### Other Economic/Social Factors

- **GOM cod** is an important resource for the recreational fishing industry, with an average of 85 for-hire recreational vessels targeting GOM cod or haddock from 2016-2020. ACE lease prices have shown a declining trend for GOM cod from $1,200 to $1,500 per metric ton in 2015 to $900 to $1,100 per metric ton in 2020. Gross commercial (sector and common pool) groundfish revenue for GOM cod: $1,500,000 in 2017, $1,700,000 in 2018, $1,600,000 in 2019, $1,200,000 in 2020.

### Current Management Program

- Multispecies groundfish fishery with commercial and recreational components. The Total ACL is divided between several sub-ACLs and sub-components. The commercial sub-ACL is further divided between the sector sub-ACL and the common pool sub-ACL. The majority of commercial permits participate in sectors, fishing under quotas. The common pool operates under days-at-sea, with trip limits and trimester TACs controlling catch. Accountability measures can be triggered if overages occur under certain conditions for components with sub-ACLs.

### Variability in Catch/Revenues?

- Gross Commercial (Sector and Common Pool) Groundfish Revenue for GOM cod: $1,500,000 in 2017, $1,700,000 in 2018, $1,600,000 in 2019, $1,200,000 in 2020.

### Data - Vessels, Permits, Dealers, Processors, Employment

- FY 2020: 876 commercial groundfish permitted vessels, of those 590 vessels which received revenue from any species on a declared groundfish trip and 197 vessels with revenue from groundfish. 59 dealers reported buying groundfish. 79 for-hire recreational vessels fishing cod or haddock from the GOM.

### Fishing Communities

- Commercial: The top 5 ports based on the Groundfish-Specific Commercial Engagement Indicator (2004-2020) are Gloucester, MA; New Bedford, MA; Boston, MA; Narragansett, RI; and Portland, ME. Recreational: When expanding out to the top 20 communities in recreational engagement in the Northeast (all recreational fishing) Recreational Engagement Indicators (2009-2018), New England communities include: Narragansett/Point Judith, RI, Newburyport, MA and Barnstable, MA. Other ports of interest with relatively high engagement (i.e., ranking somewhere outside the top 20) in the last five years include Gloucester, MA, Waterford, CT, East Lyme/Niantic, CT, and Old Saybrook, CT.

### Other Economic/Social Factors

- GOM cod is an important resource for the recreational fishing industry, with an average of 85 for-hire recreational vessels targeting GOM cod or haddock from 2016-2020. ACE lease prices modeled using a hedonic price model for 2015-2019. Lease prices have shown a declining trend for GOM cod from $4.75 in quarter 1 of 2015 to $1.50 in quarter 4 of 2019. Between 2016 and 2018, lease prices were between $2 and $2.50 in most quarters.

### Major Sources of Scientific Uncertainty

- In the current models - natural mortality and recruitment. Two models with different assumptions of natural mortality exist for GOM cod (M=0.2 and M-ramp). The different assumptions affect the scale of biomass, recruitment, fishing mortality estimates, and overfishing status. Other areas of uncertainty include the increasing amount of retrospective error in both models, stock structure, ecosystem effects, and the veracity of fishery catch data.

### Major Sources of Management Uncertainty

- The default management uncertainty buffer of 5% is applied to the commercial fishery. A management uncertainty buffer of 7% is used for the recreational fishery. Observed commercial trips may not be representative, recent changes to monitoring. See above.

### How is the probability of overfishing addressed?

- Recently, the SSC applied 75%Fmsy and held constant for 3 years, averaged for the two models using only a single bridge year.

### What is the consequence of overfishing?

- Reduction in biomass, yield, and net economic benefits over long-term.
<table>
<thead>
<tr>
<th>How are expected net benefits to the Nation currently measured/evaluated?</th>
<th>Yield (mt and $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactions with Other Fisheries/Stocks, Bycatch Issues</td>
<td>Cod is frequently caught with other abundant groundfish stocks (e.g., haddock and pollock) in the multi-species fishery. The low catch limit on cod can lead to reduce catches of other stocks.</td>
</tr>
<tr>
<td>Ecosystem Considerations: Trophic Interactions</td>
<td>Cod are generalists. Fishermen have noted that the two groups of cod typically have different diets, with cod on Stellwagen Bank feeding primarily on sand lance, while those on Jeffreys Ledge mainly feed on herring and shrimp. There has been a decline in many cod predators (Atlantic halibut, large hakes, large cod) but it is unclear if the declines in predators are due to the decline in cod.</td>
</tr>
<tr>
<td>Ecosystem Considerations: Habitat</td>
<td>GOM cod habitat vulnerability was assessed in Omnibus Habitat Amendment 2. The current spatial distribution of the stock is considerably less than its historical range within the Gulf of Maine. Year-round and seasonal closures are in place in the GOM to protect cod and increase successful cod spawning.</td>
</tr>
<tr>
<td>Ecosystem Considerations: Climate</td>
<td>Atlantic cod is considered moderately vulnerable to climate change (high climate exposure risk and moderate biological sensitivity). Fishermen have commented that cod are sensitive to water temperatures and shifted to deeper waters to spawn. Others have noted the location of spawning will change from year-to-year depending on water temperature.</td>
</tr>
<tr>
<td>Other Important Considerations/Notes</td>
<td>Stock structure of Atlantic cod. The current GOM cod stock overlaps the new cod biological units of Western Gulf of Maine winter spawners, Western Gulf of Maine spring spawners, and Eastern Gulf of Maine. Research Track for Atlantic cod underway.</td>
</tr>
</tbody>
</table>
**Stock(s):** Georges Bank Cod  

**Last Assessment:** Management Track, 2021

### Assessment Model, Terminal Year

<table>
<thead>
<tr>
<th>Description of Assessment Model</th>
<th>Overfishing?</th>
<th>In Rebuilding Program?</th>
<th>OFL</th>
<th>ABC/ABC CR</th>
<th>ACL</th>
<th>ACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PlanBSmooth, 2020</td>
<td>Yes/Yes (determined by NOAA Fisheries)</td>
<td>Yes 2004-2026</td>
<td>Unknown in 2022</td>
<td>Total ABC 754 mt in and US ABC 343 mt in FY2022</td>
<td>330 mt in 2022</td>
<td>N/A for groundfish</td>
</tr>
</tbody>
</table>

### Major Sources of Management Uncertainty

- **Fishing Communities:** Iconic New England species. Multispecies groundfish fishery with commercial and recreational catches. Overfished and unknown if overfishing occurring. Co-caught with other abundant species, such as haddock and pollock. Transboundary EGB cod management unit co-managed by the U.S. and Canada.

- **Other Economic/Social Factors:**
  - **Fishing Communities:** Revenue from EGB: $500,000 in 2018; $800,000 in 2019; $200,000 in 2020; $400,000 5-year average WGB: $3,200,000 in 2018; $2,300,000 in 2019; $1,600,000 in 2020; $2,700,000 5-year average Ex-vessel price/lb: EGB: $2.52 in 2018; $2.31 in 2019; $2.18 in 2020; $2.52 5-year average WGB $2.36 in 2018; $2.73 in 2019; $2.47 in 2020; $2.64 5-year average
  - **Fishing Communities:** GB cod is an important resource for the recreational fishing industry, an average of 98 for-hire recreational vessels targeted GB cod or haddock on GB.

### Availability of Biological and Assessment Data

- **Recent Performance Against Harvest Control Rule:**
  - Total ACL caught: 58.4% of ACL in FY2018, 36.9% of ACL in FY2019, and 59.3% of the ACL in FY2020.

### Overfishing?

- **Overfishing Limit (OFL):** Unknown. The ABC is based on the results of the empirical model applied to a recent 3-year average catch. For GB cod, the total ABC is reduced by the amount of the Canadian quota and an estimate of catch expected from state waters, non-groundfish commercial fisheries, and the recreational fishery. There is no allocation of GB cod to the recreational fishery, however a recreational catch target is established along with measures (i.e., bag limits, seasons, fish sizes) to stay within the target. Components of the fishery that receive an allocation have a sub-ACL set by reducing their portion of the ABC to account for management uncertainty and are subject to accountability measures (AM) if they exceed their respective catch limit during the fishing year. The commercial groundfish sub-ACL is further divided into the non-sector (common pool) sub-ACL and the sector sub-ACL. Eastern GB cod is jointly managed with Canada under the United States/Canada Resource Sharing Understanding. Each year, the Transboundary Management Guidance Committee (TMGC) and Sterling Committee (SC) recommends a shared quota for Eastern GB cod based on the most recent stock information and the TMGC’s harvest strategy. The shared quotas are allocated between the United States and Canada based on a formula that considers historical catch (10-percent weighting) and the current resource distribution (90-percent weighting).

### Fishing Communities

- **Other Economic/Social Factors:** GB cod is an important resource for the recreational fishing industry, an average of 98 for-hire recreational vessels targeted GB cod or haddock from FY2016 through FY2020.  

### What is the consequence of overfishing?

- **Quota overages in the sector or common pool fisheries trigger accountability measures within season or in subsequent fishing years or fishing trimesters (common pool only). The measures are designed to correct the problems that caused the quota to be exceeded.**

### How is the probability of overfishing?**

- **For the recreational fishery, the Regional Administrator can adjust measures to prevent the fishery from exceeding the recreational catch target in FY2023 and FY2024.** Any US fishery overage of the EGB cod U.S. TAC is subtracted from the following year’s U.S. TAC.
### How are expected net benefits to the Nation currently measured/evaluated?

<table>
<thead>
<tr>
<th>Yield (mt and $)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Interactions with Other Fisheries/Stocks, Bycatch Issues

The TMGC/SC recommends TACs for the U.S./Canada shared resources for GB cod (and haddock and yellowtail flounder). Cod is frequently caught with other abundant groundfish stocks (e.g., haddock and pollock) in the multi-species fishery. The low catch limit on cod can lead to reduced catches of other stocks.

### Ecosystem Considerations: Trophic Interactions

Cod are generalists. The GB cod diet has changed over the last three decades, reflecting changes in the relative abundance of different prey. There has been a decline in many cod predators (Atlantic halibut, large hakes, large cod) but it is unclear if the declines in predators are due to the decline in cod.

### Ecosystem Considerations: Habitat

GB cod habitat vulnerability was assessed in Omnibus Habitat Amendment 2. The range of GB cod has contracted over time, and their current center of distribution has moved north. Closures in place in the GB area include the GB Dedicated Habitat Research Area, Closed Area II, and a Seasonal Spawning Closure.

### Ecosystem Considerations: Climate

Atlantic cod is considered moderately vulnerable to climate change (high climate exposure risk and moderate biological sensitivity). Fishermen have commented that cod are sensitive to water temperatures and shifted to deeper waters to spawn. Others have noted the location of spawning will change from year-to-year depending on water temperature.

### Other Important Considerations/Notes

Recent ABC reductions are anticipated to allow the stock to rebuild. GB cod continues to show a truncated age structure. Stock structure of Atlantic cod. The current GB cod stock overlaps the new cod biological units of Western Gulf of Maine winter spawners, Georges Bank, and Southern New England. Research Track for Atlantic cod underway.

In a letter to the Council, sector managers noted FY2022 YTD median EGB/WGB ACE lease asking price is $4.38 (the highest for any stock since the start of the catch share program) which is indicative of concerns low GB cod quotas might force vessels out of GB cod stock areas mid-year. See Sector Managers to NEFMC letter at: [https://www.nefmc.org/calendar/aug-25-2022-ssc-committee](https://www.nefmc.org/calendar/aug-25-2022-ssc-committee)
Despite low levels of catches, the stock is still considered in poor condition, with productivity influenced by environmental conditions. Challenges include bycatch in non-groundfish commercial fisheries.

### Major Sources of Scientific Uncertainty
From the 2022 Management Track Assessment: 1) natural mortality, which is not well studied, and affects the scale of the biomass and fishing mortality estimates in the assessment; 2) length distribution of the recreational discards; and 3) recruitment, as the population projections are based on estimated values in the assessment; 2) length distribution of the recreational discards; and 3) recruitment, as the population projections are based on estimated values in the assessment.

### Major Sources of Management Uncertainty
The default management uncertainty buffer of 5% is applied to the commercial fishery. Despite low levels of catches, the stock is still considered in poor condition, with productivity influenced by environmental conditions.

### Other Economic/Social Factors
ACE lease prices modeled using a hedonic price model for 2017-2021. Trends in estimated ACE lease prices: $0.40-$0.70 per pound in FY2017-2018, below $0.20 per pound in FY2019, not statistically significant from $0.00 in FY2020 and FY2021.

### How is the probability of overfishing addressed?
In the previous assessment the SSC applied 75%fmsy and held OFL constant for 3 years; ABC held constant for 3 years as three-year average catch.

### What is the consequence of overfishing?
Reduction in biomass, yield, and net economic benefits over long-term.

### How are expected net benefits to the Nation currently measured/evaluated?
Yield (mt and $)

### Interactions with Other Fisheries/Stocks, Bycatch Issues
No sub-ACLs. Other federal fishery components with SNE/MA winter flounder catches over 5% of total catches in recent years are the scallop fishery and squid fishery. Recent increases in bycatch of SNE/MA winter flounder in squid fisheries.

### Ecosystem Considerations: Trophic Interactions
Winter flounder are opportunistic/omnivorous predators. Polychaetes and crustaceans make up the bulk of their diet.

### Ecosystem Considerations: Habitat
Winter flounder are not known to rely on complex structures for shelter. The species moves inshore to spawn in late winter/early spring.

### Ecosystem Considerations: Climate
Winter flounder are considered highly vulnerable to climate change (high climate exposure risk and high biological sensitivity). Extensive work has been carried out to evaluate the effects of climate change on recruitment for SNE/MA winter flounder. The environmental index (time-series of mean winter estuary temperatures) applied in the alternative assessment models (an environmental ASAP model) was used as support in the 2022 assessment for choosing a more representative time period of recruitment for the projections, until these alternative models can be considered for management in the next research track assessment (2026).
While the updated 2022 assessment resulted in a significant change in stock status to not overfished and to a rebuilt status, this change is directly due to changing the recruitment stanza going into the projections. Previous assessments have used the entire time-series of recruitment, with historical recruitments that are well beyond the current productivity of the stock. The truncated recruitment stanza (last 20 years) led to a much reduced biomass target and as a result the overfished status of the stock has changed. While the stock status has changed, the perception of the stock has not, and recent model estimates and fishery independent survey indices all reveal a poor stock condition for SNE/MA winter flounder. ASFMC management see: http://www.asmfc.org/species/winter-flounder  

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In 2021, the Winter Flounder Management Board reviewed 2021-2023 specifications. For the GOM stock, the 2021-2023 ACL was set at 1.06 million pounds, an increase from the 2020 ACL of 952,397 pounds. In addition, the state waters sub-component nearly increased by 40% from 306,443 pounds in 2020 to 427,697 pounds for 2021-2023. For the SNE/MA stock, the 2021-2023 ACL was set at 972,239 pounds, a significant decrease from the 2020 ACL of 1.54 million pounds. The state waters sub-component also decreased from 79,366 pounds in 2020 to 46,297 pounds in 2021-2023. The Board did not alter management measures for winter flounder in response to these specifications.```

### FMP
**NORTHEAST MULTISPECIES (GROUNDFISH)**

### STOCK(S)

Georges Bank Yellowtail Flounder

### LAST ASSESSMENT

TRAC 2022 (July)

<table>
<thead>
<tr>
<th>Assessment Model, Terminal Year</th>
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<th>Overfishing?/Overfished?</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Empirical, 2022</td>
<td>Averages estimates of biomass from the bottom trawl surveys and applies exploitation rate</td>
<td>Yes/Yes (determined by NOAA Fisheries)</td>
<td>Yes 2006-2032</td>
<td>unknown</td>
<td>Total ABC (US/CA TAC) of 200 mt and US ABC (US TAC) of 122 mt in 2022 and CA TAC of 78 mt</td>
<td>118 mt (US) in FY 2022</td>
<td>N/A for groundfish</td>
</tr>
</tbody>
</table>

Low stock biomass, poor recruitment, record low catches, and bycatch issues. Transboundary stock co-managed by the U.S. and Canada.

### Availability of Biological and Assessment Data

- Updated data since last assessment: survey (2021 NEFSC fall survey and 2022 NEFSC spring survey) and fisheries (U.S. and Canadian commercial catches) data; DFO spring 2022 unavailable due to new vessel and pending calibration work.
- Other Data: independent research studies presented - Scallop surveys - VIMS, CFF, SMAST

### Recent Performance Against Harvest Control Rule


### Current Management Program

- The Total ACL is divided between several sub-ACLs and sub-components. The commercial sub-ACL is further divided between the sector sub-ACL and the common pool sub-ACL. The majority of commercial permits participate sectors, fishing under quotas. The common pool operates under days-at-sea, with trip limits and trimester TACs controlling catch. The Atlantic sea scallop fishery and small-mesh fisheries receive sub-ACLs for GB yellowtail flounder. State waters and the other sub-component round out the final components of the total ACL. Landings and discards from all fisheries count against the applicable sub-ACL or sub-component, which are monitored throughout the year. If an average occurs, an accountability measure is triggered for a subsequent fishing year. The scallop fishery cannot possess GB yellowtail flounder. GB yellowtail flounder is jointly managed with Canada under the United States/Canada Resource Sharing Understanding. Each year, the Transboundary Management Guidance Committee (TMGC) and Steering Committee (SC) recommends a shared quota for GB yellowtail flounder based on the most recent stock information and the TMGC’s harvest strategy. The shared quotas are allocated between the United States and Canada based on a formula that considers historical catch (10-percent weighting) and the current resource distribution (90-percent weighting).

### Variability in Catch/Revenues?

- Commercial Groundfish Revenue for GB flounder (2020S): $0.1 million in FY 2018, <$0.1 million in FY 2019, <$0.1 million in FY 2020; $0.1 million 5-year average
- Total groundfish landings: 44.28 million pounds in FY2018, 42.66 million pounds in FY2019, 50.66 million pounds in FY2020
- GB yellowtail flounder catch (landings + discards): 40.5 mt in FY2018, 4.8 mt in FY2019, 9.7 mt in FY2020

### Data - Vessels, Permits, Dealers, Processors, Employment

- FY2020: 876 commercial groundfish permitted vessels, with 590 reporting landings. 99 dealers reported buying groundfish.

### % Food, % Recreational

- 82% of the US ABC is allocated to the commercial groundfish fishery.

### Other Economic/Social Factors

- Food consumption; market demand; ex-vessel price; sector ACE lease value (influenced by suite of ACLs for all groundfish stocks, market liquidity, transaction costs, operating rules)

### Major Sources of Scientific Uncertainty

- Evaluating sources of mortality; declining trend in survey biomass despite reductions in catch; lack of an analytic assessment model; variability and uncertainty in survey estimates. Low catches in the fishery make sampling challenging including catch and weight-at-age estimation (TRAC 2022).

### Major Sources of Management Uncertainty

- Management uncertainty is set at 3%.

### How is the probability of overfishing addressed?

- The GB yellowtail flounder stock status is unknown due to a lack of biological reference points. Because a stock assessment model framework is lacking, no historical estimates of biomass, fishing mortality rate, or recruitment can be calculated. Status determination relative to reference points is not possible because reference points cannot be defined. In the absence of an assessment model, an empirical approach based on survey catches indicates stock condition is poor, given a declining trend in survey biomass despite reductions in catch to historical low levels. 2022 stock assessment results for GB yellowtail flounder continue to indicate low stock biomass and poor productivity (TRAC 2022). Recent catches are at historic low amounts. NMFS determined that the stock status for GB yellowtail flounder is overfished, with overfishing occurring.

### What is the consequence of overfishing?

- Quota overages in the sector or common pool fisheries trigger accountability measures within season or in subsequent fishing years or fishing trimesters (common pool only). The measures are designed to correct the problems that caused the quota to be exceeded. For the scallop fishery and small-mesh fisheries, an overage can lead to gear-restrictions in the GB yellowtail flounder stock area in a year following the overage. For any US fishery overage of the EGB cod U.S. TAC is subtracted from the following year’s U.S. TAC.

### How are expected net benefits to the Nation currently measured/evaluated?

- Yield (mt and $)

### Interactions with Other Fisheries/Stocks, Bycatch Issues

- The scallop fishery and small-mesh fisheries each receive a sub-ACL of GB yellowtail flounder (16% and 2% of the total ABC, respectively).

### Ecosystem Considerations: Trophic Interactions

- Amphipods and polychaetes are the main prey of yellowtail flounder, with occasional consumption of other benthic invertebrates and small fish (Johnson et al., 1999; Klein-MacPhee, 2002). Predators include Spiny Dogfish, Atlantic Cod, several skate species, and several other benthic piscivores (Johnson et al., 1999; Klein-MacPhee, 2002) NOAA/NEFSC Northeast Vulnerability Assessment
<table>
<thead>
<tr>
<th>Ecosystem Considerations: Habitat</th>
<th>Closures in place in the GB area include the GB Dedicated Habitat Research Area, Closed Area II, and a Seasonal Spawning Closure.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecosystem Considerations: Climate</td>
<td>Yellowtail flounder is considered to have a low vulnerability to climate change (high climate exposure risk and low biological sensitivity), yet high distributional vulnerability driven by temperature. &quot;The effect of climate change on Yellowtail Flounder on the Northeast U.S. Shelf is very likely to be negative (&gt;95% certainty in expert scores). Recruitment of the southern stock has decreased and this has been linked to warming. The species has also shifted northward in recent years as temperatures have warmed. Decreasing productivity and northward shifts will lead to negative consequences for Yellowtail Flounder in the coming years.&quot; NOAA/NEFSC Northeast Vulnerability Assessment</td>
</tr>
<tr>
<td>Other Important Considerations/Notes</td>
<td>Use of the GB Yellowtail Flounder Limiter approach to develop catch advice was recommended by the 2022 TRAC and Groundfish PDT.</td>
</tr>
</tbody>
</table>