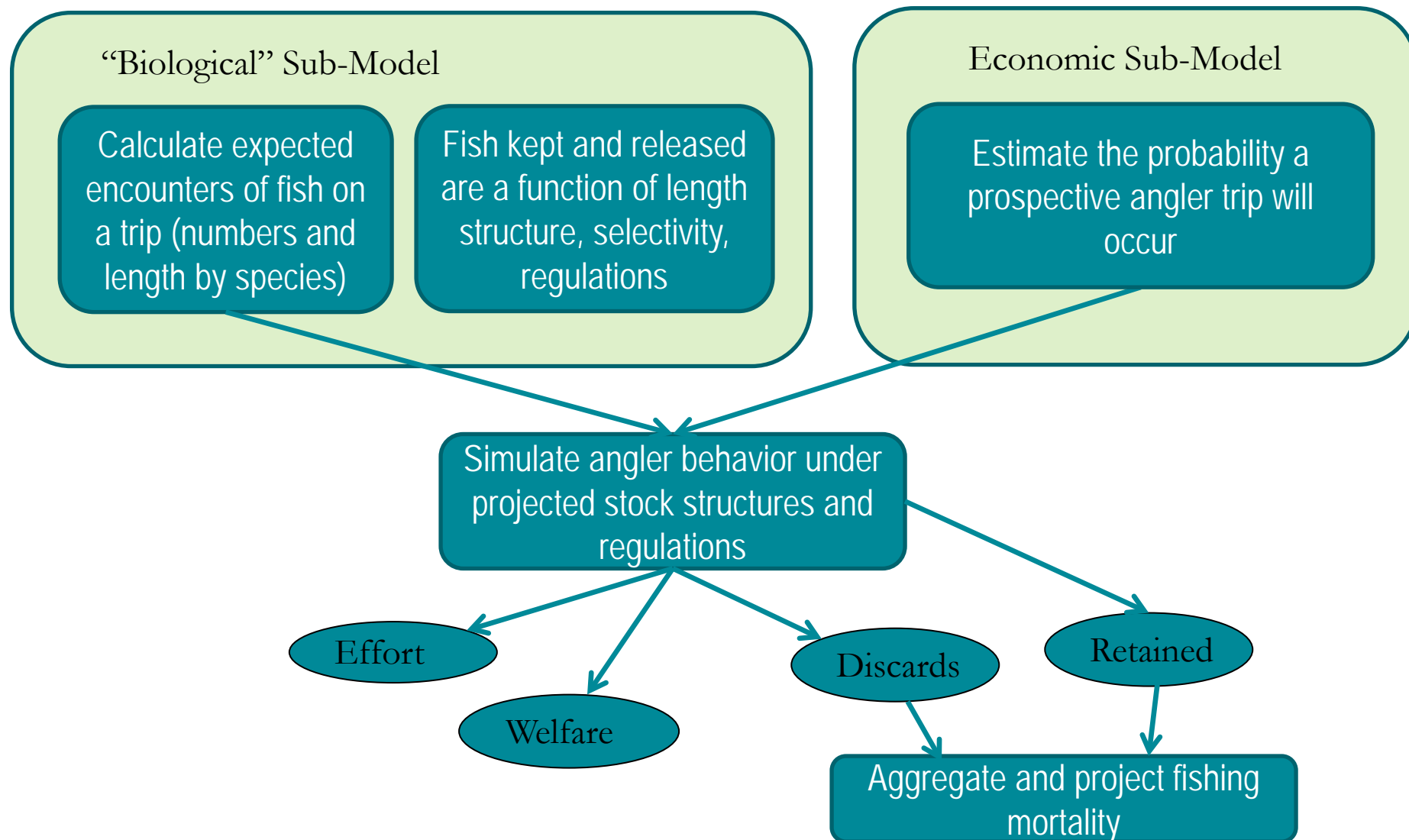


GOM Cod and Haddock Recreational Bioeconomic Model

- Used to help develop management options for GOM cod and haddock each year since 2013 (excluding FY 2021)
- Lee, Min-Yang, Scott Steinback, Kristy Wallmo. 2017.
“Applying a Bioeconomic Model to Recreational Fisheries Management: Groundfish in the Northeast United States.”
Marine Resource Economics 32:2.



Bioeconomic Model Overview

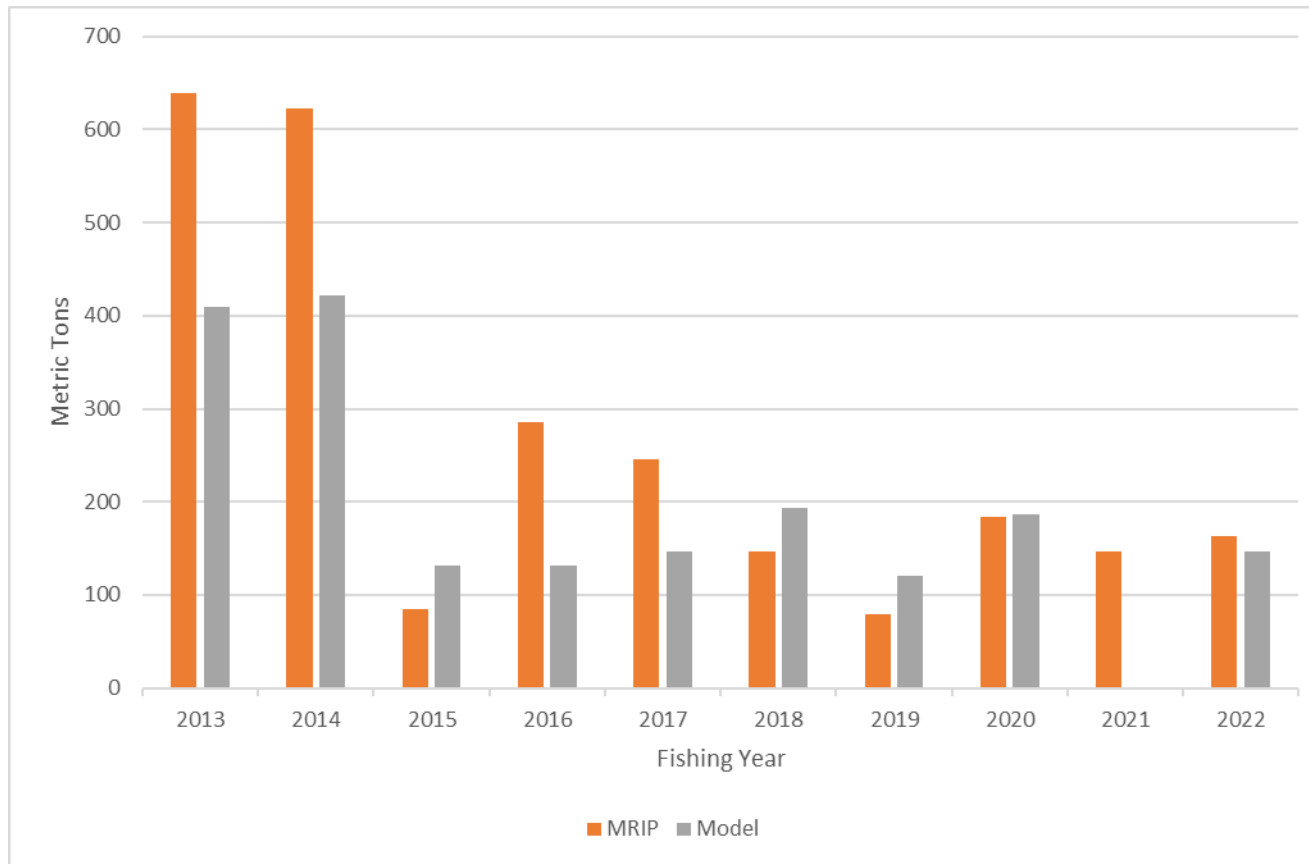


2023 Model Data

- Monthly MRIP length-frequencies (FY 2022)
- Monthly MRIP catch-per-trip for cod and haddock
- FY 2023 estimated numbers-at-age for cod and haddock from the AGEPRO assessment projections
 - Median values taken from the combined M2 and MRAMP models
- Bottom trawl survey data from 2021-2022 used to form the age-length keys
- Economic parameters from Carr-Harris and Steinback (forthcoming in *Journal of Ocean and Coastal Economics*)



Model Predictions versus MRIP: GOM cod



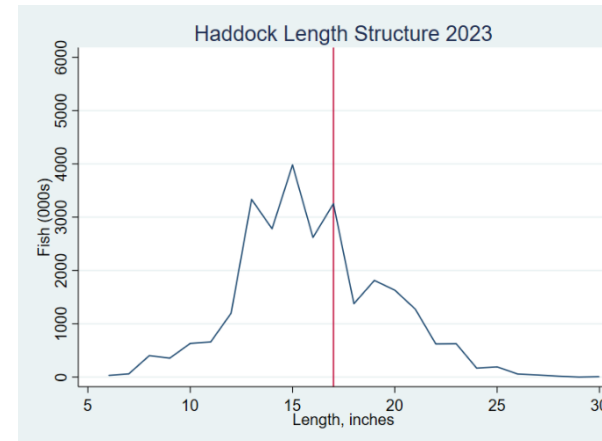
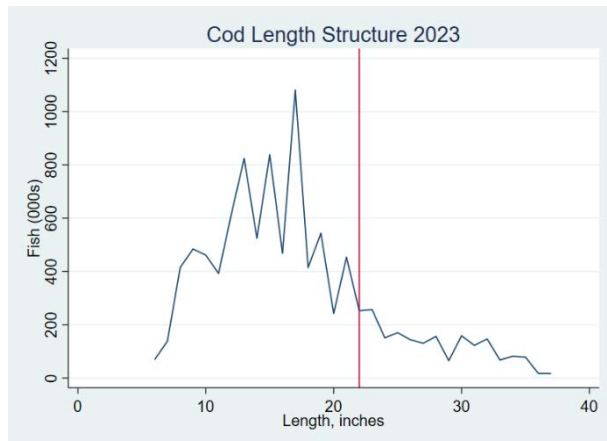
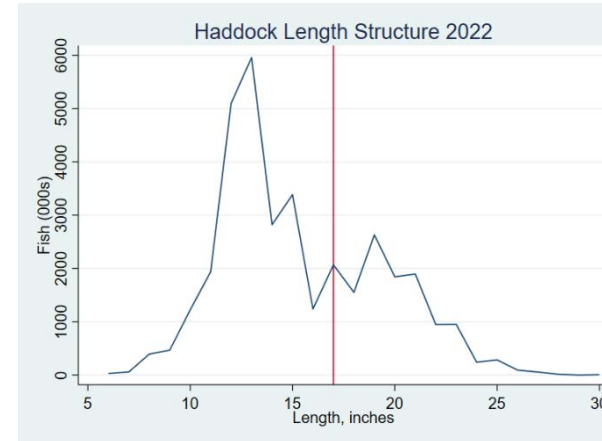
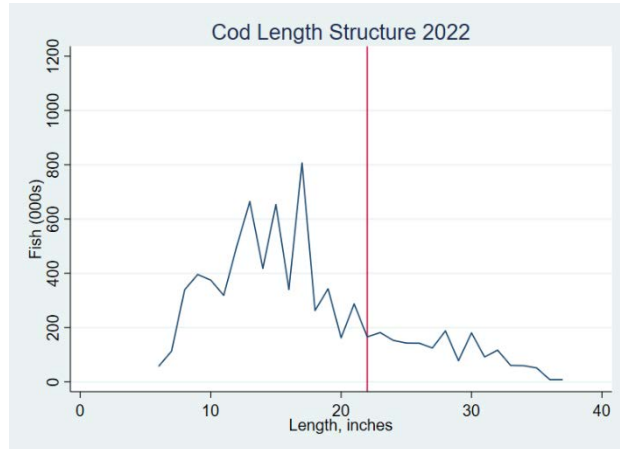
FY 2023 Status Quo Mortality Projections

Option	Mode	Cod				Haddock				
		Cod Limit	Cod Size	Cod Open Season	Cod Total Mortality mt (Median)	Had Limit	Had Size	Had Open Season	Had Total Mortality mt (Median)	Angler Trips (Median)
(Status Quo)	All	1	22"	Sept 1 -Oct 7, Apr 1-14	159	20	17"	May-Feb28, Apr 1-Apr30	644	256,074

- Projected FY 2022 cod mortality = 163 mt
- Projected FY 2022 haddock mortality = 666 mt
- Projected FY 2022 angler trips = 256,415



Why FY 2023 Mortality Under Status Quo Regulations is Estimated to be Slightly Lower than FY 2022



FY 2023 Status Quo Mortality Projections

Option	Mode	Cod				Haddock				Angler Trips (Median)	% Under Cod ACL (out of 100 Simulations)	% Under Had ACL (out of 100 Simulations)
		Cod Limit	Cod Size	Cod Open Season	Cod Total Mortality mt (Median)	Had Limit	Had Size	Had Open Season	Had Total Mortality mt (Median)			
(Status Quo)	All	1	22"	Sept 1 -Oct 7, Apr 1-14	159	20	17"	May-Feb28, Apr 1-Apr30	644	256,074	96	17

FY 2023 rec sub-ACLs: cod = 192 mt, haddock 610 mt



FY 2023 Mortality Projections from Alternative Scenarios

Option	Mode	Cod				Haddock					Angler Trips (Median)	% Under Cod ACL (out of 100 Simulations)	% Under Had ACL (out of 100 Simulations)
		Cod Limit	Cod Size	Cod Open Season	Cod Total Mortality mt (Median)	Had Limit	Had Size	Had Open Season	Had Total Mortality mt (Median)				
(Status Quo)	All	1	22"	Sept 1 -Oct 7, Apr 1-14	159	20	17"	May-Feb28, Apr 1-Apr30	644	256,074	96	17	
1 Haddock Limit 10 fish	All	1	22"	Sept 1 -Oct 7, Apr 1-14	158	10	17"	May-Feb28, Apr 1-Apr30	582	253,595	97	89	
2 Haddock Limit 10 fish, Open cod Sept 1 -Oct 31	All	1	22"	Sept 1 -Oct 31	160	10	17"	May-Feb28, Apr 1-Apr30	577	252,446	95	95	
3 Haddock Limit 10 fish, Open cod Sept 1 -Oct 31, Apr 1 -14	All	1	22"	Sept 1 -Oct 31, Apr 1-14	174	10	17"	May-Feb28, Apr 1-Apr30	585	255,621	80	85	

FY 2023 rec sub-ACLs: cod = 192 mt, haddock 610 mt

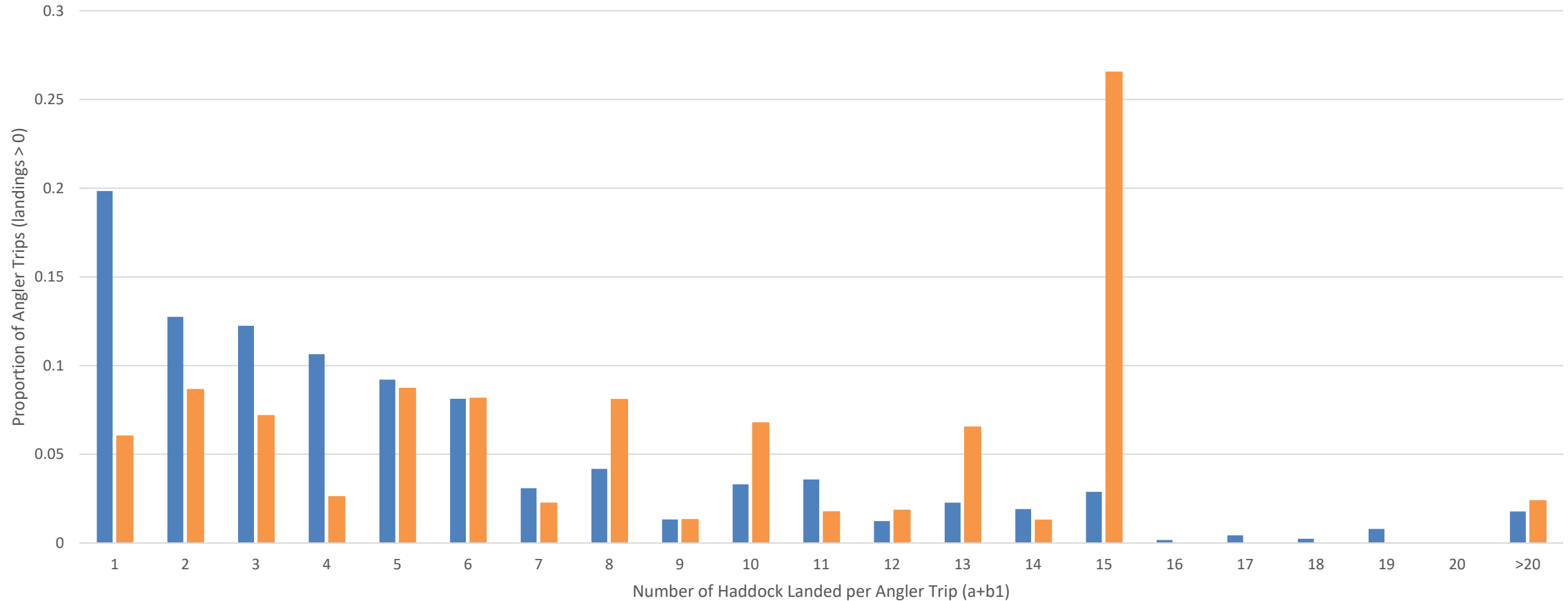
Options considered but rejected because % under had ACL < 50%

Status quo, but haddock limit changed to 15 fish (% under haddock ACL = 20%)

Status quo, but haddock limit changed to 12 fish (% under haddock ACL = 39%)



FY 2022 Gulf of Maine Recreational Haddock Landing Frequencies by For-Hire Modes



Head: ~ 85% of angler trips landed 10 or fewer haddock
Charter: ~ 60% of angler trips landed 10 or fewer haddock

■ Headboat Proportions ■ Charter Boat Proportions