JOINT MEETING OF THE

GROUNDFISH COMMITTEE AND GROUNDFISH ADVISORY PANEL

Webinar

May 27, 2026

New England Fishery Management Council

Groundfish Outlook by Quarter in 2026, updated May 26, 2026, NEFMC Staff

Council Priority*	Jan – Mar	Apr - Jun	July - Sept	Oct - Dec
Amendment 25	Final Submission	GARFO implementation		
Recreational Measures	Develop recommendations for cod & haddock	GARFO implementation		
Framework Adjustment 72	Preliminary & Final Submissions	GARFO implementation		
Amendment 23 Review	Conduct review analyses	Complete review		Consider recommendations for follow-up actions
Redfish Sector Exemption Review	Conduct review analyses	Complete review		Consider recommendations for follow-up actions
ABC Control Rules Framework (68)	Contract work conducted to evaluate integration of revised Risk Policy with revised ABC CRs	Develop revised ABC CRs from simulation testing , conduct analysis	Final action	Implementation of revised ABC CRs for specifications
Framework Adjustment 74		Develop scope / Initiate action	Develop specifications & measures, conduct analysis	Final action
Atlantic Cod Management			Continue to develop transition plan; paused pending Amendment 25 decision	
White Hake Rebuilding			Conduct rebuilding plan analyses & review biological reference points	
Stock Assessments		MT- GB haddock (Jun.)	Domestic updates for transboundary mgmt. (cod, haddock, yellowtail flounder) (Jul.)	MT- GOM haddock, plaice Data updates- pollock, witch flounder, halibut (Sept.)

*Additional: Participate in TMGC, coordinate on EFH designation updates, and make recommendations for 2027 Council priorities

DRAFT Amendment 23 Review

GROUNDFISH SECTOR MONITORING PROGRAM REVIEW

For Today:

- **Receive a report from the PDT on the review.**
- **Discuss the review analyses and outcomes.**

GROUNDFISH SECTOR MONITORING PROGRAM REVIEW

Scope:

Develop review metrics and conduct review of Amendment 23 groundfish sector monitoring program.

Objectives:

Evaluate the effectiveness of higher monitoring coverage.

Determine whether accuracy of catch data has improved, value of the data has been maximized, and costs have been minimized.

Fishing Year 2023 was the first full year that the provisions of Amendment 23 were in effect.

GROUNDFISH SECTOR MONITORING PROGRAM REVIEW

Review Questions and Themes:

(1) **Data Impacts:** Do higher monitoring coverage rates improve accuracy and reduce bias of catch data?

(2) **Fishery Impacts:** Do higher monitoring coverage rates impact fishery performance?

(3) **Program Reach:** Are the structure and process of the monitoring program conducive to achieving its objectives?

Data Impacts: Relevant Metrics

M1 Observer Bias

M2 Biased Vessels

M3 Magnitude of Observer Bias

M6 Discard Estimates

M10 Exclusion Catch Estimates

M11 Management Uncertainty Buffers (MUB)

M9 Catch Allocation by Statistical Area/Broad Stock Area (BSA) Reporting*

Data Impacts: Bottom Line Up Front

- Some analyses need additional work.
- Observer bias has declined.
    - Since the original analysis, there have been important changes:
        - Database changes.
        - Changes in constraining stocks over time.
        - Potential worldwide pandemic complications.
        - Major changes in achieved coverage with time.
    - These changes make it difficult to draw a clear conclusion from some of the updated analyses.
- Failure to see a clear observer effect pattern in the data under higher coverage rates is consistent with the hypothesis that higher coverage rates would address bias.

Data Impacts: Bottom Line Up Front

- We have not eliminated observer bias but have ameliorated it with coverage.
- The source of discard data for commercial groundfish sector trips has shifted from predominantly being calculated using discard rates (2018-2021) to primarily coming from ASM and reviewed EM (2022-2024).
    - The total amount of discards (mt) has declined from over 800 mt in 2018 to a low of <500 mt in 2021 and has been steady at slightly over 500 mt in 2022, 2023, and 2024.
    - This suggests accuracy and precision of catch data has improved.
- Limited NEFOP coverage of ASM-excluded trips, but discard rates are lower than those on standard trips.
- The Amendment 23 Review work does not generate a single ASM coverage level to address bias.

Data Impacts: M1 Observer Bias

Landings and Effort Ratios Between Observed and Unobserved Trips

Hypothesis:

- **If** constraining stocks that produce incentives for observer effects are causing unseen discards of legal-sized fish on unobserved trips,
- **Then** this should result in a difference in stock landings per unit effort ratios between observed and unobserved trips in the multispecies fishery.
  - Looks for consistent patterns
  - Yellow highlights show that vessels land more of a stock on observed trips and grey highlights that vessels land more of a stock on unobserved trips.
  - Patterns and changes are circled.
  - The values will be available in the written report.

land more on observed trips

land more on unobserved trips

Data Impacts: M1 Observer Bias

A23 Results

Gulf of Maine

land more on observed trips

land more on unobserved trips

Gulf of Maine trawl kept to kall ratios.

year	number of trips	Observed	cod	dabs	haddock	pollock	redfsh	winter flounder	white hake	witch flounder	yellowtail flounder
2011	873	ob	0.21	0.07	0.03	0.20	0.08	0.01	0.15	0.03	0.02
2011	2300	un	0.22	0.07	0.02	0.21	0.10	0.01	0.14	0.03	0.03
2012	1009	ob	0.15	0.06	0.03	0.20	0.13	0.02	0.13	0.05	0.04
2012	3052	un	0.12	0.05	0.02	0.24	0.21	0.02	0.10	0.04	0.04
2013	543	ob	0.09	0.09	0.02	0.23	0.14	0.02	0.13	0.05	0.05
2013	2121	un	0.06	0.07	0.02	0.27	0.22	0.01	0.12	0.04	0.03
2014	519	ob	0.06	0.07	0.02	0.26	0.20	0.02	0.11	0.04	0.04
2014	1630	un	0.05	0.07	0.02	0.23	0.26	0.01	0.11	0.03	0.03
2015	331	ob	0.02	0.10	0.07	0.16	0.26	0.01	0.10	0.04	0.03
2015	1275	un	0.01	0.08	0.06	0.14	0.36	0.01	0.10	0.03	0.02
2016	262	ob	0.02	0.08	0.12	0.11	0.27	0.01	0.08	0.03	0.03
2016	1347	un	0.01	0.07	0.13	0.15	0.27	0.01	0.08	0.02	0.02
2017	237	ob	0.02	0.06	0.17	0.14	0.17	0.01	0.11	0.03	0.01
2017	1677	un	0.01	0.06	0.14	0.16	0.26	0.01	0.10	0.02	0.01

Gulf of Maine trawl kept to days absent ratios.

year	number of trips	Observed	cod	dabs	haddock	pollock	redfsh	winter flounder	white hake	witch flounder	yellowtail flounder
2011	873	ob	742	247	98	707	295	25	529	120	77
2011	2300	un	829	265	90	787	385	39	519	129	125
2012	1009	ob	480	192	78	631	392	58	409	150	118
2012	3052	un	462	212	87	936	851	70	415	154	159
2013	543	ob	280	274	75	713	432	56	392	146	160
2013	2121	un	255	293	62	1100	921	59	497	149	138
2014	519	ob	270	312	102	1119	855	70	448	169	153
2014	1630	un	218	352	97	1100	1218	56	509	150	125
2015	331	ob	69	394	267	662	1052	55	406	166	118
2015	1275	un	56	446	314	767	1897	57	515	161	108
2016	262	ob	93	344	488	462	1129	60	337	125	127
2016	1347	un	76	389	752	861	1520	54	482	131	129
2017	237	ob	103	356	1012	817	985	68	661	152	79
2017	1677	un	66	391	984	1093	1808	52	710	122	103

Gulf of Maine gillnet kept to kall ratios.

year	number of trips	Observed	cod	dabs	haddock	pollock	redfsh	winter flounder	white hake	witch flounder	yellowtail flounder
2011	1371	ob	0.30	-	0.01	0.35	0.01	-	0.09	-	-
2011	3423	un	0.25	-	0.01	0.40	0.01	-	0.09	-	-
2012	1112	ob	0.20	-	0.00	0.32	0.00	-	0.10	-	-
2012	3298	un	0.17	-	0.00	0.37	0.01	-	0.12	-	-
2013	484	ob	0.10	-	0.00	0.51	0.01	-	0.12	-	-
2013	2094	un	0.08	-	0.00	0.47	0.02	-	0.16	-	-
2014	736	ob	0.09	-	0.00	0.42	0.01	-	0.10	-	-
2014	1831	un	0.09	-	0.01	0.38	0.01	-	0.09	-	-
2015	286	ob	0.04	-	0.00	0.38	0.01	-	0.05	-	-
2015	954	un	0.04	-	0.01	0.39	0.02	-	0.08	-	-
2016	185	ob	0.06	-	0.00	0.19	0.01	-	0.10	-	-
2016	839	un	0.06	-	0.01	0.30	0.01	-	0.10	-	-
2017	144	ob	0.05	-	0.00	0.19	0.01	-	0.06	-	-
2017	863	un	0.04	-	0.01	0.23	0.01	-	0.06	-	-

Gulf of Maine gillnet kept to days absent ratios.

year	number of trips	Observed	cod	dabs	haddock	pollock	redfsh	winter flounder	white hake	witch flounder	yellowtail flounder
2011	1371	ob	668	-	27	796	20	-	196	-	-
2011	3423	un	684	-	20	957	22	-	217	-	-
2012	1112	ob	411	-	9	644	9	-	200	-	-
2012	3298	un	374	-	9	783	20	-	254	-	-
2013	484	ob	201	-	6	1046	18	-	250	-	-
2013	2094	un	156	-	5	870	29	-	297	-	-
2014	736	ob	246	-	12	1119	39	-	257	-	-
2014	1831	un	230	-	14	990	33	-	247	-	-
2015	286	ob	110	-	14	1080	39	-	137	-	-
2015	954	un	93	-	22	1038	54	-	221	-	-
2016	185	ob	227	-	15	694	46	-	345	-	-
2016	839	un	161	-	25	827	35	-	266	-	-
2017	144	ob	171	-	12	677	27	-	210	-	-
2017	863	un	127	-	24	773	37	-	194	-	-

Data Impacts: M1 Observer Bias

Updated Results

Gulf of Maine

land more on observed trips

land more on unobserved trips

Gulf of Maine trawl kept to kall ratios.

year	number of trips #	%	Observed	cod	dabs	haddock	pollock	redfsh	winter flounder	white hake	witch flounder	yellowtail flounder
2018	412	17%	ob	0.02	0.07	0.16	0.15	0.22	0.00	0.11	0.03	0.01
2018	2050	83%	un	0.01	0.06	0.16	0.14	0.26	0.01	0.10	0.03	0.01
2019	612	27%	ob	0.01	0.05	0.20	0.13	0.27	0.00	0.10	0.03	0.01
2019	1649	73%	un	0.01	0.05	0.18	0.14	0.27	0.00	0.09	0.03	0.01
2020	443	17%	ob	0.01	0.02	0.21	0.17	0.26	0.00	0.09	0.03	0.01
2020	2128	83%	un	0.01	0.02	0.21	0.15	0.28	0.00	0.09	0.02	0.01
2021	1006	39%	ob	0.01	0.03	0.29	0.14	0.17	0.01	0.09	0.04	0.02
2021	1600	61%	un	0.01	0.02	0.24	0.17	0.23	0.00	0.08	0.03	0.01
2022	1192	58%	ob	0.01	0.04	0.24	0.18	0.12	0.01	0.10	0.04	0.02
2022	849	42%	un	0.01	0.02	0.21	0.20	0.19	0.00	0.09	0.03	0.02
2023	1747	82%	ob	0.02	0.05	0.17	0.19	0.17	0.01	0.11	0.04	0.03
2023	383	18%	un	0.01	0.06	0.24	0.16	0.12	0.00	0.12	0.04	0.01
2024	1897	87%	ob	0.01	0.07	0.09	0.13	0.32	0.01	0.09	0.05	0.02
2024	279	13%	un	0.01	0.10	0.08	0.14	0.25	0.00	0.11	0.06	0.01
2025	1640	85%	ob	0.02	0.09	0.10	0.13	0.21	0.01	0.11	0.06	0.01
2025	285	15%	un	0.01	0.10	0.08	0.17	0.20	0.01	0.10	0.06	0.01

Gulf of Maine trawl kept to days absent ratios.

year	Observed	cod	dabs	haddock	pollock	redfsh	winter flounder	white hake	witch flounder	yellowtail flounder
2018	ob	79	348	777	736	1075	21	526	127	29
2018	un	62	302	815	717	1334	31	509	148	51
2019	ob	49	267	1092	743	1509	16	559	145	31
2019	un	57	276	1100	846	1628	17	561	198	38
2020	ob	65	131	1156	932	1442	11	496	188	34
2020	un	46	108	1095	814	1493	10	498	131	31
2021	ob	51	117	1203	578	702	26	367	162	91
2021	un	50	107	1262	885	1228	24	443	166	72
2022	ob	59	186	1063	794	538	26	419	179	75
2022	un	63	127	1054	1053	971	25	438	174	92
2023	ob	96	267	819	939	833	46	525	210	131
2023	un	76	330	1292	874	635	16	625	216	55
2024	ob	70	378	499	688	1667	36	478	263	95
2024	un	72	490	404	662	1245	9	539	272	32
2025	ob	75	463	487	628	1039	29	521	292	63
2025	un	57	482	404	829	1002	59	483	299	65

Gulf of Maine gillnet kept to kall ratios.

year	number of trips #	%	Observed	cod	dabs	haddock	pollock	redfsh	winter flounder	white hake	witch flounder	yellowtail flounder
2018	163	16%	ob	0.07	-	0.01	0.35	0.01	-	0.11	-	-
2018	887	84%	un	0.04	-	0.01	0.24	0.01	-	0.13	-	-
2019	269	26%	ob	0.06	-	0.01	0.23	0.00	-	0.07	-	-
2019	780	74%	un	0.03	-	0.01	0.12	0.00	-	0.06	-	-
2020	104	14%	ob	0.09	-	0.01	0.54	0.00	-	0.08	-	-
2020	646	86%	un	0.04	-	0.01	0.22	0.00	-	0.08	-	-
2021	317	42%	ob	0.04	-	0.02	0.22	0.00	-	0.12	-	-
2021	442	58%	un	0.03	-	0.01	0.21	0.00	-	0.09	-	-
2022	349	53%	ob	0.03	-	0.01	0.17	0.00	-	0.10	-	-
2022	308	47%	un	0.03	-	0.01	0.18	0.00	-	0.10	-	-
2023	508	78%	ob	0.04	-	0.02	0.17	0.00	-	0.05	-	-
2023	147	22%	un	0.03	-	0.01	0.16	0.00	-	0.08	-	-
2024	584	90%	ob	0.04	-	0.01	0.21	0.00	-	0.06	-	-
2024	68	10%	un	0.06	-	0.02	0.30	0.00	-	0.12	-	-
2025	484	92%	ob	0.02	-	0.00	0.23	0.00	-	0.06	-	-
2025	41	8%	un	0.05	-	0.00	0.25	0.00	-	0.08	-	-

Gulf of Maine gillnet kept to days absent ratios.

year	Observed	cod	dabs	haddock	pollock	redfsh	winter flounder	white hake	witch flounder	yellowtail flounder
2018	ob	146	-	28	750	12	-	244	-	-
2018	un	82	-	21	536	12	-	285	-	-
2019	ob	151	-	17	579	12	-	177	-	-
2019	un	79	-	18	313	9	-	162	-	-
2020	ob	213	-	23	1224	8	-	181	-	-
2020	un	90	-	19	546	7	-	207	-	-
2021	ob	88	-	40	545	5	-	286	-	-
2021	un	72	-	28	556	10	-	247	-	-
2022	ob	66	-	28	396	3	-	244	-	-
2022	un	64	-	19	435	3	-	243	-	-
2023	ob	104	-	41	420	2	-	127	-	-
2023	un	85	-	31	396	2	-	206	-	-
2024	ob	103	-	25	503	3	-	151	-	-
2024	un	117	-	38	594	2	-	228	-	-
2025	ob	57	-	4	542	3	-	143	-	-
2025	un	84	-	7	404	1	-	130	-	-

Data Impacts: M1 Observer Bias

A23 Results

Georges Bank

land more on observed trips

land more on unobserved trips

Georges Bank trawl kept to kall ratios.

year	number of trips	Observed	cod	dabs	haddock	pollock	redfsh	winter flounder	white hake	witch flounder	yellowtail flounder
2011	105	ob	0.116	0.050	0.325	0.041	0.012	0.127	0.022	0.025	0.078
2011	457	un	0.096	0.038	0.323	0.067	0.039	0.137	0.026	0.021	0.076
2012	79	ob	0.093	0.074	0.085	0.026	0.021	0.182	0.026	0.033	0.072
2012	486	un	0.126	0.057	0.133	0.047	0.039	0.185	0.022	0.030	0.041
2013	59	ob	0.088	0.047	0.126	0.029	0.026	0.273	0.035	0.023	0.014
2013	389	un	0.080	0.039	0.173	0.045	0.076	0.244	0.030	0.020	0.025
2014	61	ob	0.103	0.053	0.289	0.017	0.030	0.127	0.040	0.024	0.004
2014	349	un	0.123	0.051	0.311	0.033	0.070	0.131	0.024	0.017	0.016
2015	33	ob	0.116	0.058	0.185	0.005	0.006	0.182	0.018	0.016	0.018
2015	333	un	0.104	0.032	0.299	0.042	0.067	0.098	0.029	0.015	0.012
2016	27	ob	0.184	0.021	0.153	0.063	0.078	0.063	0.023	0.011	0.001
2016	293	un	0.070	0.027	0.195	0.070	0.159	0.068	0.019	0.010	0.006
2017	40	ob	0.031	0.019	0.096	0.051	0.087	0.039	0.028	0.026	0.003
2017	295	un	0.029	0.024	0.201	0.037	0.199	0.058	0.019	0.015	0.008

Georges Bank trawl kept to days absent ratios.

year	number of trips	Observed	cod	dabs	haddock	pollock	redfsh	winter flounder	white hake	witch flounder	yellowtail flounder
2011	105	ob	538	233	1507	192	58	588	104	117	363
2011	457	un	584	229	1968	410	238	832	155	128	465
2012	79	ob	438	346	399	120	99	854	122	156	340
2012	486	un	606	274	640	225	187	887	107	142	196
2013	59	ob	308	165	442	103	92	952	121	81	50
2013	389	un	350	172	754	198	331	1065	132	89	109
2014	61	ob	423	217	1182	69	122	520	162	100	17
2014	349	un	696	285	1752	188	396	739	138	98	90
2015	33	ob	472	236	754	19	23	741	74	65	74
2015	333	un	594	185	1707	237	380	559	164	83	66
2016	27	ob	1117	128	927	382	470	383	139	66	6
2016	293	un	473	181	1324	472	1077	458	128	71	42
2017	40	ob	218	131	671	355	611	276	198	179	21
2017	295	un	232	197	1623	298	1608	466	151	123	67

Data Impacts: M1 Observer Bias

land more on observed trips

land more on unobserved trips

Georges Bank

Updated Results

Georges Bank trawl kept to kall ratios.

year	number of trips #	%	Observed	cod	dabs	haddock	pollock	redfish	winter flounder	white hake	witch flounder	yellowtail flounder
2018	63	15%	ob	0.05	0.01	0.32	0.04	0.06	0.09	0.02	0.01	0.00
2018	344	85%	un	0.04	0.02	0.38	0.04	0.06	0.08	0.02	0.02	0.01
2019	104	25%	ob	0.05	0.02	0.52	0.04	0.07	0.05	0.01	0.02	0.00
2019	306	75%	un	0.04	0.02	0.51	0.04	0.06	0.05	0.02	0.02	0.00
2020	76	15%	ob	0.02	0.01	0.49	0.07	0.10	0.02	0.02	0.03	0.00
2020	448	85%	un	0.03	0.02	0.48	0.04	0.06	0.05	0.02	0.03	0.00
2021	115	27%	ob	0.04	0.04	0.36	0.06	0.10	0.10	0.04	0.03	0.00
2021	307	73%	un	0.03	0.05	0.38	0.06	0.09	0.04	0.03	0.04	0.00
2022	166	49%	ob	0.01	0.06	0.21	0.07	0.12	0.05	0.03	**0.05**	0.00
2022	173	51%	un	0.02	0.06	0.23	0.04	0.08	0.03	0.03	0.05	0.00
2023	345	71%	ob	0.02	0.04	0.30	0.07	0.14	0.06	0.03	0.03	0.00
2023	140	29%	un	0.01	0.07	0.21	0.07	0.11	0.05	0.02	0.05	0.00
2024	353	75%	ob	0.02	0.03	0.25	0.06	0.19	0.11	0.01	0.03	0.00
2024	116	25%	un	0.02	0.04	0.17	0.06	0.08	0.18	0.01	0.03	0.00
2025	330	78%	ob	0.01	0.03	0.23	0.06	0.16	0.12	0.02	0.04	0.00
2025	91	22%	un	0.02	0.03	0.23	0.05	0.11	0.08	0.02	0.04	0.00

Georges Bank trawl kept to days absent ratios.

year	Observed	cod	dabs	haddock	pollock	redfish	winter flounder	white hake	witch flounder	yellowtail flounder
2018	ob	259	57	1607	226	283	476	115	69	8
2018	un	248	100	2179	223	333	472	103	96	37
2019	ob	325	122	3648	254	485	364	90	124	8
2019	un	292	140	3480	292	399	358	103	153	2
2020	ob	153	88	3476	459	677	112	156	207	0
2020	un	171	143	2774	253	346	265	110	193	5
2021	ob	172	170	1701	305	451	448	189	128	0
2021	un	171	242	1880	305	461	209	148	196	1
2022	ob	67	296	990	322	588	234	135	238	0
2022	un	108	273	1081	192	388	153	160	227	0
2023	ob	106	186	1487	369	703	274	131	161	0
2023	un	54	313	948	338	491	212	84	235	0
2024	ob	128	155	1326	344	1003	598	79	175	1
2024	un	95	199	811	275	360	843	45	118	0
2025	ob	68	170	1157	303	799	594	86	192	1
2025	un	114	124	1138	220	531	367	106	208	0

Data Impacts: M1 Observer Bias

A23 Results

Stat Area 521

land more on observed trips

land more on unobserved trips

Mixed stock statistical area 521 trawl kept to kall ratios.

year	number of trips	Observed	cod	dabs	haddock	pollock	redfish	winter flounder	white hake	witch flounder	yellowtail flounder
2011	153	ob	0.212	0.031	0.048	0.339	0.107	-	0.080	0.039	0.013
2011	558	un	0.295	0.034	0.054	0.233	0.102	-	0.079	0.039	0.021
2012	103	ob	0.141	0.059	0.023	0.277	0.139	-	0.121	0.058	0.003
2012	570	un	0.151	0.054	0.035	0.271	0.141	-	0.102	0.044	0.031
2013	75	ob	0.140	0.079	0.143	0.132	0.084	0.124	0.073	0.041	0.016
2013	549	un	0.117	0.079	0.128	0.139	0.15	0.069	0.083	0.036	0.016
2014	75	ob	0.092	0.089	0.168	0.076	0.1 9	0.106	0069	0.040	0.007
2014	472	un	0.121	0.068	0.229	0.103	0.1 46	0.046	0064	0.032	0.007
2015	73	ob	0.101	0.062	0.181	.057	0. 45	0.101	045	0.026	0.005
2015	400	un	0.107	0.063	0.181	.078	0. 01	0.081	044	0.027	0.012
2016	52	ob	0.056	0.062	0.215	.087	0. 43	0.080	039	0.027	0.018
2016	373	un	0.084	0.037	0.288	.086	0.1 7	0.056	035	0.020	0.005
2017	38	ob	0.051	0.027	0.269	0.060	0.08	0.157	043	0.019	0.023
2017	420	un	0.039	0.027	0.367	0.087	0.147	0.045	0.053	0.014	0.003

Mixed stock statatisical area 521 trawl kept to days absent ratios.

year	number of trips	Observed	cod	dabs	haddock	pollock	redfish	winter flounder	white hake	witch flounder	yellowtail flounder
2011	153	ob	1235	183	280	1979	624	-	468	228	74
2011	558	un	1773	204	327	1403	616	-	475	236	129
2012	103	ob	758	318	126	1496	747	-	655	315	16
2012	570	un	788	281	184	1413	735	-	530	231	163
2013	75	ob	565	318	575	532	339	502	292	164	64
2013	549	un	511	345	558	605	669	301	362	156	70
2014	75	ob	318	310	583	263	44	366	240	137	25
2014	472	un	585	32	1104	496	70	222	07	154	31
2015	73	ob	365	22	654	206	88	366	65	93	19
2015	400	un	448	2 4	756	24	83	339	83	114	50
2016	52	ob	259	2 6	986	00	65	366	81	123	83
2016	373	un	526	2 3	1797	536	97	346	216	124	31
2017	38	ob	310	16	1633	367	507	953	261	116	140
2017	420	un	306	210	2839	675	1136	346	409	109	24

Data Impacts: M1 Observer Bias

land more on observed trips

land more on unobserved trips

Stat Area 521

Updated Results

Mixed stock statistical area 521 trawl kept to kall ratios.

	number of trips								winter	white	witch	yellowtail
year	#	%	Observed	cod	dabs	haddock	pollock	redfish	flounder	hake	flounder	flounder
2018	84	13%	ob	0.07	0.02	0.38	0.07	0.11	0.03	0.05	0.02	0.00
2018	541	87%	un	0.06	0.02	0.46	0.08	0.11	0.03	0.04	0.01	0.00
2019	147	24%	ob	0.06	0.01	0.51	0.06	0.08	0.02	0.04	0.02	0.00
2019	475	76%	un	0.08	0.01	0.48	0.05	0.12	0.02	0.04	0.03	0.00
2020	102	15%	ob	0.04	0.02	0.34	0.05	0.12	0.02	0.08	0.04	0.00
2020	558	85%	un	0.04	0.01	0.55	0.05	0.12	0.01	0.04	0.02	0.00
2021	178	31%	ob	0.03	0.02	0.46	0.06	0.08	0.01	0.08	0.03	0.00
2021	394	69%	un	0.05	0.02	0.30	0.08	0.16	0.01	0.07	0.03	0.00
2022	253	50%	ob	0.03	0.03	0.42	0.11	0.11	0.02	0.05	0.04	0.00
2022	252	50%	un	0.06	0.03	0.32	0.10	0.10	0.01	0.07	0.04	0.00
2023	547	73%	ob	0.02	0.05	0.28	0.13	0.12	0.00	0.09	0.04	0.00
2023	198	27%	un	0.02	0.05	0.28	0.11	0.13	0.00	0.08	0.06	0.00
2024	56	77%	ob	0.07	0.04	0.19	0.09	0.23	0.01	0.07	0.05	0.00
2024	17	23%	un	0.09	0.05	0.22	0.09	0.17	0.02	0.05	0.05	0.00
2025	360	78%	ob	0.03	0.05	0.15	0.07	0.33	0.01	0.07	0.04	0.00
2025	102	22%	un	0.04	0.05	0.19	0.09	0.25	0.00	0.07	0.04	0.00

Mixed stock statatisical area 521 trawl kept to days absent ratios.

							winter	white	witch	yellowtail
year	Observed	cod	dabs	haddock	pollock	redfish	flounder	hake	flounder	flounder
2018	ob	356	97	2063	381	606	152	292	119	8
2018	un	350	94	2733	463	678	189	260	82	7
2019	ob	389	55	3146	358	494	124	218	110	3
2019	un	500	72	2834	319	684	95	240	166	5
2020	ob	193	114	1571	233	539	103	374	190	3
2020	un	272	67	3304	294	747	57	220	144	2
2021	ob	163	116	2203	278	375	59	364	147	18
2021	un	218	106	1362	338	735	41	337	147	3
2022	ob	135	126	2070	526	525	102	264	189	1
2022	un	230	127	1316	402	398	43	303	165	4
2023	ob	85	229	1203	568	523	4	378	178	5
2023	un	80	237	1204	476	548	5	350	258	14
2024	ob	246	130	704	311	852	31	251	189	12
2024	un	343	184	841	354	656	64	210	180	7
2025	ob	149	228	672	289	1447	26	289	184	4
2025	un	159	195	716	346	942	13	270	160	9

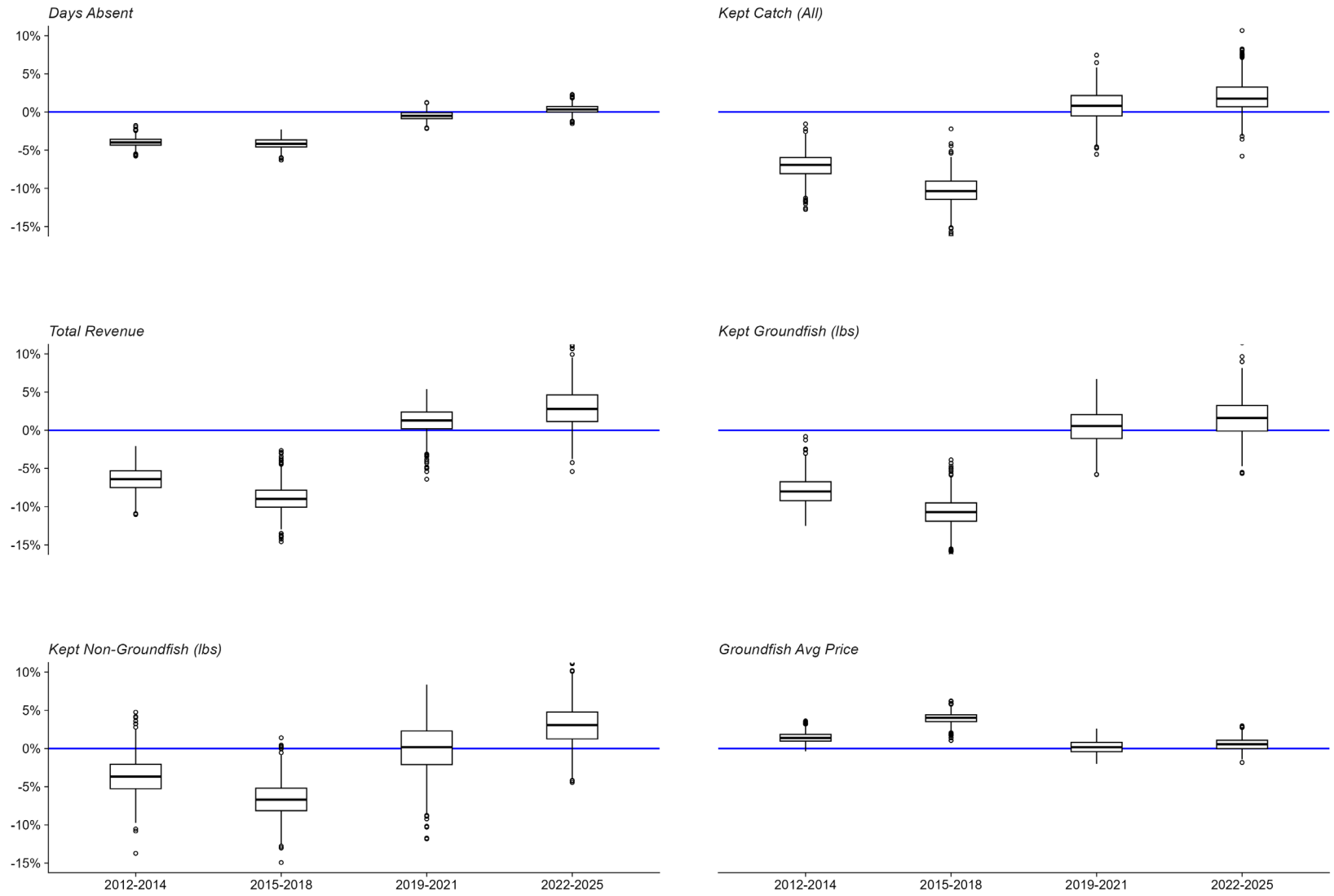
Data Impacts:
M1 Observer Bias
M2 Biased Vessels
M3 Magnitude of Bias

Observer Bias and Magnitude of Bias

Trawl Vessels (By Management Stanza)

Percent difference (Target - Baseline / mean U). Median bootstrap values from 1,000 replicates.

	2012-2014	2015-2018	2019-2021	2022-2025
O-U Pairs:	2,573	1,558	1,579	2,176
U-U Pairs:	8,306	7,255	5,695	1,457
O-U unique vessels:	166	123	88	66
U-U unique vessels:	178	133	96	69

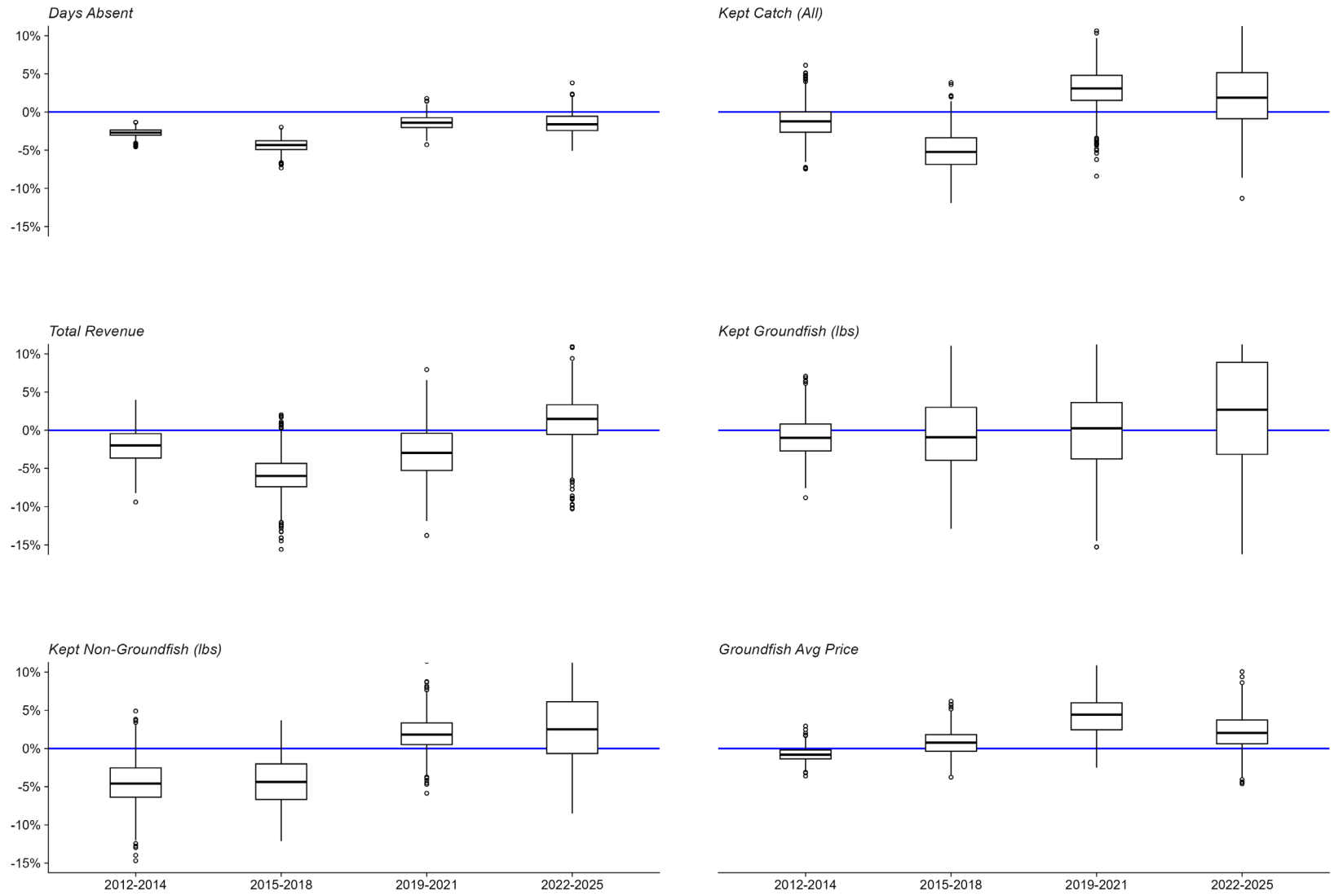


Observer Bias and Magnitude of Bias

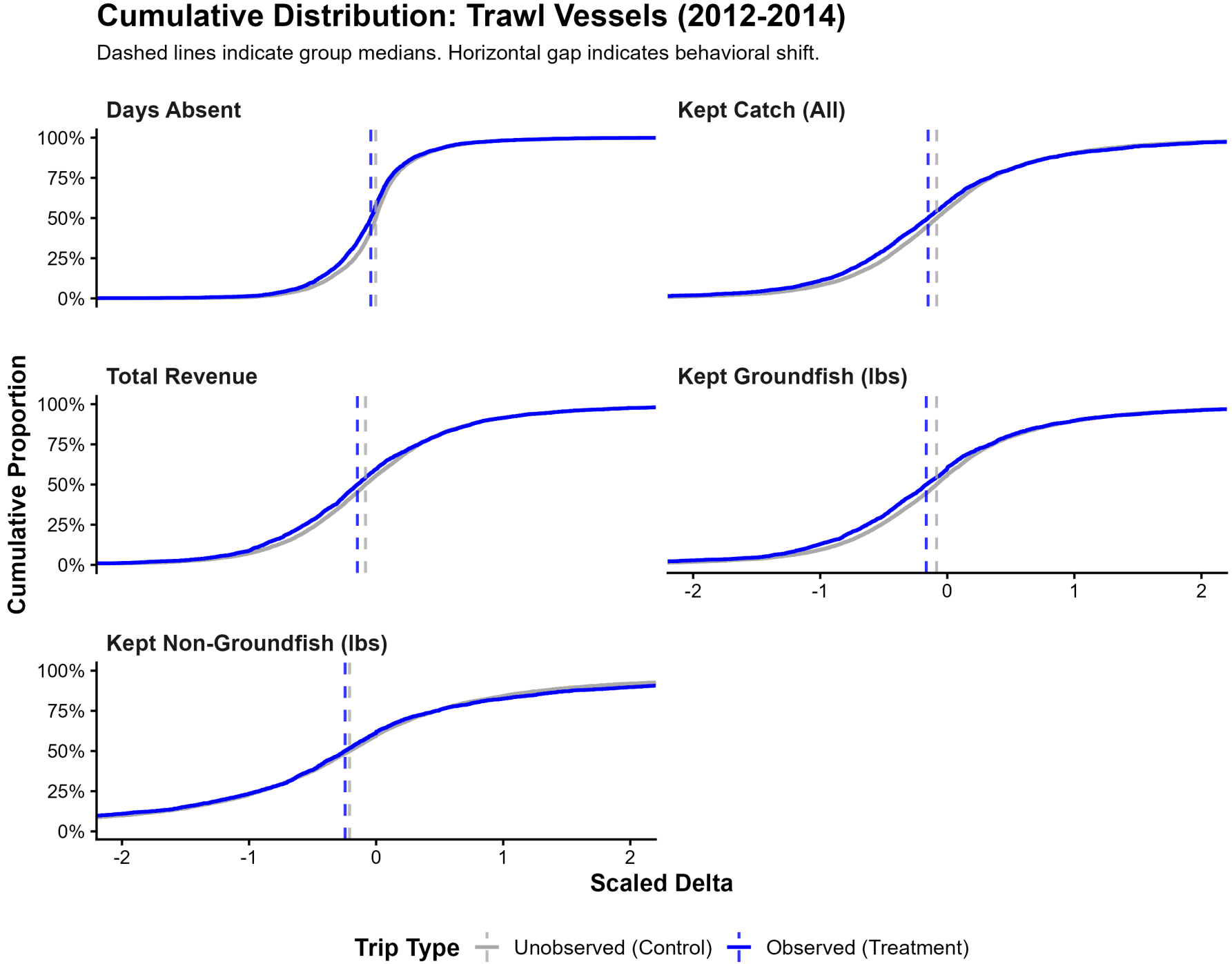
Gillnet Vessels (By Management Stanza)

Percent difference (Target - Baseline / mean U). Median bootstrap values from 1,000 replicates.

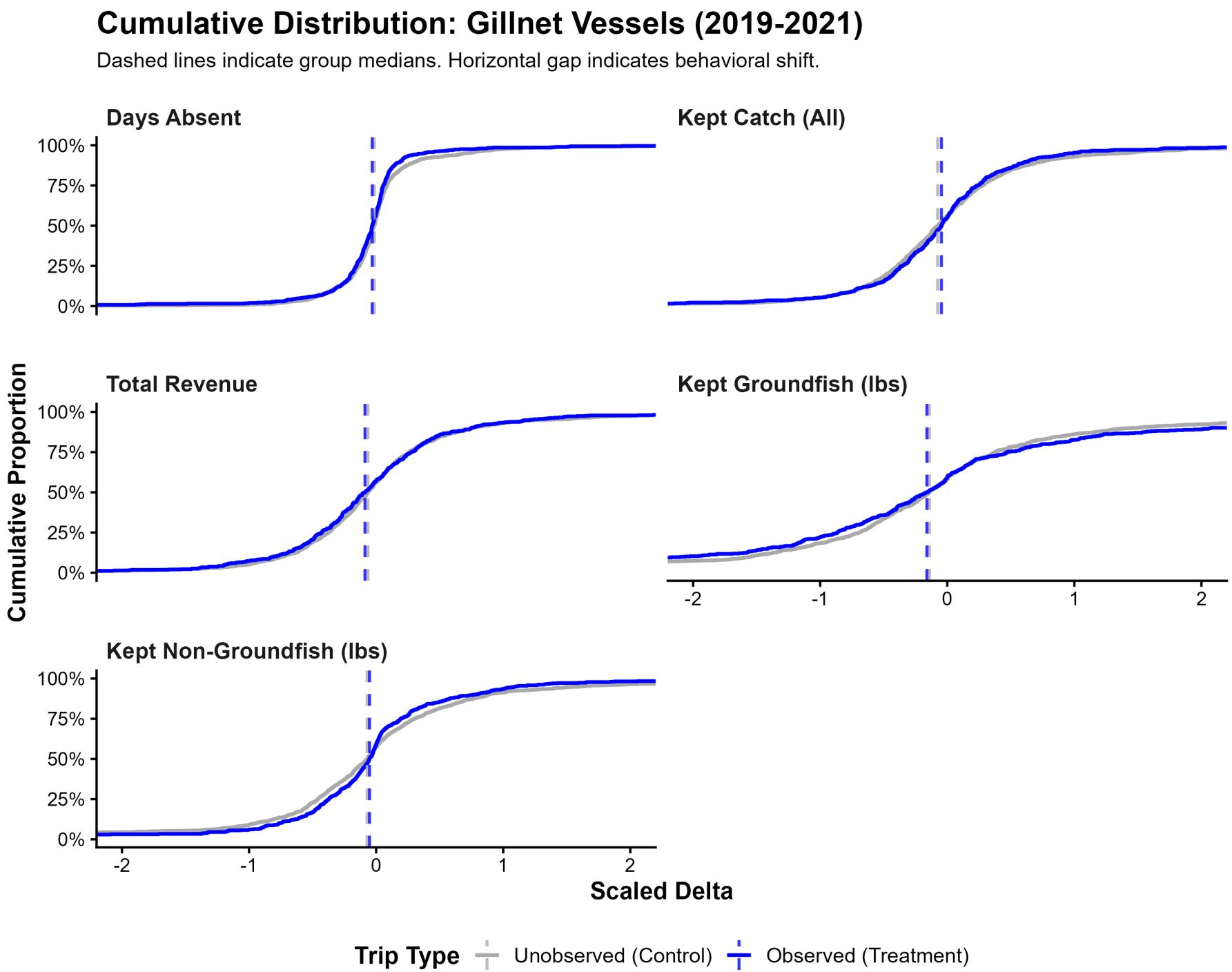
	2012-2014	2015-2018	2019-2021	2022-2025
O-U Pairs:	1,423	729	503	964
U-U Pairs:	4,655	2,680	1,390	415
O-U unique vessels:	70	45	23	21
U-U unique vessels:	74	52	27	22



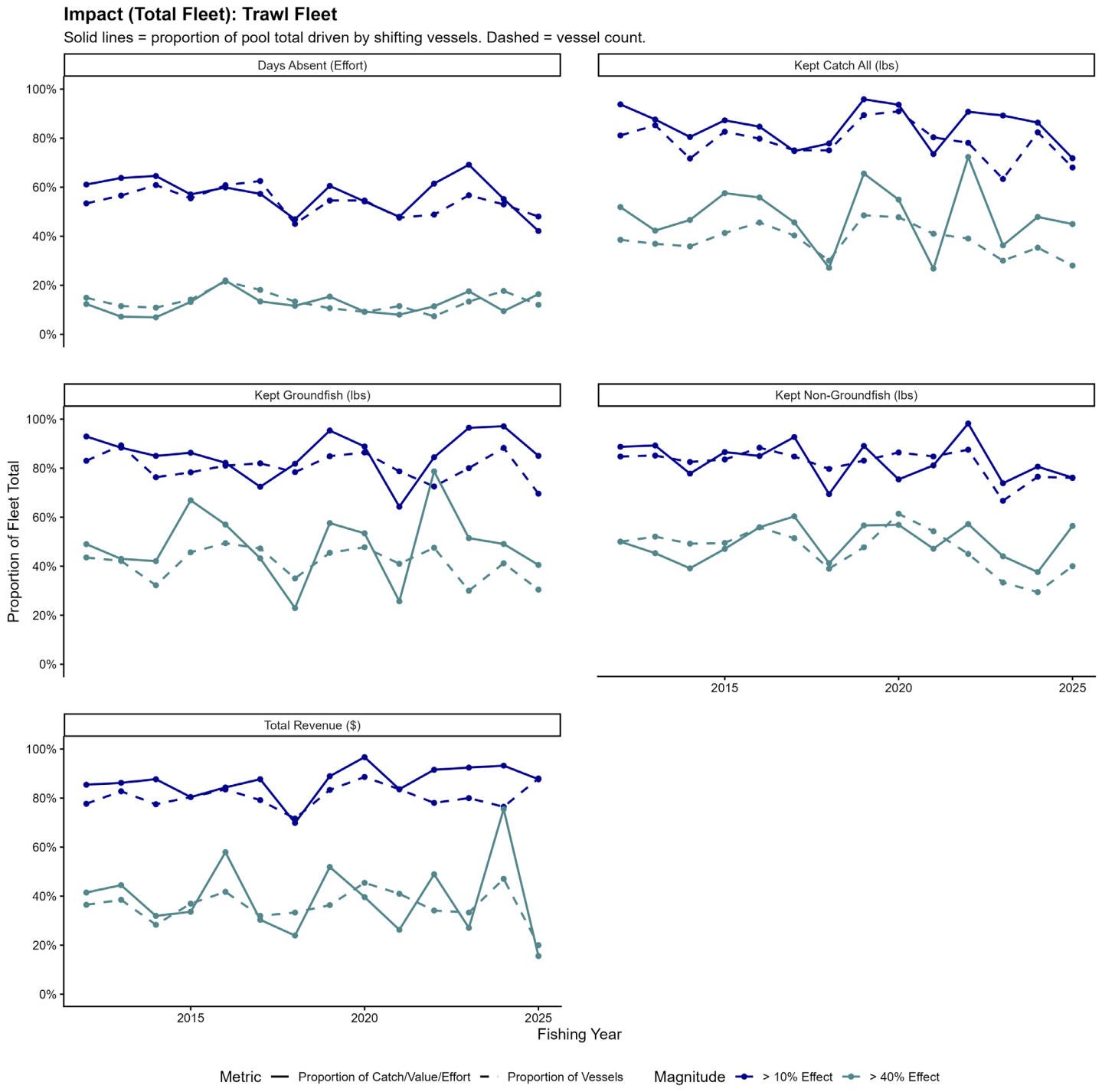
Observer Bias and Magnitude of Bias



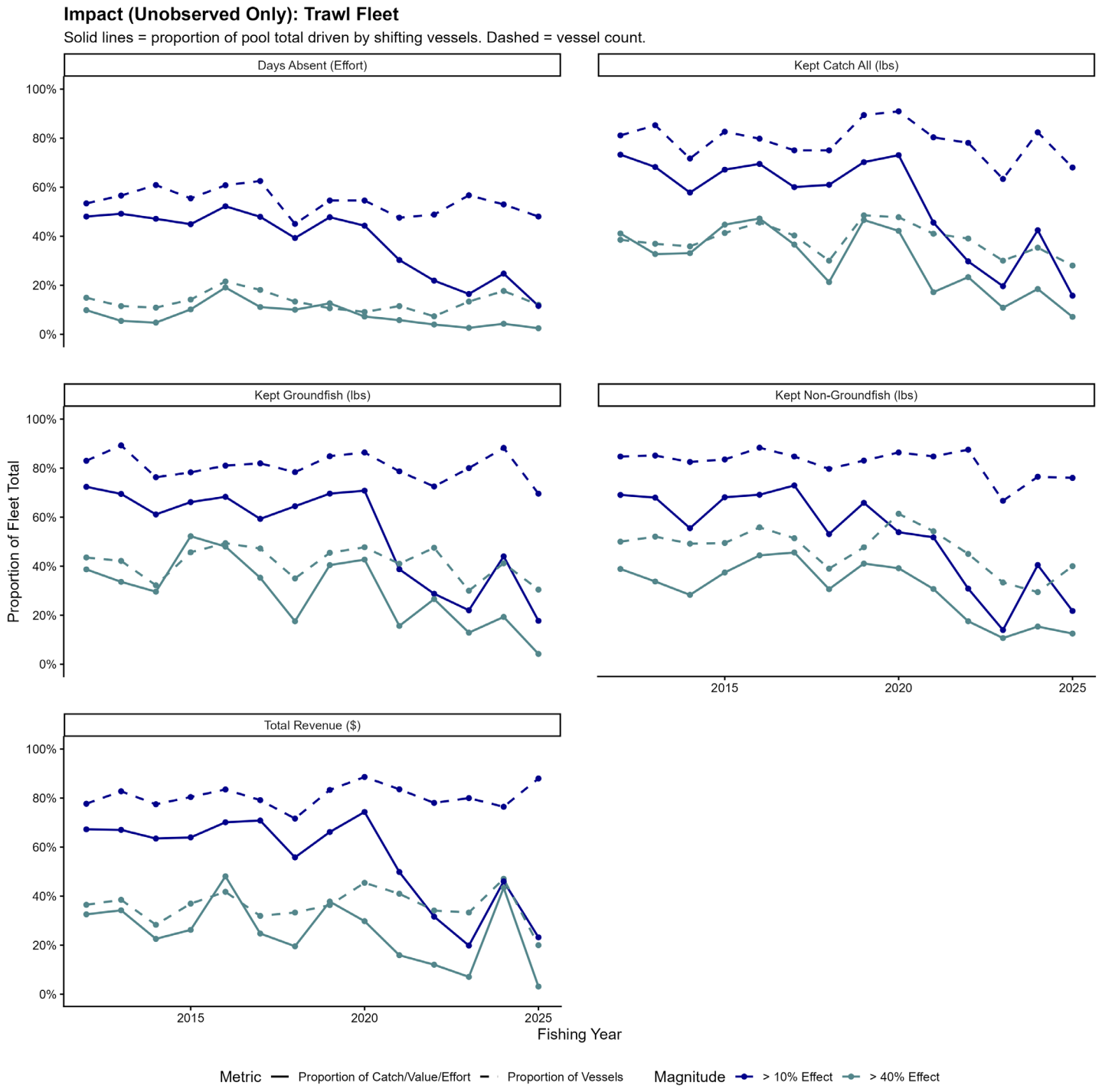
Observer Bias and Magnitude of Bias



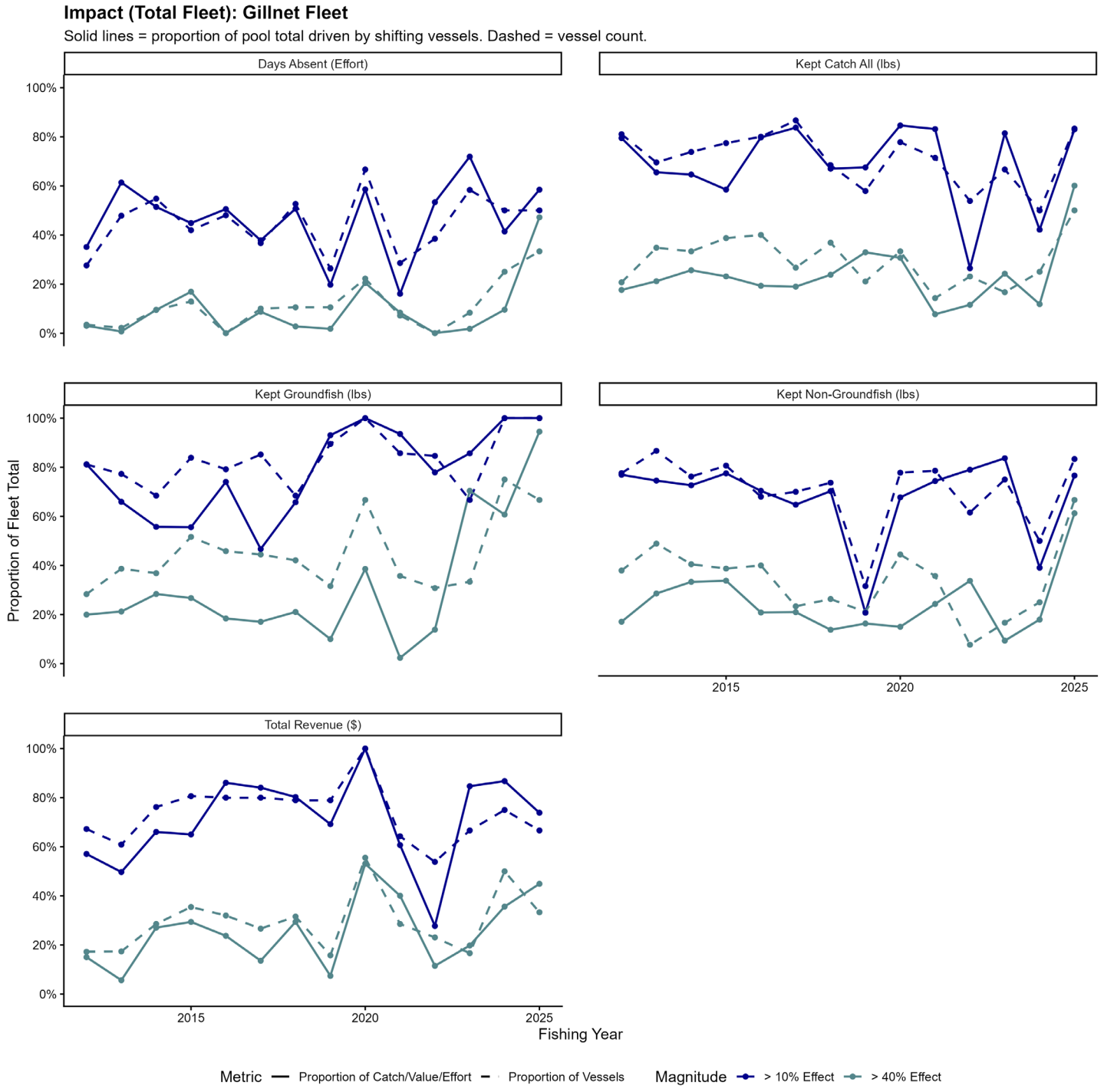
Observer Bias and Magnitude of Bias



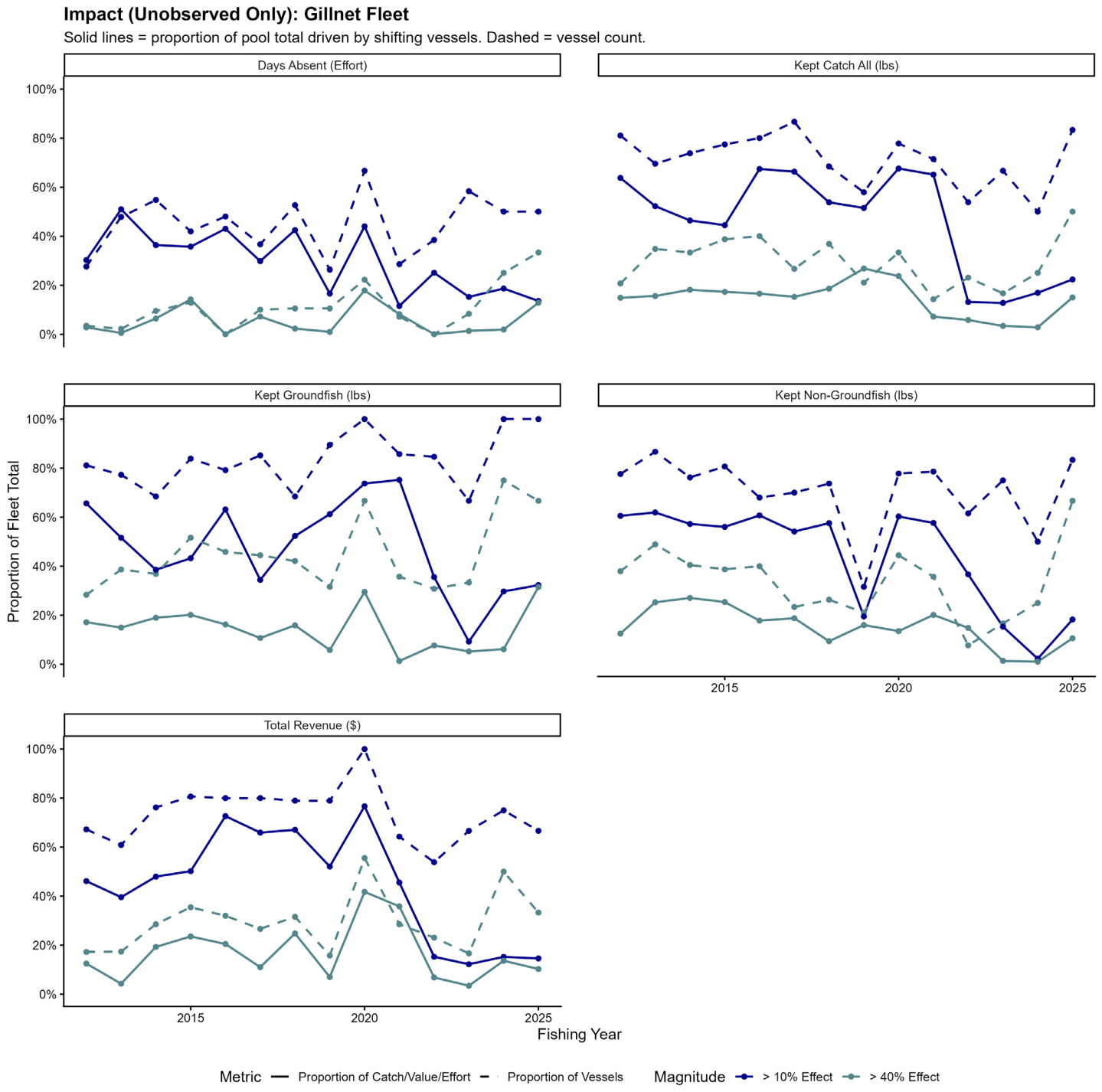
Observer Bias and Magnitude of Bias



Observer Bias and Magnitude of Bias

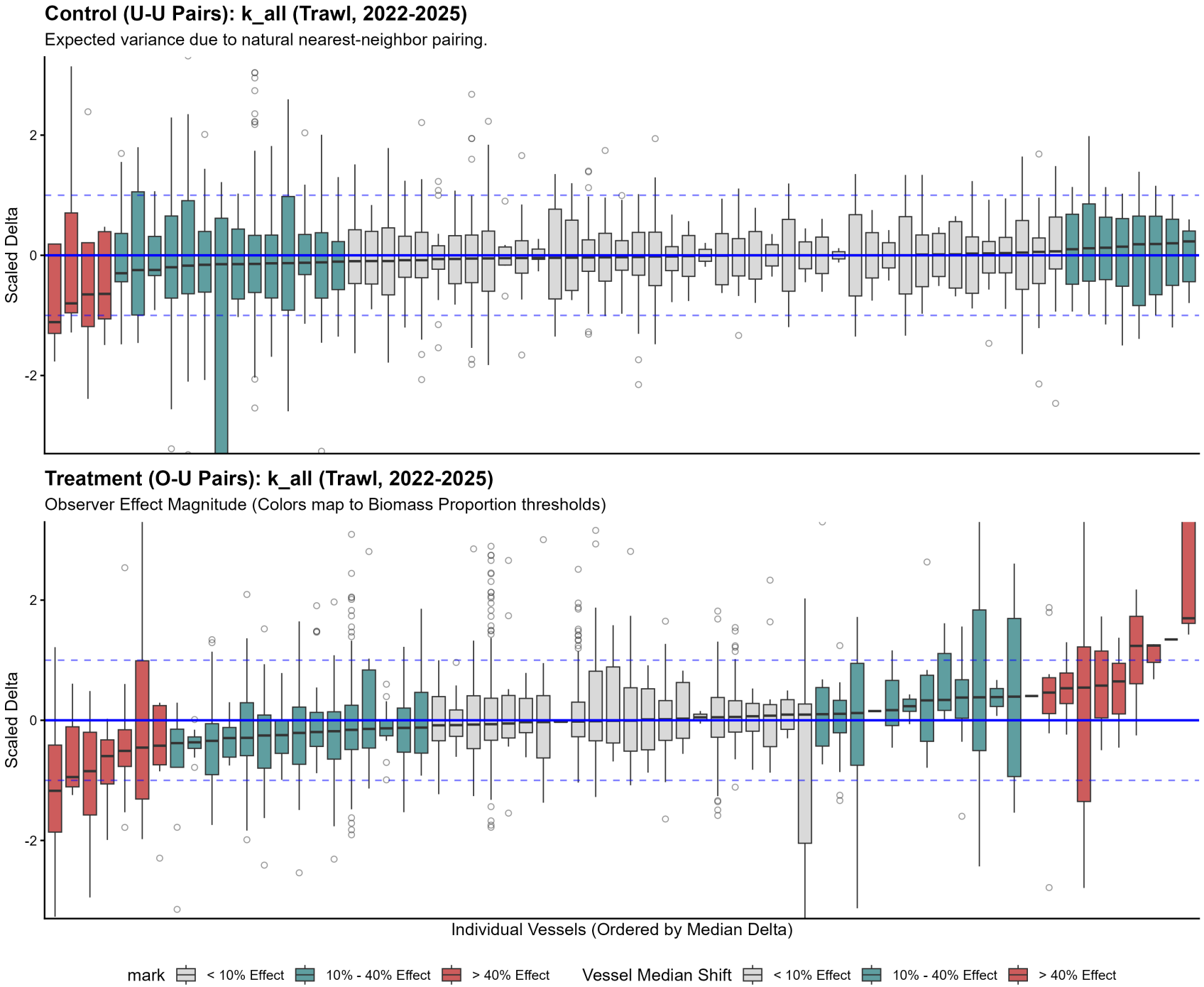


Observer Bias and Magnitude of Bias



Observer Bias and Magnitude of Bias

Observer Bias and Magnitude of Bias



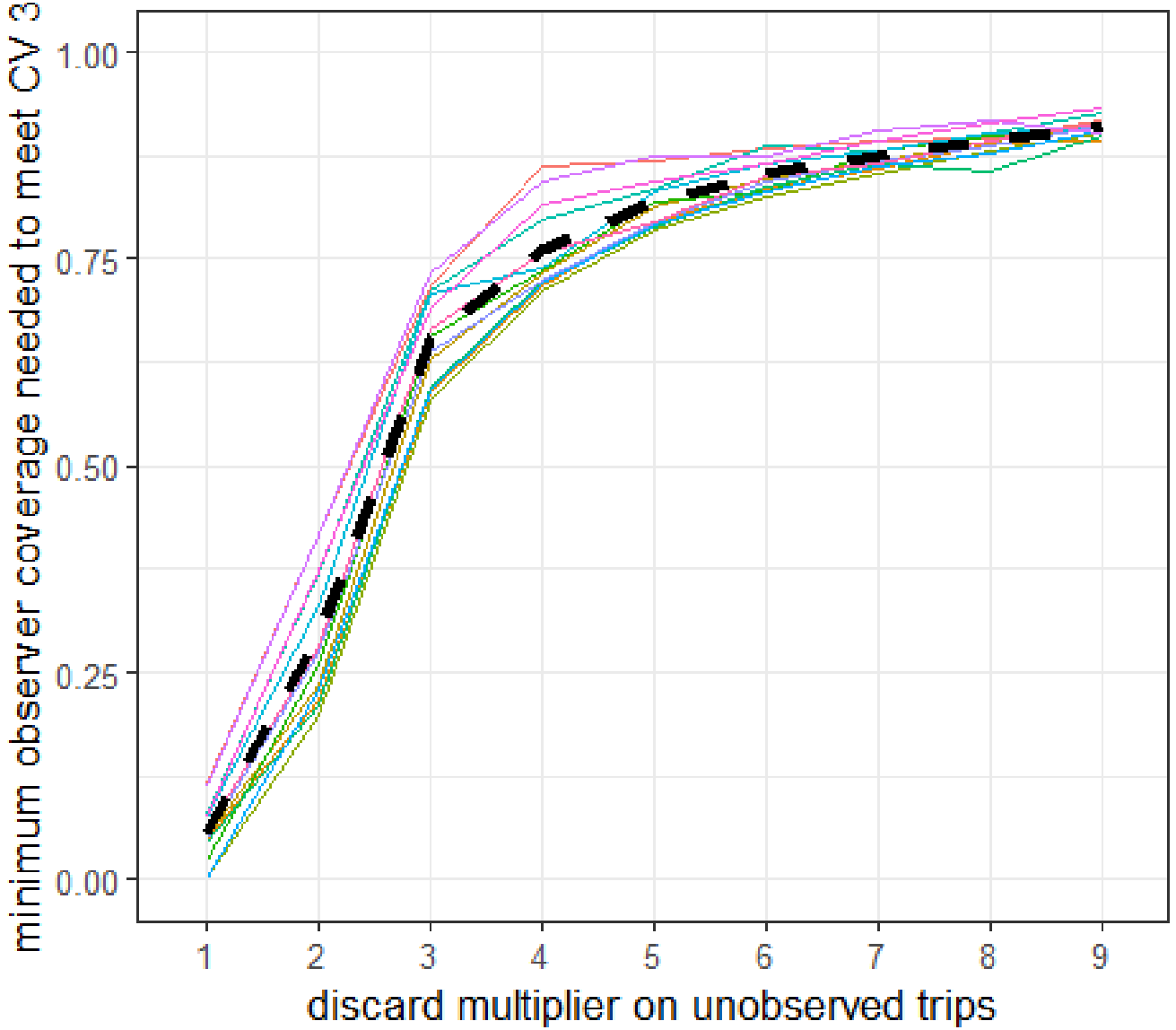
Data Impacts: M3 Magnitude of Bias

Estimating Observed Coverage Needs Through Simulation

- Use simulations with intentional bias
- Define precision target as a probability statement
  - E.g., 30% CV is roughly equivalent to “90% of simulations produce discard estimates that are within +/- 50% of the true discard amount”
- **This accounts for both bias and variance**
  - Traditional CV calculations only account for variance
- Find the minimum coverage level that meets the criteria

Groundfish FY25

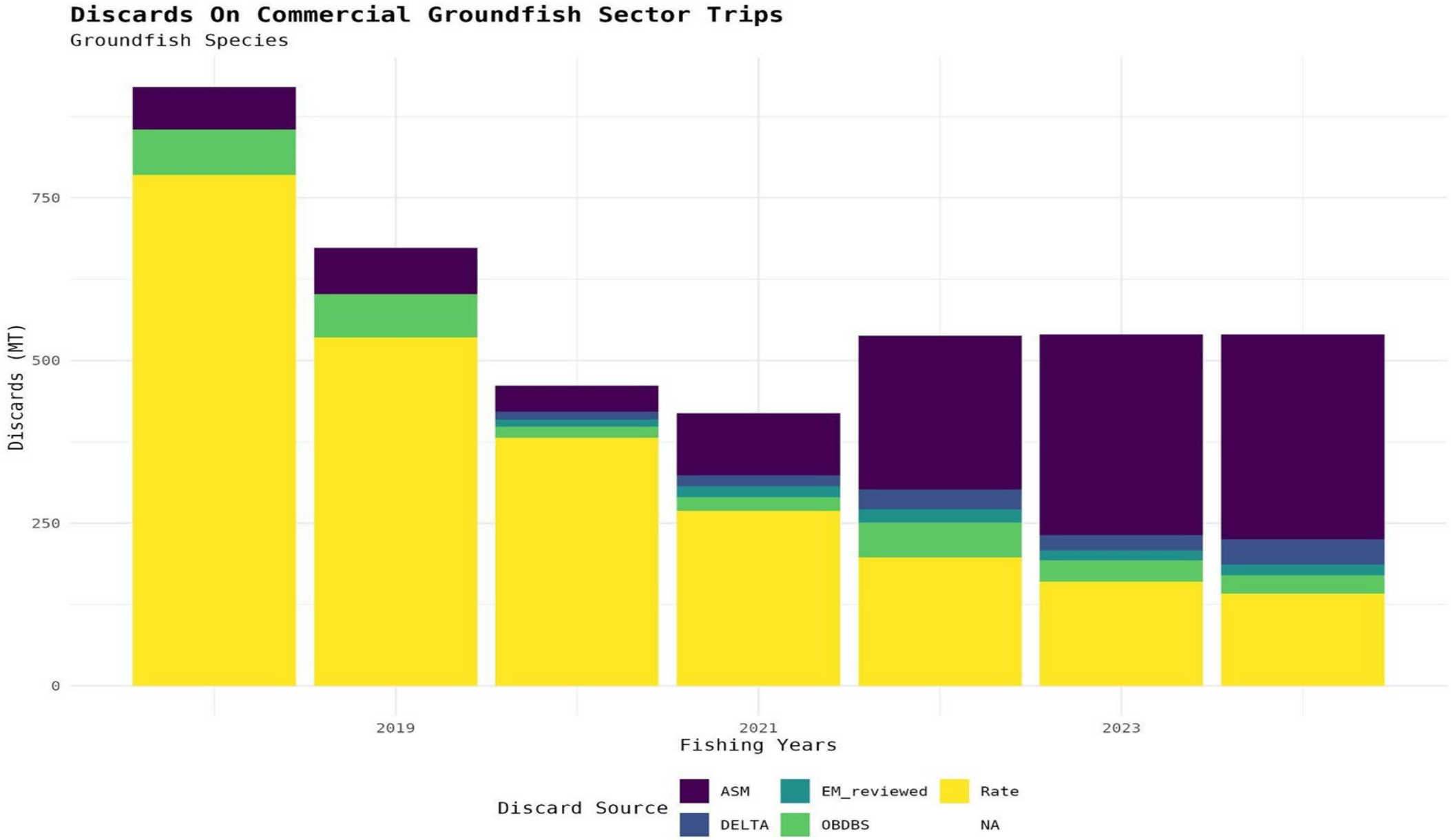
excluding common pool, EM vessels, and all ASM-exempted trips (but includes redfish trips)
discard estimates stratified by sector and gear type



Species

- COD,ATLANTIC
- FLOUNDER,PLAICE,AMERICAN (DAB)
- FLOUNDER,SAND DAB (WINDOWPANE)
- FLOUNDER,WINTER
- FLOUNDER,WITCH (GRAY SOLE)
- FLOUNDER,YELLOWTAIL
- HADDOCK
- HAKE,ATLANTIC,WHITE
- HALIBUT,ATLANTIC
- OCEAN POUT
- POLLOCK,ATLANTIC
- REDFISH,ACADIAN
- WOLFFISH,ATLANTIC

Data Impacts: M6 Discard Estimates



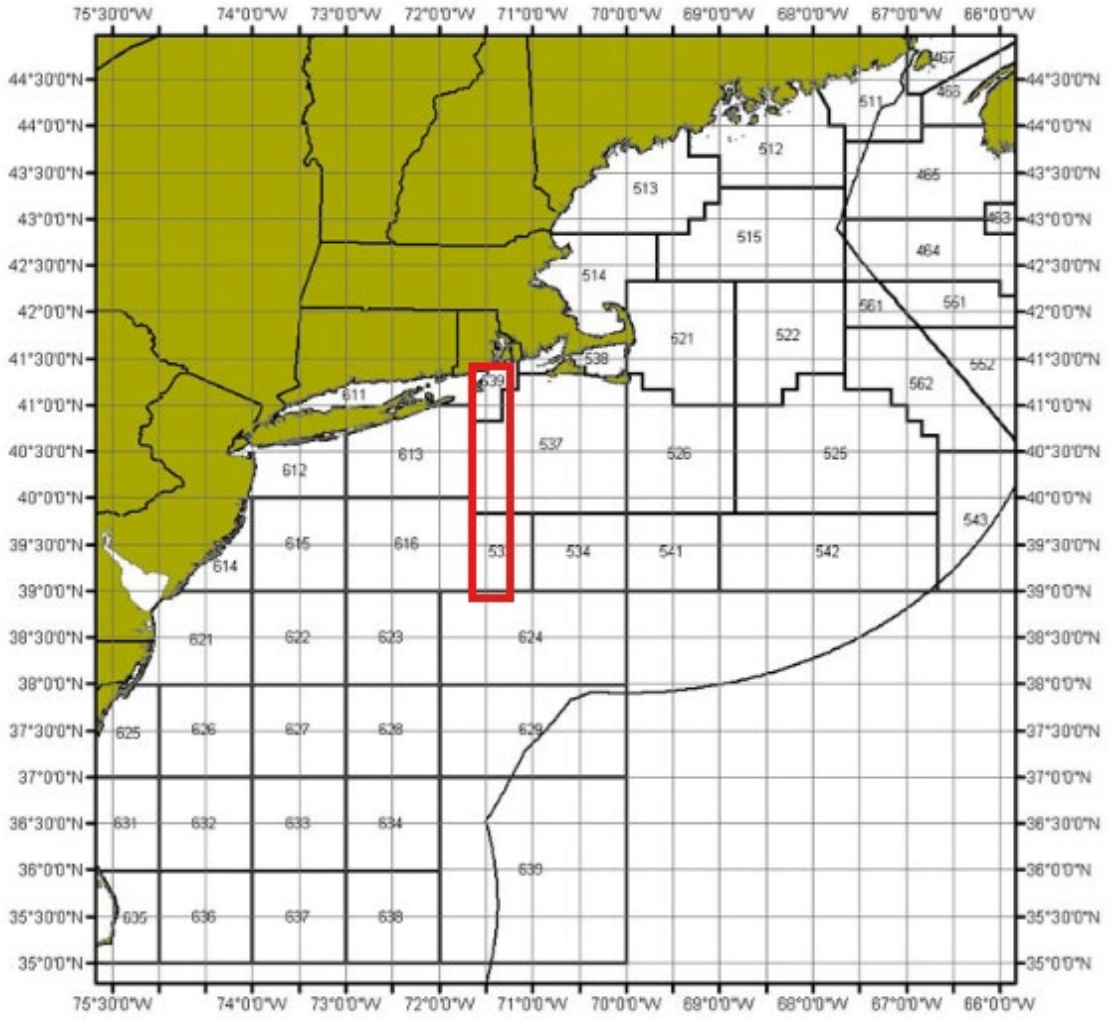
Data Impacts: M10 Exclusion Catch

FY	Exempt	Not Exempt
2023	62	5853
2024	39	5924
2025	26	5240

7130 Exemption

XLG Gillnet Exemption

FY	Exempt	Not Exempt
2023	862	5053
2024	890	5073
2025	948	4318



Data Impacts: M11 MUB

Fishing Year	MUB Removed?	Effect[1]
2023	[2]	[3]Groundfish Revenue, Total Revenue, and Operating Profit all below predicted levels.
2024	Yes	[4]Groundfish Revenue (+$2.2M), Total Revenue (+$4.5M), and Operating Profit (+$2.7M) all above predicted levels with or w/o MUB.
2025	Yes	[5]Groundfish Revenue (+$1.2M), Total Revenue (+$2.6M), and Operating Profit (+$1.6M) all predicted to be higher with MUB removed.

Data Impacts: M9 Catch Allocation

- **Work is on-going and will be included in the report.**
- Analysis will compare area reported on VTRs to area calculated from VMS data.

Data Impacts: Summary + Questions

- Observer bias has declined.
- Lack of clear observer effect pattern in the data is consistent with the hypothesis that higher coverage rates would address bias.
- We have not eliminated observer bias but have ameliorated it with coverage.
- The source of discard data has shifted from predominantly being calculated using discard rates to primarily coming from direct observation by ASM.
- Total discards has declined and is slightly over 500 mt in 2022 - 2024.
- This suggests accuracy and precision of catch data has improved.
- ASM-excluded trips appear to have lower discard rates.
- The Amendment 23 Review work does not generate a single ASM coverage level to address bias.

Fishery Impacts: Relevant Metrics

M12 Total Monitoring Costs

M13 Industry Monitoring Costs

M14 Cost Efficiency (in development)

M18 Spatial Observer Bias (in development)

Fishery Impacts: BLUF

- Total monitoring costs have increased.
  - More of this increase is related to the increase in achieved coverage, but industry monitoring costs per observed ASM day absent have increased ~6%.
  - More work is underway on industry costs, cost efficiency, and spatial observer bias.

Fishery Impacts: M12 Total Costs

Activity	FY18	FY19	FY20	FY21	FY22	FY23	FY24
Industry Sea Day Costs Allocated	$6.26M	$4.1	$4.12	$3.42	$5.5*	$5.5	$5.5
Shoreside Support (Program Operations)	$1.21	$2.7	$3.42	$3.42	$3.3	$3.1	$3.4
Shoreside Support (Electronic Technologies)	$1.22	$1.5	$1.95	$1.95	$1.7	$1.4	$1.1
Additional ASM Training		$0.6		$0.6	$0.3	$0.3	$0.2
Other Total (Obs. Equipment)	$0.9	$0.7	$0.1	$0.2	$0.2	$0.2	$0.3
Mission Support	$0.7	$0.7	$0.7	$0.7	$0.7	$0.7	$0.7
Total	**$10.3**	**$10.3**	**$10.3**	**$10.3**	**$11.7***	**$11.2**	**$11.2**

Fishery Impacts: M13 Industry Costs

Category	*Fishing Year*		
	2016	**2017**	**2023**
At-Sea Cost (2025 USD)	$882,936	$576,871	$5,030,297
ASM Observed Days Absent	1135	694	5,721
Cost per ASM Observed Day Absent (2025 USD)	$778	$831	$879
Total Days Absent	12,083	11,269	8,913
Cost per Total Day Absent (2025 USD)	$73	$51	$564

Fishery Impacts: M14 Cost Efficiency

- **Work is on-going and will be included in the report.**
- Preliminarily, it appears that EM is more cost efficient than ASM.

Fishery Impacts: M18 Spatial Bias

- **Work is on-going and will be included in the report.**
- Analysis will look at whether there are changes in the spatial distribution of bias (e.g., locations of observed vs unobserved trips, sailing ports, landing ports, areas fished, etc.).

Fishery Impacts: Summary and Questions

- Total monitoring costs have increased.
  - More of this increase in related to the increase in achieved coverage, but industry monitoring costs per observed ASM day absent have increased ~6%.
  - More work is underway on industry costs, cost efficiency, and spatial observer bias.

Program Reach: Relevant Metrics

M20 ASM Coverage Targets

M19 Achieved Coverage

M28 Waiver Counts

M29 Acceptance Rates

M31 Refusals

M32 Incidents

M33 PTNS Notification Compliance

M34 PTNS Cancellations

M27 Coverage Equitability

M28 Distribution of Vessels

M39 EM Video Review Rates

Program Reach: BLUF

- The expansion of the sector monitoring program has been effective and has achieved the highest monitoring coverage the fishery has experienced.
- Since implementation of A23 in 2023, coverage targets have ranged from 90% to 100%, and achieved coverage has ranged from 81% to 86%.
- Beginning in 2023, sector management uncertainty buffers (MUB) have been removed for some or all stocks each year.
- Trip acceptance rates by providers have increased throughout the time series and become less variable.
- Trip cancelation rates have gradually increased for fixed trips, while flex trip cancelation is more sporadic. Cancelations peak between 0-24 hours of trip start, and between 24-48 hours of trip start.

Program Reach: BLUF

- Fleetwide PTNS compliance rates are highly consistent, between 95% and 97%.
- More incidents are reported as a result of increased coverage, but the proportion of incident types remains consistent. Refusals remain low.
- Coverage waivers have declined with higher coverage rates, and mot are not related to safety.
- Achieved coverage rates are variable between sectors but generally follow the target coverage rate. Achieved coverage increases with the target. Achieved coverage is generally only slightly behind the target, with 2020 being the standout expectation due to COVID-19 impacts.
- Coverage equitability is open to interpretation.

Program Reach: M20 ASM Targets

Fishing Year	Coverage Target (%)	Coverage Achieved (%)	Date Announced	Notes
2021	40	32[1]	1/26/2021	COVID-related waivers ended June 17, 2021.
2022	99	60	12/14/2021	99% target set to address bias and to prepare for A23. Reduced to 80% based on appropriations for NMFS' costs.
	80		11/29/2022	
2023[4]	90	81	3/16/2023	Confirmed 9/26/2023.
2024[5]	100	86	2/20/2024	A23 set coverage at 100% for 2022-2025, when federal funding can support industry and agency costs. Target defaults to 40% in 2026, but may be increased if federal funding is available.
2025[6]	100	81[2]	3/21/2025	
2026	100	[3]	3/13/2026	

Amendment 23
FMRD Metrics Review

Prepared by:
Cameron Day
Brant McAfee
Glenn Chamberlain
Gabi Clardy-Pryor
Mary Sheehan

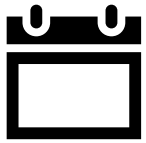
FMRD Metrics

Provider Acceptance Rates	**Cancellation Rates**	**Notification Compliance**
Incident Reports & Refusals	**Coverage Waivers**	**Coverage Rates & Equitability**

All data are preliminary and subject to change.

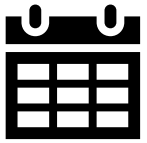
NOAA FISHERIES

PTNS Notification Types



Fixed

Typically day trips, cannot be delayed, must sail on the calendar date notified for.

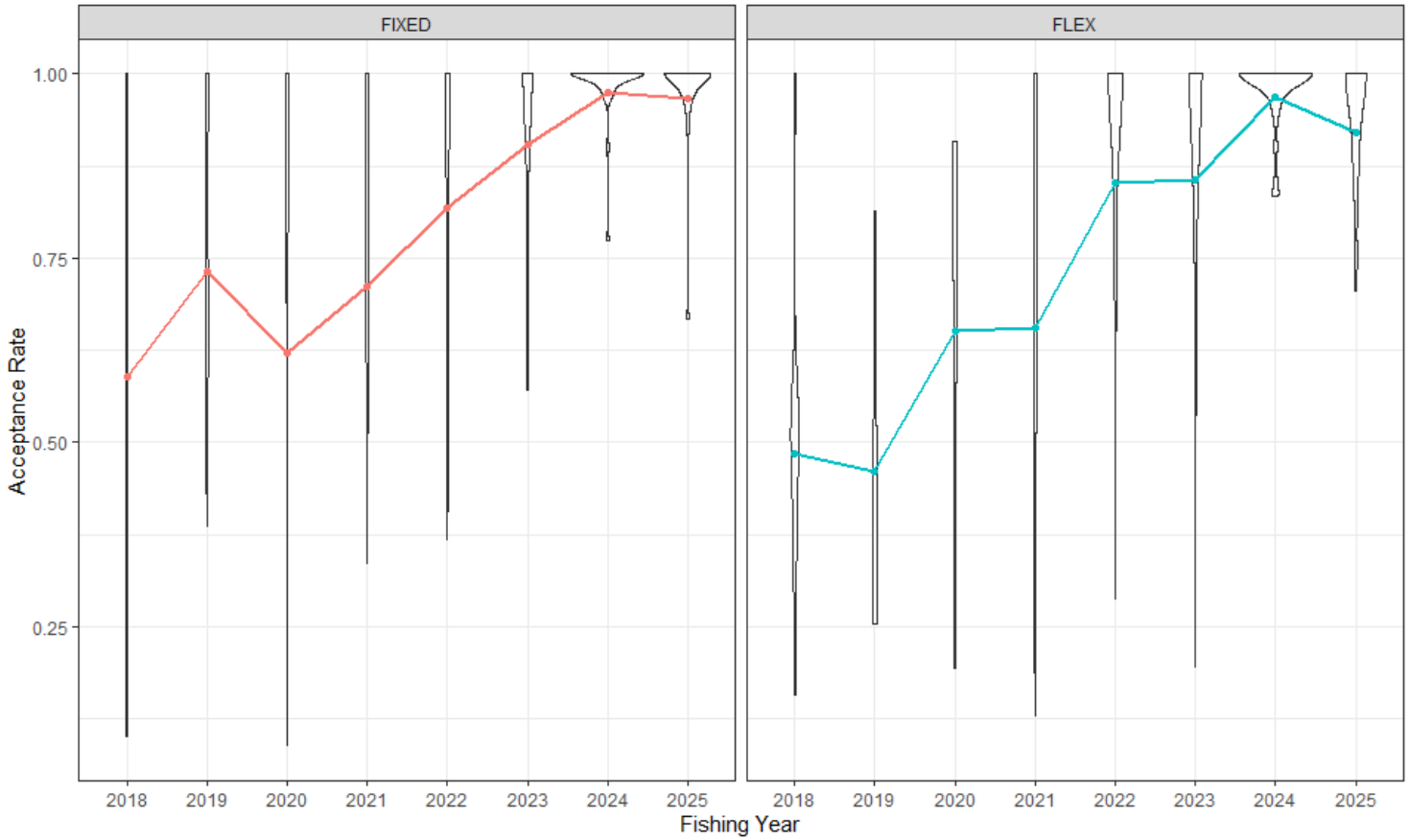


Flex

Typically multi-day trips, can be delayed past notified sail date.

NOAA FISHERIES

Provider Acceptance Rates



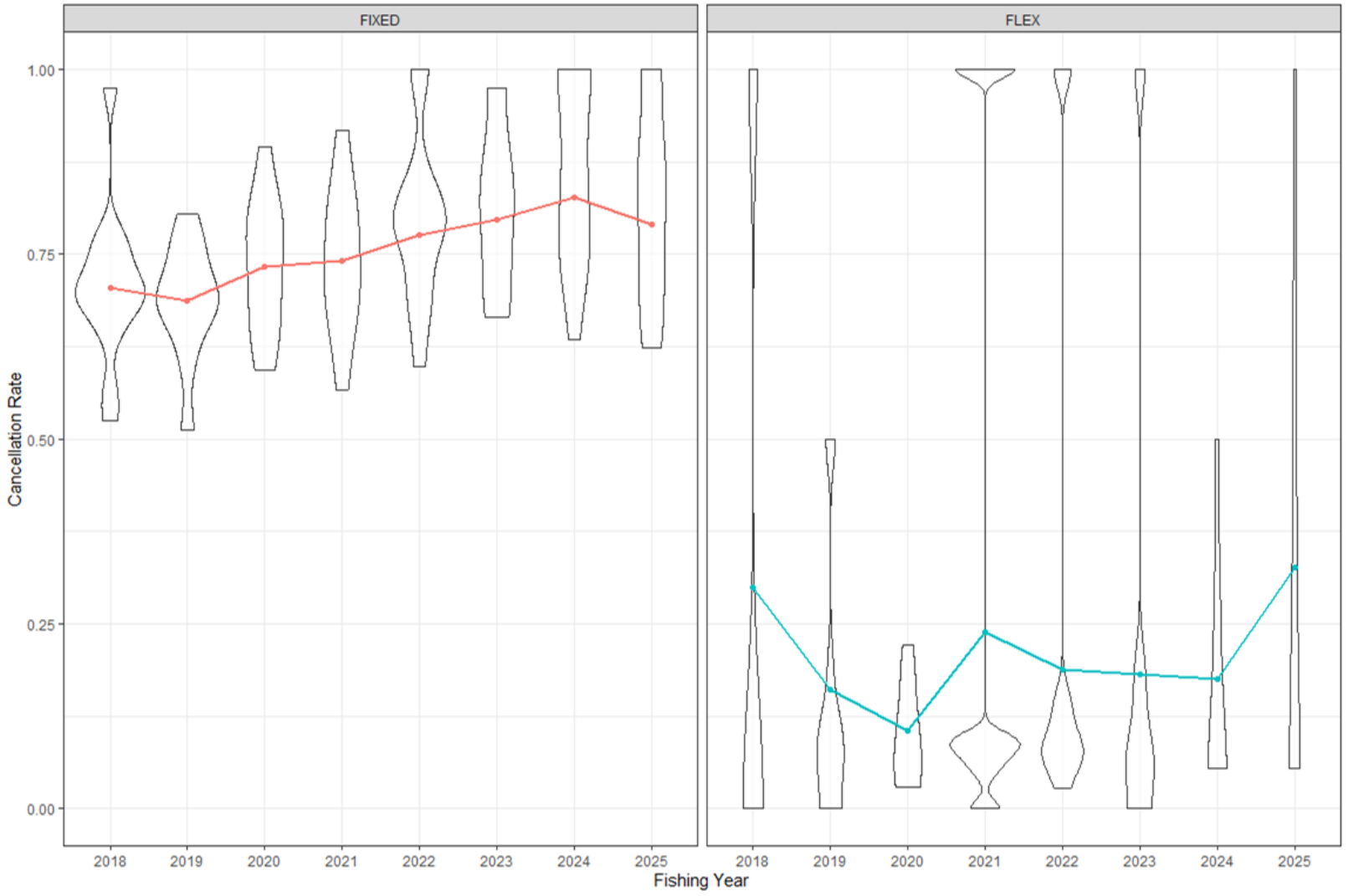
Average provider acceptance rates are increasing

Distribution is narrowing, clustering closer to 100%

Higher coverage rates may reduce provider operational selectivity

NOAA FISHERIES

Cancellation Rates



Fixed vs. Flex

Fixed trip cancellation rates are higher and less variable than flex trip cancellations, consistent with PTNS rules.

Increasing Rates

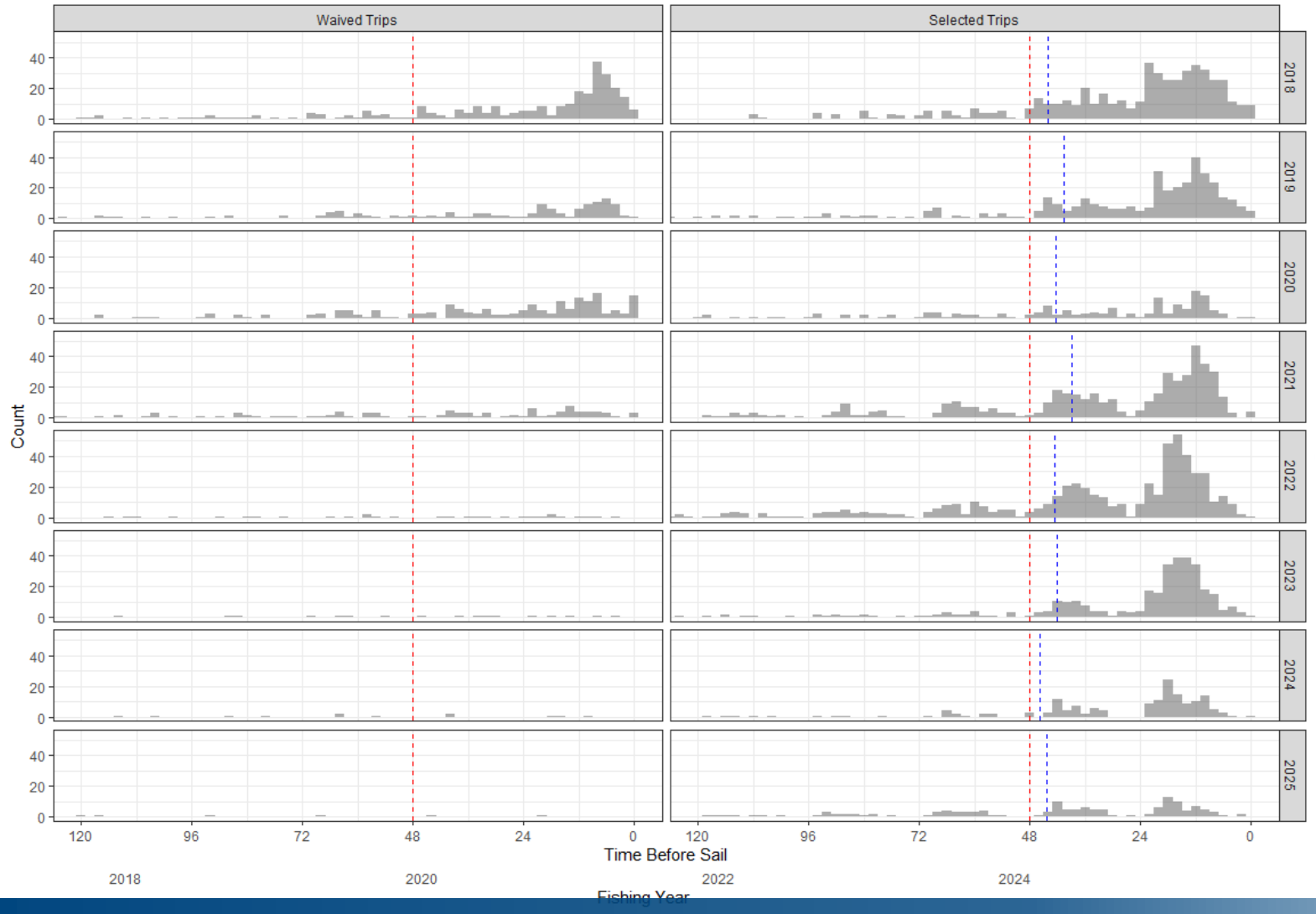
Fixed trip cancellation rates are increasing but the ratio of vessel- to FMRD-initiated cancellations is decreasing. Flex trip cancellations are less predictable.

Vessel-Initiated Cancellation Frequency

48-24 hrs: Peak correlated with observer assignment times.

24-0 hrs: Reasons likely operational.

Cancellation Rates



rule

Fixed vs. Flex

Fixed trip cancellation rates are higher and less variable than flex trip cancellations, consistent with PTNS rules.

trending_up

Increasing Rates

Fixed trip cancellation rates are increasing but the ratio of vessel- to FMRD-initiated cancellations is decreasing. Flex trip cancellations are less predictable.

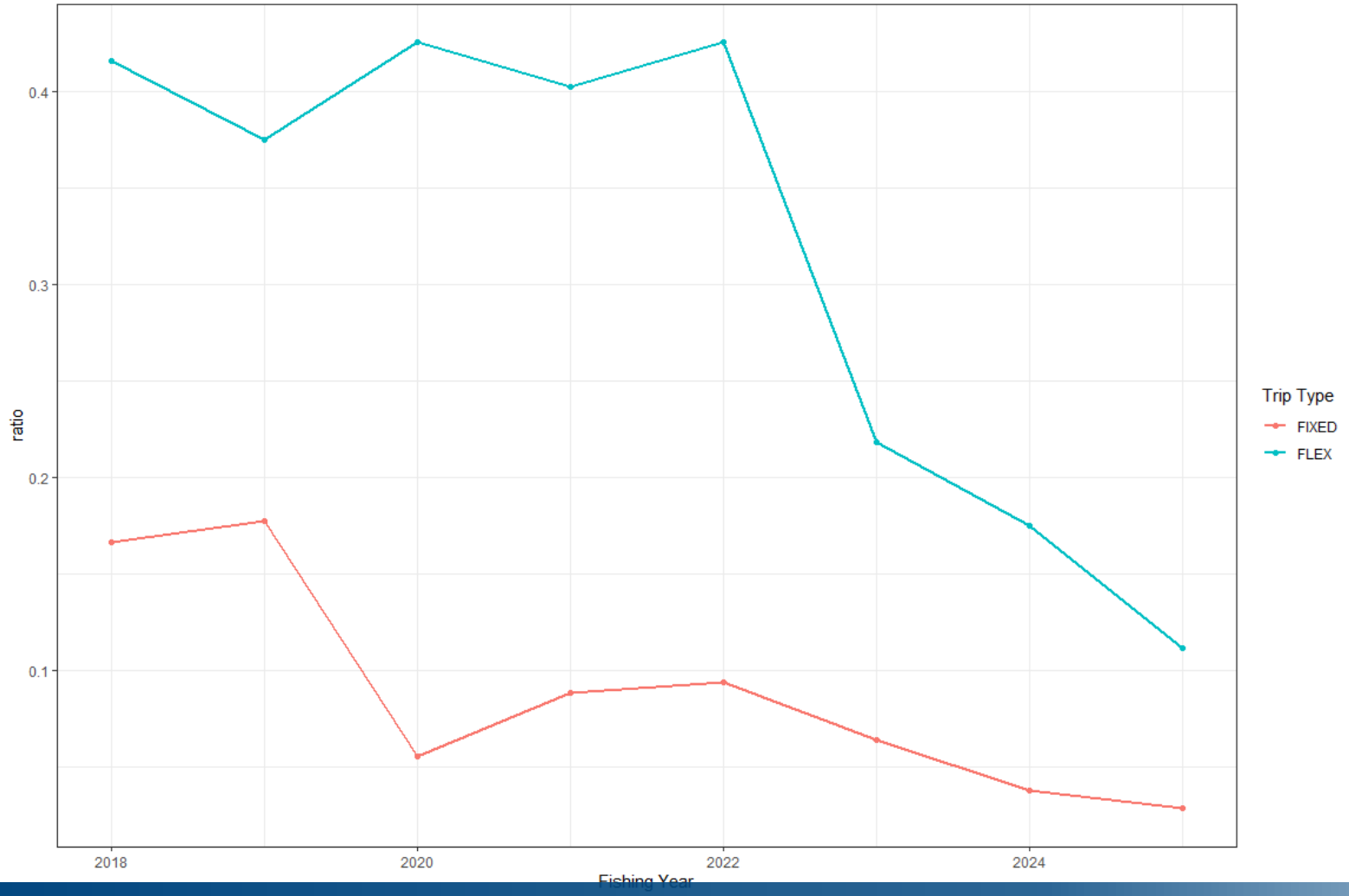
schedule

Vessel-Initiated Cancellation Frequency

48-24 hrs: Peak correlated with observer assignment times.

24-0 hrs: Reasons likely operational.

Cancellation Rates



rule

Fixed vs. Flex

Fixed trip cancellation rates are higher and less variable than flex trip cancellations, consistent with PTNS rules.

trending_up

Increasing Rates

Fixed trip cancellation rates are increasing but the ratio of vessel- to FMRD-initiated cancellations is decreasing. Flex trip cancellations are less predictable.

schedule

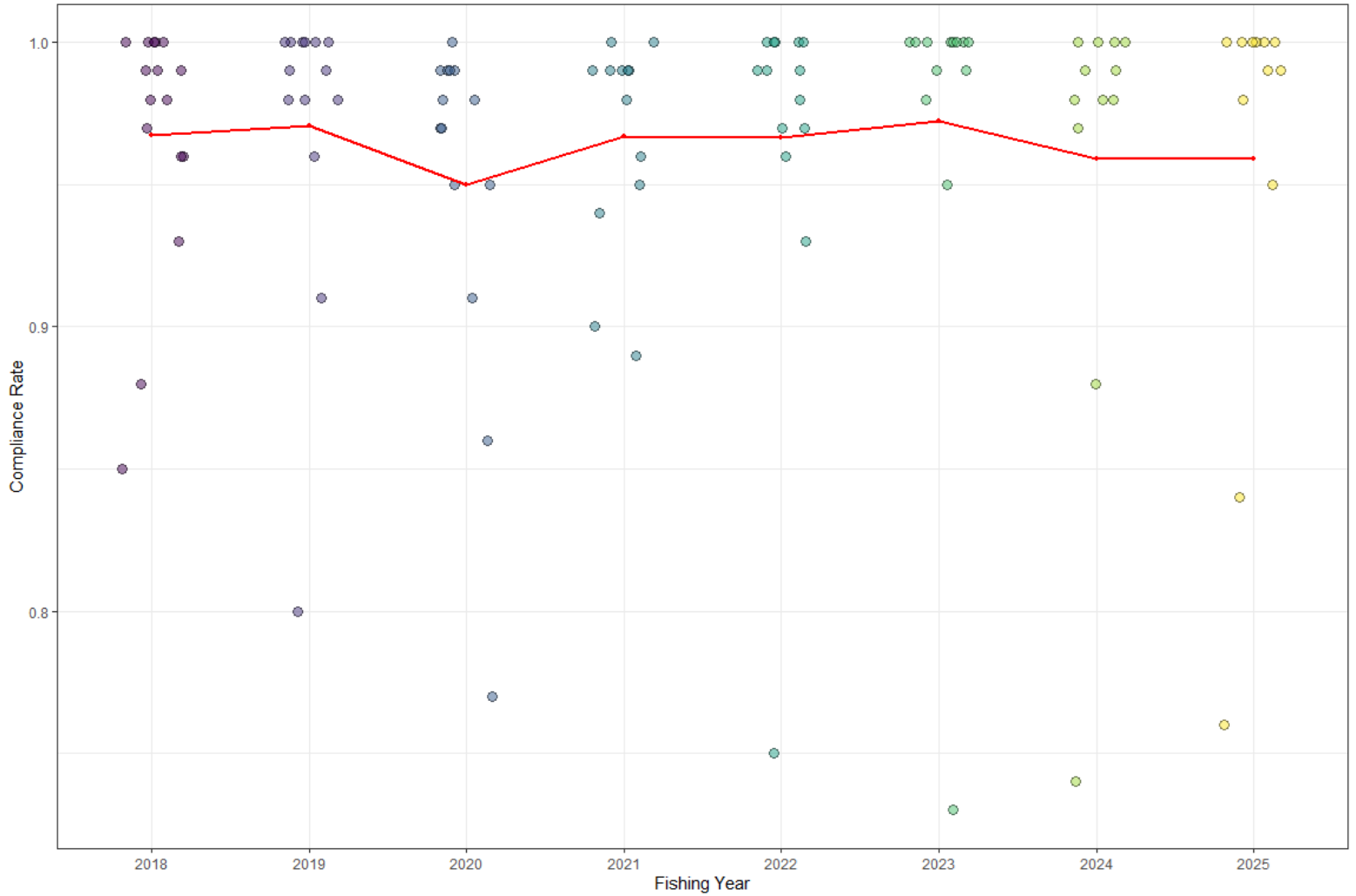
Vessel-Initiated Cancellation Frequency

48-24 hrs: Peak correlated with observer assignment times.

24-0 hrs: Reasons likely operational.

NOAA FISHERIES

PTNS Notification Compliance



High Fleet Consistency

Sector average remains consistent (~95-97%). Most sectors stay above the mean with a few trailing behind.

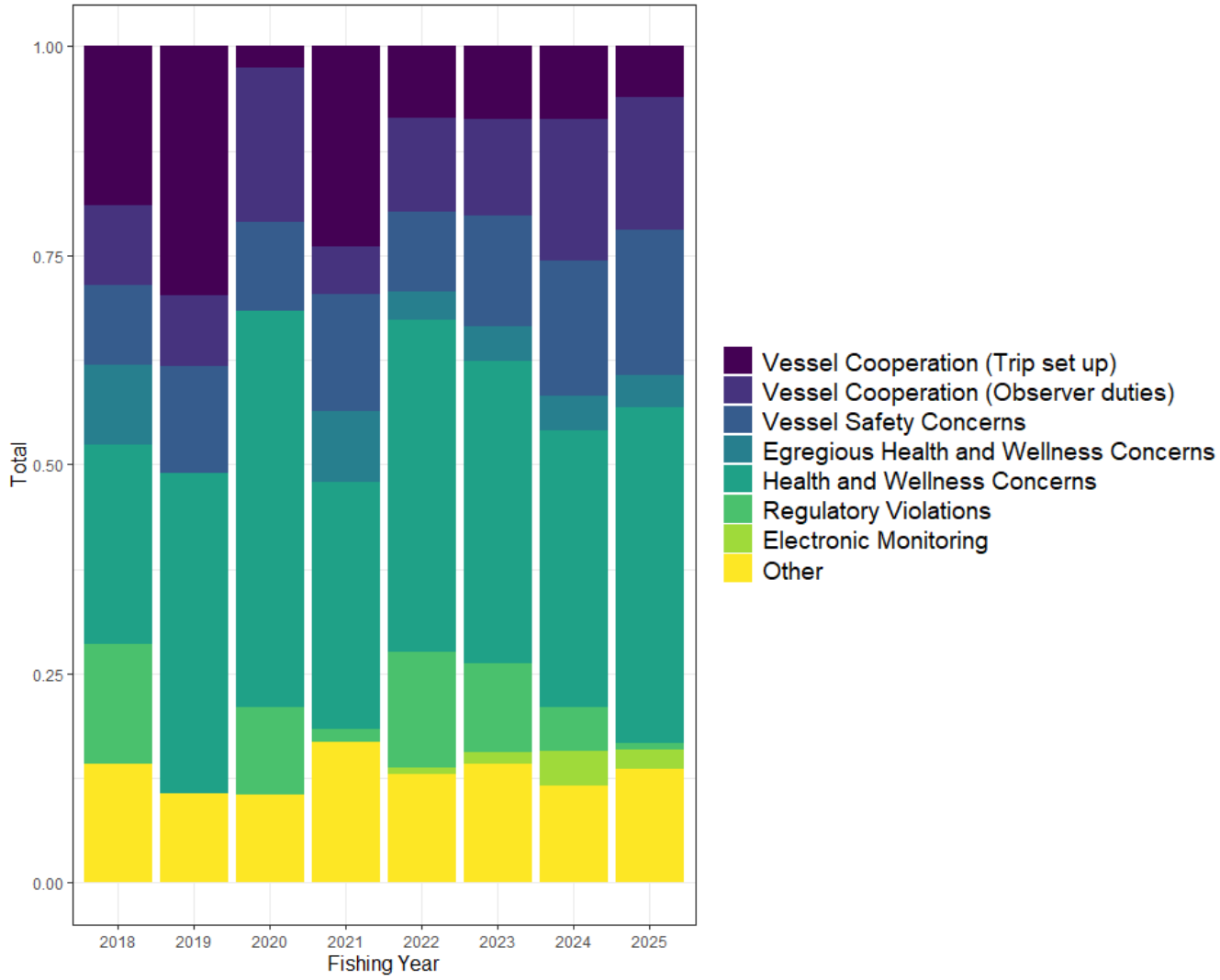
Established Requirement

Notification requirement in place since 2010; vessels have largely adjusted to the requirement.

Compliance Outreach

The PTNS team conducts occasional outreach with non-compliant vessels.

Incident Reports & Refusals



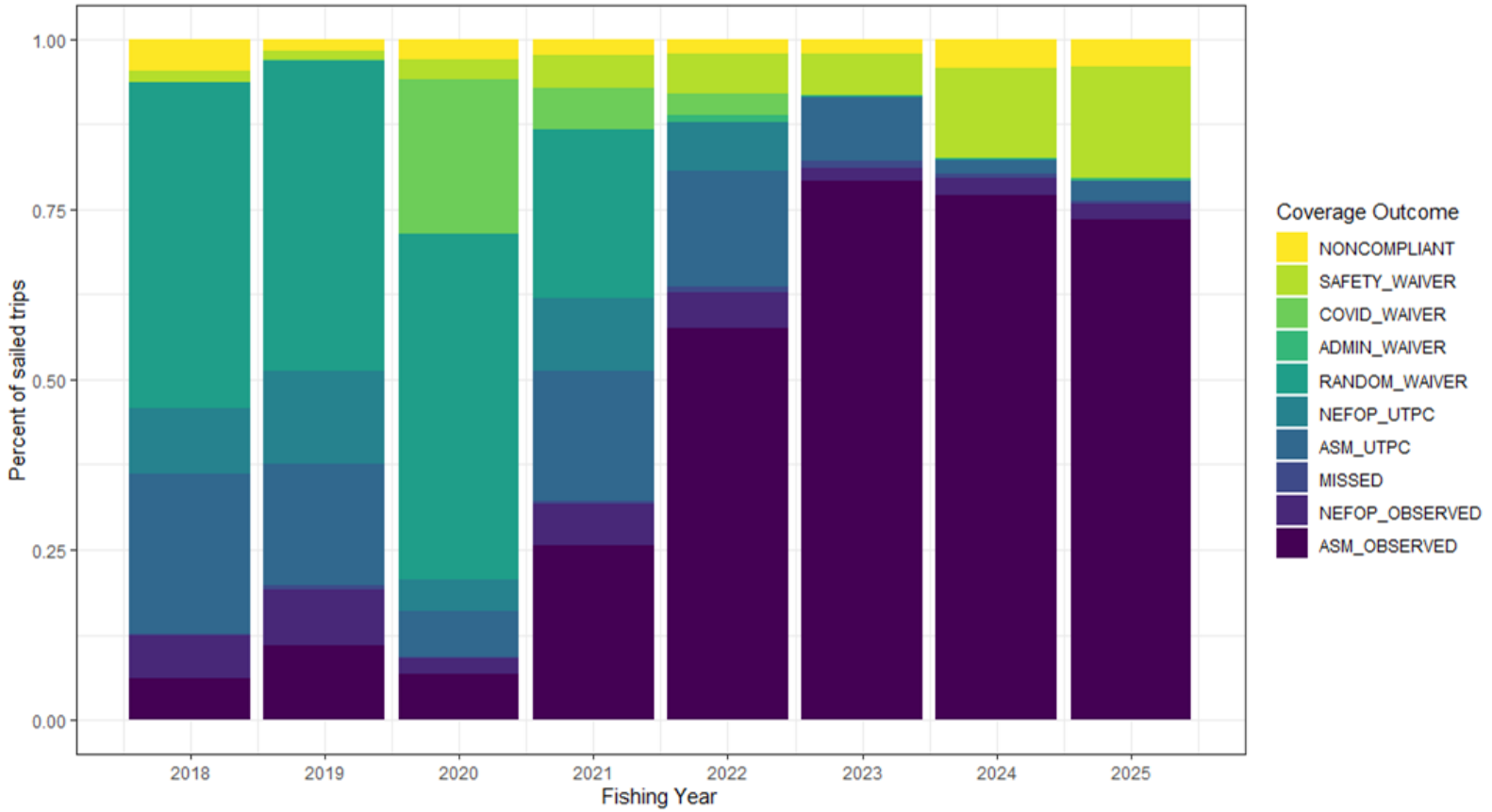
Steady Proportions
Minimal changes in incident proportions to total incidents received.

Health & Wellness
Most incidents related to minor health and wellness concerns.

Low Refusal Rates
Refusals are low, consistent with overall low proportions of vessel cooperation (trip set up) type incidents.

Increasing Cooperation
Vessel cooperation (trip set up) only significant decrease post-A23 → cooperation in the fleet is increasing.

Coverage Waivers



Shift in Dominance

Transition from random waiver dominance to safety waiver dominance in higher coverage years.

Safety Waiver Surge

Safety waivers are over 3x higher than expected post-A23.

ASM UTPC Decline

ASM UTPC down over 90% from expected values post-A23.

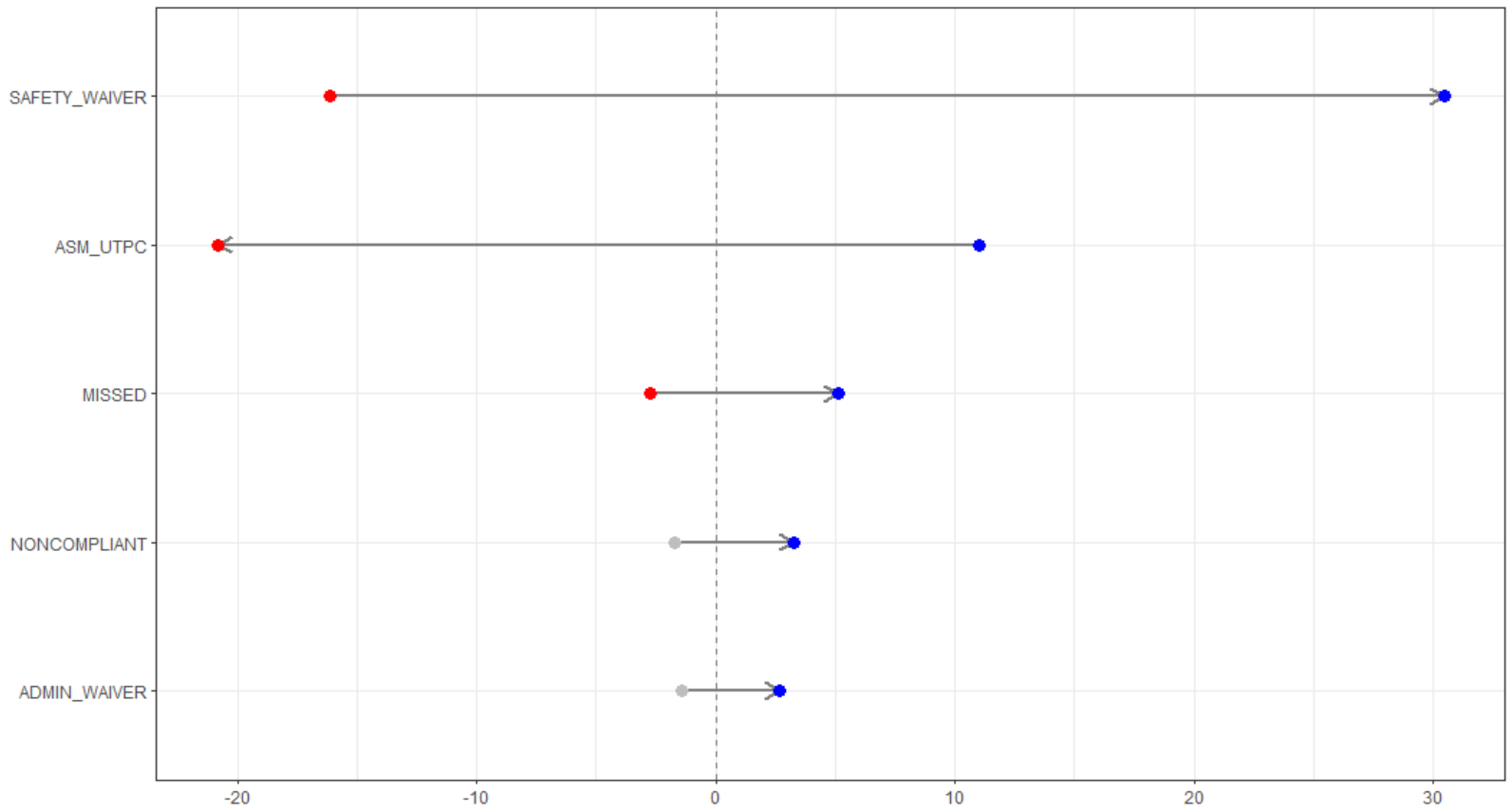
Operational Consistency

Admin waivers and missed trips remain below 1% of sailed trips despite a slight increase from pre-A23 values.

Non-compliance Trend

Non-compliance is increasing, though the overall rate remains consistent.

Coverage Waivers



swap_horiz

Shift in Dominance

Transition from random waiver dominance to safety waiver dominance in higher coverage years.

trending_up

Safety Waiver Surge

Safety waivers are over 3x higher than expected post-A23.

trending_down

ASM UTPC Decline

ASM UTPC down over 90% from expected values post-A23.

settings

Operational Consistency

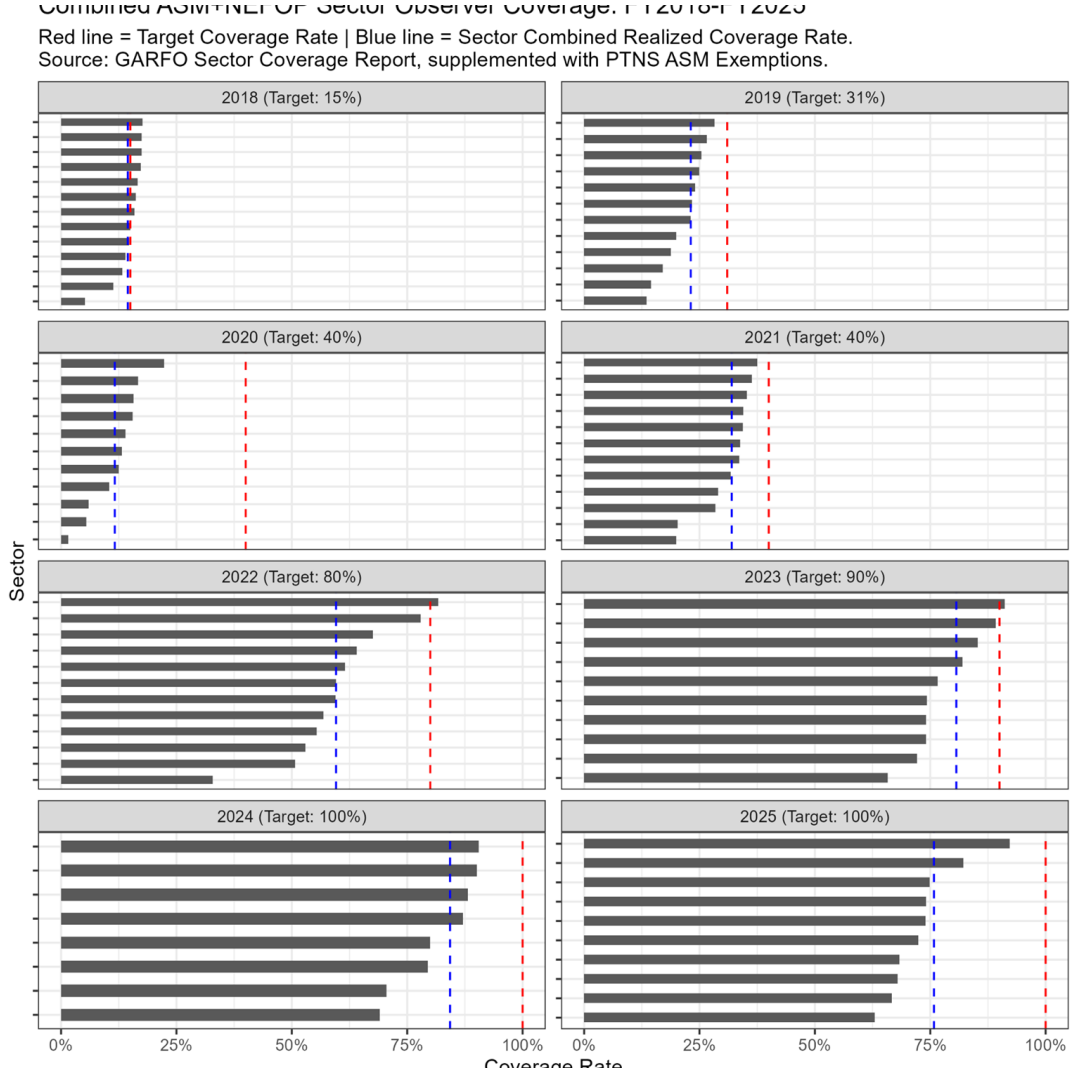
Admin waivers and missed trips remain below 1% of sailed trips despite a slight increase from pre-A23 values.

warning

Non-compliance Trend

Non-compliance is increasing, though the overall rate remains consistent.

Realized Coverage: Sector



Coverage Analysis Insights

Sector Variability

Realized coverage rates varied between sectors across fishing years and generally followed the target coverage rate.

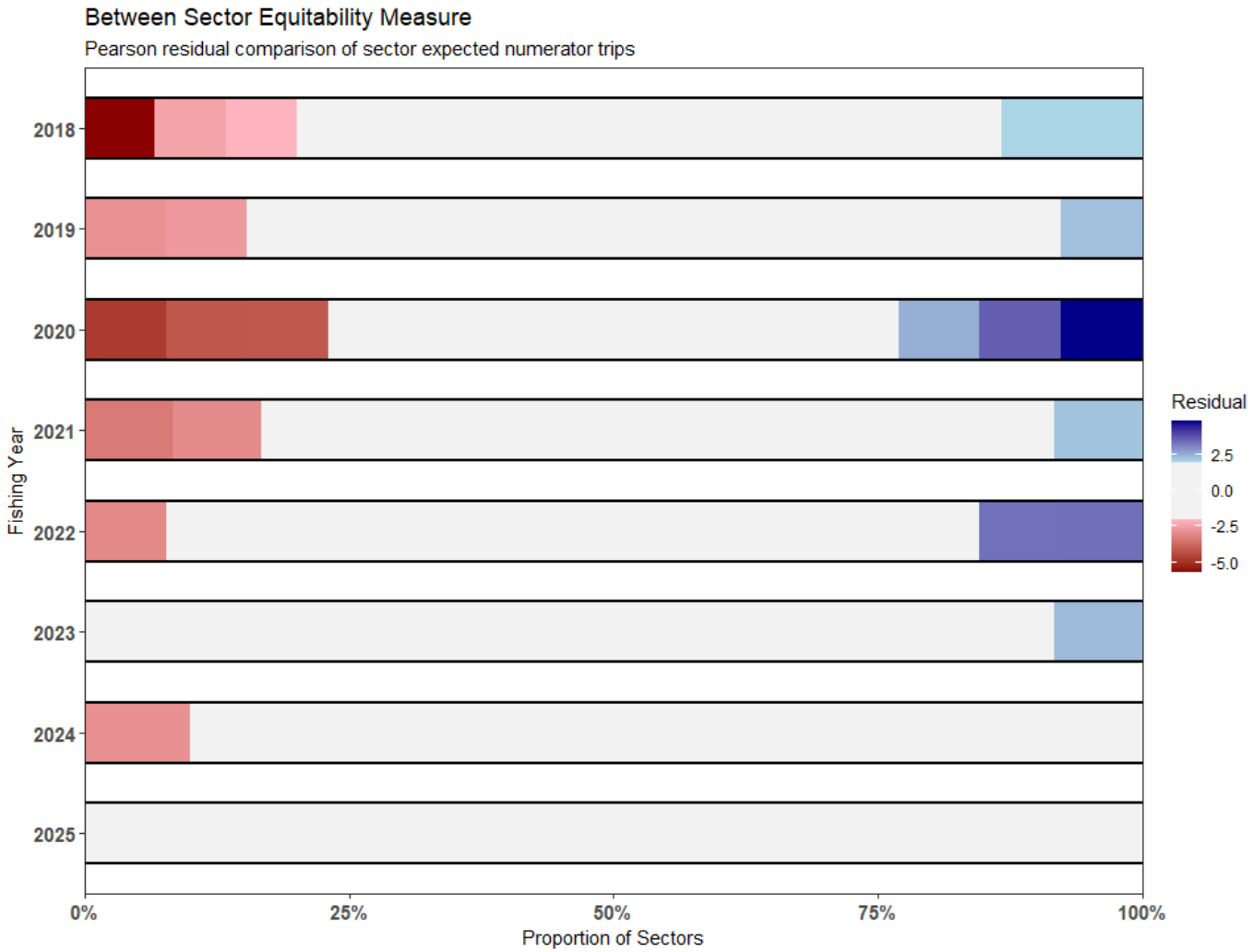
External Impacts

COVID-19 observer coverage waivers impacted achieved sector coverage rates.

100% Coverage Challenges

At 100% coverage, no sectors achieved the target coverage likely due to unavoidable operational limitations.

Coverage Equitability: Between Sectors



Key Insights

Sector Alignment

The majority of sectors fell within expected observed trip counts relative to the fleet total.

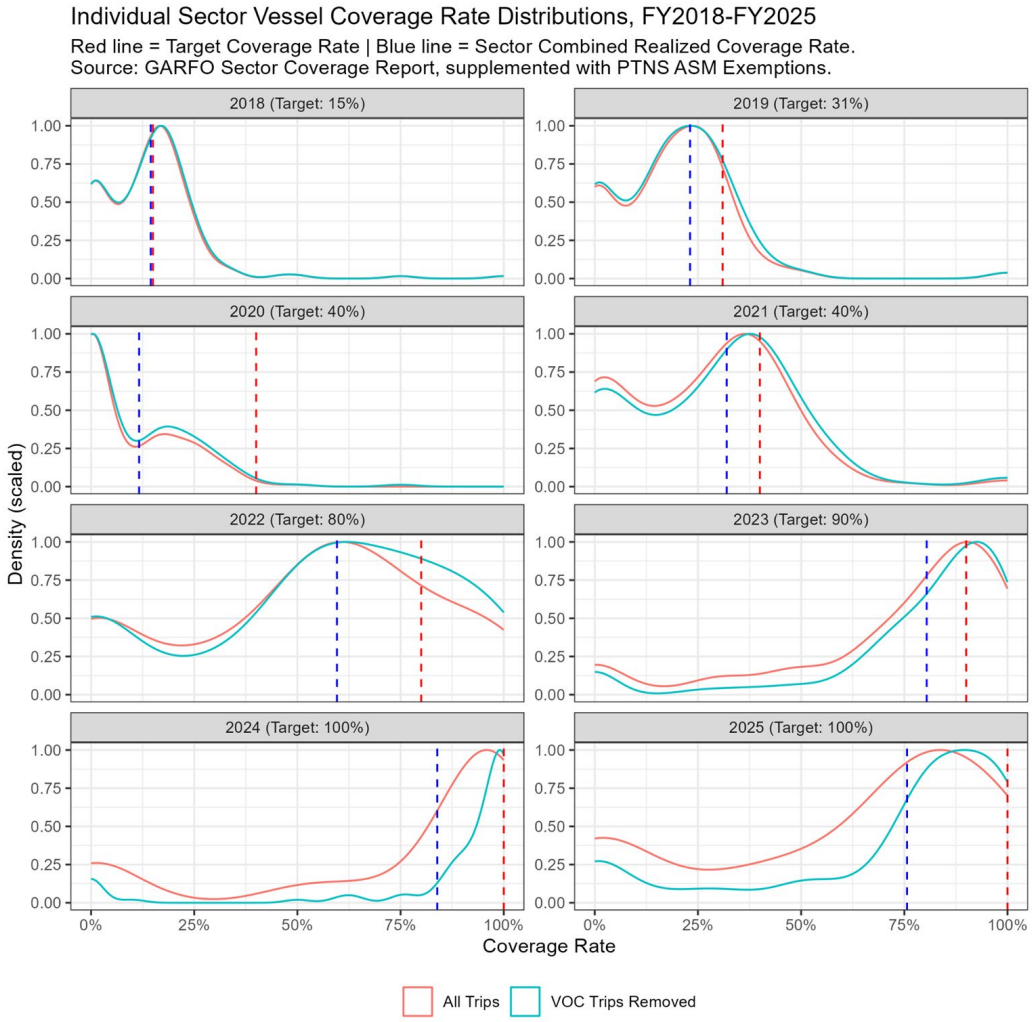
Under-sampling

Generally, a larger portion of sectors are under observed than over observed.

Improved Equitability

The percentage of sectors inequitably covered has decreased in the high coverage years.

Realized Coverage: Vessel



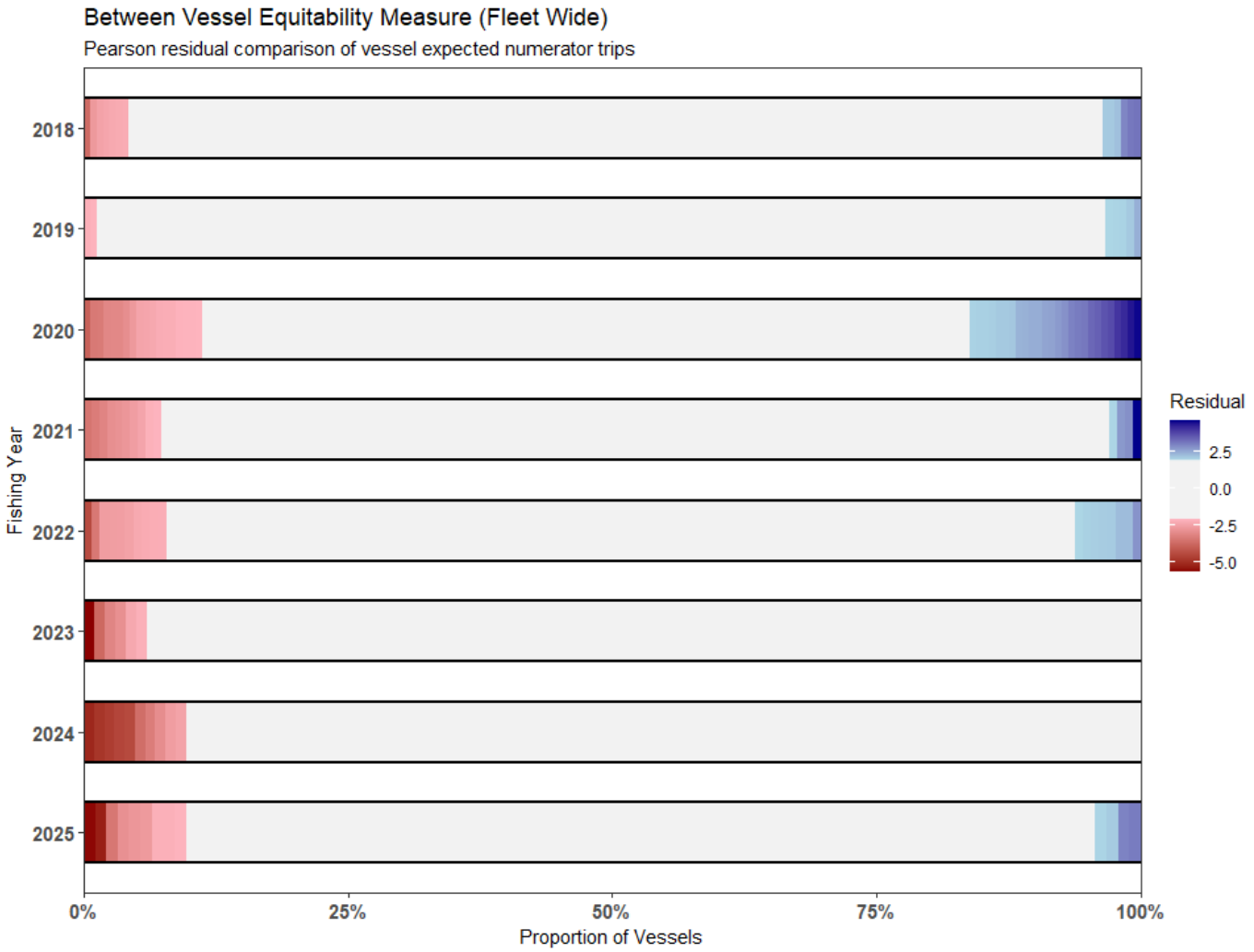
Key Coverage Observations

- Realized coverage rates varied between vessels across fishing years.
- The peak of the distributions follow target coverage rates.
- COVID-19 observer coverage waivers likely impacted these distributions.
- The distributions becomes less bimodal starting in FY2023.

Impact of Vessel of Concern (VOC) Trips

- Removal of VOC trips narrows and shifts the distribution closer to the coverage target.
- The effect of VOC trips becomes more evident as observer coverage targets increase because observers aren't deployed on VOC trips. Unobserved trips become more pronounced, especially at 100% coverage targets.

Coverage Equitability: Between Vessels



Interpreting the Figure

Residual value indicates statistical difference from expected distribution relative to the fleet total.

- **Red:** Significant undersampling
- **Blue:** Significant over sampling
- **Gray:** Within expected distribution

Analysis Insights

- The majority of vessels are within expected observed trip counts relative to the fleet total.
- A higher portion of vessels are under-sampled; under-coverage magnitude increased slightly post-A23.
- Over-sampling was highest in 2020, likely making up for initial FY20 deficits (COVID waivers).

Program Reach: M39 EM Review Rates

Fishing Year	Experienced / Currently Enrolled Vessels	New / Newly Enrolled Vessels
2021	50%	50%
2022	35%	50%
2023	35%	50%
2024	35%	50%
2025	35%	50%

Program Reach: Summary and Questions

- The expansion of the sector monitoring program has been effective and has achieved the highest monitoring coverage the fisher has experienced.
- Since implementation of A23 in 2023, coverage targets have ranged from 90% to 100%, and achieved coverage has ranged from 81% to 86%.
- Beginning in 2023, sector management uncertainty buffers (MUB) have been removed for some or all stocks each year.
- Trip acceptance rates by providers have increased throughout the time series and become less variable.
- Trip cancelation rates have gradually increased for fixed trips, while flex trip cancelation is more sporadic. Cancelations peak between 0-24 hours of trip starts, and between 24-48 hours of trip start.

Program Reach: Summary and Questions

- Fleetwide PTNS compliance rates are highly consistent, between 95% and 97%.
- More incidents are reported as a result of increased coverage, but the proportion of incident types remains consistent. Refusals remain low.
- Coverage waivers have declined with higher coverage rates, and mot are not related to safety.
- Achieved coverage rates are variable between sectors but generally follow the target coverage rate. Achieved coverage increases with the target. Achieved coverage is generally only slightly behind the target, with 2020 being the standout expectation due to COVID-19 impacts.
- Coverage equitability is open to interpretation.

Discussion

Extra Slides

Data Impacts: M1 Observer Bias

- Use groundfish trips from CAMS
- Exclude common pool vessels
- Exclude all ASM-exempted trips including EM trips
- Use CAMS-estimated discards for unobserved trips as baseline
- Random selection of “observed” trips
- No deployment effect
- Estimate discards using d/K_all ratio, stratified by gear and sector
- For observer effect, multiply discards on all unobserved trips by a scalar value
- 1 = no effect to 9 = discard 9 times as much on unobserved trips

Data Impacts: M1 Observer Bias

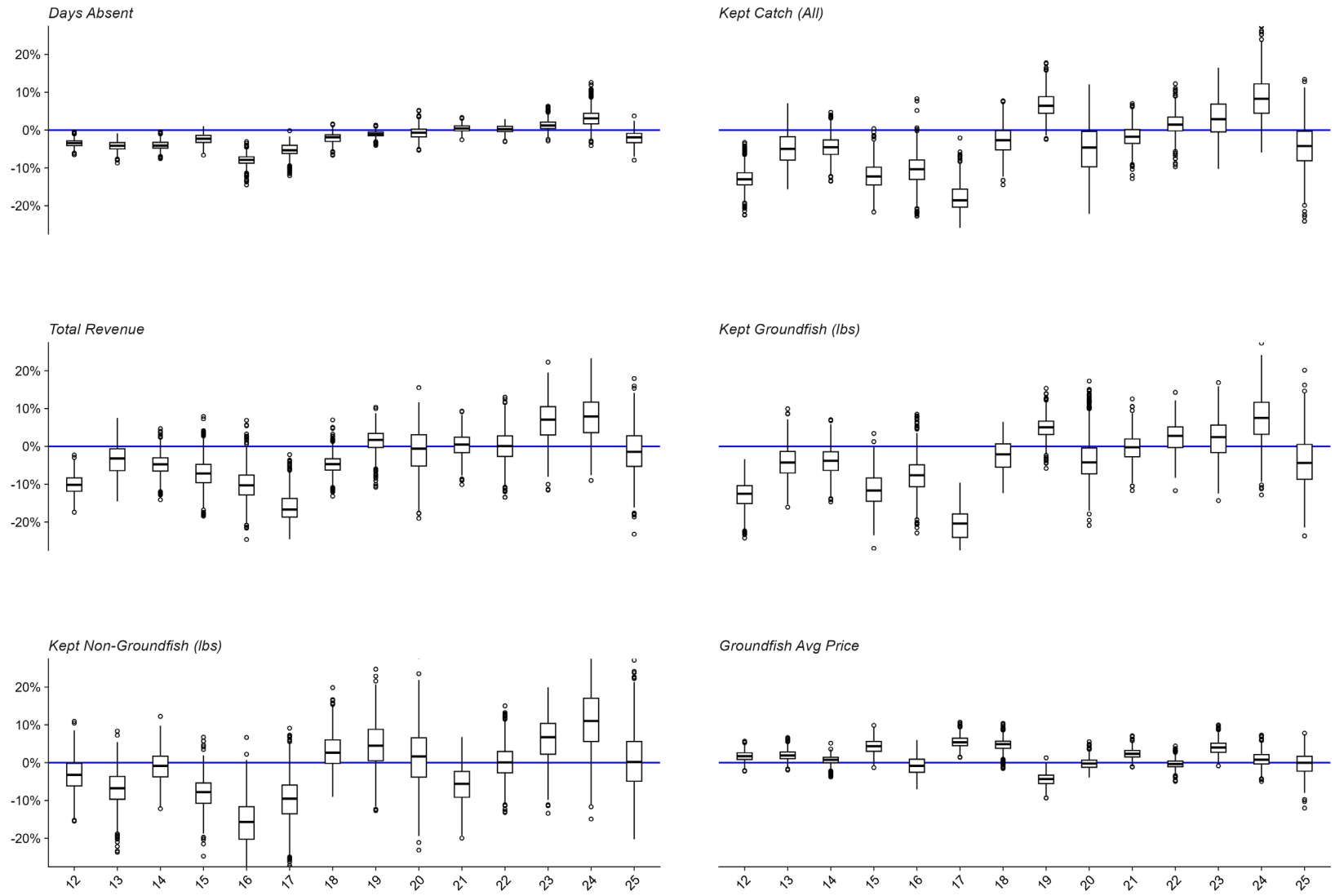
- Methods for Comparing Catch and Effort
- Effort was defined using two different metrics.
- K_{all} (similar to how effort is defined for discard estimation for monitoring and assessments).
- Day absent (DA)

Observer Bias and Magnitude of Bias

Trawl Vessels (By Fishing Year)

Percent difference (Target - Baseline / mean U). Median bootstrap values from 1,000 replicates.

	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O-U Pairs:	1,089	724	760	521	294	360	383	528	300	751	742	665	366	403
U-U Pairs:	3,650	2,613	2,043	1,881	1,683	1,747	1,944	1,878	2,301	1,516	600	289	261	307
O-U unique vessels:	148	122	120	94	79	74	60	66	44	63	44	32	17	27
U-U unique vessels:	163	129	124	105	92	86	75	71	73	70	43	34	24	34

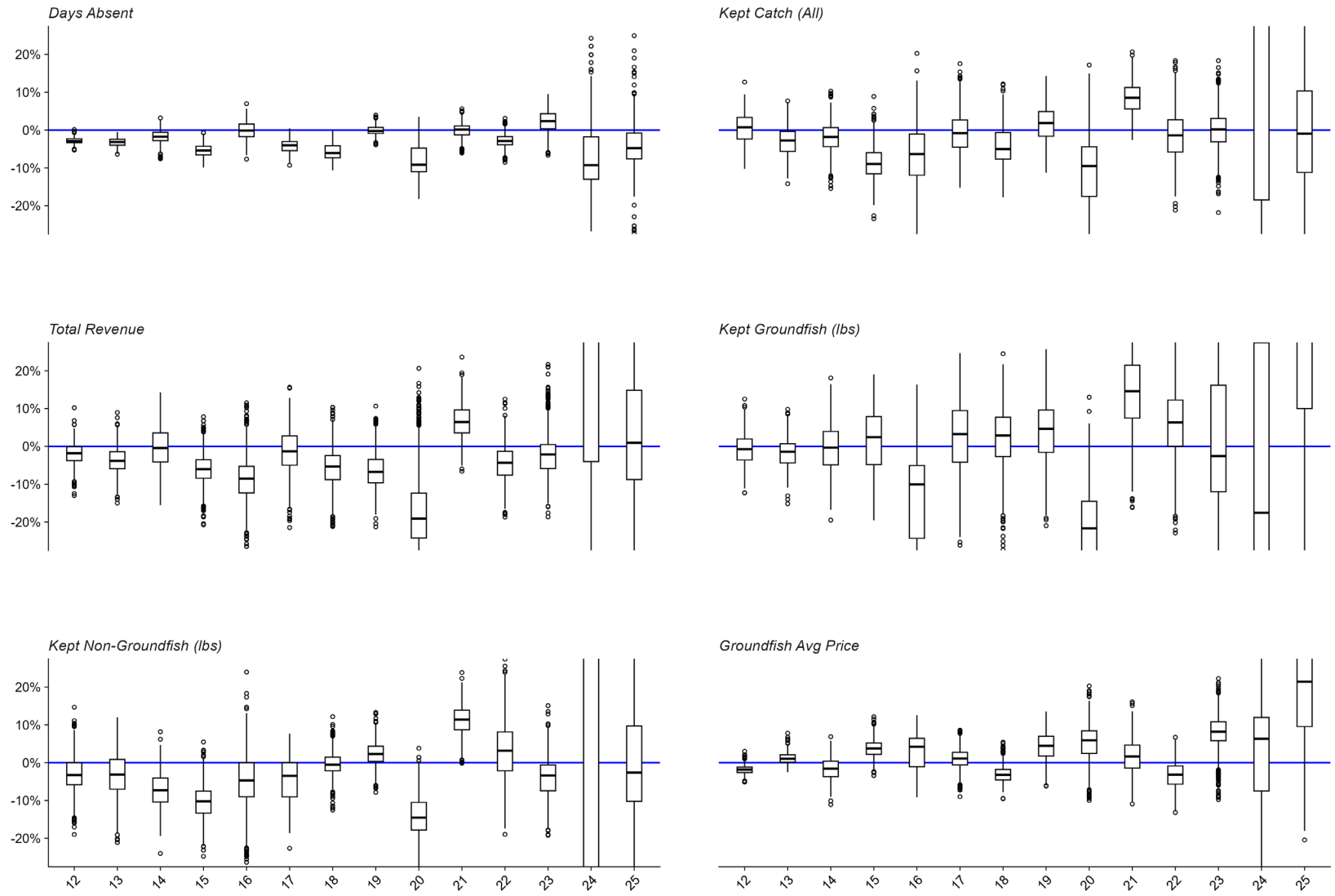


Observer Bias and Magnitude of Bias

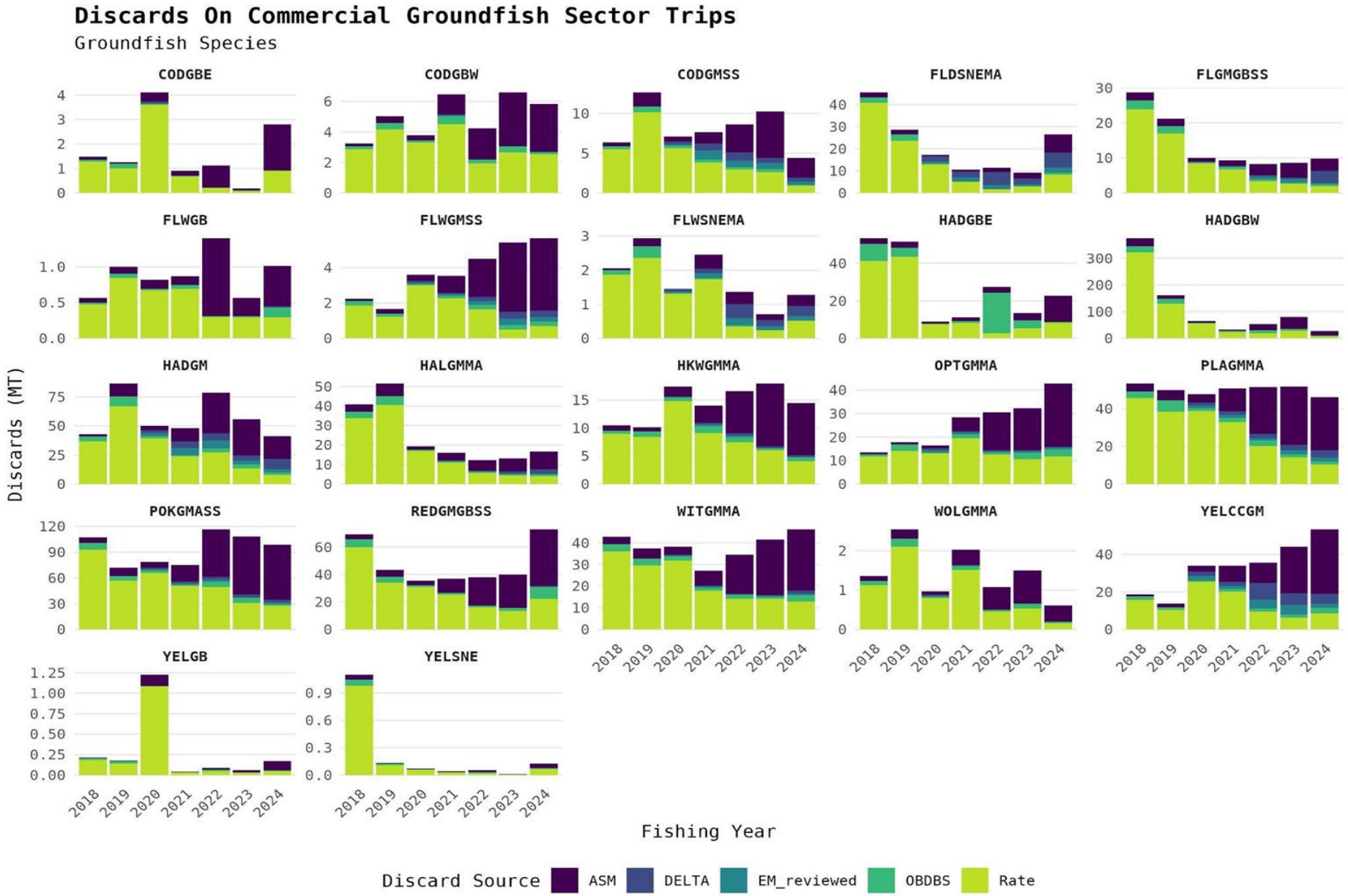
Gillnet Vessels (By Fishing Year)

Percent difference (Target - Baseline / mean U). Median bootstrap values from 1,000 replicates.

	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O-U Pairs:	522	498	403	241	118	209	161	206	83	214	315	395	145	109
U-U Pairs:	1,813	1,896	946	726	522	665	767	576	415	399	258	110	18	29
O-U unique vessels:	59	46	43	31	25	30	19	19	9	14	13	12	4	6
U-U unique vessels:	64	55	45	36	31	33	25	23	16	14	13	14	5	6



Data Impacts: M6 Discard Estimates



Supplementary Slides

*These slides partially created using Google Gemini

Coverage Equitability: Within Sectors

Key Insights

Equitable Distribution

For most years sectors had equitable coverage between vessels compared to expected trip counts.

High Inequity Years

In 2020, 2021, and 2024, the majority of sectors had a portion of significantly under covered vessels.

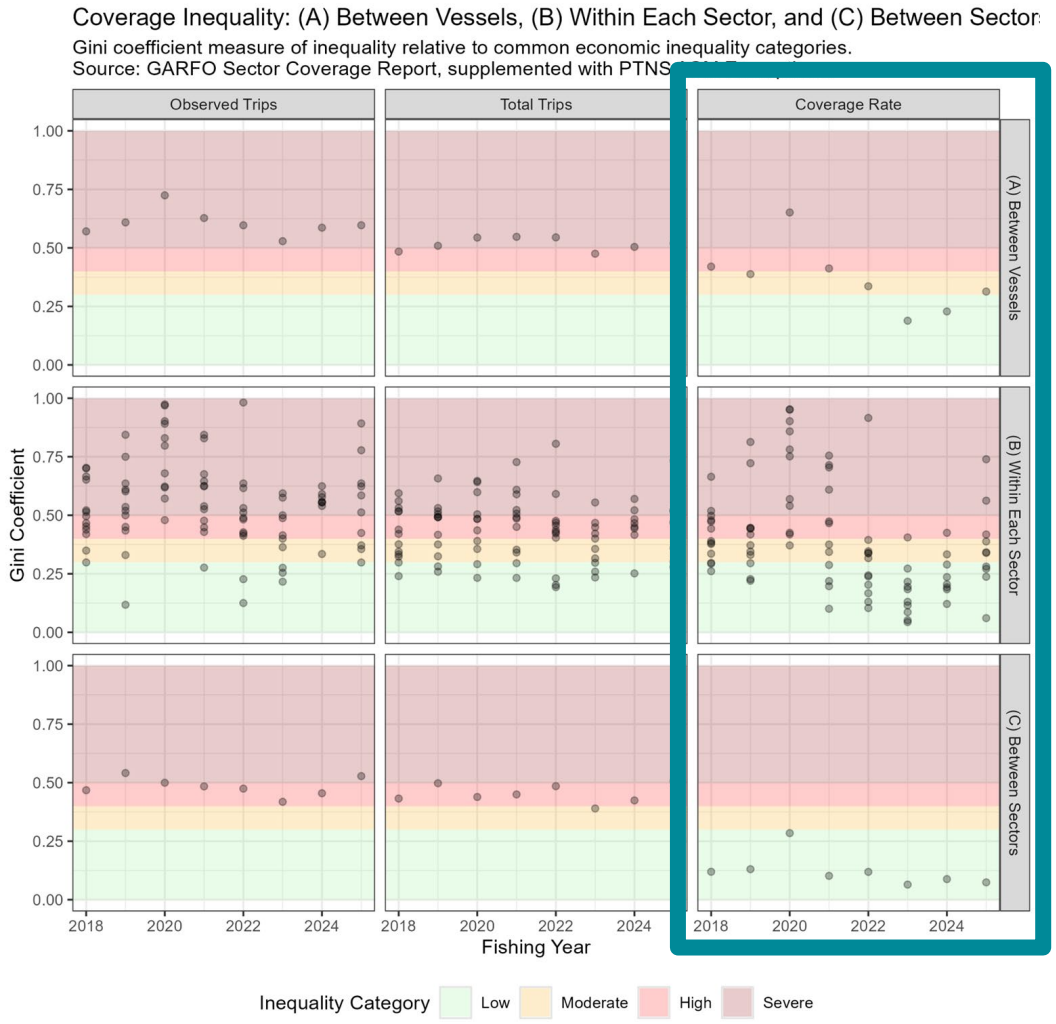
Undersampling Trends

Post-A23, inequity is primarily driven by undersampling of vessels within sectors.

COVID-19 Impact

Strong over-coverage in 2020 likely addressed deficits from COVID waivers.

Coverage Concentration: Sector and Vessel



Concentration of Effort and Observer Coverage

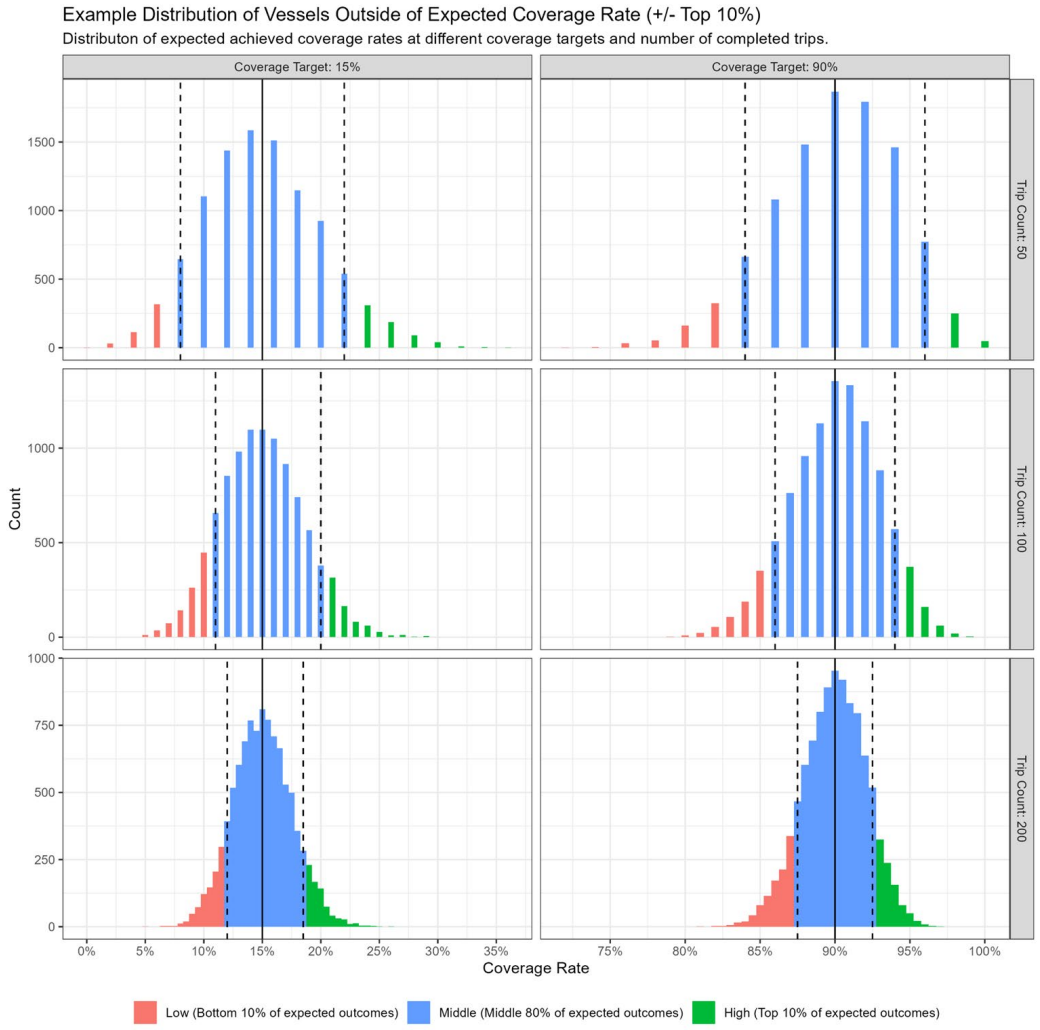
- A smaller group of vessels take the bulk of trips and observers, though individual vessel coverage rates are more evenly distributed, especially since FY2023.
- The same general pattern persists within sectors, however the degree of concentration varies between sectors.
- The pattern of a small group taking the bulk of trips and observers continues when evaluating concentration between sectors. However, when evaluating coverage rates between sectors, inequality is low due to sector-level targets.

What is the Gini Coefficient?

- A common measure of inequality or concentration used in economics (e.g., wealth or income distribution in a country).

Gini Coefficient	% Held by top 10%
0.1	15%
0.3	29%
0.5	46%
0.7	67%
0.9	89%

Coverage



Expected Coverage Explained (Target: 80%)

Sector A: 8 of 10 trips observed **(80% Coverage)**

Sector B: 7 of 9 trips observed **(78% Coverage)**

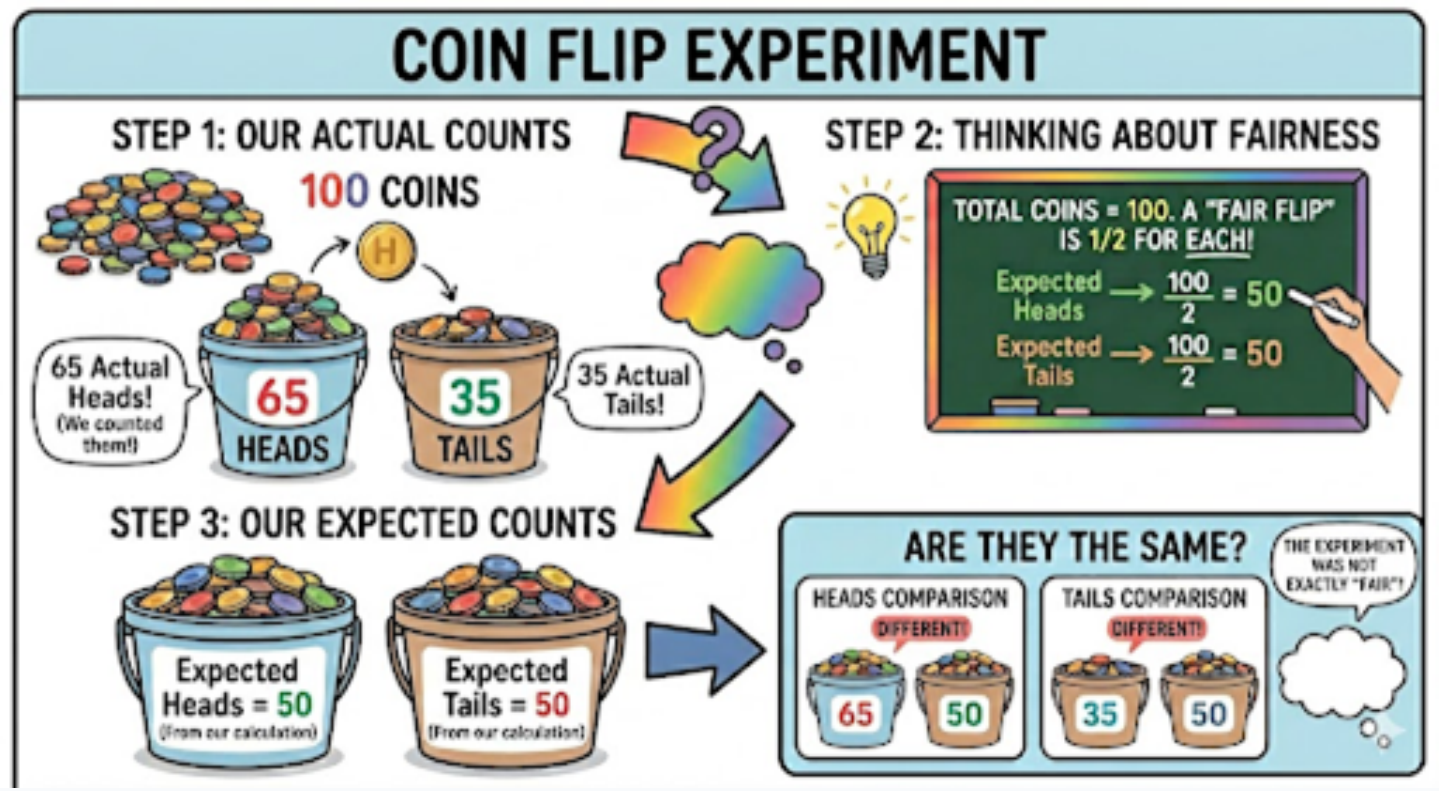
Sector C: 2 of 3 trips observed **(67% Coverage)**

Sector D: 14 of 20 trips observed **(70% Coverage)**

Key Observations:

- Sectors A, B, and C meet or exceed expected coverage.
- Sector D falls below the expected target coverage rate.

Expected vs Actual Counts

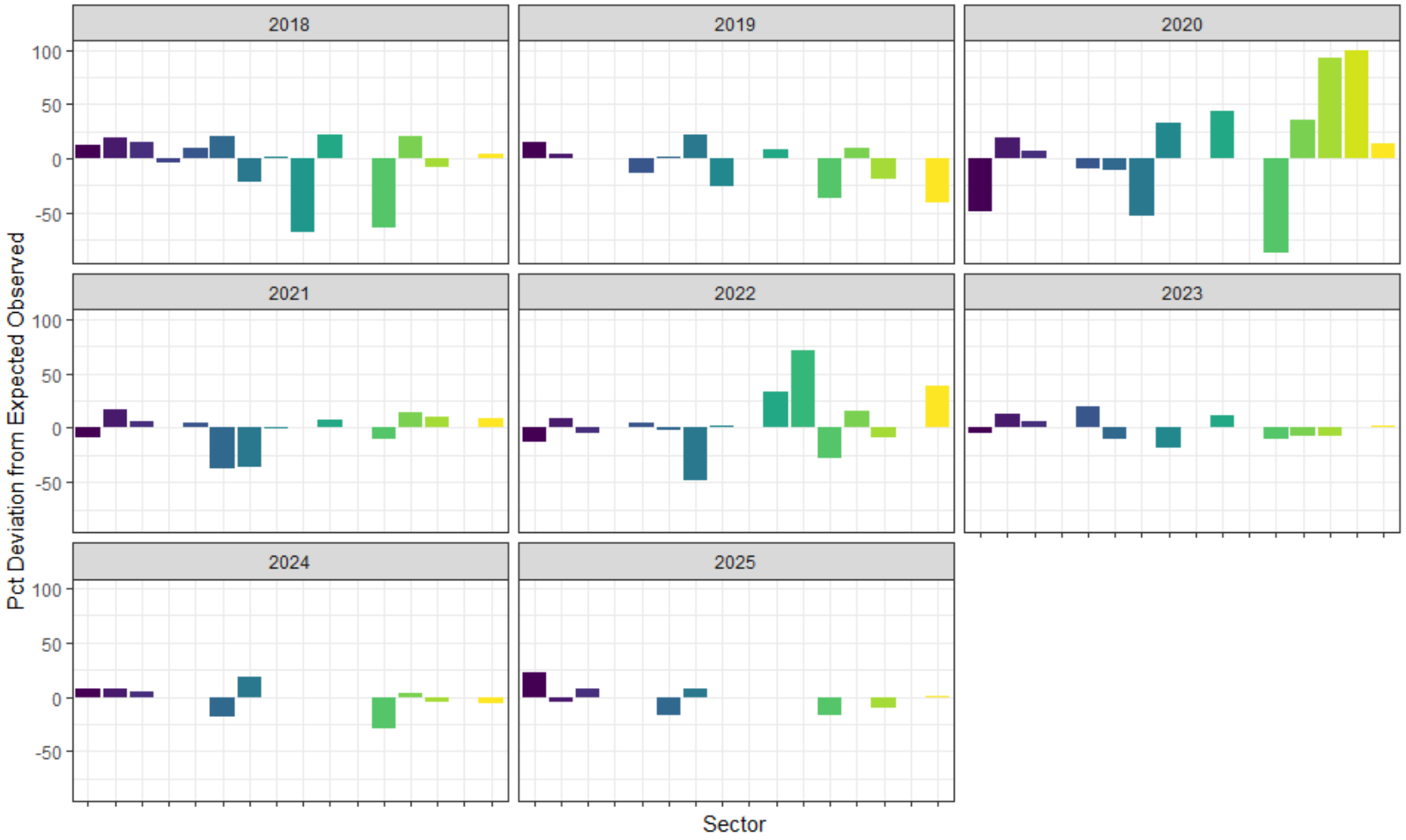


Visualizing the "Fair Flip" principle: The Expected Count is the average outcome if the experiment was repeated many times.

Probability Breakdown

- 100 coin flips: Expected is 50 heads and 50 tails
- 500 coin flips: Expected is 250 heads and 250 tails
- The expected value scales with the total number of flips.
- *Actual counts significantly above or below the expected values are considered statistically different.*

Coverage: Expected vs actual (Gaps)



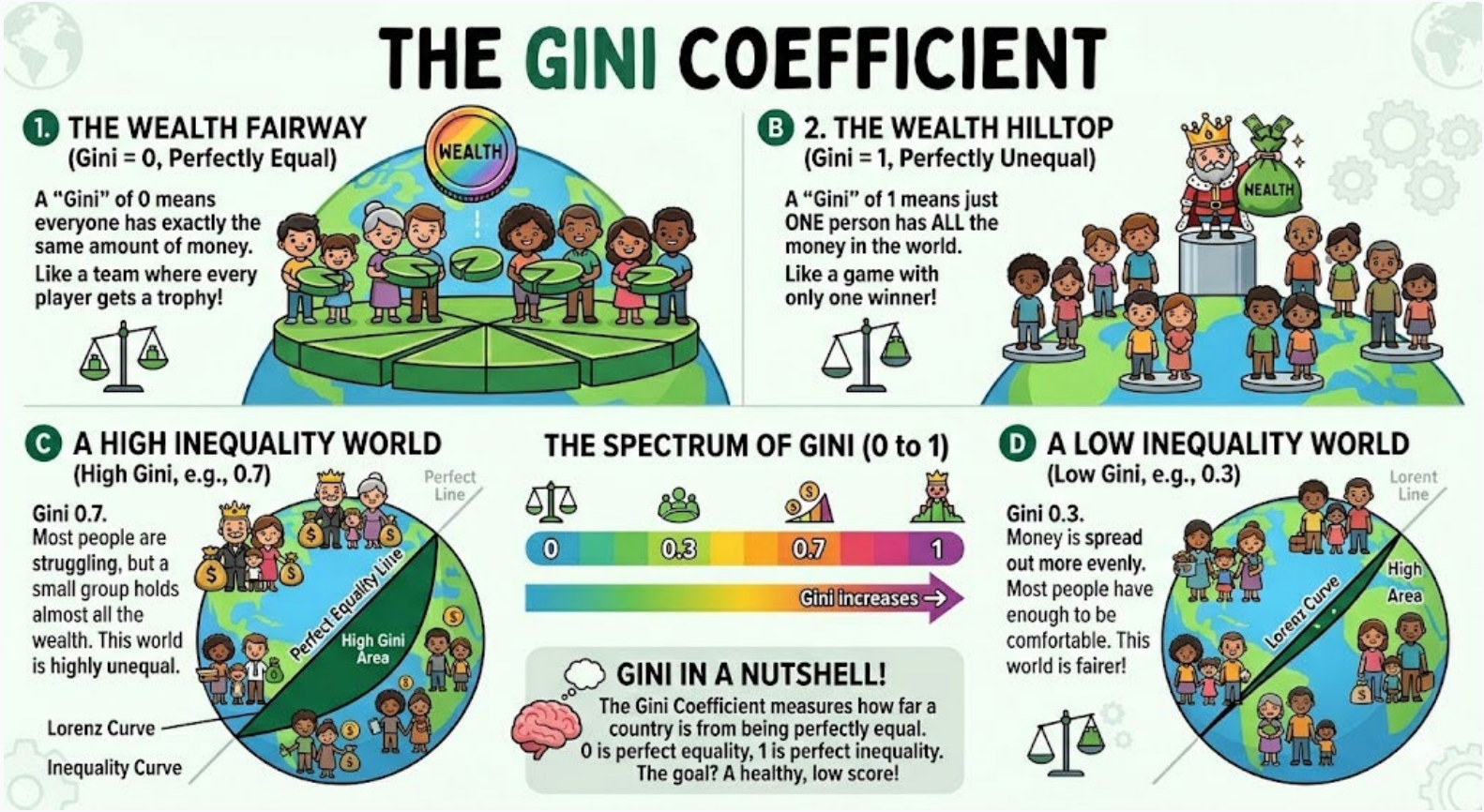
How to Read the Gaps

Zero Line: Perfect alignment. No difference between actual and expected trip counts.

Above Zero (+): Over-observed. Actual trip counts are **higher** than the expected value.

Below Zero (-): Under-observed. Actual trip counts are **lower** than the expected value.

Gini Coefficient

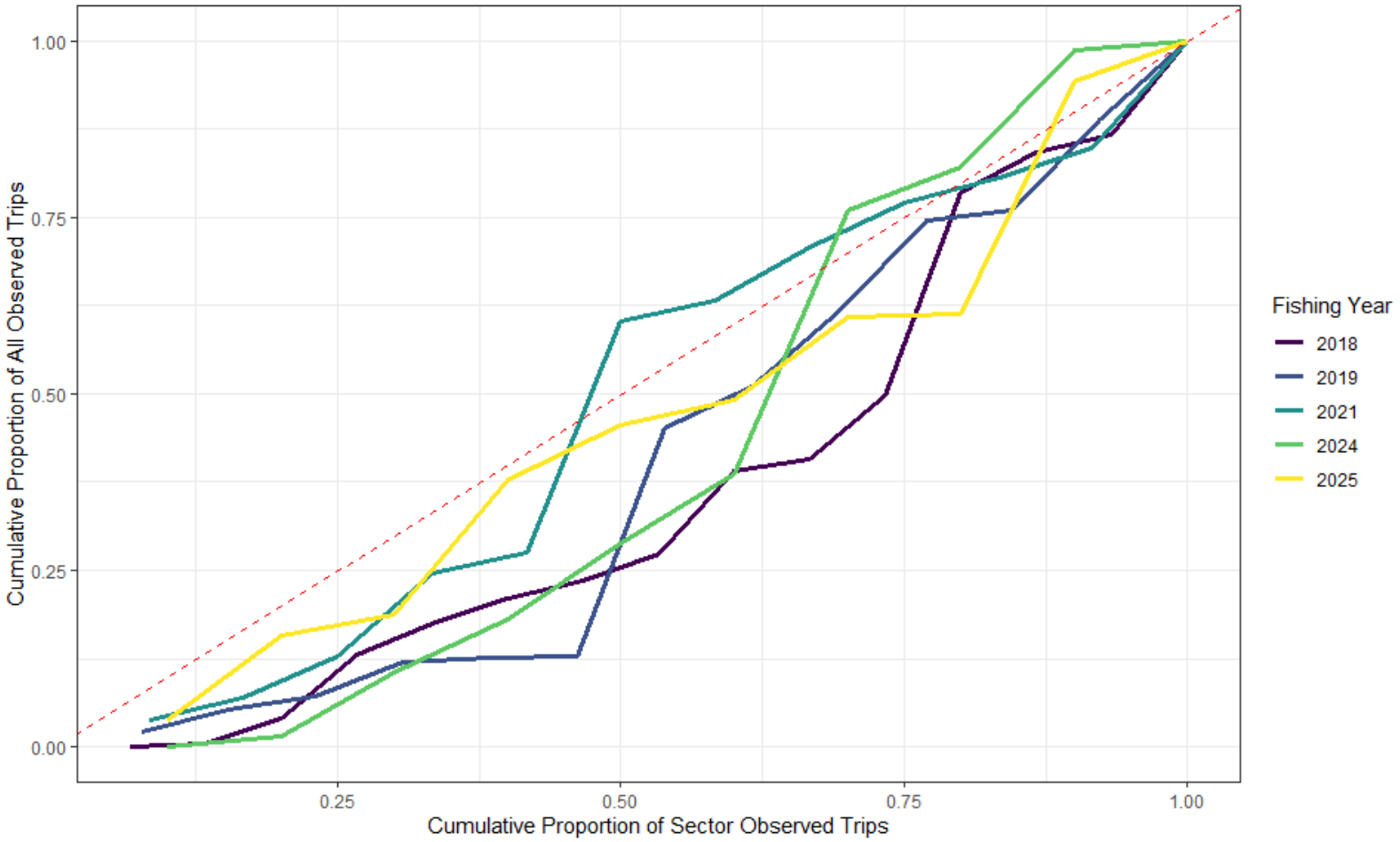


Understanding Inequality

The Gini Coefficient measures how far a country is from being perfectly equal.

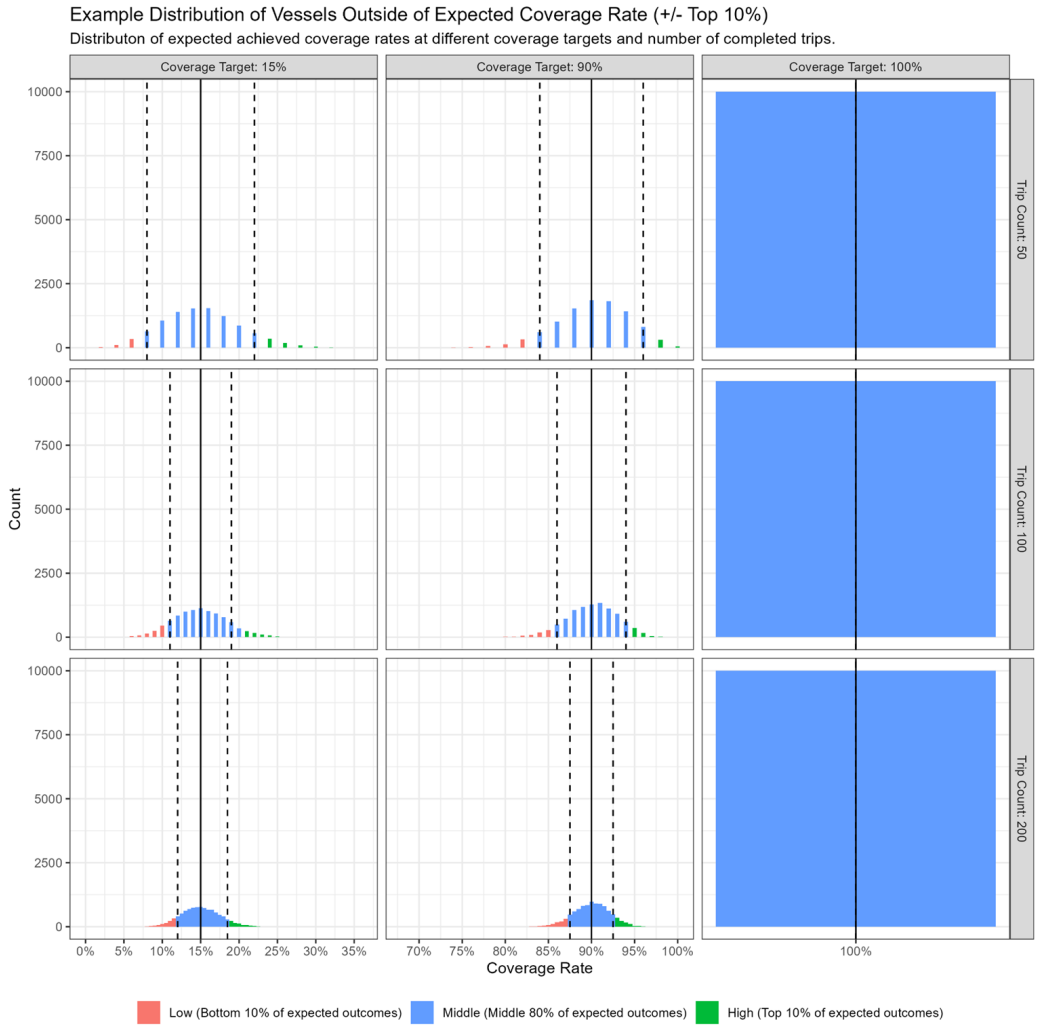
- **Gini 0:** Perfect Equality. Everyone has the same income.
- **Gini 1:** Perfect Inequality. One person has everything.
- **Gini 0.3:** Low inequality (Ideal for many).
- **Gini 0.7:** High inequality world.

Sector Lorenz Curves



- **X-Axis:** Represents cumulative activity at the sector level.
- **Y-Axis:** Represents cumulative activity at the fleet level.
- *The Lorenz curve visualizes inequality in trip distribution across fishing years.*

Coverage


Example Distribution of Vessels Outside of Expected Coverage Rate (+/- Top 10%)
Distributon of expected achieved coverage rates at different coverage targets and number of completed trips.
Coverage Target: 15%
Coverage Target: 90%
Coverage Target: 100%
Trip Count: 50
Trip Count: 100
Trip Count: 200
Count
10000
7500
5000
2500
0
0%
5%
10%
15%
20%
25%
30%
35%
70%
75%
80%
85%
90%
95%
100%
Coverage Rate
Low (Bottom 10% of expected outcomes)
Middle (Middle 80% of expected outcomes)
High (Top 10% of expected outcomes)