



Mid-Atlantic Fishery Management Council

800 North State Street, Suite 201, Dover, DE 19901

Phone: 302-674-2331 | FAX: 302-674-5399 | www.mafmc.org

Michael P. Luisi, Chairman | P. Weston Townsend, Vice Chairman

Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

Date: March 24, 2023
To: Council
From: Jason Didden
Subject: *Illex* Specifications

At the April 2023 meeting, the Council will review 2023 *Illex* specifications (making modifications if appropriate) and approve 2024-2025 *Illex* specifications. The following materials are included to support Council action:

1. Staff and Monitoring Committee Recommendations
2. Scientific and Statistical Committee (SSC) Report – See Committee Reports Tab
3. Staff ABC Recommendation Memo to Chris Moore
4. Fishery Performance Report
5. Fishery Information Document



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MEMORANDUM

Date: March 24, 2023
To: Chris Moore
From: Jason Didden
Subject: *Illex* Specifications – Staff and Monitoring Committee Recommendations

Staff recommends no change to the 2023 *Illex* specifications – the Scientific and Statistical Committee endorsed the status-quo 40,000 metric ton (MT) *Illex* Acceptable Biological Catch (ABC) for 2023 and recommended the same for 2024-2025.

Currently, 4.52% of the ABC, or 1,808 MT, is set aside for discards based on historical observations. The Mackerel, Squid, and Butterfish (MSB) Monitoring Committee¹ observed that discards varied from 315 MT to 1,407 MT from 2012-2021 and that these discard estimates may be impacted by lower observer coverage in 2020-2021 due to COVID-19. Noting the two years before COVID-19 (2018-2019) had discards of 1,407 MT and 1,331 MT, and that those were years when the quota was achieved, the Monitoring Committee concluded that the average, 1,369 MT, would avoid the specifications being exceeded. As such, they recommended this discard set-aside for future specifications.

No other changes to *Illex* specifications appeared warranted based on the information available to the Monitoring Committee. However, the public noted that the approaches taken by the Council/Monitoring Committee for *Illex* appeared stringent relative to some other fisheries/sectors managed by the Council.

Non-Target Species – Directed *Illex* Fishery (summarized from draft Environmental Assessment for 2023 *Illex* Specifications)

Staff was directed to include available discard information as part of all 2023 specifications processes. Since the Standardized Bycatch Reporting Methodology focuses on **discards of managed stocks** rather than discards in managed fisheries, staff analyses of discards vary fishery by fishery depending on data availability and historical practices. The Environmental Assessment for 2023 *Illex* specifications used discard ratios and recent landings to develop

¹ Members of the Monitoring Committee attending a short March 23, 2023 webinar meeting included Jason Didden, Chuck Adams, Lisa Hendrickson, Daniel Hocking, and Maria Fenton. Others attending included Alissa Wilson, Greg DiDomenico, Jeff Kaelin, Katie Almeida, and Mary Sabo.

approximate bycatch amounts for various species encountered in the *Illex* fishery. Due to reduced observer coverage in 2020-2022 (from COVID-19), observer data from 2017-2019 were used.

From 2017-2019 there were on average 61 observed trips annually where *Illex* accounted for at least 50% of retained catch, and those trips form the basis of the following analysis. These trips made 1,298 hauls (averaging 7 hauls per trip) of which 93% were observed.

Using the discard ratio data from these observed hauls and recent *Illex* landings, Table 1 approximates annual discards in the directed *Illex* fishery from 2017-2019, for species estimated with catch of at least 10,000 pounds. The method used for the estimates in the table is a custom staff analysis, and is best considered as a relative indicator of discard species that may be affected by the fishery. On the *Illex* trips identified in this analysis, the 2017-2019 overall discard rate was 2%. The amounts of the various species discarded in the *Illex* fishery appear quite small including for the species noted (*) to be overfished or rebuilding or otherwise depleted (Atlantic mackerel, bluefish, and red hake).

Table 1. Incidental Catch and Discards in the *Illex* Squid Fishery.

| NE Fisheries Science Center Common Name | Pounds Observed Caught | Pounds Observed Discarded | Of all discards observed, percent that comes from given species | Percent of given species that was discarded | Pounds of given species caught per mt <i>Illex</i> Kept | Pounds of given species discarded per mt <i>Illex</i> Kept | Rough Annual Catch (pounds) based on 3-year (2017-2019) average of <i>Illex</i> landings (24,597 mt) | Rough Annual Discards (pounds) based on 3-year (2017-2019) average of <i>Illex</i> landings (24,597 mt) |
|---|------------------------|---------------------------|---|---|---|--|--|---|
| SQUID, SHORT-FIN | 24,472,176 | 236,856 | 52% | 1% | 2,226 | 22 | 54,757,008 | 529,970 |
| SQUID, ATL LONG-FIN | 137,434 | 1,266 | 0% | 1% | 13 | 0 | 307,510 | 2,833 |
| DORY, BUCKLER (JOHN) | 59,564 | 15,045 | 3% | 25% | 5 | 1 | 133,275 | 33,663 |
| MACKEREL, CHUB | 50,659 | 18,909 | 4% | 37% | 5 | 2 | 113,349 | 42,310 |
| BUTTERFISH | 41,301 | 37,276 | 8% | 90% | 4 | 3 | 92,411 | 83,406 |
| HAKE, SPOTTED | 35,344 | 32,203 | 7% | 91% | 3 | 3 | 79,082 | 72,054 |
| DOGFISH, SMOOTH | 19,930 | 19,892 | 4% | 100% | 2 | 2 | 44,595 | 44,508 |
| BEARDFISH | 14,033 | 5,541 | 1% | 39% | 1 | 1 | 31,398 | 12,398 |
| HAKE, SILVER (WHITING) | 9,919 | 8,168 | 2% | 82% | 1 | 1 | 22,194 | 18,275 |
| FISH, NK | 8,332 | 8,310 | 2% | 100% | 1 | 1 | 18,642 | 18,595 |
| SEA ROBIN, NORTHERN | 8,078 | 8,078 | 2% | 100% | 1 | 1 | 18,075 | 18,075 |
| MACKEREL, ATLANTIC * | 7,902 | 5,374 | 1% | 68% | 1 | 0 | 17,682 | 12,024 |
| SCUP | 7,774 | 5,561 | 1% | 72% | 1 | 1 | 17,395 | 12,443 |
| SQUID, NK | 6,020 | 6,020 | 1% | 100% | 1 | 1 | 13,470 | 13,470 |
| BLUEFISH * | 5,052 | 1,836 | 0% | 36% | 0 | 0 | 11,303 | 4,108 |
| MONKFISH (GOOSEFISH) | 4,742 | 2,211 | 0% | 47% | 0 | 0 | 10,609 | 4,947 |
| HAKE, RED (LING) * | 4,637 | 4,280 | 1% | 92% | 0 | 0 | 10,376 | 9,576 |

The observer program creates individual animal records for some fish species of interest, mostly larger pelagics and/or elasmobranchs, as well as tagged fish. Non-expanded counts of these individual fish records from the same trips are provided in Table 2 below.

Table 2. Counts of fish in Individual Animal Records on observed *Illex* trips from 2017-2019

| COMNAME | count |
|-----------------------|-------|
| DOLPHINFISH (MAHI MAH | 4 |
| GROUPEL, SNOWY | 3 |
| MARLIN, WHITE | 1 |
| MOLA, NK | 4 |
| MOLA, OCEAN SUNFISH | 31 |
| MOLA, SHARPTAIL | 1 |
| RAY, TORPEDO | 37 |
| SHARK, ATL ANGEL | 1 |
| SHARK, BASKING | 14 |
| SHARK, BLUE (BLUE DOG | 1 |
| SHARK, CARCHARHINID,N | 4 |
| SHARK, GREENLAND | 2 |
| SHARK, HAMMERHEAD, SC | 14 |
| SHARK, HAMMERHEAD,NK | 7 |
| SHARK, NIGHT | 3 |
| SHARK, NK | 3 |
| SHARK, SANDBAR (BROWN | 48 |
| SHARK, SPINNER | 1 |
| SHARK, THRESHER, BIGE | 1 |
| SHARK, TIGER | 17 |
| STINGRAY, ROUGHTAIL | 19 |
| SWORDFISH | 108 |
| TUNA, BLUEFIN | 1 |
| TUNA, LITTLE (FALSE A | 9 |
| TUNA, YELLOWFIN | 3 |
| WRECKFISH | 1 |



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Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

Date: February 27, 2023
To: Chris Moore, Executive Director
From: Jason Didden, staff
Subject: 2023-2025 *Illex* ABCs

Executive Summary

The Council adopted a preliminary Acceptable Biological Catch (ABC) of 40,000 metric tons (MT) for *Illex* for 2023. The plan was to revisit the ABC after the NMFS Northeast Fisheries Science Center (NEFSC) updated relevant analyses (which has occurred and will be available for the SSC).

Additional information on fishery performance and past management measures can be found in the 2023 *Illex* Fishery Information Document created by staff and the 2023 *Illex* Fishery Performance Report developed by the Mackerel-Squid-Butterfish (MSB) Advisory Panel (AP).

The Council will meet in April 2023 to review the recommendations of the AP, the SSC, and the MSB Monitoring Committee, as well as receive input from the public. The Council will then recommend catch and landings limits and other management measures for 2023-2025.

There could be some rationale from the updated NEFSC analyses to support ABC increases. However, considering the relatively high uncertainties involved, staff recommends maintaining a 40,000 MT ABC for 2023-2025.

Current Measures and Review of Prior SSC Recommendations

The directed fishery operates under a limited access permit system (about 75 permits). The open access/incidental permits are limited to 10,000 pounds per trip. The directed limited access fishery does not start with trip limits, but the fishery is slowed with a 10,000-pound trip limit for all permits once 96% of landings are projected to have occurred. Given a 40,000 MT ABC for 2022, 4.52% was set aside for potential discards, and the remaining catch constitutes a landings quota of 38,156 MT.

In March 2022, the SSC established an ABC of 40,000 MT. This ABC was derived from the Council-supported escapement analysis and was associated with an approximately 5% chance of exceeding the $\frac{2}{3}$ F:M generic guidance for data poor species. Model results suggested this provides greater than 50% escapement for *Illex* squid. In July 2022 the SSC noted that the Research Track Assessment did not provide any acceptable reference points which the SSC could use to justify any revision of its previous recommendation.

Recent Catch and Landings

Quotas were reached from 2017-2021. In 2022 only 14% of the quota was landed. The Advisory Panel highlighted high diesel prices and a robust inshore 2022 longfin squid fishery as contributing to lower *Illex* landings in 2022 (see Fishery Performance Report).

Stock Status and Biological Reference Points

There are no accepted reference points. The 2022 Research Track Assessment peer reviewers concurred with the *Illex* working group that the *Illex* stock “was lightly fished in 2019.” The reviewers noted that “the term ‘lightly fished’ needs to be interpreted with caution since it has no specific definition relating to sustainable exploitation.”

Staff Recommendation

Updated analyses on likely escapement/overfishing suggest a relatively low risk of catches of up to 40,000 MT causing a problem for the *Illex* stock. Depending on one’s risk preference there could be some rationale from the updated analyses to support ABC increases. However, given the relatively high uncertainties involved with this stock, staff recommends maintaining the current ABC through 2025 unless the fishery reaches its quota – whereupon the escapement/overfishing analyses should be revisited to consider potential modifications for the next year.



Illex
Fishery Performance Report
February 2023

The Mid-Atlantic Fishery Management Council's (Council) Mackerel-Squid-Butterfish (MSB) Advisory Panel (AP) met via webinar on February 24, 2023 to review the *Illex* squid Fishery Information Document and develop the following Fishery Performance Reports. The primary purpose of the report is to contextualize recent catch history for the Scientific and Statistical Committee (SSC) by providing information about fishing effort, market trends, environmental changes, and other factors. The trigger questions below were posed to the AP to generate discussion, which began by reviewing the separate *Illex* “fishery information document.” The AP comments summarized below are not necessarily consensus or majority statements.

Advisory Panel members present: Eleanor Bochenek, Katie Almeida, Gerry O' Neill, Meghan Lapp, Sam Martin, Dan Farnham Jr, and Greg DiDomenico.

Others present: Jason Didden, Peter Hughes, Carly Bari, Mike Waine, Tom Miller, Alissa Wilson, and Haley Clinton.

Trigger questions:

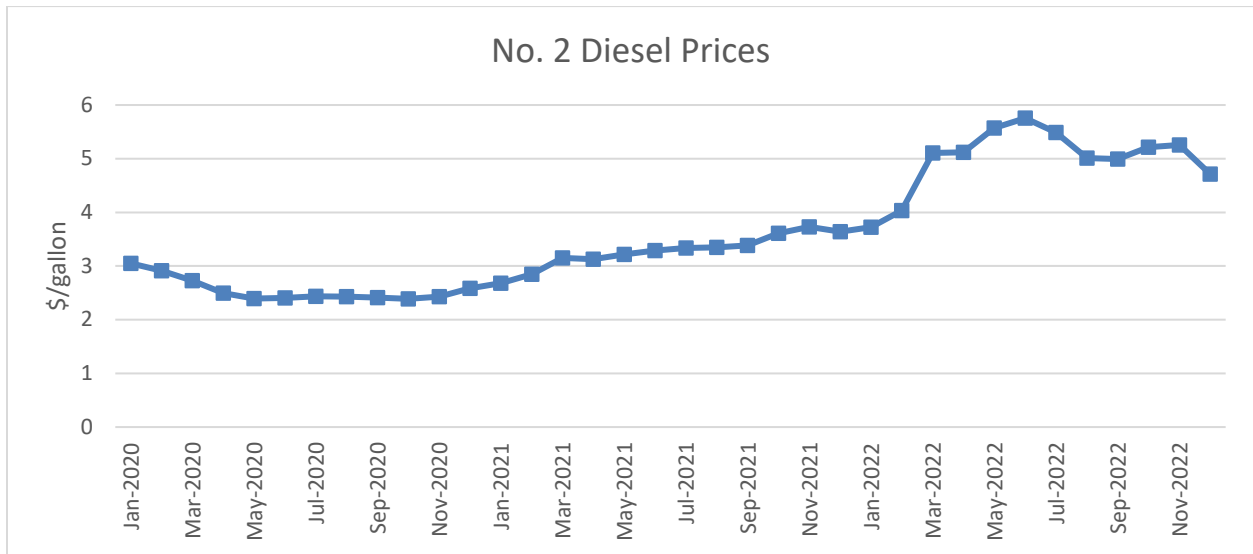
1. What factors have influenced recent catch (markets, environment, regulations, etc.)?
2. Are the current fishery regulations appropriate? How could they be improved?
3. What would you recommend as research priorities?
4. What else is important for the Council to know?

Illex Squid

Market/Economic Conditions

Freezer boats always fish *Illex* in the summer - 2022 was no different. Freezer boats fished all summer long. Fishing was not as good as recent years but they still caught *Illex*.

Fuel prices were an extreme deterrent to participation in 2022, especially combined with good longfin squid fishing near the beach. AP member conversations with other fishery participants indicated many folks did the math and chose to fish longfin instead, closer in. After the call staff downloaded 2020-2022 No. 2 Diesel prices from the U.S. Energy Information Administration (www.eia.gov) for reference.



Market conditions/prices specific to *Illex* seemed relatively similar in 2022 as 2021/2020.

U.S. suppliers continue to invest in infrastructure to regularly produce quality product. Steady supply from U.S. producers has helped with marketing – especially focusing on product quality. Think of it in terms of three aspects: efficiency, quality, and speed.

AP notes the potential to also get price increases through season as squid get bigger (higher prices for bigger squid) if fishery stays open.

U.S. *Illex* catches do not drive the price of *Illex* – Argentinian *Illex* and Japanese flying squid affect prices. Argentinian *Illex* are in international waters and the Chinese fleet catches high volumes – the world market dominates price. U.S. landings are a small component. Staff previously noted 2019 FAO catch of Argentine shortfin squid was listed as about 250,000 metric tons.

Environmental Conditions

Gulfstream did not shift inward in 2022 like previous years – An AP member noted an article that Spain has caught our *Illex* species.

For *Illex* we need a shift in thinking versus just “what happened last year.” We have good years and bad years. 2022 just demonstrates typical variability – wasn’t out of the ordinary.

It is critical to continue to involve fishermen in related work to understand environmental linkages (e.g. the Squid Squad – see <https://www.mafmc.org/briefing/february-2023>).

Management Issues

Management should consider ways to achieve 100% of the quota if in future years the current closure threshold appears to be unnecessarily constraining.

The availability/abundance of *Illex* should be taken into account when considering closures, as abundance appears to be considered when dealing with potential overages in other fisheries such as black sea bass (e.g. Harvest Control Rule procedures for recreational sector). *Illex* and commercial fisheries in general should not be treated differently than other participants.

Other Issues

The allowance for swordfish retention in the *Illex* fishery was discussed. Increasing the current incidental limits (15/trip) have not been a hot topic recently but there is some interest in revisiting that limit.

Research Priorities

See environmental considerations section above.

Additional Public Input

Staff noted that the Council will be addressing potential follow-up to the disapproved *Illex* permit action at the April 2023 meeting.



***Illex* Fishery Information Document**

February 2023

This Fishery Information Document provides a brief overview of the biology, stock condition, management system, and fishery performance for *Illex* squid with an emphasis on 2022. Data sources for Fishery Information Documents include unpublished National Marine Fisheries Service (NMFS) survey, dealer, vessel trip report (VTR), permit, and Marine Recreational Information Program (MRIP) databases and should be considered preliminary. For more resources, including previous Fishery Information Documents, please visit <http://www.mafmc.org/msb>.

Key Facts

- 2022 saw a return to *Illex* landings volatility – only 14% of the 2022 quota was landed.
- Substantial variability is to be expected with any squid species.
- 2017-2021 were consecutive “boom” *Illex* years and represented a unique sequence in the history of the fishery.
- Average price was 15% higher in 2022 than 2021.
- In March 2023 the Scientific and Statistical Committee (SSC) will review the initial 2023 ABC and set 2024-2025 ABCs.

Basic Biology

Illex is a semi-pelagic/semi-demersal schooling cephalopod species that lives less than one year and is distributed between Newfoundland and the Florida Straits. *Illex* is a semelparous, terminal spawner whereby spawning and death occur within several days of mating. The northern stock component (also highly variable) in NAFO Subareas 3 and 4, is assessed and managed separately by the Northwest Atlantic Fisheries Organization (NAFO). The southern/U.S. stock component is located in NAFO Subareas 5 and 6 between the Gulf of Maine and Cape Hatteras, NC and is managed by the Mid-Atlantic Fishery Management Council (the Council or MAFMC) and NMFS. Additional life history information is detailed in the EFH document for the species, located at: <http://www.nefsc.noaa.gov/nefsc/habitat/efh/>.

Status of the Stock

The 2021 research track assessment (RTA) was unable to develop a method to resolve stock status, so the stock will officially remain “unknown” with respect to being overfished or overfishing. The RTA Review Panel agreed with the RTA Working Group Report that indications from the various assessment approaches were that the stock was lightly fished in

2019. However, the review report stated that the term “lightly fished” should be interpreted with caution because it has no specific definition relating to sustainable exploitation. After evaluating related analyses, the MAFMC’s Scientific and Statistical Committee (SSC) recommended continuing the 2022 40,000 metric ton (MT) *Illex* Acceptable Biological Catch (ABC) to start 2023. In March 2023 the SSC will review updated analyses and may revise their 2023 ABC recommendation

In light of the failure of the assessment to produce accepted reference points to guide ABC setting, the SSC had to rely on an ad-hoc approach to setting a 2023 ABC that would meet the Council’s risk policy to avoid overfishing and achieve optimum yield. Alternative quotas were examined with respect to their consequences for risk of exceeding escapement targets ranging from 40% to 50%, as has been used for other squid fisheries. In addition, harvest rates of $F=2/3 M$ (natural mortality) have been used for forage species in various assessments around the world. The methodology allowed the SSC to examine the probability of violating the reference point for various levels of catch limits ranging from 24,000 to 60,000 mt. A 40,000 MT ABC was associated with an approximately 5% chance of exceeding a $2/3 F:M$ generic guidance for data poor species. Model results suggested a 40,000 MT ABC provided greater than 50% escapement for *Illex* squid, and a catch of 60,000 MT increases the chance of less escapement in some years. Previous SSC review (March 2022) of the analyses allowed them to conclude that:

- Escapement has been relatively high over the last 10 years, suggesting a relatively small impact of the fishery on the component of the stock that is exploited.
- Assumptions regarding parameters that were inputs to the analyses were thought to lead to minimum likely estimates.
- Distributions of the joint estimate of $F:M$ suggests that exploitation rate in the fishery is likely low.
- By comparison to empirical escapement reference points used to manage squid fisheries elsewhere globally, the current ABC levels are associated with low risks of exceeding those escapement standards.
- A 40,000 MT ABC will lead to a low risk of overfishing.

(See reports at <https://www.mafmc.org/ssc-meetings/2022/march-15-16> and <https://www.mafmc.org/ssc-meetings/2022/july-25-26>)

Management System and Fishery Performance

Management

The Council established management of *Illex* in 1978 and the management unit includes all federal East Coast waters.

Access is limited with moratorium permits. Trip limits are triggered when the quota is approached. Incidental permits are limited to 10,000 pounds per trip. Additional summary regulatory information is available at <https://www.fisheries.noaa.gov/new-england-mid-atlantic/resources-fishing/resources-fishing-greater-atlantic-region>. A 2020 action to reduce *Illex* permits given overcapitalization in the fishery was disapproved:

<https://www.fisheries.noaa.gov/bulletin/amendment-22-mackerel-squid-and-butterfish-fishery-management-plan-decision>.

The current quota is 38,192 MT, based on a 40,000 MT Acceptable Biological Catch (ABC) and a 4.52% discard rate (the mean plus one standard deviation of the most recent 10 years of observed discard rates in the previous assessment). Recent SBRM discard rates have been similar, though are not based on calendar years. 2017-2019 discards in the RTA were also a similar portion of total catch. The fishery closes when 96% of the quota is projected to be landed. In 2021 the fishery closed effective August 30, 2021 – there was not a closure in 2022 as only about 14% of the quota was landed.

Recreational catch of *Illex* is believed to be negligible. There are no recreational regulations except for party/charter vessel permits and reporting.

Commercial Fishery

Almost all 2022 landings were with bottom trawl gear. Figure 1, from a previous Science Center data update, describes *Illex* catch 1963-2021 and highlights the early foreign fishery and then domestication of the fishery. Figures 2-3 describe domestic landings, ex-vessel revenues, and prices (inflation adjusted) since 1996. Figure 4 illustrates preliminary weekly 2021 (yellow-orange) and 2022 (blue) landings through the year. Trends in the fall NEFSC trawl index are illustrated in Figure 5 (value was slightly above the median in the terminal year (2022)).

Most *Illex* landings occur in RI, NJ, and MA but further breakdown may violate data confidentiality rules (in spirit if not to the letter). Table 3 provides preliminary information on *Illex* landings by statistical area for 2022. Table 4 describes vessel participation over time.

The Gross Domestic Product Implicit Price Deflator was used to report revenues/prices as “2022 dollars.”

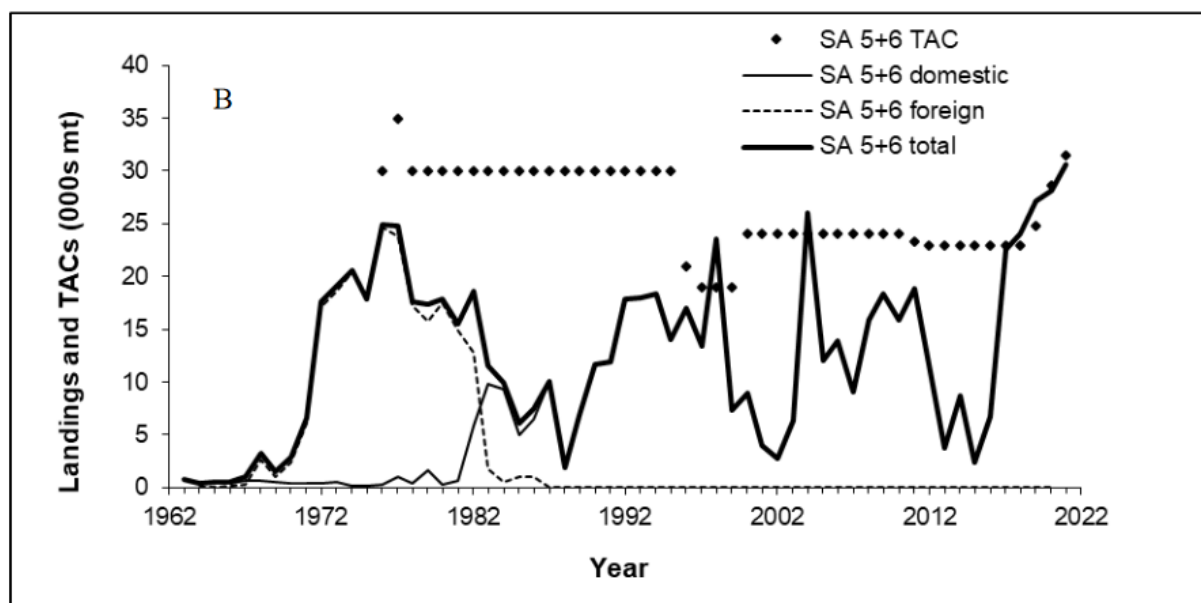


Figure 1. Total annual *Illex* landings (mt) by the U.S. and other countries for 1963-2021. Sources: NEFSC *Illex* Data update, available at <https://www.mafmc.org/ssc-meetings/2022/july-25-26>.

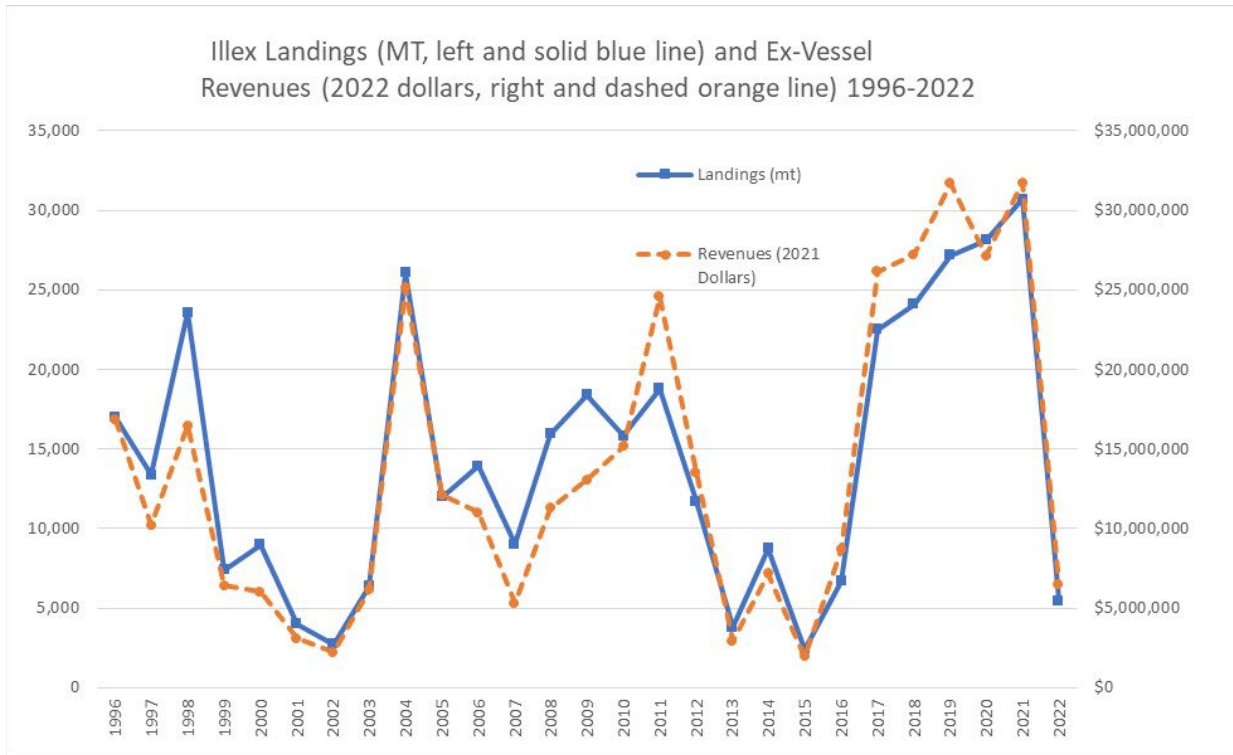


Figure 2. U.S. *Illex* Landings and Ex-Vessel Values 1996-2022. Source: NMFS unpublished dealer data.

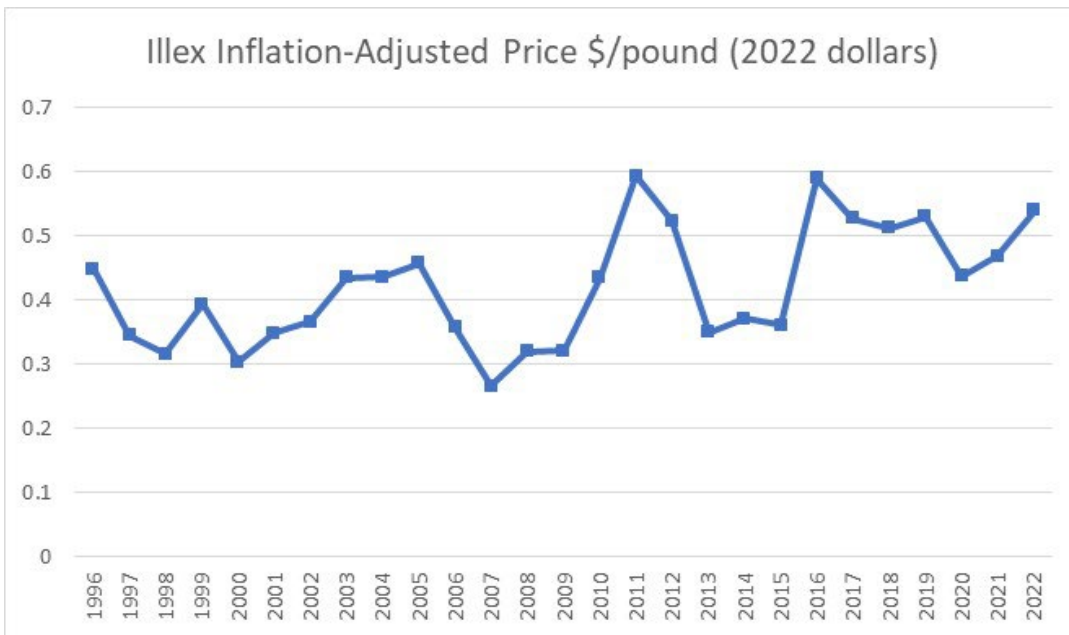


Figure 3. Ex-Vessel *Illex* Prices 1996-2022 Adjusted to 2022 Dollars Source: NMFS unpublished dealer data.

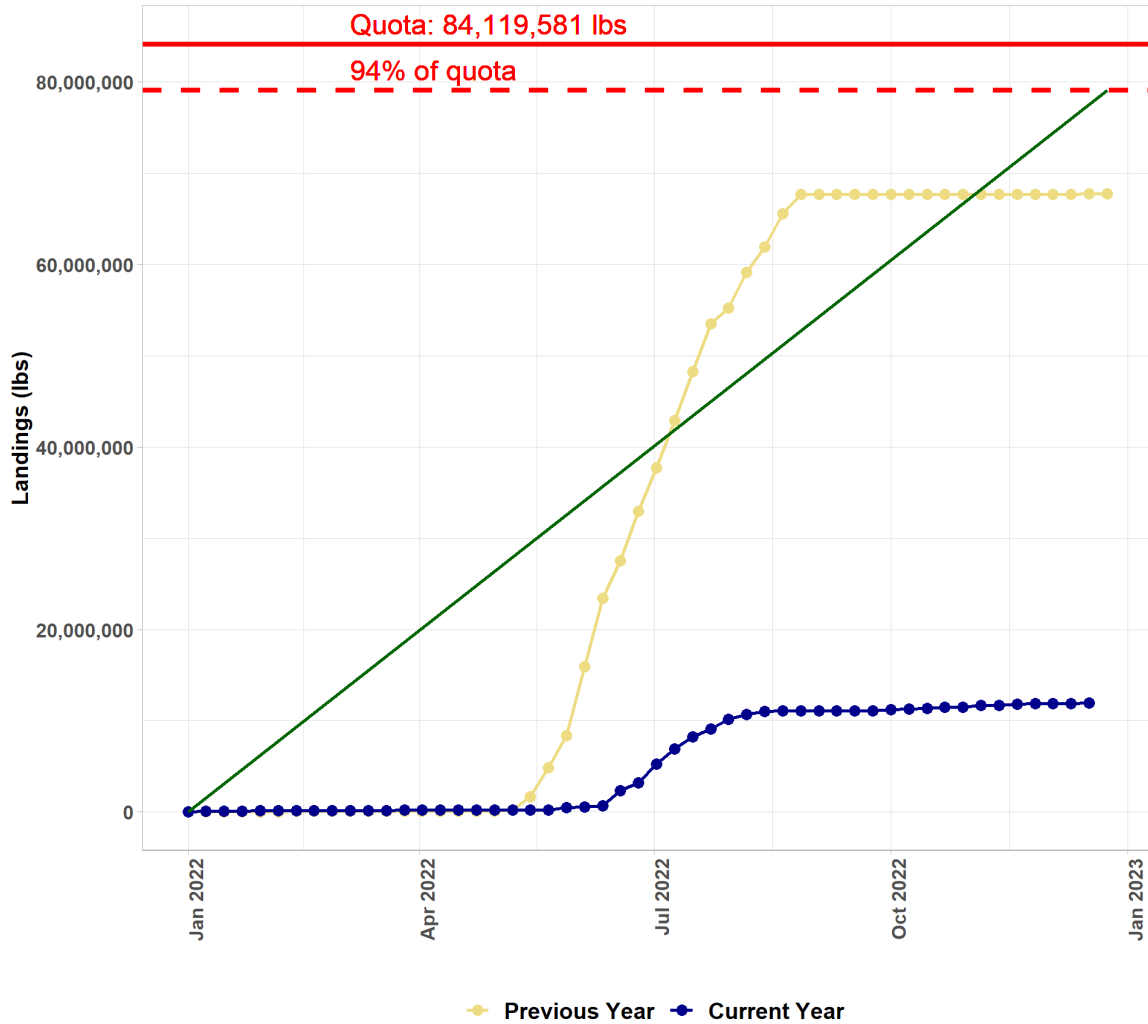


Figure 4. U.S. Preliminary *Illex* landings; 2022 (“current”) in blue, 2021 in yellow-orange (“previous”). Source: <https://www.fisheries.noaa.gov/new-england-mid-atlantic/commercial-fishing/quota-monitoring-greater-atlantic-region>

Table 1. Commercial *Illex* landings by statistical area in 2022. Source: NMFS unpublished VTR data.

| Stat Area | MT |
|-----------|-------|
| 537 | 94 |
| 616 | 347 |
| 622 | 3,198 |
| 623 | 421 |
| 626 | 859 |
| 632 | 323 |
| Other | 168 |
| Total | 5,410 |

Table 2. Vessel participation over time in the *Illex* Fishery based on annual landings (pounds)

| YEAR | Vessels 500,000+ | Vessels 100,000 - 500,000 | Vessels 50,000 - 100,000 | Vessels 10,000 - 50,000 | Total |
|------|---------------------|---------------------------------|--------------------------------|-------------------------------|-------|
| 1982 | 7 | 7 | 0 | 10 | 24 |
| 1983 | 1 | 8 | 7 | 11 | 27 |
| 1984 | 4 | 15 | 4 | 6 | 29 |
| 1985 | 2 | 6 | 4 | 3 | 15 |
| 1986 | 8 | 6 | 4 | 3 | 21 |
| 1987 | 7 | 10 | 2 | 1 | 20 |
| 1988 | 3 | 3 | 1 | 2 | 9 |
| 1989 | 8 | 5 | 1 | 3 | 17 |
| 1990 | 12 | 3 | 0 | 1 | 16 |
| 1991 | 12 | 1 | 1 | 0 | 14 |
| 1992 | 16 | 1 | 0 | 1 | 18 |
| 1993 | 19 | 3 | 1 | 3 | 26 |
| 1994 | 21 | 7 | 5 | 8 | 41 |
| 1995 | 24 | 5 | 2 | 7 | 38 |
| 1996 | 24 | 5 | 6 | 4 | 39 |
| 1997 | 13 | 9 | 2 | 0 | 24 |
| 1998 | 25 | 4 | 1 | 3 | 33 |
| 1999 | 6 | 9 | 2 | 10 | 27 |
| 2000 | 7 | 7 | 0 | 2 | 16 |
| 2001 | 3 | 4 | 1 | 2 | 10 |
| 2002 | 2 | 3 | 1 | 1 | 7 |
| 2003 | 5 | 6 | 1 | 2 | 14 |
| 2004 | 23 | 5 | 2 | 0 | 30 |
| 2005 | 10 | 10 | 2 | 2 | 24 |
| 2006 | 9 | 8 | 1 | 2 | 20 |
| 2007 | 8 | 2 | 1 | 0 | 11 |
| 2008 | 12 | 5 | 0 | 0 | 17 |
| 2009 | 10 | 3 | 1 | 1 | 15 |
| 2010 | 13 | 5 | 0 | 4 | 22 |
| 2011 | 17 | 4 | 2 | 0 | 23 |
| 2012 | 8 | 3 | 2 | 2 | 15 |
| 2013 | 5 | 4 | 3 | 5 | 17 |
| 2014 | 5 | 3 | 2 | 2 | 12 |
| 2015 | 3 | 0 | 1 | 1 | 5 |
| 2016 | 4 | 3 | 3 | 2 | 12 |
| 2017 | 14 | 6 | 0 | 0 | 20 |
| 2018 | 19 | 7 | 0 | 5 | 31 |
| 2019 | 26 | 6 | 0 | 3 | 35 |
| 2020 | 25 | 4 | 2 | 1 | 32 |
| 2021 | 23 | 8 | 0 | 2 | 33 |
| 2022 | 7 | 3 | 3 | 7 | 20 |

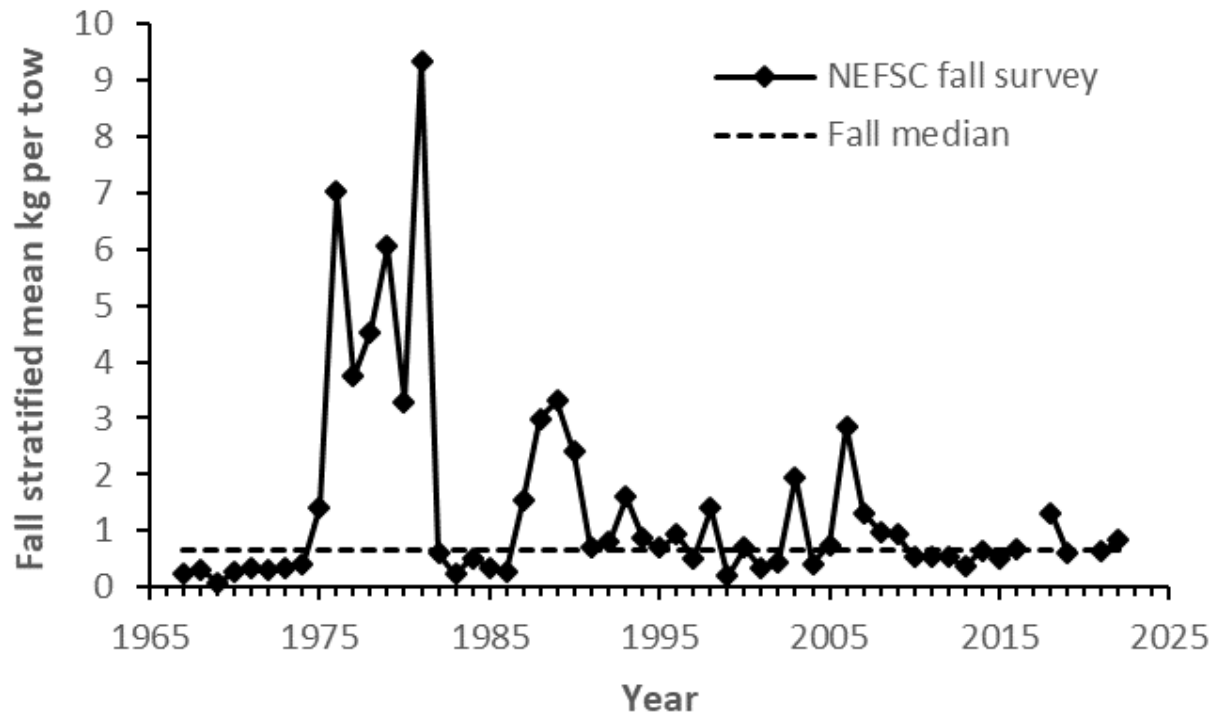


Figure 5. Fall NEFSC Trawl Survey Indices (Bigelow data (since 2009) has been converted to Albatross units based on calibration factors – see Miller et al 2010 - <https://repository.library.noaa.gov/view/noaa/3726>.)

2017 (vessel issue) and 2020 (Covid) are missing.

THIS IS THE END OF THE DOCUMENT