

## Gulf of Maine winter flounder exploitation rates using 30+ cm biomass from survey area swept estimates

The NEFSC (RV Bigelow series), MDMF, and ME/NH surveys appear to catch significant numbers of winter flounder per tow. Exploitation rates can be inferred from using a range of assumed survey efficiencies (Q) along with consideration of survey stock area coverage and different candidate ABC catches. The range of the estimates using different assumptions may help show what the likely exploitation rates are under different catches. A knife edge approximation of exploitable biomass was assumed as legal sized 30+ cm numbers converted to weight from a length-weight equation. Exploitable biomass was estimated as;

Exploitable Biomass = 30+ cm biomass index per tow /1000 x total survey Area/tow footprint x 1/q

and exploitation rate as;

Exploitation rate = catch / 30+ cm biomass

There are several important facts to take into consideration when interpreting the exploitation rate table (slide 34);

1. No single survey covers the entire stock.
2. Winter flounder is a shallow water species with a stock boundary from north of Cape Cod to the Canadian border.
3. Much higher survey catch rates are seen inshore verse offshore strata. However a significant proportion of the stock may be offshore due to the much larger strata area (offshore NEFSC 26, 40, 39).
4. The ME/NH survey catches significant numbers of fish. However relatively few exploitable 30+ cm fish are seen in the survey. Updated age data suggests slower growth rates in Maine waters.
5. The most recent three year average biomass was used for the spring and fall MDMF surveys, two years for Bigelow spring survey and only one year for the Bigelow fall survey. The combined biomass estimate was calculated from non-overlapping strata from all three surveys.
6. Most of the catch is taken from statistical area 514 (Cape Cod Bay, Mass Bay, Ipswich Bay, Stellwagen bank). MDMF exploitation estimates conservatively assume that the entire stock is within Massachusetts state waters.
7. A Q equal to 1 conservatively assumes that the survey gear is 100% efficient.
8. The combined estimate using non-overlapping strata from all three surveys covers most of the stock area.