NORTHEAST SKATE COMPLEX
FISHERY MANAGEMENT PLAN

Annual Monitoring Report for Fishing Year 2021

August 23, 2022

Prepared by the

New England Fishery Management Council

In consultation with the

National Marine Fisheries Service

New England
Fishery Management Council

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

1. *INTRODUCTION*

The regulations implementing the management measures for the Northeast Skate Complex Fishery Management Plan (FMP) state that the Skate Plan Development Team (PDT) shall meet at least annually to review the status of the species in the skate complex (§648.320). Based on this review, the Skate PDT is then to provide guidance to the Skate Committee and the Council on the need to adjust measures in the Skate FMP to better achieve the FMP objectives. At a minimum, this review includes:

- Annual updates to survey indices, fishery landings and discards;
- Re-evaluation of stock status based on the updated survey indices and the FMP's overfishing definitions;
- Determination of whether any of the accountability measures (AMs) specified under §648.323 were triggered (i.e., if a wing or bait total allowable landings (TAL) was exceeded by >5% or the annual catch limit (ACL) was exceeded); and
- Changes to other FMPs (e.g., Northeast Multispecies, Monkfish, Atlantic Scallops, Herring, Spiny Dogfish, Longfin Squid, Summer Flounder/Scup/Black Sea Bass, Habitat) that may impact skate stocks, and describe the anticipated impacts of those changes on the skate fishery.

In December 2021, the Council tasked the PDT "to consider improvements to the ABC calculation, specifications formula, and year-end catch accounting to better account for known sources of catch." This report documents the PDT work on this task, then summarizes the PDT review, which focused on Fishing Year (FY) 2021 performance and used the improvements developed.

2. *IMPROVEMENTS TO METHODS FOR FISHERY CATCH SETTING AND ACCOUNTING*

The PDT met on March 7 and May 10, 2022 to discuss the Council's task "to consider improvements to the ABC calculation, specifications formula, and year-end catch accounting to better account for known sources of catch." The PDT also considered improvements to methods for in-season quota monitoring, as this is another important component of skate management and would improve the consistency of how data are used. The PDT had been considering potential improvements over the past few years, summarized in a November 2021 memo to the Skate Committee.

The PDT reviewed the cycle of skate management. The cycle includes updates to reference points by the Northeast Fisheries Science Center (NEFSC), setting of specifications by the Council, and in-season quota monitoring and year-end catch accounting by the Greater Atlantic Regional Fisheries Office (GARFO). The PDT can recommend adjustments to the data used in updating reference points. For setting specifications, the PDT can decide what is deducted from the annual catch target (ACT), currently expected dead discards and state landings, and decide what data to use in this deduction. The PDT can recommend what fishery catch data are included in the in-season quota monitoring and year-end catch accounting. The PDT identified issues with the following and developed improvements to how these sources of catch are tracked through the management cycle: recreational catch, research catch, landings via vessel-to-vessel transfer, state catch, and dead discards.

Recreational catch

Issues: When the Skate FMP was first adopted, recreational catch was considered non-existent. Thus, recreational catch data were not included in the fishery data used to update reference points and set ABC, and there has been no specific deduction from the ABC for expected recreational catch in specifications. However, recreational catch has been included in the year-end ACL accounting, and recreational catch has been increasing, about 1-5% of ACL since FY 2017.

Solutions: Recreational catch should be included in the update of reference points and specifications. The NEFSC plans to include recreational catch data when updating reference points in 2023, though there needs to be work done on discard mortality assumptions. For FY 2024-2025 specifications and beyond, recreational

catch data will thus be included in ABC setting. The PDT will make a deduction from the ACT of the most recent three-year average of recreational catch, using the calendar year data used for ABC setting.

Research catch

Issues: Skate catch from research trips has been very small, but it is included in the update of reference points and thus included in setting of ABC. There has been no specific deduction in specifications setting; research catch has fallen within the uncertainty buffer. Research landings in dealer data have been included in year-end ACL accounting, within the "commercial landings" tally. However, research catch reported solely via vessel trip reports (VTR) have been excluded, because GARFO has only included catch reported via dealers in ACL accounting.

Solution: The PDT recommended to the GARFO/APSD office that all landings reported solely via VTR should be included in year-end ACL accounting. APSD agreed and implemented this change for the FY 2021 ACL accounting. Because research catch continues to be very small (about 1% of the buffer), the PDT will not make a specific deduction from the ACT during specification setting at this time.

Non-landed bait

Issues: Bait skate that is sold directly to other vessels or kept as bait are reported solely via VTR (i.e., not in dealer data). This catch is included in the update of reference points and thus included in setting of ABC. It is also monitored in-season against the Bait TAL, thus contributes to potentially triggering in-season AMs. However, this catch has been excluded from ACL accounting, again because GARFO has only included catch reported via dealers.

Solution: The PDT recommended to the GARFO/APSD office that this source of catch be included in year-end ACL accounting, especially because it is monitored in-season against the Bait TAL. APSD agreed and implemented this change for the FY 2021 ACL accounting.

State catch

Issues: The PDT has been concerned that state and federal landings have been identified based on the 6-digit permit number, not whether the landings were under state or federal regulations. In specifications, the state landings deduction from the ACT is a recent three-year average of the "state landings" from the FY ACL accounting. This value has been derived solely using the 6-digit permit number rather than if the vessel was fishing outside of the federal skate fishery (i.e., without a federal skate permit). In ACL accounting, landings where permit = 000000 are "state" and where permit >000000 landings are "commercial." A vessel has a permit = 000000 if it never had a federal fishing permit of any kind. The first time a vessel gets a federal permit, it is assigned number >000000.

Even though a vessel may have a permit >000000, that does not necessarily mean the vessel has a federal skate permit. The PDT has found that for in-season quota monitoring, if a vessel has any federal fishing permit on the day of landing, then all skate landings are counted against the Federal TAL. In ACL accounting, there are landings without a federal skate permit in the "commercial landings" bin rather than the "state landings." There was also concern that using the terms "commercial" and "state" landings in year-end accounting is confusing, because the state landings are likely all commercial as well.

In addition, The PDT also feels that the state landing deduction from the ACT should be based on calendar year to be consistent with how the other deductions are calculated.

Solution: The PDT recommended to the GARFO/APSD office that for in-season monitoring, only landings with a federal skate permit on the day of landing should be monitored against the Federal TAL, rather than the current practice that includes skate landings by vessels that had any federal permit on the day of landing. The PDT also recommended that in ACL accounting, "state landings" should be defined as landings with no federal skate permit on the day of landing. Landings with a federal skate permit should be the "commercial landings." Further, the term "commercial landings" should be replaced with "federal commercial landings" to reduce confusion. APSD agreed and implemented these changes for FY 2021 ACL accounting and FY 2022 in-season quota monitoring.

For FY 2024-2025 specifications, the PDT will use the state landings as newly defined for ACL accounting but based on calendar year to be consistent with other data used in specifications.

Dead discards

Issues: The NEFSC and GARFO have used two methods for calculating dead discards, for the update of reference points and in setting the discard deduction from the ACT during specification setting and ACL accounting, respectively. There have been differences in data assumptions, weightings, and extrapolations that result in different dead discard values. It is difficult to compare actual discards with what had been specified for a given year when two methods are used that are known to produce differing outcomes. The PDT notes this is an issue for many fisheries, not just skates.

Solution: This is an issue that will hopefully be addressed through the upcoming transition to the use of the Catch Accounting Management System (CAMS) by both offices. The PDT postponed efforts to resolve discrepancies in discard data until CAMS is in place, which may result in a harmonized approach and resolve the PDT's concerns.

Process for implementing changes

The GARFO staff on the PDT confirmed that the changes contemplated here do not require regulatory changes or formal approval by the GARFO/SFD office. The changes are within the scope of the PDT, the NEFSC, and the GARFO/APSD office to implement to better track data skate management cycle.

For the 2022 Annual Monitoring Report (this document), indices of abundance will be updated by the NEFSC, but there is insufficient time and resources to add the recreational catch data. This will occur in 2023.

For in-season TAL monitoring, only landings with a federal skate permit on the day of landing will be monitored against the Federal TAL. This change would result in fewer landings being monitored against TAL, so there should not be any unexpected fishery disruption.

The year-end ACL accounting for FY 2021 will:

- Include any research catch and non-landed bait reported only via VTR
- Revise the "state landings" to include all landings with no federal skate permit on the day of landing. This is expected to increase the state landings deduction in future specifications.
- Replace the term "commercial landings" with "federal commercial landings."
- Present the ACL accounting using the old and new methods for comparison. Recent prior years should be recalculated. This will be necessary for setting specifications next year.

3. SURVEY INDICES AND STOCK STATUS

This section updates survey indices and re-evaluates stock status for the skate species based on survey indices and overfishing definitions. Appendix I, a memo from the Northeast Fisheries Science Center (NEFSC), has more detail on surveys and stock status, updated through spring 2022.

Survey Indices

Indices of relative abundance for all seven skate species are derived from the NEFSC bottom trawl survey. In recent years, the survey has had delays and incomplete coverage of the survey area. Appendix I details the potential impacts on the survey indices. COVID-19 restrictions caused the spring 2020 survey to only cover a small portion of the survey area and there was no fall survey. Thus, there are no 2020 survey indices.

Stock Status

For all skate species, stock status remains unchanged from last year. One skate species remains overfished (thorny). Overfishing is not occurring for any of the seven skate species. Stock status is determined based on a three-year moving average of survey indices. The spring survey is used for little skate and the fall survey

for all other skate species. Because there are no 2020 survey indices, two-year averages are used: 2021 and 2022 for little skate and 2019 and 2021 for the other species.

Thorny skate: The 2019 and 2021 average NEFSC fall biomass index (0.15 kg/tow) for thorny skate is well below its biomass threshold reference point (2.06 kg/tow), thus is overfished. This index is only 3.6% of the B_{MSY} target (4.13 kg/tow). This is a decrease from what was reported in the 2019 Annual Monitoring Report (an index of 0.18 kg/tow and 4.3% of the biomass target). The rebuilding deadline for this stock is 2028 (25 years from implementation of the Skate FMP), yet 19 years into the rebuilding period, the survey biomass has continued to have no significant signs of rebuilding.

The 2019 and 2021 average index declined relative to the 2017-2019 average index by 19.0%. This is less than the threshold percent change of 20%. Thus, overfishing is not occurring on thorny skate.

Due to persistently low biomass and the overfished status, thorny skate has been a species/stock of concern to management and was previously petitioned for listing under the Endangered Species Act (ESA) in 2011. NOAA Fisheries determined that a status review was not warranted at that time (76 FR 78891). However, an ESA petition was submitted by Defenders of Wildlife and Animal Welfare Institute in May 2015. An extinction risk workshop, in May 2016, determined there were no distinct population segments of thorny skate and thorny skate was not currently in danger of extinction throughout all, or a significant portion, of its range (see final report).

4. FISHERY LANDINGS, DISCARDS AND ACCOUNTABILITY MEASURES

This section reports FY 2021 fishery landings and discards, and notes if the Greater Atlantic Regional Fisheries Office (GARFO) has determined whether any of the accountability measures specified under §648.323 were triggered (i.e., if a wing or bait TAL was exceeded by >5% or the ACL was exceeded.

The ABC/ACL specifications for FY 2020-2021 were set as follows. The ABC/ACL was 32,715 mt, reduced by 10% to account for management uncertainty to derive the ACT of 29,444 mt). The Federal TAL (17,864 mt) was calculated by reducing the ACT by the estimated dead discards and state landings. The TAL was split 66.5% to the wing fishery TAL (11,879 mt) and 33.5% to the bait fishery TAL (5,984 mt).

In-season Quota Monitoring

During the fishing year, GARFO monitors skate landings against the wing and bait TALs, which are managed in season, and produces weekly quota monitoring reports. Starting in FY 2022, only landings with a federal skate permit on the day of landing (sold to a Federal dealer or reported solely via VTRs) will be monitored in-season against the TALs, rather than skate landings from all vessels with a Federal fishing permit on the day of landing (federal skate permit or not).

Reported here is the FY 2021 year-end results of the in-season TAL monitoring (Table 1). The results are broken down by whether there was any federal permit on the day of landing (old method for quota monitoring) or the subset of landings with a federal skate permit on the day of landing (new method). Under both methods, the wing and bait landings were well under their TALs and 44% of the Federal TAL was landed; in-season AMs were not triggered. The FY 2021 in-season monitoring included 89 mt of landings by vessels that did not have a Federal skate permit on the day of landing but had another Federal permit. These were all wing landings. Removing these wing landings from TAL monitoring would have lowered the landings relative to the Wing TAL by <0.5%. For FY 2022, in-season monitoring is occurring under the new method.

Table 1. FY 2021 in-season monitoring of Northeast skate wing and bait landings (live weights).

	TAL		Active Federal Permit (old method)			Active Federal Skate Permit (new method)		
	lb	mt	lb	mt	%	lb	mt	%
Wing	26,188,712	11,879	10,958,940	4,971	41.8%	10,762,565	4,882	41.4%
Bait	13,192,462	5,984	6,361,527	2,886	48.2%	6,361,527	2,886	48.2%
Total	**39,381,174**	**17,864**	**17,320,467**	**7,857**	**44.0%**	**17,124,092**	**7,768**	**43.5%**

Source: cfders2021 and cfders2022, Vessel Trip Reports, and permit databases, accessed 7/08/2022.
Notes:

- Data aggregates landings from the weekly, in-season quota monitoring reports.
- "Active Federal Permit" (old) includes all skate landings from vessels with a Federal fishing permit on the day of landing.
- "Active Federal Skate Landings" (new) is the subset of landings with a Federal skate permit on the day of landing.

Year-end Catch Accounting

At the end of the fishing year, GARFO tabulates skate catches and compares to the ACL. Reported here is the FY 2021 year-end catch accounting (Table 2) with methods as described above (p. 3). Under the new method, estimated total skate catch for FY 2021 was 16,108 mt (49.2% of the ACL). Thus, no ACL overage occurred in FY 2021, so no reactive AMs will be triggered. Dead discards were estimated to be 6,603 mt, or 41% of total catch. Non-landed bait, reported only via VTR (newly included in catch accounting), was 1% of total catch. State landings were 751 mt, including 216 mt by vessels with a permit = 000000 (never had a federal permit; old definition of state landings) plus 499 by vessels with a 6-digit permit number but no federal skate permit on the day of landing.

The new method adds skate landings that are reported only via Vessel Trip Reports (i.e., non-landed bait). For FY 2021, this source of catch increased the total catch relative to the Annual Catch limit (ACL), but by a very small amount, under 1%. The new method also redefines federal and state landings for year-end accounting, such that state landings are no longer just the landings from vessels with permit # = 000000, but now includes landings by vessels that do not have a federal skate permit on the day of landing. This change did not impact total catch relative to the ACL but shifted landings between the "federal commercial landings" and "state-permitted only vessel landings", putting 535 mt more into the state landings than under the prior method.

Table 2. FY 2021 year-end Northeast skate complex ACL accounting.

	Live weight		Percent of ACL
	(lb)	(mt)	(32,715 mt)
FY 2021 – old method			
Northeast skate federal commercial landings	18,986,384	8,612	26.3%
Northeast skate state-permitted only vessel landings	476,025	216	0.7%
Northeast skate estimated dead discards	14,556,155	6,603	20.2%
Northeast skate recreational catch	1,111,664	504	1.5%
Total Northeast skate catch	**35,130,227**	**15,935**	**48.7%**
FY 2021 – new method			
Northeast skate federal commercial landings	17,806,964	8,077	24.7%
Northeast skate state-permitted only vessel landings	1,655,445	751	2.3%
Northeast skate non-landed bait	382,062	173	0.5%
Northeast skate estimated dead discards	14,556,155	6,603	20.2%
Northeast skate recreational catch	1,111,664	504	1.5%
Total Northeast skate catch	**35,512,289**	**16,108**	**49.2%**

Source: Commercial fisheries dealer database accessed 8/09/2022; Northeast Fishery Observer Program database, accessed 7/6/2022; Marine Recreational Information Program reports, accessed 7/07/2022; VTR data accessed 8/2022.

Notes:

- "Northeast skate federal commercial landings"
  - Old: landings by vessels with permit >000000, including without a federal skate permit.
  - New: landings by vessels that had a federal skate permit on the day of landing (include research landings reported to federal dealers).
- "Northeast skate state-permitted only vessel landings"
  - Old: landings by vessels with permit = 000000.
  - New: landings with no federal skate permit on the day of landing.
  - Both may include state permitted landings reported by state-only dealers provided to GARFO from states.
- "Northeast skate non-landed bait" (new) is catch reported only in VTRs (not by federal dealers). This year, there was no research catch reported only in VTRs.
- "Northeast skate estimated dead discards" is based on landings of all species and skate discards on observed trips extrapolated to all commercial landings of all species (weighted by area, gear, etc.) to calculate total skate discards. Then, a discard mortality rate is applied to the calculated total skate discards (discard estimation method differs from how discards are estimated during specifications setting, which uses the NEFSC method).
- "Northeast skate recreational catch" is private angler and party/charter landings and dead discards.

Appendix II provides in-season and year-end accounting for FY 2019 and 2020 using old and new methods for comparison. For more information about skate fishery performance, visit the Commercial Fishing Performance Measures webpage of the Northeast Fisheries Science Center.

5. OTHER FISHERY MANAGEMENT PLANS

This section reviews recent changes to other FMPs that may impact skate stocks or the skate fishery, including the Mid-Atlantic fisheries that interact with the skate fishery.

Northeast Multispecies FMP

Framework Adjustment 65: Proposes 2023-2025 total allowable catches for U.S./Canada shared resources on Georges Bank, Georges Bank cod and yellowtail flounder, specifications for 14 additional groundfish stocks, revised rebuilding plans for Gulf of Maine cod and Southern New England/Mid-Atlantic winter flounder, additional measures to promote stock rebuilding, and acceptable biological catch control rule revisions. Final action expected in December 2022.

Scallop FMP

Framework 36: Proposes specifications for fishing year 2023, default specifications for 2024, and other measures. Final action expected in December 2022.

Monkfish FMP

Framework 13: Proposes specifications for FY 2023-2025 (including adjustments to days-at-sea allocations and flexibility, and potentially increasing possession limits for both limited access and incidental permits) and management measures including increasing minimum mesh size. Final action expected in December 2022.

Herring FMP

2023-2025 Specifications: Proposes specifications for FY 2023-2025. Final action is expected in September 2022.

Spiny Dogfish FMP

2022-2023 Specifications: Set specifications for FY 2022 – 2023 and commercial trip limit adjustments, effective May 1, 2022.

Longfin (Loligo) Squid FMP

2021-2023 Specifications: Set specifications for FY 2021-2023 including adjustments to allocations.

Summer Flounder, Scup, Black Sea Bass FMP

Summer Flounder, Scup, and Black Sea Bass Recreational Harvest Control Rule Framework/Addenda: Developed approaches for setting recreational measures including bag size and season limits; the Council and Atlantic States Marine Fisheries Commission took final action during its June 2022 Council meeting.

Black Sea Bass Commercial State Allocation Amendment: Proposes several changes to the management program for black sea bass commercial fisheries. Council staff are preparing the amendment for submission to NOAA Fisheries.

Summer Flounder, Scup, and Black Sea Bass Commercial/Recreational Allocation Amendment 22: Proposes re-evaluating and potentially revising the commercial and recreational sector allocations. The amendment was submitted to NMFS for review and rulemaking in spring 2022.

Habitat Management Plan

Southern New England Habitat Area of Particular Concern (HAPC) Framework: Established an HAPC applicable to the following FMPs: Northeast Multispecies, Atlantic Sea Scallop, Monkfish, Northeast Skate Complex, and Atlantic Herring. Final action was taken in June 2022, with expected implementation later in 2022.

6. PDT GUIDANCE

This section contains Skate PDT guidance to the Skate Committee and Council on the need to adjust measures in the Skate FMP to better achieve the FMP objectives.

The skate regulations at §648.320(a)(3) require the Council to take management action when an overfished species declines in biomass to ensure that it will achieve target levels. As recommended by the PDT since at least 2012 (2012 Annual Monitoring Report), the Council should consider management measures, beyond the continuing possession prohibition that will foster rebuilding. There will be a management track assessment in the fall of 2023, which will provide an improved understanding of thorny skate.

In the Annual Monitoring Report for FY 2019, the PDT noted a need for clearer skate quota monitoring and catch accounting. This has been accomplished (as described in Section 3 above) without needing to adjust measures in the Skate FMP. However, there is a need to continue improving the data submitted by the fishery (e.g., dealer data). The PDT expects the 2023 skate assessment will reexamine methods for ensuring that all catch components are included in the assessment.

Barndoor skate was declared rebuilt in 2016 and possession has been allowed since FY 2018 (through Framework Adjustment 5), as up to 25% of the skate wing possession limit. Smooth skate has been considered rebuilt since 2018, yet possession is still prohibited. The Council could consider expanding the possession limit for Barndoor skate and allowing possession of smooth skate.

APPENDIX I
2022 NE Skate Stock Status Update (NEFSC, Lead Analyst: K. Sosebee, 7/28/2022)

Seven species of skates occur along the North Atlantic coast of the United States: winter skate (*Leucoraja ocellata*), little skate (*L. erinacea*), barndoor skate (*Dipturus laevis*), thorny skate (*Amblyraja radiata)*, smooth skate (*Malacoraja senta*), clearnose skate (*Raja eglanteria*), and rosette skate (*L. garmani*). Skates are currently managed under the New England Fishery Management Council's Skate Fishery Management Plan implemented in 2003. This plan has been changed over time and now includes mandatory reporting by species, possession prohibitions on thorny, and smooth skates, trip limits for the wing and bait fisheries, and Annual Catch Limits (ACL) for the wing and bait fisheries.

Indices of relative biomass (stratified mean weight/tow) have been developed from Northeast Fisheries Science Center's (NEFSC) bottom trawl surveys for the seven species in the skate complex. These indices and their rates of change form the basis for all of the conclusions about the status of the complex. Biomass indices and calibration coefficients are consistent with reporting from past years and have not been updated to account for variation in the swept area of the tows. Those indices and coefficients will be updated as part of the 2023 Management Track assessment for skates. All values for survey catch/tow in **Table 1** and **Figure 1** are expressed in "Albatross" units. The survey, range of years, and survey strata sets used as the basis of biological reference points for each species are given in **Table 1.** These strata sets were revised and accepted by the NEFMC SSC in 2011. The changes to the strata sets resulted in changes to biomass reference point values for all species except rosette skate, as well as a change to the overfishing reference point value for clearnose skate.

Calibration coefficients for seven skate species captured during NEFSC bottom trawl surveys:

Species	Calibration Coefficient (Std Err)*	Comment
Little *Leucoraja erinacea*	2.785519 (0.32)	Spring Survey
Winter *Leucoraja ocellata*	2.174334 (0.31)	Fall Survey
Barndoor *Dipturus laevis*	3.661128 (0.51)	Fall Survey
Thorny *Amblyraja radiata*	3.626359 (0.58)	Fall Survey
Smooth *Malacoraja senta*	4.449518 (0.67)	Fall Survey
Clearnose *Raja eglanteria*	6.189401 (0.81)	Fall Survey
Rosette *Leucoraja garmani*	8.813973 (0.98)	Based on the calibration coefficient for little skate in the fall survey comparisons

*Calibration coefficients represent the ratio of *Bigelow* to *Albatross* catch weight per tow.

Biomass reference points are based entirely on NEFSC survey data, as reliable landings and discard information are not available by species. For all species except barndoor, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species through fall 2007 or spring 2008 (**Table 1**). For barndoor skate, the B_{MSY} proxy is defined as the average of 1963-1966 fall survey biomass indices since the survey did not catch barndoor for a protracted period.

Bottom trawl surveys in spring 2015-19 were complete. However, ship problems delayed the start of the 2014 spring survey until late March and a decision was made, for that survey only, to drop any strata south of Delaware (Offshore 61-68; Inshore 32, 35, 38, 41, and 44; **Figures 2 and 3**). The consequences of the delay were relatively minor for assessment of the skate complex overall because only the little skate assessment relies on the spring survey. The time series trends without the southern strata are very similar to the full assessment strata set and are generally within the 95% confidence limits of each series (**Figure 4**). Based on survey data from multiple years, the ratio between the survey indices from the smaller (truncated) strata set and the full strata set is 1.091 kg/tow. Therefore, the estimated little skate index for spring 2014 was adjusted downward (i.e., divided) by this factor to account for the difference in spatial coverage that year. Some caution should be exercised when interpreting this value.

The spring 2016 survey was complete but delayed by several weeks. The mean Julian Day from 1982-2013 ranged from 80-103. In 2014-2016, the mean Julian Days were 121, 99, and 130. It is unknown what impact this has on the little skate survey results.

Bottom trawl surveys in fall 2014-2016 and 2019 were complete. The 2017 fall survey was incomplete and only strata from the Gulf of Maine and Georges Bank were completed (Offshore Strata 13-30, 36-40; **Figures 2 and 3**). This has major consequences for the skate complex. For two species, clearnose skate and rosette skate, there is no survey index for fall 2017 and a two-year average (2016+2018) was used in 2019 for stock status, even though alternatives were run in 2019 (**Figures 5 and 6)**. For the remaining species which use the fall survey, a ratio similar to that used for little skate in 2014 was used to adjust the survey indices to account for the missing strata. For these species, the majority of the stock happens to occur in the strata that were sampled, so the consequences were not as great as for the other two species.

For barndoor skate, smooth skate, thorny skate, and winter skate the lack of coverage in the Southern New England and the Mid-Atlantic strata described above for fall 2017 was analyzed for the entire time series to show the difference between including and excluding these strata on the estimate of mean biomass. In general, all four species of skate are more abundant in the northern strata. Thus relative biomass estimates (kg/tow) based on the northern strata only will be higher than estimates based on the entire strata set. Over the entire time series (1967-2016 or 1963-2016) the ratios of the time series without the southern strata to the full strata set, 1.223, 1.418, 1.423, and 1.610, respectively (**Figures 7-10**). To adjust the observed 2017 value for these average ratios, the 2017 values of 1.888, 0.476, 0.305, and 13.527 were divided by 1.223, 1.418, 1.423, and 1.610 yielding values of 1.54, 0.34, 0.21, and 8.40.

In fall 2018, offshore strata 30, 34, and 35 were not sampled and offshore stratum 36 only had 1 tow. This impacts barndoor skate, smooth skate, thorny skate, and winter skate. The same method as used for 2017 was used. The ratios were 0.998, 0.860, 0.996, and 1.051, respectively (**Figures 11-14**). Even though the values for barndoor and thorny skate were near one, these 4 factors were still applied to index values of 2.798, 0.214, 0.141, and 6.740 to yield modified values of 2.804, 0.249, 0.142 and 6.415, for consistency with previous years.

The spring 2020 survey only covered a small portion of the survey area and the fall survey was not conducted due to COVID-19 restrictions. Therefore, there are no 2020 indices for any species.

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 CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that skate species. The average CVs of the indices are given (as percent change for overfishing status determination in FMP) by species in **Table 1**.

For barndoor skate, the 2019 and 2021 average NEFSC fall survey biomass index of 1.52 kg/tow is above the biomass threshold reference point (0.78 kg/tow) but slightly below the B_{MSY} proxy (1.57 kg/tow). The 2019 and 2021 average index is below the 2017-2019 average index by 24.8%, which is less than the threshold percent change of 30%. It is recommended that this stock is not overfished and overfishing is not occurring.

For clearnose skate, the 2019 and 2021 average NEFSC fall biomass index of 1.10 kg/tow is above the biomass threshold reference point (0.33 kg/tow) and the B_{MSY} proxy (0.66 kg/tow). The 2019 and 2021 average index is above the 2018 and 2019 average index by 4.4%. It is recommended that this stock is not overfished and overfishing is not occurring.

For little skate, the 2021-2022 NEFSC spring average biomass index of 4.07 kg/tow is above the biomass threshold reference point (3.07 kg/tow) but below the B_{MSY} proxy (6.15 kg/tow). The 2021-2022 average index is below the 2019 and 2021 average by 15.8%, which is less than the threshold percent change of 20%. It is recommended that this stock is not overfished and overfishing is not occurring.

For rosette skate, the 2019 and 2021 average NEFSC fall biomass index of 0.054 kg/tow was above the biomass threshold reference point (0.024 kg/tow) and above the B_{MSY} proxy (0.048 kg/tow). The 2019 and 2021 average index is above the 2018 and 2019 average index by 7.6%. It is recommended that this stock is not overfished and overfishing is not occurring.

For smooth skate, the 2019 and 2021 average NEFSC fall biomass index of 0.20 kg/tow is above the biomass threshold reference point (0.134 kg/tow) but below the B_{MSY} proxy (0.27 kg/tow). The 2019 and 2021 average index is below the 2017-2019 average index by 26.2%, which is less than the threshold percent change of 30%. It is recommended that this stock is not overfished and overfishing is not occurring.

For thorny skate, the 2019 and 2021 average NEFSC fall biomass index of 0.15 kg/tow is well below the biomass threshold reference point (2.06 kg/tow). The 2019 and 2021 average index is below the 2017-2019 average index by 19.0%, which is less than the threshold percent change of 20%. It is recommended that this stock is overfished but overfishing is not occurring.

For winter skate, the 2019 and 2021 average NEFSC fall biomass index of 9.70 kg/tow is above the biomass threshold reference point (2.83 kg/tow) and above the B_{MSY} proxy (5.66 kg/tow). The 2019 and 2021 average index is above the 2017-2019 average index by 12.7%. It is recommended that this stock is not overfished and overfishing is not occurring.

References

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Sosebee K, Miller A, O'Brien L, McElroy D, Sherman S. 2016. Update of Thorny Skate, *Amblyraja radiata*, Commercial and Survey Data. Northeast Fish Sci Cent Ref Doc. 16-08; 145 pp.

Sosebee, K. 2018. 2017 NE Skate Stock Status Update. Memo to Greater Atlantic Regional Fisheries Office; 15 pp.

	BARNDOOR	CLEARNOSE	LITTLE	ROSETTE	SMOOTH	THORNY	WINTER
Survey (kg/tow)	**Autumn**	**Autumn**	**Spring**	**Autumn**	**Autumn**	**Autumn**	**Autumn**
Time Series Basis	**1963-1966**	**1975-2007**	**1982-2008**	**1967-2007**	**1963-2007**	**1963-2007**	**1967-2007**
Strata Set	**Offshore 1-30, 34-40**	**Offshore 61-76, Inshore 17,20,23,26,29,32,35, 38,41,44**	**Offshore 1-30, 34-40, 61-76, Inshore 2,5,8,11,14,17,20,23,26,29,32,35,38,41,44-46,56,59-61,64-66**	**Offshore 61-76**	**Offshore 1-30, 34-40**	**Offshore 1-30, 34-40**	**Offshore 1-30, 34-40, 61-76**
2014	1.62	0.61	6.54[a]	0.053	0.22	0.21	6.95
2015	2.08	0.82	6.82	0.045	0.25	0.19	6.15
2016	1.09	0.34	3.56[b]	0.044	0.27	0.13	6.84
2017	1.54[c]	[c]	6.09	[c]	0.34[c]	0.21[c]	8.40[c]
2018	2.80[e]	0.88	4.41	0.051	0.25[e]	0.14[e]	6.41[e]
2019	1.71	1.23	5.45	0.050	0.24	0.18	11.00
2021	1.33	0.97	4.21	0.058	0.17	0.11	8.40
2022			3.92				
2015-2017 3-year average	1.57[c]	[c]	5.49[b]	[c]	0.27[c]	0.18[c]	7.13[c]
2016-2018 3-year average	1.81[c,e]	0.61[d]	4.69[b]	0.047[d]	0.27[c,e]	0.16[c,e]	7.22[c,e]
2017-2019 3-year average	2.02 [c,e]	1.05[d]	5.32	0.050[d]	0.27 [c,e]	0.18 [c,e]	8.61 [c,e]
2019-2021 2 year average	1.52[f]	1.10 [f]	4.83 [f]	0.054 [f]	0.20 [f]	0.15 [f]	9.70 [f]
2021-2022 2 year average			4.07 [f]				
Percent change 2016-2018 compared to 2015-2017	+15.3 [c,e]	+3.1 [d]	-14.6 [b]	+0.1 [d]	-0.2 [c,e]	-8.4 [c,e]	+1.2 [c,e]
Percent change 2017-2019 compared to 2016-2018	+11.4 [c,e]	+73.1 [d]	+13.4 [b]	+6.4 [d]	+1.7 [c,e]	+11.4 [c,e]	+19.2 [c,e]
Percent change 2019-2021 compared to 2017-2019	-24.8 [f]	+4.4 [f]	-9.1 [f]	+7.6 [f]	-26.2 [f]	-19.0 [f]	+12.7 [f]
Percent change 2021-2022 compared to 2019-2021			-15.8 [f]				
Percent change for overfishing status determination in FMP	-30	-40	-20	-60	-30	-20	-20
Biomass Target	1.57	0.66	6.15	0.048	0.27	4.13	5.66
Biomass Threshold	0.78	0.33	3.07	0.024	0.13	2.06	2.83

Table 1. a. No survey tows completed south of Delaware in spring 2014. Values for 2014 were adjusted for missing strata (Offshore 61-68, Inshore 32, 35, 38, 41, 44) but may not be fully comparable to other surveys which sampled all strata. b. The 2016 spring survey was later than usual. c. No survey tows completed south of Georges Bank in fall 2017. Values either missing or adjusted for missing strata (Offshore 1-12, 61-76). d. Two-year average due to missing 2017 survey. e. Values were adjusted for missing Offshore strata 30, 34 and 35. f. Spring and fall surveys not completed due to COVID 19 restrictions.

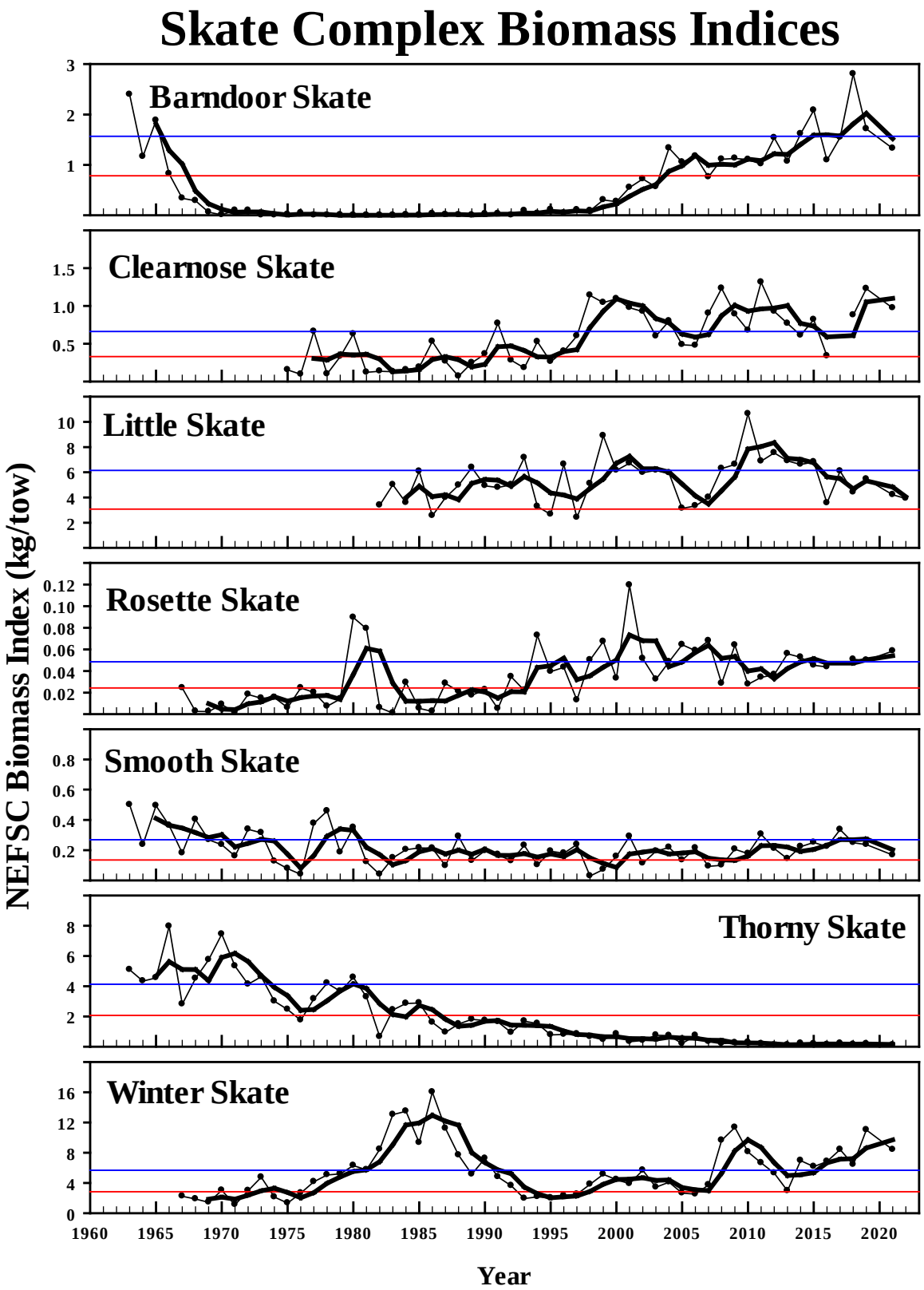

Figure 1. NEFSC survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal lines are the biomass thresholds and targets developed through 2007/2008 with consistent strata sets.

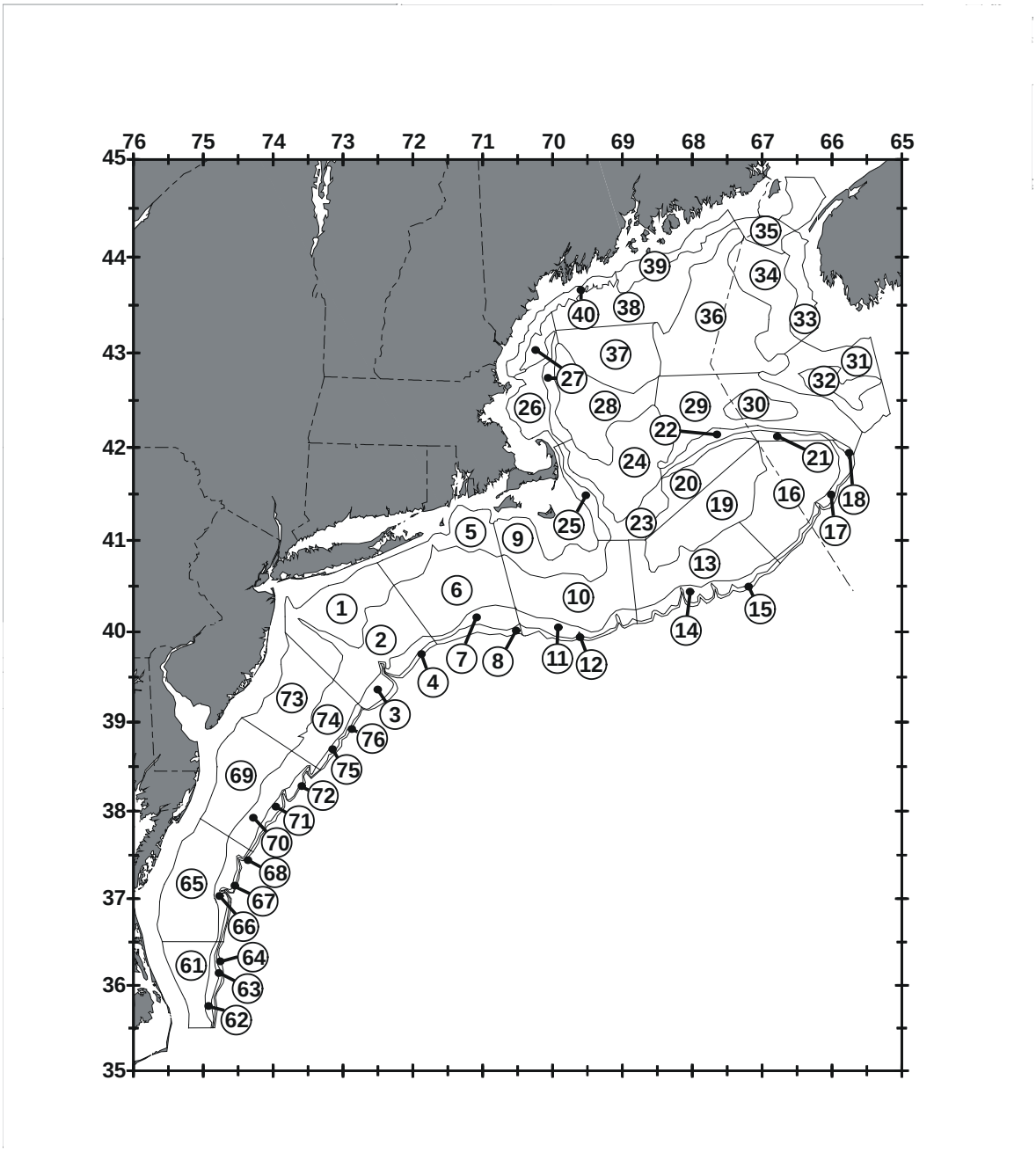

Figure 2. Offshore strata from the NEFSC spring and fall surveys.

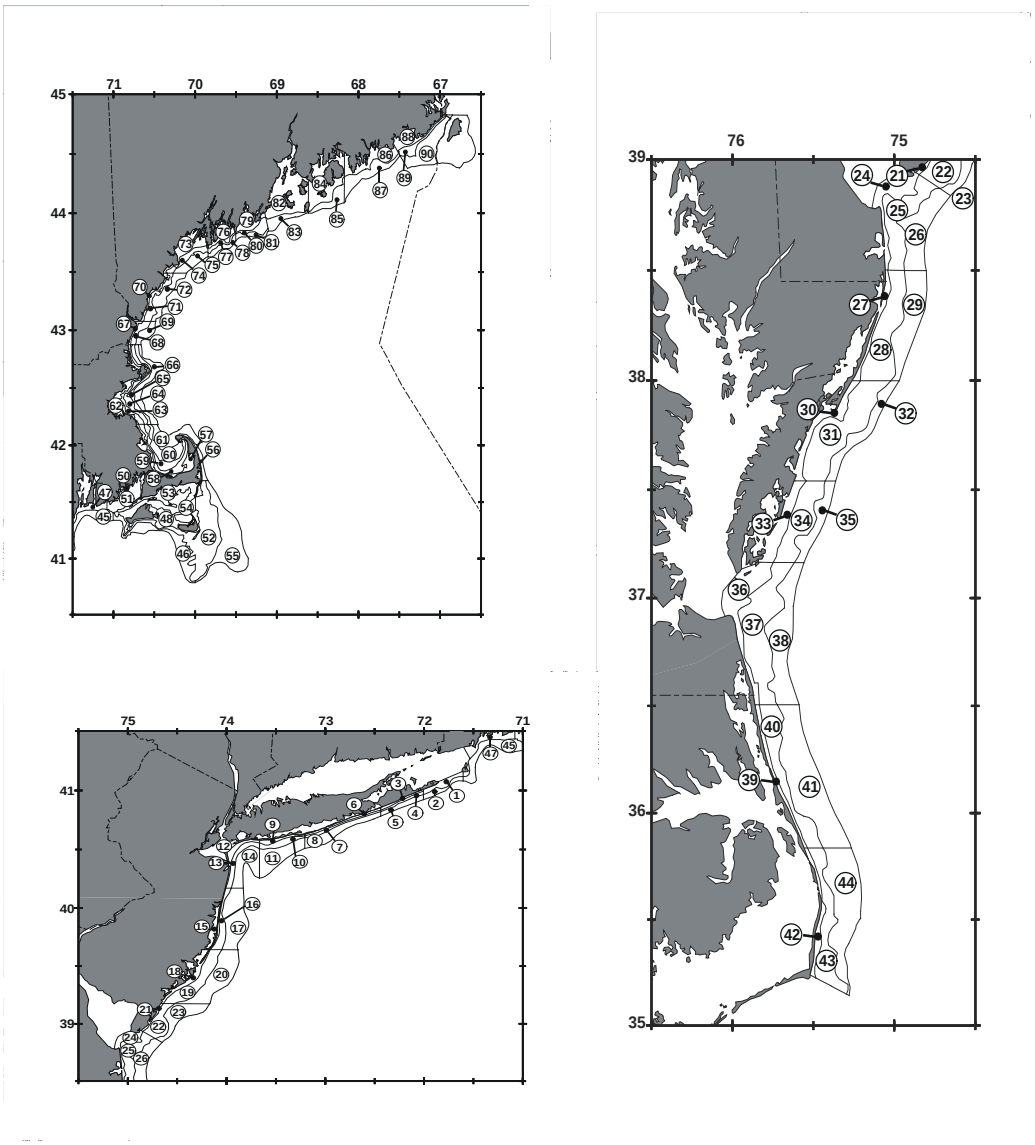

Figure 3. Inshore strata from the NEFSC spring and fall surveys.

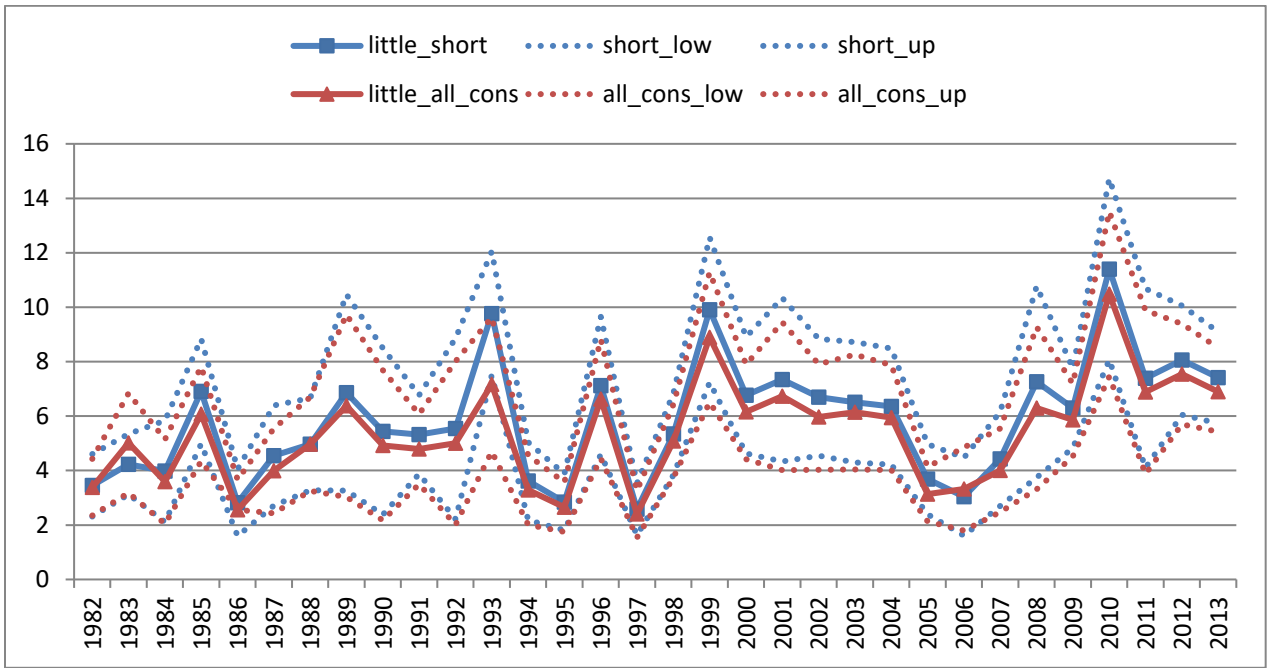

Figure 4. Little skate spring indices (kg/tow) based on all strata (i.e., full strata set; red triangles) and based on truncated strata set (i.e., strata south of Delaware Bay were removed; blue squares) from 1982-2013. The 95% confidence limits for each series are shown as dotted lines in the same color. The survey catch ratio of the truncated strata set to the full strata set is 1.091 (based on a ratio estimator = sum across years of survey estimates based on truncated series divided by sum of estimates based on full strata set).

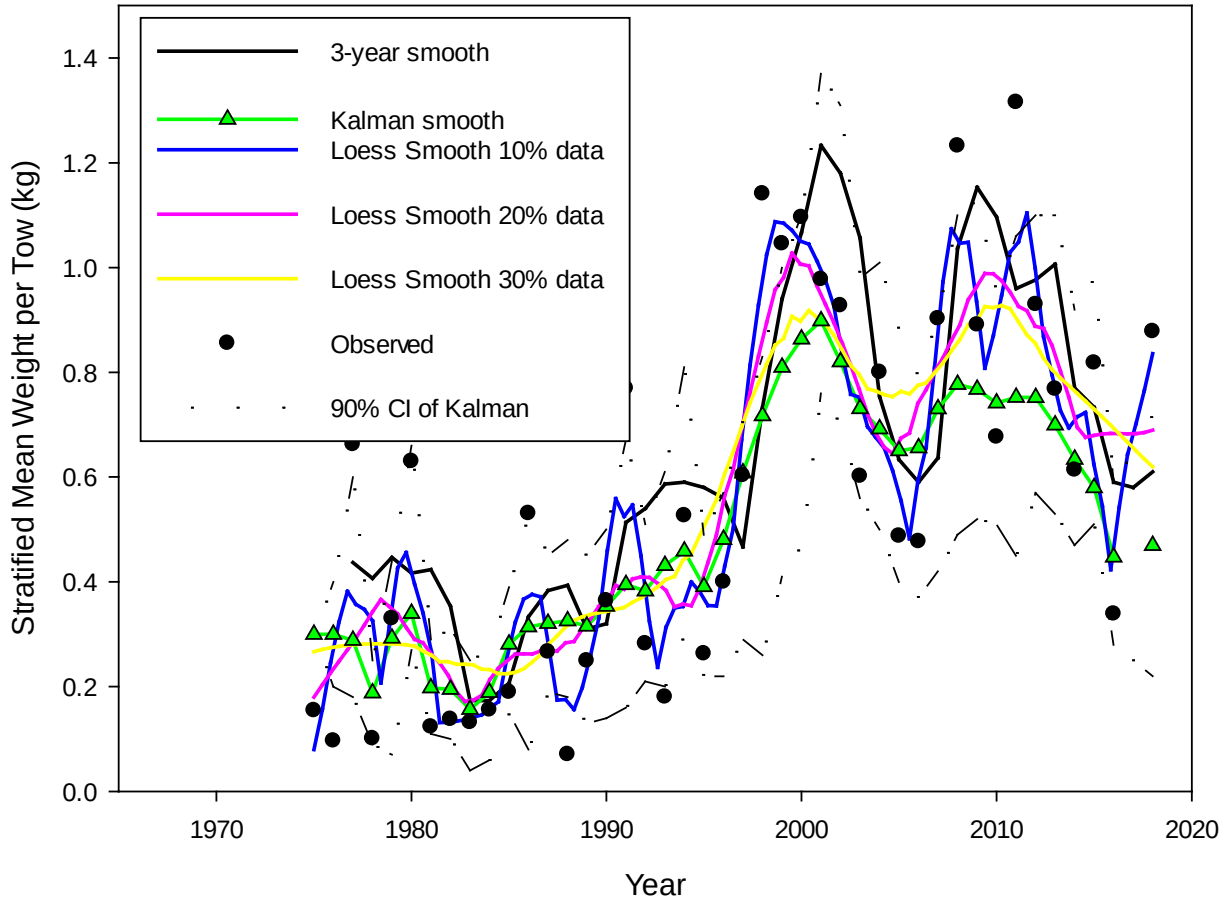

Figure 5. Comparison of smoothers for clearnose skate.

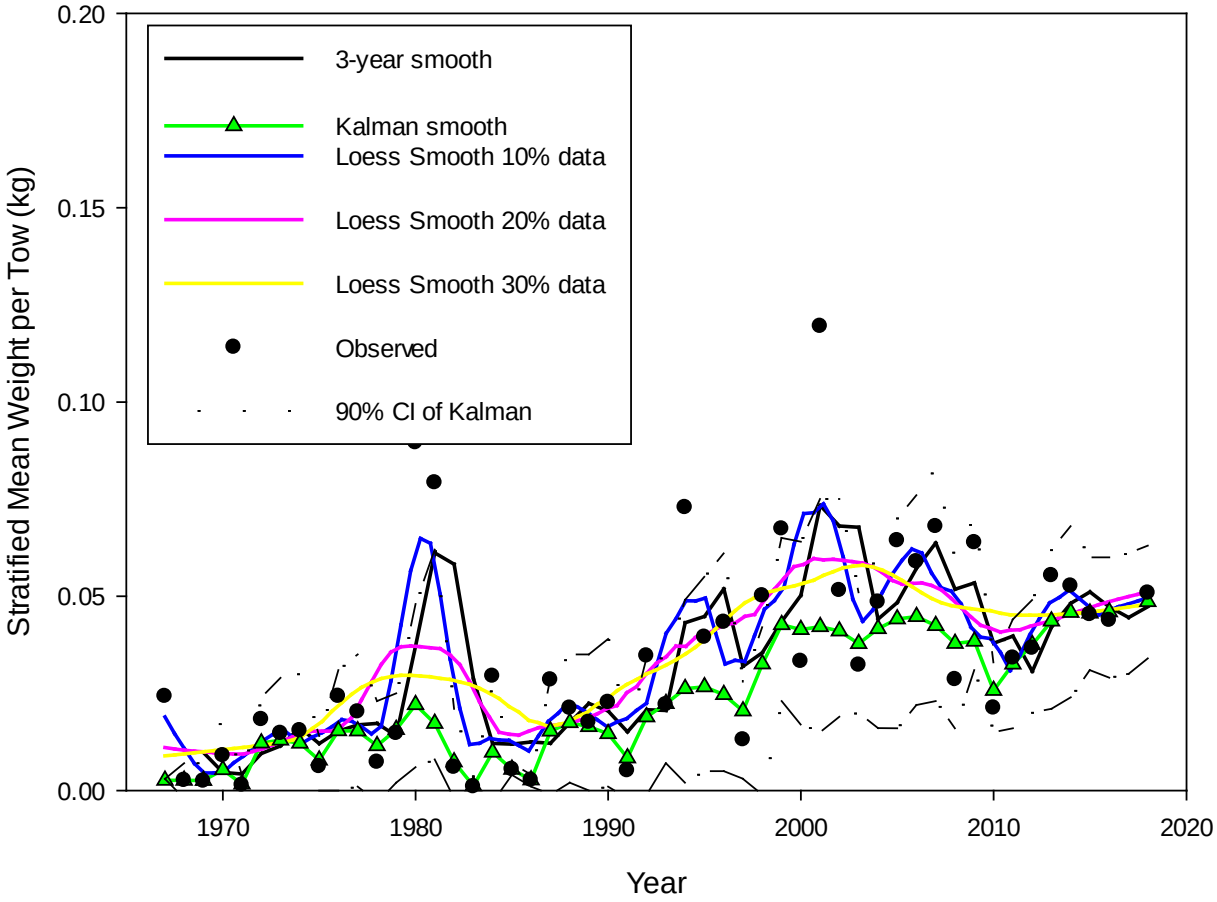

Figure 6. Comparison of smoothers for rosette skate.

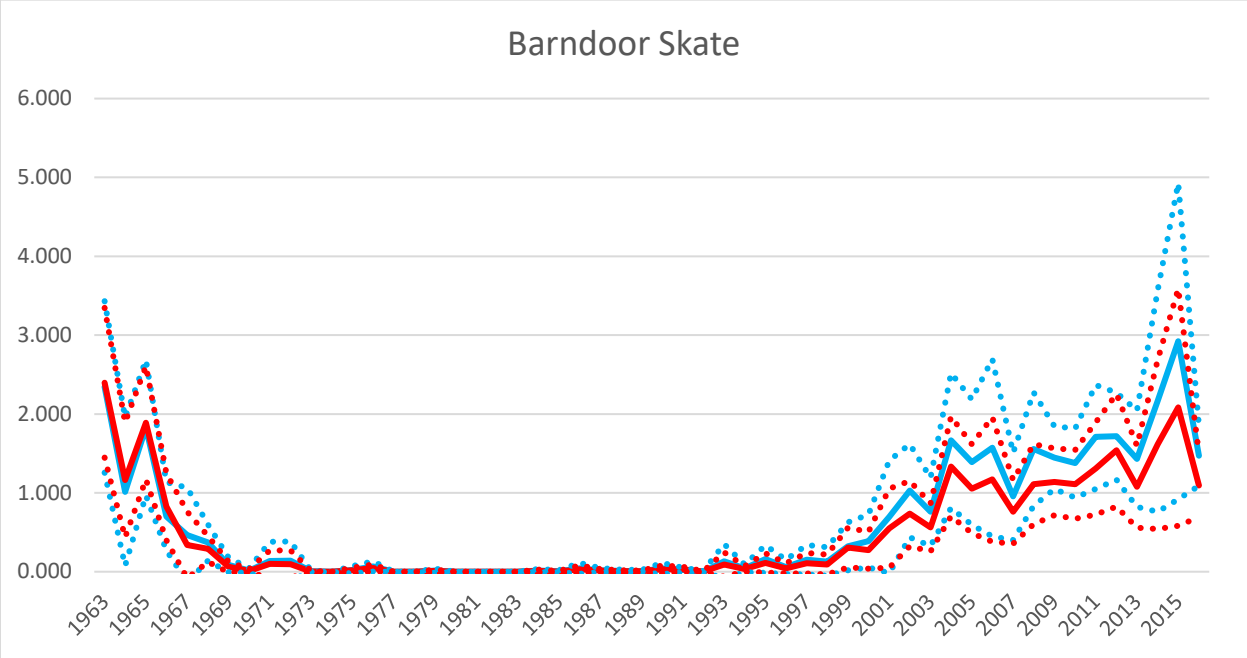

Figure 7. Barndoor skate autumn indices (kg/tow) based on offshore strata from Gulf of Maine to Southern New England (full strata set; red) and based on truncated strata set (strata south of Georges Bank were removed; blue) from 1963-2016. The 95% confidence limits for each series are shown as dotted lines in the same color. The survey catch ratio of the truncated strata set to the full strata set is 1.222 (based on a ratio estimator = sum across years of survey estimates based on truncated series divided by sum of estimates based on full strata set).

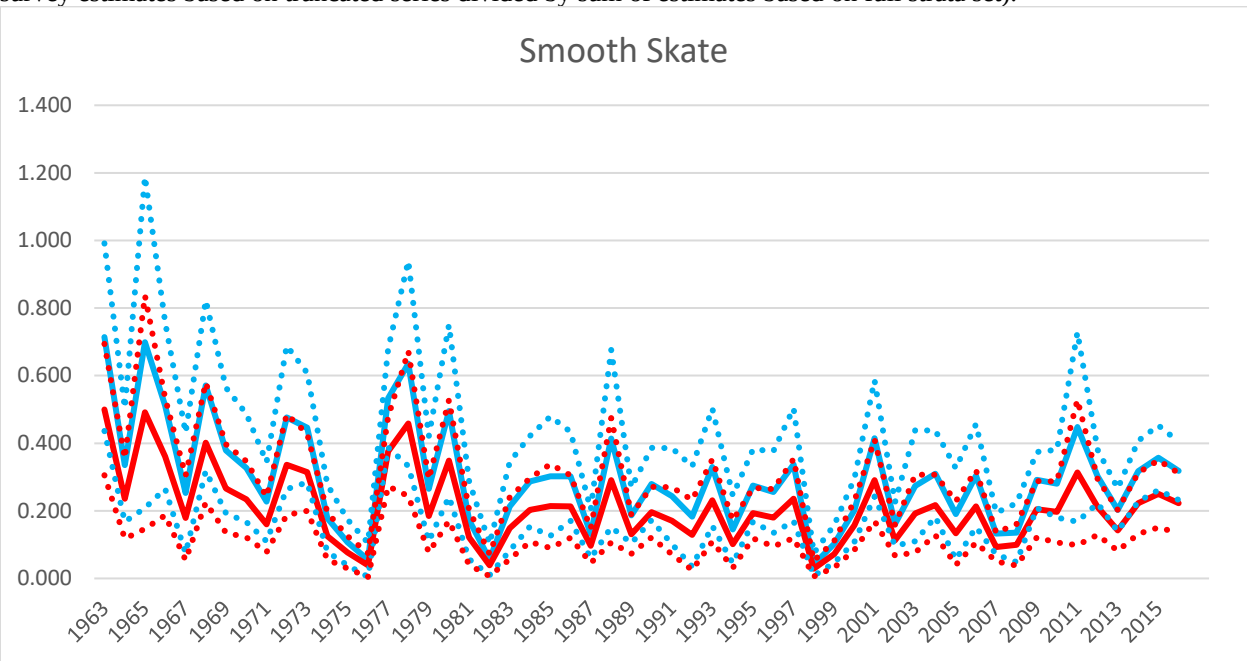

Figure 8. Smooth skate autumn indices (kg/tow) based on offshore strata from Gulf of Maine to Southern New England (full strata set; red) and based on truncated strata set (strata south of Georges Bank were removed; blue) from 1963-2016. The 95% confidence limits for each series are shown as dotted lines in the same color. The survey catch ratio of the truncated strata set to the full strata set is 1.418 (based on a ratio estimator = sum across years of survey estimates based on truncated series divided by sum of estimates based on full strata set).

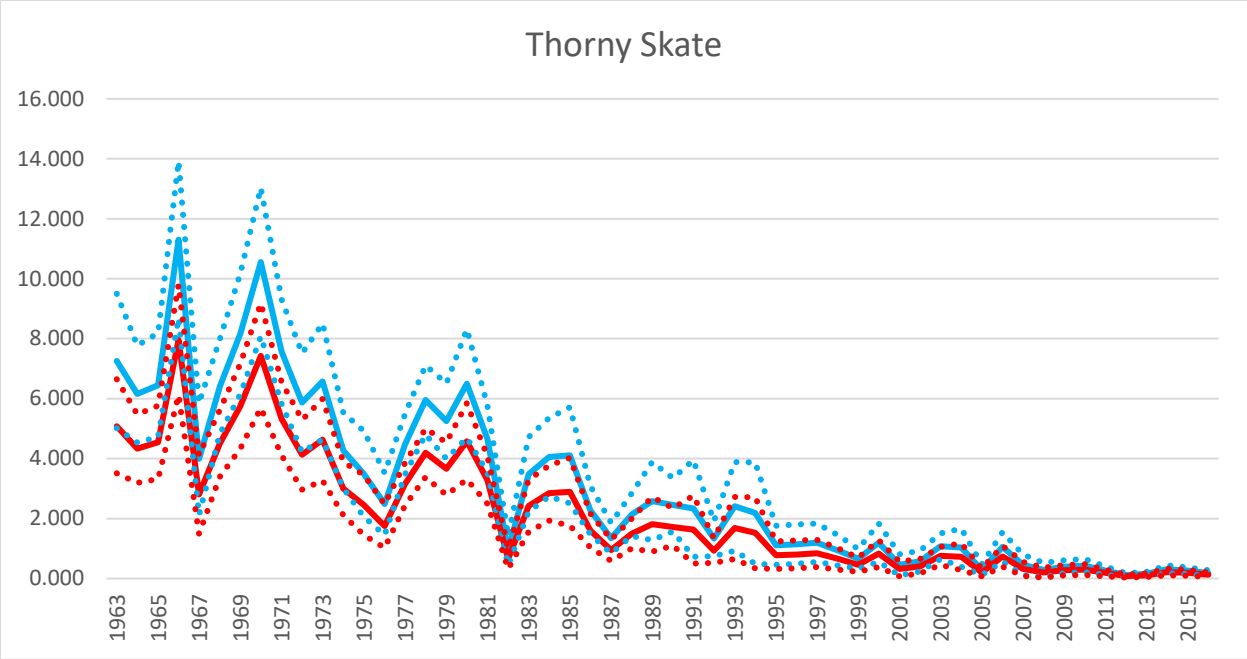

Figure 9. Thorny skate autumn indices (kg/tow) based on offshore strata from Gulf of Maine to Southern New England (full strata set; red) and based on truncated strata set (strata south of Georges Bank were removed; blue) from 1963-2016. The 95% confidence limits for each series are shown as dotted lines in the same color. The survey catch ratio of the truncated strata set to the full strata set is 1.423 (based on a ratio estimator = sum across years of survey estimates based on truncated series divided by sum of estimates based on full strata set).

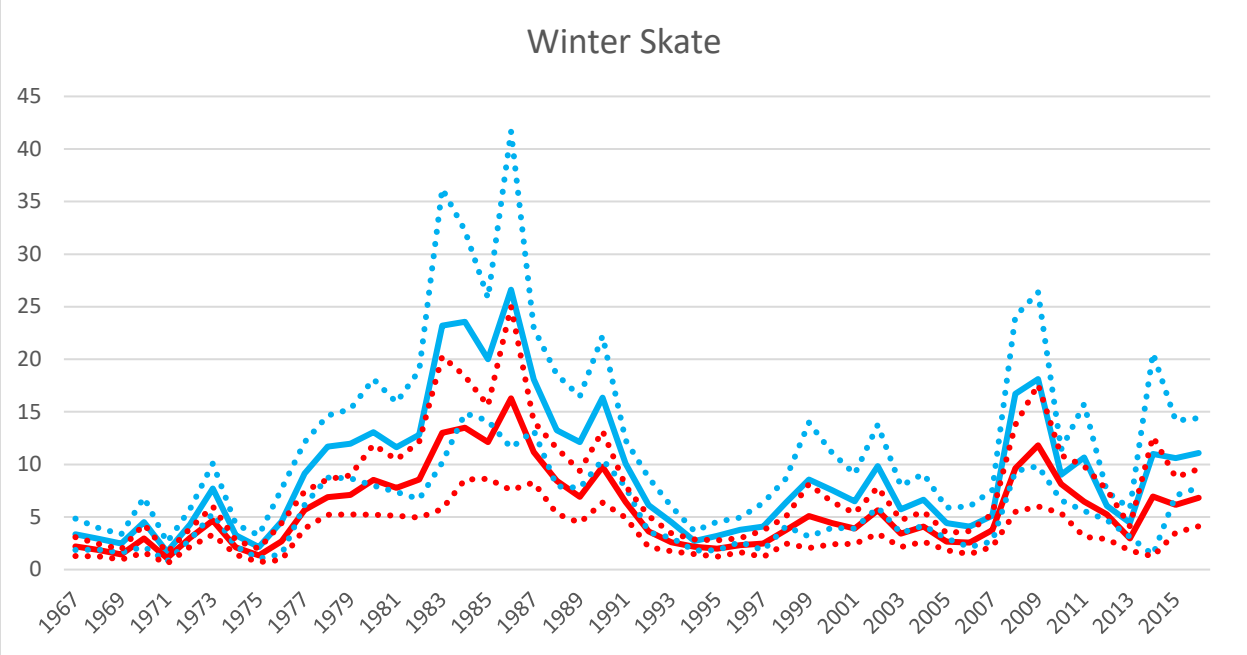

Figure 10. Winter skate autumn indices (kg/tow) based on all offshore strata (full strata set; red) and based on truncated strata set (strata south of Georges Bank were removed; blue) from 1967-2016. The 95% confidence limits for each series are shown as dotted lines in the same color. The survey catch ratio of the truncated strata set to the full strata set is 1.610 (based on a ratio estimator = sum across years of survey estimates based on truncated series divided by sum of estimates based on full strata set).

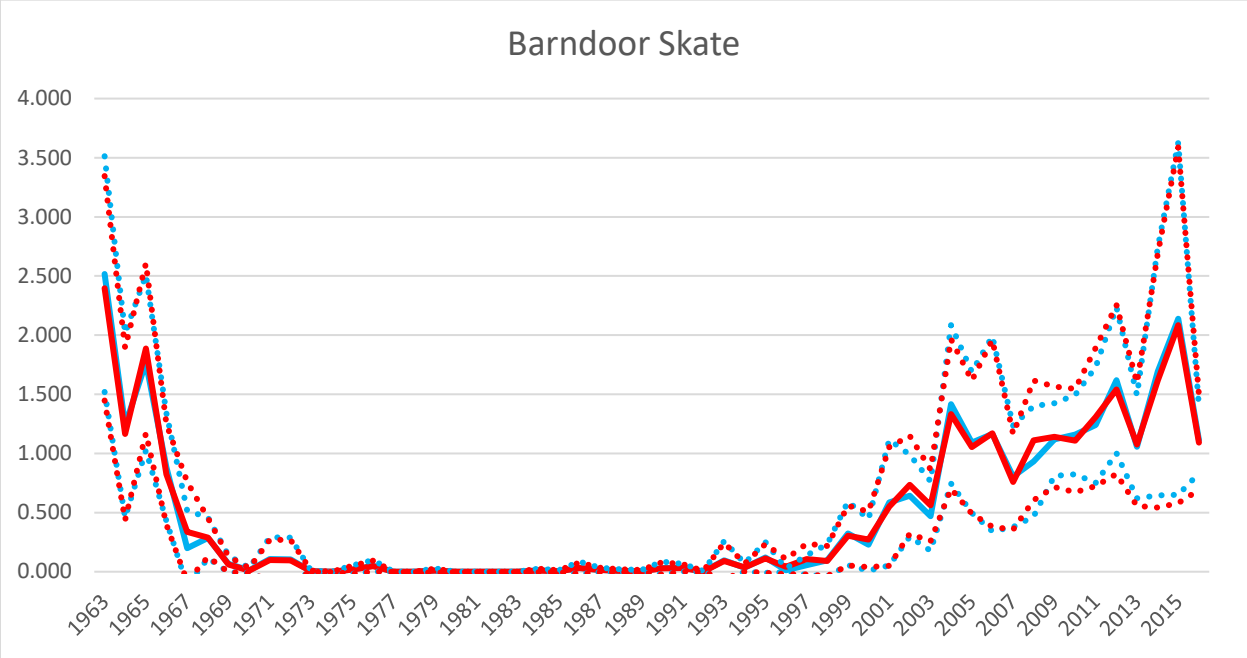

Figure 11. Barndoor skate autumn indices (kg/tow) based on offshore strata from Gulf of Maine to Southern New England (full strata set; red) and based on truncated strata set (offshore strata 01300, 01340, and 01351 were removed; blue) from 1963-2016. The 95% confidence limits for each series are shown as dotted lines in the same color. The survey catch ratio of the truncated strata set to the full strata set is 0.998 (based on a ratio estimator = sum across years of survey estimates based on truncated series divided by sum of estimates based on full strata set).

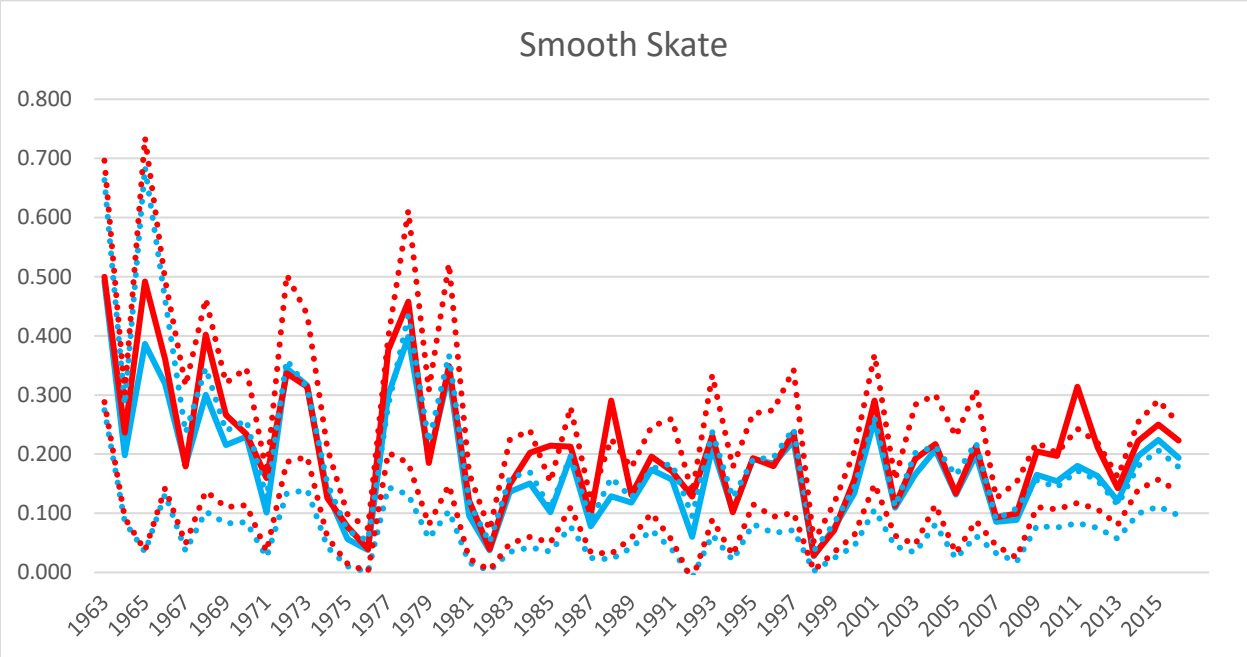

Figure 12. Smooth skate autumn indices (kg/tow) based on offshore strata from Gulf of Maine to Southern New England (full strata set; red) and based on truncated strata set (offshore strata 01300, 01340, and 01351 were removed; blue) from 1963-2016. The 95% confidence limits for each series are shown as dotted lines in the same color. The survey catch ratio of the truncated strata set to the full strata set is 0.860 (based on a ratio estimator = sum across years of survey estimates based on truncated series divided by sum of estimates based on full strata set).

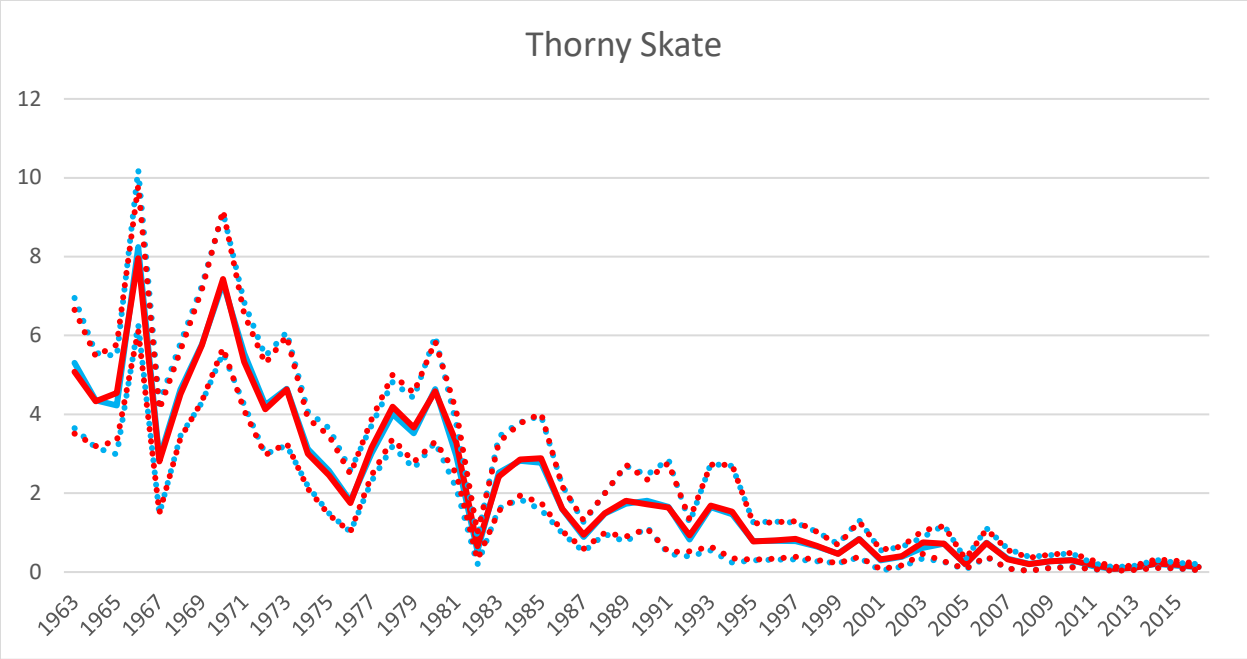

Figure 13. Thorny skate autumn indices (kg/tow) based on offshore strata from Gulf of Maine to Southern New England (full strata set; red) and based on truncated strata set (offshore strata 01300, 01340, and 01351 were removed; blue) from 1963-2016. The 95% confidence limits for each series are shown as dotted lines in the same color. The survey catch ratio of the truncated strata set to the full strata set is 0.996 (based on a ratio estimator = sum across years of survey estimates based on truncated series divided by sum of estimates based on full strata set).

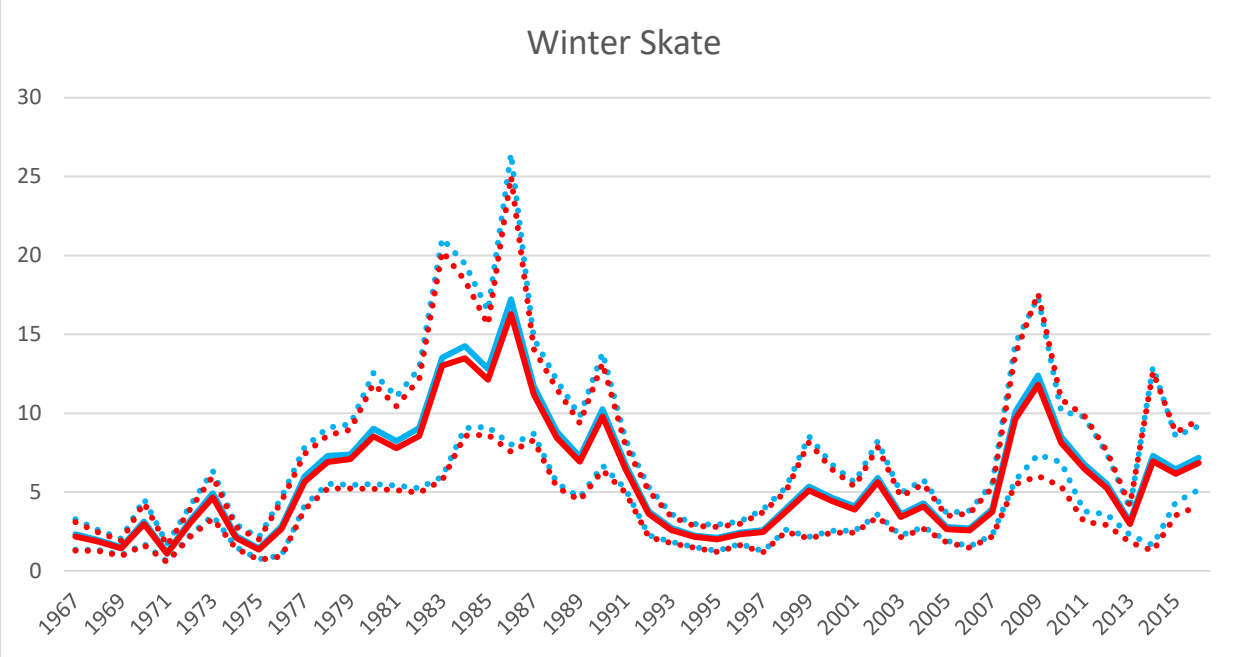

Figure 14. Winter skate autumn indices (kg/tow) based on all offshore strata (full strata set; red) and based on truncated strata set (offshore strata 01300, 01340, and 01351 were removed; blue) from 1967-2016. The 95% confidence limits for each series are shown as dotted lines in the same color. The survey catch ratio of the truncated strata set to the full strata set is 1.051 (based on a ratio estimator = sum across years of survey estimates based on truncated series divided by sum of estimates based on full strata set).

APPENDIX II
FY 2019 AND 2020 FISHERY PERFORMANCE TABLES

Provided here are tables for FY 2019 and 2020 in-season monitoring and year-end catch accounting using the old and new methods for comparison.

For both years, the new methods would have tracked fewer landings in-season against the Wing and Bait Total Allowable Landings (TAL, Table 1). This is expected, because the new method does not include landings without a federal skate permit on the day of landing in federal quota monitoring. The difference in landings between the old and new methods is very small. About 1% fewer landings would have been monitored in-season against TALs.

Table 1. FY 2019 and 2020 in-season monitoring of Northeast skate wing and bait landings (live weights).

	TAL		**Active Federal Permit (old method)**			**Active Federal Skate Permit (new method)**		
	lb	mt	lb	mt	%	lb	mt	%
FY 2019								
Wing	23,146,333	10,499	19,014,293	8,637	82%	18,620,780	8,446,	80%
Bait	11,660,249	5,289	8,539,124	3,873	73%	8,537,124	3,872	73%
Total	**34,806,582**	**15,788**	**27,580,417**	**12,510**	**79%**	**27,157,904**	**12,319**	**78%**
FY 2020								
Wing	26,188,712	11,879	20,482,224	9,291	78%	20,2000,770	9,163	77%
Bait	13,192,462	5,984	7,496,802	3,400	57%	7,496,802	3,400	57%
Total	**39,381,174**	**17,863**	**27,976,026**	**12,691**	**71%**	**27,697,572**	**12,563**	**70%**

Source: cfders2021 and cfders2022, Vessel Trip Reports, and permit databases, accessed 7/08/2022.
Notes:

- Data aggregates landings from the weekly, in-season quota monitoring reports.
- "Active Federal Permit" (old) includes all skate landings from vessels with a Federal fishing permit on the day of landing.
- "Active Federal Skate Landings" (new) is the subset of landings with a Federal skate permit on the day of landing.

For year-end accounting (Table 2), the new method adds skate landings that are reported only via Vessel Trip Reports (i.e., non-landed bait). For FY 2019 and 2020, this source of catch increased the total catch relative to the Annual Catch limit (ACL), but by a very small amount, under 1%. The new method also redefines federal and state landings for year-end accounting, such that state landings are no longer just the landings from vessels with permit # = 000000, but now includes landings by vessels that do not have a federal skate permit on the day of landing. This change did not impact total catch relative to the ACL but shifted landings between the "federal commercial landings" and "state-permitted only vessel landings", putting 794 mt and 527 mt more into the state landings than under the prior method.

Table 2. FY 2019 year-end Northeast skate complex ACL accounting.

	Live weight		Percent of ACL
	(lb)	(mt)	
FY 2019 – old method (ACL = 31,327 mt)			
Northeast skate federal commercial landings	29,557,251	13,407	42.8%
Northeast skate state-permitted only vessel landings	782,912	355	1.1%
Northeast skate estimated dead discards	13,144,115	5,962	19.0%
Northeast skate recreational catch	2,229,125	1,011	3.2%
Total Northeast skate catch	**45,713,403**	**20,735**	**66.2%**
FY 2019 – new method			
Northeast skate federal commercial landings	27,807,878	12,613	40.3%
Northeast skate state-permitted only vessel landings	2,532,286	1,149	3.7%
Northeast skate non-landed bait	463,069	210	0.6%
Northeast skate estimated dead discards	13,144,115	5,962	19.0%
Northeast skate recreational catch	2,229,125	1,011	3.2%
Total Northeast skate catch	**46,176,472**	**20,945**	**66.9%**
FY 2020 – old method (ACL = 32,715 mt)			
Northeast skate federal commercial landings	29,384,506	13,329	40.7%
Northeast skate state-permitted only vessel landings	719,304	326	1.0%
Northeast skate estimated dead discards	18,791,428	8,524	26.1%
Northeast skate recreational catch	692,135	314	1.0%
Total Northeast skate catch	**49,587,373**	**22,492**	**68.8%**
FY 2020 – new method			
Northeast skate federal commercial landings	28,223,460	12,802	39.1%
Northeast skate state-permitted only vessel landings	1,880,350	853	2.6%
Northeast skate non-landed bait	485,421	220	0.7%
Northeast skate estimated dead discards	18,791,428	8,524	26.1%
Northeast skate recreational catch	692,135	314	1.0%
Total Northeast skate catch	**50,072,794**	**22,713**	**69.4%**

Source of FY 2019 data: Commercial fisheries dealer database accessed 8/9/2022; Northeast Fishery Observer Program database, accessed 7/01/2020; Marine Recreational Information Program reports, accessed 7/06/2020; and VTR database accessed 8/2022 (new method only).
Source of FY 2020 data: Commercial fisheries dealer database accessed 8/9/2022; Northeast Fishery Observer Program database, accessed 6/30/2021; Marine Recreational Information Program reports, accessed 7/07/2022; and VTR database accessed 8/2022 (new method only).

Notes:

- "Northeast skate federal commercial landings"
  - Old: landings by vessels with permit >000000, including without a federal skate permit.
  - New: landings by vessels that had a federal skate permit on the day of landing (include research landings reported to federal dealers).
- "Northeast skate state-permitted only vessel landings"
  - Old: landings by vessels with permit = 000000.

- New: landings with no federal skate permit on the day of landing.
- Both may include state permitted landings reported by state-only dealers provided to GARFO from states.

- "Northeast skate non-landed bait" (new) is catch not reported only in VTRs (not by federal dealers). This year, there was no research catch reported only in VTRs.
- "Northeast skate estimated dead discards" is based on landings of all species and skate discards on observed trips extrapolated to all commercial landings of all species (weighted by area, gear, etc.) to calculate total skate discards. Then, a discard mortality rate is applied to the calculated total skate discards (discard estimation method differs from how discards are estimated during specifications setting, which uses the NEFSC method).
- "Northeast skate recreational catch" is private angler and party/charter landings and dead discards.