitoring and assessment of the distribution of fishing effort in the Mid-Atlantic scallop dredge fishery during the period of known sea turtle overlap (May through November) is conducted to ensure that there are no increases in the likelihood of interactions with sea turtles (migratory or feeding areas) that may result from increased		

[12] ITSs are produced by the U.S. Fish and Wildlife Service as part of a biological opinion resulting from consultations with the federal agencies under section 7 of the Endangered Species Act. The anticipated Amount of Extent of Incidental Take specify the amount or extent of incidental take that may result from the continued operation of the scallop fishery. This . This number is estimated from incidental take data from observer report for the scallop fishery and other fisheries using similar gear. NMFS has determined the level of anticipated take specified of loggerhead turtles is likely to adversely effect, but is not likely to jeopardize the NWA DPS of loggerhead sea turtles.

		effort; in addition scallop dredges operate well away from sea turtle protection designation zones. In addition research by NOAA resulted in the conclusion that the scallop fishery is likely to be within national and international requirements for the protection of turtles and that the known direct effects of this fishery are unlikely to create unacceptable impacts to them, yet there are high degrees of uncertainty. Further research; involve the use of quantitative assessment of the potential removals and unobserved mortalities to jeopardize the continued existence of the US Atlantic Ocean population of loggerhead sea turtles. A population viability analysis (PVA) was used to estimate quasi-extinction likelihoods under conditions with and without fishery effects. The results suggest that the annual removal of loggerhead sea turtles in the US fisheries for Atlantic sea scallops, though detectable, does not significantly change the calculated risk of extinction of the population of adult female Western North Atlantic loggerheads over the next 100 years (Merrick and Haas 2008). No observed capture of sea turtles or other ETP species is recorded in the fishery since 2013 and therefore the fishery is highly likely to be operating within limits of national and international requirements for protection of ETP species. SG 80 is met. Specific ongoing research to quantify and evidence any indirect and unobserved impacts of scallop dredge fishery and ETP such as loggerhead sea turtle would be required to achieve a higher score.		
b	**Guidepost**	Known direct effects are unlikely to create unacceptable impacts to ETP species.	Direct effects are highly unlikely to create unacceptable impacts to ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species.
	Met?	Y	Y	N
	Justification	For sea turtles the score of SIb is the same as for SIa because where there are requirements for protection and rebuilding, provided through the national legislation, MSC requires the team interpret “unacceptable impacts” as the likelihood that the fishery meets these protection requirements (MSC CR v1.3 Clause CB3.11.3.1) [13]. Direct effects are highly unlikely to create unacceptable impacts to ETP species Regulatory instrument such as the US Endangered Species Act (ESA) provide requirements that achieve protection and rebuilding of all nationally recognized ETP. For this reason thus considered to meet the overall intent of PI 2.3.1 that “the fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species” No observed capture of any ETP species – loggerhead sea turtle or other marine mammals – is recorded in observer report (2017) for the fishery. SG 80 is met. Available information in the form of a comprehensive ETP monitoring program specific to the fishery, and where scallop fishers record any interaction or sightings in VTR to complement observer reports, then a higher score could be achieved.		
c	**Guidepost**		Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species.
	Met?		Y	N
	Justification	Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts.		

[13] MSC Certification Requirements V1.3 CB3.11.3.1. The team shall interpret “unacceptable impacts” as: […] At SG80, where it is highly likely that the fishery meets the requirements, there would be direct demonstration that requirements for protection and rebuilding are being achieved.

		Indirect effects of the fishery relate to impacts in situations where the removal of the target species reduces its availability as prey for a predator species, and a range of ecosystem level changes as described in section GSA3.16" (GSA3.1). These interactions include situations resulting in changes to behavior, habitats or feeding opportunities of ETP species. No observed interactions (direct/indirect) with ETP species are recorded. Current scallop stock are in high abundance. Also, the scallop species that is targeted by the fishery is not a key prey or predator of any ETP species, and current information, including observer reports, indicates that fishing activities does not significantly impact ETP species directly or indirectly. In addition, seasonal closed migratory areas provide protection from indirect effects of the scallop fishery to migratory sea turtles and other ETP. The SG 80 is met. Specific research to quantify indirect effects of the fishery on ETP species would be required to meet SG100.
References		Wigley S. E. and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. (Source: http://www.nefsc.noaa.gov/publications/). Santos, .B.S., Kaplan, D.M., Friedrichs, M.A.M., Barco, S.G., Mansfield, K.L., and Manning, J.P. (2018). Consequences of drift and carcass decomposition for estimating sea turtle mortality hotspots. Ecological Indicators 84 (2018) 319–336. (Source: https://doi.org/10.1016/j.ecolind.2017.08.064). NOAA. (2017c). Recovering Threatened and Endangered Species - FY 2015 - 2016 Report to Congress. (Source: http://www.nmfs.noaa.gov/pr/laws/esa/biennial.htm). Murray K.T. (2015). Estimated loggerhead (*Caretta caretta*) interactions in the Mid-Atlantic scallop dredge fishery, 2009-2014. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-20; 15 p. (Source: http://www.nefsc.noaa.gov/publications/ doi:10.7289/V5GT5K5W).
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		**N/A**

Evaluation Table for PI 2.3.2

PI 2.3.2		The fishery has in place precautionary management strategies designed to: • **Meet national and international requirements;** • **Ensure the fishery does not pose a risk of serious harm to ETP species;** • **Ensure the fishery does not hinder recovery of ETP species; and** • **Minimise mortality of ETP species.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place that minimise mortality of ETP species, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a comprehensive strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.
	Met?	Y	Y	N
	Justification	There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species. The US's ESA supports conservation strategies which are managed by NOAA and its regional offices. Population status of endangered species are assessed annually, and at different research periods, as well as evaluation of effectiveness by expert working groups of conservation measures within the various fisheries management plans (including the scallop dredge fishery management plan of NEFMC) in order to ensure all appropriate reasonable practicable measures are implemented to minimize impacts on endangered species, as well as to facilitate their recovery, where needed. For example, strategic measures to minimize mortality of protected ETP species such as sea turtles is demonstrated where, in the Mid-Atlantic scallop dredge fishery during the period of known sea turtle overlap (May through November) is monitored, and no increases in interactions with sea turtles from fishing effort is observed. The fishery sea scallop dredge is designed with chain mats at mouth of the gear, and turtle deflection devices to reduce injuries or death to sea turtles. The RSA fund ongoing research programs such as "Understanding Impacts of the Sea Scallop Fishery on Loggerhead Sea Turtles through Satellite Tagging" 2004-2017. This research focus on assessing and reducing loggerhead sea turtle (*Caretta caretta*) bycatch in the sea scallop fisheries of the Northwest Atlantic Ocean, specifically in the Mid-Atlantic Bight (MAB), off Southern New England (SNE) and within Georges Bank (GB), by examining loggerhead behavior in areas impacted by scallop fishing. Over 29 sea turtles were tagged and monitored throughout the southern Mid-Atlantic region, closer to Cape Hatteras; Georges Bank; Southern New England and the Mid-Atlantic region from Elephant Trunk to Hudson Canyon. No observed capture of sea turtles or other ETP species is recorded in the fishery and therefore the fishery is highly likely to be operating within limits of national and international requirements for protection of ETP species. SG 80 is met. A comprehensive strategy which includes wider data collection and evaluations, with regards observed and unobserved interactions and mortality would be required to achieve a higher score.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or	There is an objective basis for confidence that the strategy will work, based on information directly about the fishery	The strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis

		comparison with similar fisheries/species).	and/or the species involved.	supports high confidence that the strategy will work.
	Met?	Y	Y	N
	Justification	There is an objective basis for confidence that the strategy will work, based on information directly about the fishery and/or the species involved. Ongoing monitoring by NEFSC (2016) indicates the most frequently detected turtle was the loggerhead turtle (*Caretta caretta*), with about 1000 individuals that ranged from 26°N–41°N, and mostly in waters on the US continental shelf. The Mid-Atlantic scallop dredge fishery during the period of known sea turtle overlap (May through November) is monitored, and no increases in interactions with sea turtles from fishing effort is observed. The fishery sea scallop dredge is designed with chain mats at mouth of the gear, and turtle deflection devices to reduce injuries or death to sea turtles. SG 80 is met. Quantitative analysis using all available ETP related data for the ecoregion, to supports high confidence that the strategy will work, would be required to achieve a higher score.		
c	**Guidepost**		There is evidence that the strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	N
	Justification	There is evidence that the strategy is being implemented successfully. Observers are requested to record all species caught. Observer coverage (observed trips and days-at-sea) ranged from 9% - 60% across all access and open areas. Also, coverage is planned with 30% CV, to represent the geographic activity of the fleet. The Mid-Atlantic scallop dredge fishery during the period of known sea turtle overlap (May through November) is monitored, and no increases in interactions with sea turtles from fishing effort is observed. SG 80 is met. The use of other information sources such as VTR and specific ongoing research to quantify and evidence any indirect and unobserved impacts of scallop dredge fishery and ETP such as loggerhead sea turtle and other marine mammals, would be required to achieve a higher score.		
d	**Guidepost**			There is evidence that the strategy is achieving its objective.
	Met?			Y
	Justification	There is evidence that the strategy is achieving its objective – which is to minimize impact to protected ETP species, as well as to implement measures such as fishing practices which do not hinder recovery of protected ETP. No observed interactions (direct/indirect) with ETP species are recorded. The fishery scallop dredge is designed with gear modifications, such as chain mats at mouth of the gear, and turtle deflection devices to reduce injuries or death to sea turtles. There are changes to fishing practice and seasonal area closures; in the Mid-Atlantic scallop dredge fishery during the period of known sea turtle overlap (May through November) is monitored, and no increases in interactions with sea turtles from fishing effort is observed. SG 100 is met.		

References	Wigley S. E. and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. (Source: http://www.nefsc.noaa.gov/publications/). Santos, .B.S., Kaplan, D.M., Friedrichs, M.A.M., Barco, S.G., Mansfield, K.L., and Manning, J.P. (2018). Consequences of drift and carcass decomposition for estimating sea turtle mortality hotspots. Ecological Indicators 84 (2018) 319–336. (Source: https://doi.org/10.1016/j.ecolind.2017.08.064). NOAA. (2017). Recovering Threatened and Endangered Species - FY 2015 - 2016 Report to Congress. (Source: http://www.nmfs.noaa.gov/pr/laws/esa/biennial.htm). Murray K.T. (2015). Estimated loggerhead (*Caretta caretta*) interactions in the Mid-Atlantic scallop dredge fishery, 2009-2014. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-20; 15 p. (Source: http://www.nefsc.noaa.gov/publications/ doi:10.7289/V5GT5K5W). NEFSC.2016c. Atlantic Marine Assessment Program for Protected Species (AMAPPS): https://www.nefsc.noaa.gov/psb/AMAPPS/docs/Annual%20Report%20of%202016%20AMAPPS_final.pdf. Patel, S.H. (2017). Understanding Impacts of the Sea Scallop Fishery on Loggerhead Sea Turtles through Satellite Tagging. Coonamessett Farm Foundation.	
OVERALL PERFORMANCE INDICATOR SCORE:		**85**
CONDITION NUMBER (if relevant):		**N/A**

Evaluation Table for PI 2.3.3

<table>
<tr><td colspan="2">PI 2.3.3</td><td colspan="3">Relevant information is collected to support the management of fishery impacts on ETP species, including:
Information for the development of the management strategy;
Information to assess the effectiveness of the management strategy; and
Information to determine the outcome status of ETP species.</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td>Guidepost</td><td>Information is sufficient to qualitatively estimate the fishery related mortality of ETP species.</td><td>Sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.</td><td>Information is sufficient to quantitatively estimate outcome status of ETP species with a high degree of certainty.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>N</td></tr>
<tr><td>Justification</td><td colspan="3">Sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.

Quantitative information with regards to interaction of the fishery and ETP species is provided in reports from the observer program as well as RSA funded studies. No interaction with ETPs is reported in the fishery. The 2016 Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US Waters of the Western North Atlantic Ocean reports high abundance (~1000) of loggerhead turtles. Also over 29 sea turtles were tagged and monitored throughout the southern Mid-Atlantic region, closer to Cape Hatteras; Georges Bank; Southern New England and the Mid-Atlantic region from Elephant Trunk to Hudson Canyon. No observed capture of sea turtles or other ETP species is recorded in the fishery. Observer reports for the scallop fishery and other fisheries using similar gears are used to estimate the number of anticipated incidental take. No evidence was provided on the impacts of sublethal interactions.

SG 80 is met.

More comprehensive information including the use of VTR to record any interact by fishers with ETPs and the use of data with regards to unobserved interactions would be required to achieve a higher score.</td></tr>
<tr><td rowspan="3">b</td><td>Guidepost</td><td>Information is adequate to broadly understand the impact of the fishery on ETP species.</td><td>Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species.</td><td>Accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>N</td></tr>
<tr><td>Justification</td><td colspan="3">Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species.

Commercial scallop dredge fishery is monitored by observers (9%-60%) at representative levels throughout the geographic distribution of the fishery. Also, scientific research is funded by the RSA program which provides additional information – through tagging and monitoring of sea turtles - with regards mortality or other impacts from scallop dredge fishing gear and the area of operation of the UoA fishery. No interaction with ETPs was recorded in these programs. SG 80 is met.

Availability of wider (100%) observer coverage and more accurate as well as verifiable information on observed and unobserved information on interaction of the fishery on ETPs would be required to achieve a higher score.</td></tr>
</table>

<table>
<tr><td colspan="2">PI 2.3.3</td><td colspan="3">Relevant information is collected to support the management of fishery impacts on ETP species, including:
• Information for the development of the management strategy;
• Information to assess the effectiveness of the management strategy; and
• Information to determine the outcome status of ETP species.</td></tr>
<tr><td rowspan="3">c</td><td>Guidepost</td><td>Information is adequate to support measures to manage the impacts on ETP species.</td><td>Information is sufficient to measure trends and support a full strategy to manage impacts on ETP species.</td><td>Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>N</td></tr>
<tr><td>Justification</td><td colspan="3">Information is sufficient to measure trends and support a full strategy to manage impacts on ETP species.

The RSA fund ongoing research programs such as “Understanding Impacts of the Sea Scallop Fishery on Loggerhead Sea Turtles through Satellite Tagging” covers a monitoring period of 2004-2017. Observer program data covers a period of over 10 years; while other ETP monitoring programs covers periods of 2010 -2016. The incidental anticipated incidental take scallop gear is expected have incidental catch of an estimated average of 140 loggerhead sea turtles each year, with 47% incidental sea turtle mortality. However with strategic implementation of chain mats and TDD, as well as seasonal area closures; observation of turtle interaction and mortality from the fishery is zero. SG 80 is met.

as Information on observed and unobserved interaction would be required to achieve a higher score.</td></tr>
<tr><td colspan="2">References</td><td colspan="3">Wigley S. E. and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. (Source: http://www.nefsc.noaa.gov/publications/).

Murray K.T. (2015). Estimated loggerhead (Caretta caretta) interactions in the Mid-Atlantic scallop dredge fishery, 2009-2014. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-20; 15 p. (Source: http://www.nefsc.noaa.gov/publications/ doi:10.7289/V5GT5K5W).

NEFSC.2016c. Atlantic Marine Assessment Program for Protected Species (AMAPPS): https://www.nefsc.noaa.gov/psb/AMAPPS/docs/Annual%20Report%20of%202016%20AMAPPS_final.pdf.

Patel, S.H. (2017). Understanding Impacts of the Sea Scallop Fishery on Loggerhead Sea Turtles through Satellite Tagging. Coonamessett Farm Foundation.</td></tr>
<tr><td colspan="4">OVERALL PERFORMANCE INDICATOR SCORE:</td><td>80</td></tr>
<tr><td colspan="4">CONDITION NUMBER (if relevant):</td><td>N/A</td></tr>
</table>

Evaluation Table for PI 2.4.1

<table>
<tr><td colspan="2">PI 2.4.1</td><td colspan="3">The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td>Guidepost</td><td>The fishery is unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.</td><td>The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.</td><td>There is evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>N</td></tr>
<tr><td>Justification</td><td colspan="3">Bottom fishing gears have the potential to impact habitat complexity, cause changes in benthic communities and reduce productivity. The impact of bottom-tending gear is dependent on some variables including the intensity of the fishing effort, the type of substrate and the recovery time of that ecosystem.

Much of the US northeastern marine area is characterized by areas with strong oceanic currents/tidal regimes (Greene et al., 2010). Analysis of overlap of the scallop fishery and habitat types indicates that areas assumed to be fishable to scallop dredges are predominantly mud and sand substrates in high-energy environments (NEFMC 2011) (See more in the background Section 3.4.6 Habitat Impacts; Table 14).

The effects of scallop dredge fishing are relatively short-lived on ecological communities adapted to high-energy environments with frequent natural disturbance by currents, tides, storms, and re-suspension of sediments such as those inhabiting soft mud/sand/sandy/gravel sediments (Bradshaw et al. 2000). Though there is evidence of reduced physical heterogeneity (including decreased sand waves, or biogenic features) and of changes in the abundance of some taxa, there is no evidence of loss or change in the number of taxa. Some research has demonstrated recovery of benthic fauna on silty sand sediments within six months post-dredging unexploited areas at a depth of 15m on GOM (Watling et al., 2001). Furthermore, no evidence of scallop dredge impact was apparent one year after a pre-dredge and post-dredge survey at three sites on sand sediments (depth of 45-88m) in the Hudson Canyon of Mid-Atlantic (Sullivan et al., 2003).

However, recovery of benthic ecology/community and function post-scallop dredging is variable according to the substrate. The vulnerability assessment conducted as part of the Swept Area Seabed Impact (SASI) model, identify low-energy granule-pebble, cobble, and boulder dominated habitats as the most vulnerable to fishing impacts. This vulnerability assessment is driven primarily by an estimated recovery time of over five years for the structural habitat features to return to their prior state (NEFMC 2011). A study of the effect of bottom fishing on benthic megafauna in Georges Bank, an area that had been closed to bottom fishing, speculated that in predominantly pebble/cobble sediments substrate areas the recovery of epibenthic communities, including complex structural species aggregations, was on the order of 5 to 10 yrs. (Collie et al., 2005). According to MSC guidelines, damage requiring 5-10 years to recover to at least 80% of its structure and function is considered as 'serious or irreversible harm' (MSC CR v2.0 SA3.13.4). These vulnerable habitat types in low-energy environments represent 3% of the distribution of the areas assumed to be fishable by the scallop fishery according to the SASI model (NEFMC 2011).

Efforts to mitigate habitat impacts of the fishery date back to 1974, when areas of the Georges Bank (the US and Canada) were closed to mobile bottom fishing. Some additional closures and restrictions for protection of EFH/HAPC followed in Georges Bank, in Southern New England and the Gulf of Maine. These are described in more detail in PI 2.4.2. Additionally, rotational closed and access area fished by the UoA fleet is subjected to a similar duration of restrictions, therefore facilitating 6 mth-10 year recovery periods for some areas that were initially fished to recover before they are fished again. In practice, target areas of high scallop densities are repeatedly fished, while other areas will never be targeted and fished. This limits the impact of the gear to particular lanes while creating</td></tr>
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		benthic unfished patches or islands of greater diversity amongst even the more heavily fished areas. Such islands support the recovery of benthic community in fished areas through neighboring emigration and by acting as source locations for new recruits to other areas (Lambert et al., 2014),. This is important because such benthic ecology/habitats are key to the life history processes (breeding, nursery and feeding areas) for a wide range of species, including commercially important fish and shellfish. Fishing effort is monitored by VMS, Vessel Trip Reports, and Observer Reports. Analysis of the magnitude and distribution of fishing effort of the scallop fishery on vulnerable habitats indicate that adverse effects of the scallops fishery appear to have declined after the mid-2000s on account of decline in overall effort levels of this fishery (NEFMC 2016). Over the period of 2016 to 2017 fishing effort has indicated a further decline in permit areas of the fishery (Galuardi, 2017). Local and situational data points to a continual decline in fishing effort as planned for the 2018 fishing season, for instance, Open Areas Days at Sea (DAS) allocations for full-time permit holders was reduced from 30.41 days in 2017, to 21.75 days for 2018. Information collected by the observer program (2015-2017) on incidental bycatch benthic species (including invertebrates and epifauna) contains specimens belonging to Clypeasteroida (sand dollar, 3.85%), Asteroidea (starfish, 1.37%), and Porifera (sponges, 0.002%); all of which are common to resilient benthic communities (benthic fauna) of the ecoregion, and are not currently considered to be at any ecological vulnerability or risk. Bycatch of related coral specimen was 0% (Wigley and Tholke 2017). This information suggests that the footprint of the UoA fleet does not overlap with vulnerable species such as corals. Regional and local scale (as well as situational) data on seabed ecology (habitat characterization), ocean regime and levels of natural disturbance, as well as areas fished by the UoA fleet (LA/LAGC fleet) are available. The limited areas fished through rotational closed and access area options, as well as evidence of benthic specimens incidentally caught as bycatch, indicates that the fishery does not significantly overlap or present a footprint that encounters HAPC/EFH areas. Recovery rates of benthic habitats and specimen encountered are generally known. Also, the targeted operation of the UoA fleet is known through VMS to fish in repeated permitted areas for over 100 years. The assessment team determined that the most commonly encountered habitat types (sand and mud) illustrate relatively low sensitivity (high resilience) to disturbance (natural and fishing). The scallops fishery is highly unlikely to reduce habitat structure and function of these habitat types, primarily on account of the relatively quick recovery time (< 5 years), meeting the SG80. For the vulnerable low-energy granule-pebble, cobble and boulder dominated habitats, though the potential impact of gear is high, and the habitat recovery is slow (>5 years) the area of habitat subject to fishing is relatively small; 3% of assumed fishable areas for the scallop fishery. Furthermore, under the management strategy to mitigate impacts on habitat described in PI 2.4.2, a proportion of vulnerable habitat types are fully protected in HAPC/EFH closed areas. Lastly, the adverse effects of the overall scallop fishery has significantly decreased over the last decade. The team concludes that the UoA is highly unlikely to impact all features of habitat structure and function to a point where there would be serious or irreversible harm, meeting the SG80. The open conditions for this PI were closed at re-assessment (See Appendix 8: Condition Tables and Justifications). Due to concentrated adverse effects in specific areas, and the limitations on information on substrate distribution and the lack of direct information demonstrating the impact of fishing activities across all different substrates, the SG100 is not met. Further evidence of the quantification of the fishery footprint as well as levels of encounter and recovery of currently known and unknown habitat ecology which might be considered vulnerable habitat types would be required to achieve a higher score.

References	Wigley S. E. and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. (Source: http://www.nefsc.noaa.gov/publications/). Aldous, D., Brand, A.R., and Hall-Spencer, J. M. (2013). USA Sea Scallop Fishery - Public Certification Report. MSC Assessment. Gallagher, S. (2016). Impact of Disturbance on Habitat Recovery in Habitat Management Areas on George's Bank. Woods Hole Oceanographic Institution. (Source: https://habcam.whoi.edu/wp-content/uploads/2017/09/2017_RSA_Gallager_HAPC_rev2.pdf). Bethoney N.D., Zhao L., Chen C., Stokesbury K.D.E. (2017) Identification of persistent benthic assemblages in areas with different temperature variability patterns through broad- scale mapping. PLoS ONE 12(5): e0177333. (Source: https://doi.org/10.1371/journal.pone.0177333). Greene, J.K., M.G. Anderson, J. Odell, and N. Steinberg, eds. (2010). The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One. The Nature Conservancy, Eastern U.S. Division, Boston, MA. Hourigan T.F., Etnoyer P.J., and Cairns S.D. (2017). The State of Deep-Sea Coral and Sponge Ecosystems of the United States. NOAA Technical Memorandum NMFS-OHC-4. Silver Spring, MD. 467 p. (Source: https://swfsc.noaa.gov/publications/CR/2017/2017Clarke.pdf). NOAA (2015). Bullard, J.K. Letter to the New England Fishery Management Council. Available: http://www.talkingfish.org/wp-content/uploads/2015/04/Bullard-Letter_4.16.15.pdf NOAA (2018c). Bullard, J.K. Letter to the New England Fishery Management Council.Available at: https://www.savingseafood.org/wp-content/uploads/2018/01/180103_OA2-Decision_Letter-to-NEFMC.pdf Collie, J. S., Hermsen, J. M. P., Valentine, C. (2005). Effects of Fishing on Gravel Habitats: Assessment and Recovery of Benthic Megafauna on Georges Bank. Benthic Habitats and the Effects of Fishing: American Fisheries Society Symposium 41. P. W. Barnes and J. P. Thomas. Bethesda, MD, American Fisheries Society: 325-343. Sullivan, M. C., Cowen, R. K., and Able K. W. (2003). Effects of anthropogenic and natural disturbance on a recently settled continental shelf flatfish. Mar. Ecol. Prog. Ser. 260: 237-253. Watling, L., Findlay, R., Mayer, M, Lawrence, F. and Schick, D. (2001). Impact of a scallop drag on the sediment chemistry, microbiota, and faunal assemblages of a shallow subtidal marine benthic community. Journal of Sea Research. 46. 309-324. 10.1016/S1385-1101(01)00083-1. NEFMC. (2014a). Omnibus Essential Fish Habitat Amendment 2 - Amendment 14 to the Atlantic Sea Scallop FMP - Draft Environmental Impact Statement. (Source: http://archive.nefmc.org/habitat/index.html).
OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	**N/A**

Evaluation Table for PI 2.4.2

PI 2.4.2		There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	Guidepost	There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a strategy in place for managing the impact of the fishery on habitat types.
	Met?	Y	Y	Y
	Justification	There is a partial strategy in place for managing impacts on habitat, primarily founded in Essential Fish Habitat (EFH) requirements in the MSFCMA. Every federally managed fishery is required to identify EFH and evaluate all potential adverse effects of fishing on EFH designated within the FMP as well as all other EFH of federally managed fisheries, including consideration of cumulative impacts. The EFH Regulatory Guidelines further require each FMP to minimize such adverse effects to the extent practicable, and to review all EFH information at least once every five years, and as recommended by the Secretary. (50 CFR Ch. VI § 600.815). There are a number of measures in place for habitat protection to minimize the adverse effect of scallop dredges, these include habitat closed areas in the multispecies and scallop FMPs, groundfish mortality areas (with associated gear restrictions) and overall reductions in effort and/or increased use of rotational management. In 1977, seasonal closures were implemented for two designated areas of the Georges Bank, explicitly restricting the use of scallop dredges. Closed area I and II were implemented in 1981-1989 with various spatial adjustments to their boundaries to achieve relevant fishery management objectives – protection of EFH/HAPC. Further area closures were implemented in 1990 to areas of Nantucket Lightship in Southern New England, as well as Jeffreys Ledge and Stellwagen Bank. In 1994 further adjustments to closed areas I and II in the Gulf of Maine (Jeffreys Ledge to Cape Ann areas) and Nantucket Lightship Closure were implemented along with special access programs for scallop fishing. Year-round closed areas were implemented in late 1990’s for the inshore Gulf of Maine and Cash Ledges (1998 and 2003). In 2016 the New England Fishery Management Council (NEFMC) published the Draft of the Omnibus Essential Fish Habitat Amendment 2 (OHA2), which was approved by NMFS on April 2018 NMFS. The first two principal objectives of the EFH Amendment are to review and revision of the EFH designations and to identify habitats where adverse impacts should be minimized. The amendment was also developed to integrate habitat management measures across all NEFMC-managed fisheries versus efforts implemented for each FMP. NMFS approved most of the Council’s proposed recommendations including the removal of the Closed Area I Habitat and Nantucket Lightship Closure Area designations, which were opened to access to the scallop fishery with the publication of Framework 29. However, the council’s recommendation for removal of Closed Area II was not approved because the proposed alternatives were found to be insufficient and inconsistent with the OHA2 “goals and objectives of improving juvenile groundfish habitat protection and the requirements of the Magnuson-Stevens Act to minimize the adverse effects of fishing to the extent practicable.” Additional benthic habitat management measures are established via the scallop rotational management areas. Areas fished the UoA fleet (LA/LAGC - the Gulf of Maine (GOM), Georges Bank (GB), Mid-Atlantic Bight (MAB), and the continental slope) are managed by fishing effort (days at sea) measures and rotational access and closed area options. Cartography mapping to target high-density scallop permitted scallop areas, compulsory VMS monitoring, and independent at-sea observers provide quantification and		

		identification of benthic habitats, as well as species (epifauna), incidentally caught as bycatch in the footprint of the fishery (Galuardi, 2017). Ongoing research and monitoring of the fishery interaction with EFH/HAPC are provided through RSA funded projects and observer programs. This information is employed to monitor the impacts of the fishery and assess the effectiveness of the management strategy, as evidence in the ten-yearly management review through Omnibus Essential Fish Habitat Amendment. The MSA, primarily via the EFH requirements, lays out a strategic arrangement for habitat impacts to be evaluated relative to prioritized habitats (EFH) and managed actions to be considered with the objective of minimizing adverse effects. Such a cohesive arrangement is deemed to meet the MSC requirements for a 'strategy' meeting SG100.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/habitats).	There is some objective basis for confidence that the partial strategy will work, based on information directly about the fishery and/or habitats involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or habitats involved.
	Met?	Y	Y	N
	Justification	VMS monitoring and independent at-sea observers' coverage provide quantification and identification of benthic habitats as well as species (epifauna) incidentally caught as bycatch in the footprint of the fishery. In addition there are no reported systemic non-compliance with fishing effort (days at sea) measures and rotational access and closed area options. Common areas fished by the UoA fleet illustrate relatively low sensitivity (high resilience) to disturbance (natural and fishing). In addition, ongoing research and monitoring of the fishery interaction with EFH/HAPC, is provided through RSA funded projects, as well as 10 yearly management review through Omnibus Essential Fish Habitat Amendment. These measures represent that - there is some objective basis for confidence that the partial strategy will work, based on information directly about the fishery and/or habitats involved. SG 80 is met. Testing of the habitat management strategy would be required in order to achieve a higher score.		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	N
	Justification	There are no reported systemic non-compliance with fishing effort (days at sea) measures and rotational access and closed area regulations. Observer coverage is implemented across the UoA fleet (LA/LAGC) and all interaction with seabed ecology is reported in the invertebrates and sediment incidental bycatch section of the annual SBRM reports. This information also provides indications of the fishery footprint, areas of overlap, and any encounter with vulnerable benthic habitats. SG 80 is met. Additional evidence habitat management strategy would be required to be implemented in order to achieve a higher score.		
d	**Guidepost**			There is some evidence that the strategy is achieving its objective.
	Met?			N

	Justification	No comprehensive habitat management strategy, specific to the UoA fishing areas is implemented therefore this SG is not met. Evidence of an implement comprehensive habitat management strategy which takes consideration of each habitat element of the entire area of the fishery would be required in order to achieve this score.
References		Wigley S. E. and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. (Source: http://www.nefsc.noaa.gov/publications/). Greene, J.K., M.G. Anderson, J. Odell, and N. Steinberg, eds. (2010). The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One. The Nature Conservancy, Eastern U.S. Division, Boston, MA. Hourigan T.F., Etnoyer P.J., and Cairns S.D. (2017). The State of Deep-Sea Coral and Sponge Ecosystems of the United States. NOAA Technical Memorandum NMFS-OHC-4. Silver Spring, MD. 467 p. (Source: https://swfsc.noaa.gov/publications/CR/2017/2017Clarke.pdf). NOAA (2015). Bullard, J.K. Letter to the New England Fishery Management Council. Available: http://www.talkingfish.org/wp-content/uploads/2015/04/Bullard-Letter_4.16.15.pdf NOAA (2018c). Bullard, J.K. Letter to the New England Fishery Management Council.Available at: https://www.savingseafood.org/wp-content/uploads/2018/01/180103_OA2-Decision_Letter-to-NEFMC.pdf Collie, J. S., Hermsen, J. M. P., Valentine, C. (2005). Effects of Fishing on Gravel Habitats: Assessment and Recovery of Benthic Megafauna on Georges Bank. Benthic Habitats and the Effects of Fishing: American Fisheries Society Symposium 41. P. W. Barnes and J. P. Thomas. Bethesda, MD, American Fisheries Society: 325-343.
OVERALL PERFORMANCE INDICATOR SCORE:		**85**
CONDITION NUMBER (if relevant):		**N/A**

Evaluation Table for PI 2.4.3

PI 2.4.3		Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There is basic understanding of the types and distribution of main habitats in the area of the fishery.	The nature, distribution and vulnerability of all main habitat types in the fishery are known at a level of detail relevant to the scale and intensity of the fishery.	The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types.
	Met?	Y	Y	N
	Justification	Detailed profile mapping of habitat sediments, seabed topography, and bathymetry is known across the 3 sub-region (GoM/SNE/MAB) operated by the UoA fleet (Greene et. al. 2010). This information together with Gallager and Purcell (2017) research in HMA of the Northern GB, indicated that sediments across the fished areas are generally gravel, sand and mud, or mixtures of these sediments, with occasional larger sediments (boulders) and local areas of rocky relief and rocky outcrops. The distributions of vulnerable marine habitats (such as corals) are known as a result of research by Bethoney et. al. (2017), where they mapped benthic fauna, substrate characteristics, and oceanic conditions on monthly, annual and decadal time scales along the U.S. continental shelf. By combining maps of persistent benthic megafauna and bottom temperature variability over approximately 90,000 km^2, they identified wide spread benthic animal assemblages and regional disparity in temperature variability. Furthermore, important information provided by Hourigan et. al. (2017) includes mapping of the distribution corals, sponges, canyons, and seamounts in the Northeastern US waters. Typically areas of importance identified with corals were at depths >200m common to canyons and shelf edge. Scallop dredge fishery typically operate at depths <100m and are unlikely to encounter corals in their footprint or immediate overlap. This is evidence in the SBRM report indicating no coral incidental bycatch. In addition throughout the ecoregion known corals areas are protect within coral protection zones and MPA (NEFMC 2018e). Based on the combined information provided, it can be said that the nature, distribution and vulnerability of all main habitat types in the fishery are known at a level of detail relevant to the scale and intensity of the fishery. SG 80 is met. Further evidence of the quantification of the fishery footprint as well as levels of encounter and recovery of currently known and unknown vulnerable marine habitat which might be considered VME would be required to achieve a higher score.		
b	**Guidepost**	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear.	Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear.	The physical impacts of the gear on the habitat types have been quantified fully.
	Met?	Y	Y	N

	Justification	Extensive research including commercial information on the impacts of scallop dredge fishing on benthic marine habitats is known from the work of Gallagher, S. and Purcell, M. (2017), Collie, et. al. (2005), and Kaiser, et. al., (2006). VMS units are installed on all vessels in the UoA fleet which facilitate monitoring of the spatial and temporal interaction of the fleet with regards permitted areas of operation. It can be said that sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear. SG 80 is met. Evidence of the physical impact of the scallop dredge gear on all habitat types (known and currently unknown) would be required to achieve a higher score.		
c	**Guidepost**		Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Changes in habitat distributions over time are measured.
	Met?		Y	N
	Justification	Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures). Also, changes in habitat distributions over time are measured. Spatial and temporal interaction of the UoA fleet is monitoring through compulsory implementation and use of VMS and this information facilitate monitoring the footprint, overlap and potential risk of the fleet with regards to any areas of known vulnerable marine habitats. Observer SBRM reports include information on identification and quantification of incidental bycatch of benthic specimens, therefore facilitate identification of interaction with any vulnerable habitats or species. A more detailed measurement of changes in all disturbed habitats would be required to meet the SG100.		
References		Wigley S. E. and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. (Source: http://www.nefsc.noaa.gov/publications/). Gallagher, S. and Purcell, M. (2017). Impact of Disturbance on Habitat Recovery in Habitat Management Areas on the Northern Edge of George's Bank. (Interim Report March 2017). Woods Hole Oceanographic Institution. Bethoney N.D., Zhao L., Chen C., Stokesbury K.D.E. (2017) Identification of persistent benthic assemblages in areas with different temperature variability patterns through broad- scale mapping. PLoS ONE 12(5): e0177333. (Source: https://doi.org/10.1371/journal.pone.0177333). NEFMC (2018e). Council Takes Final Action on Deep-Sea Coral Amendment; Comments on Offshore Oil and Gas Drilling in North Atlantic. NEFMC press release 31st Jan. 2018. Available at: http://s3.amazonaws.com/nefmc.org/NEFMC-Approves-Deep-Sea-Coral-Amendment-OilGas-Drilling-Comments.pdf Greene, J.K., M.G. Anderson, J. Odell, and N. Steinberg, eds. (2010). The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One. The Nature Conservancy, Eastern U.S. Division, Boston, MA. Kaiser, M.J., Clark, K.R., Hinz, H., Austen, M.C.V., Somerfield, P.J. and Karakassis, I. (2006) Global analysis and recovery of benthic biota to fishing. Marine Ecology-Progress Series,311,1–14		

	Hourigan T.F., Etnoyer P.J., and Cairns S.D. (2017). The State of Deep-Sea Coral and Sponge Ecosystems of the United States. NOAA Technical Memorandum NMFS-OHC-4. Silver Spring, MD. 467 p. (Source: https://swfsc.noaa.gov/publications/CR/2017/2017Clarke.pdf). NOAA (2015). Bullard, J.K. Letter to the New England Fishery Management Council. Available: http://www.talkingfish.org/wp-content/uploads/2015/04/Bullard-Letter_4.16.15.pdf NOAA (2018c). Bullard, J.K. Letter to the New England Fishery Management Council.Available at: https://www.savingseafood.org/wp-content/uploads/2018/01/180103_OA2-Decision_Letter-to-NEFMC.pdf Collie, J. S., Hermsen, J. M. P., Valentine, C. (2005). Effects of Fishing on Gravel Habitats: Assessment and Recovery of Benthic Megafauna on Georges Bank. Benthic Habitats and the Effects of Fishing: American Fisheries Society Symposium 41. P. W. Barnes and J. P. Thomas. Bethesda, MD, American Fisheries Society: 325-343.	
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		**N/A**

Evaluation Table for PI 2.5.1

PI 2.5.1		The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is evidence that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Y	Y	N
	Justification	The UoA scallop fishery area of operation is within the US Large Marine Ecosystem (LME), with inherent ecosystem-based management approaches of the wider as well as key ecosystem elements for appropriate environment and economic outcomes (Bethoney, et.al. 2017). Dominant species removal from the fishery is considered to be commercial size adult scallops, which are addressed under Principle 1. Incidental bycatch also included; smaller sized scallops, sand dollar, starfish, a grouping of skates, monkfish, and negligible levels of yellowtail flounder. These are considered the key elements of the ecosystem interacting with the UoA fishery. The vulnerability of benthic habitat communities (sand/gravel/cobble and structure forming epifauna) with regards to natural disturbance as well as from fishing interaction are known (Greene, et. al. 2010; Collie, et.al. 2005; Gallagher and Purcell 2017). No interaction with species recorded under the ESA, MMPA, or VME was identified in SBRM and observer reports of the fishery (Wigley and Tholke, 2017). The fishery is identified with low levels of incidental bycatch of invertebrates and epifauna specimens, this evidences the relatively low ecosystem footprint of the fishery. In addition recovery from direct or indirect interaction with benthic communities is known. Some research has demonstrated recovery of benthic fauna/communities on silty sand sediments within 6 months post-dredging unexploited areas at depth of 15m on GOM (Watling et. al. 2001). Furthermore, no evidence of scallop dredge impact was apparent 1 year after a pre-dredge and post-dredge survey at 3 sites on sand sediments (depth of 45-88m) in the Hudson Canyon of Mid-Atlantic (Sullivan et. al., 2003). Also in similar benthic ecology of the Georges Bank which was closed to bottom fishing, recovery of epibenthic communities including complex structural species aggregations was estimated to be evident within 10 years (Collie et. al., 2005). Rotational closed and access area fished by the UoA fleet are subjected to similar duration of restrictions, therefore facilitating 6mth-10year recovery periods for some areas that were initially fished to recover before they are fished again. However in practice target areas of high scallop densities are mostly fished, therefore some areas will be repeatedly fished, while other areas will never be targeted and fished. This limits the impact of the gear to particular lanes, while creating benthic unfished patches, islands or sub-ecosystem clusters of greater diversity amongst even the more heavily fished areas. Such islands (sub-ecosystem clusters) support recovery of benthic community in fished areas through neighboring emigration and by acting as source locations for new recruits to other areas. This is important because such benthic ecology/habitats are key to the life history processes (breeding, nursery and feeding areas) for a wide range of species, including commercially important fish and shellfish. NEFMC, managed fisheries (stock status, assessment and management information – 2018) indicates that scallop is not overfished or in a state of overfishing. Scallops are filter feeders (predator) on suspended planktons, and are not known to be prey to any key species or dependent link in the food web or trophic (energy) relationships of the ecoregion.		

		Sand dollar and starfish are considered resilient with relatively high post capture recovery. Increase in scavenger species have being indentified in post-dredge areas; however sand dollar and starfish are not known to be a dependent link in the food web or trophic (energy) relationships of the ecoregion. Only thorny skates are considered overfished from the skate complex grouping. Accountability management measures are implanted for rebuilding the stock by 2028. Monkfish are not overfished or in a state of overfishing. YTF stocks are in rebuilding with accountability management measures for selected years (YTF, GB 2032; YTF, SNE/MA 2019; YTF, CC/GOM 2023). These species are not known to be unique or primary prey to any key species or dependent link in the food web or trophic (energy) relationships of the ecoregion. In addition, Windowpane flounder which is likely to interact with the fishery has demonstrated rebuilt status in 2017. Further outcome benefits are provided to ecosystem elements of the UoA fishery thorough the approved measures of the Omnibus Essential Fish Habitat Amendment 2 (OHA2)/Framework 29 - "Highest Yield, Lowest Impact". Which states "By giving the fleet access to dense concentrations of scallops in the northern portion of Closed Area I and Nantucket Lightship West, scallopers will be able to catch their trip limits faster and reduce the amount of time dredges are on bottom," ….. "This scenario has another benefit in that it lets us shift effort away from Closed Area II, which means flatfish bycatch will be lower and the scallops in that area will have a chance to grow larger." Considering the above, it can be said that he fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. SG 80 is met. The open conditions for this PI were closed at re-assessment (See Appendix 8: Condition Tables and Justifications). Comprehensive evidence of the effects of the UoA fishery on genetic diversity of species interacting (incidental bycatch – fish, invertebrates, and other epifauna) with the fishery would be required to achieve a higher score.
References		Collie, J. S., Hermsen, J. M. P., Valentine, C. (2005). Effects of Fishing on Gravel Habitats: Assessment and Recovery of Benthic Megafauna on Georges Bank. Benthic Habitats and the Effects of Fishing: American Fisheries Society Symposium 41. P. W. Barnes and J. P. Thomas. Bethesda, MD, American Fisheries Society: 325-343. Bethoney N.D., Zhao L., Chen C., Stokesbury K.D.E. (2017) Identification of persistent benthic assemblages in areas with different temperature variability patterns through broad- scale mapping. PLoS ONE 12(5): e0177333. (Source: https://doi.org/10.1371/journal.pone.0177333). Gallagher, S. and Purcell, M. (2017). Impact of Disturbance on Habitat Recovery in Habitat Management Areas on the Northern Edge of George's Bank. (Interim Report March 2017). Woods Hole Oceanographic Institution. NEFMC.2018b. Status, Assessment and Management Information for NEFMC Managed Fisheries March 29, 2018 – (http://s3.amazonaws.com/nefmc.org/180328-Status-Assessment-and-Mgt-Info-2018.pdf). NEFMC, (2018f). Scallops: Framework 29 "Highest Yield, Lowest Impact" Alternative Advances Following NMFS Habitat Decision. (Source: http://s3.amazonaws.com/nefmc.org/NEFMC-Scallop-FW-29-Advances-Following-Habitat-Decision.pdf). NOAA (2018c). Bullard, J.K. Letter to the New England Fishery Management Council. Available at: https://www.savingseafood.org/wp-content/uploads/2018/01/180103_OA2-Decision_Letter-to-NEFMC.pdf Greene, J.K., M.G. Anderson, J. Odell, and N. Steinberg, eds. (2010). The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One. The Nature Conservancy, Eastern U.S. Division, Boston, MA. Wigley S. E. and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern

	United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. (Source: http://www.nefsc.noaa.gov/publications/).	
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		**N/A**

Evaluation Table for PI 2.5.2

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary.	There is a partial strategy in place, if necessary.	There is a strategy that consists of a plan, in place.
	Met?	Y	Y	N
	Justification	There is a partial strategy in place, if necessary. The NEFMC sea scallop fishery management plan is regularly updated where further evidence of the fishery interactions with ecosystems elements are known. Precautionary management measures are typically implemented in situations of uncertainty to reduce negative exposures of known ecosystem elements. Fundamentally, the fishery is managed using various measures to reduce bycatch, including; quota allocation, commercial fishing permit/license, closed and rotational access areas options and reporting of catch interactions through VTR, and dealer reported landings (sales/trade) record reconciliation with VTR, as well as at-sea observer program (Wigley and Tholke 2017). Habitat management areas (HMA) are designated across Gulf of Maine, Georges Bank, and Southern New England/Mid-Atlantic, for protection of vulnerable benthic communities (EFH/HAPC) as well as for research (dedicated habitat research areas (DHRA) which further updated management strategies (Bullard 2018). The UoA fleet are known to utilize historical knowledge of the fishing grounds, good communication among the fleet, as well as modern cartography mapping technology (including bathymetry mapping of seabed habitat features/communities) to facilitate targeted fishing effort to permitted areas of high scallop density which inherently, facilitate highest catch and reduced time that the gear is likely to interact with benthic communities (NEFMC 2018f). Overall this management practice facilitates maximum fishing efficiency of the gear and minimum direct/indirect impacts on the benthic ecology of the ecoregion (habitat, species, and community/clusters). SG 80 is met. Evidence of a comprehensive management strategy with specific focus on all ecosystem elements would be required to achieve a higher score.		
b	**Guidepost**	The measures take into account potential impacts of the fishery on key elements of the ecosystem.	The partial strategy takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	The strategy, which consists of a plan, contains measures to address all main impacts of the fishery on the ecosystem, and at least some of these measures are in place. The plan and measures are based on well-understood functional relationships between the fishery and the Components and elements of the ecosystem. This plan provides for development of a full strategy that restrains impacts on the ecosystem to ensure the fishery does not cause serious or irreversible harm.
	Met?	Y	Y	N

	Justification	The partial strategy takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance. Good available information such as from fisheries and habitat research and stock assessment, as well as from groundfish operational ecosystem assessment considerations reports, and observer as well as vms reports, for all relevant elements of the partial strategy (detailed in SIa) are utilized and expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance. SG 80 is met. Evidence of a comprehensive management strategy with specific focus on all ecosystem elements would be required to achieve a higher score.		
c	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The partial strategy is considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved.
	Met?	Y	Y	Y
	Justification	The partial strategy is considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems); and the measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved. In this UoA, federally managed species comprise the majority of the catch, and all main species have a healthy stock status. Reporting on catch composition across all fleets is published annually. Habitat impacts have been modeled for consideration of impacts on designated EFH for all federally managed species. ETP species are also monitored with regulatory mechanisms to spur management response when impacts exceed biological limits. Information directly from the fishery and interacting ecosystem are utilized to implement the partial strategies (detailed in SIa) and have demonstrated some effectiveness. For instance, Windowpane flounder stocks have demonstrated rebuilt status in the SNE/MAB, inherent to ongoing stock assessment and implementation of Accountability measures such as Acceptable Biological catch/annual limits (zero landing) as well as zero access areas. SG 100 is met.		
d	**Guidepost**		There is some evidence that the measures comprising the partial strategy are being implemented successfully.	There is evidence that the measures are being implemented successfully.
	Met?		Y	Y
	Justification	There is evidence that the measures are being implemented successfully. PIs 2.1.2, 2.2.2, 2.3.2, and 2.4.2 provide examples of implementation of management measures to meet objectives for each of these ecosystem components. Windowpane flounder stocks have demonstrated rebuilt status in the SNE/MAB, inherent to ongoing stock assessment and implementation of Accountability measures such as Acceptable Biological catch/annual limits (zero landing) as well as zero access areas. Scallop which is the dominant catch of the fishery are not identified to be overfished or in a state of overfishing. Scallop dredge gear technical modification within management operational obligations is known to facilitate reduce impact with species listed under the ESA, MMPA, VME, as well as to reduce incidental bycatch of fish, invertebrates, and other benthic habitat specimens. Also, VMS and observer monitoring in the fishery has indicated the		

		footprint of the fleet, without any indication of systematic non-compliance to the fishery management measures. SG 100 is met.
References		NEFMC, (2018f). Scallops: Framework 29 “Highest Yield, Lowest Impact” Alternative Advances Following NMFS Habitat Decision. (Source: http://s3.amazonaws.com/nefmc.org/NEFMC-Scallop-FW-29-Advances-Following-Habitat-Decision.pdf). NOAA (2018c). Bullard, J.K. Letter to the New England Fishery Management Council. Available at: https://www.savingseafood.org/wp-content/uploads/2018/01/180103_OA2-Decision_Letter-to-NEFMC.pdf Greene, J.K., M.G. Anderson, J. Odell, and N. Steinberg, eds. (2010). The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One. The Nature Conservancy, Eastern U.S. Division, Boston, MA. Wigley S. E. and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. (Source: http://www.nefsc.noaa.gov/publications/).

OVERALL PERFORMANCE INDICATOR SCORE:	**90**
CONDITION NUMBER (if relevant):	**N/A**

Evaluation Table for PI 2.5.3

<table>
<tr><td colspan="2">PI 2.5.3</td><td colspan="3">There is adequate knowledge of the impacts of the fishery on the ecosystem</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td>Guidepost</td><td>Information is adequate to identify the key elements of the ecosystem (e.g., trophic structure and function, community composition, productivity pattern and biodiversity).</td><td>Information is adequate to broadly understand the key elements of the ecosystem.</td><td></td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td></td></tr>
<tr><td>Justification</td><td colspan="3">Scallop (kept and discarded) are the dominant catch in the fishery and considered the key element of the fishery interaction with ecosystem.

Incidental bycatch also included; smaller sized scallops, sand dollar, starfish, a grouping of skates, monkfish, and negligible levels of yellowtail flounder. These are considered the key elements of the ecosystem interacting with the UoA fishery.

Information on NEFMC, managed fisheries (stock status, assessment and management information – 2018) indicates that scallop is not overfished or in a state of overfishing. Scallops are filter feeders (predator) on suspended planktons, and are not known to be prey to any key species or dependent link in the food web or trophic (energy) relationships of the ecoregion.

Sand dollar and starfish are considered resilient with relatively high post capture recovery. Increase in scavenger species have being indentified in post-dredge areas; however sand dollar and starfish are not known to be a dependent link in the food web or trophic (energy) relationships of the ecoregion. Only Thorny skates are considered overfished from the skate complex grouping. Accountability management measures are implanted for rebuilding the stock by 2028. Monkfish are not overfished or in a state of overfishing. YTF stocks are in rebuilding with accountability management measures for selected years (YTF, GB 2032; YTF, SNE/MA 2019; YTF, CC/GOM 2023). These species are not known to be unique or primary prey to any key species or dependent link in the food web or trophic (energy) relationships of the ecoregion. In addition, Windowpane flounder which is likely to interact with the fishery has demonstrated rebuilt status in 2017.

Seabed habitat characterization and communities are known at good details throughout the ecoregion - Gulf of Maine, Georges Bank, and Southern New England/Mid-Atlantic – (Greene et. al., 2010). Also, impact on, and recovery of, benthic habitats and communities across the fishery are researched and these information facilitate identification of any risk to key elements of the ecosystem , as well as adjustments to FMP for scallops and other groundfish species, and the wider ecosystem elements (Bethoney et. al., 2017; Collie et. al. 2005; NEFMC 201f8; NEFSC 2017).

It can be said that Information is adequate to broadly understand the key elements of the ecosystem.SG 80 is met.</td></tr>
<tr><td rowspan="2">b</td><td>Guidepost</td><td>Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, and have not been investigated in detail.</td><td>Main impacts of the fishery on these key ecosystem elements can be inferred from existing information and some have been investigated in detail.</td><td>Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>Y</td></tr>
</table>

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
	Justification	Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated. The SBRM report and observer coverage program provide identification and quantification of species caught (kept and discarded) in the fishery, as well as any interaction with species listed under the ESA. MMPA, or VME designation. Observer coverage is spatially and temporally representative across all areas of the fishery (9%-60% at 30% CV). VMS, implemented on all vessels in the UoA fleet provides identification of the fleet operational areas as well as compliance with rotational closed-access areas options – including HMA and EFH/HAPC - which are key ecosystem elements containing benthic habitat (sediment types – sand/gravel/silt) important for life stages of various species. Ongoing research funded by the scallop RSA program provides information on before and after impact on seabed communities from scallop dredge fishing (Gallagher and Purcell 2017; Wigley and Tholke 2017). Seabed habitat characterization and communities are known at good details throughout the ecoregion - Gulf of Maine, Georges Bank, and Southern New England/Mid-Atlantic – (Greene et. al., 2010). Also, impact on, and recovery of, benthic habitats and communities across the fishery are researched and these information facilitate adjustments to FMP for scallops and other groundfish species, as well as wider ecosystem elements (Bethoney et. al., 2017; Collie et. al. 2005; NEFMC 2018f; NEFSC 2017). SG 100 is met.		
c	Guidepost		The main functions of the Components (i.e., target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are known.	The impacts of the fishery on target, Bycatch, Retained and ETP species are identified and the main functions of these Components in the ecosystem are understood.
	Met?		Y	N
	Justification	The SBRM report and observer coverage program provide identification and quantification of species caught (kept and discarded) in the fishery, as well as any interaction with species listed under the ESA. MMPA, or VME designation. Observer coverage is spatially and temporally representative across all areas of the fishery (9%-60% at 30% CV). VMS, implemented on all vessels in the UoA fleet provides identification of the fleet operational areas as well as compliance with rotational closed-access areas options – including HMA and EFH/HAPC - which are key ecosystem elements containing benthic habitat (sediment types – sand/gravel/silt) important for life stages of various species. Ongoing research funded by the scallop RSA program provides information on before and after impact on seabed communities from scallop dredge fishing (Gallagher and Purcell 2017; Wigley and Tholke 2017). The main functions of the components – target catch/retained catch, Bycatch, and ETP species and Habitats - in the ecosystem are known. SG 80 is met. Evidence of a greater understanding of the functional ecosystem components, especially in situation of multiple parameters (duration/nature/intensity) of interactions, would be required to achieve a higher score.		
d	Guidepost		Sufficient information is available on the impacts of the fishery on these Components to allow some of the main consequences for the ecosystem to be inferred.	Sufficient information is available on the impacts of the fishery on the Components and elements to allow the main consequences for the ecosystem to be inferred.

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
	Met?		Y	Y
	Justification	Sufficient information is available on the impacts of the fishery on the Components and elements to allow the main consequences for the ecosystem to be inferred. The SBRM and observer reports provide identification and quantification of species caught (kept and discarded) in the fishery. Observer coverage is spatially and temporally representative across all areas of the fishery (9%-60% at 30% CV). VMS, implemented on all vessels in the UoA fleet provides identification of the fleet operational areas as well as compliance with rotational closed-access areas options – including HMA and EFH/HAPC - which are key ecosystem elements containing benthic habitat (sediment types – sand/gravel/silt) important for life stages of various species (Gallagher and Purcell 2017; Wigley and Tholke 2017). Scallop which is the dominant kept and discarded species are not known to be key or dependent species in the prey – predator or trophic (energy) network of the ecosystem. Trophic relationship of the other incidental bycatch species is known and does not represent any key or dependent link for the functional integrity of the ecosystem, meaning they are related to flexible or wide –ranging prey-predator relationships. SG 100 is met.		
e	Guidepost		Sufficient data continue to be collected to detect any increase in risk level (e.g., due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Information is sufficient to support the development of strategies to manage ecosystem impacts.
	Met?		Y	Y
	Justification	Information is sufficient to support the development of strategies to manage ecosystem impacts. Information from the SBRM and observer reports provide identification and quantification of species caught (kept and discarded) in the fishery. Observer coverage is spatially and temporally representative across all areas of the fishery (9%-60% at 30% CV). VMS, implemented on all vessels in the UoA fleet provides identification of the fleet operational areas as well as compliance with rotational closed-access areas options (Gallagher and Purcell 2017; Wigley and Tholke 2017). Information on seabed habitat characterization and communities are known at good details throughout the ecoregion - Gulf of Maine, Georges Bank, and Southern New England/Mid-Atlantic – (Greene et. al., 2010). Also, impact on, and recovery of, benthic habitats and communities across the fishery are researched and these information facilitate adjustments to FMP for scallops and other groundfish species, as well as wider ecosystem elements (Bethoney et. al., 2017; Collie et. al. 2005; NEFMC 2018f; NEFSC 2017). It can be said that sufficient and appropriate information on the UoA fleet, and the ecosystem area of operations, is collected and available for development of strategies with regards to managing ecosystem impacts from the UoA fleet. SG 100 is met.		
References		Bethoney N.D., Zhao L., Chen C., Stokesbury K.D.E. (2017) Identification of persistent benthic assemblages in areas with different temperature variability patterns through broad- scale mapping. PLoS ONE 12(5): e0177333. (Source: https://doi.org/10.1371/journal.pone.0177333). Gallagher, S. and Purcell, M. (2017). Impact of Disturbance on Habitat Recovery in Habitat Management Areas on the Northern Edge of George's Bank. (Interim Report March 2017). Woods Hole Oceanographic Institution.		

PI 2.5.3	There is adequate knowledge of the impacts of the fishery on the ecosystem
	NEFMC.2018b. Status, Assessment and Management Information for NEFMC Managed Fisheries March 29, 2018 – (http://s3.amazonaws.com/nefmc.org/180328-Status-Assessment-and-Mgt-Info-2018.pdf). NEFMC, (2018f). Scallops: Framework 29 "Highest Yield, Lowest Impact" Alternative Advances Following NMFS Habitat Decision. (Source: http://s3.amazonaws.com/nefmc.org/NEFMC-Scallop-FW-29-Advances-Following-Habitat-Decision.pdf). NOAA (2018c). Bullard, J.K. Letter to the New England Fishery Management Council. Available at: https://www.savingseafood.org/wp-content/uploads/2018/01/180103_OA2-Decision_Letter-to-NEFMC.pdf Greene, J.K., M.G. Anderson, J. Odell, and N. Steinberg, eds. (2010). The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One. The Nature Conservancy, Eastern U.S. Division, Boston, MA. Wigley S. E. and Tholke C. (2017). 2017 discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 p. (Source: http://www.nefsc.noaa.gov/publications/). NEFSC. (2017). Ecosystem Considerations for the 2017 Groundfish Operational Assessment. (Source: https://www.nefsc.noaa.gov/groundfish/operational-assessments-2017/docs/2017_Ecosystem_Considerations.pdf).

OVERALL PERFORMANCE INDICATOR SCORE:	**95**
CONDITION NUMBER (if relevant):	**N/A**

Principle 3

Evaluation Table for PI 3.1.1 – Legal and/or customary framework

<table>
<tr><td colspan="2">PI 3.1.1</td><td colspan="3">The management system exists within an appropriate legal and/or customary framework which ensures that it:
• Is capable of delivering sustainability in the UoA(s); and
• Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and
• Incorporates an appropriate dispute resolution framework.</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="4">a</td><td colspan="4">Compatibility of laws or standards with effective management</td></tr>
<tr><td>Guidepost</td><td>There is an effective national legal system and a framework for cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2</td><td>There is an effective national legal system and organized and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2</td><td>There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>Y</td></tr>
<tr><td>Justification</td><td colspan="3">MSC Principle 1 states that: “A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

MSC Principle 2 states that: “Fishing operations should allow for the maintenance of the structure, productivity, function, and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

The U.S. federal fishery management system operates under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), the National Environmental Protection Act, the Administrative Procedures Act, and various executive orders. Each of these governing statutes create binding requirements and procedures that must be followed to prevent overfishing, to rebuild depleted stocks, and to protect the ecosystem and ecologically related species for all fisheries.

The MSFCMA contains ten national standards for fishery conservation and management. The national standards of particular relevance to MSC Principles 1 and 2 are as follows:

(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

(2) Conservation and management measures shall be based upon the best scientific information available.</td></tr>
</table>

PI 3.1.1		The management system exists within an appropriate legal and/or customary framework which ensures that it: • Is capable of delivering sustainability in the UoA(s); and • Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and • Incorporates an appropriate dispute resolution framework.
		(3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination. (9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. The US fishery management system is governed by binding procedures that require cooperation with all parties with an interest in a fishery under management. One stated purpose of the MSFCMA is “to establish Regional Fishery Management Councils to exercise sound judgment in the stewardship of fishery resources through the preparation, monitoring, and revision of such plans under circumstances (A) which will enable the States, the fishing industry, consumer and environmental organizations, and other interested persons to participate in, and advise on, the establishment and administration of such plans, and (B) which take into account the social and economic needs of the States.” The MSFCMA also sets forth a policy “to assure that the national fishery conservation and management program utilizes, and is based upon, the best scientific information available; involves, and is responsive to the needs of, interested and affected States and citizens; considers efficiency; draws upon Federal, State, and academic capabilities in carrying out research, administration, management, and enforcement; considers the effects of fishing on immature fish and encourages development of practical measures that minimize bycatch and avoid unnecessary waste of fish; and is workable and effective…” The National Standard Guidelines for National Standard 3 in the MSFCMA speaks directly to cooperation with other parties where necessary to deliver appropriate management outcomes: “Cooperation and understanding among entities concerned with the fishery (e.g., Councils, states, Federal Government, international commissions, foreign nations) are vital to effective management. Where management of a fishery involves multiple jurisdictions, coordination among the several entities should be sought in the development of an FMP. Where a range overlaps Council areas, one FMP to cover the entire range is preferred. The Secretary designates which Council(s) will prepare the FMP, under section 304(f) of the Magnuson-Stevens Act.” (NOAA NMFS 2016. ; USOFR 2018) This system has proven to be effective at maintaining and re-establishing healthy populations of targeted species and maintaining the integrity of ecosystems. Sea scallops are one of multiple stocks that were severely depleted during the latter half of the 20th Century and were fully restored by measures developed and implemented through the management system in the mid-1990s. The sea scallop resource was declared to be fully rebuilt in 2001. The MFCMA requires Councils to designate essential fish habitat (EFH) and take steps to minimize the impacts of fishing gear on EFH to the extent practicable. The NEFMC’s 1999 habitat amendment designated EFH for the 18 species managed by the Council at the time, documented major threats to EFH from both fishing and non-fishing related activities, and designated Habitat Areas of Particular Concern (HAPC) for Atlantic salmon and Atlantic cod (https://www.nefmc.org/management-plans/habitat). In 2004, the NEFMC initiated Omnibus EFH Amendment 2 (OHA2). Once implemented, OHA2 will update EFH designations for all species managed by the Council (now 28), designate new HAPCs, and revise the current habitat and groundfish management areas. The amendment

<table>
<tr><td colspan="2">PI 3.1.1</td><td colspan="3">The management system exists within an appropriate legal and/or customary framework which ensures that it:
• Is capable of delivering sustainability in the UoA(s); and
• Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and
• Incorporates an appropriate dispute resolution framework.</td></tr>
<tr><td></td><td></td><td colspan="3">used a new Swept Area Seabed Impact (SASI) model to assess habitat vulnerability to fishing gear and develop revised habitat management areas (https://www.nefmc.org/management-plans/habitat).

The NEFMC is also developing a deep-sea coral amendment that considers coral conservation measures: (1) in canyons and on seamounts south of Georges Bank, some of which overlap with the recently designated Northeast Canyons and Seamounts Marine National Monument; and (2) in the Gulf of Maine, both inshore off the eastern Maine coast and offshore in Jordan and Georges Basins. The Council is coordinating with the Mid-Atlantic Fishery Management Council on deep-sea coral management efforts, pursuant to a 2013 memorandum of understanding (https://www.nefmc.org/management-plans/habitat).

Council actions must also conform to the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), the Administrative Procedures Act (APA), the Paperwork Reduction Act (PRA), the Coastal Zone Management Act (CZMA), the National Environmental Policy Act (NEPA), the Regulatory Flexibility Act (RFA), The Information Quality Act (IQA), Regulatory Impact Review (RIR), and various Executive Orders. These laws and executive orders help ensure that in developing an amendment, the councils consider the full range of alternatives and their expected impacts on the marine environment, living marine resources, and the affected human communities. FMPs and amendments are published as an integrated document that contains all required elements of the action as required by NEPA and information to ensure consistency with other applicable laws and executive orders.

The US Atlantic sea scallop fishery meets the requirements for SG 100.</td></tr>
<tr><td>b</td><td colspan="4">Resolution of disputes</td></tr>
<tr><td></td><td>Guidepost</td><td>The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.</td><td>The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the UoA.</td><td>The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective.</td></tr>
<tr><td></td><td>Met?</td><td>Y</td><td>Y</td><td>Y</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">U.S. law, including the MSFMCA, provides a transparent mechanism for the resolution of legal disputes. NMFS has legal responsibility for implementing the MSFCMA, and can be subject to lawsuits, during which the public “administrative record” (the basis for decision making—including everything in the public record on all fisheries related issues) is used to demonstrate how NMFS made its decisions. NMFS also has legal responsibility for reviewing and approving (or not) FMPs, implementing and enforcing regulations, and administering supporting programs. This system has been tested and proven to be effective in multiple instances, including legal challenges to a number of fishery management plans. The US Atlantic sea scallop fishery meets the requirements for SG 100.</td></tr>
<tr><td>c</td><td colspan="4">Respect for rights</td></tr>
</table>

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• Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and
• Incorporates an appropriate dispute resolution framework.</td></tr>
<tr><td rowspan="3"></td><td>Guidepost</td><td>The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</td><td>The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</td><td>The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>Y</td></tr>
<tr><td>Justification</td><td colspan="3">The MSFCMA contains ten national standards that guide the development of fishery management plans in the U.S. The Act also requires NMFS to develop National Standard Guidelines that further interpret the National Standards and give guidance to the regional fishery management councils on how to comply with the National Standards.

National standard Number 8 states that: “Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirements of paragraph (2), in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.”

The National Standard Guidelines state that: “All other things being equal, where two alternatives achieve similar conservation goals, the alternative that provides the greater potential for sustained participation of such communities and minimizes the adverse economic impacts on such communities would be the preferred alternative.” The guidelines also say that “The term ‘‘sustained participation’’ means continued access to the fishery within the constraints of the condition of the resource.”

The MSFCMA requires a provision in all fishery management plans to: “… assess, specify, and analyse the likely effects, if any, including the cumulative conservation, economic, and social impacts, of the conservation and management measures on, and possible mitigation measures for—

(A) participants in the fisheries and fishing communities affected by the plan or amendment;

(B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants;…”

Fishery management plans that establish a limited access system for the fishery in order to achieve optimum yield require the Council and the Secretary of Commerce to take into account—

(A) present participation in the fishery;

(B) historical fishing practices in, and dependence on, the fishery;

(C) the economics of the fishery;

(D) the capability of fishing vessels used in the fishery to engage in other fisheries;</td></tr>
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• Incorporates an appropriate dispute resolution framework.</td></tr>
<tr><td></td><td></td><td colspan="2">(E) the cultural and social framework relevant to the fishery and any affected fishing communities;
(F) the fair and equitable distribution of access privileges in the fishery; and
(G) any other relevant considerations.
The make-up of the regional fishery management councils and their advisory panels, together with public meetings in the region, assure that existing arrangements will be taken into account in the development of fishery management plans. These provisions of the law do not guarantee that existing legal or customary rights will be incorporated into a management plan but fishery management plans can formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2. Any failure to recognize existing legal rights would be subject to challenge in the courts and the law is written so as to encourage consideration of customary rights. The nature of the consultative process of FMP development insures that customary rights will be given consideration. The mechanism available to observe legal rights created explicitly or established by custom would be a provision in the FMP. A provision in an FMP would also be a formal commitment.
The US Atlantic sea scallop fishery therefore has the formal commitment mechanism necessary to meet the requirement of SG 100.</td></tr>
<tr><td colspan="2">References</td><td colspan="2">Administrative Procedure Act. 1946. (5 U.S.C. Subchapter II). Accessed March 2017 at: http://www.archives.gov/federal-register/laws/administrative-procedure/
MSFCMA 2007
NOAA-NMFS 2016
USOFR 2018</td></tr>
<tr><td colspan="3">OVERALL PERFORMANCE INDICATOR SCORE (UoAs 1-4):</td><td>100</td></tr>
<tr><td colspan="3">CONDITION NUMBER (if relevant):</td><td></td></tr>
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Evaluation Table for PI 3.1.2 – Consultation, roles and responsibilities

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
Scoring Issue		SG 60	SG 80	SG 100
a	Roles and responsibilities			
	Guidepost	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.
	Met?	Y	Y	Y
	Justification	The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) sets forth the structure, functions, roles, and responsibilities of the official organizations and individuals involved in the management of US fisheries in federal waters. Key roles and functions for US Atlantic sea scallop are as follows: • National Marine Fisheries Service ("NMFS") (NOAA) – final approving authority for the US Atlantic Sea scallop Fishery Management Plan ("FMP") and amendments thereto; final approving authority for annual quotas; authority for issuance of administrative rules implementing management decisions. The Regional Administrator of NMFS is a voting member of the NEFMC. NMFS staff provides analysis and input to the councils on issues confronting the councils. • Northeast Fisheries Science Center (NEFSC/Woods Hole) – responsible for at sea surveys of all federally-managed species, estimating volume of biomass, age/length relationships, recruitment, etc.; responsible for periodic formal (peer reviewed) stock assessments, evaluating all characteristics of the biomass, based on the at sea surveys, and providing projections of future volume of biomass under varying hypothetical harvest scenarios, all for the use of regulators in setting quotas. NEFSC representatives make regular presentations to the NEFMC regarding scientific research and results relevant to the business of the Council. • New England Fishery Management Council ("NEFMC") – entity with jurisdiction under the Magnuson Act for the development of management measures for the sea scallop fishery through the initiation, development, and approval of all amendments to the FMP, as well as the setting of annual quotas (see website www.nefmc.org). The MSFCMA created eight regional fishery management councils (councils) responsible for the fisheries that require conservation and management in their region. The councils are composed of both voting and non-voting members representing the commercial and recreational fishing sectors in addition to environmental, academic, and government interests. The qualifications required for appointment to the regional fishery management councils are set forth in Section 302 of the MSFCMA. Appointed members must be individuals who, by reason of their occupational or other experience, scientific expertise, or training, are knowledgeable regarding the conservation and management, or the commercial or recreational harvest, of the fishery resources of the geographical area concerned. The US Secretary of Commerce, in making appointments to the regional councils, is required, to the extent practicable, to ensure a fair and balanced apportionment, on a rotating or other basis, of the active participants (or their representatives) in the commercial and recreational fisheries under		

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
		the jurisdiction of the Council. Each year the Secretary of Commerce must report to Congress on actions taken by the Secretary to ensure a fair and balanced apportionment of council membership. The voting members of each Council are the principal State official with marine fishery management responsibility, the regional director of the NMFS, and the members required to be appointed by the Secretary of Commerce in accordance with the criteria established in the MSFCMA. The roles and responsibilities of the respective Councils are set forth in the MSFCMA. The law establishes procedural guidelines for the Councils and requires each Council to publish and make available to the public a statement of its organization, practices and procedures. The MSFCMA requires each Council to establish, maintain, and appoint members of a scientific and statistical committee to "assist in the development, collection, evaluation, and peer review of such statistical, biological, economic, social, and other scientific information as is relevant to such Council's development and amendment of any fishery management plan." The MSFCMA also directs each Council to establish such advisory panels as are necessary or appropriate to assist it in carrying out its functions under the Act. • Scientific and Statistical Committee ("SSC") of the NEFMC – a group of approximately 15 scientists and academics required by the Magnuson Act to review annual reports from the NEFMC staff and NEFSC regarding the status of the stocks, and then to set the ABC ("Acceptable Biological Catch") for each species. The ABC is the maximum level at which the NEFMC may set the harvest quota each year. The SSC additionally recommends improvements for the assessments and notes parameters – such as biological reference points – that they believe need further study. • Sea Scallop Committee of the NEFMC – committee comprised of NEFMC members charged with initial responsibility for interacting with industry, and for recommending to the full Council proposed changes in the FMP, implementing regulations and proposed annual quotas. - Sea Scallop Advisory Panel – decisions related to the Sea Scallop FMP are largely the product of ongoing meetings and collaboration between the Sea Scallop Committee and the Sea Scallop Advisory Panel. The Advisory Panel consists of members of the public with an interest in and knowledge of the sea scallop fishery, most of whom are fishery participants. The US Atlantic sea scallop fishery meets the requirements for SG 100 for explicitly defined and well understood roles and responsibilities for all areas of action.		
b	Consultation processes			
	Guidepost	The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used.
	Met?	Y	Y	Y

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**		
	Justification	The Council process is fully public and there are regular opportunities for public involvement. Public notification procedures are specified by law and all meetings must be open to the public. The consultation process includes a formal advisory panel that meets regularly and provides an opportunity for relevant information, including local knowledge, to be brought forth and considered in the development and adjustment of fishery management plans. Council committee meetings and council meetings provide opportunities for input of relevant information. Open council discussions inform the public how their input is being used. Multiple Council meetings and public hearings precede a final Council vote on management measures. Following the adoption of a fishery management measure by the Council, NMFS goes through a formal rule-making process that requires notification of the public through the Federal Register of proposed actions and provides multiple opportunities for public comment. Final rules include responses to public comments, explaining how input was used, in cases when the input was not used this is also described and an explanation that is publically available is provided. A response to public comments is required. The US Atlantic sea scallop fishery therefore meets the requirements of SG 100.		
c	Participation			
	Guidepost		The consultation process provides opportunity for all interested and affected parties to be involved.	The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.
	Met?	Y	Y	Y
	Justification	The US federal fishery management system provides the opportunity, encouragement, and facilitation for interested and affected parties to be involved through its basic structure and through the procedures followed in the development of FMPs and amendments. Interested and affected parties can be involved by seeking appointment to a fishery management council or a council advisory panel. Council members have their expenses paid and receive a stipend that reduces the financial burden of council participation. Members of council advisory panels have their meeting expenses paid by the councils to facilitate their attendance at meetings. Interested and affected parties who are not council or advisory panel members are also encouraged and given multiple opportunities to be involved. The fishery management councils maintain web sites that provide information to the public on all council activities and meetings. In addition, the councils maintain contact lists of interested parties to whom they send notices of meetings and information relevant to upcoming actions. Interested and affected parties can attend council meetings in person or by way of conference calls and webinars. Every NEFMC meeting includes a time set aside for comments from members of the public on subjects that are not on the agenda for that meeting. For issues that are on the Council agenda, members of the public are given an opportunity to speak on issues before the Council votes. Public hearings are held throughout the region whenever the Council considers any significant change in an FMP or regulations. The NEFMC actively solicits and considers public comment on issues under consideration by the Council. Interested and affected parties also have multiple opportunities to engage in the process through the federal rule-making process that follows Council adoption of management		

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties	
		measures. NEPA and the Administrative Procedures Act require opportunities for public comment before rules are implemented. The US Atlantic sea scallop fishery meets the requirements of SG 100.	
References		Administrative Procedure Act (5 U.S.C. Subchapter II) Accessed March 2018 at: *http://www.archives.gov/federal-register/laws/administrative-procedure/* MSFCMA 2007 NEFMC 2015b National Environmental Policy Act 1970	
OVERALL PERFORMANCE INDICATOR SCORE (UoAs 1-4):			**100**
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 3.1.3 – Long term objectives

PI 3.1.3		**The management policy has clear long-term objectives to guide decision-making that are consistent with MSC fisheries standard, and incorporates the precautionary approach.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guidepost	Long-term objectives to guide decision-making, consistent with the MSC fisheries standard and the precautionary approach, are implicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach are explicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach, are explicit within and required by management policy.
	Met?	Y	Y	Y
	Justification	The MSFCMA established clear long-term objectives to guide the development of fishery management plans by the regional fishery management councils. The National Standards for fishery management and the National Standard Guidelines require that: "The fishing mortality rate does not jeopardize the capacity of a stock or stock complex to produce MSY." The national standards are further interpreted through the National Standard Guidelines, required by the MSFCMA and developed and published by NMFS. The National Standard Guidelines for National Standard 1 require that: "when specifying limits and accountability measures intended to avoid overfishing and achieve sustainable fisheries, Councils must take an approach that considers uncertainty in scientific information and management control of the fishery. These guidelines describe how to address uncertainty such that there is a low risk that limits are exceeded." Since 2007, the MSFCMA has required that all FMPs include catch limits and accountability measures that are intended to insure that overfishing can't reduce a stock below the level that will produce MSY on a continuing basis. These provisions of law and policy are consistent with the MSC fisheries standard and the precautionary approach. They are explicit and required by management policy. Therefore, the US Atlantic sea scallop fishery meets the requirements of SG 100.		
References		MSFCMA USOFR 2018		
OVERALL PERFORMANCE INDICATOR SCORE (UoAs 1-4):				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.1.4 – Incentives for Sustainable Fishing

PI 3.1.4		**The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and seeks to ensure that perverse incentives do not arise.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and explicitly considers incentives in a regular review of management policy or procedures to ensure they do not contribute to unsustainable fishing practices.
	Met?	Y	Y	Y
	Justification	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and explicitly considers incentives in a regular review of management policy or procedures to ensure they do not contribute to unsustainable fishing practices. Statutory management planning by the Council gives certainty about the rules and goals of management in accordance with principles of sustainability, meeting the SG60 and SG80 scoring issues. Planning Development Team (PDT) of the Council conducts a regular review of the management plan to determine if objectives are being met. Action is taken through amendments to the Scallop Fishery Plan and incentives for sustainable fishing are explicitly considered through Accountability Measures including reductions in quotas in subsequent years if the Annual Catch Limit is exceeded, meeting the requirements of the SG100 scoring issue.		
References		MSFCMA Magnuson-Stevens Act Provisions; National Standard Guidelines https://www.federalregister.gov/documents/2016/10/18/2016-24500/magnuson-stevens-act-provisions-national-standard-guidelines		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.2.1 Fishery-specific objectives

PI 3.2.1		**The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guidepost	Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery-	Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery-	Well defined and measurable short and long-term objectives, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are

PI 3.2.1		The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.		
		specific management system.	specific management system.	explicit within the fishery-specific management system.
	Met?	Y	Y	Y
	Justification	MSC Principle 1 states that: "A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery. MSC Principle 2 states that: "Fishing operations should allow for the maintenance of the structure, productivity, function, and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends. The fishery-specific management system operates within a framework established by the broader US federal fishery management system. Long-term objectives for all federally-managed fisheries in the US are set forth in the ten National Standards for Fishery Management contained in the MSFCMA. Every fishery-specific management plan must comply with the National Standards. The National Standards specifically directed toward achieving the outcomes expressed by MSC's Principles 1 and 2 are as follows: 1. Prevent overfishing while achieving optimum yield. 2. Be based upon the best scientific information available. 3. Manage individual stocks as a unit throughout their range, to the extent practicable; interrelated stocks shall be managed as a unit or in close coordination. 6. Take into account and allow for variations among and contingencies in fisheries, fishery resources, and catches. 9. Minimize bycatch or mortality from bycatch. Additional explicit objectives that align with MSC Principles 1 and 2 are found in the EFH Requirements, MMPA, and ESA, among other laws and regulations that guide the development of fishery-specific FMPs. NEPA requires that all fishery management actions be analysed for their impact on multiple Valued Ecosystem Components. By law, councils must specify objective and measurable criteria for identifying when the fishery to which an FMP applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery. Actions taken to achieve the long- and short-term objectives can be found within FMP Amendments, and importantly, fishery specification documents that set important measures such as catch limits. Fishery management councils are required by law to "Review on a continuing basis, and revise as appropriate, the assessments and specifications contained in each fishery management plan for each fishery within its geographical area with regard to: (1) The present and probable future condition of the fishery; (2) The maximum sustainable yield from the fishery; (3) The optimum yield from the fishery…" Current FMPs contain harvest control rules that establish automatic responses to changes in the status of fish stocks. The status of fish stocks is determined through a peer-reviewed stock assessment process. The results of stock assessments are further reviewed by the councils' Scientific and Statistical Committees, which set the maximum catch that may be taken from a stock. Councils then develop annual catch limits for each managed fishery. Annual catch limits may not exceed the fishing level		

PI 3.2.1		The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.
		recommendations established by the Scientific and Statistical Committee. Annual catch limits may be set each year or for a multi-year period. In 1996 Congress amended the Magnuson-Stevens Fishery Conservation and Management Act with the Sustainable Fisheries Act (SFA). SFA emphasized the importance of habitat protection to healthy fisheries and strengthened the ability of the National Marine Fisheries Service (NMFS) and the Councils to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. The SFA required the Council, after receiving recommendations from NMFS, to amend its fishery management plans by October 1998 to: 1. Describe and identify the essential habitat for the species managed by the Council 2. Minimize to the extent practicable adverse effects on EFH caused by fishing 3. Identify other actions to encourage the conservation and enhancement of EFH also included material to satisfy the requirements of the NMFS guidelines at 50 CFR part 600, Subpart J for mandatory requirements of an FMP to: (1) Identify any fishing activities that are not managed under the MSA that may adversely affect EFH. (2) Identify activities other than fishing that may adversely affect EFH. For each activity, the FMP should describe known and potential adverse effects to EFH. (3) Identify actions to encourage the conservation and enhancement of EFH, including recommended options to avoid, minimize, or compensate for the adverse effects, especially in HAPCs. (4) List the major prey species for the species in the fishery management unit and discuss the location of prey species' habitat. Consider adverse effects on prey species and their habitats that may result from actions that reduce their availability, either through direct harm or capture, or through adverse effects to prey species' habitats. (5) Recommendations, in priority order, for research effects necessary to improve upon the description and identification of EFH, the identification of threats to EFH from fishing and other activities and the development of conservation and enhancement measures for EFH. (6) Conduct a cumulative impact analysis that describes impacts on an ecosystem or watershed scale (Cumulative effects of multiple gear types in included in the Gear Effects Evaluation Section). On January 14, 2016, the NEFMC submitted Omnibus Habitat Amendment 2 (OHA2) to NMFS GARFO. Implemented in 2017, OHA2 updates EFH designations for all species managed by the Council (now 28), designates new HAPCs, and revises the current habitat and groundfish management areas. The amendment used a new Swept Area Seabed Impact (SASI) model to assess habitat vulnerability to fishing gear and develop revised habitat management areas. The Council is developing a trailing action to OHA2 that will consider whether to exempt clam dredges in part or all of two new habitat management areas. Prior to OHA2, efforts to minimize the adverse effects of Council-managed fisheries on essential fish habitat (EFH) were largely developed and implemented plan by plan, although fishery effects on EFH are cumulative across fishery management plans because fish and fishery distributions overlap across both species and plans. In 1999, NOAA Fisheries implemented the first Habitat Omnibus Amendment that addressed new Magnuson Fishery Conservation and Management Act mandates in most New England Council FMPs. The amendment also identified and described EFH for the 18 species managed by the Council, major threats to EFH from both fishing and non-fishing related activities, and proposed conservation and enhancement measures and designated Habitat Areas of Particular Concern for Atlantic salmon and Atlantic cod. EFH Omnibus Amendment 2 Although some designations, specifically skates, wolffish, and red crab, are more recent,

PI 3.2.1		The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.
		many of the New England designations were developed for the 1998 Omnibus EFH Amendment. The new designations proposed in OHA2 include additional years of distribution data as well as information about depth and temperature preferences. The FMP for Atlantic Sea Scallops was initially implemented on May 15, 1982. The objectives of the plan are: 1) to restore adult stock abundance and age distribution; 2) to increase yield per recruit for each stock; 3) to evaluate plan research, development and enforcement costs; and 4) to minimize adverse environmental impacts on sea scallops. Amendment 11 had the goal of controlling capacity and mortality in the general category scallop fishery. In order to achieve this goal, the Council identified the following list of objectives: 1. Allocate a portion of the total available scallop harvest to the general category scallop fishery. 2. Establish criteria to qualify a number of vessels for a limited entry general category permit. 3. Develop measures to prevent the limited entry general category fishery from exceeding their allocation. 4. Develop measures to address incidental catch of scallops while fishing for other species. Progress in meeting these objectives is measured though regular periodic stock assessments with defined biological reference points, continuing review of all aspects of the management system, and continuing research on the environmental impact of sea scallop fishing. In the case of the LAGC IFQ fishery, the MSFCMA requires councils to conduct five-year program reviews of any Limited Access Privilege Program (LAPP). Short-term objectives for the sea scallop fishery and other north-eastern US fisheries take the form of "annual specifications." Annual specifications set a total allowable catch for the target species, and catch limits for by-catch species. The scallop fishery is subject to sub-annual catch limits (sub-ACLs) for four flatfish stocks. The Council uses accountability measures (AMs) to prevent or react to ACL overages and prevent overfishing. "Proactive" AMs are designed to avoid overages, while "reactive" AMs are triggered once an overage occurs. Framework 29, adopted in December 2017, contains a new AM for northern windowpane flounder, as well as modified AMs for Georges Bank yellowtail flounder and Southern New England/Mid-Atlantic yellowtail. The Council took action in framework 29 to streamline all of the reactive flatfish AMs in the scallop fishery and make them consistent with the current AM for southern windowpane flounder. If an AM is triggered, scallopers will need to use modified dredges – configured with a five-row apron with a 1.5:1 maximum hanging ratio – to fish in designated gear-restricted areas (GRA). The duration of an AM is dependent on the magnitude of a sub-ACL overage as follows: Small AMs – These are triggered if a quota overage is greater than 0% but less than 20%; and Large AMs – These are triggered when overages exceeds 20% of the sub-ACL for a flatfish stock.

PI 3.2.1		The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.
		The Council approved identical reactive AMs for northern windowpane flounder and Georges Bank yellowtail flounder. The Council took this step so that if an AM is triggered for either stock, the action will reduce the impacts of scallop fishing on both flatfish stocks. The reactive AMs for the scallop fishery are described as follows: Northern windowpane flounder and Georges Bank yellowtail flounder: o Small AM: If triggered, modified dredges will need to be used for six weeks from November 16 through December 31 in Closed Area II and the Closed Area II Extension; and o Large AM: If triggered, modified dredges will need to be used year-round in Closed Area II and the Closed Area II Extension The Council already has taken many steps to reduce flatfish bycatch in the scallop fishery, including: prohibiting possession of flatfish; requiring that dredges be constructed with a maximum of seven rows in the apron and 10" twine tops to allow flatfish escapement; and seasonally closing the Scallop Closed Area II access area from August 15 through November 15 to protect yellowtail flounder and windowpane flounder. The law requires fishery management councils to determine periodically whether the stocks under their jurisdiction are overfished or whether overfishing is occurring. These determinations are made with reference to defined reference points. Continuing analysis of by-catch and stock assessments for key by-catch and protected species provide measurable outcomes for ecosystem components other than the target species. Ongoing research on the structure and function of the ecosystem and the impacts of fishing on habitat provide measurable outcomes for the maintenance of ecosystem function. The fishery has "well defined and measurable short and long-term objectives, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery-specific management system," thereby meeting the requirements for SG 100.
References		ESA 1973 MMPA 1972 MSFCMA 2007 NEFMC 1982 NEFMC 2017c NEPA 1970

OVERALL PERFORMANCE INDICATOR SCORE (UoAs 1-4):	**100**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 3.2.2 – Decision-making processes

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.		
Scoring Issue		SG 60	SG 80	SG 100
a	Decision-making processes			
	Guidepost	There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	Y	Y	
	Justification	Federal fisheries in the U.S. are managed under the MSFCMA, which sets out the decision-making process to be used by regional fishery management councils in the development of fishery management plans. FMPs contain measures and strategies to achieve the fishery-specific objectives. One purpose of the Act is "to establish Regional Fishery Management Councils to exercise sound judgment in the stewardship of fishery resources through the preparation, monitoring, and revision of such plans under circumstances (A) which will enable the States, the fishing industry, consumer and environmental organizations, and other interested persons to participate in, and advise on, the establishment and administration of such plans, and (B) which take into account the social and economic needs of the States." The NEFMC has 17 voting members. Each of the five member states (Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut) have at least two voting members. Council members come from a variety of stakeholder groups. The voting membership also includes the regional administrator of NMFS. Non-voting members include representatives of the US Coast Guard, the Atlantic States Marine Fisheries Commission, the US Department of State, and the US Fish & Wildlife Service. Appointed members of the Council must be individuals who, by reason of their occupational or other experience, scientific expertise, or training, are knowledgeable regarding the conservation and management, or the commercial or recreational harvest, of the fishery resources of the geographical area concerned. The Secretary, in making appointments to the regional councils, is required, to the extent practicable, to ensure a fair and balanced apportionment, on a rotating or other basis, of the active participants (or their representatives) in the commercial and recreational fisheries under the jurisdiction of the Council. Each year the Secretary of Commerce must report to Congress on actions taken by the Secretary to ensure a fair and balanced apportionment of council membership. The MSFCMA requires the regional councils to establish and maintain various committees and advisory panels, including a Scientific and Statistical Committee, a fishing industry advisory committee, and such advisory panels as are necessary or appropriate to assist it in carrying out its functions under the Act. In developing catch limits for each of its managed fisheries, councils may not exceed the fishing level recommendations of its scientific and statistical committee or the peer review process. Councils must review on a continuing basis, and revise as appropriate, the assessments and specifications made with respect to the present and probable future condition of, and the maximum sustainable yield and optimum yield from their fisheries, Councils must also provide a summary of the information utilized in making those determinations.		

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.
		Councils must specify objective and measurable criteria for identifying when the fishery to which an FMP applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery. Councils must also establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority— (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided The National Environmental Policy Act (NEPA) and the Administrative Procedures Act (APA) and various executive orders govern the activities of the regional councils and assure that all meetings are public and the public has ample opportunity to participate in the process. All council actions must comply with the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) as well as the previously mentioned laws. Every council action involves multiple opportunities for public input at both the council level and in the federal rule-making process. The Council also must comply with the applicable requirements of the Regulatory Flexibility Act (RFA), the Administrative Procedure Act (APA), the Paperwork Reduction Act (PRA), the Coastal Zone Management Act (CZMA), the Information Quality Act (IQA), and Regulatory Impact Review (RIR). After approval by a regional fishery management council, council actions must go through a federal approval process and a federal rule-making process. Final approval or disapproval of council actions is done by the Secretary of Commerce through a process described in the MSFCMA as summarized below. Upon transmittal by the Council to the Secretary of a fishery management plan or plan amendment, the Secretary shall— (A) immediately commence a review of the plan or amendment to determine whether it is consistent with the national standards, the other provisions of this Act, and any other applicable law; and (B) immediately publish in the Federal Register a notice stating that the plan or amendment is available and that written information, views, or comments of interested persons on the plan or amendment may be submitted to the Secretary during the 60-day period beginning on the date the notice is published. (2) In undertaking the review required under paragraph (1), the Secretary shall— (A) take into account the information, views, and comments received from interested persons; (B) consult with the Secretary of State with respect to foreign fishing; and (C) consult with the Secretary of the department in which the Coast Guard is operating with respect to enforcement at sea and to fishery access adjustments referred to in section 303(a)(6). (3) The Secretary shall approve, disapprove, or partially approve a plan or amendment within 30 days of the end of the comment period under paragraph (1) by written notice to the Council. A notice of disapproval or partial approval shall specify— (A) the applicable law with which the plan or amendment is inconsistent; (B) the nature of such inconsistencies; and

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.		
		(C) recommendations concerning the actions that could be taken by the Council to conform such plan or amendment to the requirements of applicable law. If the Secretary does not notify a Council within 30 days of the end of the comment period of the approval, disapproval, or partial approval of a plan or amendment, then such plan or amendment shall take effect as if approved. The US Atlantic sea scallop fishery meets the requirements of SG 80.		
b	Responsiveness of decision-making processes			
	Guidepost	Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	Y	Y	Y
	Justification	One purpose of the MSFCMA is "to establish Regional Fishery Management Councils to exercise sound judgment in the stewardship of fishery resources through the preparation, monitoring, and revision of such plans under circumstances (A) which will enable the States, the fishing industry, consumer and environmental organizations, and other interested persons to participate in, and advise on, the establishment and administration of such plans, and (B) which take into account the social and economic needs of the States." The US Congress lists one policy of Congress in the Act "to assure that the national fishery conservation and management program utilizes, and is based upon, the best scientific information available; involves, and is responsive to the needs of, interested and affected States and citizens; considers efficiency; draws upon Federal, State, and academic capabilities in carrying out research, administration, management, and enforcement; considers the effects of fishing on immature fish and encourages development of practical measures that minimize bycatch and avoid unnecessary waste of fish; and is workable and effective…" The nature of the US fishery management council system is such that any and all issues identified in relevant research, monitoring, evaluation and consultation can be brought to the NEFMC for consideration through multiple channels. The Regional Administrator of NMFS is a member of the council and is assisted by agency staff from all agency programs, including the Office of Sustainable Fisheries, the Office of Law Enforcement, Office of NOAA General Counsel, Office of Protected Resources, the Office of Analysis and Program Support, Office of Habitat Conservation and Restoration, the NOAA Office of Highly Migratory Species, the Stakeholder Engagement Division, Office of Seafood Inspection, Vessel Monitoring System, NOAA Grants Office, the NOAA Freedom of Information Act Program, the Environmental Analyses and NEPA Program. The NMFS Northeast Fisheries Science Center plays an integral role in the management of northeast fisheries by providing research on all aspects of the regions marine resources. Representatives of the NEFSC give regular reports on Center activities and directed reports on issues under consideration by the NEFMC. NEFSC research includes biology, stock assessment, ecosystem assessment, protected species studies, and social and economic research and analysis. The NEFSC manages a cooperative research program that involves		

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.
		fishery participants and researchers at academic institutions. NEFSC also manages an observer program that deploys onboard observers, maintains data, and prepares reports for the councils and the public. The NEFMC maintains numerous Committees composed of Council members and others who monitor their area of responsibility and bring action items to the Council when an issue needing attention arises. These Committees include: Ecosystem-Based Fishery Management Committee Enforcement Committee/Vessel Monitoring System Research Steering Committee Observer Policy Committee (Industry-Funded Monitoring) Scientific and Statistical Committee Council Coordination Committee Northeast Regional Coordinating Council Transboundary Management Guidance Committee Risk Policy Working Group Fishery-specific Oversight Committees Fishery-specific Advisory Panels In addition to the formal structure that is designed to bring relevant issues to the attention of the councils, at every Council meeting the NEFMC provides an opportunity for public input on issues not on the Council agenda. The US fishery management system is adaptive by nature. Scientists, managers, fishery participants, NGOs, and policy-makers are continuously monitoring all aspects of fisheries and bringing issues to the attention of the fishery management councils. Issues are deliberated through an open and transparent process that assures that the wider impacts of decisions are taken into account. The adaptive nature of the management system for sea scallops is demonstrated by the fact that the fishery management plan has been amended 17 times since it was first implemented in 1982 and has been subject to 29 Framework Actions, which were intended to be an expedited amendment process but follow essentially the same process as a plan amendment. The wider implications of decisions are also taken into account through the NEPA process, a Regulatory Flexibility Act Assessment, and a Regulatory Impact Review. Environmental impact statements required by NEPA focus on Valued Ecosystem Components that include both human and non-human components of the ecosystem. Amendment 17 to the FMP was implemented on June 15, 2016 for the purpose of allowing the incorporation of advancements in the best scientific information as it becomes available, facilitating the precautionary approach. Most recently, the NEFMC has prioritized catch accounting and monitoring as a result of the review and analysis of enforcement and compliance data during a Council review of the LAGC IFQ program and other enforcement incidents. The Council's Sea Scallop PDT, AP, and Sea Scallop Committee have prepared and reviewed background information and made preliminary recommendations to respond to the issues raised in the report. The NEFMC and the NMFS have in place processes to respond to all issues identified in relevant research, monitoring, evaluation and consultation. The process is transparent and

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.		
		is timely to the extent that taking into account the wider implications of decisions allows. This meets the SG100 requirements.		
c	Use of precautionary approach			
	Guidepost		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Y	
	Justification	The regional fishery management councils and NMFS operate under the MSFCMA and the National Standard Guidelines. National Standard 2 requires that: "conservation and management measures shall be based upon the best scientific information available." The National Standard Guidelines specify that: "Scientific information that is used to inform decision making should include an evaluation of its uncertainty and identify gaps in the information. Management decisions should recognize the biological (e.g., overfishing), ecological, sociological, and economic (e.g., loss of fishery benefits) risks associated with the sources of uncertainty and gaps in the scientific information." The councils' Statistical and Scientific Committees (SSCs) are responsible for developing acceptable biological catch (ABC) recommendations for the councils. The National Standard Guidelines for National Standard 2 state that: "The SSC is expected to take scientific uncertainty into account when making its ABC recommendation (§600.310(f)(4))." The US Atlantic sea scallop fishery meets the requirements of SG 80.		
d	Accountability and transparency of management system and decision-making process			
	Guidepost	Some information on the fishery's performance and management action is generally available on request to stakeholders.	Information on the fishery's performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders provides comprehensive information on the fishery's performance and management actions and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Y	Y	Y
	Justification	Accountability and transparency of the management system is required by multiple laws and Executive Orders. The National Standard Guidelines for National Standard 2 specifically require transparency in the provision of scientific information for fishery management. Under the heading "Transparency and openness," the NS Guidelines state that: "The Magnuson-Stevens Act provides broad public and stakeholder access to the fishery conservation and management process, including access to the scientific information upon which the process and management measures are based. Public comment should be solicited at appropriate times during the review of scientific information. Communication with the public should be structured to foster understanding of the scientific process." They further require that: "Scientific information products should describe data collection methods, report sources of uncertainty or statistical error, and acknowledge other data limitations. Such products should explain any decisions to exclude data from analysis.		

<table>
<tr><td colspan="2">PI 3.2.2</td><td colspan="3">The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.</td></tr>
<tr><td></td><td></td><td colspan="3">Scientific products should identify major assumptions and uncertainties of analytical models. Finally, such products should openly acknowledge gaps in scientific information.”

The management system provides comprehensive information on the fishery’s performance and management actions through open meetings, mailed and emailed notices, written copies of relevant documents, and a comprehensive web site through which interested parties can obtain almost every document associated with the management of the fishery. Where research, monitoring, evaluation and review activity result in management actions, interested parties are informed of proposed rules and provided an opportunity to comment. Final rules include explanations of how the agency responded to comments.

The US Atlantic sea scallop fishery meets the requirements of SG 100.</td></tr>
<tr><td rowspan="4">e</td><td colspan="4">Approach to disputes</td></tr>
<tr><td>Guidepost</td><td>Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.</td><td>The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.</td><td>The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>Y</td></tr>
<tr><td>Justification</td><td colspan="3">The management system for sea scallops acts proactively to avoid legal disputes by taking action to incorporate new legal requirements as they take effect. Since 1994 the sea scallop fishery has been conservatively managed under a management system that has maintained a healthy resource and a profitable scallop industry, which reduces the likelihood of legal disputes. The fishery management system receives continuing legal advice and acts proactively to avoid legal disputes and rapidly implements judicial decisions arising from legal challenges.

MSC guidance states that CABs may consider collective, participative and publically accountable involvement in management of the fishery by a broad spectrum of local stakeholders of the fishery as potential evidence of the presence of proactive avoidance of legal disputes. Multiple laws and presidential executive orders require participative and publically accountable involvement in management of the sea scallop fishery by a broad spectrum of stakeholders. The appointment process, structure, and procedures followed by the fishery management councils and NMFS carry out these requirements.

The US Atlantic sea scallop fishery meets the requirements for SG 100.</td></tr>
<tr><td colspan="2">References</td><td colspan="3">APA 1946

MSFCMA 2007

NEPA 1970

RFA 1980</td></tr>
<tr><td colspan="4">OVERALL PERFORMANCE INDICATOR SCORE (UoAs 1-4):</td><td>100</td></tr>
<tr><td colspan="4">CONDITION NUMBER (if relevant):</td><td></td></tr>
</table>

Evaluation Table for PI 3.2.3 – Compliance and enforcement

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.		
Scoring Issue		SG 60	SG 80	SG 100
a	MCS implementation			
	Guidepost	Monitoring, control and surveillance mechanisms exist, and are implemented in the fishery and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance system has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A comprehensive monitoring, control and surveillance system has been implemented in the fishery and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Y	N	N
	Justification	The National Marine Fisheries Service (NMFS) and the United States Coast Guard (USCG) share responsibility for the enforcement of fishing laws and regulations by U.S. vessels. NMFS also has agreements with state partners for the enforcement of federal fishery laws. These agencies have land-based and seagoing enforcement officers and a complete system of monitoring, control and surveillance (MCS) for the US Atlantic sea scallop fisheries, including: • At-sea surveillance by patrol vessels and fixed-wing aircraft; • Prescribed on-board observer coverage with protocols to monitor the catch; • Unannounced dockside monitoring of landings; • Submission of vessel fishing log books; • Catch and Effort database to track catch against allocations; • Electronic vessel monitoring systems (VMS) on each vessel; • And, potential catch seizure and significant fines and loss of fishing privileges for violations of regulations. This monitoring, control and surveillance system operates continuously, 24 hours per day, 365 days per year. Table 17 provides data on US Coast Guard fishery boardings, violations, and the resulting violation rate. The Coast Guard has demonstrated a consistent ability to conduct boardings of fishing vessels at sea and to detect violations when present. The frequency of boardings remains relatively steady over time, as does the compliance rate, generally above 95%. NMFS operates a vessel monitoring system that can determine the location and speed of vessels on a regular basis. VMS technicians monitor the system continually and receive automatic alerts if a vessel is operating outside expected parameters. Enforcement is thought to be effective and compliance is thought to be good for the Limited Access portion of the fleet that is responsible for 95% of the sea scallop catch. A significantly smaller portion of the scallop fishery is the Limited Access General Category (LAGC) IFQ fleet, which accounts for only 5% of the overall ACL for the fishery, LAGC IFQ and NGOM vessels are required to send a Vessel Monitoring System (VMS) Scallop Pre-Landing Notification form before arrival to port. A 2014 Fishery Performance Evaluation for the LAGC Individual Fishing Quota (IFQ) fishery for FY 2011-2014 found that a segment of the fishery (about 30 vessels each year) were not sending in pre-landing notifications at all, potentially compromising effective monitoring and enforcement of the program. (NEFMC 2014). Information was not available to the assessment team on how many of these chronically non-compliant vessels were on IFQ scallop-declared trip vs non-IFQ declared trips targeting		

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.
		other species (groundfish, or surf clam/ocean quahog)[14], the latter are not part of the UoA and their compliance is not evaluated here. The 2017 Five-Year Program Review of the LAGC IFQ does provide information differentiating compliance between the IFQ scallop-declared trips and the non-IFQ trips. This updated review found that for the IFQ scallop-declared trips compliance with VMS reporting requirements generally improved during the IFQ program period from 2010 [69% compliance] – 2015 (80% compliance), with a combined overall compliance rate for this period of 74% (NEFMC 2017). The assessment team did not receive any evidence of enforcement action sanctions for the offenses of the IFQ scallop-declared trips. This issue is reviewed in more detail in Scoring Issue b of this PI. Despite the improvements, the sea scallop Plan Development Team (PDT) has identified VMS pre-landing notifications as not meeting it's 100% compliance goal. According to the IFQ report "Dockside monitoring and enforcement has been very limited for the LAGC IFQ program." , with <1% of offloads monitored between 2010-2015. The level of monitoring is believed to be proportional to the LAGC IFQ ACL quota which accounts for only 5% of the overall ACL for the fishery, In response to the low VMS reporting compliance and the low number of LAGC IFQ offloads monitored. The Council defined Monitoring and Catch Accounting as one of the 2018 priorities. In January 2018 NOAA presented civil penalties against vessel owner and permitted dealer Carlos Rafael on account of a number of violations including; failing to report the purchase of scallops, falsifying vessel trip reports, and failing to transmit VMS vessel position. Carlos Rafael is currently serving 46 months in federal prison after pleading guilty to 23 Lacey Act violations related to false labeling of fish, and criminal offenses counts of bulk cash smuggling, tax evasion and falsifying federal records. Shortly after the filing of the civil case, the Massachusetts Environmental Police reported on an incident of overage and filing false records for scallop vessel F/V Dinah Jane, a LAGC IFQ permitted vessel[15]. In addition to identified, and generally improving problems with hail requirements (pre-landing notifications) the sea scallop PDT has noted other enforcement problems in the sea scallop fishery, with quota overage and lack of adherence to trip limits and allocations, and is supporting an effort by the Council's Sea Scallop Advisory Panel and Sea Scallop Committee to improve catch accounting and monitoring On May 2018 the NEFMC sent a letter to NOAA requesting an increased emphasis on the enforcement of reporting requirements for the scallop fishery. The letter included the following suggestions: enforcement of regulations, review of penalty schedules and increasing penalties for VMS pre-landing requirement, and pursue technical solutions to assist with quota compliance. The letter also notes that "Failure to submit required VMS reports creates gaps in vessel trip data that can undermine the successful management of the fishery. Full compliance would provide the reliable, timely stream of data on scallop landings that is needed for quota monitoring and enforcement" (Nies 2018). Because the weaknesses in compliance/monitoring of the IFQ-fleet affect the ability of the MSC system to enforce relevant management measures, as required by SG80 for this Scoring Issue, a condition is placed for the LAGC -IFQ component of the fishery. The assessment team notes the ongoing improvement in compliance of the IFQ scallop fleet on scallop-declared

[14] There is a small number of vessels that land incidentally caught scallops on non-IFQ declared trips, these are primarily vessels on surf clam/ocean quahog and groundfish trips. Scallop landings on these trips are counted against the IFQ quota, however, these vessels use different gear types and are not part of the UoA.

[15] Note: MA DMF records indicate the F/V Dinah Jane is owned by Carlos Rafael. https://www.mass.gov/service-details/fishermen-and-vessels-permit-lookup

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.		
		trips and the efforts of the Council to improve compliance with reporting requirements. These efforts are expected to continue to improve compliance of the IFQ fleet and to resolve the problem, thus this condition is placed with the primary objective to monitor these expected improvements. The SG 60 is met but the SG 80 is not met.		
b	Sanctions			
	Guidepost	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence.
	Met?	Y	N	N
	Justification	There is an explicit and statutory sanction framework that is applied for violations of fishery regulations. Sanctions to deal with non-compliance are listed in the Code of Federal Regulations and can be severe, consisting of: • Significant monetary penalties; • Confiscation of catch; • Permit cancellations or suspensions; • Permanent prohibitions on participation in the fishery. Other than assaults on fishery officers, violations of federal fishery regulations are treated as civil cases, using a "preponderance of the evidence" rule. Cases are adjudicated by a limited number of administrative law judges who have expertise in fishery laws, providing consistency in approach. Regulations are enforced by the US Coast Guard and by NOAA Office of Law Enforcement officers. As explained in above in "Monitoring, Control, and Surveillance," the records normally made available to the public do not differentiate among fisheries and many of the categories of violations apply to multiple fisheries. It is therefore not possible to compile enforcement statistics by specific fishery.Table 17 provides data on USCG First District fishing vessel boardings for all federal fisheries in the First District and the resulting violations. For the 39 month period from October 2014 through December 2017, 3,468 boardings resulted in 134 violations for an observed compliance rate of 96% for all federal fishery regulations, including administrative requirements such as carrying a permit onboard and having an up-to-date operator's permit on board. The NOAA OGC publishes periodic summaries of enforcement actions such as Notices of Violation, Notices of Permit Sanctions, and written warnings, generally without any indication of the specific fishery. OGC also publishes a list of "cases settled," which occurs some months or years after the violation. A review of these reports indicates that in general sanctions appear to be consistently applied in accordance with enforcement policy. The NEFMC has prioritized monitoring and catch accounting for work in 2018 primarily because of issues raised in a 2014 Fishery Performance Evaluation for the Limited Access General Category (LAGC) IFQ fishery. As mentioned in Scoring Issue a of this PI the NEFMC (2017) report found that the improving compliance for the IFQ scallop-declared trips with VMS reporting requirements has a combined overall compliance rate of 74% for the period of 2010-2015, falling short of the required 100% compliance goal. No information was available to the team to indicate the reasons for the improved compliance rate. Additionally, the pre-landing notifications are not meeting the requirements of 100% compliance. The team did not receive any evidence of the sanctions		

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.		
		issued to vessels that violated the VMS pre-landing requirements, and thus was unable to confirm that sanctions are being consistently applied. At the moment it is unclear if the problem lies in the monitoring system failing to identify violators, or whether NOAA is unable to effectively enforce the controls and apply the sanctions. Council staff documents prepared for the AP and Sea Scallop Committee in March 2018 point to other violations of sea scallop regulations that reinforced the Council's decision to make monitoring and catch accounting a priority for 2018. The team believes the criminal conviction of the Carlos Rafael case noted above, is one of the factors prompting the focus on monitoring and catch accounting. The Council has asked OLE for additional information and has additional meetings scheduled to discuss this issue. As noted in SI a in response to poor compliance with VMS hail requirements the Council has sent a letter to NOAA petitioning for enforcement of regulations on the books and a review of penalty schedules and consideration to increasing penalty schedule for VMS pre-land non-compliance. Additionally the Council has requested that NOAA provide information on "how often first violations result in a fine, and how second, and third violations have been addressed through the NOVA [Notice of Violation and Assessment] process" (Nies 2018). The request from the scallop Committee and the non-compliance issues identified VMS pre-notification reporting, call into question whether sanctions for violations of haul reporting requirements are being consistently applied and whether the current sanctions in place are sufficient to provide effective deterrence. The team is encouraged by the improved compliance stated above in the most recent report (NEFMC 2017). The SG 60 is met but the SG 80 is not met.		
c	Compliance			
	Guidepost	Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Y	Y	N
	Justification	The assessment team met with representatives of the NEFMC, GARFO Sustainable Fisheries Division during the reassessment site visit in December 2018. Managers noted a high level of cooperation and compliance among LA vessels. Managers also noted the finding in the 2014 LAGC IFQ Performance Evaluation Report citing a lack of compliance with the pre-landing notification requirement The assessment team met with the NOAA Offices of Law Enforcement and General Counsel Enforcement Section during the 3rd Annual Surveillance site visit in June 2017. OLE and OGC did not express any concerns about enforcement and compliance in the sea scallop fishery. Additional information provided by managers and researchers indicates that fishers generally comply with the management system under assessment and provide information of importance to the effective management of the fishery, although managers noted the poor compliance with the LAGC IFQ pre-landing requirement that was discovered during the 2014 and 2017 LAGC IFQ program review. Since the LAGC IFQ ACL quota accounts for only 5% of the overall ACL for the fishery, the team does not believe that the noncompliance by a minority of boats in the LAGC IFQ fleet negates the overall high level of compliance in the fishery.		

<table>
<tr><td colspan="2">PI 3.2.3</td><td colspan="3">Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.</td></tr>
<tr><td></td><td></td><td colspan="3">The US Atlantic sea scallop fishery meets the requirements of SG 80. However, on account of the issues flagged information is not available to establish a “high degree of confidence that fishers comply with the management system,” which is a requirement for SG 100.</td></tr>
<tr><td rowspan="4">d</td><td colspan="4">Systematic non-compliance</td></tr>
<tr><td>Guidepost</td><td></td><td>There is no evidence of systematic non-compliance.</td><td></td></tr>
<tr><td>Met?</td><td></td><td>Y</td><td></td></tr>
<tr><td>Justification</td><td colspan="3">Representatives of the NOAA OLE specifically stated that there is no evidence of systematic non-compliance in the sea scallop fishery overall. Others interviewed did not provide any evidence of systematic non-compliance. Although the extent of non-compliance with the pre-landing notification in the LAGC IFQ fishery is troubling, the number of violators and the volume of catch represented by the violators are small in comparison to the overall fishery.

On the basis of information available for the assessment, there is no evidence of systematic non-compliance. The US Atlantic sea scallop fishery meets the requirements of SG 80.</td></tr>
<tr><td colspan="2">References</td><td colspan="3">USOFR 1998

Murphy et. al. 2015

NEFMC. 2014. Limited Access General Category (LAGC) IFQ Fishery Performance Evaluation (LAGC IFQ Report)

NEFMC. 2017c. Five-Year LAGC IGQ Program Review. New England Fishery Management Council, Newburyport, MA.

Nies T. 2018, May 14, 2018. Letter from NEFMC to NOAA.</td></tr>
<tr><td colspan="4">OVERALL PERFORMANCE INDICATOR SCORE (UoAs 1-4):</td><td>70</td></tr>
<tr><td colspan="4">CONDITION NUMBER (if relevant):
1. By the fourth surveillance the fishery provides evidence to demonstrate that:
(a) A monitoring, control and surveillance system has been implemented in the IFQ fleet and has demonstrated an ability to enforce relevant management measures, strategies and/or rules. AND (b) Sanctions to deal with non-compliance are consistently applied and thought to provide effective deterrence.</td><td></td></tr>
</table>

Evaluation Table for PI 3.2.4 – Research Plan

<table>
<tr><td colspan="2">PI 3.2.4</td><td colspan="4">The fishery has a research plan that addresses the information needs of management</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td colspan="2">SG 100</td></tr>
<tr><td rowspan="3">a</td><td>Guidepost</td><td>Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2.</td><td>A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.</td><td colspan="2">A comprehensive research plan provides the management system with a coherent and strategic approach to research across P1, P2 and P3, and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td colspan="2">Y</td></tr>
<tr><td>Justification</td><td colspan="4">The Magnuson-Stevens Reauthorization Act of 2006 requires each regional fishery management council to develop a five-year research priority plan (MSFCMA 1996). The NEFMC's Plan Development Teams, species committees, Scientific and Statistical Committee, and the full Council review and update the Council's Research Priorities and Data Needs document periodically, most recently revising the priorities for 2017-2021 in January 2018. The NEFMC's Research Priorities and its research agenda specific to scallops is described on page 119. Priorities related to Principles 1 and 2 include; research on estimating and projecting landings per unit effort, identifying major sources of management uncertainty and research priorities focused on habitat impact. Cooperative research is a fundamental component of the research program and has been shown to result in improvements in management. Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2, meeting SG 60. A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2, meeting SG 80. A comprehensive research plan provides the management system with a coherent and strategic approach to research across P1, P2, and P3, and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2, meeting SG 100.</td></tr>
<tr><td rowspan="3">b</td><td>Guidepost</td><td>Research results are available to interested parties.</td><td>Research results are disseminated to all interested parties in a timely fashion.</td><td colspan="2">Research plan and results are disseminated to all interested parties in a timely fashion and are widely and publicly available.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td colspan="2">Y</td></tr>
<tr><td>Justification</td><td colspan="4">Research results are disseminated to all interested parties in a timely fashion and are widely and publicly available through presentations at Council meetings, stock assessment workshops, and web sites, meeting SG 100.</td></tr>
<tr><td colspan="2">References</td><td colspan="4">MSFCMA 1996
NEFSC 2018
NEFMC 2018g</td></tr>
<tr><td colspan="5">OVERALL PERFORMANCE INDICATOR SCORE:</td><td>100</td></tr>
<tr><td colspan="5">CONDITION NUMBER (if relevant):</td><td></td></tr>
</table>

Evaluation Table for PI 3.2.5 – Monitoring and management performance evaluation

<table>
<tr><td colspan="2">PI 3.2.5</td><td colspan="3">There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives.
There is effective and timely review of the fishery-specific management system.</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="4">a</td><td colspan="4">Evaluation coverage</td></tr>
<tr><td>Guidepost</td><td>There are mechanisms in place to evaluate some parts of the fishery-specific management system.</td><td>There are mechanisms in place to evaluate key parts of the fishery-specific management system</td><td>There are mechanisms in place to evaluate all parts of the fishery-specific management system.</td></tr>
<tr><td>Met?</td><td>Y</td><td>Y</td><td>Y</td></tr>
<tr><td>Justification</td><td colspan="3">The management system is regularly reviewed and amended if necessary through the NEFMC council process. The following entities continually evaluate all parts of the fishery-specific management system and initiate changes when required:

New England Fishery Management Council (NEFMC) – entity with jurisdiction under the Magnuson Act for operational management of the scallop fishery, including review/approval of all amendments to the FMP, as well as the setting of annual quotas (see website www.mafmc.org).

Scientific and Statistical Committee ("SSC") of the NEFMC – a group of approximately 15 scientists and academics required by the Magnuson Act to review annual reports from the NEFMC staff and NEFSC regarding the status of the stocks, and then to set the ABC ("Acceptable Biological Catch") for each species. The ABC is the maximum level at which the NEFMC may set the harvest quota each year. The SSC additionally recommends improvements for the assessments and notes parameters – such as biological reference points – that they believe need further study.

Sea Scallop Committee of the NEFMC – committee comprised of NEFMC members charged with initial responsibility for interacting with industry, and for recommending to the full Council proposed changes in FMP/management regs and proposed annual quotas.

Sea Scallop Advisory Panel (AP)– composed of members of the public representing interested parties.

Northeast Fishery Science Center – performs periodic stock assessments.

In the case the LAGC IFQ fishery, the MSFCMA requires that all LAPPs undergo a five-year program review. The IFQ program was implemented March 1, 2010. In 2014, in preparation for the five year review, the NEFMC Sea Scallop PDT prepared a performance evaluation of the LAGC IFQ fishery. The review included performance indicators for four overall subjects: biological performance, economic performance, safety and enforcement, and governance. (NEFMC 2014b)

In June 2017 the NEFMC published a five-year review of the LAGC IFQ program. The scope of the program review was informed by the MSFCMA guidance, NOAA Fisheries Guidance for Conducting Review of Catch Share Programs, NOAA Fisheries Catch Share Policy, and the goals and objectives of Amendment 11. The Council's Scientific and Statistical Committee (SSC), Scallop Advisory Panel, and Scallop Committee also provided input on the scope of the report. A formal technical work group consisted of staff from the Northeast Fisheries Science Center (NEFSC), Greater Atlantic Regional Fisheries Office (GARFO), and Council. (NEFMC 2017c)

The US Atlantic sea scallop fishery meets the requirements of SG 100.</td></tr>
<tr><td>b</td><td colspan="4">Internal and/or external review</td></tr>
</table>

PI 3.2.5		There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives. There is effective and timely review of the fishery-specific management system.		
	Guidepost	The fishery-specific management system is subject to occasional internal review.	The fishery-specific management system is subject to regular internal and occasional external review.	The fishery-specific management system is subject to regular internal and external review.
	Met?	Y	Y	N
	Justification	The management system is designed and organized to provide regular internal and external review. Many of the participants in the system do not work for the government and represent a wide range of interests and competencies. Stock assessments are always peer-reviewed by outside experts. NEFMC council staff and officers participate in periodic meetings of the Council Coordination Committee (CCC). The CCC consists of the chairs, vice chairs, and executive directors from each regional fishery management council, or other staff, as appropriate. This committee meets twice each year to discuss issues relevant to all councils, including issues related to the implementation of the MSA. NOAA Fisheries is committed to the timely implementation of all provisions of the MSA. Regular face-to-face meetings or conferences between NOAA Fisheries and the leadership of the eight councils are critical to ensure administrative and MSA priorities are met. In 2011, the NEFMC contracted with an outside consulting group to review the operations of the Council (Pate/SRA Touchstone Report 2011). The Touchstone Group conducted interviews with 179 stakeholders selected from nine groups: NERO, NEFSC, NEFMC, industry, research partners, non-governmental organizations (NGOs), Mid-Atlantic Fishery Management Council (MAFMC), NMFS Headquarters and municipalities. In response to the Touchstone Report, the NEFMC undertook a process of developing additional, regular outside reviews of Council performance. In 2016 the Council placed the conduct of a programmatic, or performance, review on its list of priorities for 2017. In the case the LAGC IFQ fishery, the MSFCMA requires that all LAPPs undergo a five-year program review. The IFQ program was implemented March 1, 2010. In 2014, in preparation for the five year review, the NEFMC Sea Scallop PDT prepared a performance evaluation of the LAGC IFQ fishery. The review included performance indicators for four overall subjects: biological performance, economic performance, safety and enforcement, and governance. (NEFMC 2014b) In June 2017 the NEFMC published a five-year review of the LAGC IFQ program. The scope of the program review was informed by the MSFCMA guidance, NOAA Fisheries Guidance for Conducting Review of Catch Share Programs, NOAA Fisheries Catch Share Policy, and the goals and objectives of Amendment 11. The Council's Scientific and Statistical Committee (SSC), Scallop Advisory Panel, and Scallop Committee also provided input on the scope of the report. A formal technical work group consisted of staff from the Northeast Fisheries Science Center (NEFSC), Greater Atlantic Regional Fisheries Office (GARFO), and Council. (NEFMC 2017c) MSC guidance provides that external review for SG80 and SG100 could be by another department within an agency or by another agency or organization within the country (GSA4.10.1). Considering this, the Council structure wherein NMFS and NOAA GC (other departments or agencies) review alternatives for management changes presented for Council decision-making might also be considered as "external review" of the management system for these purposes. NEFSC is also another department within NMFS. A variety of agencies and interest groups outside the fishery management system regularly review the system with regards to their particular field of interest. These include ETP Take Reduction Teams, the Department of Commerce Inspector General and others. On occasion, the U.S. Congress will direct the National Research Council to investigate some fishery management issue. The Congressional Research Service also reviews council actions		

PI 3.2.5		There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives. There is effective and timely review of the fishery-specific management system.
		pertaining to issues of interest to Members of Congress. The management system is clearly subject to a high degree of oversight, but there is no regular, formal external review of the overall management system. The US Atlantic sea scallop fishery meets the requirements of SG 80, but does not quite meet the requirements for SG 100 because there is no regular external review.
References		Marine Stewardship Council (MSC). 2014. MSC Fisheries Certification –Requirements v2.0. Marine Stewardship Council. London. NEFMC. 2014b NEFMC. 2017c Pate/SRA Touchstone Group. 2011
OVERALL PERFORMANCE INDICATOR SCORE (UoAs 1-4):		90
CONDITION NUMBER (if relevant):		

Appendix 1.3 Conditions

Only one condition was raised at re-assessment for PI 3.2.3 (See Table 32. Condition 1). This condition is not related to conditions previously raised in the first full assessment.

During the fourth assessment three conditions remained open and were carried over to the re-assessment. These conditions were closed at the re-assessment (See Appendix 8: Condition Tables and Justifications).

Table 32. Condition 1

<table>
<tr><th>Performance Indicator</th><th colspan="2">3.2.3 Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.</th></tr>
<tr><td>Score</td><td colspan="2">70</td></tr>
<tr><td>Rationale</td><td colspan="2">See Rationale for SIa and b : Evaluation Table for PI 3.2.3 MSC system</td></tr>
<tr><td>Condition</td><td colspan="2">By the third surveillance the fishery provides evidence to demonstrate that:
(a) A monitoring, control and surveillance system has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.
(b) Sanctions to deal with non-compliance are consistently applied and thought to provide effective deterrence.</td></tr>
<tr><td>Milestones</td><td colspan="2">Year 1 Surveillance (2019): Provide evidence of further progress in improvement of compliance of LAGC-IFQ fleet with VMS pre-landing notification requirements.

Year 2 (2020): Provide evidence that sanctions to deal with non-compliance are consistently applied and thought to provide effective deterrence.

Years 3 Surveillance (2021): Provide evidence that the monitoring, control and surveillance system has been implemented in the LAGC-IFQ fleet and has demonstrated an ability to enforce relevant management measures, strategies and/or rules</td></tr>
<tr><td rowspan="7">Client action plan</td><td colspan="2">Year 1 Surveillance (2019): Surveillance (2019): Provide evidence of further progress in improvement of compliance of LAGC-IFQ fleet with VMS pre-landing notification requirements</td></tr>
<tr><td>Responsible Parties</td><td>The client group</td></tr>
<tr><td>Activities:</td><td>The client group will continue to be engaged with fishery managers regarding compliance of LAGC-IFQ fleet with VMS pre-landing notification requirements.</td></tr>
<tr><td>Expected deliverables:</td><td>The client group expects the compliance of LAGC-IFQ fleet with VMS pre-landing notification requirements will continue to improve as noted by the scallop PDT (NEFMC 2017).</td></tr>
<tr><td colspan="2">Year 2 (2020): Provide evidence that sanctions to deal with non-compliance are consistently applied and thought to provide effective deterrence.</td></tr>
<tr><td>Responsible Parties</td><td>The client group</td></tr>
<tr><td>Activities:</td><td>The client group will continue to be engaged with fishery managers and will monitor federal law enforcement reports of actions taken against the extremely small percentage of non-compliance in the scallop fishery.</td></tr>
</table>

	Expected deliverables:	The client group expects the compliance of LAGC-IFQ fleet with VMS pre-landing notification requirements will continue to improve as noted by the scallop PDT (NEFMC 2017).
	Years 3 Surveillance (2021): Provide evidence that the monitoring, control and surveillance system has been implemented in the LAGC-IFQ fleet and has demonstrated an ability to enforce relevant management measures, strategies and/or rules	
	Responsible Parties	The client group
	Activities:	The client group will continue to be engaged with fishery managers and will monitor federal law enforcement's on-going actions pursuant to federal laws and regulations regarding the LAGC-IFQ fleet.
	Expected deliverables:	The client group expects the compliance of LAGC-IFQ fleet with VMS pre-landing notification requirements will continue to improve as noted by the scallop PDT (NEFMC 2017).
Consultation on condition	NA	

Appendix 2 Peer Review Reports

8.2.1 Peer Reviewer A

Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes/No** **Yes**	**Conformity Assessment Body Response**
Justification: It should be made clear in section 1.3 (and in 6.6 when completed) that this is a re-assessment and the team's recommendation is to continue certification (or to re-certify) of the fishery, which is well supported by the evidence presented.		Information now included in Section 1.3

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	**Yes/No** **Yes**	**Conformity Assessment Body Response**
Justification: The SG 80 wording of SIs a and b of PI 3.2.3 is included in the one condition raised (Table 32) and clearly define what is required. The milestones included provide a path that should allow the client to achieve the desired outcome in the designated timeframe.		No response necessary

If included:

Do you think the client action plan is sufficient to close the conditions raised?	**Yes/No** **Yes**	**Conformity Assessment Body Response**
Justification: The CAP was reviewed subsequent to the original PRDR in which milestones were included in Table 32. Note that the number of milestones has been reduced from 4 to 3 and wording has been changed somewhat. The condition relates to SIs a and b of PI 3.2.3. In the CAP, the year 1 milestone deals simply with improved compliance regarding the problem identified, year 2 specifically addresses SI b (note however, that the expected deliverables focuses on continued improved compliance), and year 3 specifically addresses SI a. Since actions to address each SI would go hand in hand, I'd suggest re-wording the milestones (along the lines of the originals in Table 32) and expected deliverables to require/show continuing progress with each and achieving the desired outcome (SG80 wording) for each at the end of the 3-year period. The recently identified concern that is the basis for raising the condition is a very small problem in the context of the overall MCS system for the fishery. Despite the comments above,		*The CAB has opted to keep the milestones as currently worded, as indicated by the peer reviewer, there is no apparent reason why the CAP as currently worded will not address the small issue that raised the nonconformity.*

there is no apparent reason why the CAP will not address and fix it.	

General Comments on the Assessment Report (optional)

There are several minor concerns not addressed in the PI specific comments below.

Throughout P1 and P2 background sections of the report (as well as the evaluation tables), minor editing is needed to correct the English. In the report I've highlighted many places with incorrect verb tense, awkward phrasing, spelling mistakes, etc. In a number of places, SG (scoring guidepost) is used to identify a scoring issue (SI). "&" is used a fair bit instead of "and" between names in a 2-author citation – "and" being the more acceptable. Specie (not an English word) is used in quite a few places instead of species (which is both singular and plural. Historical is the correct word in places where "historic" is used. There are commas in Table 6 where there should be decimal places. There are a few places where MSC is used but MCS is intended. There are no other comments in the report. The highlights will make it easier to find where editing is needed but, I have not tried to be thorough in this regard.

The suggested grammar edits have been corrected

There is some confusion in some of the wording in 3.4.1 (p. 67) and 4.3 (p. 123). This fishery is in full re-assessment using v1.3. Note that the report heading line says MSCV2.0.

This is because the fishery was assessed under process MSC v2.0 and assessment tree v1.3. Consequently, the report format used is that of v2.0.

In sections 1.3 (p. 11), 4.2 (p. 122) and 6.3 (p. 140) reference should be provided to Appendix 7 (p. 278) where all the details related to previous conditions can be found.

Reference included

There appears to be no reference to P2 supporting information in Appendix 6 (p. 268) in the background sections or the evaluation tables.

Reference included

Reference to open/closed areas starts on p. 35 (?) and proceeds to get very complicated and confusing. The reader gets some help to sort things out on p. 53, but even then some confusion remains. A much more comprehensive description should be provided up front to help the reader wade through it.

Both pages 35 and 53 regarding the area rotation system has been edited. On page 35 we avoided using the names of the different types of areas in the area rotation system not to confuse the reader. A reference to section on page 53 was also added for a description of the area rotation system. In page 53 more information was added and an example was given in order to better understand how the area rotation system is actually implemented in the fishery.

On p. 39, recruitment in sea scallops is described as being very variable. For any given area it is usually characterized as periodically displaying strong pulses that are driven by environmental conditions. This is evident in Fig. 11 which unfortunately only goes back to 2003. Typically, landings increase rapidly as a strong year class grows and declines just as rapidly as it is fished down. This usual pattern deserves some consideration. Improved management, as described on pp. 34-36, notwithstanding, the re-building described is likely due mainly to a strong recruitment pulse. A glance at Fig. 12 (landings) suggests at least four strong recruitment pulses, including one around 1998.

We have expanded recruitment information on pages 34-36 and 39 to better explain the recruitment pulses, the relationship between those pulses and landings observed in the fishery and the successful use of those pulses by management measures implemented.

The most serious concern by far is with the lack of actual results from the recent stock assessment in section 3.3.3 (P1 background) and in the evaluation table. Detailed comments are provided below. The time series of biomass estimates (Fig. 19) from the model does not include confidence limits, there is no times series of F estimates, and the time series of recruitment estimates (Fig. 11) is short. There are no results from the rigorous examination of sources of uncertainty or sensitivity analyses referred to on p. 47 or any results of any other model performance evaluation. These results have to be readily available in the stock assessment document and at least some are needed to provide the kind of evidence needed in the justifications for 1.2.2, SI b and 1.2.4, SI c to justify the SG 100 scores.

We do not understand what the PR mean by "lack of actual results from the recent stock assessment". For the section "3.3.3 Stock assessment" of the report we have mainly used information from the Assessment Report of the 59th Northeast Regional Stock Assessment Workshop (59th SAW) (NEFSC 2014) which was the last stock assessment report available at the time we wrote this MSC Fishery Assessment Report. We are aware that the Sea Scallop working Group has done three meetings during the period February - May 2018 for the SAW/SARC 65th Northeast Regional Stock Assessment Workshop, but the report is not available yet. Since the last SAW report is from 2014, and, in order to have more updated information, we have also used FW29 report from March 2018 (NEFMC 2018a). This was stated in the first paragraph of the section "3.3.3 Stock assessment".

Regarding confidence limits of the biomass estimates, we have not found a graph showing that. In the 59th SAW report (NEFSC 2014) there is a 2-pages table that gives a measure of the dispersion of the sample mean for the abundance, biomass and fishing mortality rate (F) for Georges Bank, Mid-Atlantic Bight and Total for the 1975-2013 period. We have now added this table in the report as "Appendix 6 Supporting information P1". A reference to this appendix was put in section 3.3.3.

Regarding time series of fishing mortality (F) estimates, we totally agree with the PR and a graph for the period 1975-2016 (the longest available) has been included in the P1 background. Not putting this graph initially in the report was a momentary lapse (fishing mortality is fundamental for describing the performance of any fishery) and we apologize for that, actually we used this same graph in the 3rd and 4th Surveillance Audit reports.

Regarding longer time series of recruitment estimates, a CASA model estimated recruitment for the 1975-2013 period has been added in the "Appendix 6 Supporting information P1". Moreover, a reference to this appendix was put in section 3.3.3.
Regarding the uncertainty and sensitivity analysis, some results were already shown on p. 47, but we agree with the PR that more information would be useful for supporting the scores given in PI 1.2.2, SI b and PI 1.2.4, SI c. We have therefore extended this part in the section "3.3.3 Stock assessment" and added several graphs in "Appendix 6 Supporting information P1" showing the results from the last evaluation of the CASA model performance.

Performance Indicator Review

Please complete the table below for each Performance Indicator which are listed in the Conformity Assessment Body's Public Certification Draft Report.

PI	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.1.1	Yes	Yes	NA	Both SIs a and b relate to stock size. SI a justification provides recent assessment results for F, the relevant information (stock size in relation to lower reference point) is provided in SI b. A graph or table from NEFSC (2014) showing model probabilities cited in a and b should be included in section 3.3.3. The 2016 biomass estimate in SI b should include the confidence intervals. Section 3.3.3 should have a figure with the time series of biomass estimates and the biomass reference points.	Following PR suggestion more information has been included in section 3.3.3 (see above CAB answer to the General Comments on the Assessment Report regarding this same topic). A new Appendix 6 (Supporting Information P1) has also been added to the report with more detailed information from NEFSC (2014) supporting P1 PIs scores. A table with CASA model estimates and a measure of the dispersion of the sample mean for the abundance, biomass and fishing mortality rate (F) is included for Georges Bank, Mid-Atlantic Bight and Total for the 1975-2013 period.

PI	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.1.2	Yes	Yes	NA	The SRRs (especially considering the general comment above re recruitment) and the probability distribution of the reference points referred to in SI a should be included in section 3.3.3.	Stock recruitment relationships and probability distribution of the reference points has been added in the Appendix 6 (Supporting Information P1).
1.1.3	NA	NA	NA		
1.2.1	Yes	Yes	NA	Much of the evidence included in justification for SI a is not really relevant to the SG being addressed. For example, it includes a fair bit of detail on monitoring that belongs in SI c where instead reference back to SI a is made – some of the detail regarding data collection belongs in 1.2.3 SI a. The paragraph devoted to details of the assessment model is more relevant to 1.2.4 SI a and the description of the HCR to 1.2.2 SI a. All of the indirectly related details tend to obscure the evidence that is directly related to the SG 100 wording.	PI 1.2.1 is about the whole Harvest Strategy, which, as it is defined by the MSC FCR v2.0, is the combination of monitoring, stock assessment, harvest control rules and management actions. But, each of these components have their our PIs (PI 1.2.3, PI 1.2.4 and PI 1.2.2, respectively), so, it is somehow unavoidable to repeat some of the information. We have nevertheless edited the rationale on this PI following some of the PR suggestions for a clearer evidence.

1.2.2	No	No	NA	SI a, last two lines of 1st paragraph – the ACT is not based on reference points but is calculated from the estimate of available biomass from the assessment model. The F reference point is simply the first step in the calculation. SI b – This provides a very general description of the sources of uncertainty considered but no actual results of their "rigorous examination" or the sensitivity analyses that were done (p. 47) are provided here or in section 3.3.3. A time series of model estimates of biomass is provided in Fig. 19 (p. 48) without confidence intervals. SAMS is not mentioned here. It is described as a forecasting model on p. 52 but no outputs or evaluation of model performance are provided. Normally, a forecasting model would provide the basis for a risk assessment to inform managers about probabilities of some F level being exceeded for a range of catch options. How does forecasting from SAMS relate to foreward projecting by CASA? How is the kind of risk assessment referred to above covered off? Are the precautionary steps in the ACT calculation based on a risk assessment or are they a replacement for it? More details are needed to justity SG 100 for SI b.	SI a: of course ACT is not based on reference points, sorry for this typo. Correction was done. ACT is calculated through several steps from the overfishing limit (OFL). OFL is get after applying the F_{MSY} to the estimate of available biomass. SI b: several results related to the uncertainties in the assessment can now be found on the new "Appendix 6 Supporting information P1". A reference to this appendix has been made in the rationale of SI b. Information about CASA, SAMS and SYM models is given. Nevertheless, the rationale was mainly expanded to other unkwon factors (following the wording of GSA2.5.2 from GCR v2.0) of uncertainty (e.g. climate change effects, massive mortality events, metapopulation structure), not properly considered before. The score was re-checked taking into account all sources of uncertatinty and SI b was downgraded from SG100 to SG80. Final score for PI 1.2.2 was therefore 85 (instead of 100 as it was before).

PI	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.2.3	Yes	Yes	NA	No further comment.	No response necessary
1.2.4	No	No	NA	SI c – The wording of SG 100 is not addressed in any kind of definitive way. Most of the justicication is devoted to the"possible impact" of scallops on the Canadian side of GB – a very minor uncertainty in the context of this SI. See comments above for 1.1.1, 1.1.2 and 1.2.2 for the kind of details that are lacking here.	We focused the SI c rationale on the impact of the Canadian populations and refered to SI a for the other unertainties. Since it is clear that this way is confusing and for clarification, the rationale has been modified and focused on the uncertainties pointed out by the PR. The PI score does not change.
2.1.1	Yes	Yes	NA	No further comment.	No response necessary
2.1.2	Yes	Yes	NA	No further comment.	No response necessary
2.1.3	Yes	Yes	NA	No further comment.	No response necessary

PI	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.2.1	Yes	Yes	NA	No further comment.	No response necessary
2.2.2	Yes	Yes	NA	No further comment.	No response necessary
2.2.3	Yes	Yes	NA	No further comment.	No response necessary
2.3.1	Yes	Yes	NA	SI a – elaboration on the expected incidental catch estimate would be useful here. SI b – VTR is another source of information mentioned on p. 78.	SIa – Footnote 10 with further context on the expected incidental catch estimate now included. SIb- the VTRs are a potential source of infomration, but no evidence was received that these are consistently implemented for collecting information on interactions with ETP species
2.3.2	Yes	Yes	NA	No further comment.	No response necessary

PI	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.3.3	Yes	Yes	NA	SI a – according to p. 80, VTR is used. The evidence in these SI justifications could be presented more clearly. The observer coverage and VTRs are the only ongoing, direct sources of information. Historical records (p. 80) appear to provide the basis of the much overestimated (?) expected incidental catch – a brief explanation of the estimate would be helpful (see 2.3.1 above). Murray (2015) provides another unexplained estimate. The RSA funded tagging program presumably would have detected any lethal interactions but, what about non-lethal ones?	Further context included in now (p; 85) to indicate that the assessment team did not receive evidence that the VTRs are used in a consistent manner to record information on interaction with ETP species. Additional context on how the anticipated Incidental Take is estimated is estimated is now provided. The justification now notes, that the assessment team did not received any explanaitonon the impacts of sublethal interactions.

PI	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.4.1	Yes	Yes	NA	Do NEFMC (2016) and Galuardi (2017) provide any measure of how much overall fishing effort has declined? Is there any measure of the fishery footprint in terms of bottom area contacted by the gear in fishable habitat open to fishing in a given year?	The maps provided from Galuardi (See Gigh 29) provide changes in fishing effort in number of hours. NEFMC(2016) does provide estimates of the fishery footprint by habitat type, based on historical fishing information. A table of the model estimates of potentially fishable areas by energy and substrate type is provided in the background (See Table 14)
2.4.2	Yes	No	NA	The PI score of 90 is justified, however, the SI d justification is not consistent with achieving SG 100.	This was a typo, it has now been fixed SG100 is not met for Sid. This brings down the overall Score for this PI to 85
2.4.3	Yes	Yes	NA	No further comment.	No response necessary
2.5.1	Yes	Yes	NA	No further comment.	No response necessary
2.5.2	Yes	Yes	NA	No further comment.	No response necessary

PI	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.5.3	Yes	Yes	NA	No further comment.	No response necessary
3.1.1	Yes	Yes	NA	A very minor consideration to be sure but, the wording of the highest SG achieved for a SI is usually copied into the justification – this general practice was followed in Ps 1 and 2.	No response necessary
3.1.2	Yes	Yes	NA	The second part of SG 100 for SI b is addressed in the justicication in a single sentence. It's clear that there is opportunity to discuss how input is used but, it doesn't "demonstrate" that an explanation is required.	The sentence is now expanded to include an explanation of when the input is not used.
3.1.3	Yes	Yes	NA	No further comment.	No response necessary
3.1.4	NA	NA	NA		
3.2.1	Yes	Yes	NA	No further comment.	No response necessary
3.2.2	Yes	Yes	NA	No further comment.	No response necessary

PI	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.2.3	Yes	Yes	Yes	No further comment.	No response necessary
3.2.4	Yes	Yes	NA	No further comment.	No response necessary
3.2.5	Yes	Yes	NA	Please note the mis-labelling of this PI as 3.2.4 on the left side of the evaluation table template.	Typo corrected.

9.1.1 Peer Reviewer B

Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes/No**	**Conformity Assessment Body Response**
Justification: *This is a comprehensive report, well structured, easy to read and correctly referenced. Scores are well addressed, based on the available literature and they are adequately justified and easy to understand.* *It seems to be a well-managed fishery which has dealt with the potential impacts of the gear used on bottom habitats and ecosystems. Stock is in good shape, the harvesting strategy has improved over time, and there is a strong legal and management framework. However,* *In regard to Principle 1 my main concern is about the NGOM stock. Although landings from this area represent a very low proportion of the total landings of the scallop stock, it seems that formal reference points have not been set for that stock, connectivity with the Canadian scallop stock is unclear and a TAC was only set very recently in 2018 for the LA fleet. Is that correct? Therefore, I consider that scores in some scoring issues in P1 are maybe too high (see my comments there) as the special characteristics of this are not taken into account.* *In regard to Principle 2, it seems that since the first assessment knowledge about the impact of the fishery on the habitat and bycatch species and management has improved. However, I have two main concerns, one is about the amount of available information at the species level (in particular for skate species) to support the management strategy for bycatch species. And the second one, is about the impact of dredges on vulnerable habitat types in low-energy environments.* *No main issues for Principle 3. It seems that monitoring, control and surveillance needs to be improved both at sea and in the landing site for the LAGC-IFQ fleet.* *Please, see my comments in the scoring table.*		*Regarding Principle 1 concerns, we agree that formal reference points have not been set for NGOM and that the LA fleet just has a TAC since 2018 when fishing in the NGOM (LAGC fleet has a TAC since the inception of the NGOM management area in 2008). But, the literature we have found does not support the connectivity of the NGOM with the Canadian scallop populations suggested by the PR (see section 3.3.1 Atlantic Sea Scallop; Sea scallop Stock structure - Metapopulations). We have taken into account the NGOM on the scoring tables, and carefully read the PR observations, but, as explained below on the PI Review table, the PI scores did not change.* *Principle 2: for the skate complex see comments below in specific PIs for Bycatch species and for habitats comments are also addressed in the relevant PIs.*

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	**Yes**	**Conformity Assessment Body Response**
Justification: The wording of the condition is explicit and if milestones are met, I think that it should result in the SG80 outcome being met for 3.2.3.		*No comment necessary*

If included:

Do you think the client action plan is sufficient to close the conditions raised?	**No**	**Conformity Assessment Body Response**

<u>Justification:</u> The client action plan seems very general and no specific deliverables are set (e.g: reports showing that compliance has improved over time).	*<u>Though the action plan is general, if the client provides evidence of the outcomes mentioned under 'expected deliverables' this would be sufficient for SCS to assess outcomes and proves in each subsequent surveillance.</u>*

General Comments on the Assessment Report (optional)

Performance Indicator Review

Please complete the table below for each Performance Indicator which are listed in the Conformity Assessment Body's Public Certification Draft Report.

PI	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.1.1	No	Yes	N/A	Based on the particularities of the NGOM, I consider that this performance indicator is scored too high. The assessment team in the Canadian scallop fishery took a more precautionary approach when scoring these issues as they considered that the information available for the minor banks did not provide the high degree of certainty required to meet the SG100 requirements. If I am not wrong, here we have a similar situation for the NGOM (1% of the landings), but a score of 100 has been given to all the scoring issues.	The minor banks in the Canadian offshore fishery accounts for an average of ~8%, and this was fundamental for not achieving the SG100. NGOM landings only accounts for 0.46% in the period 2008-2017, due to the uncommon circumstances in 2017 that allowed very large LA fleet landings. The management system has quickly reacted to avoid this in the furture and a TAC for for all fleets has been set, based on independent surveys from only a portion of the NGOM and on a very conservative F=0.18 (when F_{MSY}≈0.3). The 2018 NGOM TAC is only 0.22% of the UoA ACT. Excluding 2017, NGOM landings account for only 0.14% of the UoA landings. We reviewed the Canadian case when scoring this PI and finally considered that the circumstances are not compareble to the

					offshore Canadian fishery. Based on the above and the 5 reasons stated in last paragraph of the SIa rationale, we consider the score of 100 to be justified.
1.1.2	No	Yes	N/A	My main concern is again with the NGOM stock. It is true that landings in this region are low relative to the rest of the scallop stock but there are no formal reference points derived for the area. Therefore, I am not sure if it can be considered that limit and target reference points reach the 100 guidepost for all the stocks.	Following the same arguments given in the CAB response for PI 1.1.1, we consider the score of 100 to be justified.
1.1.3	N/A	N/A	N/A	The PI is not scored since stock is not depleted.	No response necessary
1.2.1	No	Yes	N/A	S.I a and b. Again for the NGOM stock. It seems that in 2017 1,000,000lbs of scallops were taken out of area, more than double what was recommended for harvest. After the assessment, it was determined that the area could only sustain a catch of 200,000lbs (https://www.mainecoastfishermen.org/single-post/2017/12/13/The-2018-Gulf-of-Maine-Scallop-Fix) and the total allowable catch for the Gulf of Maine fishery was set at this quantity for 2018. cannot see it	The large landings in 2017 from NGOM was an exceptional circunstance (never seen before). Arguably the weakness of the harvest strategy in dealing with this unpredictable factor could have lead to re-consider an SG100 score. Nevertheles, the management system quickly reacted: - Management actions were taken and an early closure of the NGOM was decided. - After the closure, the NEFMC asked the NFSC to expand scallop survey coverage to include the area where FY2017 NGOM fishing was heavily concentrated (i.e. southern Jeffreys Ledge and Stellwagen Bank). The NEFSC supported this request and amended two previously approved RSA

				as a "precautionary harvest strategy".	awards to include surveys in the southern part of the NGOM. Density found in Stellwagen Bank was estimated to be roughly 0.1 scallops m^{-2}, which translates to a harvestable density similar to what would be seen on Georges Bank. There was some evidence of recruits in the southwest part of Jeffreys Ledge, and scallops > 75 mm seemed to be distributed across the survey area. (Information extracted from FW29 Appendix III – NEFMC 2018a). - For 2018 a TAC for all fleets has been set, based on independent surveys from only a portion of the NGOM and on a very conservative F set at 0.18 (when F_{MSY} is expected to be roughly 0.3). The assessment was based on the harvest strategy in place for the NGOM as of the publication of the PCDR, which is considered to be a "precautionary harvest strategy" Based on the above and the arguments given in the CAB response for PI 1.1.1, we consider the score of 100 to be justified.
1.2.2	Yes	Yes	N/A	All scoring issues of this PI are satisfactorily explained. No further comments are necessary.	No response necessary
1.2.3	Yes	Yes	N/A	Score 85 agreed. No further comments are necessary.	No response necessary
1.2.4	Yes	Yes	N/A	All scoring issues of this PI are satisfactorily explained. No further comments are necessary.	No response necessary

2.1.1	Yes	Yes	N/A	No retained species are present in this fishery	No response necessary
2.1.2	Yes	Yes	N/A	Score 100 agreed. All scoring issues of this PI are satisfactorily explained. No further comments are necessary.	No response necessary
2.1.3	Yes	Yes	N/A	All scoring issues of this PI are satisfactorily explained. No further comments are necessary.	No response necessary
2.2.1	Yes	Yes	N/A	S.I.a Here, as in the introduction section is stated that “In the scallop fishery the three most commonly captured skate species are little skate; winter skate and barndoor skate” but no reference is given for this statement. The previous paragraph in the introduction refers to landing data but I understand that this last information is not based on landing data but on data reported by the observers? Would it be possible to include a table with the proportion of each skate species caught? (I am just interested in knowing which percentage represents thorny skate, which seems to be the only species of the complex	The three skate species classified as main are little, winter and skate, not thorny. This error is now fixed in the background. The assessment team was not provided with the proportions of landing by each skate species. The available bycatch reports group all skate species as a complex. Evaluations on the condition and discard mortality of skates in the sea scallop drede fishery cite little, winter and barnoor skates as the most commonly captured skate species in this fishery (Rudders et al., 2015 and Knotek et al., 2018).

				overfished). It is clear that yellowtail flounder it is not within biologically based limits. Therefore, score 80 agreed.	
2.2.2	Yes	Yes	N/A	The strategy in place to manage bycatch species seems to be adequate. Score 100 agreed.	No response necessary
2.2.3	Yes	No	N/A	It seems that more information at the species level (e.g: skate complex) is necessary to support a strategy to manage bycatch species. S.I.c Just a quick comment, I think that the guidepost 100 in this scoring issued refers only to retained species? As in this fishery it is considered that there are not retained species, maybe can be stated this guidepost is reached for this particular S.I.? In this case the final score for this performance indicator should be 85.	A note is now included in SI referring to the studies conducted to assess species-specific condition and discard mortality rate for the three main skate species captured in the scallop fishery. SI c. This was a type in the scoring table, it should read "byatch species', the tupe is now corrected. The score of 80 is mantained for this PI
2.3.1	Yes	Yes	N/A	It seems that the only ETP species affcetd by the fishery is loggerhead turtle. Score 80 agreed. No further comments are necessary.	No response necessary
2.3.2	Yes	Yes	N/A	Score 85 agreed. No further comments are necessary.	No response necessary
2.3.3	Yes	Yes	N/A	Score 80 agreed. However, I	Agree, comment recommending 100%

				consider that a 100% coverage is an unrealistic objective for many fisheries, including this one. S.I.c The sentence "Important information indicates that historically, scallop gear is expected have incidental catch.." doesn't make a lot of sense. What means "important information"? If it is a report, please include a reference.	observer coverage removed. SI C. The sentece is now corrected
2.4.1	Yes	No	N/A	S.I.a I think that the sentence "Such islands support the recovery of benthic community in fished areas through neighboring emigration and by acting as source locations for new recruits to other areas." needs a reference. The assessment of the impact on the habitat of dredges, as for other high environmental impact gears such as bottom trawls, is always tricky. The assessment team states that the benthic species bycatch is made of resilient benthic communities and the bycatch of corals specimens is 0%. However, is it not because the fishery has been working there for more than 100 years and corals and less resilient species have dissapeared as a result of the	A reference to habitat revocery on account of unfished patches is now included. The impact of multiple generation of fishign gear on benthic habitat of the Atlantic Coast in the United States is undeniable. However, in recent decades management measures have been implemented to mitigate these impacts. Furthermore, the assessment team interprets the intent of MSC with this Outcome PI to assess further serous or irreversible harm, rather than pre-existing historical state is known or if recovery is possible: "If the habitat has been altered completely so that the pre-existing state does not exist, recovery of that state is not expected; however if recovery of the pre-existing state is possible, this should be considered." (MSC CR v2.0 GSA3.13.4).

				fishing activity? The other thing that worries me is that according to the NEMFC 2011 reference, "vulnerable habitat types in low-energy environments represent 3% of the distribution of the areas assumed to be fishable by the scallop fishery". It means that in this 3% of the habitat a 'serious or irreversible harm' is still ocurring according to the MSC definition. So, it could be considered that for these areas the guidepost 80 is not reached. I guess that if it is "only" a 3%, there is not imapct on a regional basis but I think that the closure of all these areas should be considered. No reference is done to the closure of the previous condition in this section. I would include a short sentence stating that now the condition is closed and sending the reader to the annex for more info would be interesting to the closure of this	As mentioned by the Peer Reviewer, there is the potential for the fishery to impact a small proportion of vulnerable low-energy granule-pebble, cobble and boulder dominated habitats, with a habitat recovery of >5 years. However, as also mentioned by the reviewer this area is relatively small, the area of habitat subject to fishing is relatively small; and these type of vulnerable benthic habitat are mostly fully protected in HAPC/EFH closed areas. A reference to the closed conditions is now included.
2.4.2	Yes	Yes	N/A	Score 90 agreed. It seems that the managing of the habitat impact has improved during the certification period. Again no reference to the closure of this condition is done.	No response necessary
2.4.3	Yes	Yes	N/A	Score 80 agreed. No further	No response necessary

				commenta re necessary.	
2.5.1	No	Yes	N/A	It seems that the Omnibus Essential Fish Habitat Amendment 2 has restricted fishing with mobile bottom gear in all closed areas and the score seem to be adequate. However, I have two concerns about the rationale used to justificate this score. One is that again in this section no reference is done to the closure of the previous condition. Therefore, if we do not read the annexes it seems that nothing have happened during the assessment period (maybe the inclusion of a short sentence stating that now the condition is closed and send the reader to the annex for more info would be interesting). My second concern is that all the references used in the fourth paragraph to explain the post-dredging recovery of benthic fauna/communities in the area (Watling et. al. 2001, Sullivan et. al., 2003, Collie et. al., 2005) are quite old but it seems that some research is ongoing. No more recent references are available?	A reference to the closed conditions is now included. The most recent information available employed was: Gallagher, S. and Purcell, M. (2017), the SASI model information (NEFMC 2011) and the information from the observer data obtained from last fishing years.
2.5.2	Yes	No	N/A	Score agreed. I find these scoring issues in 2.5 always difficult to	Further detail include in Sis c and d.

				justify. Maybe more specific info is necessary to justify that the guidepost 100 is met in 2.5.2c and d.	
2.5.3	Yes	Yes	N/A	All scoring issues of this PI are satisfactorily explained. No further comments are necessary.	No response necessary
3.1.1	Yes	Yes	N/A	Well justified. No further comments are necessary.	No response necessary
3.1.2	Yes	Yes	N/A	PI scores 100 (agreed)	No response necessary
3.1.3	Yes	Yes	N/A	Long-term objectives seem to be clearly defined	No response necessary
3.1.4	No	No	N/A	This scoring issue is missing?	PI now included
3.2.1	Yes	Yes	N/A	I would delete the first two paragraph of the justification as MSC principle 1 and 2 objectives have been defined in 3.1.1. Score 100 agreed. No further comments are necessary.	No response necessary
3.2.2	Yes	Yes	N/A	All scoring issues of this PI are satisfactorily explained. No further comments are necessary.	No response necessary
3.2.3	Yes	Yes	Yes	3.2.3a In my opinion the	No response necessary

				information regarding a specific case of non-compliance is not necessary. 3.2.3d "Others interviewed did not provide any evidence of systematic non-compliance." It would be interesting to specify to which "others" refers. Score 70 agreed It seems that the milestones in the conditions to raise the fishery's performance to 80 are well defined and they are addressed in the CAP.	
3.2.4	Yes	Yes	N/A	Score 100 agreed but maybe a summary of these research priorities should be included in the justification	A brief summary is now included.
3.2.5	Yes	Yes	N/A	The numbering of this performance indicator is incorrect. There is not a regular external review. Score 90 agreed.	No response necessary

10.

11. Any Other Comments

Comments	Conformity Assessment Body Response
Page 12. In the list of strengths for P2, the sentence "The likely recovery rates (~10years) of benthic communities" seems to be redundant. Page 15. The last sentence of Gonzalo's Macho profile is written in the first person.	p. 12. Corrected Page 15. Corrected Page 46-47 The section on the stock assessment model was edited for clarification.

Page 46. The first two sentences of the last paragraph are unclear. In general, I think that the description of the data used in the CASA model (see also page 47) is unclear. Page 71. The resolution of tables 10 and 11 is poor which makes difficult to interpret them. Page 73. In the second paragraph of page 73 states that thorny skate is overfished but in table 12 it says that it is not. Please, could you clarify it? In general, I consider that this section should be clarified. At the beginning of the skate complex section it is stated that winter skate, little skate and barndoor skate are the main bycatch species but later when talking about the main characteristics of these species, only the two first species are treated but no barndoor skate. Also in table 12, thorny skate appears but barndoor skate is again missing. Page 127. A bullet point is left. Page 140. Scores for the habitat component in the P2 summary table (table 30) do not coincide with the scores shown in table 29. Page 141. All the recommendation made by the assessment team seem to refer to P2. As in the P1 summary is stated that "The only weak point is the NGOM since this region is data-poor relative to the rest of the scallop resource, is not included within the assessment model, and there are no biological reference points set", maybe a specific recommendation should be included in reference to this point. Missing references in Page 64 (last paragraph), page 86 (last paragraph), page 87 (second paragraph).	p. 71 tables enlarged for better resolution p. 73. This section has been corrected to include barndoor instead of thorny skate. . p. 127 extra bullet point eliminated p. 140. Scores are double-checked and now coincide Page 141 Recommendations are optional and not included for P 1 P, 64., 86 and 87: References now included

Appendix 3 Stakeholder Submissions

No written or verbal submissions made by stakeholders during consultation opportunities listed in FCR 7.15.4.1. were received.

SCS did receive a MSC technical oversight report for the US Atlantic scallop fishery after the 30-day consultation period for the PCDR.

Table 33. MSC technical oversight report

SubID	Page Ref.	Grade	Requirement Version	Oversight Description	Pi	CAB Comment
28925	137	Guidance	FCR-7.12.1.3 v2.0	Please further describe the points of landing (location and/or number) and further detail any associated risks.		Information on points of landing are now included in Table 25.
28926	137	Guidance	FCR-7.12.1.4 v2.0	Table 26: Please provide further rationale for why risks of mixing between certified and non-certified catch during processing activities (at sea and/or before CoC) and risks of mixing between certified and non-certified catch during transhipment are 'not applicable'.		Not an applicable risk because processing or transshipment activities do not take place at sea, a note is now included in Table 26
28927	130	Guidance	FCR-7.6.1 v2.0	Please clarify that the target eligibility date(June 1) is in 2018. Also related to the TO comment on version of the process requirements applied in this fishery, per v2.0 process (FCR), please clarify the eligibility date given the outlined dates provided in FCR 7.6.1.		Year is now included. Date updated to July 3rd, the date of the publication of the PCDR

28928	10, 19, 138, 25	Guidance	FCR-7.4.7 v2.0	Tables 1,2,27 & Figure 4: Table 1, Page 10 states that the method of capture is the New Bedford Dredge, however Table 2 describes the method of capture as 'Scallop Dredges' and Table 27 refers to DRS, DSC, DTS and DTC. Please clarify the difference between a New Bedford Dredge and any other type of Dredge referenced if they are different, and if not, please unify the description for consistency. Page 10: Of the 11 limited access sea scallop permit types, only seven of these permit types are included in the UoA. Please further clarify what the different permit types involve. Page 25, Figure 4: Please also clarify where the fishing areas in the UoA are located and how the permit categories are distributed across both UoA and non-UoA areas. The resolution of Figure 4 is very low, making it difficult to read and interpret.		Have updated to refer to "New Bedford style scallop dredges", in Table 1, 2 and 27. The scallop dredges and New Bedford dredges refers to the same gear type. The gear codes in Table 27 refer to minor variations of the New Bedford style scallop dredges. There is a description of the different permit types in the first row of Table 26. A reference to this section is now included in the caption of Table 4 Figure 4: resolution improved, the legend now includes information on fishing areas for the LA and LAGC permit categories
28929	137	Minor	FCR-7.12.2 v2.0	The report states that "The point of intended change of ownership of product is the first sale from a vessel, federally permitted dealer or auction house to one of the processing plants that is part of the client group." The sentence is confusing. The report also states 'Transfer of product to a dealer is not considered purchase of fish/change of ownership'. Please clarify where the change of ownership takes place, which entities require CoC, and please also further detail the		Section 5.3 Eligibility to Enter Further Chains of Custody was edited to improve clarity

				types and roles of the entities that comprise the client group.		
28930	270	Guidance		Peer review comments are presented in A4 sideways which makes reading difficult.		Peer Review tables are displayed in the same horizontal layout as in the MSC format
28931	257, 125	Minor		The report states on page 125 that v.1.3 process was approved for use in this assessment by a Fisheries Assessment Manager at the MSC, and consequently applied to this fishery. According to the MSC implementation timeframes, any re-assessment commencing after the effective date (1 April 2015) shall be conducted in accordance with the new process requirements in v2.0. Additionally, in response to peer review comments on page 257, the report states that v.2.0 process was applied and this was also specified in the fishery announcement. Please clarify.		This fishery entered assessment by October 1st 2017, according to the interpretation provided by MSC (ID: 2042) "Existing fisheries (in assessment or certified) will have to apply the new standard at their first reassessment commencing **after** 1 October 2017," The response provided to the peer reviewer explains that "the fishery was assessed under process MSC v2.0 and assessment tree v1.3. Consequently, the report format used is that of v2.0." The MSC Interpretation log ID:2042 also states that "All existing assessments will use version FCR v2.0 and GCR v2.1 of the process requirements at the commencement of a new surveillance audit or at reassessment." Indicating that for a re-assessment commencing by October 1 existing fisheries may use the assessment tree v1.3, but they are required to use process requirements from FCR v2.0
28932	247	Guidance		PI 3.2.3 SI b. 'Additionally, the pre-landing notifications are not meeting theThe' - the sentence is incomplete.	3.2.3,	Sentence completed

28933	251	Guidance		PI 3.2.5 SI a. The report states 'New England Fishery Management Council (NEFMC) - entity with jurisdiction under the Magnuson Act for operational management of the longfin squid/quahog fishery' - it is not clear how this is relevant to the rationale as it is referring to longfin squid/quahog.	3.2.5,	Sentence corrected to "scallop fishery"
28934	183	Guidance		PI 2.1.1 SI a,c and d. The assessment tree used is v1.3. However, in the rationale for 2.1.1 a, c and d, references are provided to SA3.2.1 MSC CR v2.0.	2.1.1,	Rationales have been updated to refer to CB3.2.1 in V 1.3

Appendix 4 Surveillance Frequency

SCS has determined the fishery is eligible for a reduced Level 4 surveillance with 2 on-site surveillance audits 2 off-site surveillance audits. A detailed rationale for the rationale behind each surveillance activity and the number of auditors is outlined in the tables below.

the management system and client have a very high capacity and infrastructure to provide information that can be easily verified remotely:

- The clients and key stakeholders possess the infrastructure and mechanisms to engage with the team via email, phone and remote conference platforms.
- The information required to demonstrate progress against conditions evaluate progress against the conditions includes: fishery science reports, government reports and regulations and meeting notes. This documented evidence is generally made publically available through the official NOAA website. Any reports or information not found online can be easily requested electronically.
- There are no milestones that require investigation of physical aspects of the fishery
- There is a high level of transparency in management; assessment reports are made public on a timely manner. There are a number of evaluation processes of the management system itself, which are also publically available, enhancing the transparency and facilitation verification.

This is the second certification period for this fishery, and all conditions are associated only with one Principle, SCS concludes a reduced team of 1 auditor may be used (MSC CR v.2 7.23.4.2)

There is no proposed change in timing of the surveillance from the requirement to undertake the surveillance audits up to 6 months earlier or later from the anniversary date.

Table 34. Surveillance level rationale

Year	Surveillance activity	Number of auditors	Rationale
1	*Off-site surveillance audit*	1 auditor	Information needed to verify progress towards open condition (meeting minutes, government documents and other relevant reports) are produced electronically, are usually publically available and can easily be verified remotely by the auditor. Additionally, there are ample opportunities and mechanisms to engage remotely with clients and key stakeholders such as skype, email and phone. Furthermore, by Year 1 the fishery is not expected to show significant progress towards closing the conditions.
2	On-site surveillance audit	1 auditor	Information needed to verify progress towards condition can be provided remotely in year 2. However, SCS determines that on-site surveillance would be more beneficial in Year 2 as it provides an opportunity to gain a more comprehensive perspective and to cover small details that may not be perfectly captured via written records/remote communications, and maintain rapport with key stakeholders and clients.
3	*Off-site surveillance audit*	1 auditor	Information needed to verify progress on year 3 towards condition (meeting minutes, government documents and other relevant reports) are produced electronically, are usually publically available and can easily be verified remotely by the auditor. Additionally, there are ample opportunities and mechanisms to engage remotely with clients and key stakeholders such as skype, email and phone.
4	On-site surveillance audit	1 auditor	Conditions will be closed by year 3. However, because It is assumed that this site visit will be combined with the site visit for the re-assessment an on-site surveillance will be conducted.

Table 35. Timing of surveillance audit

Surveillance Level	Year 1	Year 2	Year 3	Year 4
Level 2	Off-site surveillance audit	On-site surveillance audit	Off-site surveillance audit	On-site surveillance audit & re-certification site visit

Appendix 5 Supporting Information P1

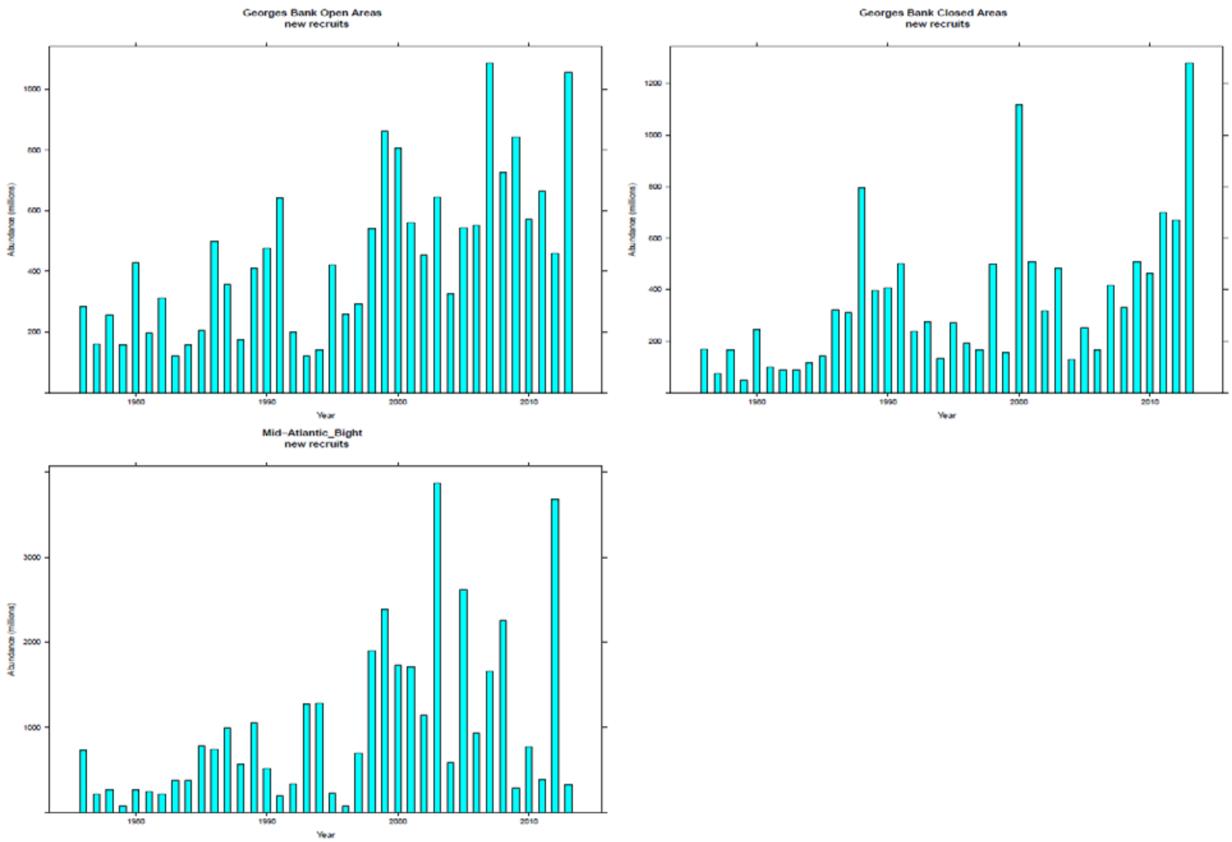
Appendix 6.1: CASA model estimates and standard errors for July 1 abundance and biomass (40+mm SH), and fully recruited fishing mortality for George Bank open, GB closed, GB total, Mid-Atlantic Bight and Total (GB and MAB combined). (Source: 59th SAW report - NEFSC 2014).

	Georges Bank Open						Georges Bank Closed						Georges Bank Total					
Year	Abund	SE	Biomass	SE	F	SE	Abund	SE	Biomass	SE	F	SE	Abund	SE	Biomass	SE	F	SE
	(millions)		(mt)				(millions)		(mt)				(millions)		(mt)			
1975	969	37	16322	622	0.08	0.01	537	23	10625	461	0.09	0.01	1507	623	26946	622	0.09	0.01
1976	1023	35	17449	666	0.19	0.01	601	23	11952	478	0.14	0.01	1624	667	29401	666	0.17	0.01
1977	859	32	16389	634	0.30	0.02	502	20	11651	464	0.28	0.02	1361	635	28040	634	0.29	0.02
1978	752	27	14047	567	0.34	0.02	460	18	10155	412	0.34	0.02	1212	568	24202	567	0.34	0.03
1979	602	24	11299	482	0.45	0.03	312	15	7504	353	0.58	0.04	914	483	18803	482	0.50	0.04
1980	678	25	9484	394	0.43	0.03	359	17	5948	291	0.49	0.04	1037	395	15432	394	0.45	0.03
1981	575	22	8118	313	0.63	0.04	299	15	5160	265	0.58	0.04	875	314	13279	313	0.61	0.05
1982	500	19	6080	249	0.87	0.06	241	15	4371	276	0.49	0.04	741	250	10451	249	0.73	0.06
1983	358	17	4632	230	0.74	0.05	206	18	3667	314	0.56	0.04	565	231	8298	230	0.67	0.05
1984	314	18	3978	244	0.54	0.03	230	21	3682	352	0.26	0.02	543	245	7660	244	0.43	0.04
1985	334	21	3792	257	0.61	0.04	265	26	4034	408	0.47	0.03	598	258	7827	257	0.54	0.05
1986	490	26	3676	239	1.19	0.08	392	35	4551	433	0.72	0.05	883	240	8227	239	0.95	0.09
1987	524	25	4389	239	0.84	0.05	440	45	5005	541	0.89	0.06	964	240	9394	239	0.86	0.08
1988	393	23	4233	270	0.95	0.06	804	62	7335	605	0.87	0.06	1197	271	11568	270	0.91	0.14
1989	451	26	3803	266	0.98	0.06	816	57	10092	728	0.52	0.04	1268	267	13895	266	0.65	0.09
1990	535	26	4033	229	1.21	0.08	674	44	9074	570	1.10	0.08	1209	230	13108	229	1.13	0.13
1991	634	26	4293	188	1.49	0.10	583	30	6445	313	1.44	0.10	1217	190	10738	188	1.46	0.14
1992	376	15	3366	135	1.69	0.11	352	24	4070	269	1.70	0.12	728	136	7435	135	1.69	0.16
1993	222	11	2270	119	1.13	0.07	343	34	3633	368	0.92	0.07	564	120	5903	119	1.02	0.13
1994	220	14	2200	143	0.53	0.03	351	37	4890	546	0.13	0.01	571	143	7090	143	0.26	0.04
1995	440	19	3278	166	0.55	0.04	522	44	7743	726	0.00	0.00	962	167	11022	166	0.17	0.04
1996	466	20	4369	196	0.77	0.05	629	48	11235	905	0.00	0.00	1095	197	15603	196	0.26	0.05
1997	451	22	4456	225	0.81	0.05	691	52	15342	1142	0.00	0.00	1142	226	19798	225	0.24	0.05
1998	637	33	5260	259	0.67	0.04	1014	64	20416	1347	0.00	0.00	1651	261	25676	259	0.30	0.04
1999	1015	44	7770	325	0.90	0.06	988	65	23875	1552	0.20	0.01	2003	328	31645	325	0.44	0.06
2000	1306	45	11600	404	0.60	0.04	1687	86	29443	1689	0.15	0.01	2993	406	41043	404	0.35	0.04
2001	1328	42	14741	468	0.59	0.04	1900	84	38707	1881	0.03	0.002	3229	469	53448	468	0.31	0.04
2002	1174	39	15006	478	0.65	0.04	1918	80	47889	2063	0.00	0.00	3092	480	62895	478	0.29	0.04
2003	1210	37	14775	481	0.53	0.03	2058	79	55666	2216	0.00	0.00	3268	482	70441	481	0.19	0.03
2004	1149	37	16192	521	0.27	0.02	1860	72	58707	2292	0.07	0.005	3008	523	74899	521	0.14	0.02
2005	1257	43	18019	576	0.34	0.02	1676	70	55653	2303	0.15	0.01	2933	577	73672	576	0.21	0.03
2006	1213	47	16459	558	0.85	0.05	1380	66	47466	2251	0.25	0.02	2593	560	63925	558	0.44	0.06
2007	1562	61	16564	605	0.60	0.04	1359	72	41169	2219	0.16	0.01	2921	608	57733	605	0.30	0.04
2008	1694	73	19653	800	0.57	0.04	1376	77	39837	2245	0.07	0.005	3070	803	59489	800	0.25	0.04
2009	1838	91	22826	1101	0.48	0.03	1565	89	41774	2358	0.05	0.004	3403	1105	64600	1101	0.24	0.03
2010	1862	105	26747	1485	0.24	0.01	1689	101	44361	2558	0.09	0.01	3551	1488	71109	1485	0.16	0.02
2011	1994	127	31320	1924	0.17	0.01	1928	127	46717	2908	0.18	0.01	3923	1928	78037	1924	0.17	0.02
2012	1871	140	32374	2400	0.36	0.02	2077	154	48792	3423	0.21	0.02	3948	2404	81166	2400	0.29	0.03
2013	2006	211	29533	2834	0.54	0.03	2756	251	56926	4275	0.06	0.00	4762	2842	86460	2834	0.30	0.04

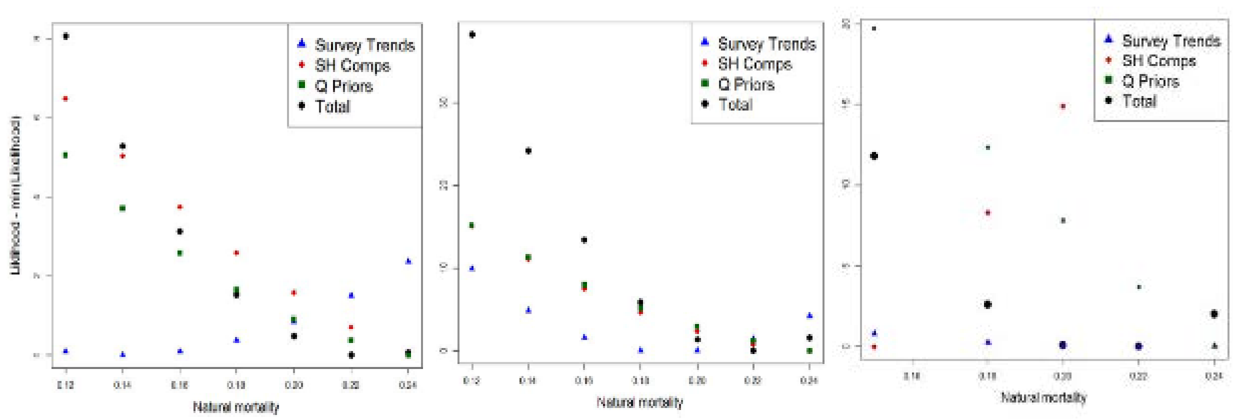
Appendix 6.1 continued:

			Mid-Atlantic						Total			
Year	Abund	SE	Biomass	SE	F	SE	Abund	SE	Biomass	SE	F	SE
	(millions)		(mt)				(millions)		(mt)			
1975	516	26	5890	305	0.56	0.05	2023	50	32837	832	0.17	0.02
1976	632	22	6709	355	1.02	0.10	2256	47	36110	893	0.31	0.03
1977	644	21	8372	307	0.53	0.05	2004	43	36412	844	0.35	0.03
1978	496	15	7821	246	1.07	0.10	1708	36	32023	743	0.49	0.04
1979	328	10	6108	194	0.97	0.09	1241	30	24911	628	0.59	0.04
1980	318	10	4820	172	0.46	0.04	1355	32	20252	519	0.45	0.03
1981	417	12	5601	192	0.17	0.02	1292	30	18880	453	0.50	0.04
1982	473	14	6912	226	0.29	0.03	1215	28	17363	435	0.56	0.04
1983	528	15	7093	236	0.56	0.05	1092	29	15391	455	0.62	0.05
1984	573	18	7021	249	0.68	0.07	1116	33	14681	496	0.54	0.05
1985	799	24	8002	286	0.61	0.06	1397	41	15829	561	0.58	0.05
1986	1087	32	11482	382	0.44	0.04	1969	54	19708	625	0.65	0.05
1987	1270	37	12113	393	0.93	0.09	2234	63	21506	711	0.90	0.08
1988	1230	40	12613	445	0.77	0.07	2427	77	24181	798	0.84	0.07
1989	1212	35	11149	368	1.20	0.12	2480	72	25044	858	0.87	0.08
1990	1097	30	10541	326	1.06	0.10	2306	60	23649	695	1.10	0.09
1991	735	21	8520	263	1.10	0.11	1952	45	19258	450	1.30	0.10
1992	515	18	5733	213	1.12	0.11	1242	34	13168	369	1.47	0.11
1993	941	35	6381	257	0.90	0.09	1505	50	12284	464	0.97	0.08
1994	1405	59	9885	465	1.38	0.13	1976	71	16975	731	0.78	0.10
1995	1044	30	10031	306	1.51	0.15	2007	57	21052	805	0.81	0.11
1996	583	18	7737	246	0.81	0.08	1678	55	23340	958	0.46	0.05
1997	649	25	6606	257	0.61	0.06	1790	62	26404	1191	0.33	0.03
1998	1484	49	9934	364	1.08	0.10	3135	87	35610	1419	0.46	0.04
1999	2655	74	22092	691	0.80	0.08	4658	108	53736	1730	0.57	0.05
2000	3275	84	36301	1025	0.66	0.06	6268	128	77344	2016	0.51	0.06
2001	3355	80	43631	1155	0.69	0.07	6583	123	97079	2257	0.51	0.06
2002	3076	73	44862	1165	0.68	0.07	6168	115	107757	2417	0.47	0.05
2003	3991	87	45517	1109	0.75	0.07	7259	124	115958	2524	0.43	0.05
2004	3801	88	50849	1198	0.93	0.09	6809	120	125748	2638	0.43	0.06
2005	3790	92	52694	1334	0.80	0.08	6723	123	126366	2723	0.41	0.04
2006	3856	99	61284	1650	0.35	0.03	6449	128	125209	2846	0.40	0.03
2007	3681	92	62298	1673	0.62	0.06	6602	132	120031	2844	0.46	0.05
2008	3879	88	58561	1504	0.70	0.07	6948	138	118050	2818	0.47	0.06
2009	3209	74	54706	1272	0.82	0.08	6612	147	119306	2897	0.49	0.06
2010	2343	61	44283	1215	0.85	0.08	5894	158	115392	3197	0.43	0.05
2011	1675	57	33973	1159	0.87	0.08	5598	188	112010	3674	0.39	0.05
2012	2808	134	30516	1468	0.74	0.07	6756	248	111682	4431	0.40	0.03
2013	3253	182	46101	2649	0.39	0.04	8014	375	132561	5772	0.32	0.03

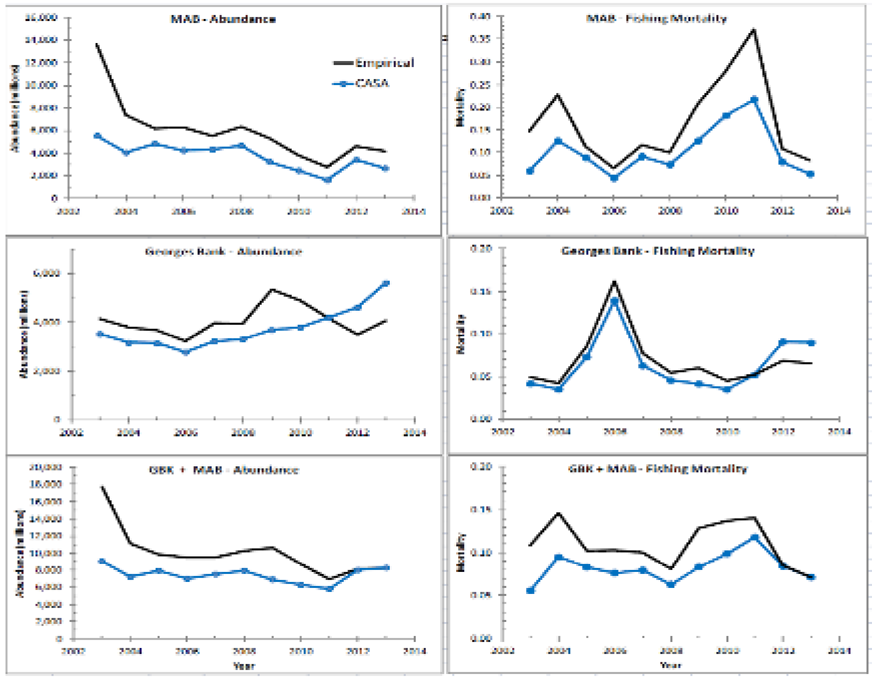
Appendix 6.2: CASA model estimated recruitment for Georges Bank (open and close areas) and the Mid-Atlantic Bight. (Source: 59th SAW report - NEFSC 2014).



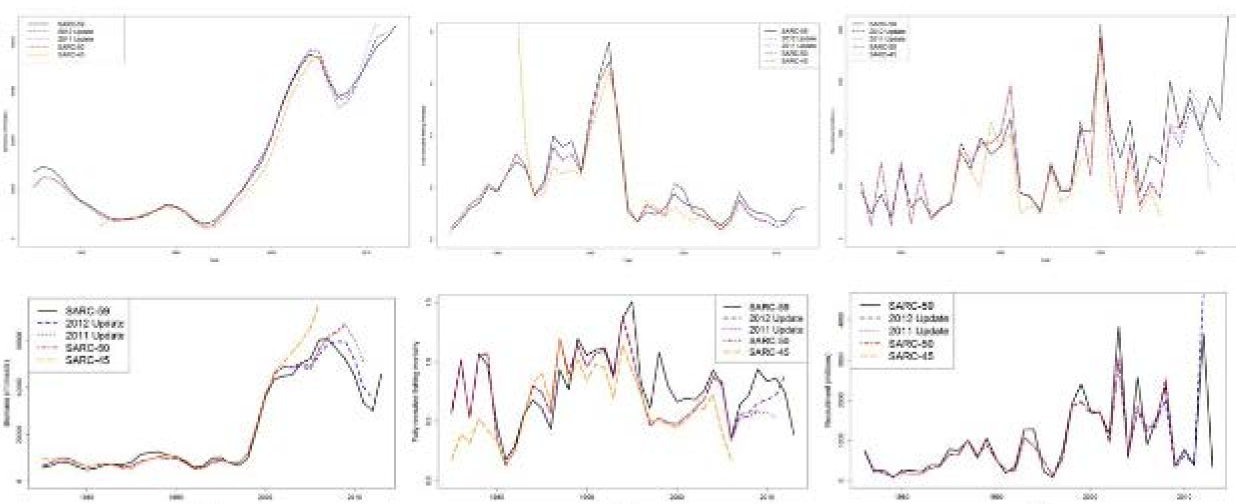
Appendix 6.3: Likelihood profiles over the assumed natural mortality for all but the largest size bin for (left) Georges Bank Open, (middle) Georges Bank Closed and (right) Mid-Atlantic sea scallops. (Source: 59th SAW report - NEFSC 2014).



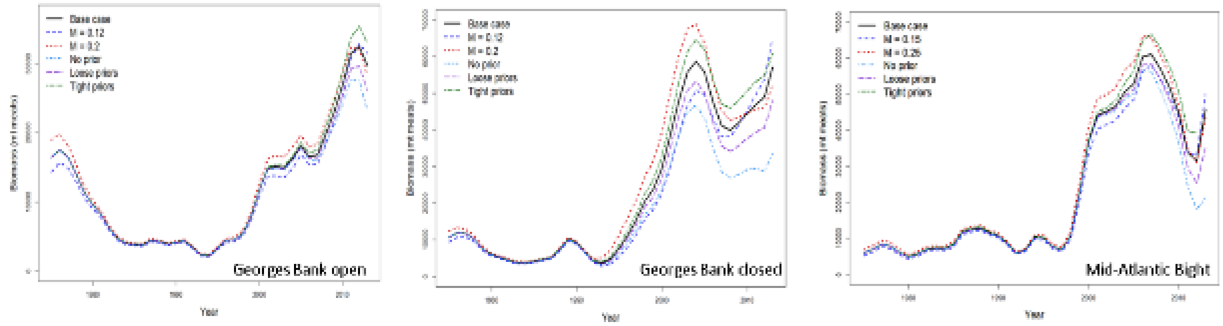
Appendix 6.4: Abundance (left) and fishing mortality estimates (right) from the empirical method and the CASA model during 2003-2013 for the Georges Bank (top), Mid-Atlantic (middle) and combined (bottom) regions. (Source: 59th SAW report - NEFSC 2014).



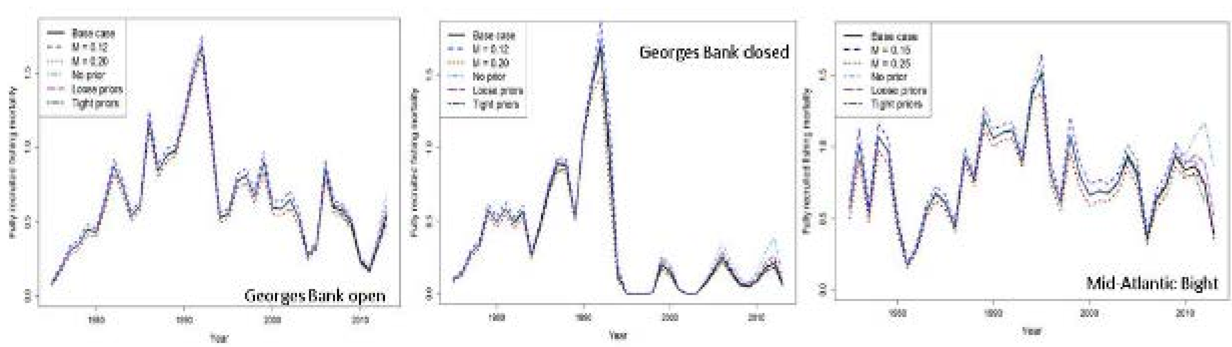
Appendix 6.5: Comparison of current CASA model estimates of biomass (left), fishing mortality (middle), and recruitment (right) to previous CASA model estimates for Georges Bank (top) and the Mid-Atlantic (bottom) sea scallops. (Source: 59th SAW report - NEFSC 2014).



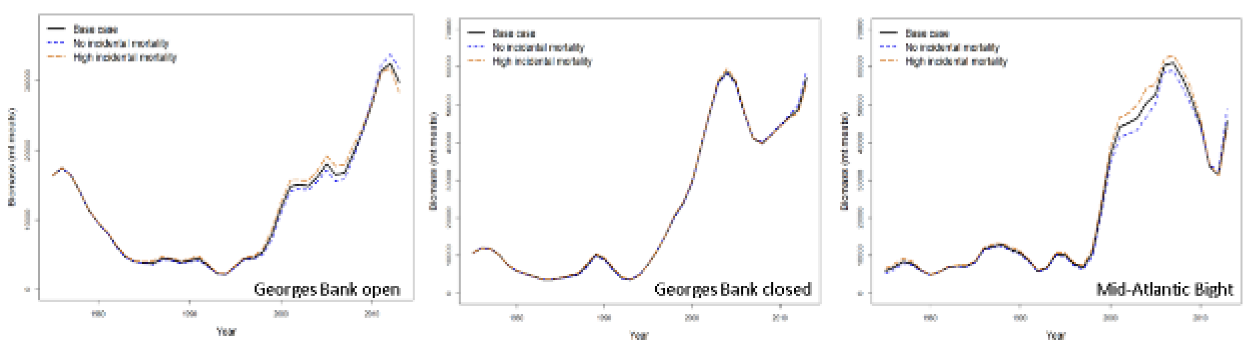
Appendix 6.6: Sensitivity of estimated biomass to assumptions about natural mortality and survey efficiency priors in CASA models for Georges Bank open (left), Georges Bank closed (middle), and the Mid-Atlantic Bight (right). (Source: 59th SAW report - NEFSC 2014).



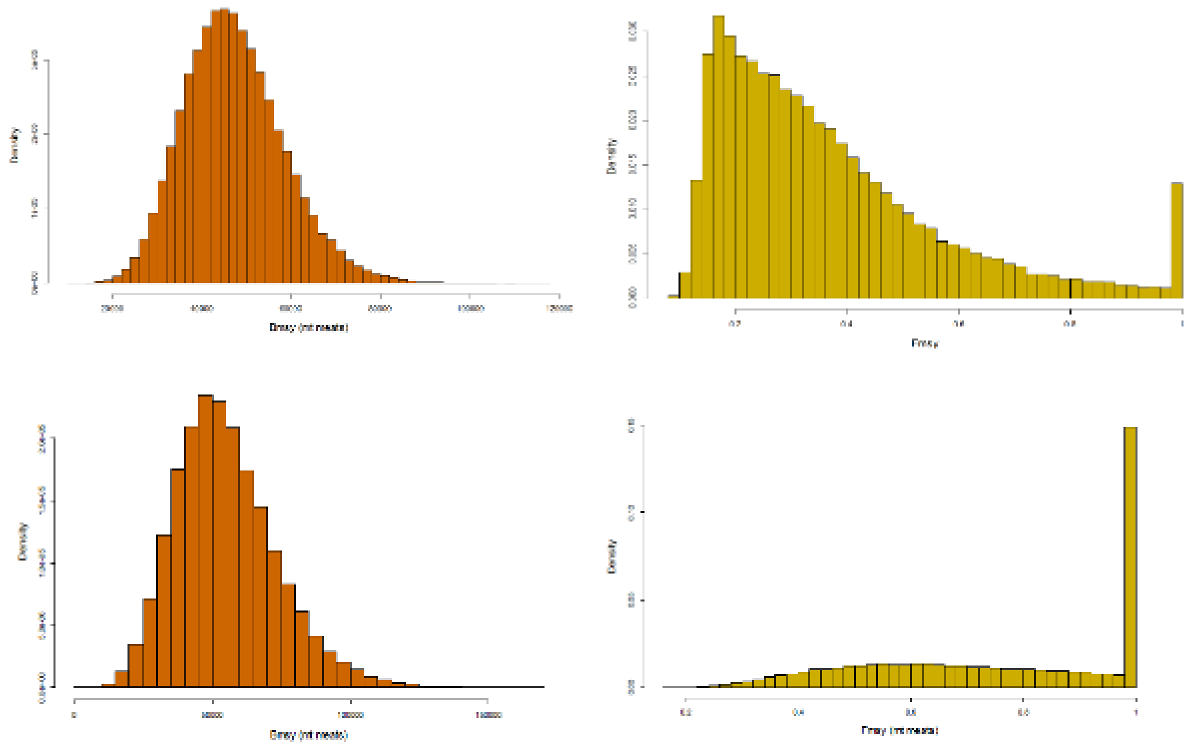
Appendix 6.7: Sensitivity of estimated fishing mortality to assumptions regarding natural mortality and survey efficiency priors in CASA models for Georges Bank open (left), Georges Bank closed (middle), and the Mid-Atlantic Bight (right). (Source: 59th SAW report - NEFSC 2014).



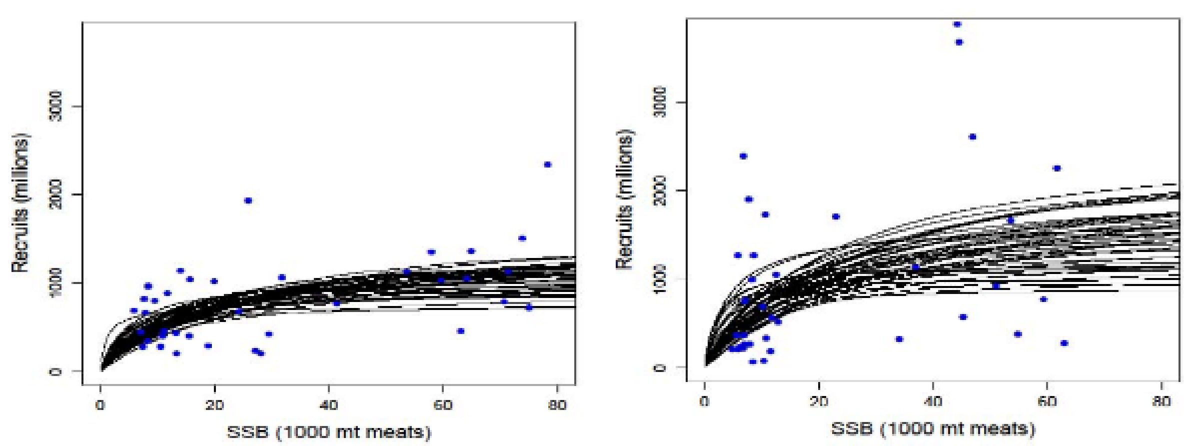
Appendix 6.8: Sensitivity of estimated biomass to assumptions regarding incidental fishing mortality in CASA models for Georges Bank open (left), Georges Bank closed (middle), and the Mid-Atlantic Bight (right). (Source: 59th SAW report - NEFSC 2014).



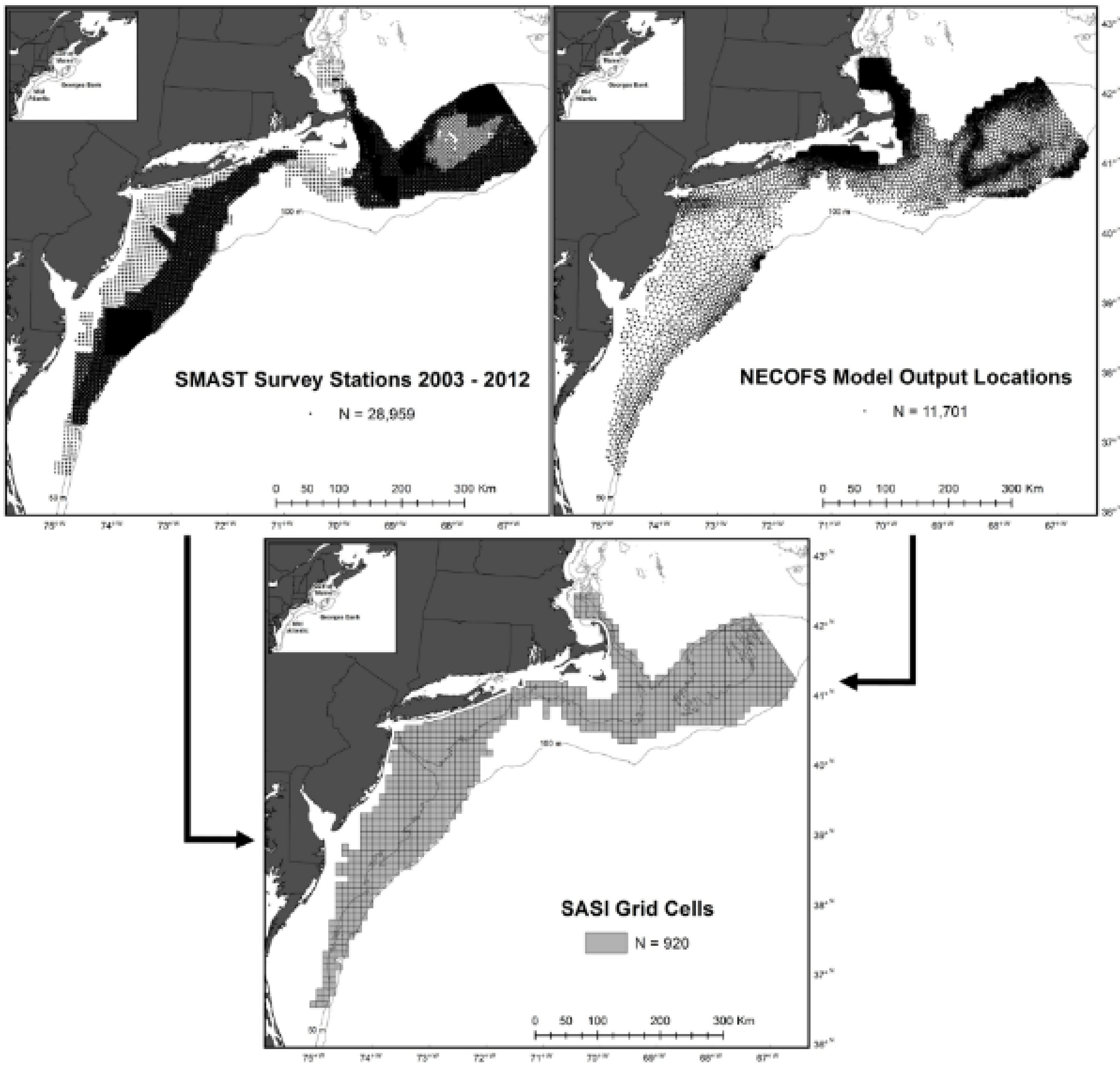
Appendix 6.9: Probability distributions for B_{MSY} in the Georges Bank (top left) and Mid-Atlantic (bottom left) and for F_{MSY} in the Georges Bank (top right) and Mid-Atlantic (bottom right) regions. (Source: 59th SAW report - NEFSC 2014).



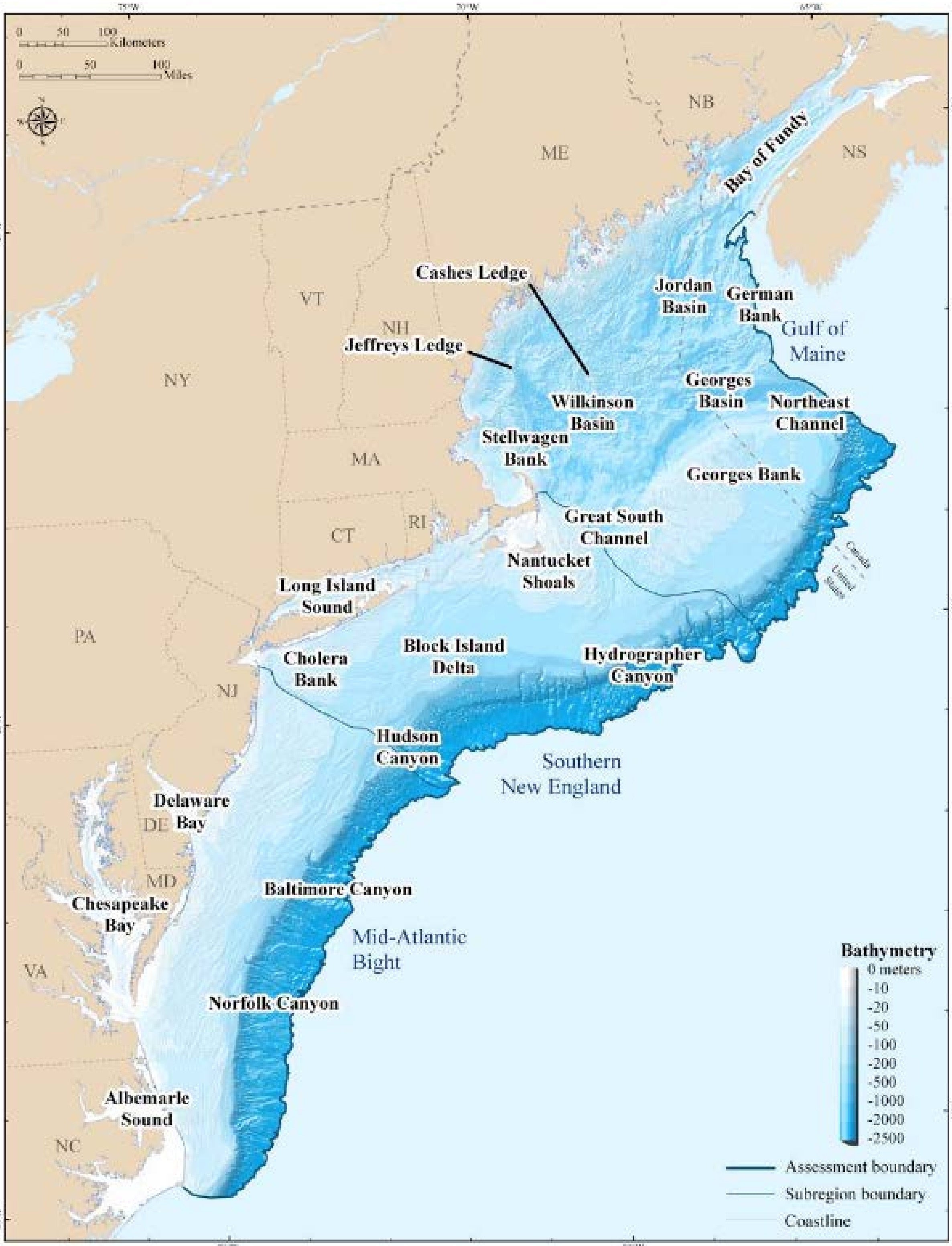
Appendix 6.10: Stock-recruit relationships for Georges Bank (left) and the Mid-Atlantic (right) showing spawner-recruit estimates from the CASA model (blue dots) and 50 example fitted Beverton-Holt curves. (Source: 59th SAW report - NEFSC 2014).



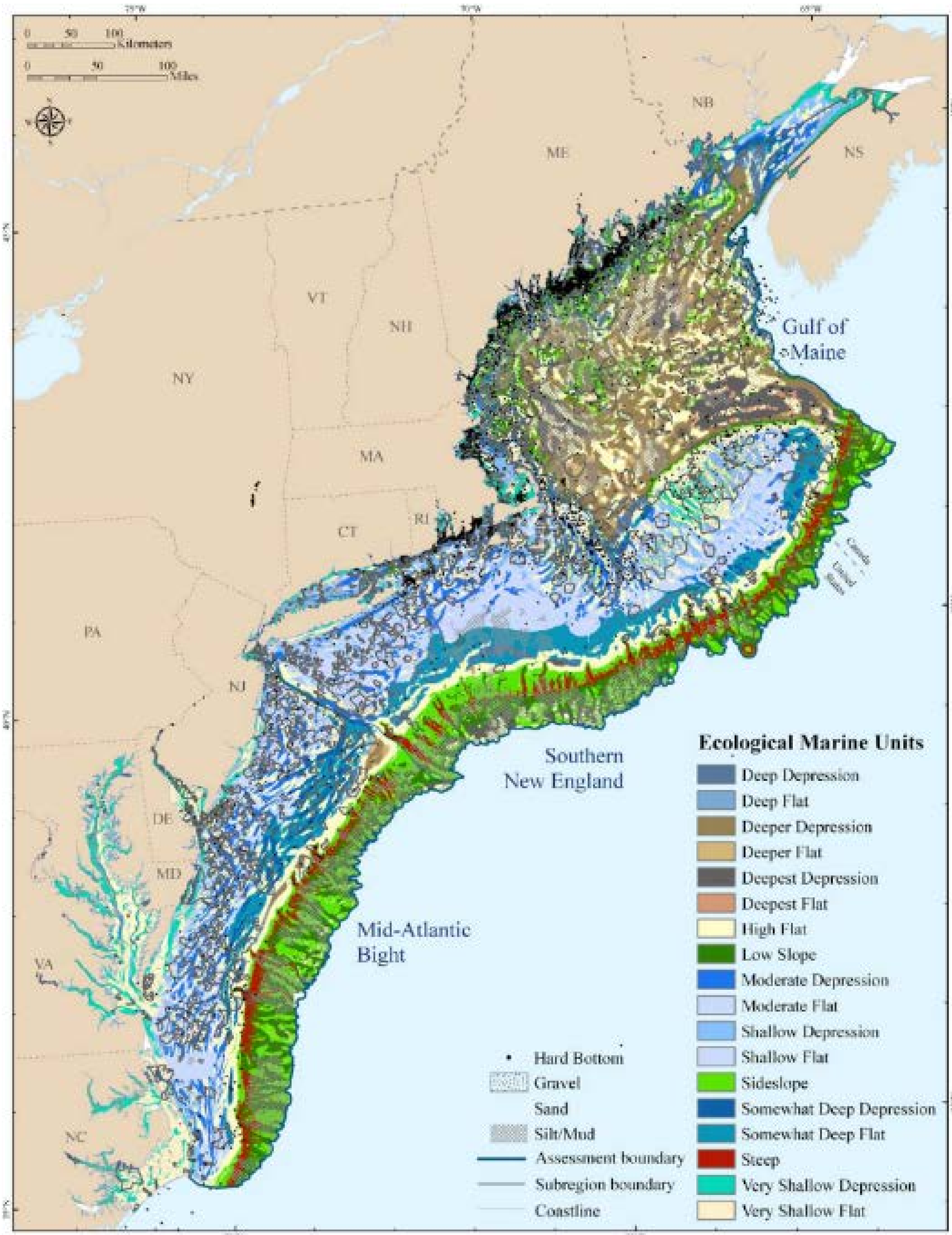
Appendix 6 Supporting Information P2



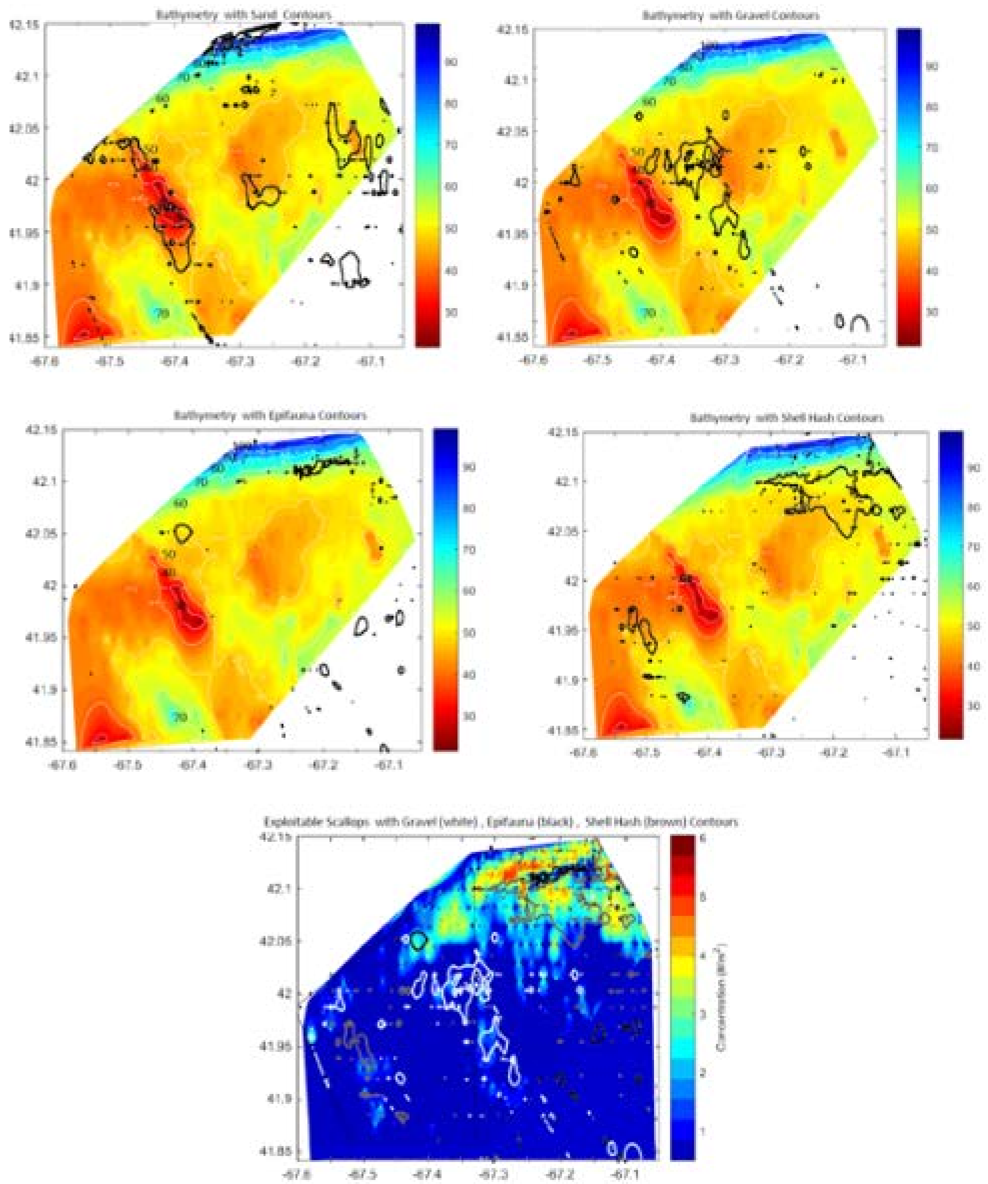
Appendix 1: <u>SASI Area of Coverage</u> - Identification of persistent benthic assemblages in areas with different temperature variability patterns through broad-scale mapping. The Swept Area Seabed Impact (SASI) model utilised combined datasets from broadscale drop camera survey (2003 -2012 on a 5.6 km grid, as well as finer scale surveys on 1 to 4 km grids in certain years) in order to characterize the spatial extent of the scallop fishery in the benthic ecology. Over 90,000km^2 of benthic fauna and seabed substrates were characterized in the process of mapping scallop fishery area of interactions (Source: Bethoney, et. al., 2017).



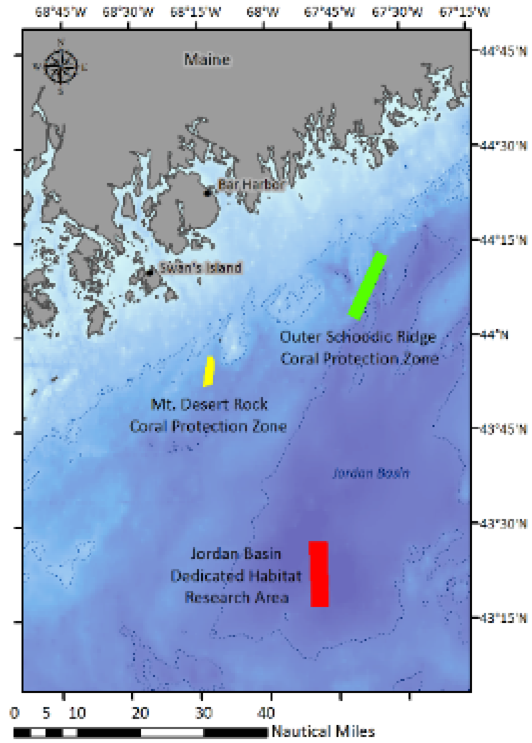
Appendix 2: Bathymetry profile of the 3 sub-regions of operation by the UoA scallop dredge fleet. (Greene, et. al., 2010).



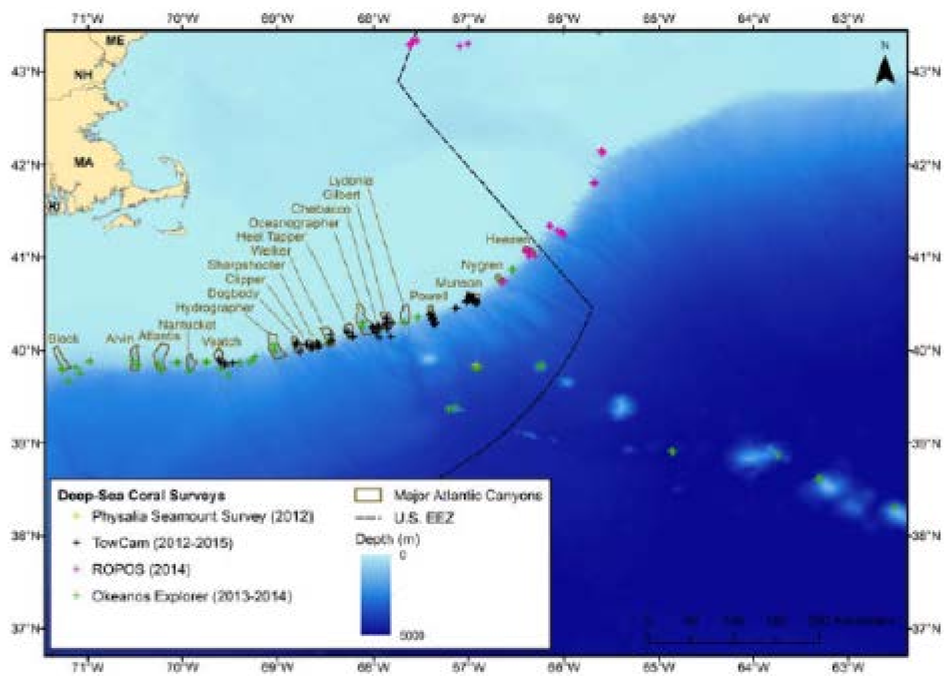
Appendix 3: Seabed sediments and topography profile of the 3 sub-regions of operation by the UoA scallop dredge fleet. (Greene, et. al., 2010).



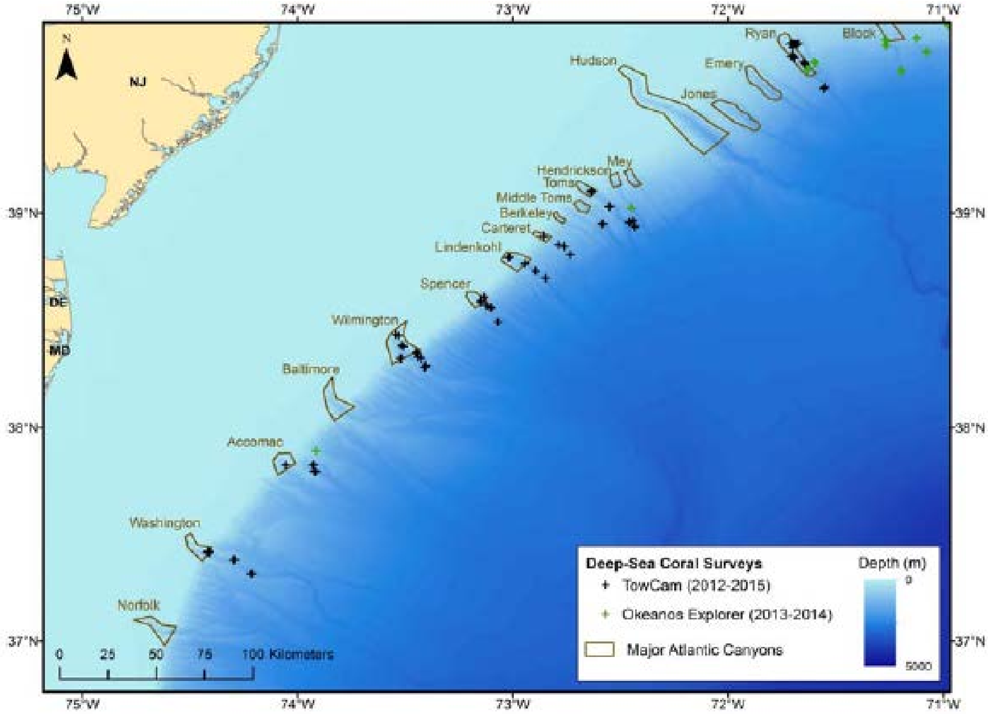
Appendix 4: <u>Bathymetry profile of the Northern Edge of Georges Bank</u>, Habitat Management Areas, including data on densities of scallop, other benthic fauna and sediment types. The dataset provided characterization of depths across the region, to identify benthic specimens' depth preferences (profile), and to demonstrate seabed topographic forms common to the area and likely to interact with the scallop fishery, where they overlap. This data is collected in ongoing research - Impact of Disturbance on Habitat Recovery – by Woods Hole Oceanographic Institution research program (Gallagher, 2016).



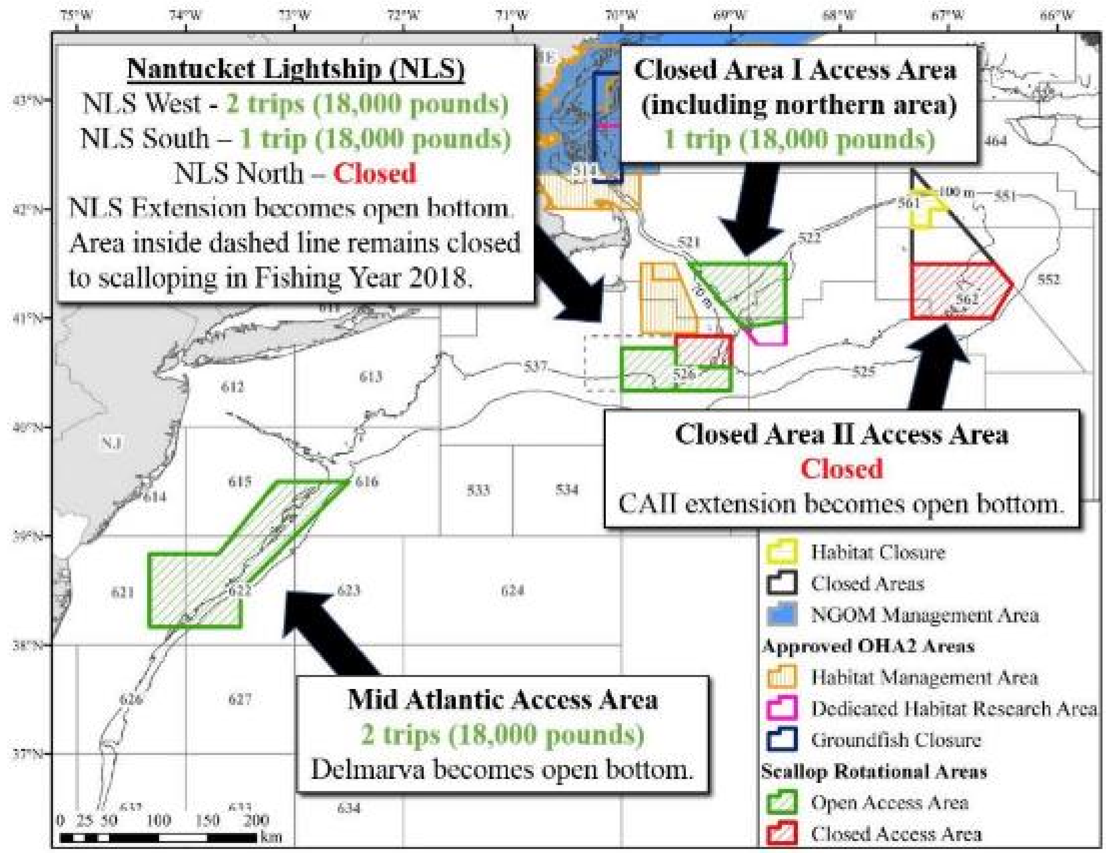
Appendix 5: Indicative mapping of known Coral protection zone in Gulf of Maine (NEFMC 2018e).



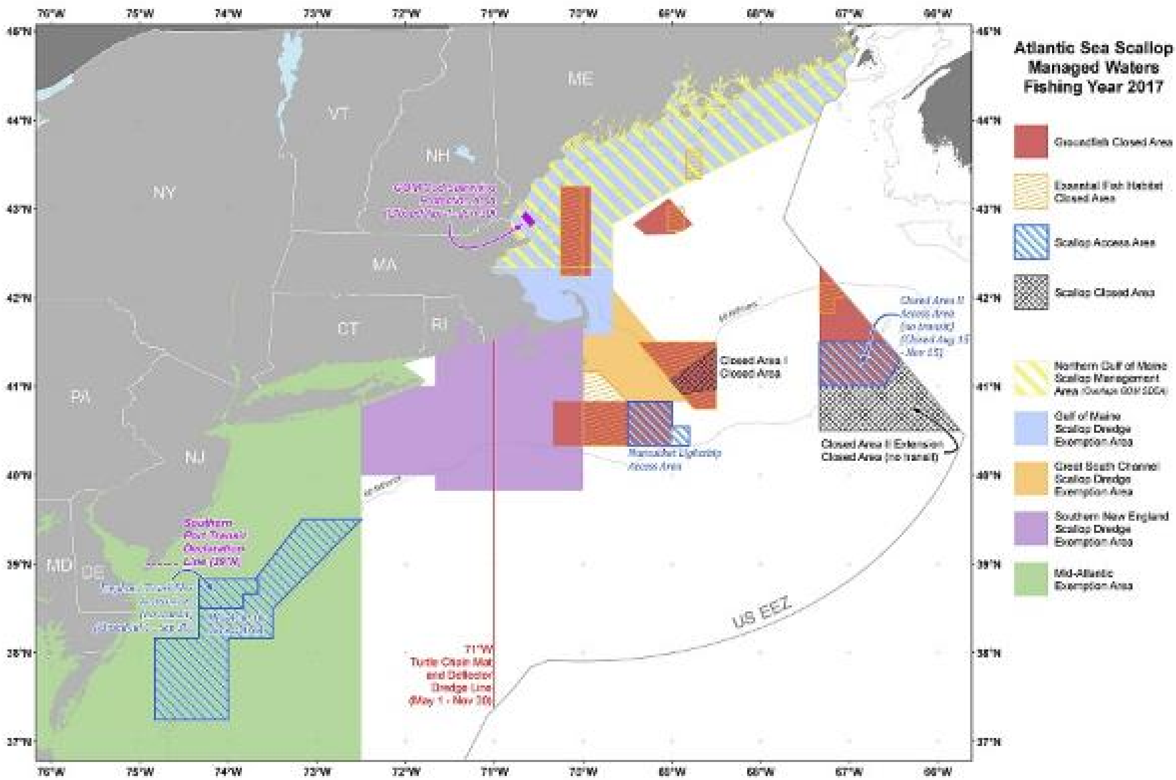
Appendix 6: Indicative mapping of deep sea corals and canyons in the New England sub-region (Hourigan et. al., 2017).



Appendix 7: Indicative mapping of deep sea corals and canyons in the Mid Atlantic sub-region (Hourigan et. al., 2017).



Appendix 8: Management Areas for Scallops Fishery 2018 - Framework 29 with 2018-2019 habitat amendments to access areas and scallop fishing trips. "IMPORTANT: The above 2018 access area trips will be allocated to full-time scallop permit holders only after: (1) NMFS implements the final rule for the habitat amendment; and (2) NMFS approves and implements Scallop Framework 29." (Source: NEFMC Framework 29)



Appendix 9: Management Areas for Scallops Fishery 2017 - as of the publication of this report from NOAA 2017 Atlantic Sea Scallop Managed Waters (Source: https://www.greateratlantic.fisheries.noaa.gov/nr/2017/March/17scafw28lagcphl.html).

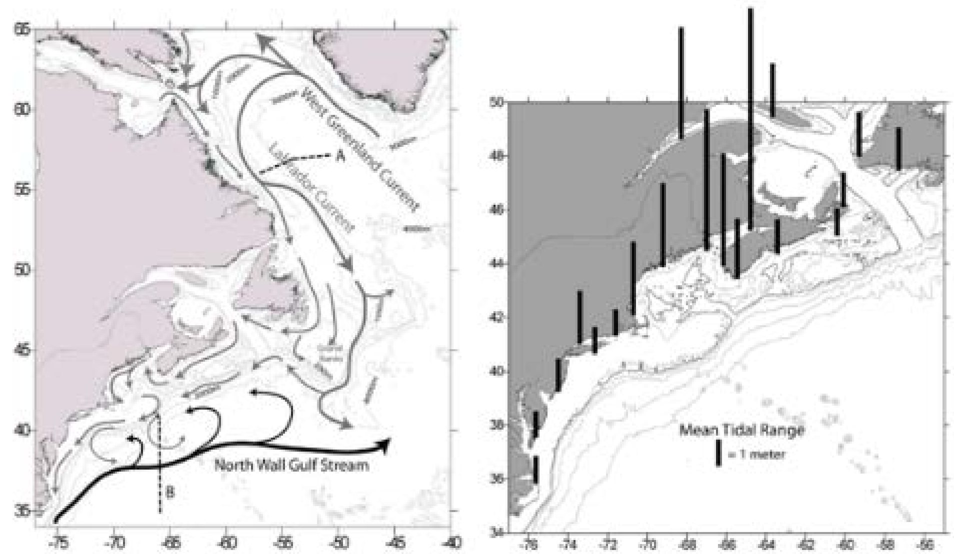
Title 50: Wildlife and Fisheries
PART 648—FISHERIES OF THE NORTHEASTERN UNITED STATES

Subpart D—Management Measures for the Atlantic Sea Scallop Fishery

Contents

SOURCE: 69 FR 35215, June 23, 2004, unless otherwise noted.

https://www.greateratlantic.fisheries.noaa.gov/sustainable/species/scallop/index.html)



Appendix 11: Currents in the Northwest Atlantic ecoregion cold (West Greenland/Labrador) and warm (Gulf Stream) currents mixing (Left) and Mean tidal range in the Northwest Atlantic ecoregion (Greene et. al., 2010).

Appendix 7: Condition Tables and Justifications

Condition 2. PI 2.4.1

<table>
<tr><td rowspan="2">Performance Indicator(s) & Score(s)</td><td>PI</td><td>Insert relevant scoring issue/ scoring guidepost text</td><td>Score</td></tr>
<tr><td>PI 2.4.1</td><td>The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.</td><td>60</td></tr>
<tr><td>Condition</td><td colspan="3">The client is required to present evidence by the fourth annual audit that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.</td></tr>
<tr><td>FA Scoring Rationale</td><td colspan="3">The SG60 scoring issue is met since, although the fishery causes significant alteration of habitat cover/mosaic that causes major change in the structure or diversity of the species assemblages, parts of some scallop grounds are permanently closed to scallop fishing and low habitat impacts have been noted on sand in the mid-Atlantic. The present score of this performance indicator is predicated on closed areas remaining closed. The higher degree of certainty required by the SG80 scoring issue is not met within the current management strategy. This could be met by constraining fishing effort to areas of shallow, unconsolidated coarse sediments that have relatively rapid recovery times. The SASI output needs to be used in concert with statistical approaches to identify clusters of vulnerable grid cells and the ecological interpretation of results and recommendations by the NEFMC Habitat Plan Development Team. The fishery should not access areas of hard substratum (e.g. boulders and cobble), especially those that have been closed and may soon be open for fixed gear fisheries as otherwise these areas will be subject to continuous chronic impacts from dredges.</td></tr>
<tr><td>Milestones</td><td colspan="3">The following milestones will be monitored during each surveillance audit:
1. By the first annual audit the client will provide evidence of representation to the management authority to advocate for further analysis and strategic options regarding the impact of the fishery on marine habitat.
2. By the second annual audit the client will provide evidence of work to document the benthic habitat impact and recovery rates within the area in which the US limited access scallop fishery operates.
3. <s>By the third annual audit the client will present a report of the habitat impacts of the fishery and the management measures being considered to meet the condition.</s> By the third annual audit the client will provide evidence of work to document the fishery’s impact on benthic habitat and recovery rates.
4. <s>By the fourth annual audit the client will provide evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.</s> By the fourth annual audit the client will present a preliminary report on completed and ongoing research related to the effectiveness of current and proposed management measures expected to mitigate any serious or irreversible harm caused by the fishery to habitat structure and function</td></tr>
</table>

	5. By the end of the next certificate cycle the client will provide evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm. Only when the final milestone is complete will the team be able to provide a revised score of 80.
Client action plan	1. By the first annual audit: The client will advocate, by writing to NEFMC and Plan attend/participate in NEFMC meetings, to promote/encourage federal fishery managers to use the Swept Area Seabed Impact model (SASI) to assess fishing effort impact on Essential Fish Habitat (EFH) in the scallop grounds. At the first annual audit the client will provide evidence of this advocacy and the response/action that has been achieved. By the second annual audit: the client will have reviewed the results of the SASI / fishing impact assessment and will have begun to compile a report to document the benthic habitat impact and recovery rates within the area in which the US limited access scallop fishery operates. 2. ~~By the third annual audit the client will provide a complete written report of the SASI fishing impact on EFH assessment. If the EFH assessment concludes the fishery is highly likely to reduce habitat structure and function to a point where there would be serious or irreversible harm, the client will show that management measures are being considered to avoid this.~~ ……. To get back on track the client will provide a preliminary report on completed and ongoing research related to the effectiveness of current and proposed management measures in mitigating any serious or irreversible harm caused by fishery to habitat structure and function 3. ~~By the fourth annual audit: the client will provide written evidence to show that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm based on the expected results of the SASI assessment.~~ By the fourth annual audit the client will present a preliminary report on completed and ongoing research related to the effectiveness of current and proposed management measures expected to mitigate any serious or irreversible harm caused by the fishery to habitat structure and function (if any). Only when the final milestone is complete will the team be able to provide a revised score of 80.
Progress on Condition [Year 1]	This evidence is sufficient to conclude that the client has met the first year milestone of the action plan and is on target to meet this condition by the fourth annual audit as planned. Status of Condition 2: Open – On target.
Progress on Condition [Year 2]	The work that has been conducted to prepare the Essential Fish Habitat Amendment 2 is evidence that the second year milestone has been met. Although the preparation of the Amendment 2 meets the second year milestone, since the Amendment has not been accepted by the federal regulator as yet, the milestones for years 3 and 4 are not yet met. Therefore, the client is on-target to meet the condition within the time frame. No additional scoring is presented. Status of Condition 2: Open – On target.
Progress on Condition [Year 3]	Since the second surveillance, the development of the NEFMC's Habitat Amendment 2 has continued to move forward. In September 2016 the revised version was submitted to NMFS GARFO for approval. The NMFS confirmed its intent to publish the Habitat Amendment proposed rule in 2017, the expected implementation of the Amendment is dependent on the determination made by NFMS. This project has already experienced delays in completing past milestones, due to the additional time required to analyze the alternatives. As an overarching

	framework, the Habitat Amendment 2 does not include specifics for the scallop's fishery access to new areas. Once the Amendment is finalized, the NEFMC will modify the scallop access area boundaries consistent with the Habitat Amendment 2 via a scallop framework adjustment. Given the current timelines for the publication of the Final Rule for the Omnibus Habitat Amendment 2, it's unlikely that the scallop framework adjustment for area specifications will be available by the fourth surveillance, making the closure of this condition unachievable within a certification cycle. Acknowledging, that the timeline and development implementation of the management measures have been outside the control of the fishery, but that progress is being demonstrated in the timelines that may be reasonably expected of a stakeholder inclusive and science-based federal regulatory process, the assessment team considers these to be exceptional circumstances that merit a timeline extension beyond the current certificate cycle. Consequently, the milestones and timelines are modified to meet those of management system. The year two milestone requested evidence of work to document the benthic habitat impact and recovery rates. This milestone was marked as "on target", based on the progress made on Habitat Amendment 2. The current team infers the goal of the year two milestone was to document the additional information to inform the report to meet the year three milestone. As no new information documenting benthic habitat impact and recovery rates was presented in year two, this milestone should have been marked as "behind target" and the fishery alerted of the need for remedial actions. Since the client was not alerted, the team considers it appropriate to have the second annual surveillance milestone repeated on the third surveillance. The 2013 MSC Public Certification Report (PCR) for the Sea Scallops noted that the SASI model is a useful framework, but that there are limitations to the use of the SASI model for determining the impact of the scallop fishery on habitat (For a summary of limitations identified in the 2013 MSC report see ….). Accordingly, the team at that time agreed that in addition to SASI, other sources of information would need to be taken into account for the fishery to achieve the SG80 scoring level and close the condition. During the third surveillance the team received information of several plans expected to improve information and tools available to management, including an update to the northeast SASI model user interface to facilitate use by Council staff. Principally, in 2016 the Woods Hole Oceanographic Institution obtained support from the Sea Scallop Research Set-Aside, to conduct experimental projects in Georges Bank to evaluate the persistence and impacts of scallop dredging on ecosystem and habitat resiliency in different substrate types and at different impact scales. The development of the research project to measure habitat impacts specifically of New Bedford dredges, within the area of the fishery, shows progress towards meeting the second/third annual milestone. However, as no results have been made available, for this reason the team considers that the progress is insufficient to meet the second/third annual milestone.
Progress on Condition [Year 4]	The Client required action to demonstrated compliance and appropriate progress to get back on track with the third surveillance and for the 4th (2018) surveillance audit, is worded that "<u>the client will provide a preliminary report on **completed and ongoing research** related to the effectiveness of current and proposed management measures in mitigating any serious or irreversible harm caused by fishery to habitat structure and function.</u>" In cooperation with scientist Dr. David Rudders (VIMS - Virginia Institute of Marine Science and recipient of 2016 -2017 sea Scallop RSA project funding), the American Scallop Association (ASA)

	provided important information in a number of summarised reports with regards to fishery-relevant research related to habitat impacts funded via this program. The RSA program priorities, are said to remain fairly stable in focus over time, the effect of the scallop dredge on the environment are considered as important area of research for the program. The dredge-benthos interactions are considered broadly, however, as the primary gear in the fishery, the bottom tending scallop dredge and its potential impact transcend a narrow definition. Typically, fishery impacts are understood as interactions that affects habitat function and structure with special consideration to aspects of life history stages of managed species. The fundamental focus and relevance includes the important evaluations and understanding that “the fishery does not cause serious or irreversible harm to habitat structure and function, considered on a bioregional basis.” While this is certainly a reasonable definition, inclusion of the benthic impact as it relates to bycatch (both target and non-target species) could be included when thinking holistically about the benthic ecology and ecosystem encompassed by the spatial extent of the sea scallop fishery. In Surveillance Audit 4 - Appendix 2. Client Progress Summary; the summaries of completed (2013-2016) and on-going (2017- onwards) projects supported by the Sea Scallop RSA program that addressed habitat and ecosystem function/structure priorities, illustrates some historical and ongoing actions by science and industry partnership to better understand, characterize, and measures the impact of the scallop fishery habitat structure and function of the benthic communities, as well as to guide management mitigations. A minimum of 20 relevant projects were conducted during 2013-2016 which included focus to characterise and measure impact of scallop dredge fishing gear on benthic communities – such as; Impact of Disturbance on Habitat Recovery in Habitat Management Areas on George's Bank (2016); and Habitat Characterization and Sea Scallop Resource Enhancement Study in a Proposed Habitat (2015). In addition to important bycatch reduction work – such as; A Modified Flounder Sweep for Flatfish Bycatch Reduction in the LAGC Scallop Fishery (2016); and Determination of the Impacts of Dredge Speed on Bycatch Reduction and Scallop Selectivity weights of NW Atlantic sea scallops via paired field surveys and laboratory experiments (2015). An important observation is that these projects included some areas of work where before and after impacts were recorded and compared; as well as to facilitate preparation of swept area analysis calculations of the scallop fishery in order to inform fishery management measures such Omnibus Habitat Amendment 2 (OHA2) and Framework 29 (closed and access areas approvals in compliance with Magnuson-Stevens Fishery Conservation and Management Act). Significant research continued into 2017 and under the 2018-19 RSA funded program with the priority focus of improving fishery information and appropriate management actions; for instance, research are ongoing to explore; A Modified Foot Sweep for Bycatch Reduction in the Limited Access Scallop Fishery (2017); and An Optical Assessment of Sea Scallop and Predator Abundance and Distribution in the Nantucket Lightship Closed Area and Surrounds in Coordination with the VIMS Dredge Survey (2017). Ongoing projects such as - Impact of Disturbance on Habitat Recovery in Habitat Management Areas on the Northern Edge of Georges Bank, is focused on providing further information which should update the SASI model (used in previous assessment) and facilitate local scale evaluation of scallop fishery impact on any sensitive benthic community. It is identified that segments of these projects utilize optical tools (cameras) and acoustics equipment which record important relative status of benthic communities of the ecoregion and thereby inform management and conservation strategies. Progress was indentified in processes - New England Fishery Management Council's Omnibus Essential Fish Habitat Amendment 2; and Scallop Framework 29 - which are intended to manage

	habitat outcomes and connected particularly, to where *"the client is required to present evidence by the* ***fourth annual audit*** *that the* ***fishery is highly unlikely to reduce habitat structure and function*** *to a point where there would be serious or irreversible harm."* The ASA through active participation such as provisions of RSA funding and research is considered to have contributed important information that was appropriate in aiding the assessment of areas for fishing access approval based on proposed management measures being effective with regards to protection of vulnerable benthic habitat; as well as disapproving access to areas where available information suggest uncertainly of the impact to vulnerable benthic ecology. Availability of the RSA funding supports continuation of research which is intended to provide further transparencies on any likely impact to vulnerable habitat structure and functions, as well as designation measures for their protection. The selection of research project information provided in Appendix 2. Client Progress Summary is considered sufficient that the client has provided a preliminary report on completed and ongoing research related to the effectiveness of current and proposed management measures in mitigating any serious or irreversible harm caused by fishery to habitat structure and function." Status on condition - On –target
Progress on Condition 2 PI 2.4.1 [At Re-assessment]	This condition (PI 2.4.1) requires "*the Client to present evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm*". Essentially, evidence provided shall indicate "*the fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function".* For the Habitats and Ecosystem components*, "the concept of 'serious or irreversible harm' refers to change caused by the fishery that fundamentally alters the capacity of the component to maintain its function or to recover from the impact"* (MSC CR 1.3, section CB3.14). A score (60) was awarded to this PI during the initial assessment on the premise that the fishery causes significant alteration to habitat cover/mosaic, with major change in the structure or diversity of the species assemblages. It recognised that parts of some scallop grounds are permanently closed to scallop fishing and low habitat impacts have been noted on sand in the mid-Atlantic. The score was predicated on closed areas remaining closed. The higher degree of certainty required by the SG80 scoring issue was not met within the then management strategy. This could be met by constraining fishing effort to areas of shallow, unconsolidated coarse sediments that have relatively rapid recovery times. The outcome of this fishery interaction with habitat structure and function on both regional and bioregional scale is linked to the current management measures. In January 2018, Bullard (2018) wrote to the NEFMC to outline approved new management measures of the fishery in the Omnibus Essential Fish Habitat Amendment 2 (OEFHA 2, also recognised in Framework 29). These measures are based on current scientific and industry information; approving fishery operations in areas where it is highly unlikely to cause serious or irreversible harm to habitat structure and function. In addition the approved measures were determined to comply with the Magnuson-Stevens Fishery Conservation and Management Act requirements to identify and describe EFH and to minimize to the extent practicable the adverse effects of fishing on such habitat. The measures approved are understood by the assessment team to reduce the overlap or encounter of the fishery and EFH. For example, approved measures restricted fishing from areas of; essential fish habitat (EFH) designations, the habitat areas of particular concern (HAPC)

designations, the dedicated habitat research areas (DHRA), the groundfish spawning recommended areas, and most of the habitat management area (HMA) recommendations. The framework also included monitoring measures to review effectiveness and compliance with these measures. Areas of Stellwagen Bank and Georges Bank are established has dedicated habitat research areas (DHRA) with plans for 3yearly review.

It is important to note that the fishery is not approved to operate in areas overlapping with;

- All EFH designated areas
- All HAPC designation such as segments of:
  - Northern Edge, Great South Channel, Cashes Ledge, Jeffrey's Ledge, Stellwagen Bank, Eleven canyons or canyon assemblages (Heezan Canyon; Lydonia, Gilbert, and Oceanographer Canyons; Hydrographer Canyon; Veatch Canyon; Alvin and Atlantis Canyons; Hudson Canyon; Toms, Middle Tom, and Hendrickson Canyon; Wilmington Canyon; Baltimore Canyon; Washington Canyon; and Norfolk Canyon), and Two seamounts (Bear and Retriever).
- HMA (which are close to mobile bottom gear) such as areas of:
  - Eastern Maine - closed to mobile bottom-tending gear,
  - Cash Ledge – closed areas for habitat and groundfish - to mobile bottom gear
  - Jeffrey's Ledge – close areas to mobile bottom gear
  - Fippennies Ledge - close areas to mobile bottom gear
  - Western Gulf of Maine

In addition further fishing restrictions were established as a precaution to protect habitat structure and function in areas of Cox Ledge and Eastern Georges Bank, where not enough information was available to evaluate the overlap and impact of the fishery, with regards to reducing habitat impact (Bullard 2018).

A further important point relates to fishing effort monitoring by VMS and the use of cartography tools by skippers to map and target seabed areas of high scallop densities, as well as avoiding benthic areas of known vulnerable benthic ecology (also termed VME). These approaches in combination with reduction in days at sea therefore reduce likely impact to seabed ecology. Over the period of 2016 to 2017 fishing effort has indicated decline in permit areas of the fishery as indicated by the 2017 report from the Scallop Plan Development Team PDT (Galuardi, 2017). Local and situational data, indicates further decline in fishing effort as planned for the 2018 fishing season, for instance, Open Areas Days at Sea (DAS) allocations for full time permit holders reduced from 30.41days in 2017, to 21.75days for 2018. Further evidence is presented in observer report (2015-2017) on incidental bycatch of benthic species (including invertebrates and epifauna) where specimens belonging to Clypeasteroida (sand dollar, 3.85%), Asteroidea (starfish, 1.37%), and Porifera (sponges, 0.002%), all of which are common to resilient benthic communities (benthic fauna) of the ecoregion, and are not currently considered to be at any ecological vulnerability or risk. Bycatch of coral related specimen was 0% (Wigley and Tholke

	2017). This information indicates the outcome of the practical overlap and footprint of the UoA fleet as well as any encounter with VME (vulnerable marine habitats). There are no encounter with VME species (such as corals) and all incidental bycatch species are return to the seabed (in shortest time post-landing), where most are likely to recover from fishing interaction. Recovery of benthic ecology/community as well as their function post-scallop dredging is variable. Though there is evidence of reduced physical heterogeneity (including decreased sand waves, or biogenic features) and abundance of some taxa, there was no loss or change in number of taxa. Some research has demonstrated recovery of benthic fauna on silty-sand sediments within 6months post-dredging unexploited areas at depth of 15m on GOM (Watling et. al. 2001). Furthermore, no evidence of scallop dredge impact was apparent 1 year after a pre-dredge and post-dredge survey at 3 sites on sand sediments (depth of 45-88m) in the Hudson Canyon of Mid-Atlantic (Sullivan et. al., 2003). Also in similar benthic ecology of the Georges Bank which was closed to bottom fishing, recovery of epibenthic communities including complex structural species aggregations was estimated to be evident within 10 years (Collie et. al., 2005). Rotational closed and access area fished by the UoA fleet are subjected to similar duration of restrictions, therefore facilitating 6mth-10year recovery periods for some areas that were initially fished to recover before they are fished again. However in practice target areas of high scallop densities are mostly fished, therefore some areas will be repeatedly fished, while other areas will never be targeted and fished. This limits the impact of the gear to particular lanes, while creating benthic unfished patches or islands of greater diversity amongst even the more heavily fished areas. Such islands support recovery of benthic community in fished areas through neighbouring emigration and by acting as source locations for new recruits to other areas. This is important because such benthic ecology/habitats are key to the life history processes (breeding, nursery and feeding areas) for a wide range of species, including commercially important fish and shellfish. In summary, the new approved management measures in Omnibus Essential Fish Habitat Amendment 2/Framework 29 functions to constrain the fishery away from closed areas and areas of EFH (reducing fishery overlap or encounter with EFH) as well as seabed habitat that are considered sensitive or vulnerable to scallop dredge impact. Closed areas are maintained closed, excepted where current scientific information facilitated access changes to Nantucket Lightship area. Recovery of benthic habitat post-dredge is known to be >10years. Using instrument such as the RSA program, there are ongoing scientific and industry research related to the effectiveness of current and proposed management measures in mitigating any serious or irreversible harm caused by fishery to habitat structure and function. Though benthic species abundance changes are recognised, there are no known species lost. No sensitive or vulnerable benthic species were indentified in the invertebrate bycatch data. These information represent the higher degree of certainty that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm. SG 80 is met and the condition is closed.
Status of condition	Closed

Condition 3. PI 2.4.2

<table>
<tr><th></th><th>PI</th><th>Insert relevant scoring issue/ scoring guidepost text</th><th>Score</th></tr>
<tr><td>Performance Indicator(s) & Score(s)</td><td>PI 2.4.2</td><td>There is a partial strategy in place that is expected to achieve the Habitat Outcome 80 level of performance of PI 2.4.1.
There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or habitats involved.
There is some evidence that the partial strategy is being implemented successfully.</td><td>70</td></tr>
<tr><td>Condition</td><td colspan="3">The client is required to demonstrate by the fourth annual audit that:
There is a partial strategy in place that is expected to achieve the Habitat Outcome 80 level of performance of PI 2.4.1.
There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or habitats involved.
There is some evidence that the partial strategy is being implemented successfully.</td></tr>
<tr><td>FA Scoring Rationale</td><td colspan="3">The fishery meets SG60 since there are measures in place that prevent habitat damage to scallop grounds in closed areas in the north-eastern part of the fishery and it is likely that such measures would work throughout the biogeographic regions of the fishery, meeting the second SG80 scoring issue.

There is evidence that the measures are being implemented successfully in the Georges Bank and Gulf of Maine permanent closures, and this therefore comprises a partial strategy, meeting the third SG80 scoring issue.

However, the first and second SG80 scoring issues are not met since without expansion of the strategy to other areas, the partial strategy is not expected to achieve the SG80 level of the Habitat Outcome PI 2.4.1 and the fishery remains likely to reduce habitat structure and function to a point where there would be serious or irreversible harm</td></tr>
<tr><td>Milestones</td><td colspan="3">The following milestones will be monitored during each surveillance audit:
By the first annual audit the client will provide evidence of their representation to the management authority to advocate for further analysis and strategic options regarding the impact of the fishery on marine habitat.
By the second annual audit the client will provide evidence of work to document the benthic habitat impact and recovery rates within the area in which the US limited access scallop fishery operates.
<s>By the third annual audit the client will present a report of the habitat impacts of the fishery and the management measures being considered to meet the condition.</s> By the third annual audit the client will provide evidence of work to document the fishery’s impact on benthic habitat and recovery.</td></tr>
</table>

	4. By the fourth annual audit, the client will demonstrate that: a. There is a partial strategy in place that is expected to achieve the Habitat Outcome 80 level of performance of PI 2.4.1. b. There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or habitats involved. c. There is some evidence that the partial strategy is being implemented successfully. 5. By the fourth annual audit the client will present a preliminary report on completed and ongoing research related to the effectiveness of current and proposed management measures in mitigating any serious or irreversible harm caused by fishery to habitat structure and function. 6. By the end of the next certificate cycle the client will provide evidence that: a. There is a partial strategy **in place** that is expected to achieve the Habitat Outcome 80 level of performance of PI 2.4.1. b. There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or habitats involved. c. There is some evidence that the partial strategy is being implemented successfully. Only when the final milestone is complete will the team be able to provide a revised score of 80.
Client action plan	1. By the first annual audit the client will advocate, by writing to NEFMC and attend/participate in NEFMC meetings, to promote/encourage federal fishery managers to use the Swept Area Seabed Impact model (SASI) to assess fishing effort impact on Essential Fish Habitat (EFH) in the scallop grounds. At the first annual audit the client will provide evidence of this advocacy and the response/action that has been achieved. 2. By the second annual audit the client will have reviewed the results of the SASI fishing impact assessment and will have begun to compile a report to document the benthic habitat impact and recovery rates within the area in which the US limited access scallop fishery operates. 3. By the third annual audit the client will provide a complete written report of the SASI fishing impact on EFH assessment. If the EFH assessment concludes the fishery is highly likely to reduce habitat structure and function to a point where there would be serious or irreversible harm, the client will show that management measures are being considered to avoid this. By the third annual audit the client will advocate/support government efforts to conduct analysis and research to document the benthic habitat impact and recovery rates for this fishery. To get back on track the client will provide evidence of its advocacy

	and support of government efforts to conduct analysis and research to document the benthic habitat impact and recovery rates for this fishery. 4. By the fourth annual audit the client will provide written evidence to show: a. There is a partial strategy in place that is expected to achieve the Habitat Outcome 80 level of performance of PI 2.4.1. b. There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or habitats involved. c. There is some evidence that the partial strategy is being implemented successfully. d. By the fourth annual audit the client will produce a preliminary report on completed and ongoing research related to the effectiveness of current and proposed management measures in mitigating serious or irreversible harm to habitat structure and function.
Progress on Condition [Year 1]	The client provided a List of Activities during 2014 (See Section 13) that included attendance of meetings of the NEFMC Habitat Committee where this topic would have been discussed. New England Council was able to confirm considerable involvement of the industry including members of the ASA in the many meetings leading to the development of the Omnibus Essential Fish Habitat Amendment 2, currently in draft. Also, The New England Council was able to confirm that the SASI model has been adopted as the tool being used to assess fishery impacts. This evidence is sufficient to conclude that the client has met the first year milestone of the action plan and is on target to meet this condition by the fourth annual audit as planned. Status of Condition 3: Open – On target.
Progress on Condition [Year 2]	The work that has been conducted to prepare the Essential Fish Habitat Amendment 2 is evidence that the second year milestone has been met. Although the preparation of the Amendment 2 meets the second year milestone, since the Amendment has not been accepted by the federal regulator as yet, the milestones for years 3 and 4 are not yet met. Therefore, the client is on-target to meet the condition within the time frame. No additional scoring is presented. Status of Condition 3: Open – On target.
Progress on Condition [Year 3]	See Progress on Condition #2 for Year 3
Progress on Condition [Year 4]	The management focus and measures of progress of this condition is that – "<u>by the fourth annual audit the client will produce a preliminary report on completed and ongoing research related to the effectiveness of current and proposed management measures in mitigating serious or irreversible harm to habitat structure and function".</u> Relevant information provided on the progress of Condition #2, year 4; is applicable to this condition. In addition; during the site visit the client provided the assessment team with a copy of letter dated – 12th January 2018 – and addressed to the NEFMC, with a request for support with regards to prioritizing research and analysis of benthic habitat impacts and recovery rates of ecosystem structure in the scallop fishery, as well as to update the SASI model from 2011

	information in order to facilitate a more representative and local scale measures of the impact of the scallop fishery on benthic communities. Habitat management measures approved and disapproved with regards to scallop dredge and mobile bottom fishing as documented in the New England Fishery Management Council's Omnibus Essential Fish Habitat Amendment 2; and Scallop Framework 29, are applicable to 10yearly and annual reviews; as well as during any stages where appropriate information confirms other more effective management approaches. Furthermore, according to information provided in Surveillance Audit 4 - Appendix 2. Client Progress Summary including Framework 29 information; it is identified that past as well as ongoing research facilitated by the RSA program is being fundamental to management approvals in the fishery. For instance, management changes in the 2018 fishing season were approved based on the detail level of research evidence that these planned approved changes are considered to be consistent with complying with the Magnuson-Stevens Fishery Conservation and Management Act requirements - to identify and describe EFH, as well as to minimize to the extent practicable the adverse effects of fishing on such habitat, and include updates to areas relevant to UoC such as: 1. The essential fish habitat (EFH) designations, 2. The habitat areas of particular concern (HAPC) designations, 3. The dedicated habitat research areas (DHRA), 4. The groundfish spawning recommendations, 5. The framework and monitoring measures, and 6. Various other habitat management area (HMA) recommendations In summary (and according to NMFS), changes approved by the Amendment's focused on minimizing the total area closed to fishing, while maximizing the amount of vulnerable habitat protected, sought in part to provide more habitat for juvenile groundfish and enhance the productivity of groundfish resources. In addition the framework adjustment and monitoring measures will be subjected to 10-year review requirement; and modifications to habitat management areas that are appropriate. Also flat fish accountability measures are being reviewed and updated within the conservation strategies of the fishery management plans. Together, the above information demonstrates that the client (through science partnerships) is showing active participation in ongoing research related to the effectiveness of current and proposed management measures in mitigating serious or irreversible harm to habitat structure and function". Status on condition - On –target
Progress on Condition 3 PI 2.4.2 [At Re-assessment]	• This condition requires evidence that "there is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types". For instance; There is evidence that the measures are being implemented successfully in the Georges Bank and Gulf of Maine permanent closures, and this therefore comprises a partial strategy, meeting the third SG80 scoring issue. Fundamentally, evidence in the fishery shall indicate that:

	1. There is a partial strategy **in place** that is expected to achieve the Habitat Outcome 80 level of performance of PI 2.4.1. 2. There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or habitats involved. 3. There is some evidence that the partial strategy is being implemented successfully. Habitat management measures approved (and outline) in the Omnibus Essential Fish Habitat Amendment 2 (Framework 29) represent a partial strategy which the NEFMC implements in cooperation with fishers and NOAA to restricted fishing from areas of; all essential fish habitat (EFH) designations, all the habitat areas of particular concern (HAPC) designations, the dedicated habitat research areas (DHRA), the groundfish spawning recommendations, and most of the habitat management area (HMA) recommendations. The framework also included monitoring measures to review effectiveness and compliance with these measures. Areas of Stellwagen Bank and Georges Bank are established has DHRA with plans for 3yearly review. All framework adjustment and monitoring measures are subjected to 10-yearly review in order to facilitate further appropriate modifications to habitat management areas (Bullard 2018). These approved measures were determined to comply with the Magnuson-Stevens Fishery Conservation and Management Act requirements to identify and describe EFH and to minimize to the extent practicable the adverse effects of fishing on such habitat, therefore also expected to achieve the Habitat Outcome 80 level of performance of PI 2.4.1. There is objective evidence that the partial management strategy is working and implemented successfully in the fishery. VMS monitoring (regional and bioregional scale) of the UoA fleet is mandatory and no systemic management non-compliance is reported to indicate fishers operate in areas overlapping closed or EFH areas. Fishing restrictions (closed area to mobile bottom gear) are implemented for all EFH and HAPC, as well as some HMA including closed areas of the Georges Bank and Gulf of Maine. The objective nature of this approach in the Omnibus Essential Fish Habitat Amendment 2 (Framework 29) is identified in the framework monitoring measures by way of 3yearly and 10yearly review of effectiveness and compliance with these measures (with modifications where appropriate). Management measures are only approved and implemented where the measures is supported by sufficient information. For example, the Omnibus EFH Amendment 2 disapproved access to fishing in Cox Ledge and Eastern Georges Bank on the basis of insufficient information quantifying impact on habitat (Bullard 2018). Furthermore, the ongoing independent at-sea observer program is a mandatory management measures which included reporting of any non-compliance with fishing in areas designated as closed or EFH. There were no reported systemic non-compliance with fishing effort (days at sea) measures and rotational access and closed area options. Common benthic areas fished by the UoA fleet illustrate relatively low sensitivity (high resilience) to disturbance (natural and fishing). Information on benthic habitat including likely levels of natural perturbation is known through ongoing scientific research (RSA; National Seabed monitoring; and Northwest Atlantic Marine Ecoregional Assessment) in the bioregion (Wigley and Tholke 2017; Greene et. al. 2010). It is important to note that the MSA, primarily via the EFH requirements, lays out a strategic arrangement for habitat impacts to be evaluated relative to prioritized habitats (EFH) and managed actions (Scallop FMP) to be considered with the objective of minimizing adverse impacts. Such a cohesive arrangement is considered to meet the MSC requirements for a ‘effective management strategy’.

	In summary, the new approved management measures of the Omnibus Essential Fish Habitat Amendment 2 (Framework 29) represent a partial strategy restricting bottom mobile gear fishing in Georges Bank and Gulf of Maine permanent closures, as well as all EFH and HAPC. There is objective basis of monitoring effectiveness of approved management measures through compliance with mandatory VMS, and independent observer program. The ongoing scientific research on seabed habitat (including before and after scallop dredge, projects) also provides evidence for 3yearly and 10yearly review of management effectiveness, as well as appropriate modifications. These approved measures comply with the Magnuson-Stevens Fishery Conservation and Management Act requirements to identify and describe EFH and to minimize to the extent practicable the adverse effects of fishing on such habitat, therefore also facilitating achievement of the Habitat Outcome 80 level of performance of PI 2.4.1. SG 90 is met and the condition is closed.
Status of condition	Closed

Condition 4. PI 2.5.1

	PI	Insert relevant scoring issue/ scoring guidepost text	Score
Performance Indicator(s) & Score(s)	**PI 2.5.1**	The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	**60**
Condition	The client is required to present evidence by the fourth annual audit that **the fishery is highly unlikely to disrupt benthic communities structure and function** to a point where there would be a serious or irreversible harm.		
FA Scoring Rationale	The US Atlantic scallop fishery is known to have widespread impacts on geological and biological components of the ecosystem, with recovery rates for some key features of ecological importance known to be very slow. The fishery meets the scoring guidepost 60 since there is evidence for ecosystem recovery in a permanently closed area on Georges Bank. The fishery, as it is currently conducted, does not meet the higher degree of certainty required for the SG80 scoring issue.		
Milestones	The following milestones will be monitored during each surveillance audit: 1. By the first annual audit the client will provide evidence of their representation to the management authority to advocate for further analysis and strategic options regarding the impact of the fishery on marine habitat. 2. By the second annual audit the client will provide evidence of work to document the benthic habitat impact and recovery rates within the area in which the US limited access scallop fishery operates. 3. By the third annual audit the client uses the above information to evaluate the likely impacts of scallop dredge fishing on these key elements of the ecosystem. If unacceptable impacts are identified, by the fourth annual audit, the client implements new management strategies and measures to detect and manage ecosystem impacts of the fishery ensuring key elements are protected. By the third annual audit the client will provide evidence of work to document the impacts of the fishery on ecosystem structure and function, including benthic communities. 4. By the fourth annual audit the client will present a preliminary report on completed and ongoing research related to impacts of the fishery on ecosystem structure and function, including benthic communities. 5. If necessary, by the end of the next certificate cycle, the fishery will provide evidence of successful implementation of measures to management measures to ensure the fisher is highly unlikely to disrupt key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. • The above provides incremental steps in achieving the condition. Only when the final step is complete will the team be able to provide a revised score. • By the second annual audit at reassessment the required minimum score is 80.		
Client action plan	1. By the first annual audit the client will advocate, by writing to NEFMC and attend/participate in NEFMC meetings, to promote/encourage federal fishery managers to use the Swept Area Seabed Impact model (SASI) to assess fishing effort impact on Essential Fish Habitat (EFH) in the scallop grounds. At the first annual		

	audit the client will provide evidence of this advocacy and the response/action that has been achieved. 2. By the second annual audit the client will have reviewed the results of the SASI fishing impact assessment and will have begun to compile a report to document the benthic habitat impact and recovery rates within the area in which the US limited access scallop fishery operates. 3. By the third annual audit the client will provide a complete written report of the SASI fishing impact on EFH assessment. If the EFH assessment concludes the fishery is highly likely to reduce benthic communities' structure and function to a point where there would be serious or irreversible harm, the client will show that management measures are being considered to avoid this. By the third annual audit the client will advocate/support government efforts to conduct research to document the fishery's impacts on ecosystem structure, including benthic communities. Remedial actions to be undertaken this year may include: advocating supporting continuation of research. To get back on track the client will provide publicly available outputs of the work documenting impacts of the fishery on ecosystem structure and function, including benthic communities. 6. By the fourth annual audit the client will provide written evidence to show that the fishery is highly unlikely to reduce benthic communities' structure and function to a point where there would be serious or irreversible harm based on the expected results of the SASI assessment. By the fourth annual audit the client will continue, as necessary, to advocate and support government efforts to ensure continuation of necessary work to document impacts of fishery on ecosystem structure. The client will present a preliminary report on publicly available completed and ongoing research related to the fishery's impact on ecosystem structure and function, including benthic communities. •
Progress on Condition [Year 1]	The client provided a List of Activities during 2014 (See Section 13) that included attendance of meetings of the NEFMC Habitat Committee where this topic would have been discussed. New England Council was able to confirm considerable involvement of the industry including members of the ASA in the many meetings leading to the development of the Omnibus Essential Fish Habitat Amendment 2, currently in draft. Also, The New England Council was able to confirm that the SASI model has been adopted as the tool being used to assess fishery impacts. This evidence is sufficient to conclude that the client has met the first year milestone of the action plan and is on target to meet this condition by the fourth annual audit as planned. Status of Condition 4: Open – On target.
Progress on Condition [Year 2]	The work that has been conducted to prepare the Essential Fish Habitat Amendment 2 is evidence that the second year milestone has been met. Although the preparation of the Amendment 2 meets the second year milestone, since the Amendment has not been accepted by the federal regulator as yet, the milestones for years 3 and 4 are not yet met. Therefore, the client is on-target to meet the condition within the time frame. No additional scoring is presented. Status of Condition 4: Open – On target.
Progress on Condition [Year 3]	Most of the progress on Condition #2 for Year 3 is applicable to this Condition and will not be repeated in this section.

	However, the team would like to make the distinction that this Principal Indicator considers "[…] the broad ecological community and ecosystem in which the fishery operates. The Ecosystem component does not repeat the status assessment of the other components individually but rather considers the wider system structure and function [...] The Ecosystem component addresses system-wide issues, primarily impacted indirectly by the fishery, including ecosystem structure, trophic relationships and biodiversity." (MSC CR v2.0 GSA3.16). • Between the evaluation of the impacts of the fishery the Habitat Component (PI 2.4.X), already addressed the fisheries impacts on most of the ecosystem components, including physical habitat structure and considerations for essential fish habitat. However, there is limited information on the impact of the fishery on benthic communities, which is not incorporated into the 2011 SASI model. Thus the expected progress for this condition is closely related to that of conditions #2 and #3, with the additional considerations to benthic communities. According to the Client Action Plan, by the third annual audit the client was expected to present a "[…] written report of the SASI fishing impact on EFH assessment. If the EFH assessment concludes the fishery is highly likely to reduce benthic communities' structure and function to a point where there would be serious or irreversible harm, the client will show that management measures are being considered to avoid this." It's the understanding of the assessment team that there is currently not enough information on impacts of fishing on benthic communities, to enable an accurate assessment of the impact of scallop dredges on the recovery of benthic communities, thus there is not sufficient information to determine that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
Progress on Condition [Year 4]	The information outcome focus and measures of progress of this condition is that – "by the fourth annual audit the client will continue, as necessary, to advocate and support government efforts to ensure continuation of necessary work to document impacts of fishery on ecosystem structure. The client will present a preliminary report on publicly available completed and ongoing research related to the fishery's impact on ecosystem structure and function, including benthic communities". Evidence provided to the assessment team during the site visit can be found in the details of Surveillance Audit 4 - Appendix 2. Client Progress Summary and Surveillance audit information, which included the Client letter to the NEFMC (dated 12th January 2018). Important information on the measures of impact from the scallop fishery is generated from research such as - Improving an Ecosystem Friendly Scallop Dredge (2015); and A Modified Foot Sweep for Bycatch Reduction in the Limited Access Scallop Fishery (2017); as well as Impact of Disturbance on Habitat Recovery in Habitat Management Areas on the Northern Edge of Georges Bank Ongoing research, which is being used to updated the SASI model. Overall, the information from these projects represents a broad effort to protect critical habitat throughout portions of the spatial extent of the sea scallop fishery. In addition, some of the base data used to populate the SASI model, came in part from efforts supported by the sea scallop RSA program. Subsequent information gathering efforts to improve the SASI model are currently underway and this evolution is reflected via regionally supported through engagement with one of the model developers (Dr. Brad Harris. Alaska Pacific University). This effort will

	leverage refinements to the model as extended in an application to the North Pacific marine bioregion. These refinements will be applied to the Northeast region in an attempt to further the understanding of the processes involved and facilitate the development of an improved tool to aid in providing management advice related to habitat protection (B. Harris, personal communication). In addition to broad efforts within the Habitat Plan to facilitate protection of ecosystem structure and function including benthic communities, there are numerous strategies found in the scallop plan to provide additional protections. Many of these efforts are explicit strategies to mitigate an impact on the resource, habitat or non-scallop species. The empirical basis to support many of these approaches comes directly from research undertaken via the scallop RSA. Broad areas already described above relate specifically to ecosystem, habitat and bycatch, as well as the sea scallop resource itself. Though the SASI model is still being updated, the available information on the fishery interaction with ecosystem elements of the ecoregion is provided by complimentary research, and indicates that fishery specific information is sufficient to measures and mange the fishery according the Magnuson-Stevens Fishery Conservation and Management Act. The National Observer benthic specimens' bycatch discarded data by Wigley and Tholke (2017) indicated insignificant/negligible bycatch of vulnerable benthic species such as corals or sponges, which is an indication of the insignificant/negligible footprint of the fishery overlap with aggregations of vulnerable marine ecosystem (VME) and benthic ecosystem. The outcome measures – protection to VME and benthic ecosystem – can be indentified to being delivered through the approval and disapproved measures of the New England Fishery Management Council's Omnibus Essential Fish Habitat Amendment 2. In this document, scallop dredge was disapproved access to fishing areas identified with limited information measuring the impact of the fishery on VME, and inadvertently connected to restrictions on fishing in areas where there might be significant footprint overlap with vulnerable benthic specimens. Therefore reducing and avoiding situations where "**the fishery is highly unlikely to disrupt benthic communities' structure and function** to a point where there would be a serious or irreversible harm". In addition according to (Hourigan et. al. 2017) "*steps taken by the Mid-Atlantic Fishery Management Councils have significantly increased (by over 99,000 km2 (~38,000 square miles) the area of protected deep-sea coral and sponge habitats, reducing the threat from bottom-fishing impacts to the most important areas"*. Evaluation based on an ecoregional scale, indicates perceived threats to vulnerable benthic communities has improved over the period of 2007 to 2017 for the NorthEastern US marine areas, from high to medium with regards interactions with mobile bottom fishing gear (which includes scallop dredges). Together, the above information demonstrates that the client (through science partnerships and communication with fishery management council) other relevant research is showing active participation in ongoing evaluations related to the fishery's impact on ecosystem structure and function, including benthic communities". Status on condition - On –target
Progress on Condition 4 PI 2.5.1 [At Re-assessment]	Evidence in the Client fishery is required to demonstrate that: • "The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm".

	• "the fishery is highly unlikely to disrupt benthic communities' structure and function to a point where there would be a serious or irreversible harm". • "successfully implemented management measures ensure the fisher is highly unlikely to disrupt key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm". We are reminded that, for the Habitats and Ecosystem components, *"the concept of 'serious or irreversible harm' refers to change caused by the fishery that fundamentally alters the capacity of the component to maintain its function or to recover from the impact"* (MSC CR 1.3, CB3.14). The score (60) awarded during the initial assessment was based on the need of evidence for ecosystem recovery in a permanently closed area on Georges Bank. At that period, the fishery, was considered to be conducted in areas which, does not meet the higher degree of certainty required for the SG80 scoring issue. In January 2018, a number of management measures were approved in the New England Fishery Management Council's Omnibus Essential Fish Habitat Amendment 2 (Framework 29). These measures restricted fishing with mobile bottom gear in all closed areas; and were determined to comply with the Magnuson-Stevens Fishery Conservation and Management Act requirements to identify and describe EFH and to minimize to the extent practicable the adverse effects of fishing on such habitat (including benthic ecosystem). Among these approved measures are restriction to the use of mobile bottom gear in closed areas of the Georges Bank and Gulf of Maine, as well as all areas designated as EFH and HAPC. In addition closed area restrictions were approved for a number of HMA and DHRA. In particularly, these measures are approved on the basis of ongoing monitoring (3yearly and 10yearly) of effectiveness to achieve the conservation objectives - Magnuson-Stevens Fishery Conservation and Management Act. Areas of the Cox Ledge and Eastern Georges Bank were also approved to remain closed to mobile bottom gear on the basis of insufficient information to evaluate impact on benthic ecology (Bullard 2018). These approved management measures are implement for conservation of the benthic ecology (ecosystem) of areas of the Georges Bank and all EFH, to ensure (based on current information) the fishery is highly unlikely to disrupt key elements underlying ecosystem structure and function to a point where there would be serious or irreversible harm. Scallops are the dominant component of both retained as well as discarded bycatch. Incidental bycatch also included; smaller sized scallops, sand dollar, starfish, skates, monkfish, and negligible levels of yellowtail flounder. These are considered the key elements of the ecosystem interacting with the UoA fishery. These species are not known to be prey to any key species or dependent link in the food web or trophic (energy) relationships of the ecoregion, therefore the fishery is unlikely to disrupt ecosystem regimes is this part (Wigley and Tholke, 2017). The vulnerability of benthic habitat communities (sand/gravel/cobble and structure forming epifauna) with regards to natural disturbance as well as from fishing interaction are known (Greene et. al. 2010; Collie et. al. 2005; Gallagher and Purcell 2017). No interaction with species recorded under the ESA, MMPA, or VME was identified in SBRM and observer reports of the fishery (Wigley and Tholke, 2017). The fishery is indentified with low levels of incidental bycatch of invertebrates and epifauna specimens, this evidence the relatively low ecosystem footprint of the fishery across the ecosystem of the bioregion.

	In addition recovery from direct or indirect interaction with benthic communities is known. Some research has demonstrated recovery of benthic fauna/communities on silty-sand sediments within 6months post-dredging unexploited areas at depth of 15m on GOM (Watling et. al. 2001). Also in similar benthic ecology of the Georges Bank which was closed to bottom fishing, recovery of epibenthic communities including complex structural species aggregations was estimated to be evident within 10 years (Collie et. al. 2005). Rotational closed and access area fished by the UoA fleet are subjected to similar duration of restrictions, therefore facilitating 6mth-10year recovery periods for some areas that were initially fished to recover before they are fished again. However in practice target areas of high scallop densities are mostly fished, therefore some areas will be repeatedly fished, while other areas will never be targeted and fished. This limits the impact of the gear to particular lanes, while creating benthic unfished communities, patches, islands or sub-ecosystem clusters of greater diversity amongst even the more heavily fished areas. Such islands (sub-ecosystem clusters) support recovery of benthic community in fished areas through neighbouring emigration and by acting as source locations for new recruits to other areas. This is important because such benthic ecology/habitats are key to the life history processes (breeding, nursery and feeding areas) for a wide range of species, including commercially important fish and shellfish. The UoA scallop fishery area of operation is within the US Large Marine Ecosystem (LME), with inherent ecosystem-based management approaches of the wider as well as key ecosystem elements for appropriate holistic environment and economic outcomes (Bethoney et. al. 2017). In summary, the key ecosystem elements of the fishery are known and are dominated by scallop retained and discarded bycatch. Recovery of benthic ecology is known across various ecosystem sediment types. No interaction with species that are key links to a trophic relationship, or species under ESA, MMPA, or VME is reported. The approved measures of Omnibus Essential Fish Habitat Amendment 2 (Framework 29) facilitate protection to ecosystem and all EFH and HAPC through closed area restriction to mobile bottom gear and comply with the Magnuson-Stevens Fishery Conservation and Management Act requirements to identify and describe EFH and to minimize to the extent practicable the adverse effects of fishing on such habitat (including benthic ecosystem). These approved management measures are implement for areas of the Georges Bank and all EFH and HAPC, and are understood by the assessment team to ensure the fishery is highly unlikely to disrupt key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. SG 80 is met and the condition is closed.
Status of condition	closed