

Assembly rules for aggregate-species production models: simulations in support of management strategy evaluation

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Supplement 1. Simulation model parameterization, logistic assessment model fits, and detailed realized yield and biomass results for each management strategy

Table S1. Parameters used for the simulated Georges Bank system. Abbreviations defined in Table 4 in the main article

Parameter	Cod	Haddock	Herring	Mackerel	Redfish	Skates	Dogfish	Winter fl.	Yellowtail fl.	Window-pane fl.
Growth Rate	0.64	0.52	0.62	0.32	0.232	0.2	0.2	0.74	0.66	0.6
Initial Biomass	22563	300000	209400	77600	40048.8	60683.6	40000	4301	8000	7288
Carrying Capacity	296168	316000	268240	77600	108400	422292.4	40000	32000	86400	11198
Competition Coefficient										
with Cod	0	0.236	0	0	0.276	0	0	0.101	0.124	0.248
with Haddock	0.236	0	0	0	0.125	0	0	0.341	0.424	0.233

with Herring	0	0	0	0.5	0	0	0	0	0	0
with Mackerel	0	0	0.5	0	0	0	0	0	0	0
with Redfish	0.276	0.125	0	0	0	0	0	0.041	0.076	0.219
with Skates	0	0	0	0	0	0	0.3	0	0	0
with Dogfish	0	0	0	0	0	0.3	0	0	0	0
with Winter fl.	0.101	0.341	0	0	0.041	0	0	0	0.721	0.132
with Yellowtail fl.	0.124	0.424	0	0	0.076	0	0	0.721	0	0.261
with Windowpane fl.	0.248	0.233	0	0	0.219	0	0	0.132	0.261	0

Predation Loss Rates

on Cod	0	0	0	0	0	0	0	0	0	0
on Haddock	0	0	0	0	0	0	0	0	0	0
on Herring	2E-08	0	0	0	2E-08	2E-08	2E-08	0	0	0
on Mackerel	2E-08	0	0	0	2E-08	2E-08	2E-08	0	0	0
on Redfish	0	0	0	0	0	0	0	0	0	0
on Skates	0	0	0	0	0	0	0	0	0	0
on Dogfish	0	0	0	0	0	0	0	0	0	0
on Winter fl.	0	0	0	0	0	0	0	0	0	0
on Yellowtail fl.	0	0	0	0	0	0	0	0	0	0
on Windowpane fl.	0	0	0	0	0	0	0	0	0	0

Table S2. Parameters used for the simulated Gulf of Alaska system. Abbreviations defined in Table 4 in the main article

Parameter	F. H.			P.			Sablefish	Skates	Pollock	
	Arrowtooth	Dogfish	Sole	Herring	P. Cod	Halibut				POP
Growth Rate	0.27484	0.1	0.28619	0.70342	0.55783	0.19141	0.11781	0.2192	0.2	0.635
Initial Biomass	2121440	79257	325357	389081	428000	125523	330480	183333	110320	893700
Carrying Capacity	2394120	158514	325357	778162	428000	290854	455220	401894	220640	1380000
Competition Coefficient										
with Arrowtooth	0	0.457	0.203	0.196	0.362	0.348	0.223	0.458	0.267	0.360
with Dogfish	0.457	0	0.206	0.209	0.351	0.327	0.243	0.452	0.280	0.372
with F. H. Sole	0.203	0.206	0	0.077	0.431	0.142	0.105	0.178	0.178	0.296
with Herring	0.196	0.209	0.077	0	0.046	0.005	0.853	0.167	0.000	0.570

with P. Cod	0.362	0.351	0.431	0.046	0	0.476	0.121	0.358	0.436	0.379
with P. Halibut	0.348	0.327	0.142	0.005	0.476	0	0.035	0.323	0.226	0.114
with POP	0.223	0.243	0.105	0.853	0.121	0.035	0	0.232	0.073	0.655
with Sablefish	0.458	0.452	0.178	0.167	0.358	0.323	0.232	0	0.150	0.340
with Skates	0.267	0.280	0.178	0.000	0.436	0.226	0.073	0.150	0	0.227
with W. Pollock	0.360	0.372	0.296	0.570	0.379	0.114	0.655	0.340	0.227	0

Predation Loss Rates

on Arrowtooth	3.51E-09	1.12E-09	0	0	2.56E-09	3.85E-09	3.27E-10	0	2.43E-09	1.76E-09
on Dogfish	0	1.91E-08	0	0	0	0	0	0	0	0
on F. H. Sole	8.24E-09	1.07E-09	0	0	9.42E-09	3.36E-09	0	0	2.33E-09	4.91E-09
on Herring	6.53E-08	4.16E-09	0	0	1.54E-10	1.31E-09	0	3.64E-09	4.90E-10	4.71E-10
on P. Cod	6.10E-09	8.88E-10	0	0	1.94E-11	2.69E-09	0	5.32E-10	6.17E-10	1.25E-10
on P. Halibut	3.54E-11	1.60E-09	0	0	1.10E-11	1.14E-11	0	0	3.49E-09	0
on POP	0	3.14E-09	0	0	1.03E-11	3.53E-09	0	0	2.75E-11	0
on Sablefish	3.19E-09	0	0	0	0	2.07E-09	0	0	4.59E-11	0
on Skates	0	9.54E-09	0	0	0	0	0	0	8.46E-11	0
on W. Pollock	3.78E-08	5.95E-10	8.85E-11	0	1.14E-08	1.53E-08	0	3.80E-09	4.17E-10	9.79E-09

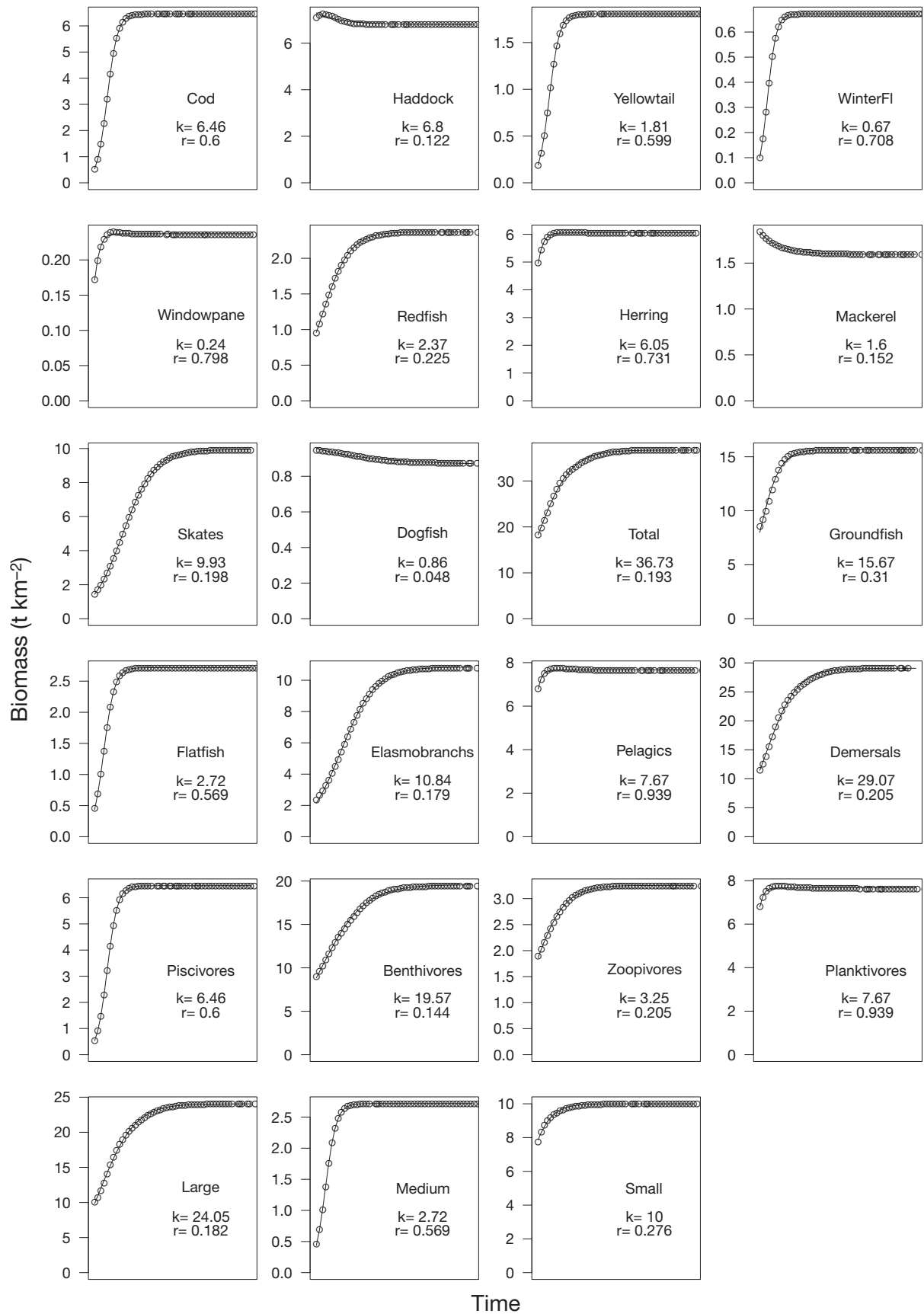


Fig. S1. ‘Assessment’ fits to biomass trajectories from year 0 to 50 with deterministic $F = 0$ run for Georges Bank species aggregations. Abbreviations defined in Table 4 in the main article

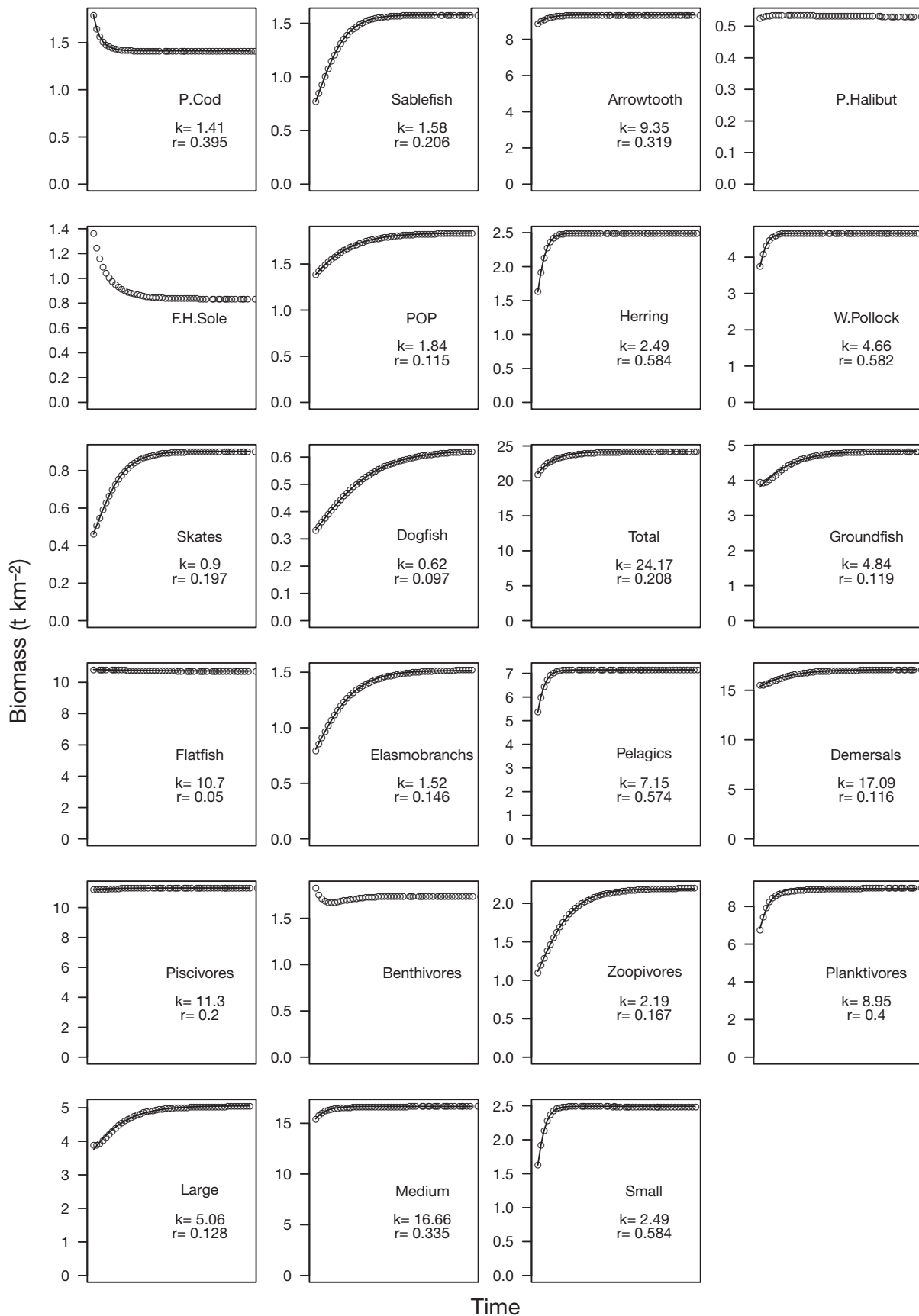


Fig. S2. ‘Assessment’ fits to biomass trajectories from year 0 to 50 with deterministic $F = 0$ run for Gulf of Alaska (GOA) species aggregations. The estimation procedure failed for GOA F.H. sole and P. halibut, as well as the benthivore aggregation which contains flathead sole and skates. Abbreviations defined in Table 4 in the main article

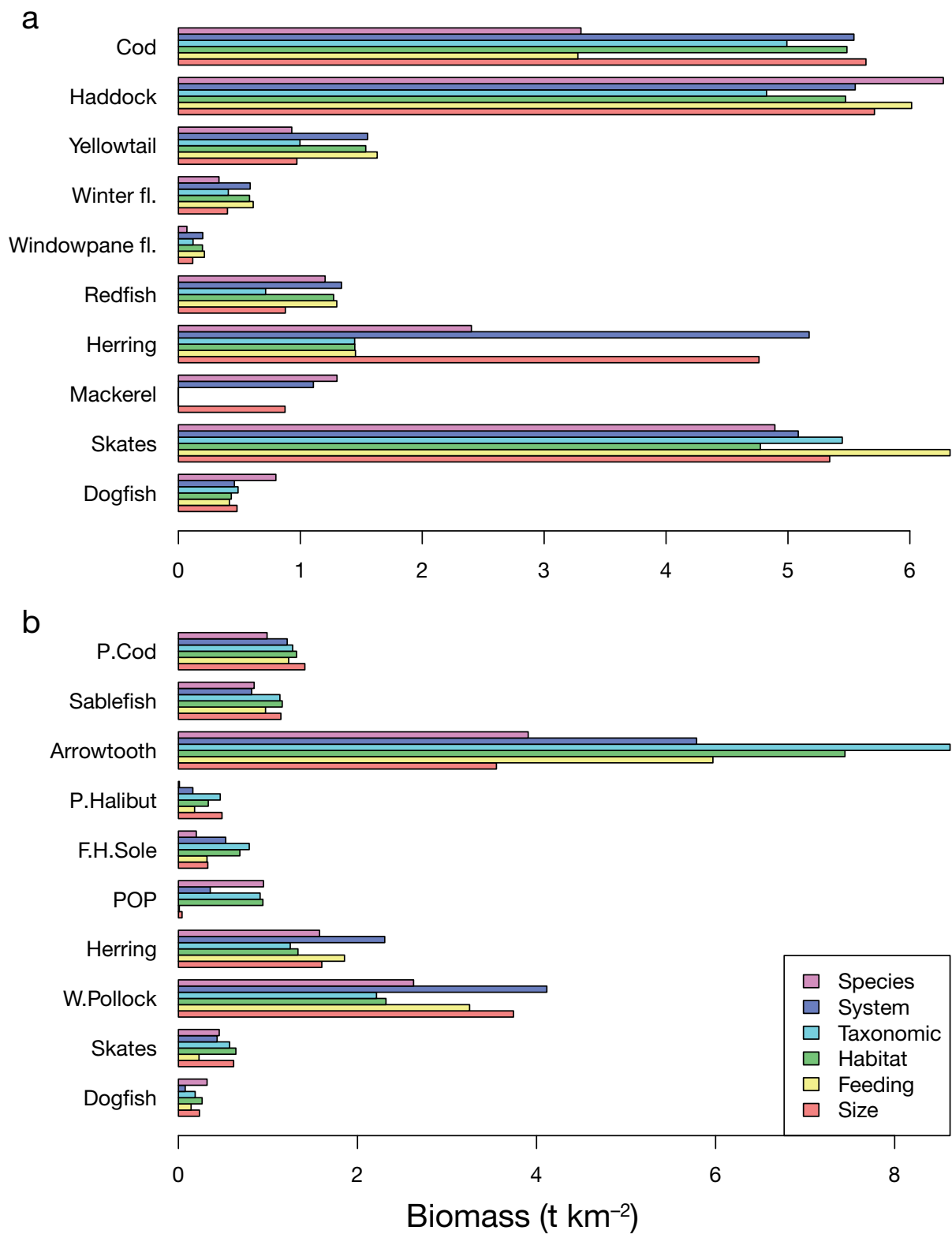


Fig. S3. Equilibrium biomass for each species after 50 yr of fishing at the assessment-based F_{MSY} for (a) Georges Bank and (b) Gulf of Alaska

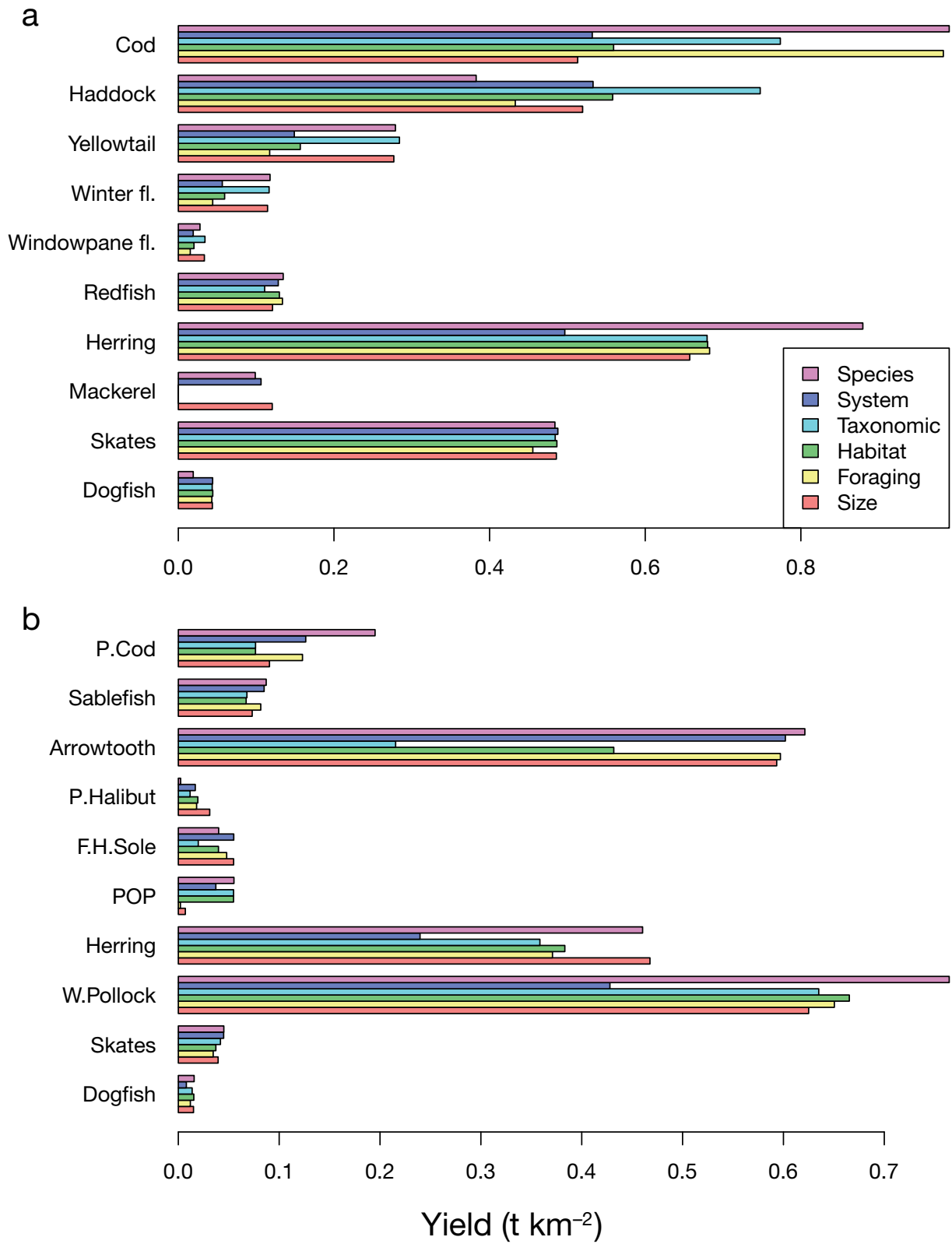


Fig. S4. Equilibrium yield for each species after 50 yr of fishing at the assessment-based F_{MSY} for (a) Georges Bank and (b) Gulf of Alaska