Testing of WGEM Ecospace Outputs

Matthew S Woodstock

2024-11-13

Contents

Summary

- Created several metrics to diagnose Ecospace
- Each environmental driver affects functional groups differently
- Bottom temperature changes produce weird clumping of groups
- Dispersal metrics are not consistent among groups, but within groups show a pattern
- Catch and Discard temporal trends look forced in the model
- Relative changes follow in all regions, suggesting forced fishing effort is felt evenly
- Really need a way to calibrate spatially

Problem Statement

- Ecospace may be fitting weird
- Need Ecospace to create realistic population movements (e.g., seasonal movements)

Objectives

- Understand drivers of population dynamics
- Quantify how each environmental variable affect trends
- Compare regional trends to overall trends

Methods

- Set up Ecosim model with vulnerabilities scaled to trophic level
  - Previous discussions suggest SS may not be the best calibration method, particularly considering the lack of spatial consideration in Ecosim
- Applied time series forcings and left all forcing functions and environmental responses the same
  - Many of these were applied by Holden
- Set up several Ecospace scenarios within the spatial-temporal framework (Table 1)

Table 1: Scenarios run in Ecospace

Number	Name	Description
1	no_driver	No environmental drivers applied
2	surface_temp	Only surface temperatures are dynamic
3	bottom_temp	Only bottom temperatures are dynamic
4	chla_prod	Monthly CHLa concentrations drive monthly primary productivity
5	salt	Only water-coumn integrated salinity is applied
6	all_driver	All environmental drivers are applied

- Created regions corresponding to geographical areas (LATex shelf, Mississippi River outflow, West Florida Shelf, Dry Tortugas; Figure 1)

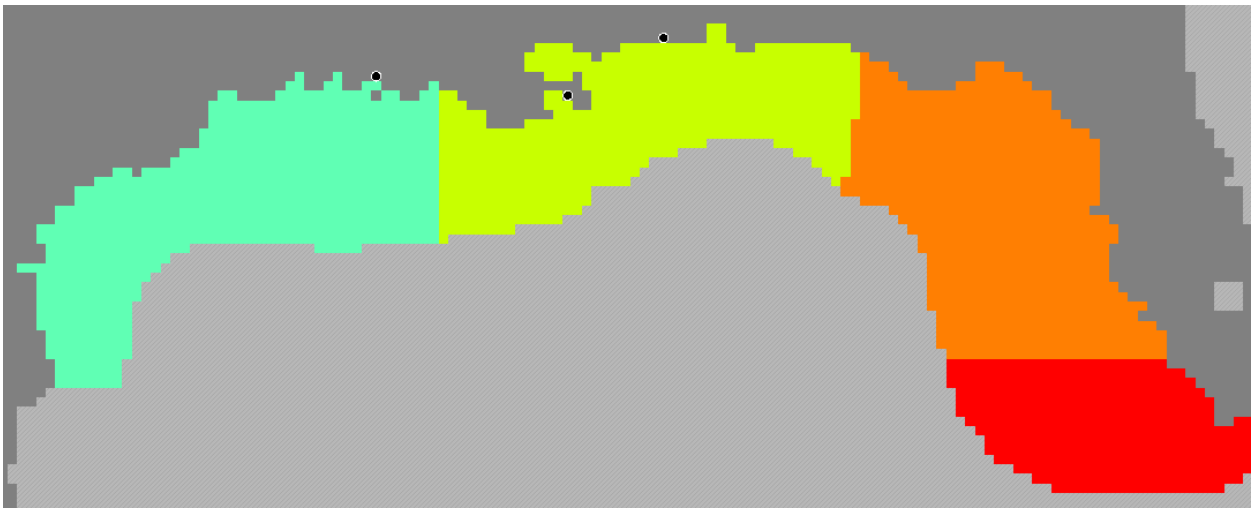


Figure 1: The regions applied in regional analyses aligning with basic regions in the Gulf of Mexico. LaTex shelf (green), Mississippi River (yellow), West Florida Shelf (orange), Dry Tortugas (red).

- Quantify the influence of each driver on population and ecosystem scale metrics
- Gather several metrics:
  - Biomass, catch, discards (t/km2)
  - Fishing effort (units?)
  - Habitat Capacity
  - Ecosystem-scale indicators
- Conduct analyses:
  - Center of mass movement
  - Spatially explicit end/start for all metrics
  - Compare population dispersion at start/end of simulation
  - Overall trends vs. regional trends

Results

Distribution Shifts

Click here for full outputs.

Biomass

Table 2: Biomass center of mass distribution shifts for all functional groups in all scenarios that moved greater than 50km from the 1981 starting point. Coordinates represent the center of mass of the population.

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
all_driver	Coastal dolphins	(28.32, -88.87)	(28.09, -88.14)	76.1
	Sandbar shark	(28.13, -90.31)	(28.09, -90.92)	60.1
	Atlantic sharpnose shark	(28.12, -86.23)	(27.41, -84.03)	230.7
	Yellowfin tuna	(27.87, -88.99)	(27.93, -87.99)	98.6
	Other tunas	(27.45, -88.37)	(27.05, -87.09)	134.3
	Billfish	(26.87, -85.97)	(27.24, -87.35)	142.9
	Swordfish	(27.32, -87.98)	(27.49, -89.48)	149.4
	Pelagic coastal piscivores	(28.45, -90.34)	(28.42, -89.39)	93.1
	King mackerel (0-1yr)	(27.8, -87.41)	(27.59, -86.64)	79.4
	Spanish mackerel (0-1yr)	(28.94, -88.23)	(28.29, -87.44)	105.8
	Spanish mackerel (1+yr)	(28.77, -88.2)	(27.79, -85.82)	257.6
	Yellowedge grouper (0-3yr)	(28.51, -89.5)	(28.1, -89.08)	61.5
	Red snapper (0yr)	(28.44, -90.37)	(28.22, -89.73)	67.3
	Red snapper (1-2yr)	(28.39, -90.55)	(28.28, -90.03)	52.4
	Red snapper (3+yr)	(28.08, -90.45)	(27.93, -89.79)	67.0
	Inshore coastal piscivores	(28.7, -89.07)	(28.88, -89.6)	55.5
	Benthic piscivores	(28.17, -89.58)	(27.9, -88.35)	124.5
	Reef piscivores	(28.12, -89.93)	(28.03, -89.28)	64.6
	Surface pelagics	(28.03, -88.23)	(27.94, -87.63)	59.8
	Menhaden (0yr)	(28.52, -89.39)	(28.37, -88.8)	60.1
	Menhaden (1yr)	(28.48, -89.09)	(28.32, -88.24)	85.1
	Menhaden (3yr)	(27.86, -87.84)	(28.02, -88.44)	61.6
	Anchovy-silverside-killifish	(27.54, -85.04)	(27.87, -86.39)	138.0
	Mobile epifauna	(28.17, -88.25)	(28.01, -87.72)	55.0
bottom_temp	Sea turtle	(28.21, -90.39)	(28.29, -91.24)	83.8
	Atlantic sharpnose shark	(27.84, -85.51)	(27.41, -84.04)	152.7
	Yellowfin tuna	(27.78, -88.98)	(27.86, -87.99)	97.9
	Bluefin tuna	(27.25, -87.04)	(26.93, -85.85)	123.2
	Other tunas	(27.6, -88.37)	(27.55, -86.92)	143.2
	Billfish	(27.06, -86.31)	(27.36, -87.08)	83.2
	Swordfish	(27.21, -87.74)	(27.36, -88.54)	80.9
	Spanish mackerel (0-1yr)	(28.72, -88.41)	(28.69, -86.21)	214.8
	Spanish mackerel (1+yr)	(28.68, -88.42)	(28.72, -86.22)	214.9
	Red grouper (3+yr)	(26.94, -84.75)	(27.02, -85.25)	50.4
chla_prod	Yellowfin tuna	(27.66, -88.59)	(27.86, -88.11)	52.3
salt	Sea turtle	(28.25, -90.41)	(28.31, -91.05)	63.1
	Atlantic sharpnose shark	(28.03, -85.24)	(28.08, -84.51)	71.9
	Yellowfin tuna	(27.8, -88.96)	(27.88, -87.97)	97.9
	Bluefin tuna	(27.14, -86.79)	(26.76, -85.52)	132.9
	Other tunas	(27.61, -88.36)	(27.53, -86.92)	142.4

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
	Billfish	(27.05, -86.34)	(27.31, -87.08)	78.8
	Swordfish	(27.21, -87.74)	(27.39, -88.61)	88.4
	Spanish mackerel (0-1yr)	(28.75, -88.04)	(28.67, -85.26)	271.6
	Spanish mackerel (1+yr)	(28.68, -88.1)	(28.62, -85.25)	278.5
surface_temp	Sea turtle	(28.2, -90.2)	(28.25, -90.73)	52.3
	Atlantic sharpnose shark	(28.02, -85.42)	(28.06, -84.53)	87.6
	Yellowfin tuna	(27.72, -88.72)	(27.93, -88.16)	59.9
	Bluefin tuna	(27.16, -86.83)	(26.72, -85.38)	152.0
	Other tunas	(27.59, -88.36)	(27.5, -86.68)	166.1
	Billfish	(27.06, -86.24)	(27.37, -87.33)	113.3
	Swordfish	(27.24, -87.84)	(27.35, -88.39)	55.8
	Pelagic coastal piscivores	(28.17, -90.05)	(28.08, -89.25)	79.2
	Spanish mackerel (0-1yr)	(28.87, -88.32)	(28.81, -85.56)	269.2
	Spanish mackerel (1+yr)	(28.82, -88.37)	(28.85, -85.75)	255.5
	Yellowedge grouper (0-3yr)	(27.93, -90.02)	(27.75, -89.45)	59.6
	Menhaden (0yr)	(28.87, -89.74)	(28.9, -90.34)	58.6

Catch

Table 3: Catch center of mass distribution shifts for all functional groups in all scenarios that moved greater than 50km from the 1981 starting point. Coordinates represent the center of mass of the population.

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
all_driver	Large oceanic sharks	(27.87, -88.27)	(27.53, -87.04)	127.0
	Atlantic sharpnose shark	(28.52, -87.01)	(27.92, -84.11)	292.2
	Small coastal sharks	(28.49, -90.55)	(28.45, -89.96)	57.9
	Yellowfin tuna	(27.9, -89.13)	(27.89, -88.19)	92.5
	Other tunas	(27.69, -88.88)	(27.39, -87.66)	125.0
	Billfish	(27.08, -86.54)	(27.43, -87.89)	139.2
	Swordfish	(27.39, -88)	(27.52, -89.64)	162.6
	Pelagic coastal piscivores	(28.74, -90.26)	(28.74, -89.42)	82.0
	Cobia	(28.64, -88.05)	(28.75, -87.55)	50.3
	King mackerel (0-1yr)	(28, -88.03)	(27.81, -87.15)	89.1
	Spanish mackerel (0-1yr)	(29.01, -88.46)	(28.5, -87.81)	85.1
	Spanish mackerel (1+yr)	(28.89, -88.64)	(28.17, -86.44)	229.6
	Skates-rays	(28.93, -89.68)	(28.82, -89.14)	54.0
	Red grouper (0-3yr)	(27.11, -84.48)	(27.34, -85.12)	68.3
	Yellowedge grouper (3+yr)	(28.01, -89.04)	(27.94, -88.29)	74.1
	Red snapper (0yr)	(28.57, -90.84)	(28.38, -90.37)	50.6
	Red snapper (3+yr)	(28.24, -90.49)	(28.14, -89.81)	67.6
	Oceanic piscivores	(28.47, -88.63)	(27.86, -87.66)	116.9
	Benthic piscivores	(28.51, -90.02)	(28.41, -89.34)	67.5

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
	Reef piscivores	(28.33, -90.07)	(28.31, -89.54)	52.0
	Surface pelagics	(28.31, -88.72)	(28.32, -88.16)	54.9
	Sardine-herring-scad	(28.5, -89.26)	(28.36, -88.69)	57.9
	Pink shrimp	(28.09, -87.45)	(28.06, -86.79)	64.9
	Mobile epifauna	(28.41, -88.55)	(28.27, -87.73)	81.8
bottom_temp	Large oceanic sharks	(27.6, -88.48)	(27.38, -87.63)	87.4
	Atlantic sharpnose shark	(28.31, -86.45)	(27.99, -84.29)	215.0
	Yellowfin tuna	(27.81, -89.24)	(27.8, -88.23)	99.5
	Bluefin tuna	(27.32, -87.2)	(26.88, -85.82)	145.3
	Other tunas	(27.78, -89.01)	(27.8, -87.67)	132.0
	Billfish	(27.28, -87.1)	(27.53, -87.81)	75.5
	Swordfish	(27.23, -87.78)	(27.37, -88.67)	89.4
	Spanish mackerel (0-1yr)	(28.82, -88.76)	(28.8, -86.41)	229.2
	Spanish mackerel (1+yr)	(28.82, -88.84)	(28.87, -86.44)	234.1
	Red grouper (0-3yr)	(27.89, -85.81)	(27.95, -86.47)	65.3
	Oceanic piscivores	(28.1, -88.76)	(27.75, -88.32)	58.2
	Menhaden (0yr)	(29.06, -90.08)	(29.19, -90.71)	62.9
chla_prod	Yellowfin tuna	(27.66, -88.72)	(27.74, -88.21)	51.0
	Spanish mackerel (1+yr)	(28.6, -88.82)	(28.96, -88.49)	51.4
	Oceanic piscivores	(28.1, -88.76)	(27.71, -88.23)	67.8
	Menhaden (0yr)	(28.8, -89.49)	(29, -90.16)	69.0
salt	Large oceanic sharks	(27.6, -88.46)	(27.31, -87.49)	101.1
	Atlantic sharpnose shark	(28.43, -86.14)	(28.49, -84.75)	136.2
	Yellowfin tuna	(27.82, -89.21)	(27.82, -88.21)	98.5
	Bluefin tuna	(27.21, -86.96)	(26.66, -85.4)	166.5
	Other tunas	(27.79, -89.01)	(27.79, -87.67)	132.0
	Billfish	(27.26, -87.13)	(27.49, -87.84)	74.7
	Swordfish	(27.23, -87.78)	(27.39, -88.72)	94.7
	Spanish mackerel (0-1yr)	(28.85, -88.53)	(28.76, -85.41)	304.5
	Spanish mackerel (1+yr)	(28.83, -88.69)	(28.8, -85.39)	321.9
	Yellowedge grouper (3+yr)	(27.65, -89.18)	(27.59, -88.62)	55.6
	Oceanic piscivores	(28.18, -88.88)	(27.76, -88.4)	66.4
surface_temp	Large oceanic sharks	(27.6, -88.51)	(27.4, -87.81)	72.6
	Atlantic sharpnose shark	(28.41, -86.4)	(28.44, -84.8)	156.7
	Yellowfin tuna	(27.71, -88.88)	(27.87, -88.39)	51.4
	Bluefin tuna	(27.23, -87)	(26.69, -85.37)	172.5
	Other tunas	(27.77, -89.01)	(27.77, -87.42)	156.6
	Billfish	(27.25, -86.95)	(27.55, -88.1)	118.5
	Swordfish	(27.26, -87.86)	(27.37, -88.53)	67.4
	Pelagic coastal piscivores	(28.44, -90.45)	(28.33, -89.74)	70.6
	Spanish mackerel (0-1yr)	(28.96, -88.77)	(28.93, -85.8)	289.3
	Spanish mackerel (1+yr)	(28.93, -88.8)	(29, -85.93)	279.6
	Yellowedge grouper (0-3yr)	(28.02, -90.45)	(27.86, -89.91)	56.0
	Oceanic piscivores	(28.11, -88.85)	(27.74, -88.41)	59.7
	Menhaden (0yr)	(29.11, -89.95)	(29.2, -90.78)	81.3

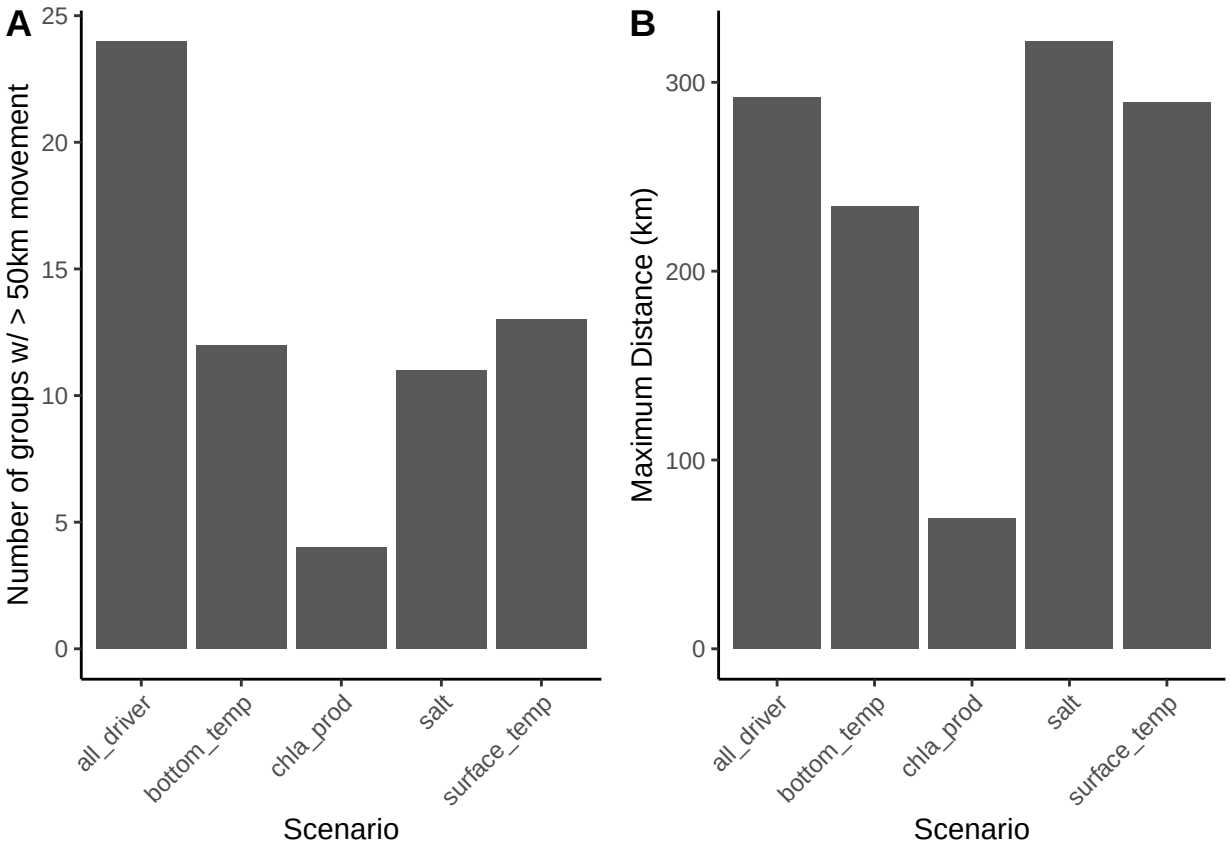


Figure 2: Summarized Catch movement infomration. A) The number of functional groups that moved greater than 50km by scenario. B) The maximum distance (km) traveled by a functional group per scenario.

Discards

Table 4: Biomass center of mass distribution shifts for all functional groups in all scenarios that moved greater than 50km from the 1981 starting point. Coordinates represent the center of mass of the population.

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
all_driver	Coastal dolphins	(28.32, -88.87)	(28.09, -88.14)	76.1
	Sandbar shark	(28.13, -90.31)	(28.09, -90.92)	60.1
	Atlantic sharpnose shark	(28.12, -86.23)	(27.41, -84.03)	230.7
	Yellowfin tuna	(27.87, -88.99)	(27.93, -87.99)	98.6
	Other tunas	(27.45, -88.37)	(27.05, -87.09)	134.3
	Billfish	(26.87, -85.97)	(27.24, -87.35)	142.9
	Swordfish	(27.32, -87.98)	(27.49, -89.48)	149.4
	Pelagic coastal piscivores	(28.45, -90.34)	(28.42, -89.39)	93.1
	King mackerel (0-1yr)	(27.8, -87.41)	(27.59, -86.64)	79.4

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
	Spanish mackerel (0-1yr)	(28.94, -88.23)	(28.29, -87.44)	105.8
	Spanish mackerel (1+yr)	(28.77, -88.2)	(27.79, -85.82)	257.6
	Yellowedge grouper (0-3yr)	(28.51, -89.5)	(28.1, -89.08)	61.5
	Red snapper (0yr)	(28.44, -90.37)	(28.22, -89.73)	67.3
	Red snapper (1-2yr)	(28.39, -90.55)	(28.28, -90.03)	52.4
	Red snapper (3+yr)	(28.08, -90.45)	(27.93, -89.79)	67.0
	Inshore coastal piscivores	(28.7, -89.07)	(28.88, -89.6)	55.5
	Benthic piscivores	(28.17, -89.58)	(27.9, -88.35)	124.5
	Reef piscivores	(28.12, -89.93)	(28.03, -89.28)	64.6
	Surface pelagics	(28.03, -88.23)	(27.94, -87.63)	59.8
	Menhaden (0yr)	(28.52, -89.39)	(28.37, -88.8)	60.1
	Menhaden (1yr)	(28.48, -89.09)	(28.32, -88.24)	85.1
	Menhaden (3yr)	(27.86, -87.84)	(28.02, -88.44)	61.6
	Anchovy-silverside-killifish	(27.54, -85.04)	(27.87, -86.39)	138.0
	Mobile epifauna	(28.17, -88.25)	(28.01, -87.72)	55.0
bottom_temp	Sea turtle	(28.21, -90.39)	(28.29, -91.24)	83.8
	Atlantic sharpnose shark	(27.84, -85.51)	(27.41, -84.04)	152.7
	Yellowfin tuna	(27.78, -88.98)	(27.86, -87.99)	97.9
	Bluefin tuna	(27.25, -87.04)	(26.93, -85.85)	123.2
	Other tunas	(27.6, -88.37)	(27.55, -86.92)	143.2
	Billfish	(27.06, -86.31)	(27.36, -87.08)	83.2
	Swordfish	(27.21, -87.74)	(27.36, -88.54)	80.9
	Spanish mackerel (0-1yr)	(28.72, -88.41)	(28.69, -86.21)	214.8
	Spanish mackerel (1+yr)	(28.68, -88.42)	(28.72, -86.22)	214.9
	Red grouper (3+yr)	(26.94, -84.75)	(27.02, -85.25)	50.4
chla_prod	Yellowfin tuna	(27.66, -88.59)	(27.86, -88.11)	52.3
salt	Sea turtle	(28.25, -90.41)	(28.31, -91.05)	63.1
	Atlantic sharpnose shark	(28.03, -85.24)	(28.08, -84.51)	71.9
	Yellowfin tuna	(27.8, -88.96)	(27.88, -87.97)	97.9
	Bluefin tuna	(27.14, -86.79)	(26.76, -85.52)	132.9
	Other tunas	(27.61, -88.36)	(27.53, -86.92)	142.4
	Billfish	(27.05, -86.34)	(27.31, -87.08)	78.8
	Swordfish	(27.21, -87.74)	(27.39, -88.61)	88.4
	Spanish mackerel (0-1yr)	(28.75, -88.04)	(28.67, -85.26)	271.6
	Spanish mackerel (1+yr)	(28.68, -88.1)	(28.62, -85.25)	278.5
surface_temp	Sea turtle	(28.2, -90.2)	(28.25, -90.73)	52.3
	Atlantic sharpnose shark	(28.02, -85.42)	(28.06, -84.53)	87.6
	Yellowfin tuna	(27.72, -88.72)	(27.93, -88.16)	59.9
	Bluefin tuna	(27.16, -86.83)	(26.72, -85.38)	152.0
	Other tunas	(27.59, -88.36)	(27.5, -86.68)	166.1
	Billfish	(27.06, -86.24)	(27.37, -87.33)	113.3
	Swordfish	(27.24, -87.84)	(27.35, -88.39)	55.8
	Pelagic coastal piscivores	(28.17, -90.05)	(28.08, -89.25)	79.2
	Spanish mackerel (0-1yr)	(28.87, -88.32)	(28.81, -85.56)	269.2
	Spanish mackerel (1+yr)	(28.82, -88.37)	(28.85, -85.75)	255.5

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
	Yellowedge grouper (0-3yr)	(27.93, -90.02)	(27.75, -89.45)	59.6
	Menhaden (0yr)	(28.87, -89.74)	(28.9, -90.34)	58.6

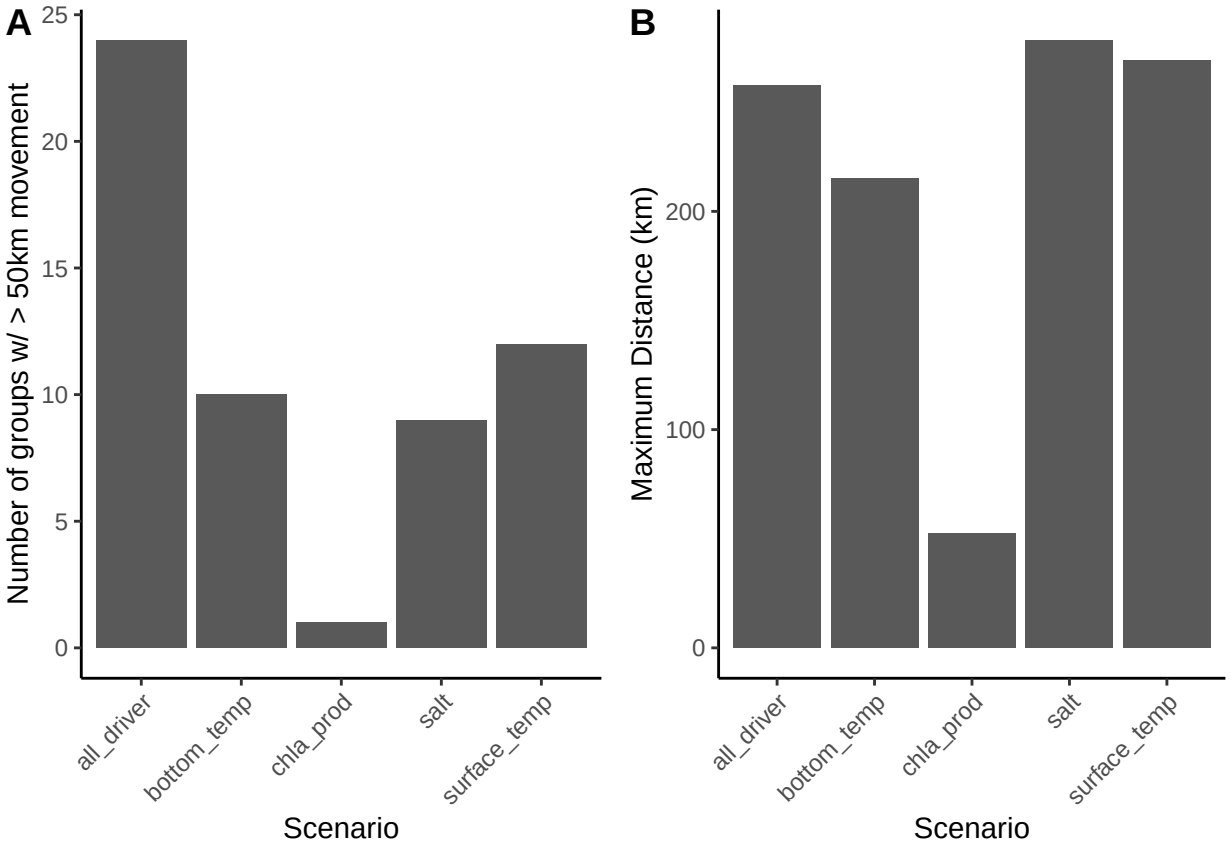


Figure 3: Summarized Discards movement infomration. A) The number of functional groups that moved greater than 50km by scenario. B) The maximum distance (km) traveled by a functional group per scenario.

Fishing Effort

Table 5: Fishing Effort center of mass distribution shifts for all functional groups in all scenarios that moved greater than 50km from the 1981 starting point. Coordinates represent the center of mass of the population.

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
all_driver	Comm_Longline_Fish	(28.11, -88.14)	(27.96, -87.63)	52.8

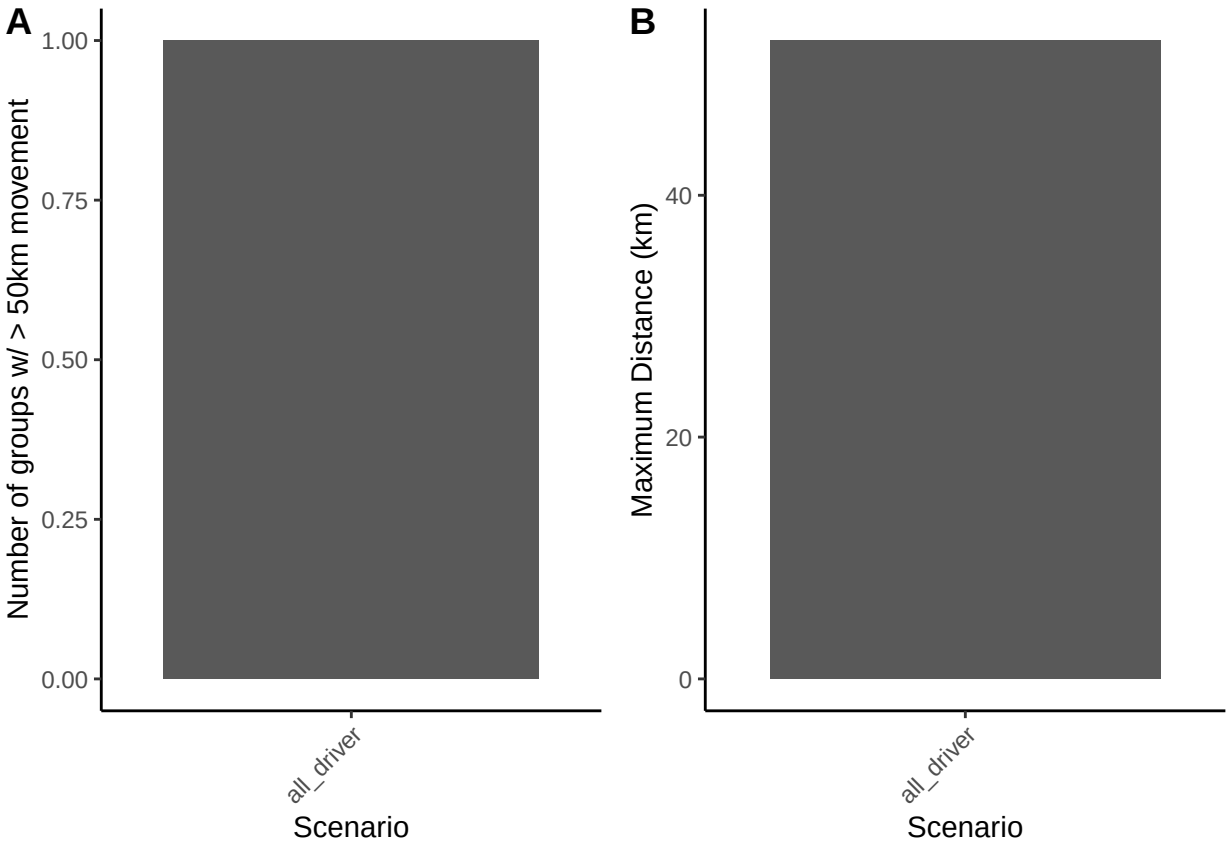


Figure 4: Summarized fishing effort movement infomration. A) The number of functional groups that moved greater than 50km by scenario. B) The maximum distance (km) traveled by a functional group per scenario.

Habitat Capacity

Table 6: Habitat Capacity center of mass distribution shifts for all functional groups in all scenarios that moved greater than 50km from the 1981 starting point. Coordinates represent the center of mass of the population.

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
all_driver	King mackerel (0-1yr)	(27.05, -85.46)	(26.75, -84.4)	110.4
	Demersal coastal invertebrate feeders	(27.25, -86.41)	(27.15, -85.71)	70.2
	Menhaden (1yr)	(26.94, -85.7)	(27.09, -85.15)	57.0
	Menhaden (2yr)	(26.78, -85.13)	(26.99, -84.65)	53.1
	Menhaden (3yr)	(27.06, -85.92)	(27.22, -85.33)	61.1
	Menhaden (4yr)	(27.24, -86.54)	(27.34, -85.93)	61.4
salt	King mackerel (0-1yr)	(28.2, -87.84)	(27.79, -86.45)	144.0

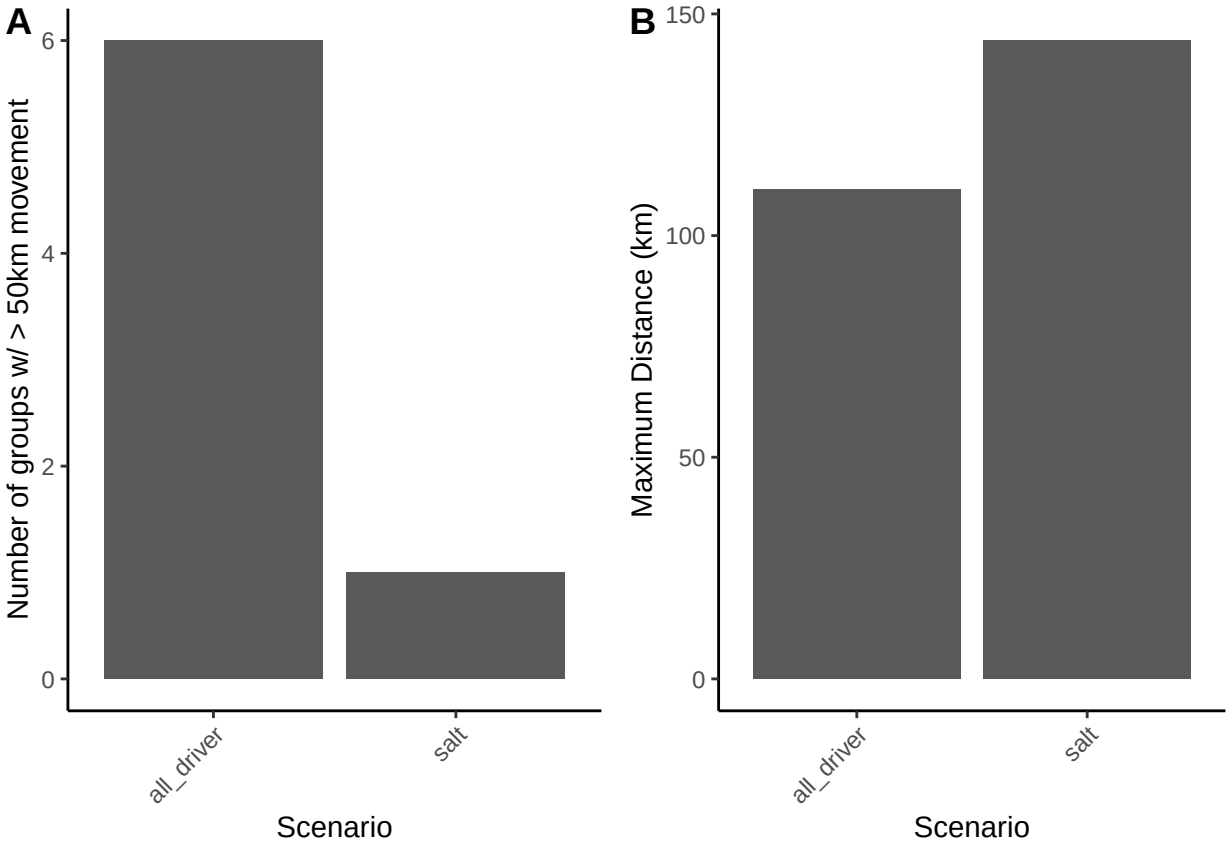


Figure 5: Summarized habitat capacity movement infomration. A) The number of functional groups that moved greater than 50km by scenario. B) The maximum distance (km) traveled by a functional group per scenario.

Indicators

Table 7: Indicator center of mass distribution shifts for all functional groups in all scenarios that moved greater than 50km from the 1981 starting point. Coordinates represent the center of mass of the population.

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
all_driver	Discards	(28.68, -88.45)	(28.44, -87.77)	71.7
	Predatory B	(27.59, -88.04)	(27.26, -86.89)	119.4
	Predatory C	(27.59, -87.38)	(27.34, -86.91)	54.1
	Total C	(29.01, -89.98)	(28.9, -89.38)	59.7
bottom_temp	Discards	(28.73, -89.2)	(28.64, -88.68)	51.8
	Predatory B	(29.31, -89.95)	(27.97, -87.64)	270.5
	Predatory C	(28.24, -89.8)	(27.12, -85.66)	426.7
	TL community 4	(27.85, -88.82)	(27.81, -88.03)	77.9
salt	Discards	(28.79, -89.28)	(28.64, -88.51)	77.0
	Predatory B	(29.41, -90.08)	(28.3, -88.14)	225.9

Scenario	Group	1981 (Lat, Lon)	2017 (Lat, Lon)	Distance (km)
	Predatory C	(28.26, -89.87)	(27, -85.34)	468.2
surface_temp	Predatory B	(29.48, -89.73)	(28.18, -87.8)	237.4
	Predatory C	(28.16, -88.48)	(27.13, -85.51)	314.5

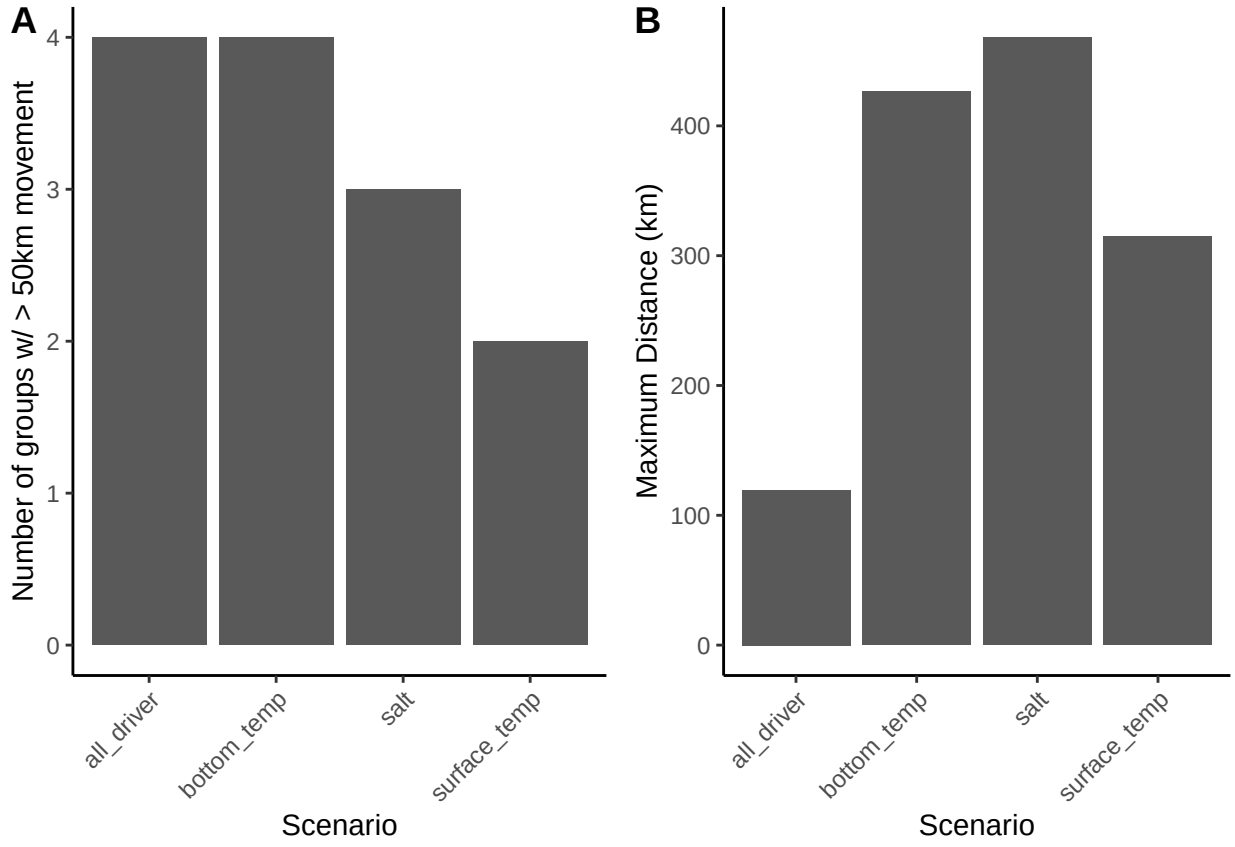


Figure 6: Summarized indicator movement infomration. A) The number of functional groups that moved greater than 50km by scenario. B) The maximum distance (km) traveled by a functional group per scenario.

End/Start

Click here for full outputs.

Dispersion

Click here for full outputs.

Biomass The dispersion of biomass changes over time as populations move. Hypothetically, this is driven by ideal habitat.

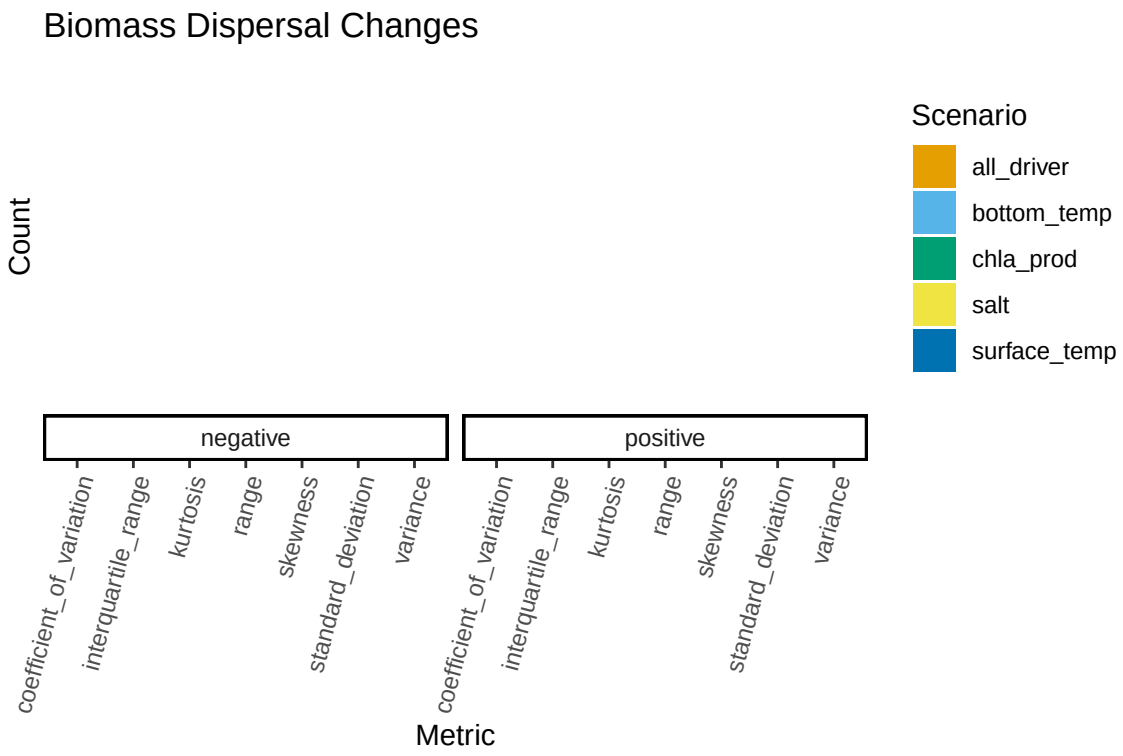


Figure 7: Summary of the influence of each environmental driver scenario towards the dispersion of functional groups using various metrics.

Catch The dispersion of catch changes over time as populations and fisheries move.

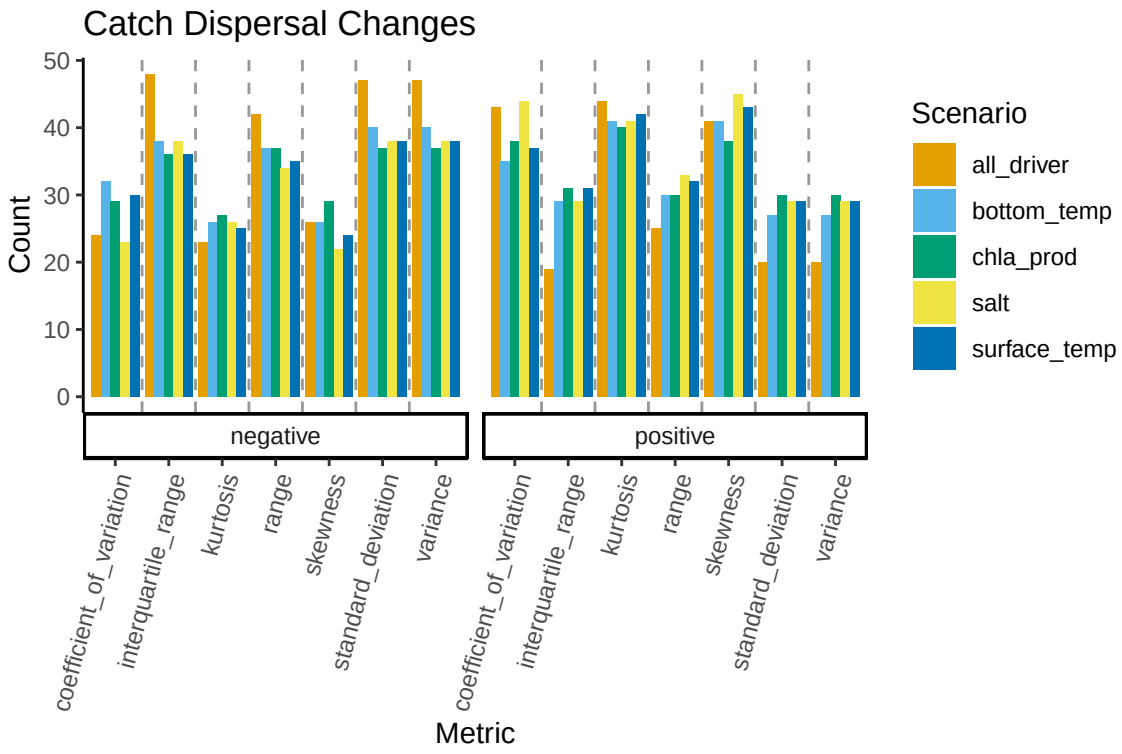


Figure 8: Summary of the influence of each environmental driver scenario towards the dispersion of functional groups using various metrics.

Discards The dispersion of discards changes over time as populations and fisheries move.

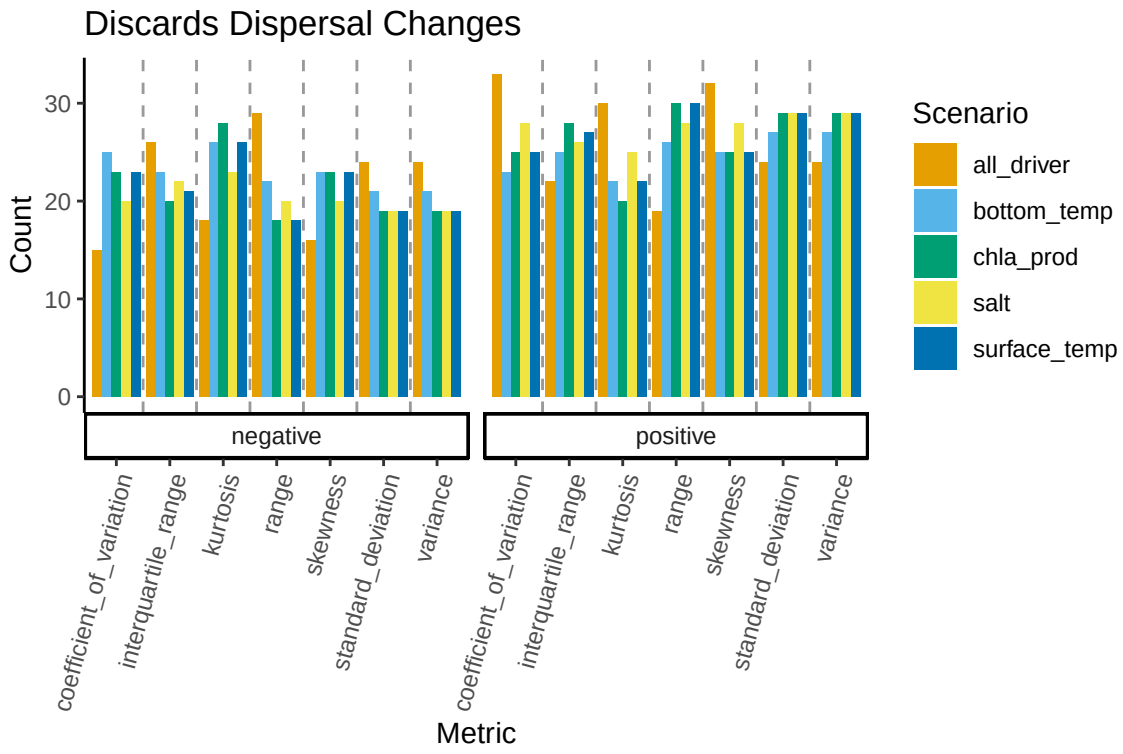


Figure 9: Summary of the influence of each environmental driver scenario towards the dispersion of functional groups using various metrics.

Fishing Effort The dispersion of fishing effort changes over time fisheries move.

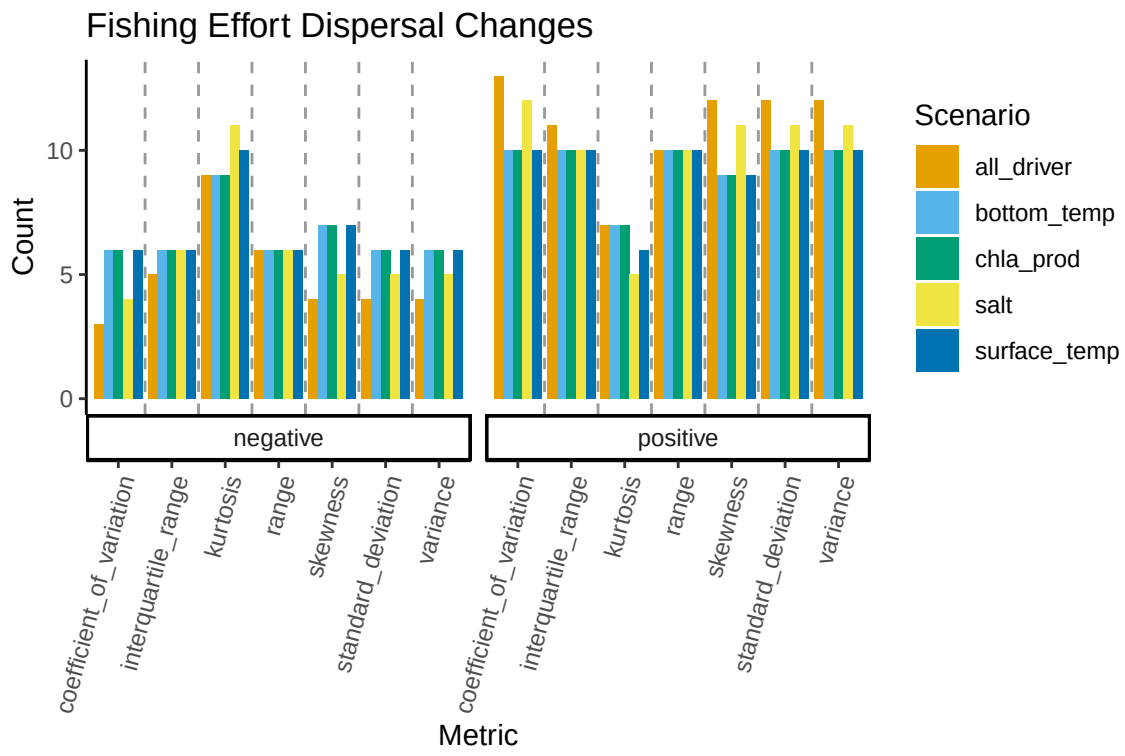


Figure 10: Summary of the influence of each environmental driver scenario towards the dispersion of functional groups using various metrics.

Habitat Capacity The dispersion of habitat capacity changes over time with environmental characteristics change and is driven by the input functional responses

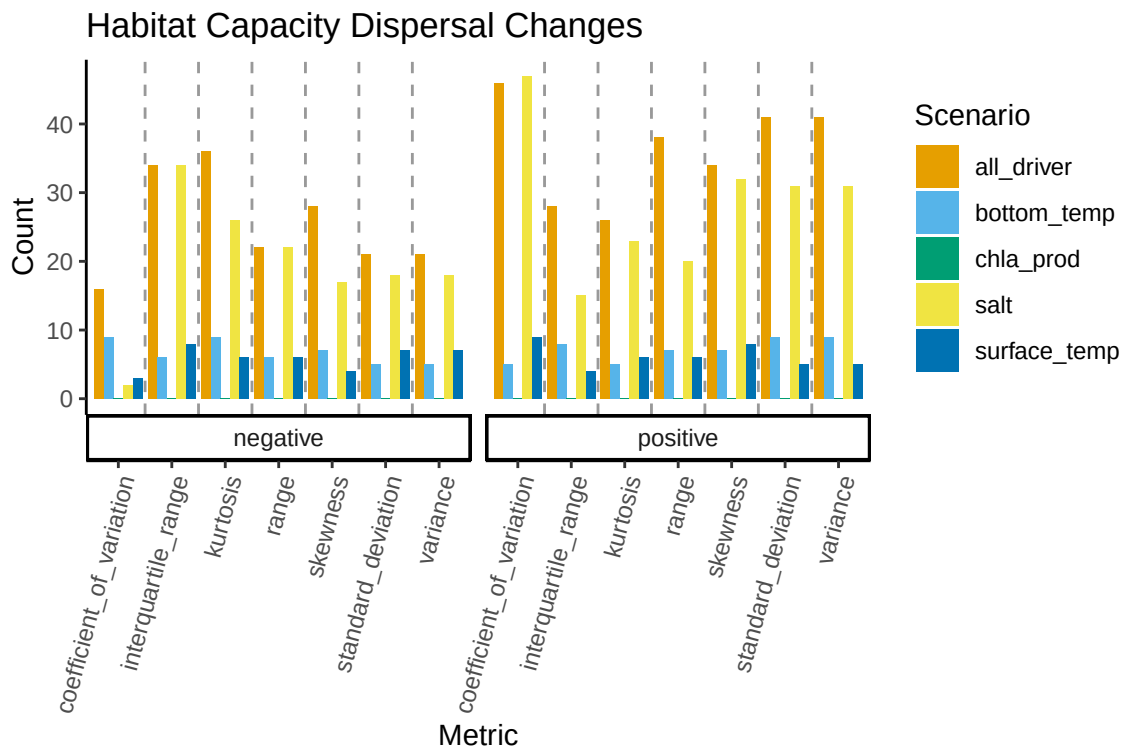


Figure 11: Summary of the influence of each environmental driver scenario towards the dispersion of functional groups using various metrics.

Indicators All aspects mentioned above should change the dispersion of indicators as long as they are consistent within the indicator type.

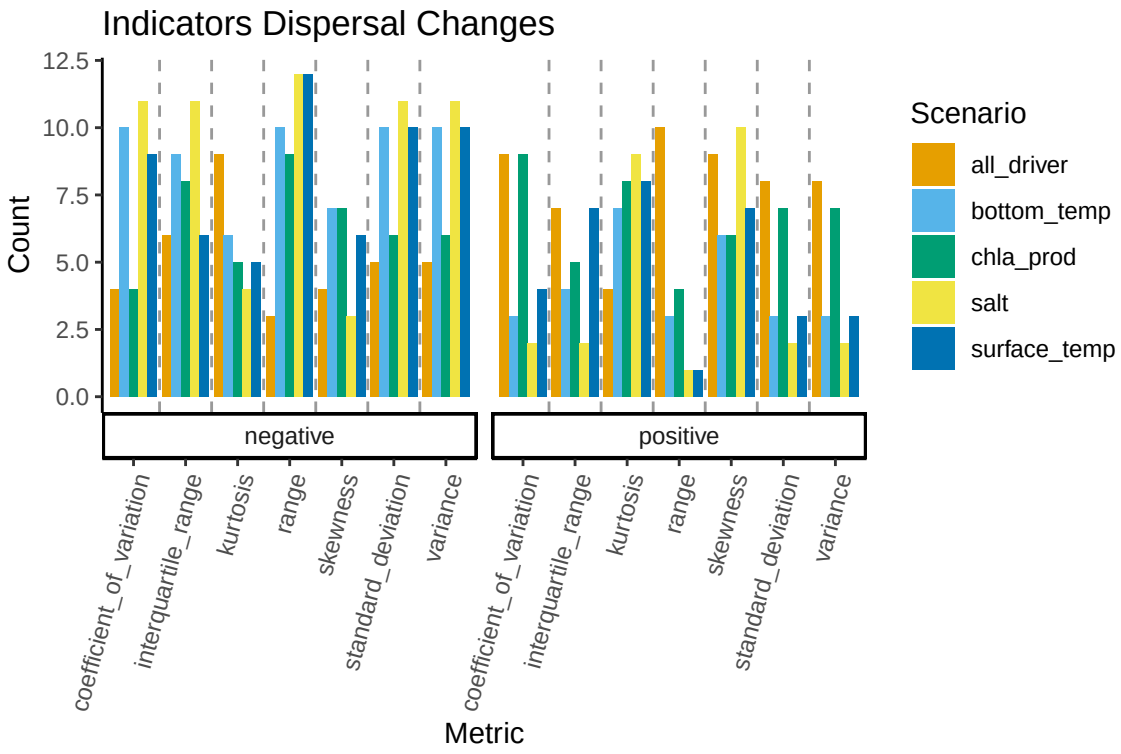
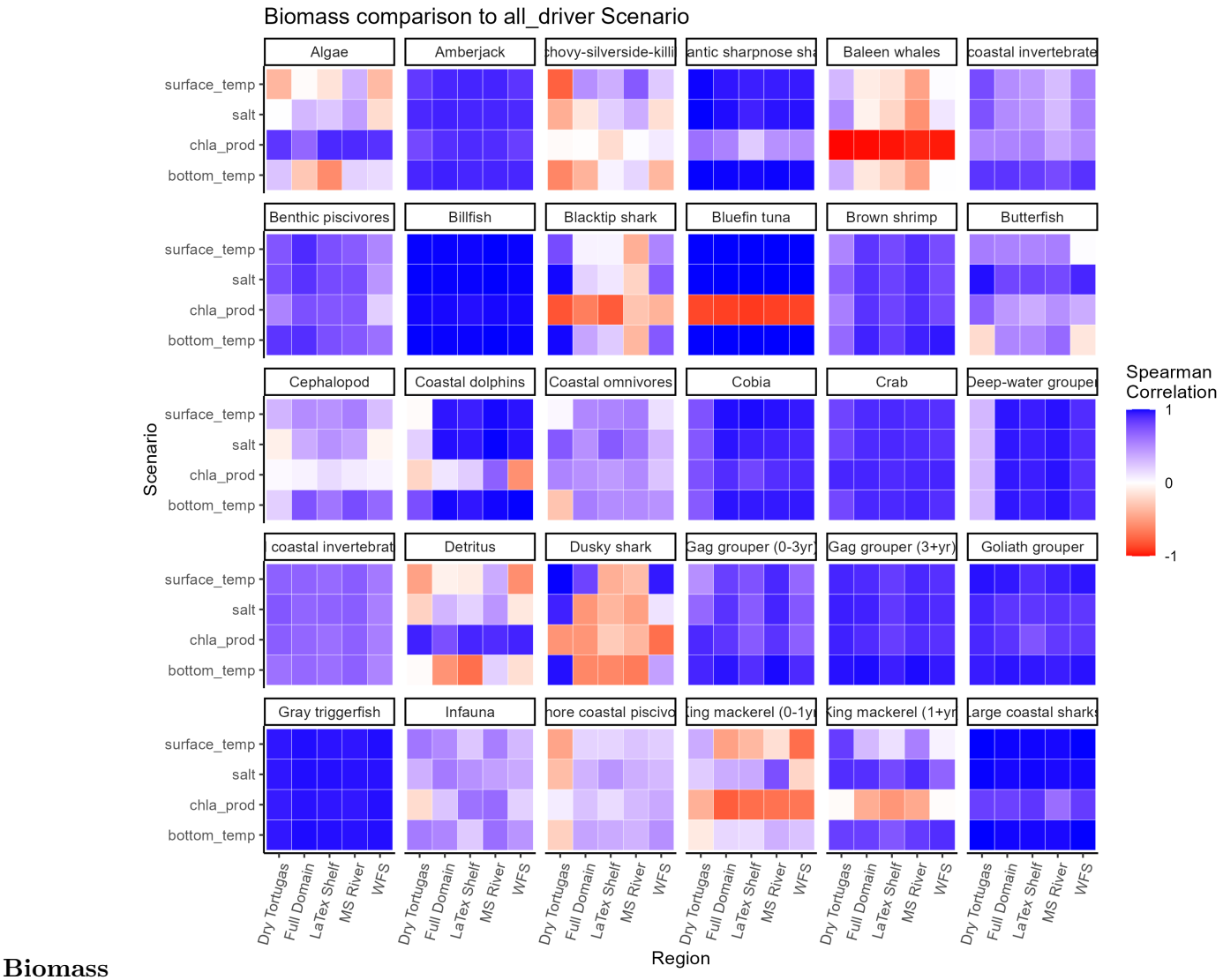


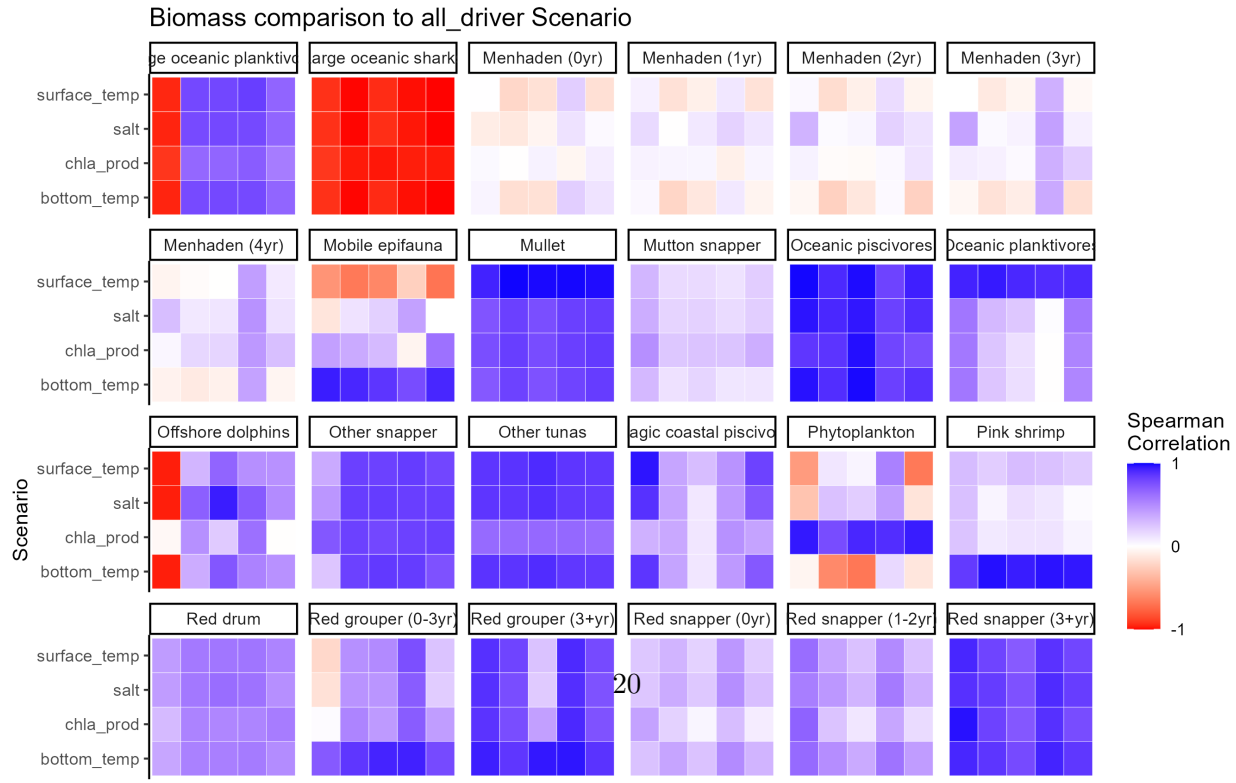
Figure 12: Summary of the influence of each environmental driver scenario towards the dispersion of functional groups using various metrics.

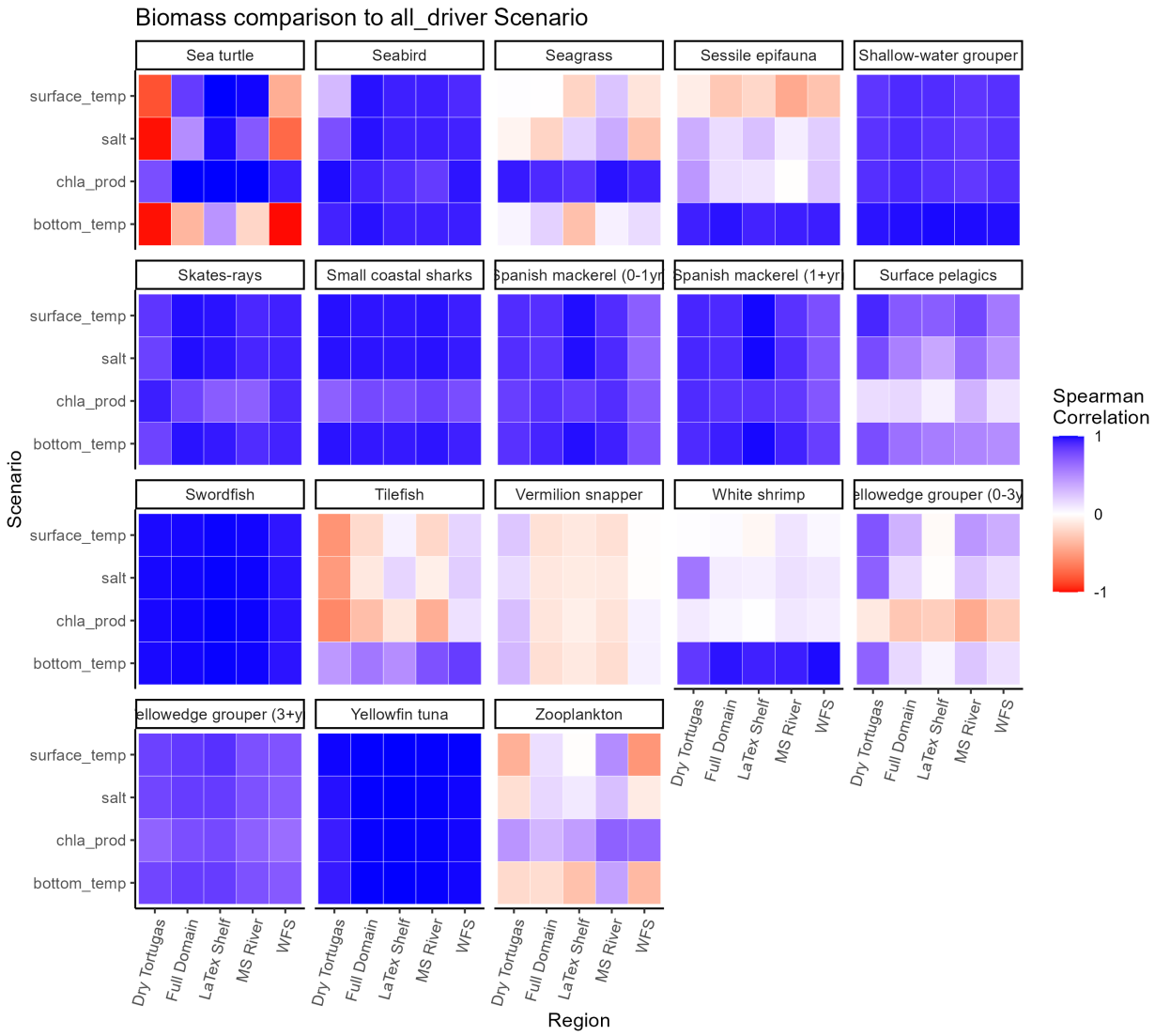
Temporal Trends

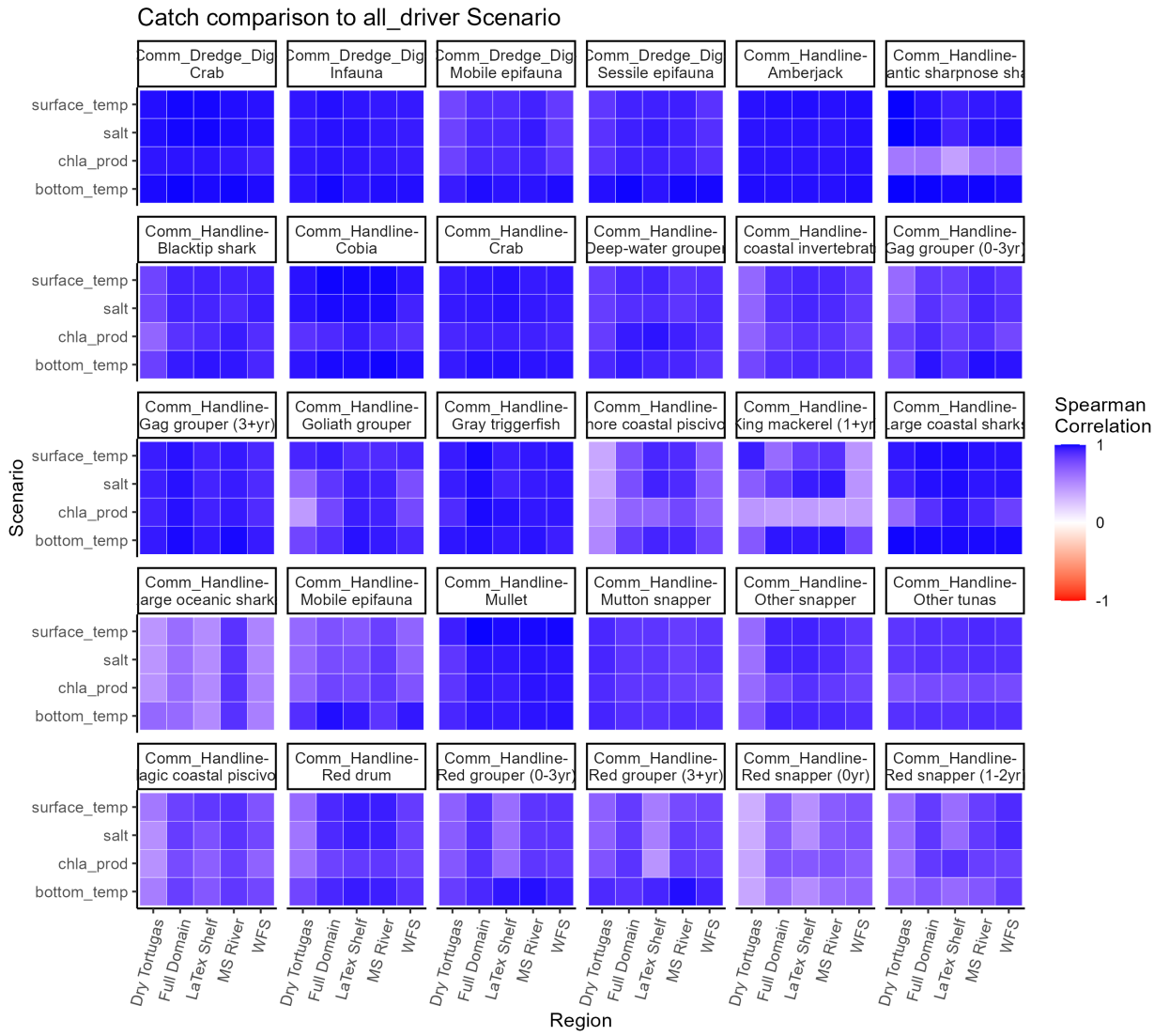
Visit this link for detailed outputs without plotting them.


Biomass comparison to all_driver Scenario
Algae
Amberjack
chovy-silverside-killi
antic sharpnose sha
Baleen whales
coastal invertebrate
Benthic piscivores
Billfish
Blacktip shark
Bluefin tuna
Brown shrimp
Butterfish
Cephalopod
Coastal dolphins
Coastal omnivores
Cobia
Crab
Deep-water grouper
coastal invertebrat
Detritus
Dusky shark
Gag grouper (0-3yr)
Gag grouper (3+yr)
Goliath grouper
Gray triggerfish
Infauna
hore coastal piscivo
King mackerel (0-1yr
King mackerel (1+yr
Large coastal sharks
surface_temp
salt
chla_prod
bottom_temp
Scenario
Spearman Correlation
1
0
-1
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region

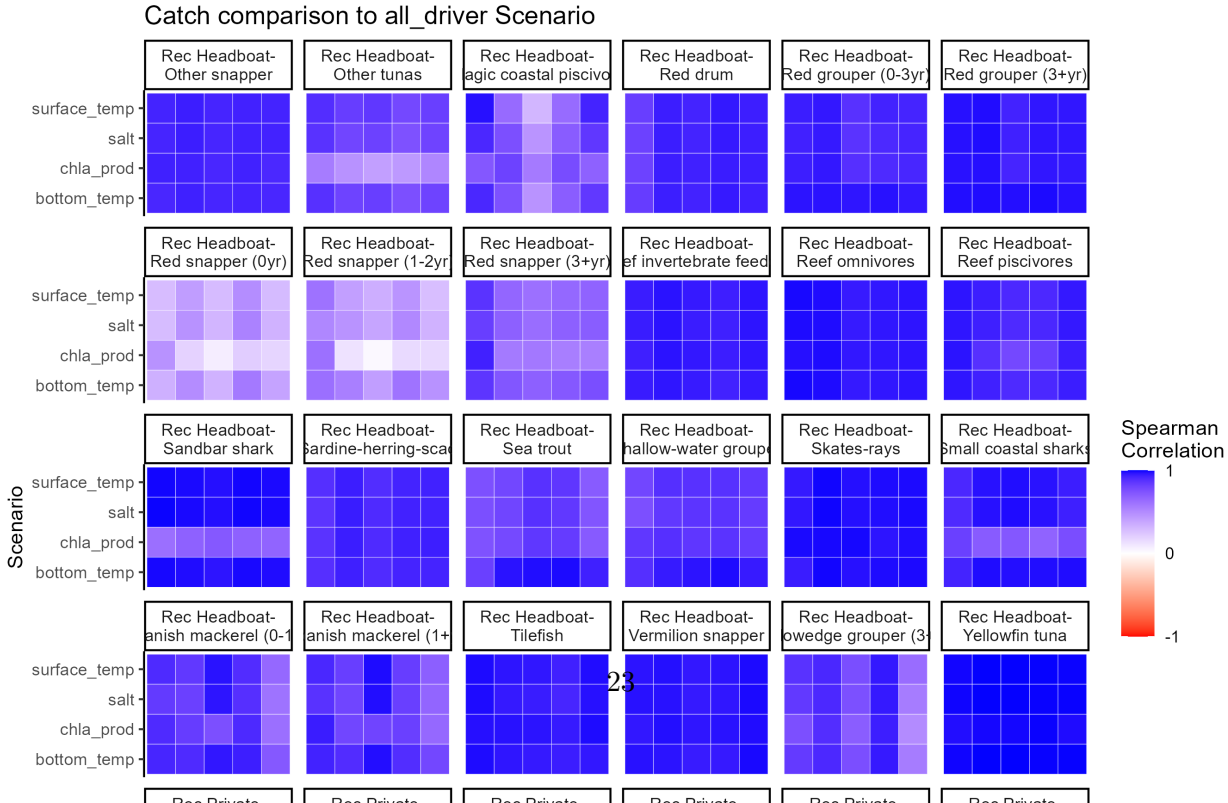
Biomass

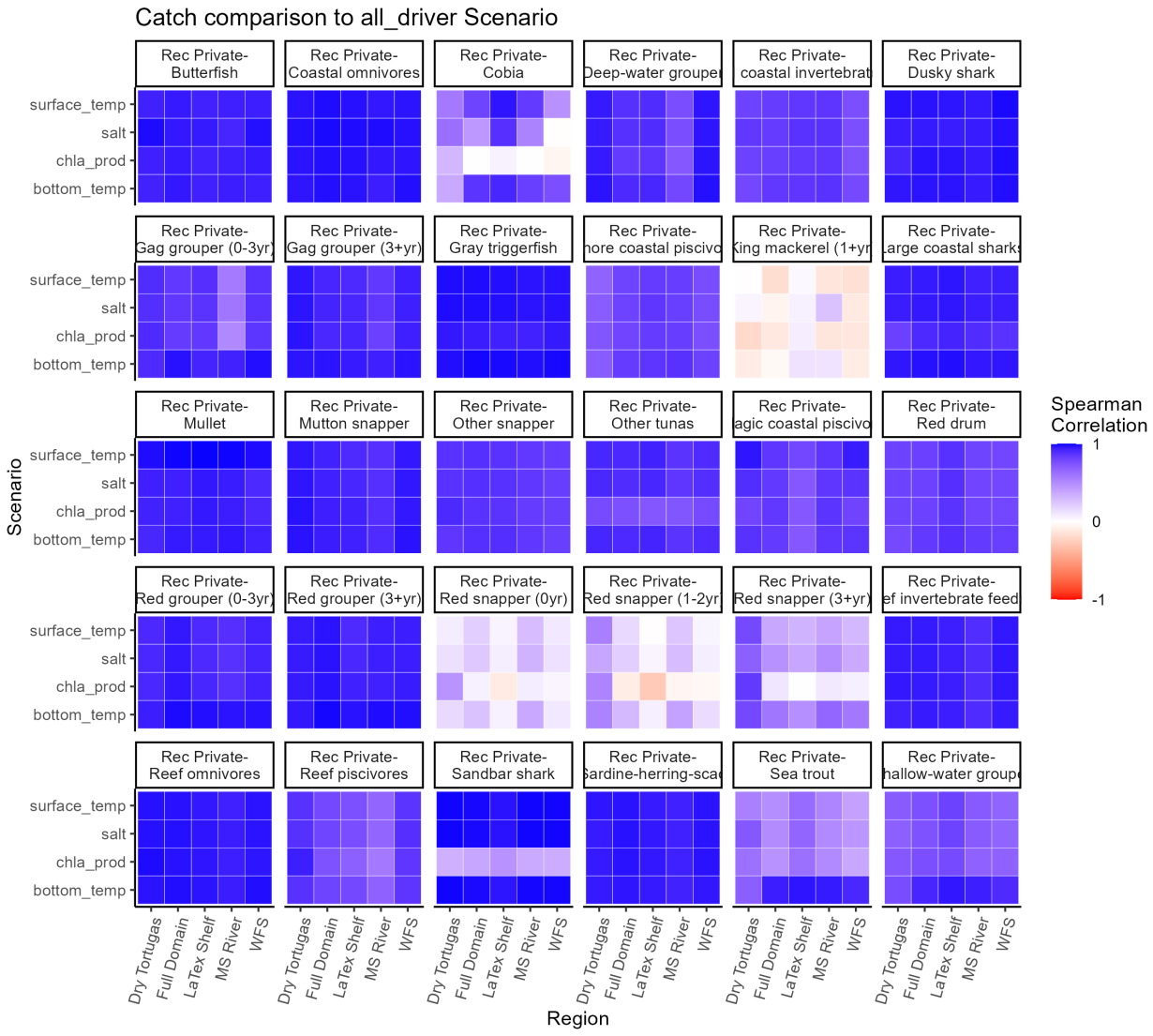

Biomass comparison to all_driver Scenario
ge oceanic planktivo
arge oceanic shark
Menhaden (0yr)
Menhaden (1yr)
Menhaden (2yr)
Menhaden (3yr)
Menhaden (4yr)
Mobile epifauna
Mullet
Mutton snapper
Oceanic piscivores
Oceanic planktivores
Offshore dolphins
Other snapper
Other tunas
agic coastal piscivo
Phytoplankton
Pink shrimp
Red drum
Red grouper (0-3yr)
Red grouper (3+yr)
Red snapper (0yr)
Red snapper (1-2yr)
Red snapper (3+yr)
surface_temp
salt
chla_prod
bottom_temp
Scenario
Spearman Correlation
1
0
-1

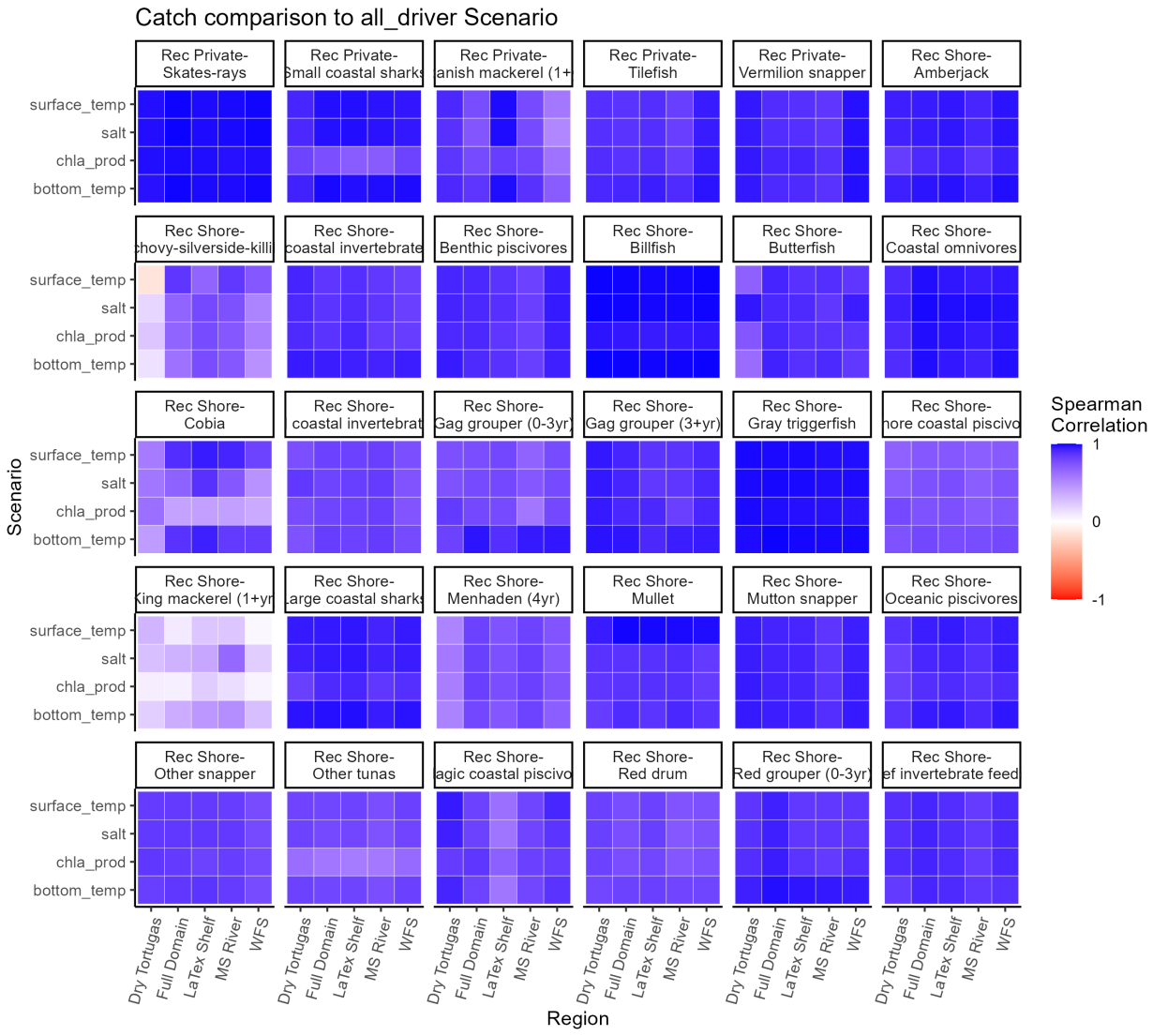

Biomass comparison to all_driver Scenario
Sea turtle
Seabird
Seagrass
Sessile epifauna
Shallow-water grouper
Skates-rays
Small coastal sharks
Spanish mackerel (0-1yr
Spanish mackerel (1+yr
Surface pelagics
Swordfish
Tilefish
Vermilion snapper
White shrimp
ellowedge grouper (0-3y
ellowedge grouper (3+y
Yellowfin tuna
Zooplankton
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

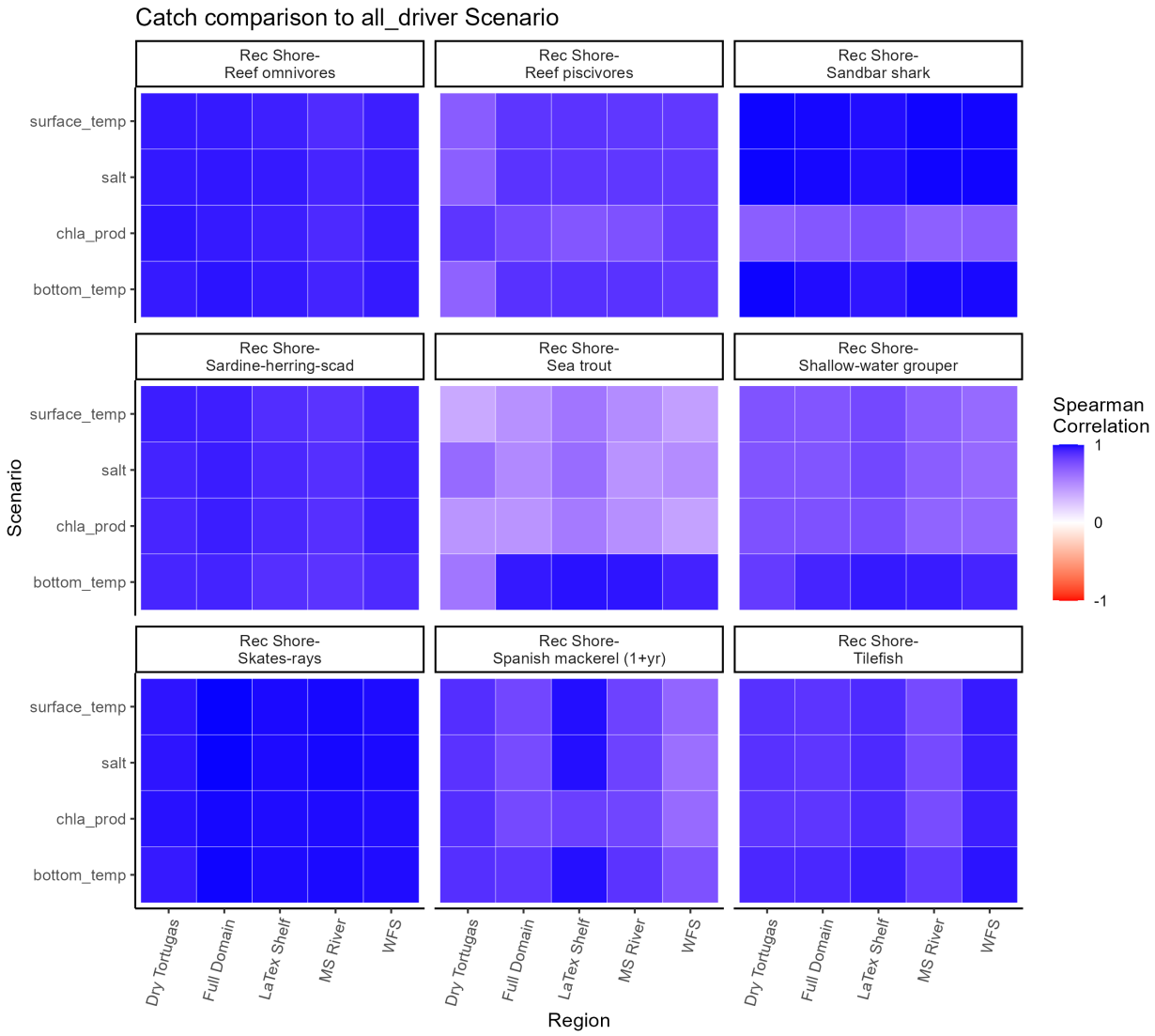

Catch comparison to all_driver Scenario
Comm_Dredge_Dig Crab
Comm_Dredge_Dig Infauna
Comm_Dredge_Dig Mobile epifauna
Comm_Dredge_Dig Sessile epifauna
Comm_Handline- Amberjack
Comm_Handline- antic sharpnose sha
Comm_Handline- Blacktip shark
Comm_Handline- Cobia
Comm_Handline- Crab
Comm_Handline- Deep-water grouper
Comm_Handline- coastal invertebrat
Comm_Handline- Gag grouper (0-3yr)
Comm_Handline- Gag grouper (3+yr)
Comm_Handline- Goliath grouper
Comm_Handline- Gray triggerfish
Comm_Handline- hore coastal piscivo
Comm_Handline- King mackerel (1+yr
Comm_Handline- Large coastal sharks
Comm_Handline- arge oceanic shark
Comm_Handline- Mobile epifauna
Comm_Handline- Mullet
Comm_Handline- Mutton snapper
Comm_Handline- Other snapper
Comm_Handline- Other tunas
Comm_Handline- agic coastal piscivo
Comm_Handline- Red drum
Comm_Handline- Red grouper (0-3yr)
Comm_Handline- Red grouper (3+yr)
Comm_Handline- Red snapper (0yr)
Comm_Handline- Red snapper (1-2yr)
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

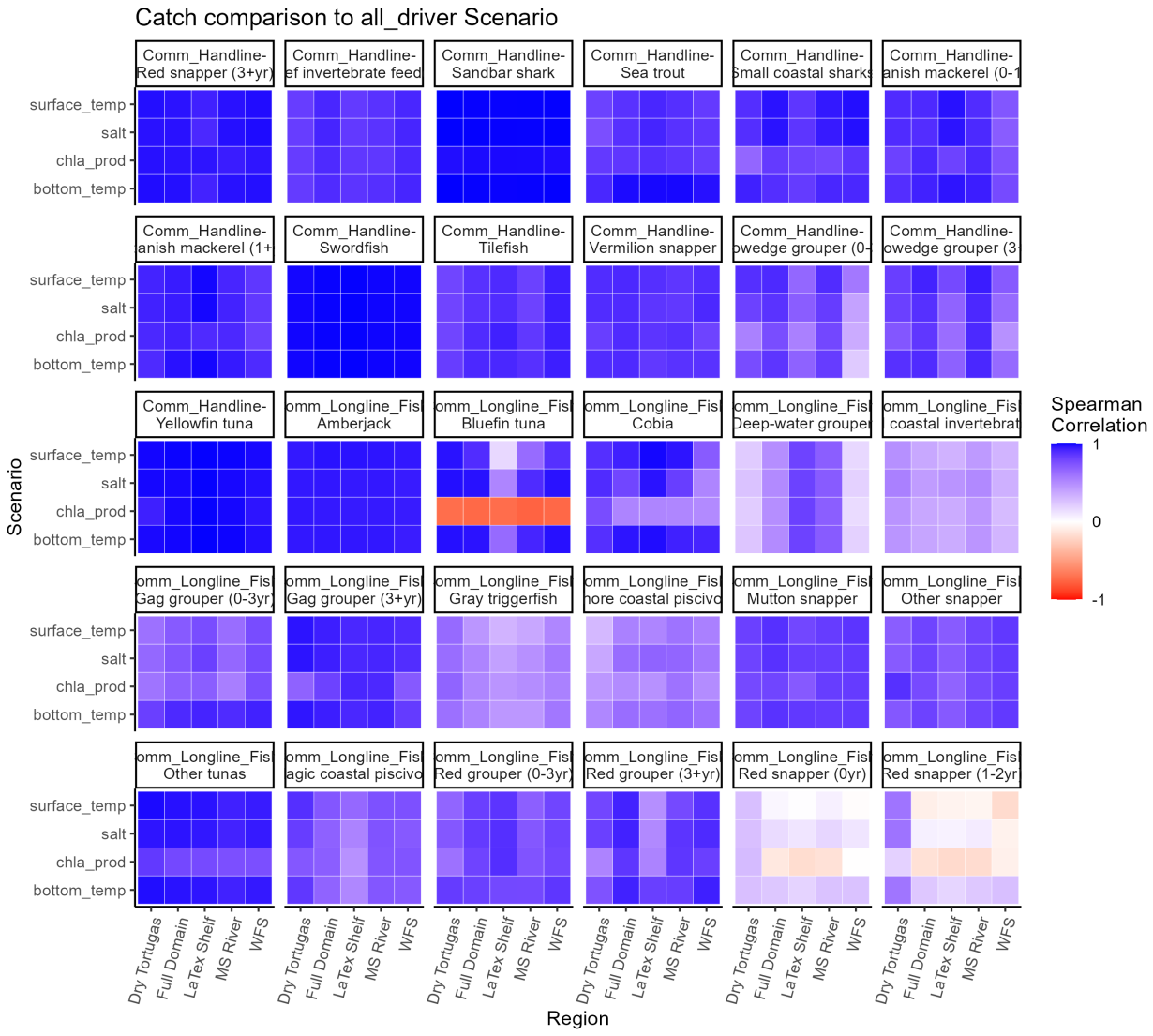
Catch

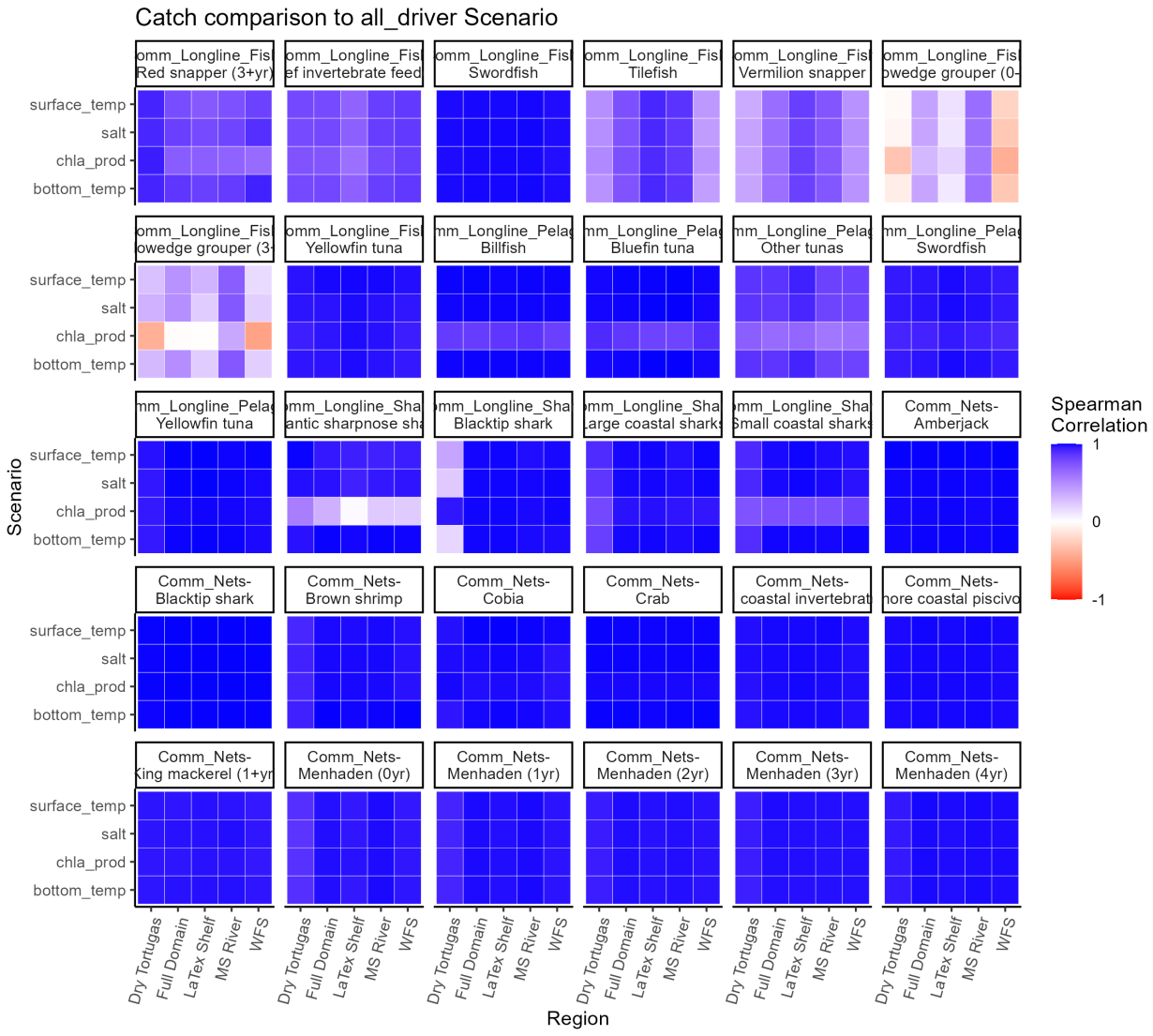

Catch comparison to all_driver Scenario
Rec Headboat- Other snapper
Rec Headboat- Other tunas
Rec Headboat- agic coastal piscivo
Rec Headboat- Red drum
Rec Headboat- Red grouper (0-3yr)
Rec Headboat- Red grouper (3+yr)
Rec Headboat- Red snapper (0yr)
Rec Headboat- Red snapper (1-2yr)
Rec Headboat- Red snapper (3+yr)
Rec Headboat- ef invertebrate feed
Rec Headboat- Reef omnivores
Rec Headboat- Reef piscivores
Rec Headboat- Sandbar shark
Rec Headboat- Sardine-herring-sca
Rec Headboat- Sea trout
Rec Headboat- hallow-water group
Rec Headboat- Skates-rays
Rec Headboat- Small coastal sharks
Rec Headboat- anish mackerel (0-1
Rec Headboat- anish mackerel (1+
Rec Headboat- Tilefish
Rec Headboat- Vermilion snapper
Rec Headboat- owedge grouper (3+
Rec Headboat- Yellowfin tuna
surface_temp
salt
chla_prod
bottom_temp
Scenario
Spearman Correlation
1
0
-1

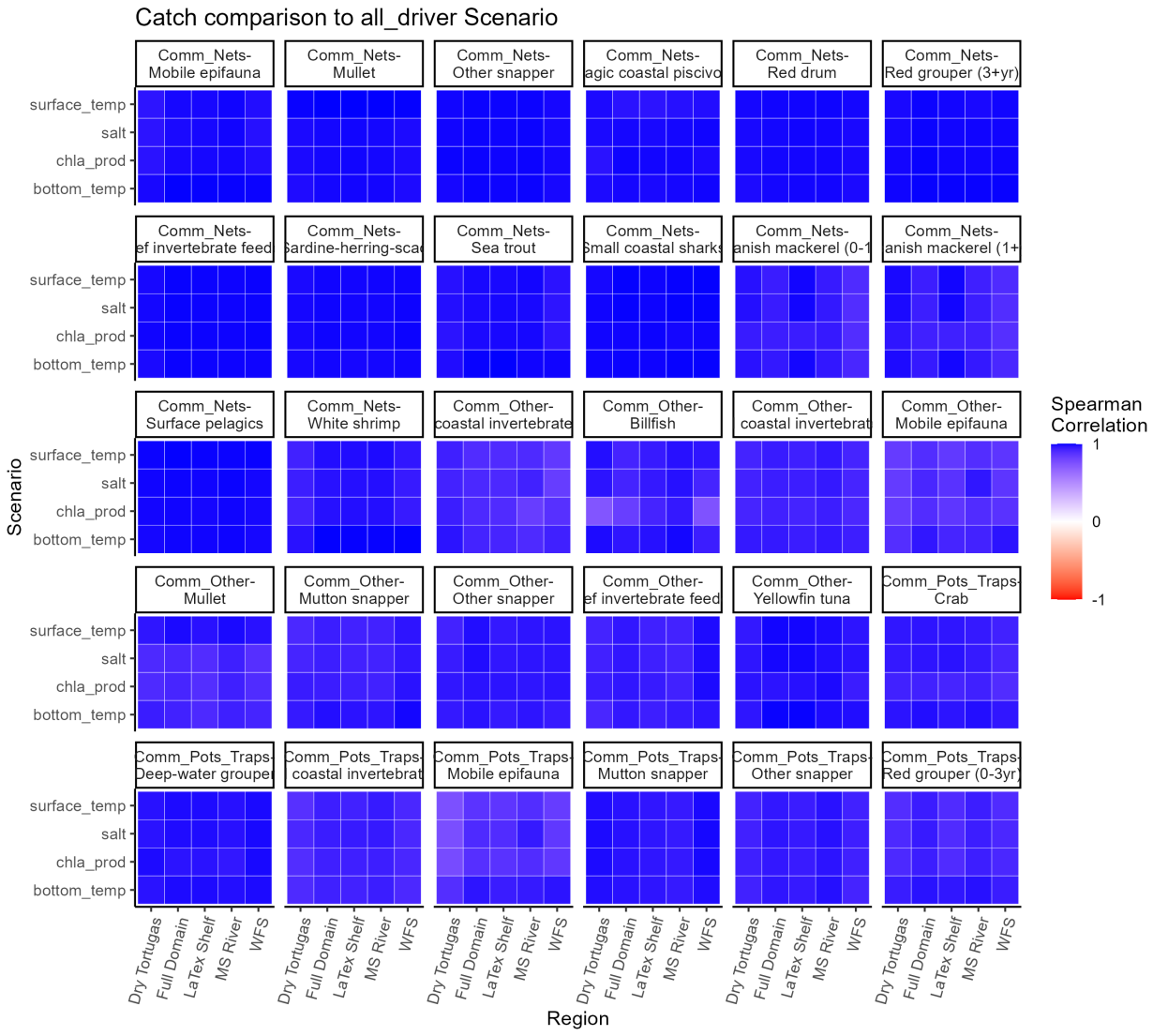

Catch comparison to all_driver Scenario
Rec Private- Butterfish
Rec Private- Coastal omnivores
Rec Private- Cobia
Rec Private- Deep-water grouper
Rec Private- coastal invertebrat
Rec Private- Dusky shark
Rec Private- Gag grouper (0-3yr)
Rec Private- Gag grouper (3+yr)
Rec Private- Gray triggerfish
Rec Private- hore coastal piscivo
Rec Private- King mackerel (1+yr
Rec Private- Large coastal sharks
Rec Private- Mullet
Rec Private- Mutton snapper
Rec Private- Other snapper
Rec Private- Other tunas
Rec Private- agic coastal piscivo
Rec Private- Red drum
Rec Private- Red grouper (0-3yr)
Rec Private- Red grouper (3+yr)
Rec Private- Red snapper (0yr)
Rec Private- Red snapper (1-2yr
Rec Private- Red snapper (3+yr)
Rec Private- ef invertebrate feed
Rec Private- Reef omnivores
Rec Private- Reef piscivores
Rec Private- Sandbar shark
Rec Private- Sardine-herring-sca
Rec Private- Sea trout
Rec Private- hallow-water group
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

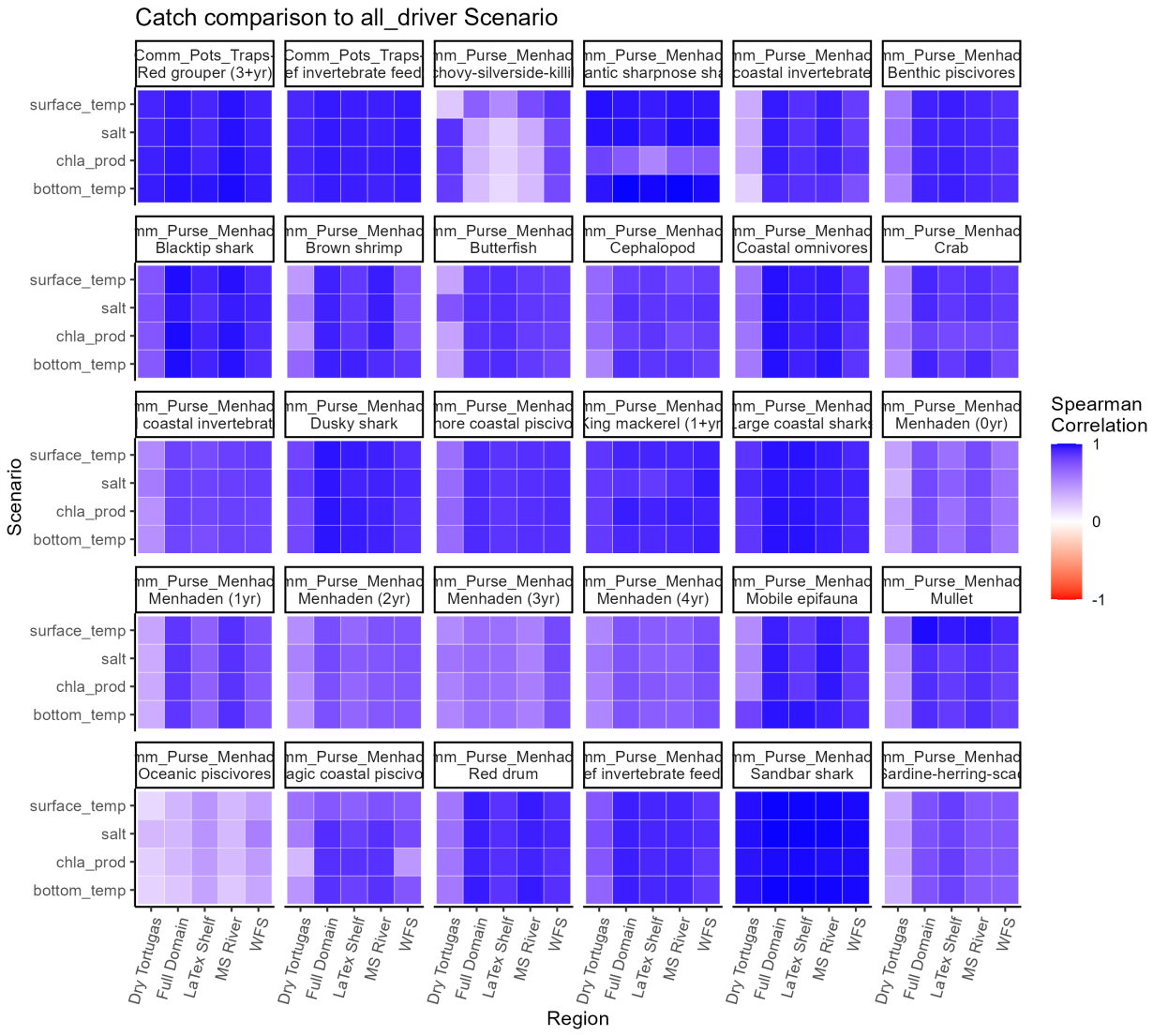

Catch comparison to all_driver Scenario
Rec Private-Skates-rays
Rec Private-Small coastal sharks
Rec Private-anish mackerel (1+
Rec Private-Tilefish
Rec Private-Vermilion snapper
Rec Shore-Amberjack
Rec Shore-chovy-silverside-killi
Rec Shore-coastal invertebrate
Rec Shore-Benthic piscivores
Rec Shore-Billfish
Rec Shore-Butterfish
Rec Shore-Coastal omnivores
Rec Shore-Cobia
Rec Shore-coastal invertebrat
Rec Shore-Gag grouper (0-3yr)
Rec Shore-Gag grouper (3+yr)
Rec Shore-Gray triggerfish
Rec Shore-hore coastal piscivo
Rec Shore-King mackerel (1+yr
Rec Shore-Large coastal sharks
Rec Shore-Menhaden (4yr)
Rec Shore-Mullet
Rec Shore-Mutton snapper
Rec Shore-Oceanic piscivores
Rec Shore-Other snapper
Rec Shore-Other tunas
Rec Shore-agic coastal piscivo
Rec Shore-Red drum
Rec Shore-Red grouper (0-3yr)
Rec Shore-ef invertebrate feed
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

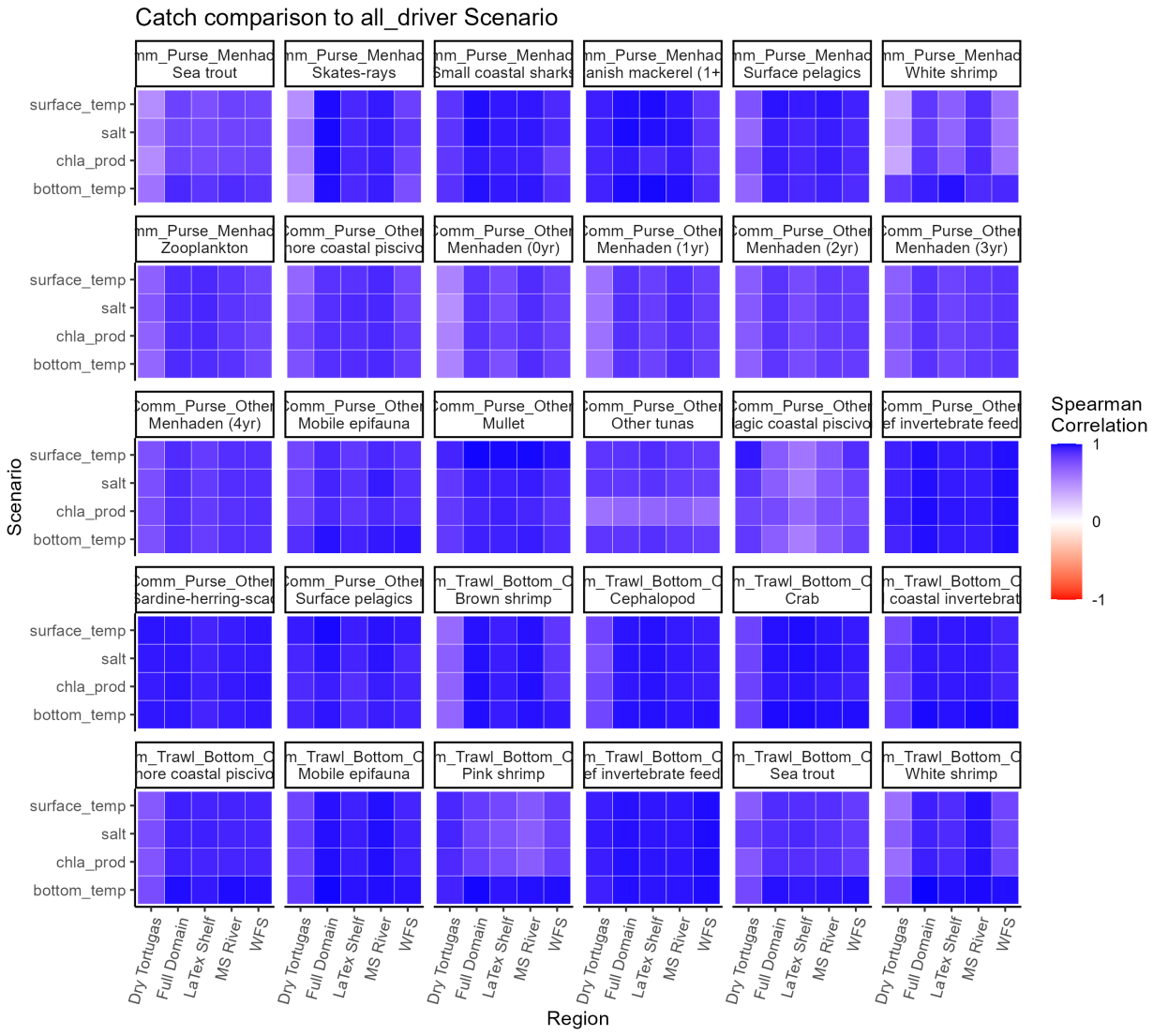

Catch comparison to all_driver Scenario
Rec Shore-
Reef omnivores
Rec Shore-
Reef piscivores
Rec Shore-
Sandbar shark
Rec Shore-
Sardine-herring-scad
Rec Shore-
Sea trout
Rec Shore-
Shallow-water grouper
Rec Shore-
Skates-rays
Rec Shore-
Spanish mackerel (1+yr)
Rec Shore-
Tilefish
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman
Correlation
1
0
-1

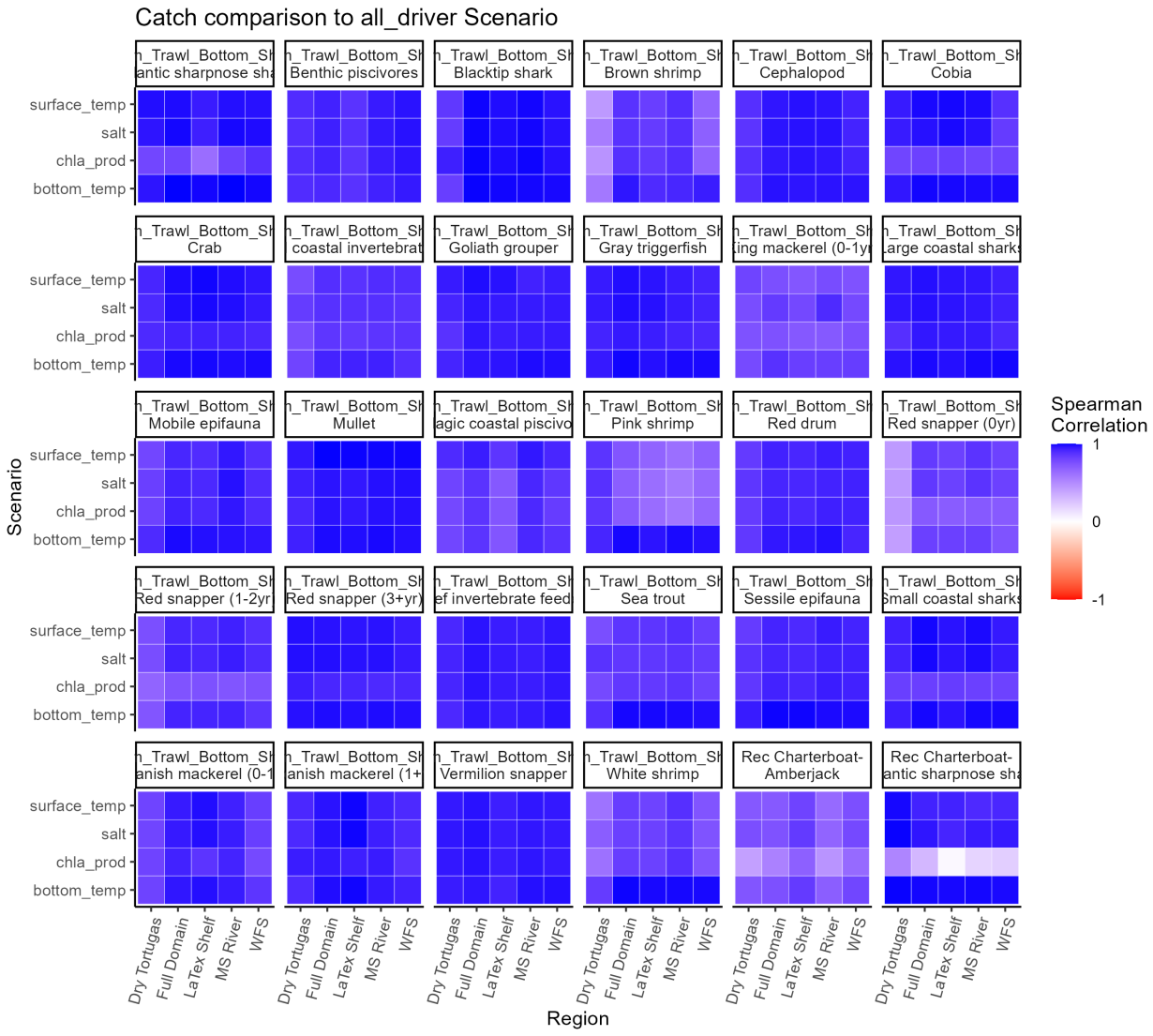

Catch comparison to all_driver Scenario
Comm_Handline-Red snapper (3+yr)
Comm_Handline-ef invertebrate feed
Comm_Handline-Sandbar shark
Comm_Handline-Sea trout
Comm_Handline-Small coastal sharks
Comm_Handline-anish mackerel (0-1
Comm_Handline-anish mackerel (1+
Comm_Handline-Swordfish
Comm_Handline-Tilefish
Comm_Handline-Vermilion snapper
Comm_Handline-owedge grouper (0-
Comm_Handline-owedge grouper (3-
Comm_Handline-Yellowfin tuna
omm_Longline_FisAmberjack
omm_Longline_FisBluefin tuna
omm_Longline_FisCobia
omm_Longline_FisDeep-water grouper
omm_Longline_Fiscoastal invertebrat
omm_Longline_FisGag grouper (0-3yr)
omm_Longline_FisGag grouper (3+yr)
omm_Longline_FisGray triggerfish
omm_Longline_Fishore coastal piscivo
omm_Longline_FisMutton snapper
omm_Longline_FisOther snapper
omm_Longline_FisOther tunas
omm_Longline_Fisagic coastal piscivo
omm_Longline_FisRed grouper (0-3yr)
omm_Longline_FisRed grouper (3+yr)
omm_Longline_FisRed snapper (0yr)
omm_Longline_FisRed snapper (1-2yr
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

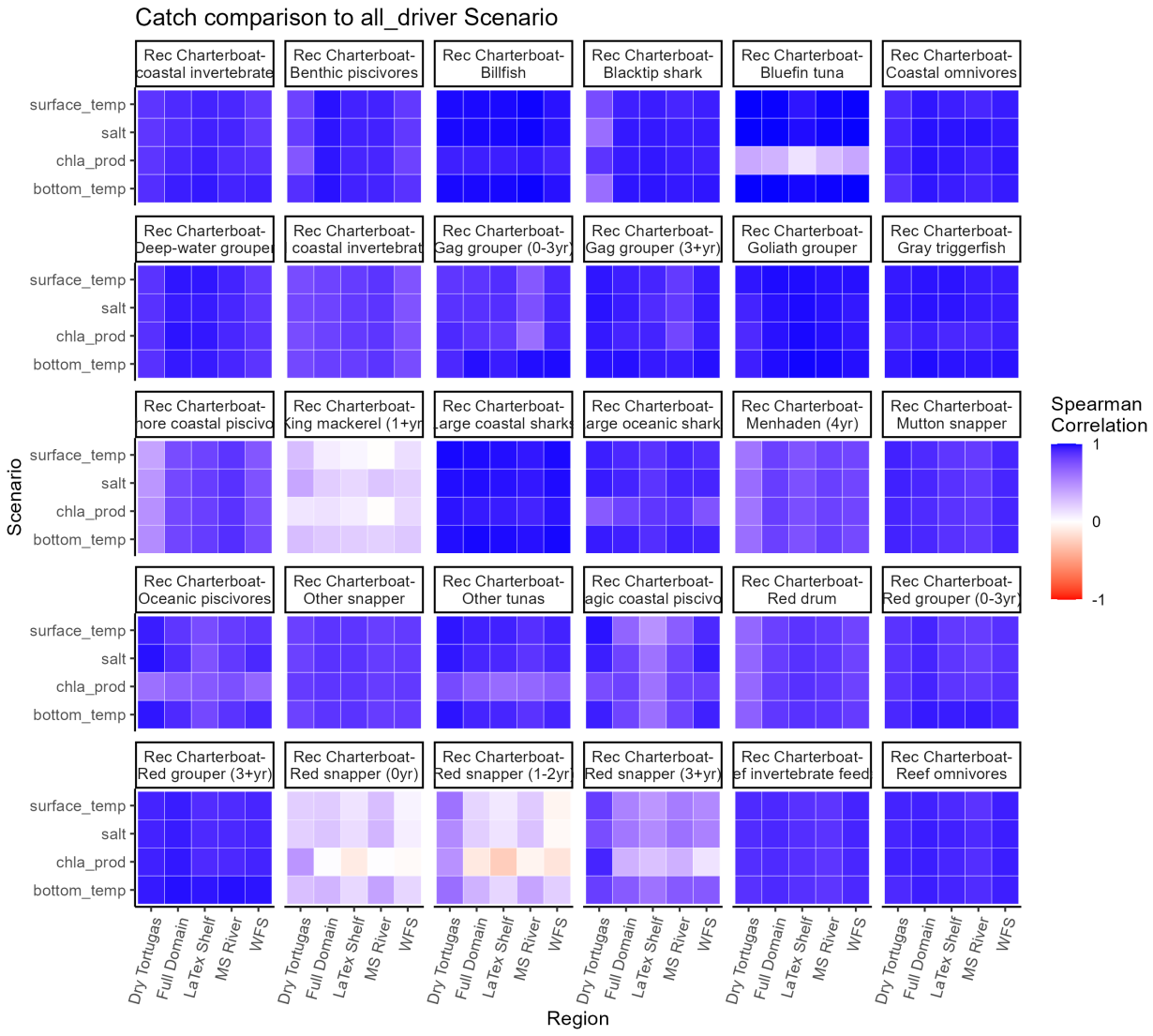

Catch comparison to all_driver Scenario
omm_Longline_Fis
Red snapper (3+yr)
omm_Longline_Fis
ef invertebrate feed
omm_Longline_Fis
Swordfish
omm_Longline_Fis
Tilefish
omm_Longline_Fis
Vermilion snapper
omm_Longline_Fis
owedge grouper (0-
omm_Longline_Fis
owedge grouper (3-
omm_Longline_Fis
Yellowfin tuna
mm_Longline_Pela
Billfish
mm_Longline_Pela
Bluefin tuna
mm_Longline_Pela
Other tunas
mm_Longline_Pela
Swordfish
mm_Longline_Pela
Yellowfin tuna
omm_Longline_Sha
antic sharpnose sha
mm_Longline_Sha
Blacktip shark
mm_Longline_Sha
Large coastal sharks
mm_Longline_Sha
Small coastal sharks
Comm_Nets-
Amberjack
Comm_Nets-
Blacktip shark
Comm_Nets-
Brown shrimp
Comm_Nets-
Cobia
Comm_Nets-
Crab
Comm_Nets-
coastal invertebrat
Comm_Nets-
hore coastal piscivo
Comm_Nets-
King mackerel (1+yr
Comm_Nets-
Menhaden (0yr)
Comm_Nets-
Menhaden (1yr)
Comm_Nets-
Menhaden (2yr)
Comm_Nets-
Menhaden (3yr)
Comm_Nets-
Menhaden (4yr)
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman
Correlation
1
0
-1

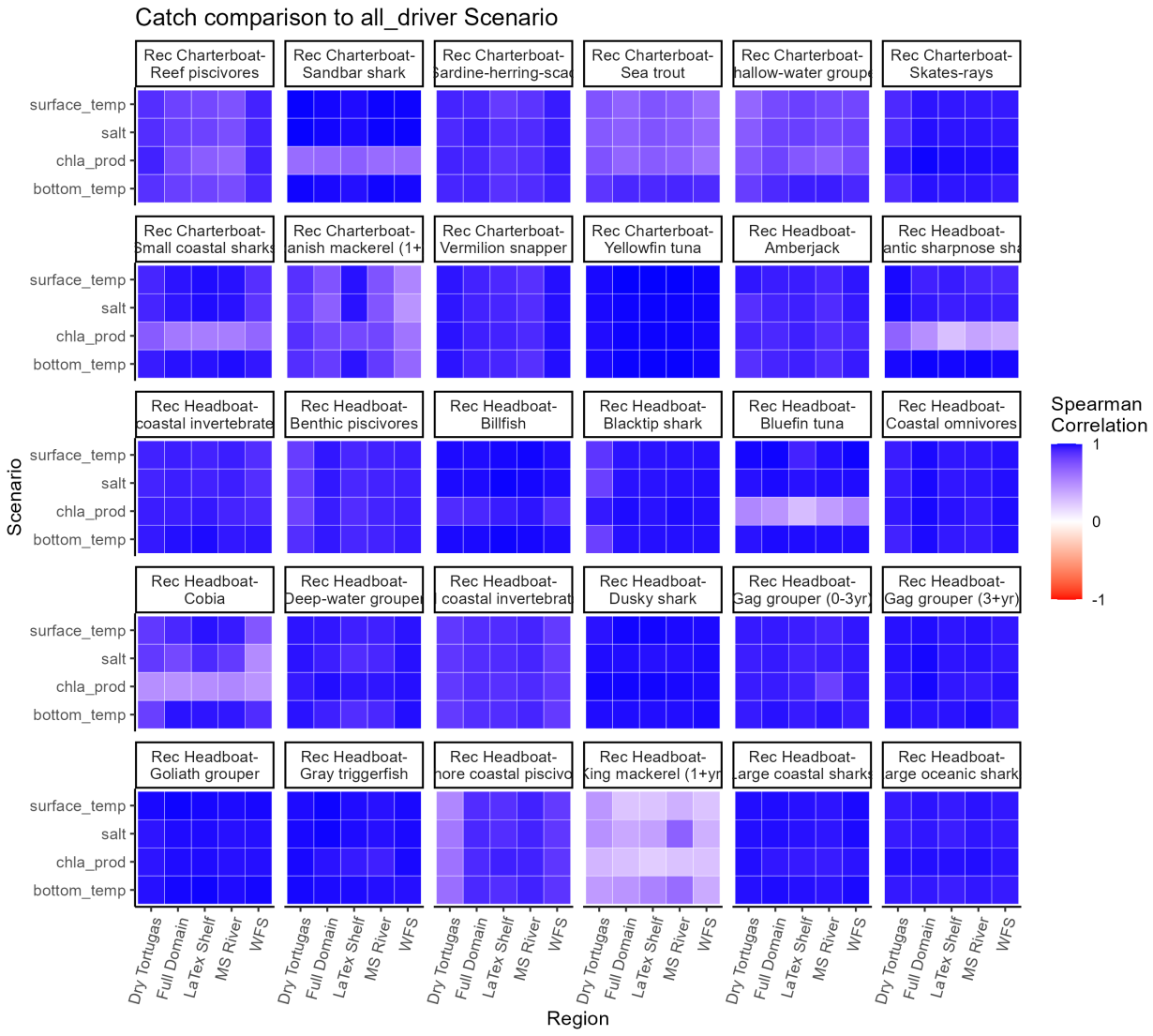

Catch comparison to all_driver Scenario
Comm_Nets-Mobile epifauna
Comm_Nets-Mullet
Comm_Nets-Other snapper
Comm_Nets-agic coastal piscivo
Comm_Nets-Red drum
Comm_Nets-Red grouper (3+yr)
Comm_Nets-ef invertebrate feed
Comm_Nets-Sardine-herring-sca
Comm_Nets-Sea trout
Comm_Nets-Small coastal sharks
Comm_Nets-anish mackerel (0-1
Comm_Nets-anish mackerel (1+
Comm_Nets-Surface pelagics
Comm_Nets-White shrimp
Comm_Other-coastal invertebrate
Comm_Other-Billfish
Comm_Other-coastal invertebrat
Comm_Other-Mobile epifauna
Comm_Other-Mullet
Comm_Other-Mutton snapper
Comm_Other-Other snapper
Comm_Other-ef invertebrate feed
Comm_Other-Yellowfin tuna
Comm_Pots_Traps-Crab
Comm_Pots_Traps-Deep-water grouper
Comm_Pots_Traps-coastal invertebrat
Comm_Pots_Traps-Mobile epifauna
Comm_Pots_Traps-Mutton snapper
Comm_Pots_Traps-Other snapper
Comm_Pots_Traps-Red grouper (0-3yr)
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

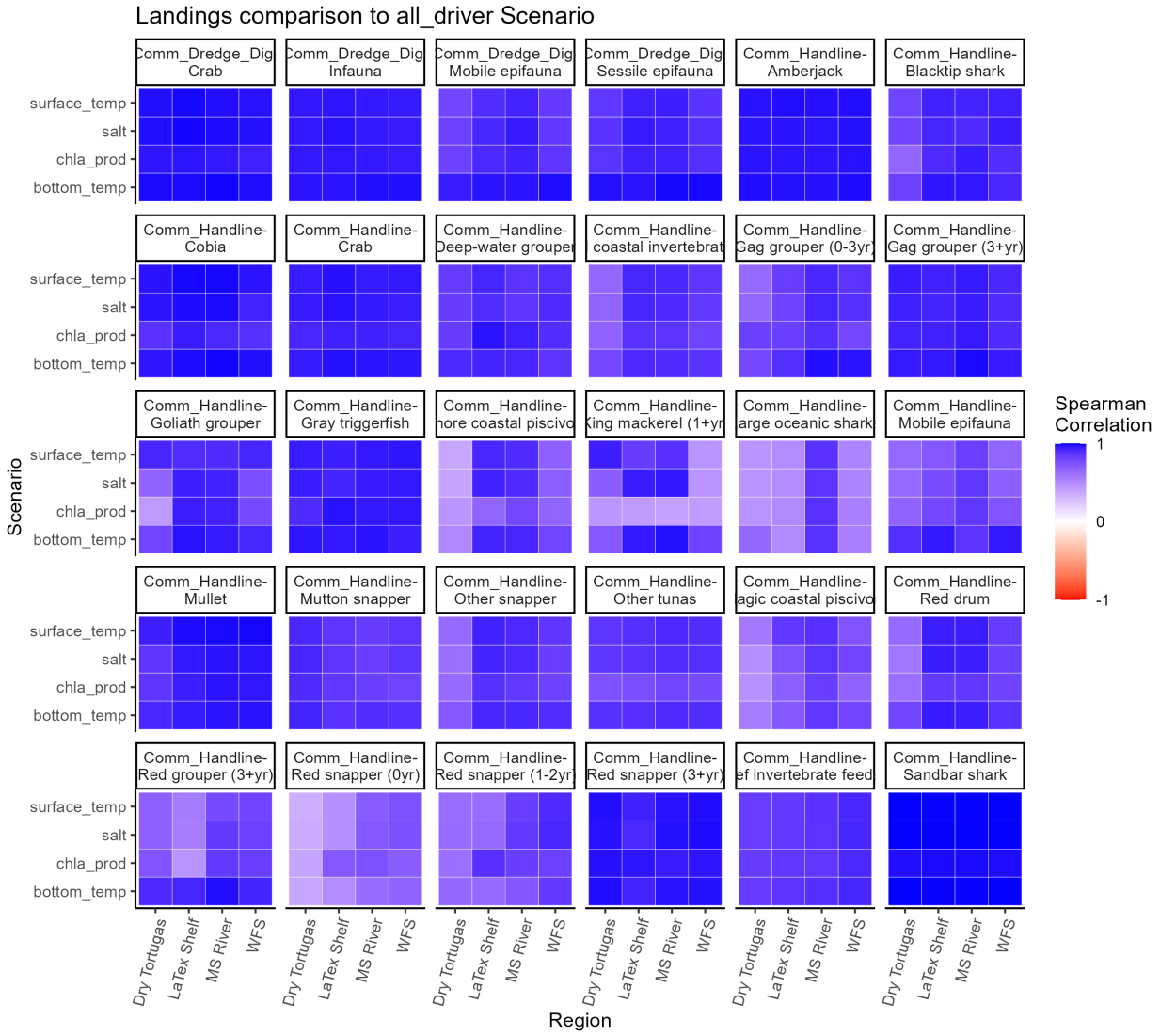

Catch comparison to all_driver Scenario
Comm_Pots_Traps-Red grouper (3+yr)
Comm_Pots_Traps-ef invertebrate feed
nm_Purse_Menhad-chovy-silverside-killi
nm_Purse_Menhad-antic sharpnose sha
nm_Purse_Menhad-coastal invertebrate
nm_Purse_Menhad-Benthic piscivores
nm_Purse_Menhad-Blacktip shark
nm_Purse_Menhad-Brown shrimp
nm_Purse_Menhad-Butterfish
nm_Purse_Menhad-Cephalopod
nm_Purse_Menhad-Coastal omnivores
nm_Purse_Menhad-Crab
nm_Purse_Menhad-coastal invertebrat
nm_Purse_Menhad-Dusky shark
nm_Purse_Menhad-hore coastal piscivo
nm_Purse_Menhad-King mackerel (1+yr
nm_Purse_Menhad-Large coastal sharks
nm_Purse_Menhad-Menhaden (0yr)
nm_Purse_Menhad-Menhaden (1yr)
nm_Purse_Menhad-Menhaden (2yr)
nm_Purse_Menhad-Menhaden (3yr)
nm_Purse_Menhad-Menhaden (4yr)
nm_Purse_Menhad-Mobile epifauna
nm_Purse_Menhad-Mullet
nm_Purse_Menhad-Oceanic piscivores
nm_Purse_Menhad-agic coastal piscivo
nm_Purse_Menhad-Red drum
nm_Purse_Menhad-ef invertebrate feed
nm_Purse_Menhad-Sandbar shark
nm_Purse_Menhad-Sardine-herring-scad
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1


Catch comparison to all_driver Scenario
nm_Purse_Menhad
Sea trout
nm_Purse_Menhad
Skates-rays
nm_Purse_Menhad
Small coastal sharks
nm_Purse_Menhad
anish mackerel (1+
nm_Purse_Menhad
Surface pelagics
nm_Purse_Menhad
White shrimp
nm_Purse_Menhad
Zooplankton
Comm_Purse_Other
hore coastal piscivo
Comm_Purse_Other
Menhaden (0yr)
Comm_Purse_Other
Menhaden (1yr)
Comm_Purse_Other
Menhaden (2yr)
Comm_Purse_Other
Menhaden (3yr)
Comm_Purse_Other
Menhaden (4yr)
Comm_Purse_Other
Mobile epifauna
Comm_Purse_Other
Mullet
Comm_Purse_Other
Other tunas
Comm_Purse_Other
agic coastal piscivo
Comm_Purse_Other
ef invertebrate feed
Comm_Purse_Other
ardine-herring-sca
Comm_Purse_Other
Surface pelagics
m_Trawl_Bottom_C
Brown shrimp
m_Trawl_Bottom_C
Cephalopod
m_Trawl_Bottom_C
Crab
m_Trawl_Bottom_C
coastal invertebrat
m_Trawl_Bottom_C
hore coastal piscivo
m_Trawl_Bottom_C
Mobile epifauna
m_Trawl_Bottom_C
Pink shrimp
m_Trawl_Bottom_C
ef invertebrate feed
m_Trawl_Bottom_C
Sea trout
m_Trawl_Bottom_C
White shrimp
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

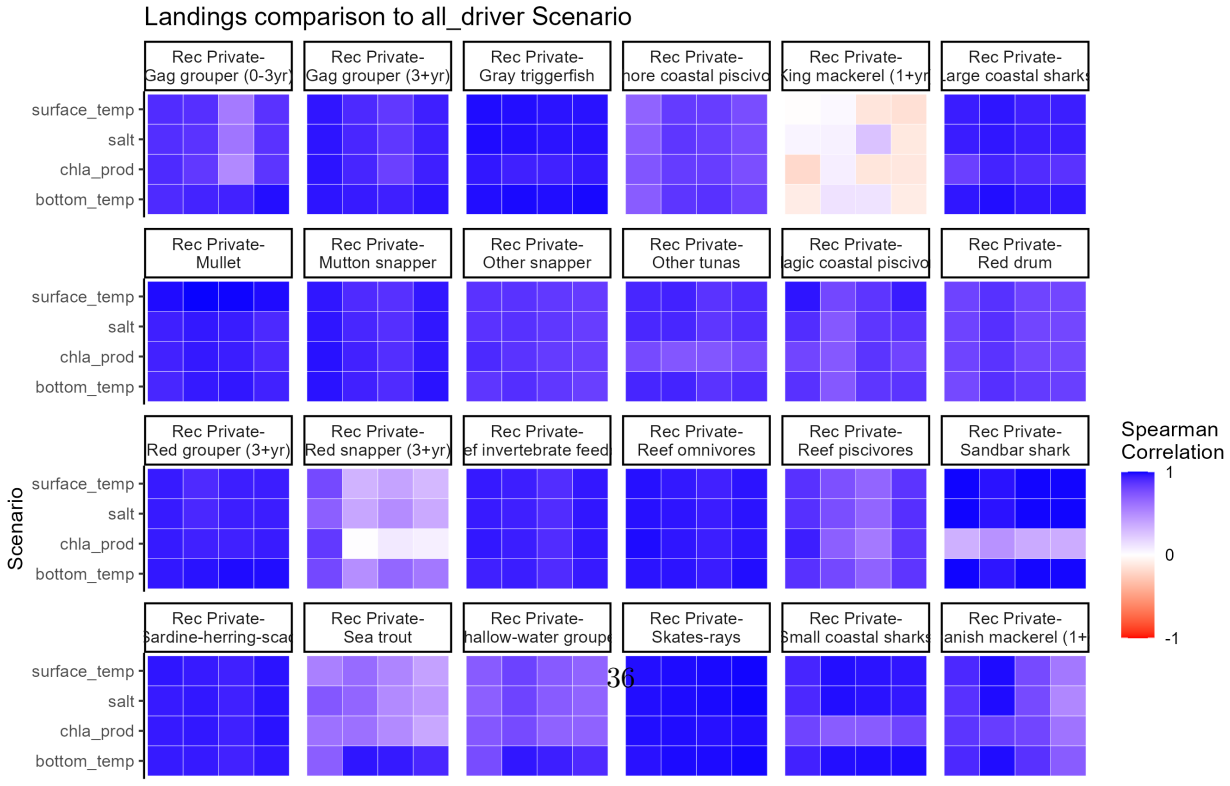

Catch comparison to all_driver Scenario
Scenario
surface_temp
salt
chla_prod
bottom_temp
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

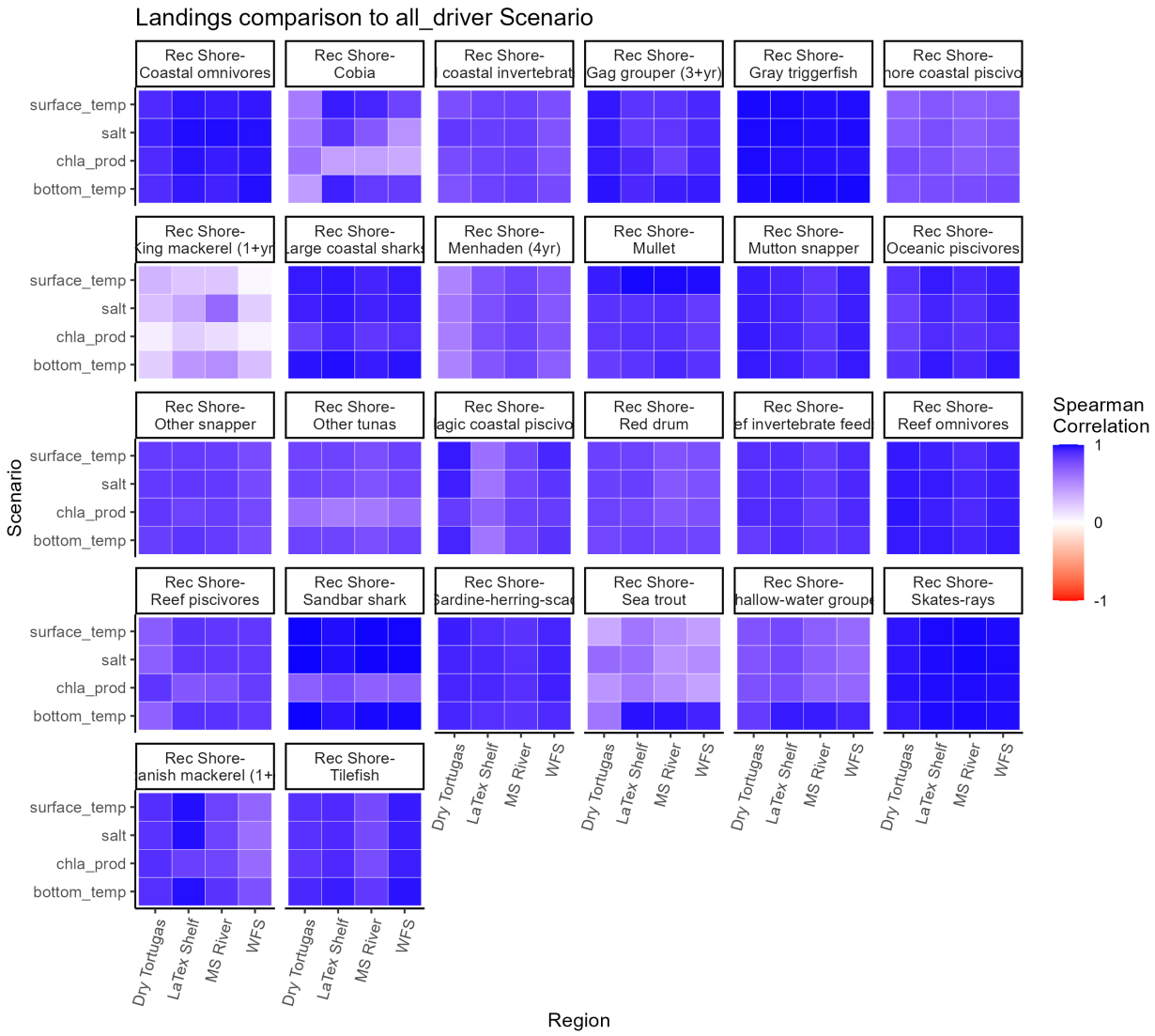

Catch comparison to all_driver Scenario
Rec Charterboat-coastal invertebrate
Rec Charterboat-Benthic piscivores
Rec Charterboat-Billfish
Rec Charterboat-Blacktip shark
Rec Charterboat-Bluefin tuna
Rec Charterboat-Coastal omnivores
Rec Charterboat-Deep-water grouper
Rec Charterboat-coastal invertebrat
Rec Charterboat-Gag grouper (0-3yr)
Rec Charterboat-Gag grouper (3+yr)
Rec Charterboat-Goliath grouper
Rec Charterboat-Gray triggerfish
Rec Charterboat-hore coastal piscivo
Rec Charterboat-King mackerel (1+yr
Rec Charterboat-Large coastal sharks
Rec Charterboat-arge oceanic shark
Rec Charterboat-Menhaden (4yr)
Rec Charterboat-Mutton snapper
Rec Charterboat-Oceanic piscivores
Rec Charterboat-Other snapper
Rec Charterboat-Other tunas
Rec Charterboat-agic coastal piscivo
Rec Charterboat-Red drum
Rec Charterboat-Red grouper (0-3yr)
Rec Charterboat-Red grouper (3+yr)
Rec Charterboat-Red snapper (0yr)
Rec Charterboat-Red snapper (1-2yr
Rec Charterboat-Red snapper (3+yr)
Rec Charterboat-ef invertebrate feed
Rec Charterboat-Reef omnivores
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

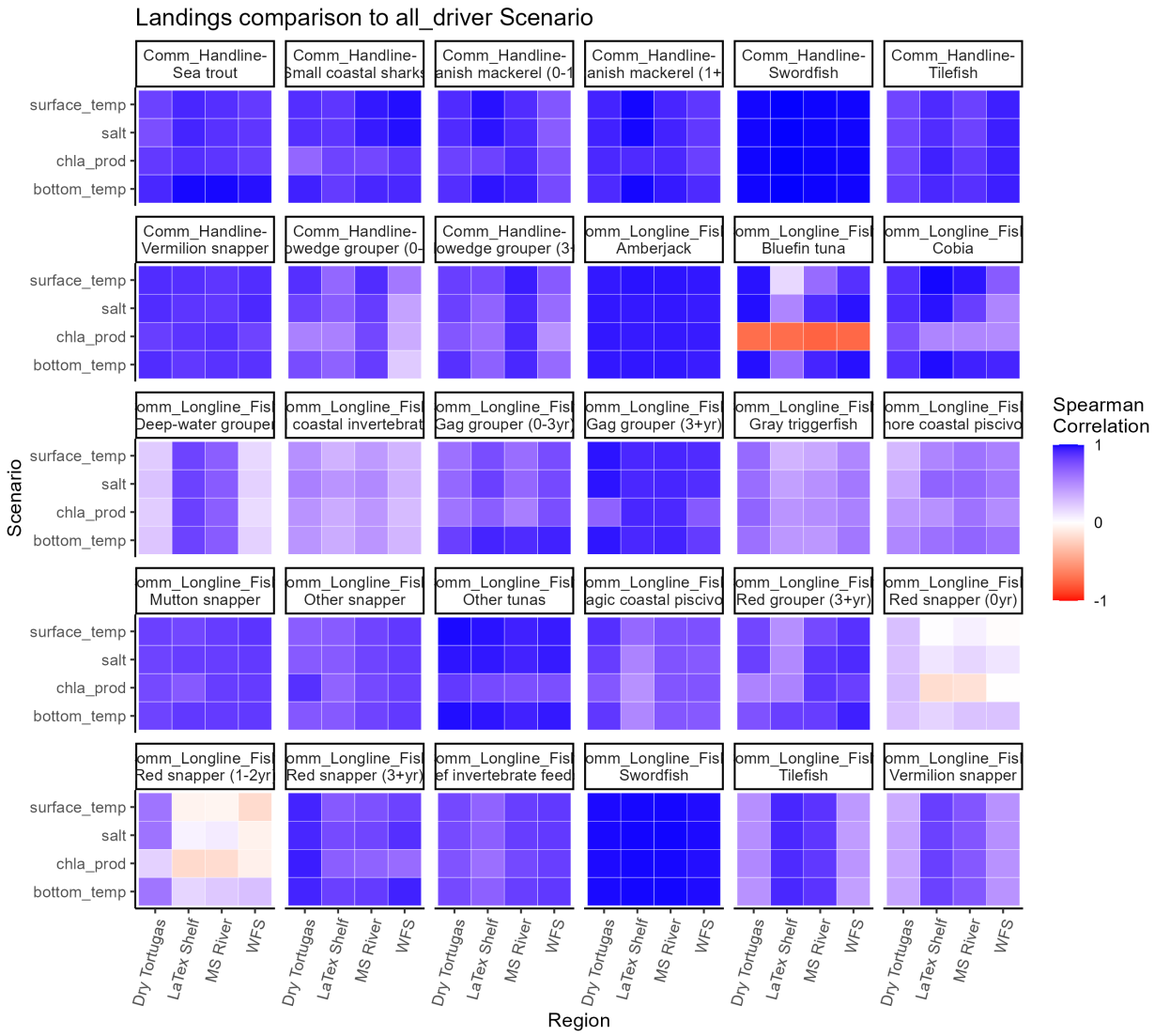

Catch comparison to all_driver Scenario
Rec Charterboat-Reef piscivores
Rec Charterboat-Sandbar shark
Rec Charterboat-Sardine-herring-scad
Rec Charterboat-Sea trout
Rec Charterboat-Shallow-water groupe
Rec Charterboat-Skates-rays
Rec Charterboat-Small coastal sharks
Rec Charterboat-anish mackerel (1+
Rec Charterboat-Vermilion snapper
Rec Charterboat-Yellowfin tuna
Rec Headboat-Amberjack
Rec Headboat-antic sharpnose sha
Rec Headboat-coastal invertebrate
Rec Headboat-Benthic piscivores
Rec Headboat-Billfish
Rec Headboat-Blacktip shark
Rec Headboat-Bluefin tuna
Rec Headboat-Coastal omnivores
Rec Headboat-Cobia
Rec Headboat-Deep-water grouper
Rec Headboat-coastal invertebrat
Rec Headboat-Dusky shark
Rec Headboat-Gag grouper (0-3yr)
Rec Headboat-Gag grouper (3+yr)
Rec Headboat-Goliath grouper
Rec Headboat-Gray triggerfish
Rec Headboat-hore coastal piscivo
Rec Headboat-King mackerel (1+yr
Rec Headboat-Large coastal sharks
Rec Headboat-Large oceanic sharks
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
Full Domain
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

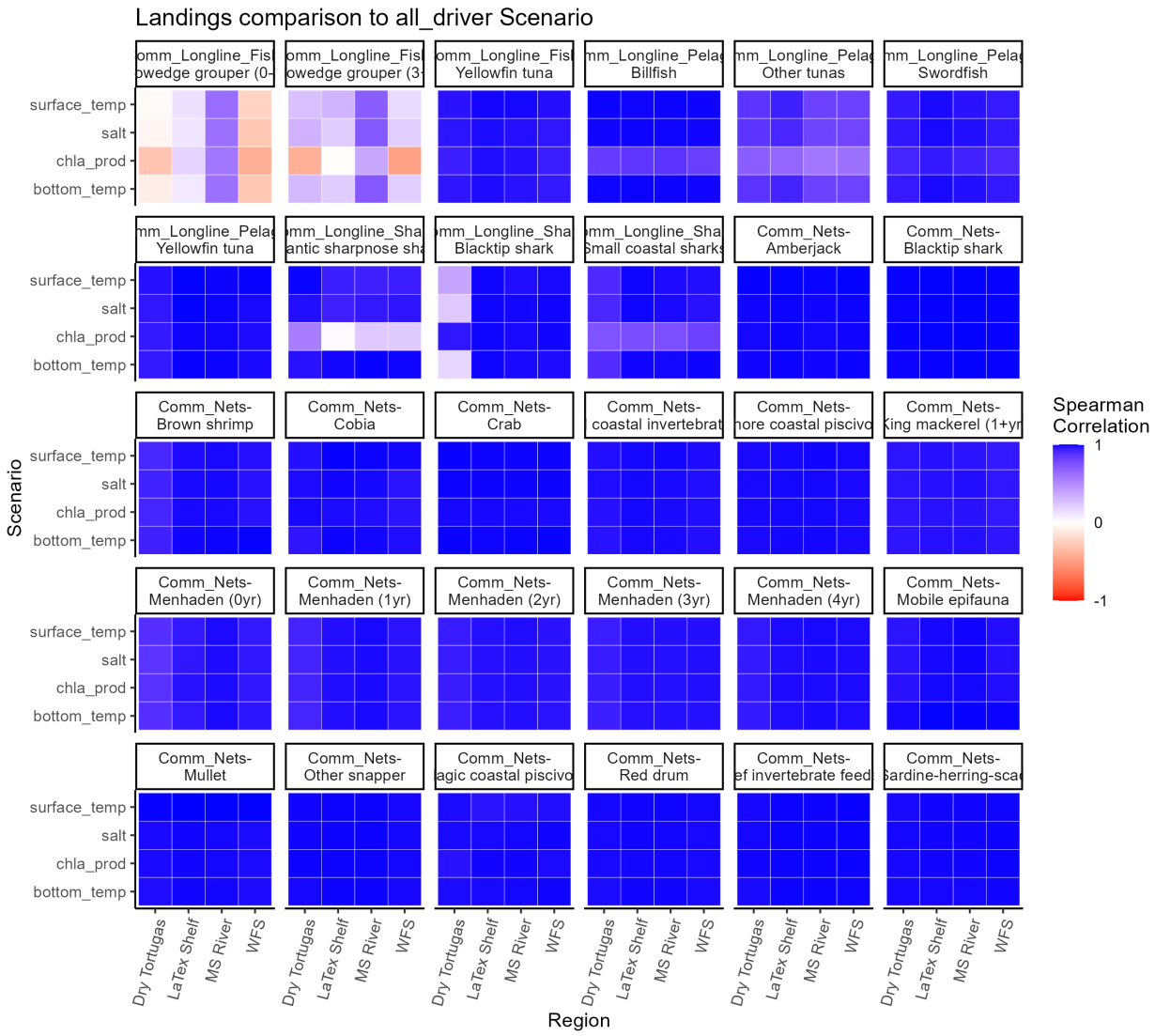

Landings comparison to all_driver Scenario
Comm_Dredge_Dig Crab
Comm_Dredge_Dig Infauna
Comm_Dredge_Dig Mobile epifauna
Comm_Dredge_Dig Sessile epifauna
Comm_Handline- Amberjack
Comm_Handline- Blacktip shark
Comm_Handline- Cobia
Comm_Handline- Crab
Comm_Handline- Deep-water grouper
Comm_Handline- coastal invertebrat
Comm_Handline- Gag grouper (0-3yr)
Comm_Handline- Gag grouper (3+yr)
Comm_Handline- Goliath grouper
Comm_Handline- Gray triggerfish
Comm_Handline- hore coastal piscivo
Comm_Handline- King mackerel (1+yr
Comm_Handline- arge oceanic shark
Comm_Handline- Mobile epifauna
Comm_Handline- Mullet
Comm_Handline- Mutton snapper
Comm_Handline- Other snapper
Comm_Handline- Other tunas
Comm_Handline- agic coastal piscivo
Comm_Handline- Red drum
Comm_Handline- Red grouper (3+yr)
Comm_Handline- Red snapper (0yr)
Comm_Handline- Red snapper (1-2yr
Comm_Handline- Red snapper (3+yr)
Comm_Handline- ef invertebrate feed
Comm_Handline- Sandbar shark
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

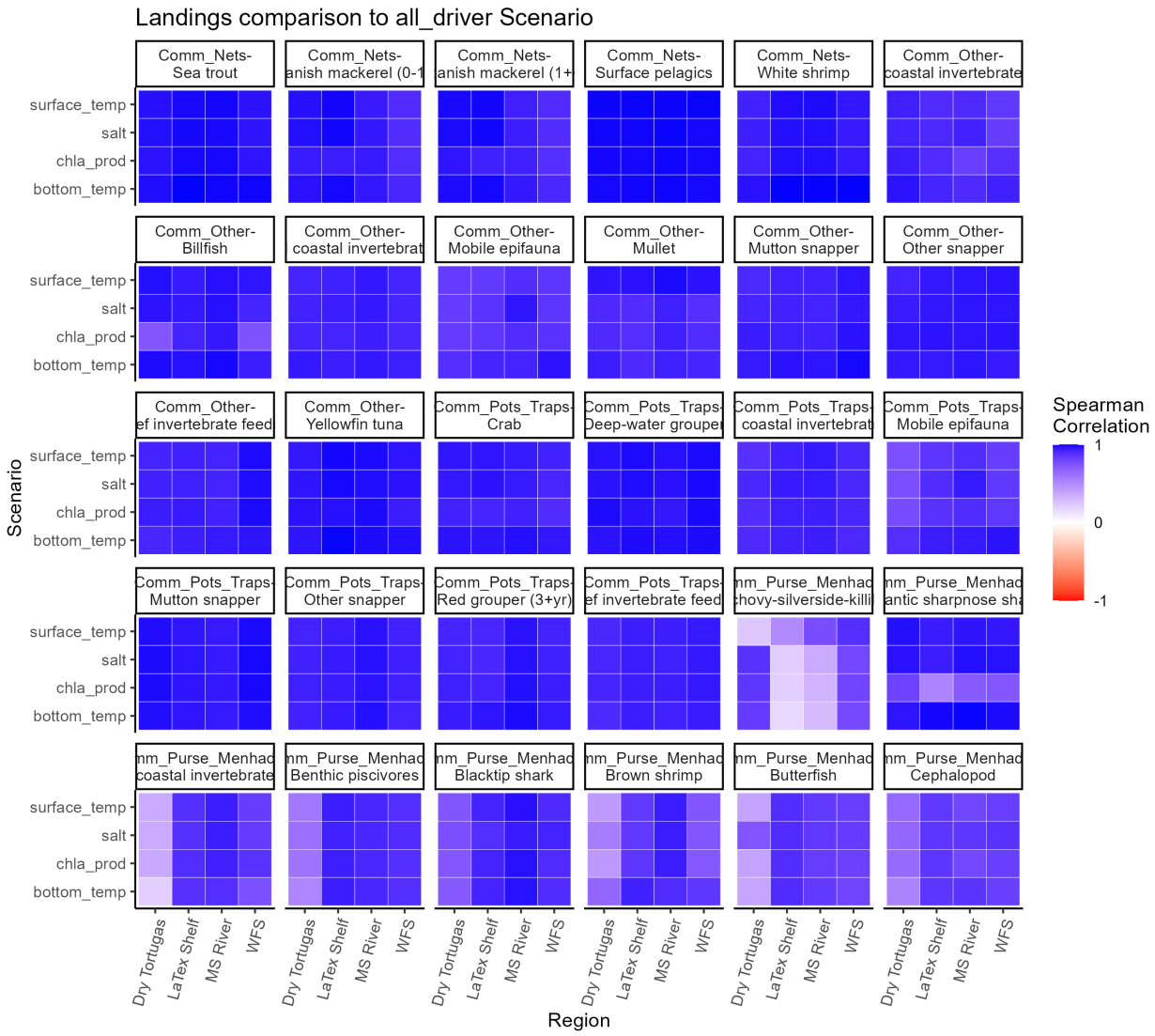
Landings

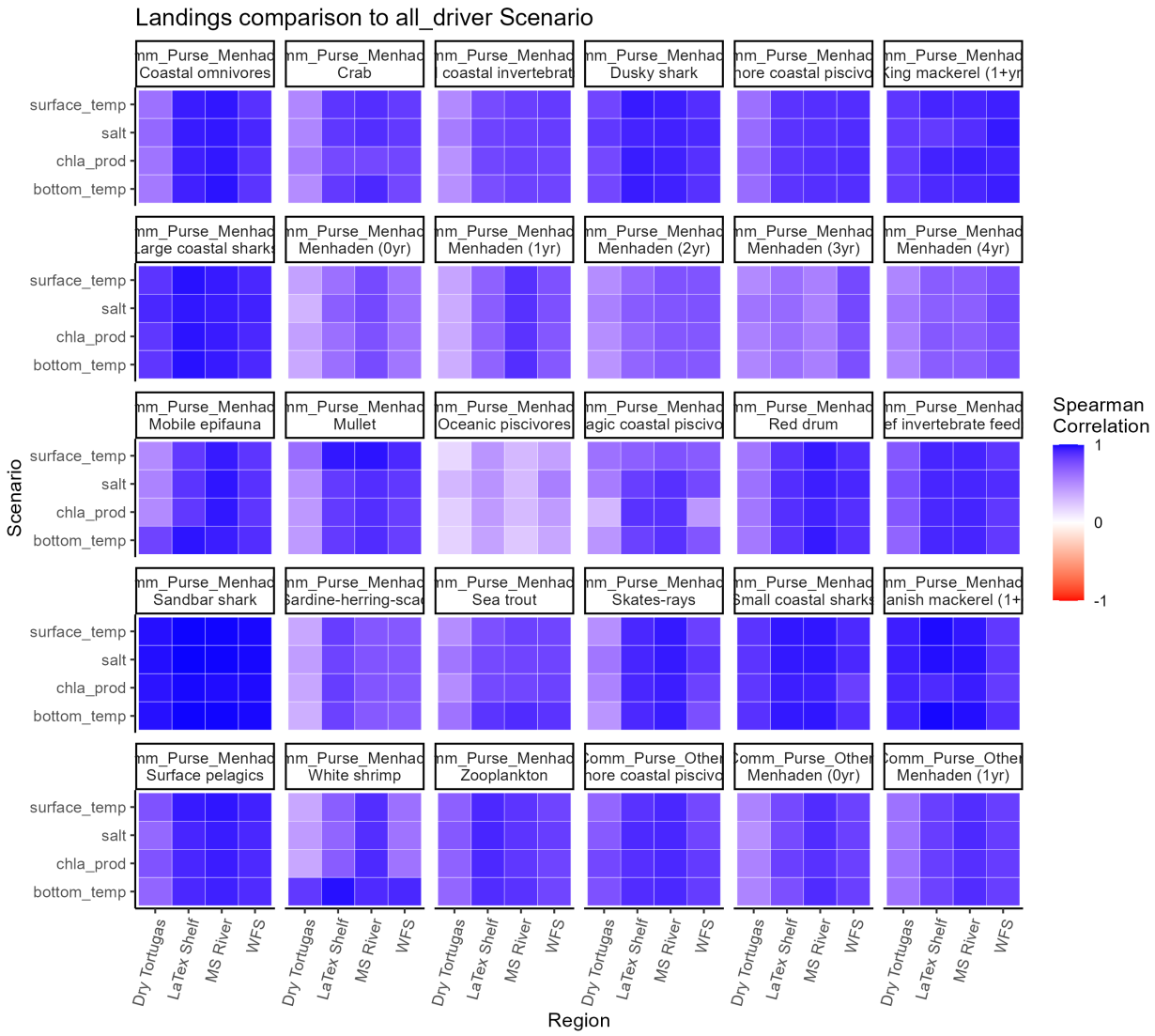

Landings comparison to all_driver Scenario
Rec Private- Gag grouper (0-3yr)
Rec Private- Gag grouper (3+yr)
Rec Private- Gray triggerfish
Rec Private- hore coastal piscivo
Rec Private- King mackerel (1+yr
Rec Private- Large coastal sharks
Rec Private- Mullet
Rec Private- Mutton snapper
Rec Private- Other snapper
Rec Private- Other tunas
Rec Private- agic coastal piscivo
Rec Private- Red drum
Rec Private- Red grouper (3+yr)
Rec Private- Red snapper (3+yr)
Rec Private- ef invertebrate feed
Rec Private- Reef omnivores
Rec Private- Reef piscivores
Rec Private- Sandbar shark
Rec Private- Sardine-herring-sca
Rec Private- Sea trout
Rec Private- hallow-water groupe
Rec Private- Skates-rays
Rec Private- Small coastal sharks
Rec Private- anish mackerel (1+
surface_temp
salt
chla_prod
bottom_temp
Scenario
Spearman Correlation
1
0
-1

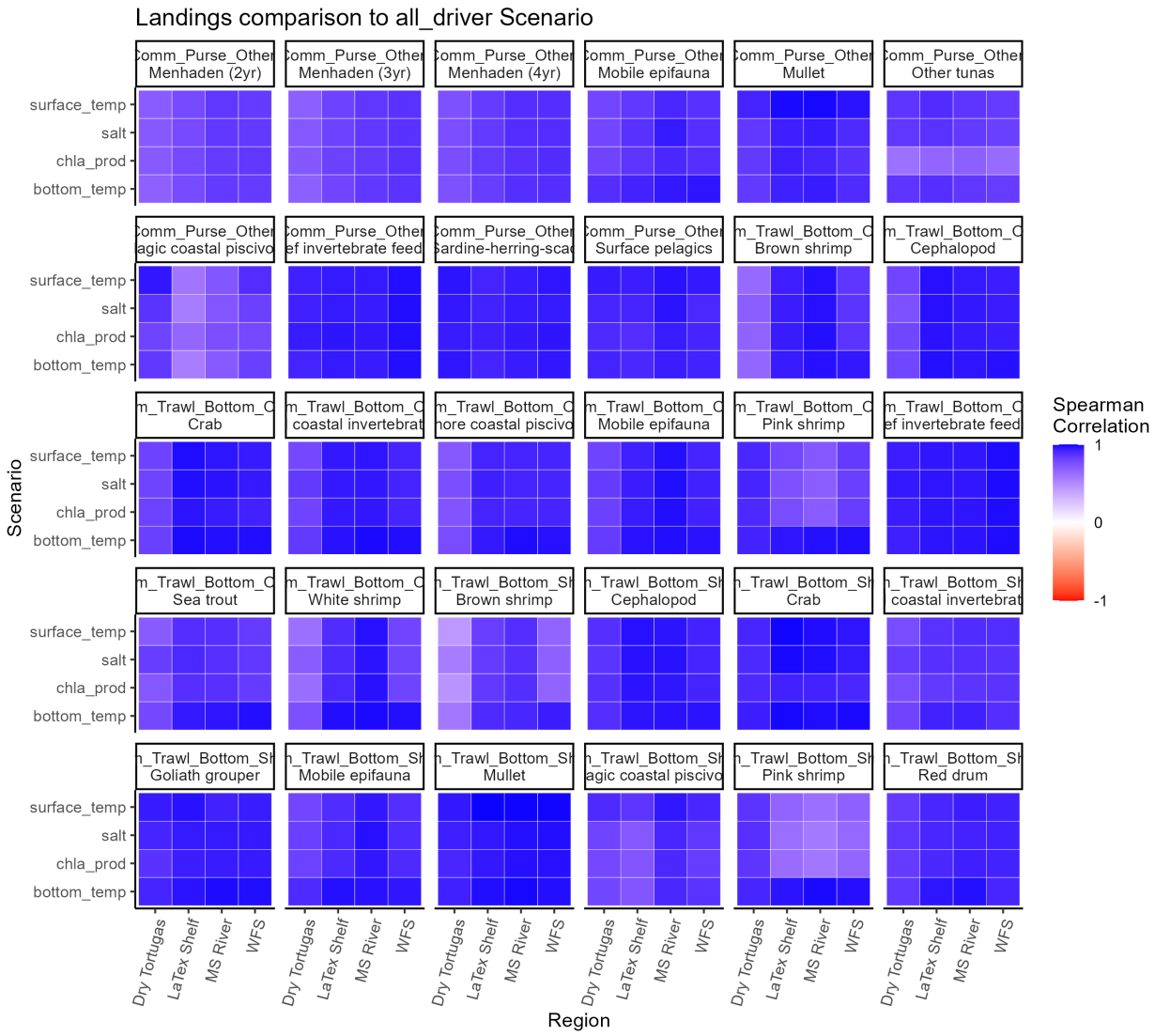

Landings comparison to all_driver Scenario
Rec Shore-Coastal omnivores
Rec Shore-Cobia
Rec Shore-coastal invertebrat
Rec Shore-Gag grouper (3+yr)
Rec Shore-Gray triggerfish
Rec Shore-hore coastal piscivo
Rec Shore-king mackerel (1+yr
Rec Shore-arge coastal sharks
Rec Shore-Menhaden (4yr)
Rec Shore-Mullet
Rec Shore-Mutton snapper
Rec Shore-Oceanic piscivores
Rec Shore-Other snapper
Rec Shore-Other tunas
Rec Shore-agic coastal piscivo
Rec Shore-Red drum
Rec Shore-ef invertebrate feed
Rec Shore-Reef omnivores
Rec Shore-Reef piscivores
Rec Shore-Sandbar shark
Rec Shore-Sardine-herring-sca
Rec Shore-Sea trout
Rec Shore-hallow-water groupe
Rec Shore-Skates-rays
Rec Shore-anish mackerel (1+
Rec Shore-Tilefish
surface_temp
salt
chla_prod
bottom_temp
Dry Tortugas
LaTex Shelf
MS River
WFS
Scenario
Region
Spearman Correlation
1
0
-1

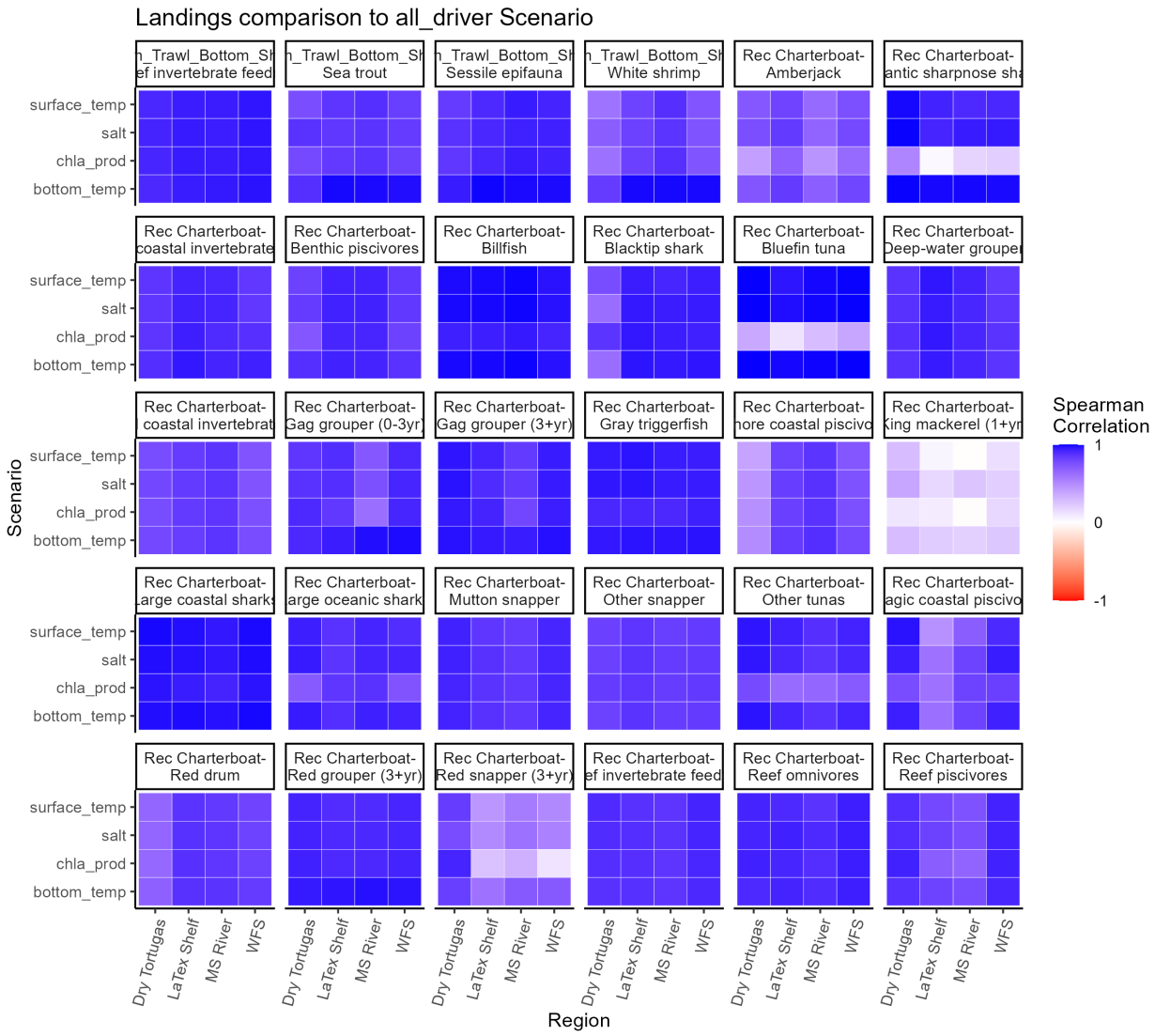

Landings comparison to all_driver Scenario
Comm_Handline-Sea trout
Comm_Handline-Small coastal sharks
Comm_Handline-anish mackerel (0-1
Comm_Handline-anish mackerel (1+
Comm_Handline-Swordfish
Comm_Handline-Tilefish
Comm_Handline-Vermilion snapper
Comm_Handline-owedge grouper (0-
Comm_Handline-owedge grouper (3-
omm_Longline_Fis Amberjack
omm_Longline_Fis Bluefin tuna
omm_Longline_Fis Cobia
omm_Longline_Fis Deep-water grouper
omm_Longline_Fis coastal invertebrat
omm_Longline_Fis Gag grouper (0-3yr)
omm_Longline_Fis Gag grouper (3+yr)
omm_Longline_Fis Gray triggerfish
omm_Longline_Fis hore coastal piscivo
omm_Longline_Fis Mutton snapper
omm_Longline_Fis Other snapper
omm_Longline_Fis Other tunas
omm_Longline_Fis agic coastal piscivo
omm_Longline_Fis Red grouper (3+yr)
omm_Longline_Fis Red snapper (0yr)
omm_Longline_Fis Red snapper (1-2yr)
omm_Longline_Fis Red snapper (3+yr)
omm_Longline_Fis ef invertebrate feed
omm_Longline_Fis Swordfish
omm_Longline_Fis Tilefish
omm_Longline_Fis Vermilion snapper
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

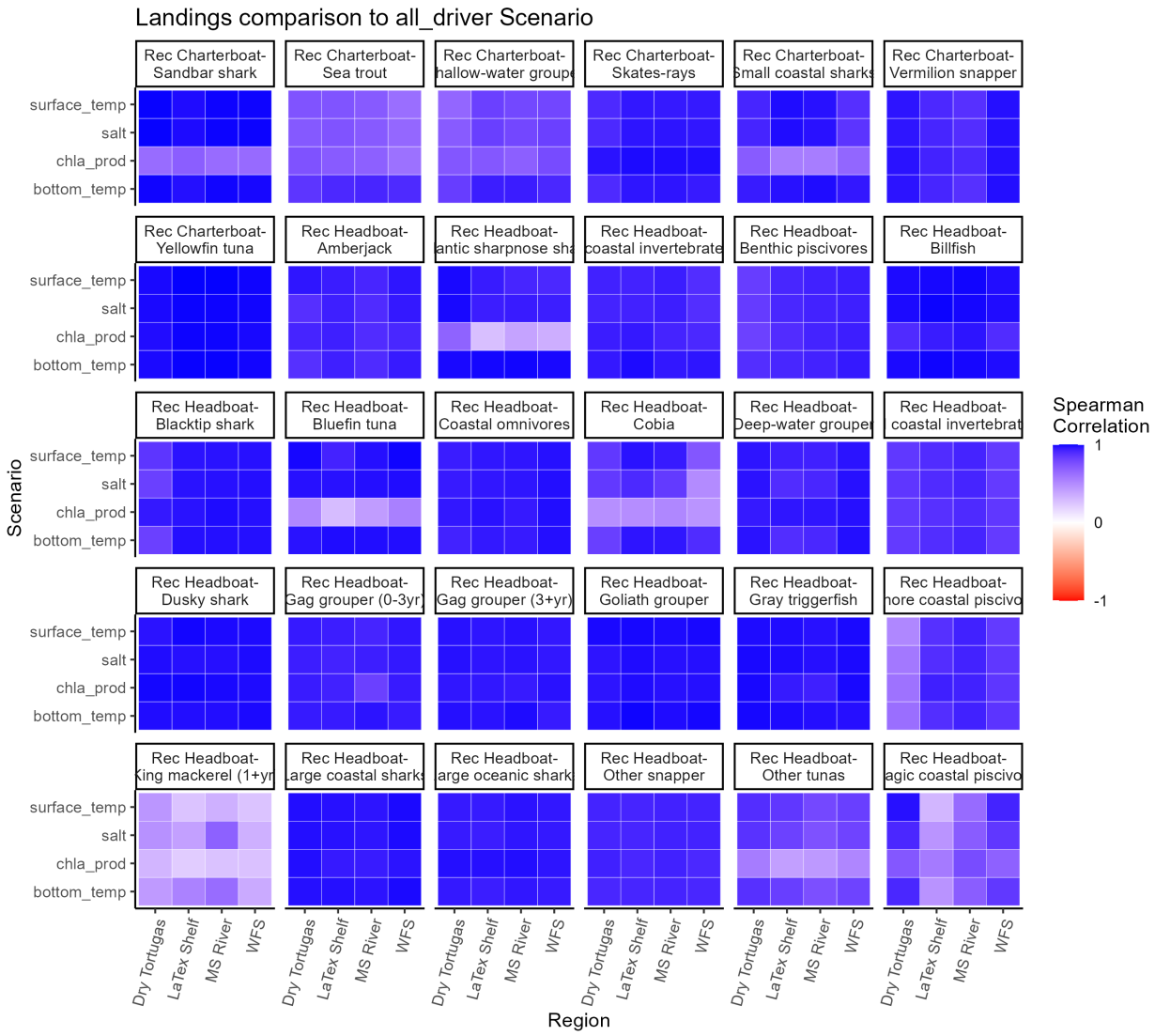

Landings comparison to all_driver Scenario
omm_Longline_Fis owedge grouper (0-
omm_Longline_Fis owedge grouper (3-
omm_Longline_Fis Yellowfin tuna
mm_Longline_Pela Billfish
mm_Longline_Pela Other tunas
mm_Longline_Pela Swordfish
mm_Longline_Pela Yellowfin tuna
omm_Longline_Sha antic sharpnose sha
omm_Longline_Sha Blacktip shark
omm_Longline_Sha Small coastal sharks
Comm_Nets-Amberjack
Comm_Nets-Blacktip shark
Comm_Nets-Brown shrimp
Comm_Nets-Cobia
Comm_Nets-Crab
Comm_Nets-coastal invertebrat
Comm_Nets-hore coastal piscivo
Comm_Nets-King mackerel (1+yr
Comm_Nets-Menhaden (0yr)
Comm_Nets-Menhaden (1yr)
Comm_Nets-Menhaden (2yr)
Comm_Nets-Menhaden (3yr)
Comm_Nets-Menhaden (4yr)
Comm_Nets-Mobile epifauna
Comm_Nets-Mullet
Comm_Nets-Other snapper
Comm_Nets-agic coastal piscivo
Comm_Nets-Red drum
Comm_Nets-ef invertebrate feed
Comm_Nets-Sardine-herring-sca
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

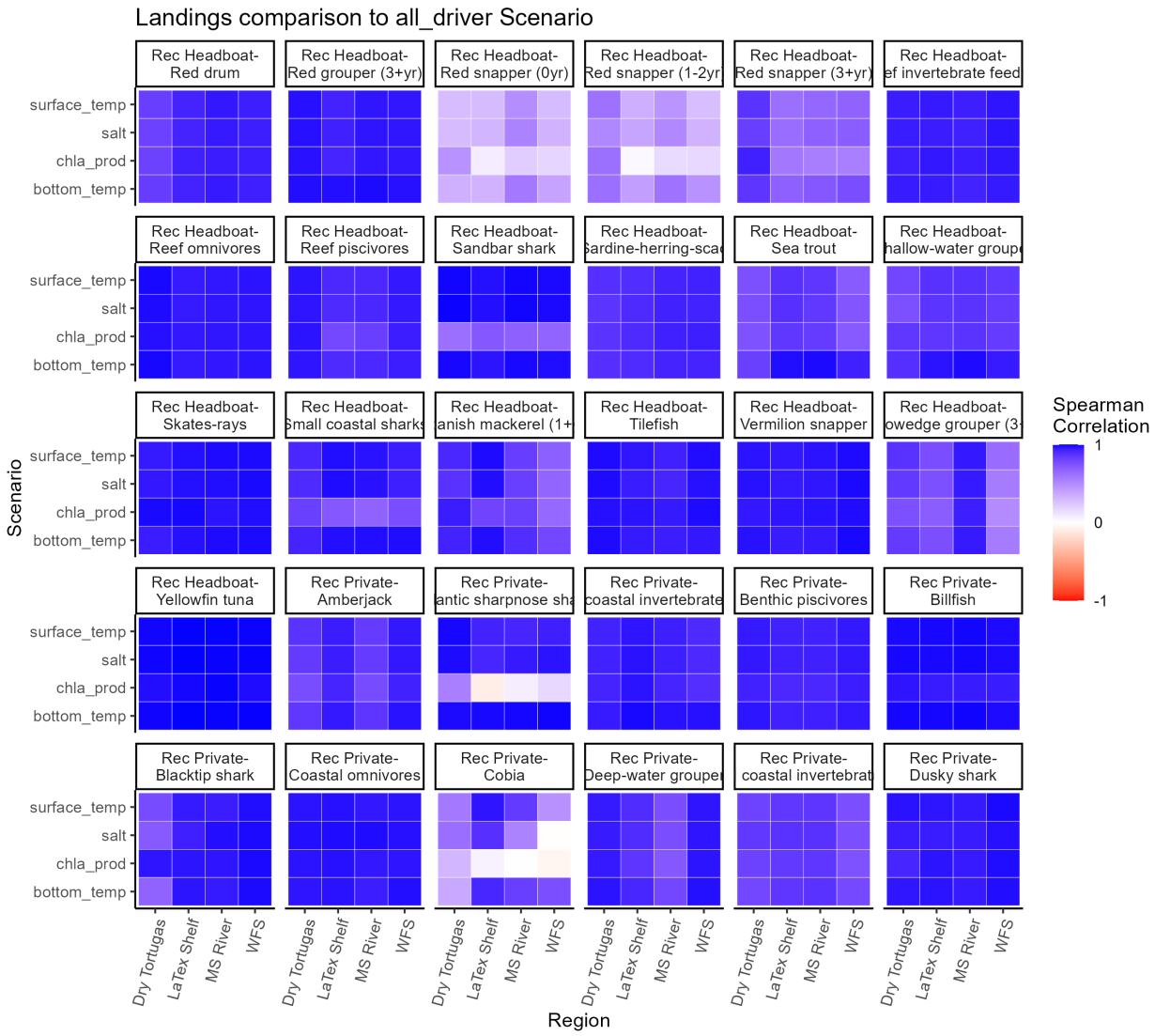

Landings comparison to all_driver Scenario
Comm_Nets-Sea trout
Comm_Nets-anish mackerel (0-1
Comm_Nets-anish mackerel (1+
Comm_Nets-Surface pelagics
Comm_Nets-White shrimp
Comm_Other-coastal invertebrate
Comm_Other-Billfish
Comm_Other-coastal invertebrat
Comm_Other-Mobile epifauna
Comm_Other-Mullet
Comm_Other-Mutton snapper
Comm_Other-Other snapper
Comm_Other-ef invertebrate feed
Comm_Other-Yellowfin tuna
Comm_Pots_Traps-Crab
Comm_Pots_Traps-Deep-water grouper
Comm_Pots_Traps-coastal invertebrat
Comm_Pots_Traps-Mobile epifauna
Comm_Pots_Traps-Mutton snapper
Comm_Pots_Traps-Other snapper
Comm_Pots_Traps-Red grouper (3+yr)
Comm_Pots_Traps-ef invertebrate feed
mm_Purse_Menhac-chovy-silverside-killi
mm_Purse_Menhac-antic sharpnose sha
mm_Purse_Menhac-coastal invertebrate
mm_Purse_Menhac-Benthic piscivores
mm_Purse_Menhac-Blacktip shark
mm_Purse_Menhac-Brown shrimp
mm_Purse_Menhac-Butterfish
mm_Purse_Menhac-Cephalopod
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1


Landings comparison to all_driver Scenario
nm_Purse_Menhad Coastal omnivores
nm_Purse_Menhad Crab
nm_Purse_Menhad coastal invertebrat
nm_Purse_Menhad Dusky shark
nm_Purse_Menhad hore coastal piscivo
nm_Purse_Menhad King mackerel (1+yr
nm_Purse_Menhad Large coastal sharks
nm_Purse_Menhad Menhaden (0yr)
nm_Purse_Menhad Menhaden (1yr)
nm_Purse_Menhad Menhaden (2yr)
nm_Purse_Menhad Menhaden (3yr)
nm_Purse_Menhad Menhaden (4yr)
nm_Purse_Menhad Mobile epifauna
nm_Purse_Menhad Mullet
nm_Purse_Menhad Oceanic piscivores
nm_Purse_Menhad agic coastal piscivo
nm_Purse_Menhad Red drum
nm_Purse_Menhad ef invertebrate feed
nm_Purse_Menhad Sandbar shark
nm_Purse_Menhad Sardine-herring-sca
nm_Purse_Menhad Sea trout
nm_Purse_Menhad Skates-rays
nm_Purse_Menhad Small coastal sharks
nm_Purse_Menhad Spanish mackerel (1+
nm_Purse_Menhad Surface pelagics
nm_Purse_Menhad White shrimp
nm_Purse_Menhad Zooplankton
comm_Purse_Other hore coastal piscivo
comm_Purse_Other Menhaden (0yr)
comm_Purse_Other Menhaden (1yr)
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

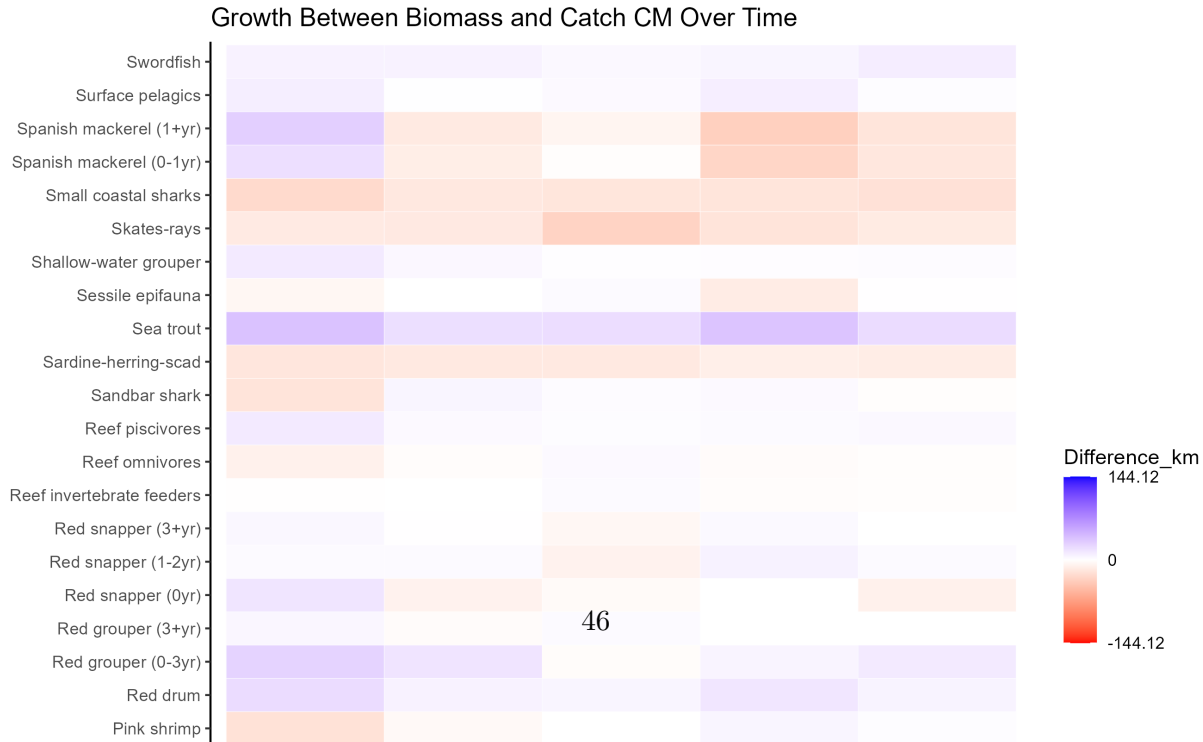

Landings comparison to all_driver Scenario
Comm_Purse_Other Menhaden (2yr)
Comm_Purse_Other Menhaden (3yr)
Comm_Purse_Other Menhaden (4yr)
Comm_Purse_Other Mobile epifauna
Comm_Purse_Other Mullet
Comm_Purse_Other Other tunas
Comm_Purse_Other agic coastal piscivo
Comm_Purse_Other ef invertebrate feed
Comm_Purse_Other Sardine-herring-scad
Comm_Purse_Other Surface pelagics
m_Trawl_Bottom_C Brown shrimp
m_Trawl_Bottom_C Cephalopod
m_Trawl_Bottom_C Crab
m_Trawl_Bottom_C coastal invertebrat
m_Trawl_Bottom_C hore coastal piscivo
m_Trawl_Bottom_C Mobile epifauna
m_Trawl_Bottom_C Pink shrimp
m_Trawl_Bottom_C ef invertebrate feed
m_Trawl_Bottom_C Sea trout
m_Trawl_Bottom_C White shrimp
h_Trawl_Bottom_Sh Brown shrimp
h_Trawl_Bottom_Sh Cephalopod
h_Trawl_Bottom_Sh Crab
h_Trawl_Bottom_Sh coastal invertebrat
h_Trawl_Bottom_Sh Goliath grouper
h_Trawl_Bottom_Sh Mobile epifauna
h_Trawl_Bottom_Sh Mullet
h_Trawl_Bottom_Sh agic coastal piscivo
h_Trawl_Bottom_Sh Pink shrimp
h_Trawl_Bottom_Sh Red drum
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

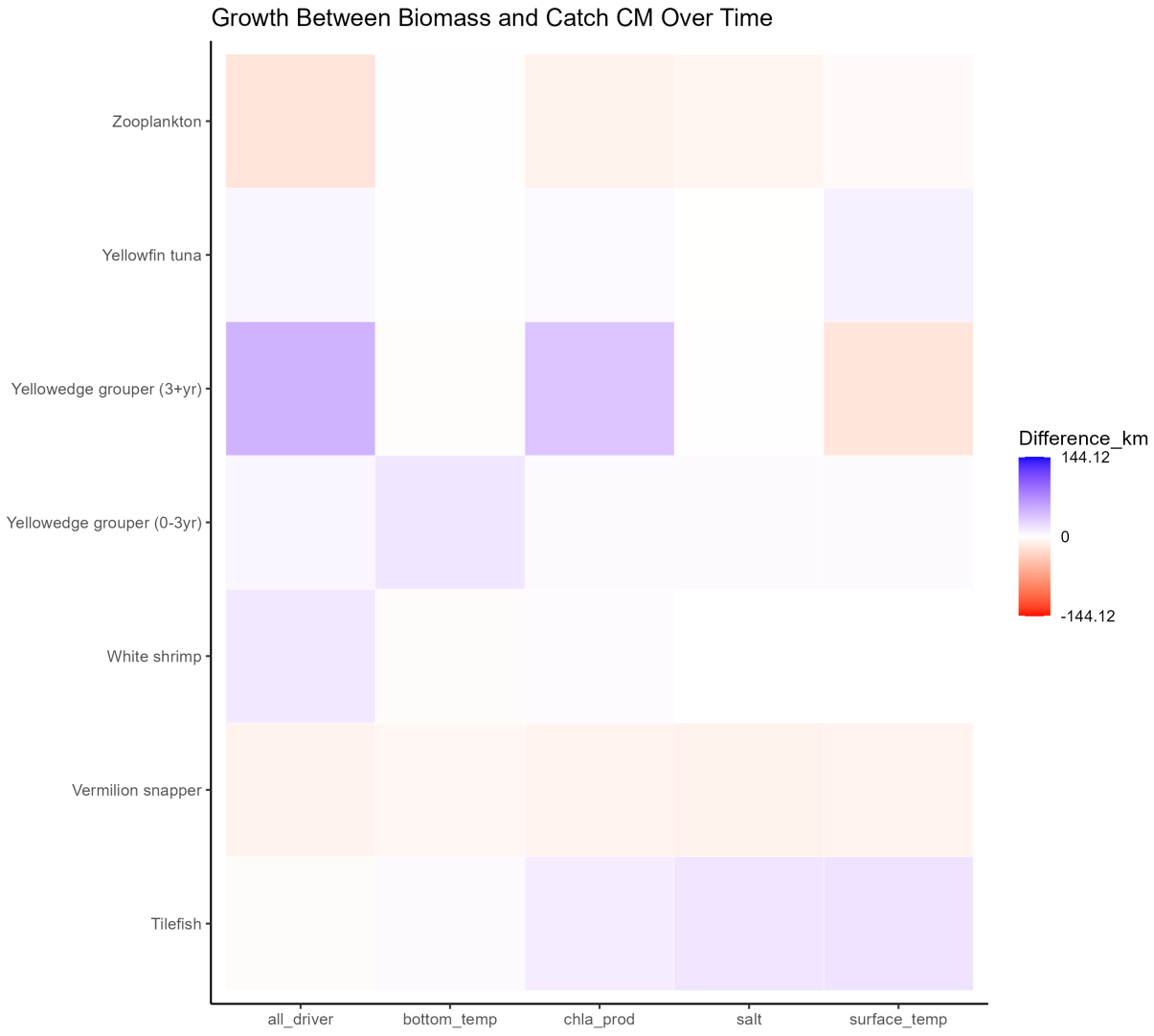

Landings comparison to all_driver Scenario
n_Trawl_Bottom_Sh
ef invertebrate feed
n_Trawl_Bottom_Sh
Sea trout
n_Trawl_Bottom_Sh
Sessile epifauna
n_Trawl_Bottom_Sh
White shrimp
Rec Charterboat-
Amberjack
Rec Charterboat-
antic sharpnose sha
Rec Charterboat-
coastal invertebrate
Rec Charterboat-
Benthic piscivores
Rec Charterboat-
Billfish
Rec Charterboat-
Blacktip shark
Rec Charterboat-
Bluefin tuna
Rec Charterboat-
Deep-water grouper
Rec Charterboat-
coastal invertebrat
Rec Charterboat-
Gag grouper (0-3yr)
Rec Charterboat-
Gag grouper (3+yr)
Rec Charterboat-
Gray triggerfish
Rec Charterboat-
hore coastal piscivo
Rec Charterboat-
King mackerel (1+yr
Rec Charterboat-
Large coastal sharks
Rec Charterboat-
arge oceanic shark
Rec Charterboat-
Mutton snapper
Rec Charterboat-
Other snapper
Rec Charterboat-
Other tunas
Rec Charterboat-
agic coastal piscivo
Rec Charterboat-
Red drum
Rec Charterboat-
Red grouper (3+yr)
Rec Charterboat-
Red snapper (3+yr)
Rec Charterboat-
ef invertebrate feed
Rec Charterboat-
Reef omnivores
Rec Charterboat-
Reef piscivores
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
LaTex Shelf
MS River
WFS
Region
Spearman
Correlation
1
0
-1


Landings comparison to all_driver Scenario
Rec Charterboat-Sandbar shark
Rec Charterboat-Sea trout
Rec Charterboat-hallow-water groupe
Rec Charterboat-Skates-rays
Rec Charterboat-Small coastal sharks
Rec Charterboat-Vermilion snapper
Rec Charterboat-Yellowfin tuna
Rec Headboat-Amberjack
Rec Headboat-antic sharpnose sha
Rec Headboat-coastal invertebrate
Rec Headboat-Benthic piscivores
Rec Headboat-Billfish
Rec Headboat-Blacktip shark
Rec Headboat-Bluefin tuna
Rec Headboat-Coastal omnivores
Rec Headboat-Cobia
Rec Headboat-Deep-water grouper
Rec Headboat-coastal invertebrat
Rec Headboat-Dusky shark
Rec Headboat-Gag grouper (0-3yr)
Rec Headboat-Gag grouper (3+yr)
Rec Headboat-Goliath grouper
Rec Headboat-Gray triggerfish
Rec Headboat-hore coastal piscivo
Rec Headboat-King mackerel (1+yr
Rec Headboat-arge coastal sharks
Rec Headboat-arge oceanic shark
Rec Headboat-Other snapper
Rec Headboat-Other tunas
Rec Headboat-agic coastal piscivo
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1


Landings comparison to all_driver Scenario
Rec Headboat-Red drum
Rec Headboat-Red grouper (3+yr)
Rec Headboat-Red snapper (0yr)
Rec Headboat-Red snapper (1-2yr
Rec Headboat-Red snapper (3+yr)
Rec Headboat-ef invertebrate feed
Rec Headboat-Reef omnivores
Rec Headboat-Reef piscivores
Rec Headboat-Sandbar shark
Rec Headboat-ardine-herring-sca
Rec Headboat-Sea trout
Rec Headboat-hallow-water group
Rec Headboat-Skates-rays
Rec Headboat-Small coastal shark
Rec Headboat-anish mackerel (1+
Rec Headboat-Tilefish
Rec Headboat-Vermilion snapper
Rec Headboat-owedge grouper (3
Rec Headboat-Yellowfin tuna
Rec Private-Amberjack
Rec Private-antic sharpnose sha
Rec Private-coastal invertebrate
Rec Private-Benthic piscivores
Rec Private-Billfish
Rec Private-Blacktip shark
Rec Private-Coastal omnivores
Rec Private-Cobia
Rec Private-Deep-water groupe
Rec Private-coastal invertebrat
Rec Private-Dusky shark
surface_temp
salt
chla_prod
bottom_temp
Scenario
Dry Tortugas
LaTex Shelf
MS River
WFS
Region
Spearman Correlation
1
0
-1

Offset Biomass and Catch Center of Masses





Interpretation

- Bottom Temperature
  - Driving a lot of movement
  - That movement seems to be centered to the mouth of the Mississippi River
- Surface Temperature
  - The obvious choice for driving much of the patterns
  - Moves animals the furthest, but not all of them
- ChlA Production
  - Concentrates animals towards Mississippi River mouth
  - Negates much of the easterly movement of populations seen in the surface temperature scenario

Appendix

Visit this link for detailed outputs without plotting them.

Distribution Shifts

- Biomass
- Catch
- Fmort
- Discards
- Effort
- Habitat Capacity
- Indicators