Supplemental Tables and Figures

Table S1. Fishery Management Plans (FMPs) and Fishery Ecosystem Plans (FEPs) used to manage U.S. federal fish and invertebrate stocks.[†]

FMP/FEP	Year	# of species	# of stocks
New England (10 FMPs)			
Atlantic Sea Scallop	1982	1	1
Deep-Sea Red Crab	2002	1	1
Northeast Multispecies	1986	13	20
Small-Mesh Multispecies (Whiting)	2000	3	5
Northeast Skate Complex	2003	7	7
Atlantic Herring	1999	1	1
Atlantic Salmon	1988	1	1
Monkfish *(with MAFMC)*	1999	1	1
Spiny Dogfish *(with MAFMC)*	1999	1	1
Atlantic HMS *(with all East Coast RFMCs)*	2006		
Mid-Atlantic (5 FMPs)			
Atlantic Surfclam & Ocean Quahog	1977	2	2
Bluefish	1990	1	1
Mackerel, Squid, Butterfish	1978	5	5
Summer Flounder, Scup, Black Sea Bass	1988	3	3
Tilefish	2001	2	2
South Atlantic (6 FMPs)			
Dolphin & Wahoo	2004	4	4
Golden Crab	1996	1	1
Shrimp	1993	4	4
Snapper-Grouper	1983	55	55
Coastal Migratory Pelagics *(with GFMC)*	1983	3	3
GOM & SA Spiny Lobster *(with GFMC)*	1982	1	1
Gulf of Mexico (3 FMPs)			
Red Drum	1986	1	1
GOM Reef Fish	1984	31	31
GOM Shrimp	1981	4	4
Caribbean (3 FMPs)			
Puerto Rico	2022	65, plus cucumbers/urchins/corals	37
St. Thomas & St. John	2022	45, plus cucumbers/urchins/corals	26
St. Croix	2022	49, plus cucumbers/urchins/corals	26
Pacific (4 FMPs)			
Coastal Pelagic Species	2000	5	5
Pacific Groundfish	1982	86	100+
Pacific Salmon	2016	3	67
Pacific HMS	2003	11	11
North Pacific (6 FMPs)			
BSAI King & Tanner Crabs	1989	5	10
Arctic Fish	2009	3	3
BSAI Groundfish	1982	17, plus 3 complexes	23
GOA Groundfish	1978	19, plus 5 complexes	28
AK Salmon	1979	5	many
AK Scallop	1995	1	1
Western Pacific (5 FEPs)			
American Samoa Archipelago	2009		1
Hawaii Archipelago	2009		15
Guam (Mariana Archipelago)	2009		2
Pacific Pelagic Fisheries	2009		16
Pacific Remote Island Areas	2009		5

[†] We did not evaluate the seven habitat-oriented FMPs because they do not manage marine fish or invertebrate fisheries: (1) New England: Habitat FMP; (2) South Atlantic: Coral and Sargassum FMPs; (3) Gulf of Mexico: Aquaculture, Coral, and Essential Fish Habitat FMPs; and (4) Pacific: Fishery Ecosystem Plan.

Table S2. Structure of the quota allocation policy database.

Description	Column name	Example
Council	council	NEFMC
Management plan	fmp	Northeast Multispecies
Stock name	stock	Granger fish - Georges Bank
Common name	comm_name	Granger fish
Scientific name	sci_name	*Petrificus totalus*
Catch prohibited (yes/no)?	prohibited_yn	No
Allocation rule (yes/no)?	allocation_yn	Yes
Geographic rule (yes/no)?	spatial_yn	Yes
Country rule (yes/no)?	country_yn	Yes
List of countries	country_list	US, Canada
Number of countries	county_n	2
Country reference years	country_yrs	1985-1990, 1995-2001
State rule (yes/no)?	state_yn	Yes
List of states	state_list	ME, NH, RI
Number of states	state_n	3
State reference years	state_yrs	1985-1990
Area (yes/no)?	area_yn	Yes
List of areas	area_list	Georges Bank, Gulf of Maine
Number of areas	area_n	2
Area reference years	area_yrs	1985-1990, 1995-2001
Sector rule (yes/no)?	sector_yn	Yes
Sector rule type (explicit/implicit)	sector_type	Explicit
List of sectors receiving set asides	sector_setaside_list	Research, incidental
List of sectors	sector_list	Recreational, commercial
Number of sectors	sector_n	2
Sector reference years	sector_yrs	1985-1990
Basis (catch/effort)	sector_basis	Catch
Subsector rule (yes/no)?	subsector_yn	Yes
List of recreational subsectors	subsector_list_rec	For-hire, private
List of commercial subsectors	subsector_list_comm	Longline, gillnet, trap
Number of subsectors	subsector_n	5
Subsector reference years	subsector_yrs	1985-1990, 1995-2001
Seasonal rule (yes/no)?	season_yn	Yes
List of seasons	season_list	Jan - May, Jun - Dec
Number of seasons	season_n	2
Season reference years	season_yrs	1985-1990
Indiv/group rule (yes/no)?	shares_yn	Yes
Year program first implemented	shares_start_year	1998
Basis (hist., equal, auction)	shares_basis	Historical catch
Reference years	shares_yrs	1985-1990
Owner	shares_owner	Vessel
Share cap	share_cap	Person (4%), Vessel (8%)
Shares transferable (yes/no)?	shares_transfer_yn	Yes
Program name	share_program	Granger Fish ITQ

Table S3. Catch share programs by Fishery Management Council (FMC).

Program	Year
Atlantic HMS	
Individual Bluefin Tuna Quota	2015
New England	
Atlantic Sea Scallops IFQ	2010
New England Multispecies Sectors	2010
Mid-Atlantic	
Surf Clam and Ocean Quahog	1990
Golden Tilefish	2009
South Atlantic	
Wreckfish	1991
Gulf of Mexico	
Red Snapper	2007
Grouper and Tilefish	2010
Pacific	
Pacific Sablefish Permit Stacking	2001
West Coast Groundfish Trawl Rationalization	2011
North Pacific	
Western Alaska Community Development Quota Program	1992
Individual Fishing Quota Halibut and Sablefish	1995
Bering Sea AFA Pollock Cooperative	1999
Weathervane Scallop Cooperative*	2000
Bering Sea and Aleutian Islands King and Tanner Crab	2005
Aleutian Islands Pollock	2005
Bering Sea and Aleutian Islands Groundfish (Non-Pollock) Cooperatives - Amendment 80	2008
Central Gulf of Alaska Rockfish	2011
Pacific Cod Trawl Cooperative Program	2024

† The Weathervane Scallop Cooperative is a voluntary program and is not listed on the NOAA Catch Share website (https://www.fisheries.noaa.gov/national/sustainable-fisheries/catch-shares). Our inclusion of this program and the recently added Pacific Cod Trawl Cooperative Program is why we arrive at 19 rather than 17 catch share programs.

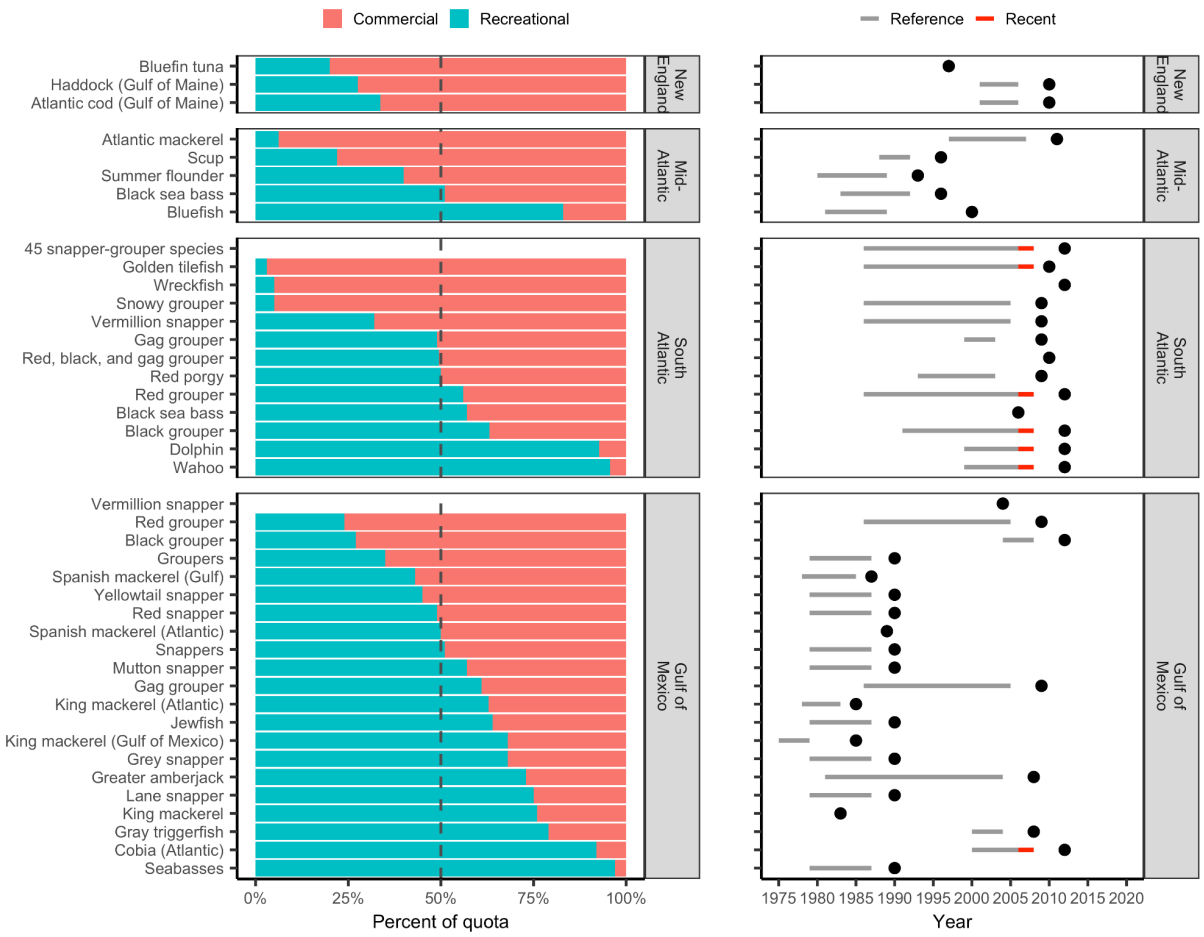

Figure S1. Sector-based allocation policies documented by Morrison and Scott (2014). Panel **A** shows the percent of quota allocated to commercial and recreational fisheries by Fishery Management Council and stock. Stocks are sorted in order of increasing allocations to recreational fisheries. The vertical dashed line indicates a 50:50 split. Panel **B** shows the reference period used to derive the allocation policy (lines) and the year in which the allocation policy went into effect (points). A few policies weigh the recent time period in addition to the selected reference time period.

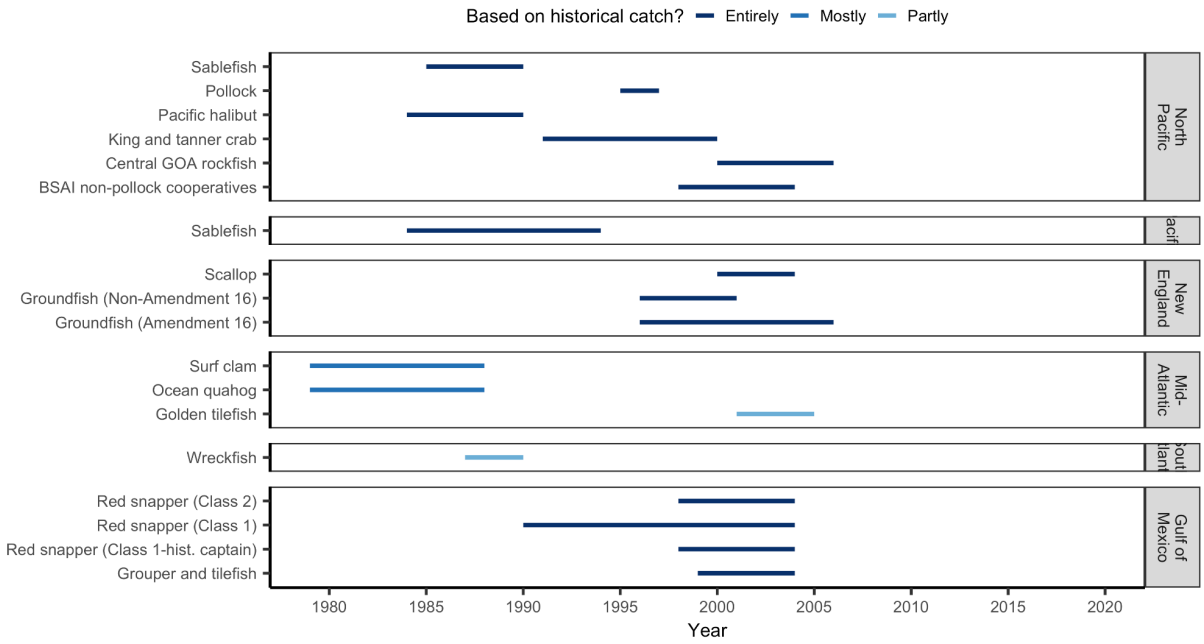

Figure S2. Basis for catch share allocations documented by Morrison and Scott (2014).

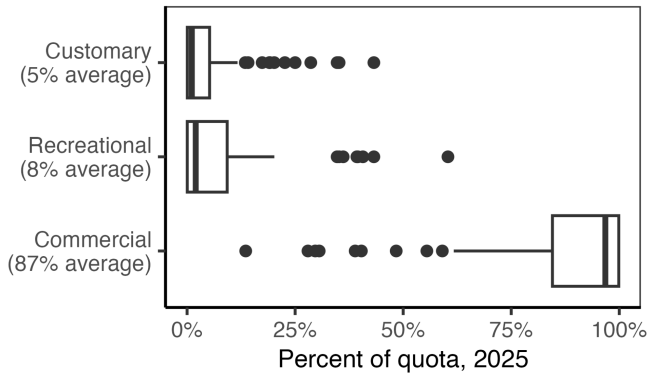

Figure S3. Quota allocation percentages among sectors for the 98 species managed within New Zealand's Quota Management System in 2025 (Fisheries of New Zealand, 2024a). In the boxplots, the solid line indicates the median, the box indicates the interquartile range (IQR; 25th to 75th percentiles), the whiskers indicate 1.5 times the IQR, and points indicate outliers.

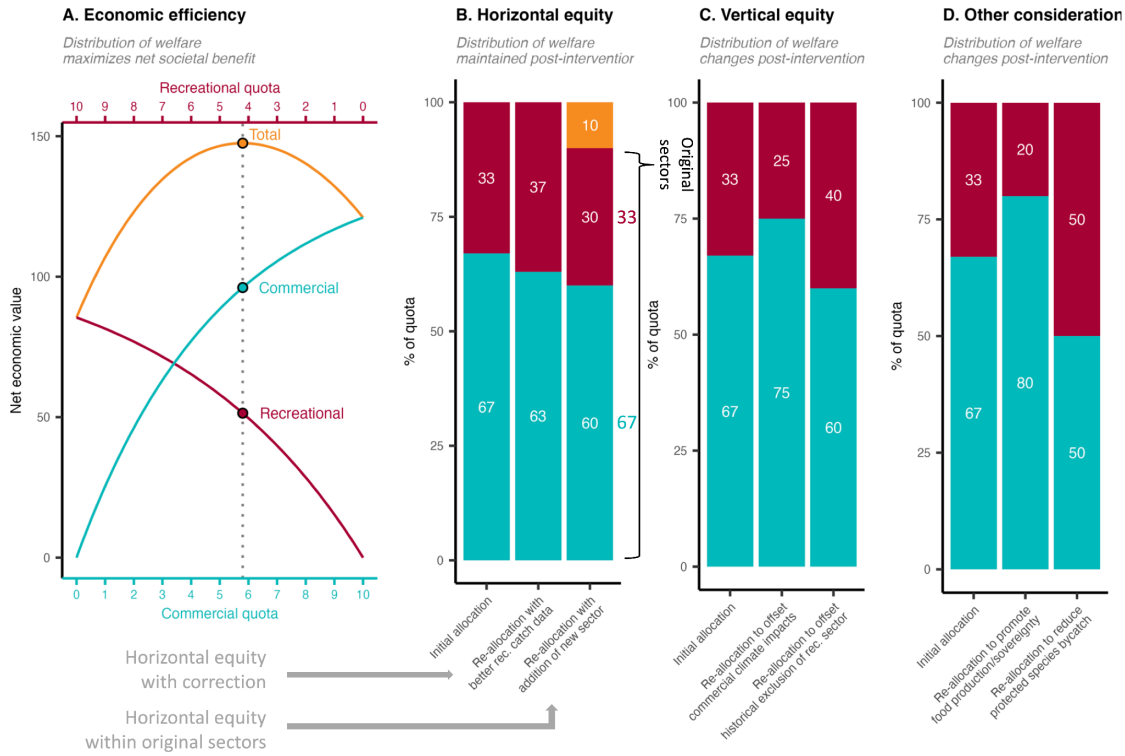

Figure S4. An illustration of alternative conceptualizations of equity in quota allocation policies. Panel **A** illustrates an allocation policy that seeks to optimize economic efficiency by maximizing the net economic benefits of commercial and recreational fisheries. The optimal policy is marked by the vertical dotted line. Panel **B** illustrates a suite of allocation policies that seek to maintain "horizontal equity" whereby the distribution of welfare remains proportional to historical levels. Column 1 shows the initial allocation based on historical catch. Column 2 illustrates a scenario in which the policy is updated with improved estimates of historical recreational catches. Although it results in a different distribution of welfare relative to the initial policy, it is motivated by the same goals (but uses better data) and is therefore still an example of horizontal equity. Column 3 illustrates a scenario in which a historically omitted subsistence sector (orange) is given access. The losses in allocation to the original sectors are proportional; thus, horizontal equity is maintained. Panel **C** illustrates a suite of allocation policies that seek to achieve "vertical equity" whereby the distribution of welfare changes after an intervention in a way considered more fair. This could be to compensate communities disadvantaged by historical allocations (column 2) or by the impacts of contemporary or future climate change (column 3). Panel **D** illustrates how managers could adjust allocation policies to achieve other fisheries objectives, such as promoting food production and sovereignty by prioritizing commercial fishing (column 2) or reducing bycatch of protected species by prioritizing more selective recreational fisheries (column 3). Although these adjustments change the distribution of welfare, they are not motivated by fairness and equity between sectors (though they do relate to broader societal concepts of fairness) and therefore do not qualify as vertical equity. We illustrate these concepts using sector allocations as an example, but all these concepts apply to any allocation between harvesting entities (states, subsectors, individuals, etc).

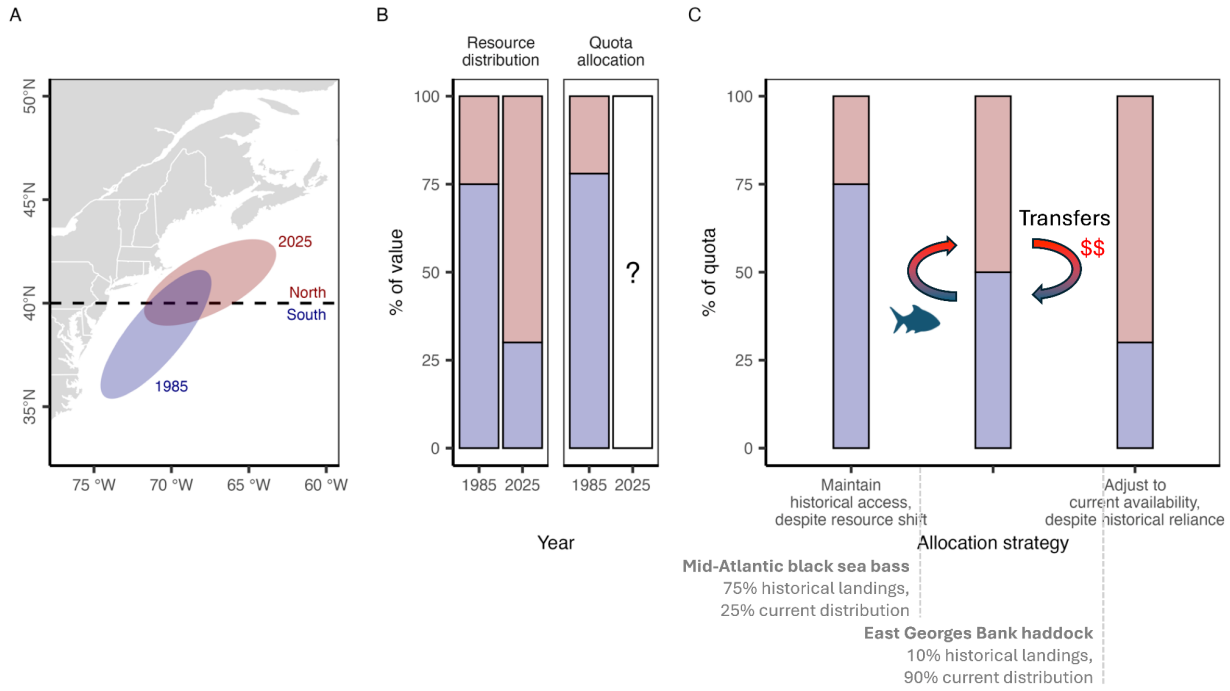

Figure S5. A conceptual schematic illustrating the spectrum of allocation options available to managers as stocks shift distributions and their availability to fisheries under climate change. Panel **A** illustrates the shift in distribution of hypothetical stock from 1985 to 2025 relative to a hypothetical management boundary. Panel **B** illustrates the proportional distribution of the resource between the two management zones in 1985 and 2025. The allocation of quota between the zones roughly matches the 1985 distribution because it was established based on 1980-1985 catch distribution. Managers must now decide whether and how to adjust the quota allocation given the climate-driven shift in distribution. Panel **C** illustrates the spectrum of options available to managers. On one end of the spectrum, managers could maintain historical access despite the resource shift. This protects historical access for southern zone fishermen but introduces inefficiencies, risks local depletion, and is unfair to northern zone fishermen. On the other end of the spectrum, managers could fully adjust to current resource distribution. This is efficient and aligned with conservation goals but does not protect historical dependence and is therefore unfair to southern fishermen. As a result, managers may wish to find a middle ground between these two extremes. Examples of allocation policies that fall in middleground are highlighted. Furthermore, allowing transfers between zones provides a mechanism for northern fishermen to gain access and for southern fishermen to be compensated for lost access.