• 2017 adopted $F_{0.1}$ management benchmark, when biomass goes up TAC goes up, vice versa

• 2017 used 2 assessment models (Stock Synthesis (SS) and Virtual Population Analysis (VPA))

• 2017 assessment indicated stock increase $\rightarrow$ increased TACs of 2350 t in 2018-2020

• Projections indicated that the stock would decline
2020 strict update of the 2017 models

- Adds 3 years of data 2016-2018
- Very few changes to model specifications
- Slight changes to future recruitment specifications in projections
- Same biology (young/old spawning fraction at age)
- For SS, growth is estimated in model and changed (fish estimated to be smaller at age 6-8) and 3 indices have environmental link on catchability (US>177, Can Acoustic, CAN GSL SWNS)

BFT-WEST Atlantic stock (Task-I) by major gear

2019 catch (2305t), as of August 30, 2020
**BFTW-Figure 2.** Indices of relative abundance for western bluefin tuna. Indices denoted with “*” represent revised indices rather than strict updates of indices used in the 2017 stock assessment. Indices denoted with an “s” were used in Stock Synthesis and indices with a “v” were used in VPA. The Canadian Acoustic index data point for 2018 was not used in the assessment models.
Model fits (Stock Synthesis)

Small fish indices

US_RR_66_114

US_RR_115_144

Large fish indices

JAPAN_LL2

GOMlarval

CAN_ACOUSTIC

CAN_GSLNS

USPLL_GOM_LL2

US_RR_GT177

Small fish indices

Large fish indices
How did we reconcile conflicting indices?

Canadian Indices
- CAN COMBINED
- Acoustic

US Indices
- US RR >177
- US RR 66-114

SCRS-2020-071. Hansell et al 2020
BTRP Research Project Spatio-temporal associations of western bluefin tuna indices of abundance with ocean climate conditions Gulf of Maine Research Institute
Reconciling conflicting indices

Atlantic Multidecadal Oscillation Index (AMO)

Graph showing AMO values from 1963 to 2015 with year-specific data points.

Maps labeled A) 1992 and B) 2016, showing latitudinal and longitudinal distributions with color-coded mean values.

Chi-squared statistic plots with labels indicating correlation coefficients and p-values.
How does the model reconcile high abundance of large fish and declines in smaller fish?

2019 and 2020 data points are projected.
West Atlantic Bluefin Tuna Estimated Recruitment

Recruitment (1000s of Age 1 Fish)

- 2017 SS
- 2017 VPA
- 2020 SS3
- 2020 VPA

Years: 1973 to 2018
WBFT Results

West Atlantic Bluefin Tuna Estimated Biomass

- 2017 SS3
- 2017 VPA
- 2020 SS3
- 2020 VPA

Total Biomass (metric tons)

Year
**BFTW-Figure 3.** Estimated F/F_{0.1} from 2017 assessment. 80% confidence intervals are indicated with dashed lines.

- **F/F_{0.1} (2015-2017)**: 0.78 (average across both models)
- **Stock status\(^1\)**: Not overfishing

\(^1\) Biomass reference points to determine stock status were not estimated in the 2020 assessment due to uncertainty in recruitment potential.
Recent (2019) index values not used in assessment indicate increasing recruitment; used to support blue line.
BFTW-Figure 7. Projected total biomass (mt) of bluefin tuna in the West Atlantic under alternative constant catch scenarios, averaged across both recruitment and maturity specifications and both Stock Synthesis and VPA.
**BFTW-Table 1.** Kobe II matrix giving the probability that the fishing mortality rate (F) will be less than the F$_{0.1}$ reference point (i.e. F$\leq$F$_{0.1}$, overfishing not occurring) over the next three years for alternative constant annual catches, based on results from the 2020 VPA and SS (combined as indicated in the main text).

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*a preliminary version of the K2SM exists in the online assessment report. As noted therein, all contents are preliminary and should be considered that until adopted by the SCRS*
Management scenarios (TBD)

Alternative scenarios for Commission

1. Fixed TAC scenarios (directly from K2SM)
   minimum of 50% probability of overfishing
   minimum of 60% probability of overfishing

2. Stepped decrease scenarios
   - approximately 50% probability of $F < F_{0.1}$
   - approximately 60% probability of $F < F_{0.1}$
   - Stepwise decrease of ~10% per annum

3. Rollover in 2021 to $F = F_{0.1}$, Requested by the commission
Stock Synthesis ~ 30% lower in total biomass than in 2017, partially due to differences in growth but mainly as additional years of indices are low and model rescales biomass.

Recruitment for years 2005-2015 lower than in 2017, has continued to decline.

Stock declined more (12%) than predicted (8%) since 2017.
• SCRS completed the Executive Summary, developed draft management advice (today)

• To be adopted by correspondence

• Commission will receive advice and make final management decision also by correspondence
Conclusions
- 2020 assessment extremely consistent in trend (SS and VPA) and scale (VPA) with 2017 assessment
- Recruitment estimated to have decreased during a period 5-10 years ago, leading to declines in fishable biomass now, though we have seen evidence of increases in recruitment in 2017-2019
- Nonetheless, several key sources of uncertainty remain
  - Indices and possible environmental influences
  - Mixing and influx of Eastern population
**BFT Workplan 2021**

1. Continue Management Strategy Evaluation as priority

2. Task 2 subGroups
   
   **A. Western Indices** to evaluate environmental factors that might affect indices including LPS and Canadian Acoustic and others and develop joint longline index with US and Mexico.

   **B. Models:** evaluate alternative assessment models for Eastern stock and for mixing.
Acknowledgements

BFT working group
ICCAT Secretariat staff
GBYP Staff, both current and former