

The University of Maine

DigitalCommons@UMaine

Documents from Environmental Organizations

Maine Environmental Collection

2019

GMRI Winter Skate Report Final June 18 2018

Gulf of Maine Research Institute

Follow this and additional works at: https://digitalcommons.library.umaine.edu/maine_env_organizations

Repository Citation

Research Institute, Gulf of Maine, "GMRI Winter Skate Report Final June 18 2018" (2019). *Documents from Environmental Organizations*. 169.

https://digitalcommons.library.umaine.edu/maine_env_organizations/169

This Other is brought to you for free and open access by DigitalCommons@UMaine. It has been accepted for inclusion in Documents from Environmental Organizations by an authorized administrator of DigitalCommons@UMaine. For more information, please contact um.library.technical.services@maine.edu.



Science. Education. Community.

Gulf of Maine Responsibly Harvested Verification Report

Winter Skate *(Leucoraja ocellata)*

- ☒ The fishery is managed by a competent authority and has a management plan in place that incorporates a science-based approach to ensure sustainability.
 - *Winter skate is managed by NMFS and the NEFMC under the Northeast Skate Complex Fishery Management Plan. This plan manages fisheries harvesting seven different species of skate, and utilizes the best available science to set biological reference points and harvest restrictions.*

- ☒ If stock sizes are below management target levels, whether due to natural or man-made causes, management plans are established that enable rebuilding within a specified timeframe.
 - *Winter skate is not below management targets. As of 2016, winter skate is not overfished and overfishing is not occurring.*

- ☒ Sufficient data exists to determine harvest levels.
 - *The last benchmark stock assessment to determine biological reference points was the 2008 Data Poor Working Group report, and the most recent assessment was in 2016, using data poor techniques. The Council sets harvest levels for the wing and bait fisheries based on the assessments, which rely on survey data.*

- ☒ Monitoring and compliance measures are in place to ensure acceptable harvest levels.
 - *Winter skate harvest is monitored through vessel trip reports (VTRs), observers, and dealer reports. Compliance is assessed through consistency throughout these reports as well as enforcement in the field.*

- ☒ Enforcement exists to ensure that harvesters follow regulations, and to prevent illegal practices and unreported harvest.
 - *U.S. Coast Guard, NMFS Office of Law Enforcement agents, and state marine patrol agents enforce the laws and regulations governing the harvest of winter skate.*

I. Definition of the Winter Skate Fishery

Winter skate (*Leucoraja ocellata*) is harvested from the waters off of Maine, New Hampshire, and Massachusetts in the Gulf of Maine and Georges Bank. While the skate stock unit extends into southern New England and the Mid-Atlantic Bight, this report focuses on the management and harvesting of winter skate in the area outlined by the Gulf of Maine Responsibly Harvested Standard, which includes statistical areas east and north of (and inclusive of) statistical area 526 (see figure 1 below).

Winter skate is primarily landed as incidental catch in the monkfish, scallop, and Northeast multispecies fisheries. It is estimated that 98% of the skate harvested for human consumption is winter skate, which is why this report is focused on winter skate within the complex of skate species. Winter skates are most commonly found in southern New England and on Georges Bank (NMFS 2003). Otter trawling is the most common method of catching winter skate and was responsible for anywhere between 65-86% of total landings between 2002-2009, with the rest landed mostly by gillnets (GARFO 2017).

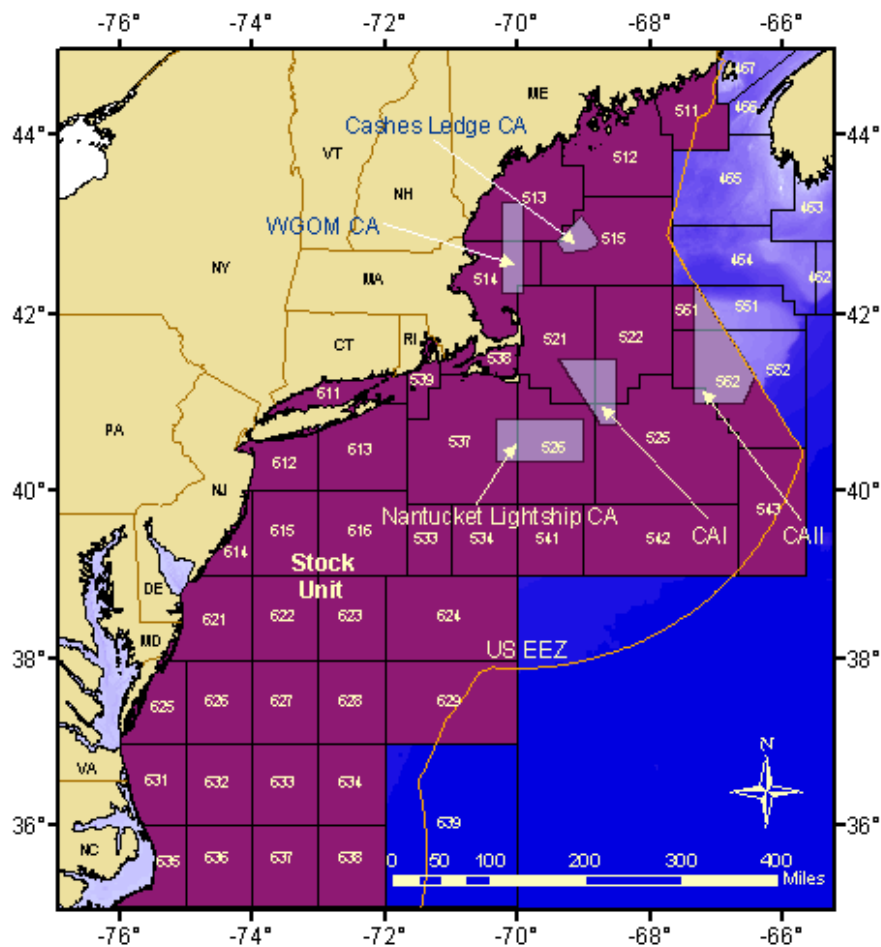


Figure 1. Fishery statistical areas for the winter skate stock (NEFSC 2006). "CA" refers to closed areas.

CRITERION: The fishery is managed by a competent authority and has a management plan in place that incorporates a science-based approach to ensure sustainability.

II. Description of Management Authority and Regulatory Process

Responsibility of winter skate management lies within the [National Marine Fisheries Service \(NMFS\)](#), which is a part of the [National Oceanic and Atmospheric Administration \(NOAA\)](#). The [New England Fishery Management Council \(NEFMC\)](#) facilitates the development of winter skate management measures as part of a complex of seven skate species that are managed together as the Northeast Skate Complex. The NEFMC consists of 18 voting members, including the Regional Administrator for NMFS, the principal marine resource management official from each New England state, and governor appointees.

For the Northeast skate complex FMP, a sub-set of NEFMC members form an Oversight Committee. This committee is responsible for the development of the fishery management plan and regulations that are consistent with the ten national standards outlined in the [Magnuson Stevens Act \(MSA\)](#), which dictate 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.

To help the oversight committee meet these requirements, an Advisory Panel made up of representatives from the fishing industry, scientists, and conservation organizations provides input to management measures. The chairs of the oversight committee provide detailed guidance (terms of reference) to a Skate Plan Development Team (PDT), which consists of scientists, managers and other experts on biology and/or management of skates. The Skate PDT meets at least annually to review the status of the FMP. The review includes annual updates to survey indices, updates to fishery landings and discards, a reevaluation of stock status based on updated survey indices and overfishing definitions, and a determination of whether accountability measures have been triggered. Based on this review, the PDT provides reports to the oversight committee in response to the terms of reference. The PDT meets regularly to provide

analysis of species-related information and to develop issue papers, alternatives, and other documents as appropriate. The NEFMC is also assisted by the members of the Scientific and Statistical Committee (SSC); SSC members review and participate in stock assessment updates, and develop acceptable biological catch (ABC) recommendations that inform management decisions. Figure 2 provides a visual of this process.

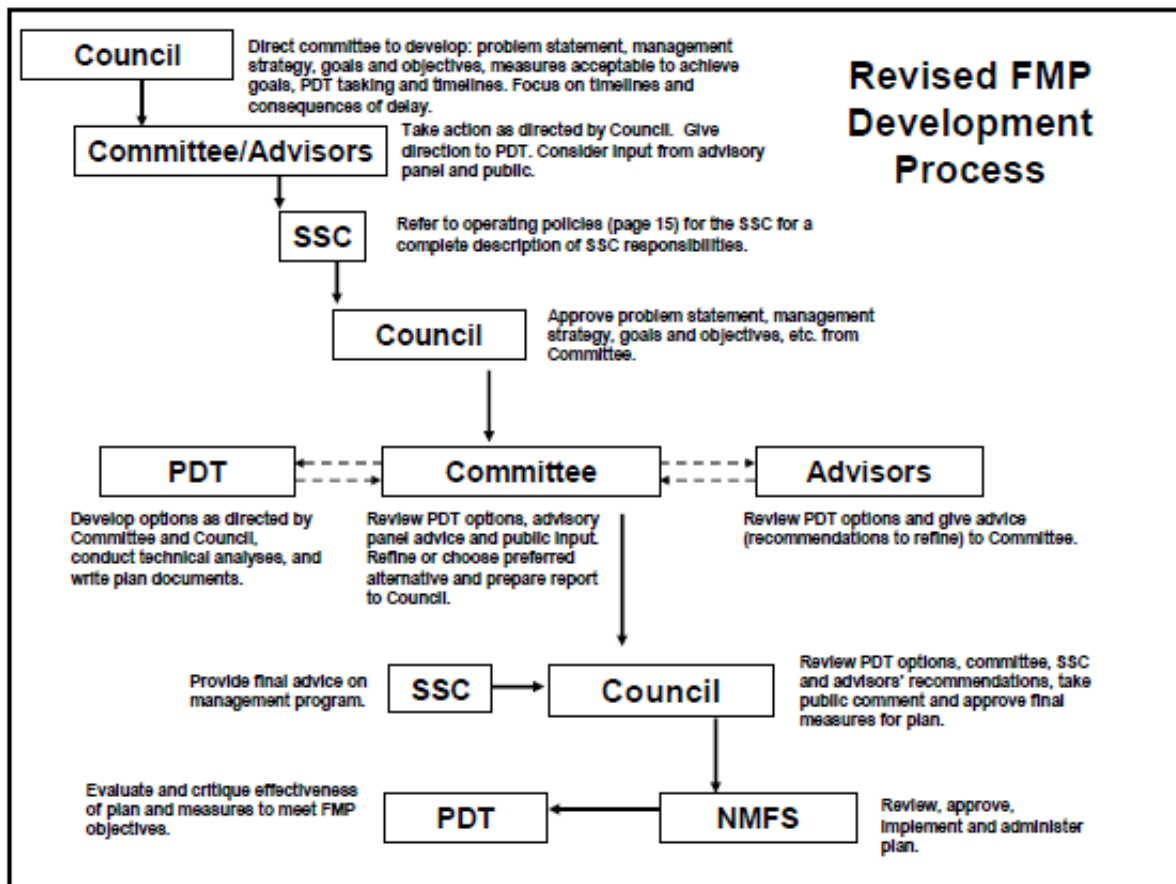


Figure 2. Fishery Management Plan Process (Fiorelli 2008)

III. Northeast Skate Complex Fisheries Management Plan

The winter skate fishery is managed as part of the Northeast Skate Complex Fisheries Management Plan (FMP), which was developed by the New England Fisheries Management Council (NEFMC) and was implemented in 2003. This management plan includes seven species of skate (winter, little, smooth, thorny, barndoor, rosette, and clearnose) from the New England and Mid-Atlantic coastal regions. When the management plan was first implemented, it was in response to findings that winter, smooth, thorny and barndoor skates were all overfished. As of 2017, the only species that remains overfished is thorny skate, and overfishing is not occurring for any of the seven species (NEFSC 2017).

The regulations under the FMP include permit requirements for vessels possessing skates and dealers purchasing skates, reporting requirements, possession limits for skate wings and whole skates, and prohibition on the possession of smooth, barndoor and thorny skates. Skates are often caught as incidental catch as part of the Northeast (NE) multispecies, scallop, and monkfish fisheries, so the skate FMP also includes management measures stipulated in those three FMPs. In order to prevent overfishing and rebuild overfished stocks in the skate complex, rules have been implemented through management measures in the skate complex, management measures in the related FMPs (NE multispecies, scallop, and monkfish), or a combination of both (NEFMC 2003).

To possess, land, or sell skates, an open access commercial skate permit is required. Skates are targeted by two different fisheries: one for bait (primarily for the lobster industry) and one for wings for human consumption. The management plan focuses on bait and wings separately, allocating percentages of the quota to each part of the fishery (GARFO 2016). Quotas are set for the directed fishery, while incidental catch landings are managed by possession limits for permit categories A and B days-at-sea (DAS) vessels, as well as non-DAS vessels, including those that operate within NE multispecies sectors.

The bait fishery is a historical and directed fishery. While little skates are the targeted species for the bait fishery, juvenile winter skates can be misidentified as little skates and thus are sometimes landed as bait. Less than 10% of bait landings are estimated to be juvenile winter skates, and the remaining 90% or more of bait landings are little skates (NMFS 2014).

Unlike the directed bait fishery, skate wings have historically been harvested as incidental catch from the NE multispecies, scallop, and monkfish fisheries. In the 1990s, skate wings became a much more directed fishery as fishermen shifted from overharvested species to species that were promoted as “underutilized,” including skates and dogfish (NEFSC 2008). Today, winter skate wings account for 98% of total skate wings landed. The market prefers winter skate wings, and other types of skates desired by the market for their wings are typically only caught further south in the mid-Atlantic (personal communication, NEFMC staff). The remaining 2% are two other large species of skate that are currently prohibited, barndoor and thorny. However, this is considered a very high compliance rate for prohibited species regulations (Curtis; Sosebee 2016). Additionally, the prohibition on harvesting barndoor skates is in the process of being removed, and the NEFMC is developing management measures for barndoor harvest in the future. Table 1 depicts the different fisheries and Vessel Monitoring System (VMS) declarations under which skate is landed (NEFMC 2017).

Table 1. Total Skate Landings (lbs live weight) by program in FY 2014		
VMS Declaration	Bait	Wing
Multispecies Sector	3,104,650	10,640,649
Multispecies Common Pool	303,450	332,955
Monkfish	29,864	9,811,186
Scallop	NA	42,082
No Declaration ¹	4,212,412	2,293,265
Declare Out-of-Fishery ²	1,736,170	988,655

¹ “No declaration” means skate has been landed during a trip that was exempt from VMS.

² “Declare Out-of-Fishery” means to declare out of the groundfish fishery for a trip, or in other words, fishing for a species that does not require a declaration (e.g. squid, or a research trip). Skates are still allowed to be landed.

The Magnuson-Stevens Reauthorization Act (MSRA) of 2006 requires the NEFMC to determine Annual Catch Limits (ACLs) and Accountability Measures (AMs) (like size limits, trip limits, gear restrictions, or closures) that prevent overfishing or enable rebuilding within specified time frames for all stocks/species under management. Recommendations for an ACL and acceptable biological catch (ABC) are developed by the PDT. The Scientific and Statistical Committee (SSC) recommends an ABC, and the NEFMC approves final ACLs, but cannot exceed the SSC's recommendations. ACLs may be broken into subcomponents for different segments of the fishery, including state waters, commercial, recreational, etc. Accountability measures can be implemented in-season as management actions to prevent reaching or exceeding the ACL, or they can be corrective post-season management actions that address overages of an ACL.

In 2009, Amendment 3 implemented an ACL framework based on survey biomass indices which were used to update biological reference points for all species within the skate complex. This amendment also introduced seasonal quotas for the bait fishery, possession limits, Annual Catch Targets (ACTs) and Total Allowable Landings (TALs) for wings and bait to improve management of the fishery (NMFS 2009). Framework Adjustment 1 under this amendment set seasonal skate wing possession limits so that the fishery could be open year round, and also allowed vessels landing skate wings to land the carcasses as bait (NMFS 2011).

Accountability measures under the skate FMP are as follows: If the Total Allowable Landings (TAL) are exceeded by 5%, the Regional Administrator will reduce the possession limit in the next fishing year by 1% for each 1% of the overage. In the case of an ACL overage, the buffer between the ACL and ACT will be increased by 1% in the following fishing year for every 1% of the overage. If the Council fails to correct any overages, the Regional Administrator can implement the adjustments that are needed to prevent further overages or overfishing.

In 2014, Framework Adjustment 2 required species-specific reporting for the first time (NMFS 2014). Fishermen are now required to report specific skate species on vessel trip reports (NMFS 2016).

CRITERION: If stock sizes are below management target levels, whether due to natural or man-made causes, management plans are established that enable rebuilding within a specified timeframe.

CRITERION: Sufficient data exist to determine harvest levels.

IV. Winter Skate Data

Stock Status

Within the Skate Complex FMP, biological reference points (BRPs) are estimated from survey data since commercial catches have not been accurately reported by species. The last benchmark stock assessment for the Skate Complex was the 2008 Data Poor Stocks Working Group (DPWG), but survey data is used to provide annual updates and assessments of the biomass. The most recent assessment of the skate

complex occurred in 2016 (NEFSC 2017). The proxy for B_{MSY} for skates is the 75th percentile of the survey biomass index time series for each species.

The biomass proxies are quantified as the stratified average weight-per-tow from the survey data (NMFS 2009). The BRPs, as well as the winter skate biomass index, from the most recent stock update based on the 2014-2016 NEFSC autumn survey are in Table 2 below (NEFSC 2017).

Table 2. 2016 Winter Skate Biological Reference Points	
B_{MSY} proxy	5.66 kg/tow
$B_{threshold}$	2.83 kg/tow
2014-16 Biomass Index	6.65 kg/tow

For the skate complex, the overfishing threshold is based on changes in survey biomass indices because the fishing mortality reference points developed the first time skates were assessed (SARC 30 in 1999) were not accepted by the NEFMC and a different method for evaluating fishing mortality was developed by the PDT (NEFSC 2008). If the three-year moving average for winter skate biomass indices declines by more than the average coefficient of variation (CV) of the survey time series, then F is assumed to be greater than F at Maximum Sustainable Yield (F_{MSY}) and overfishing is occurring.

The winter skate biomass index in 2016 was above the B_{MSY} proxy and above the $B_{threshold}$, thus the stock is not overfished. Since the 2014-2016 average survey biomass index is greater than the 2013-2015 year index by 24.42%, overfishing is not occurring (NEFSC 2017).

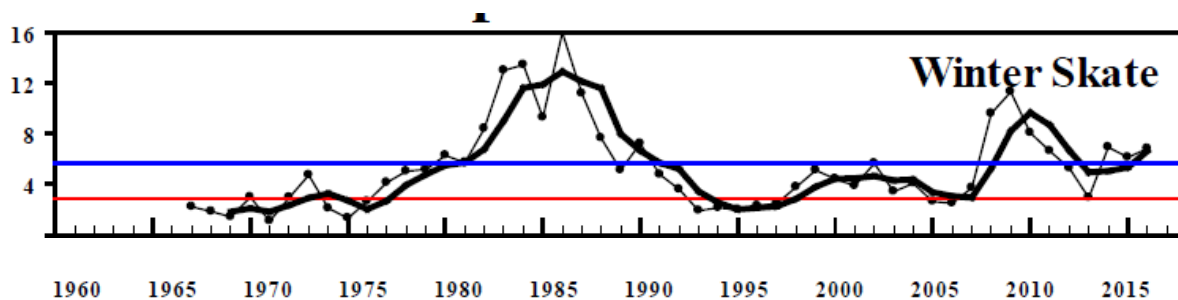


Figure 3. Offshore winter skate in the Gulf of Maine to Mid-Atlantic bight region. Biomass in stratified mean weight-per-tow (kg) with thin lines as annual indices, thick lines as 3 year moving averages and thin horizontal lines are the biomass thresholds and targets (NEFSC 2017).

The fishing mortality reference points are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average coefficient of variation of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring. The 2014-16 average index was above the 2013-15 index by 24.2%, therefore this stock is not overfished and overfishing is not occurring.

Sources of Uncertainty

The sources of uncertainty recognized in the 2016 Northeast Skate Complex stock status update, and stretching back to the 2008 Data Poor Working Group are listed below:

1. Species composition of the discards. Since the 2008 Data Poor Working Group assessment, information regarding discards has improved, although species composition remains an issue. Discards have been decreasing, and skate discards in 2016 were estimated to be 10,434 mt in dead discards (NEFMC 2017). Discard mortality is assumed for the majority of species and gear types, although some recent work has been done to improve estimates for different gear types. Winter skate discard mortality rates were revised from 50% in trawl gear to 9%, for example.
2. The overfishing definitions are not based on fishing activity, but are based on changes in trawl survey indices. Distribution shifts may influence trawl survey biomass.
3. There are life history gaps for some species in the complex.
4. A high percentage of the catch is discards, which are difficult to monitor.

To address these uncertainties, landings and catch data must be species-specific to improve understanding on a stock by stock basis. This began with the implementation of Framework Adjustment 2, for which the reporting requirements went into place in August 2016 (NMFS 2016a). The development of appropriate models and several years of length and age sampling from the commercial fishery and research vessels will be required to improve understanding of life history traits and population dynamics (NEFSC 2008).

Stock History

Skate landings have been recorded in New England fisheries since the 1800s, but did not become significant until the 1950s and 1960s. In 1969, skate landings were as high as 9,500 metric tons (mt), but subsequently dropped to 800 mt by 1981 (NEFSC 2008).

Due to the rise in demand for lobster bait and an increased export market for wings, skate landings have generally increased since the 1980s. In 1993, landings reached 12,900 mt, but declined again to 7,200 mt in 1995. Commercial landings peaked in 2004 at 16,073 mt, the highest on record. This landings data is not specific to winter skate, however 98% of wing landings are estimated to be winter skate and around 10% of bait landings are likely juvenile winter skate (Curtis, Sosebee 2016). Figure 4 shows landings trends for bait and wings in recent years (NEFMC 2017).

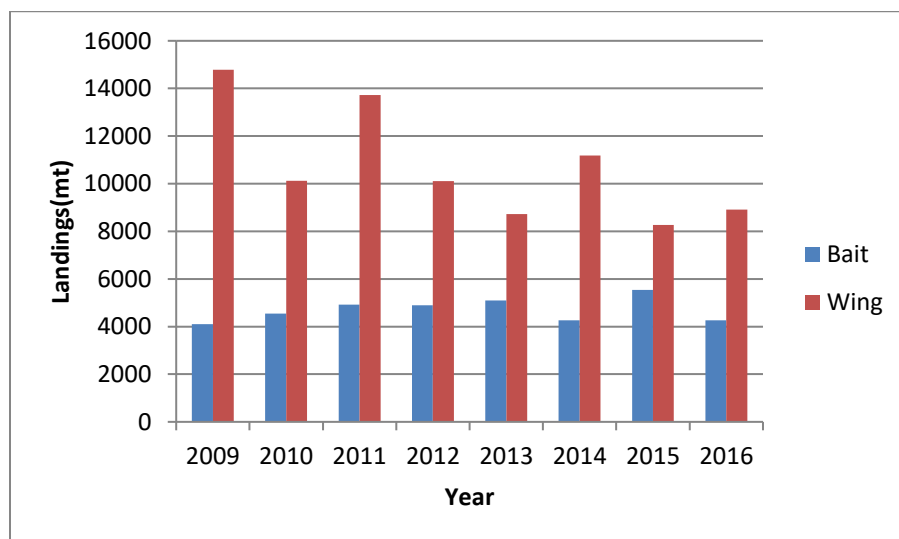


Figure 4. Bait and wing landings (mt) from fishing years 2009-2016 (NEFMC 2017).

Harvest Levels

The NEFMC approved Framework Adjustment 5 in 2017, updating Acceptable Biological Catch, Annual Catch Limits and Targets, and Total Allowable Landings based on the best scientific information available. The wing fishery was allocated 66.5% of the TAL, and 33.5% was allocated to the bait fishery. These quotas are designed to account for both scientific and management uncertainties. These TALs are shown in Table 3 (NEFMCa 2017).

Table 3. 2018-2019 Skate Specifications	
Overfishing Limit (OFL)	Undefined
Acceptable Biological Catch (ABC)	31,327 mt
Annual Catch Limit (ACL)	31,327 mt
Annual Catch Target (ACT)	23,495 mt
Total Allowable Landings (TAL)	13,157 mt (wing TAL 8,749 mt, bait TAL 4,408 mt)

Possession limits per trip are also established for skates. For skate wings caught incidentally on NE multispecies, scallop, or monkfish vessels, as well as non-DAS vessels, the possession limits are shown below in Table 4 (NMFS 2016a). These limits will roll over into fishing year 2018, as no changes have been proposed.

Table 4. Possession limits for Fishing Years 2016-2017		
Vessel	Season	Trip limits (lbs) for skate wings
NE Multispecies, Scallop, or Monkfish DAS	Season 1 (May 1-Aug 31)	2,600
	Season 2 (Sep 1-Apr 30)	4,100
NE Multispecies B DAS	May 1-Apr 30	220
Non-DAS	May 1-Apr 30	500

Framework Adjustment 4, approved by NOAA and set to take effect in March 2018, separated skate bait possession limits from the wing fishery’s limits, with the goal of better controlling the catch of bait. See Table 5 below for the new bait possession limits (NMFS 2018).

Table 5. Skate Bait Fishery Seasons and Possession Limits				
Season	Percentage of Skate Bait TAL	Possession Limit	Trigger for implementing an in-season possession limit adjustment	Incidental possession limit for skate bait once a trigger has been reached
1 (May 1 – July 31)	30.8%	25,000 lbs	90% of seasonal TAL	8,000 lbs
2 (Aug 1 – Oct 31)	37.1%	25,000 lbs	90% of seasonal TAL	8,000 lbs
3 (Nov 1 – April 30)	Remainder	12,000 lbs	80% of seasonal TAL	8,000 lbs

CRITERION: Monitoring and compliance measures are in place to ensure acceptable harvest levels.

V. Monitoring

The National Marine Fisheries Service (NMFS) has the primary responsibility for monitoring and surveillance of the Northeast Skate Complex. The monitoring programs in place provide information to scientists and managers about when, where, and how fish are caught. In addition to information about fish that are landed, the monitoring programs can provide information about species that are not landed. For example, in support of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA), observers record interactions with protected and endangered species.

Vessels are required to submit vessel trip reports (VTRs) for each fishing trip, which provide details on type of gear fished, area fished, species caught (and discarded), dealer information, and port of landing information, in addition to other details. These reports are due to the National Marine Fisheries Service on a weekly basis. When fishing in certain areas, such as the Eastern U.S./Canada Area, vessels are required to submit daily VTRs.

In 2014, Framework Adjustment 2 included a management measure that requires species-specific landings to be reported in order to improve understanding of skate landings composition. This reporting requirement was implemented in August 2016 (NMFS 2016a).

The New England Fisheries Observer Program (NEFOP) employs 8% at-sea observer coverage, as well as port sampling for the skate fleet. The final rule for Standardized Bycatch Reporting Methodology (SBRM) states that the Regional Administrator and the Science and Research Director will allocate at-sea observer coverage to the applicable fisheries of the Northeast Region sufficient to achieve a statistically significant sample (measured as the coefficient of variation [CV]) no greater than 30% for each stock it manages (73 FR 4736; January 28, 2008). In addition, vessels fishing in Special Access Programs (SAPs) are required to contact NEFOP prior to their trip to determine if they will have observer coverage. There are also shore-side port samplers who periodically work at fish auctions and exchanges taking biological samples. This program ensures compliance with the MSA in addition to the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA).

Skate trips are subject to at-sea monitoring (ASM) coverage only in specific cases where a vessel has a Northeast Multispecies permit *and* is fishing such that the vessel's groundfish discards would count against their allocation. This ASM coverage is designed to address discard questions in the NE Multispecies fishery. As skate vessels operate primarily under days-at-sea with trip limits, there is no requirement for ASM specific to skate.

Shore-side, there is 100% electronic dealer reporting on a weekly basis, which includes, but is not limited to, unique trip identifier, quantity of species landed, price per unit by species, and port and state landed.

CRITERION: Enforcement exists to ensure that harvesters follow regulations, and to prevent illegal practices and unreported harvest.

VI. Enforcement

In general, enforcement of the NE Skate Complex FMP is coordinated through NOAA's Office of Law Enforcement (OLE). OLE Special Agents and Enforcement conduct complex criminal and civil investigations, board vessels fishing at sea, inspect fish processing plants, and conduct patrols on land, in the air and at sea. In addition to this enforcement work, the OLE administers the Cooperative Enforcement Program (CEP), which authorizes certain coastal state and territorial marine conservation law enforcement agencies to enforce federal laws and regulations in the Exclusive Economic Zone (EEZ). OLE also partners with the U.S. Coast Guard (USCG) and various other federal agencies, fishery management councils, and non-governmental organizations.

As both a directed and incidental catch fishery, skate landings must be in compliance with the regulations of the VMS declaration they are landed in (see Table 1 for the various VMS declarations). For skate landed by NE multispecies common pool vessels, enforcement is focused on compliance with DAS, seasonal closures, closed areas, gear restrictions, and trip limits. Enforcement for NE multispecies sector vessels primarily relies on monitoring catches/landings through sector reporting, dockside monitoring, dealer reporting, and VTR (in addition to some of the measures described above for which sectors are not universally exempt); however individual sectors are also responsible for self-enforcement. It is the responsibility of each sector to enforce any provisions adopted through procedures established in the operations plan and agreed to through the sector contract. Sectors may be held jointly liable for violations of the following sector operations plan requirements: annual catch entitlement (ACE) overages, discarding of legal-sized fish, and misreporting of catch (landings or discards).

NOAA's Office of General Counsel reports on any enforcement actions taken, by region, on a semi-annual basis, and also outlines regional enforcement priorities on an annual basis. Northeast winter skate is not identified as a species of concern under OLE's enforcement priorities.

VII. References

- Curtis, Tobey; Sosebee, Katherine. 2016. Landings Composition of the Northeast US Skate, Rajidae, Wing Fishery, and the Effectiveness of Prohibited Species Regulations. *Marine Fisheries Review*. 77(4): 1-8. Available:
https://www.researchgate.net/publication/295546372_Landings_Composition_of_the_Northeast_US_Skate_Rajidae_Wing_Fishery_and_the_Effectiveness_of_Prohibited_Species_Regulations
- Fiorelli, P.M. 2008. New England Fisheries Management Council Process. Presentation to the Marine Resource Education Program. January 21-23, 2008, West Greenwich, Rhode Island.
- Greater Atlantic Regional Fisheries Office. 2016. Northeast Skate Information Sheet (17 August 2016): Available: <https://www.greateratlantic.fisheries.noaa.gov/regs/infodocs/neskateinfosheet.pdf>
- Greater Atlantic Regional Fisheries Office. 2017. Northeast Skate Complex. Available: <https://www.greateratlantic.fisheries.noaa.gov/sustainable/species/skate/>
- National Marine Fisheries Service. 2003. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast (NE) Skate Complex Fishery; Original Fisheries Management Plan. Available: <http://s3.amazonaws.com/nefmc.org/FINAL.Skate-FMP.EIS.FINAL.VOL.I.pdf>
- National Marine Fisheries Service. 2008. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast (NE) Skate Complex Fishery; Amendment 1. 50 CFR 648 (28 January 2008): 070627217-7523-02. Available: http://s3.amazonaws.com/nefmc.org/SBRM_Omnibus_Final_Rule.pdf
- National Marine Fisheries Service. 2009. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast (NE) Skate Complex Fishery; Amendment 3. 50 CFR 648 (16 June 2010): 080228326-0108-03. Available: http://s3.amazonaws.com/nefmc.org/SkateA3_FinalRule_75FR34049.pdf
- National Marine Fisheries Service. 2011. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast (NE) Skate Complex Fishery; Framework Adjustment 1. 50 CFR 648 (17 May 2011): 110218142-1276-02. Available: http://s3.amazonaws.com/nefmc.org/slfw1final_rule.pdf
- National Marine Fisheries Service. 2014. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast (NE) Skate Complex Fishery; Framework Adjustment 2. 50 CFR 648 (29 August 2014): 140220160-4692-02. Available: <http://s3.amazonaws.com/nefmc.org/140829.Final-Rule-FW2.pdf>
- National Marine Fisheries Service. 2016. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast (NE) Skate Complex Fishery; Framework Adjustment 3. 50 CFR 648 (17 August 2016): 160301164-6694-02. Available: <http://s3.amazonaws.com/nefmc.org/Final-Rule-Skate-FW3.pdf>

- National Marine Fisheries Service (a). 2016. Northeast Skate Information Sheet, Greater Atlantic Region. 17 August 2016. Available:
<https://www.greateratlantic.fisheries.noaa.gov/regs/infodocs/neskateinfosheet.pdf>
- National Marine Fisheries Service. 2018. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast (NE) Skate Complex Fishery; Framework Adjustment 4. 50 CFR 648 (13 February 2018): 170710645-8098-02. Available:
<http://s3.amazonaws.com/nefmc.org/180213-Skate-FW-4-Final-Rule.pdf>
- New England Fishery Management Council. 2017. Framework Adjustment 4 to the Northeast Skate Complex FMP. 8 December 2017.
- New England Fishery Management Council (a). 2017. Press Release: Skates: Council Approves 2018-19 Fishery Specifications and Proportional Barndoor Skate Possession Limit for Wing Fishery. 28 September 2017. Available: <http://s3.amazonaws.com/nefmc.org/NEFMC-Approves-Skates-Specs-Barndoor-Landings.pdf>
- Northeast Fisheries Science Center. 2006. Status of Fishery Resources off the Northeastern US: Skate Complex. Resource Evaluation and Assessment Division. Available:
<https://www.nefsc.noaa.gov/sos/spsyn/op/skate/>
- Northeast Fisheries Science Center. 2008. Skate Species Complex: Examination of Potential Biological Reference Points for the Northeast Region. Northeast Data Poor Stocks Working Group Meeting, Woods Hole, MA (8-12 December 2008). Available:
<https://www.nefsc.noaa.gov/publications/crd/crd0902/skates/skateText.pdf>
- Northeast Fisheries Science Center. 2015. Letter from Karp to Bullard: Update of Skate Stock Status Based on NEFSC Bottom Trawl Survey Data through Autumn 2014/Spring 2015. Available:
http://s3.amazonaws.com/nefmc.org/2.3-NEFSC_UpdateSkateStocks2015-.pdf
- Northeast Fisheries Science Center. 2017. 2016 NE Skate Stock Status Update. Lead Analyst: K. Sosebee. Available:
http://s3.amazonaws.com/nefmc.org/4_NEFSC_SkateMemo_July_2017_170922_085135.pdf
- Personal correspondence with New England Fishery Management Council staff, July 24, 2017.