Nonmetric Multidimensioanl Scaling-Functional group biomass

Data

- functional groups based on NOAA IEA feeding guilds (https://noaa-edab.github.io/tech-doc/aggroups.html)
- average across depth strata using the NOAA IEA procedure (https://noaa-edab.github.io/tech-doc/inshoresurvdat.html#data-analysis-29)

	Sea… <chr>	Reg… <int>	Y… <int>	benthivore <dbl>	benthos <dbl>	piscivore <dbl>	planktivore <dbl>	undefined <dbl>	YEAR_GR… <chr>
1	Fall	1	2000	30.60977	0.9329012	77.09522	13.07894	4.2592593	2000-2004
2	Fall	1	2001	47.61454	1.6392593	129.71385	27.03765	3.4701323	2000-2004
3	Fall	1	2002	18.78933	0.1253846	124.10729	21.38419	0.3071276	2000-2004
4	Fall	1	2003	52.99875	0.0500000	114.75687	29.33979	6.7406250	2000-2004
5	Fall	1	2004	28.93660	0.0450000	347.72374	113.07280	4.2019335	2000-2004
6	Fall	1	2005	41.88070	0.0277193	327.19086	30.81101	10.1458814	2005-2009

6 rows | 1-10 of 14 columns

Set up data for NMDS

- split community matrix into two dataframes- one for grouping variables and one for species biomass
- calculate dissimilarity matrix with Bray-Curtis distances

```
#set up final grouping data into dataframe
ME_group_data<-trawl_data_arrange[, c(1,2,3,9,10,11,12,13)]
ME_NMDS_data<-as.matrix(trawl_data_arrange[,4:8])

#calculate distance matrix
ME_NMDS_distance<- vegdist(ME_NMDS_data, method="bray")
```

Run the NMDS and extract scores

- change in community composition
- uses rank order
- stress < 0.2 is good, < 0.1 is great, <0.05 is excellent representation in reduced dimensions

```
ME_NMDS=metaMDS(ME_NMDS_distance, # Our community-by-species matrix
                k=2, # The number of reduced dimensions
                method="bray",
                trymax=200) #increase iterations
```

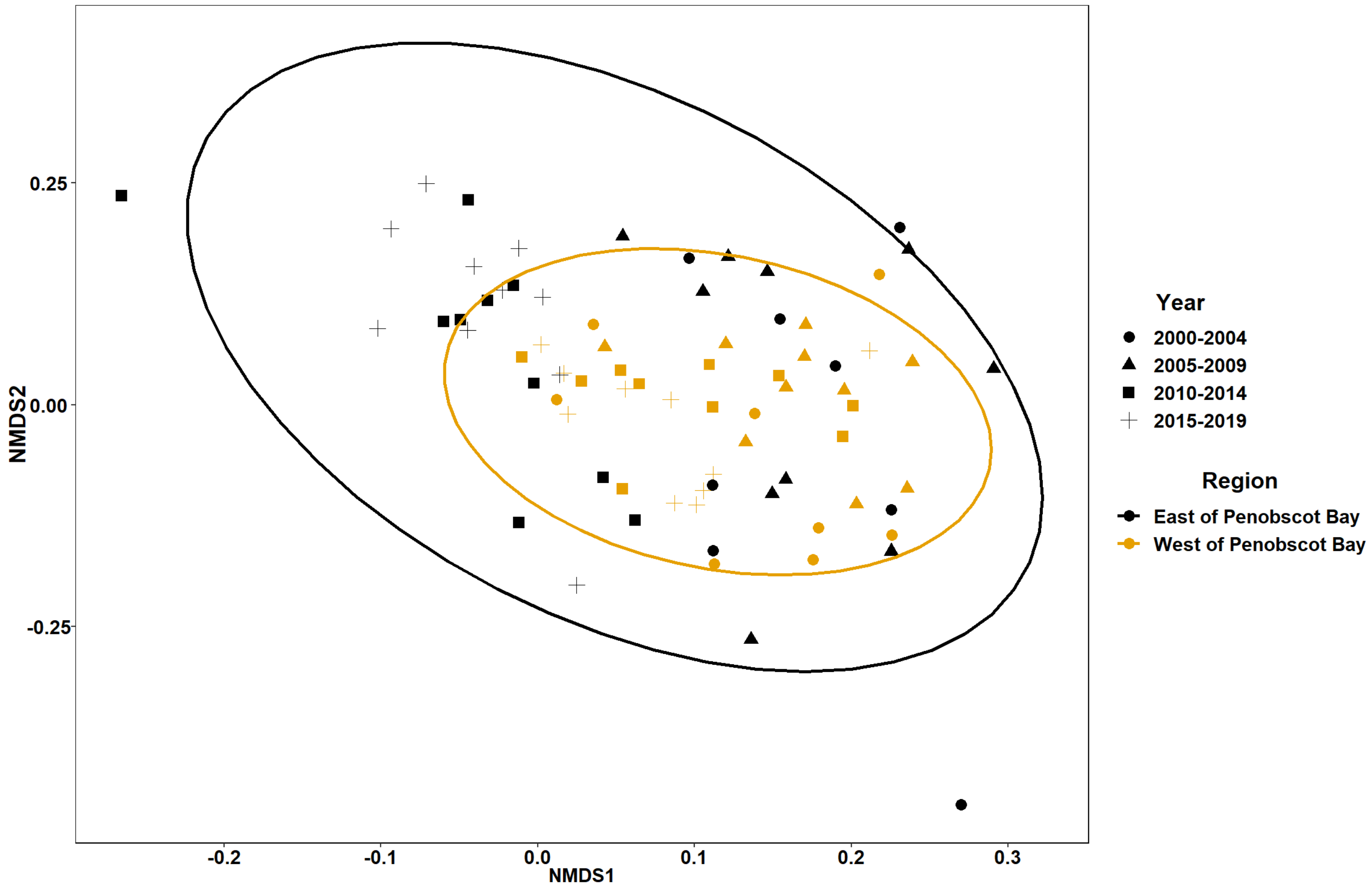
```
## Run 0 stress 0.1741426
## Run 1 stress 0.1756294
## Run 2 stress 0.1877507
## Run 3 stress 0.1746683
## Run 4 stress 0.1756323
## Run 5 stress 0.1741403
## ... New best solution
## ... Procrustes: rmse 0.0006199605  max resid 0.007893183
## ... Similar to previous best
## Run 6 stress 0.1741405
## ... Procrustes: rmse 7.09628e-05  max resid 0.0005544999
## ... Similar to previous best
## Run 7 stress 0.1773452
## Run 8 stress 0.1746632
## Run 9 stress 0.1756293
## Run 10 stress 0.1773453
## Run 11 stress 0.1773441
## Run 12 stress 0.1877506
## Run 13 stress 0.175632
## Run 14 stress 0.174663
## Run 15 stress 0.1756323
## Run 16 stress 0.1756295
## Run 17 stress 0.1756295
## Run 18 stress 0.1756293
## Run 19 stress 0.1877569
## Run 20 stress 0.1741425
## ... Procrustes: rmse 0.0006007181  max resid 0.007808326
## ... Similar to previous best
## *** Solution reached
```

```
#extract NMDS scores for ggplot
data.scores = as.data.frame(scores(ME_NMDS))
#add columns to data frame
data.scores$Stratum = trawl_data_arrange$Stratum
data.scores$Region = trawl_data_arrange$Region
data.scores$Year = trawl_data_arrange$Year
data.scores$Season= trawl_data_arrange$Season
data.scores$Year_groups= trawl_data_arrange$YEAR_GROUPS
data.scores$Year_decades= trawl_data_arrange$YEAR_DECADES
data.scores$Region_new=trawl_data_arrange$REGION_NEW
data.scores$Region_year=trawl_data_arrange$REGION_YEAR
data.scores$Season_year=trawl_data_arrange$SEASON_YEAR
```

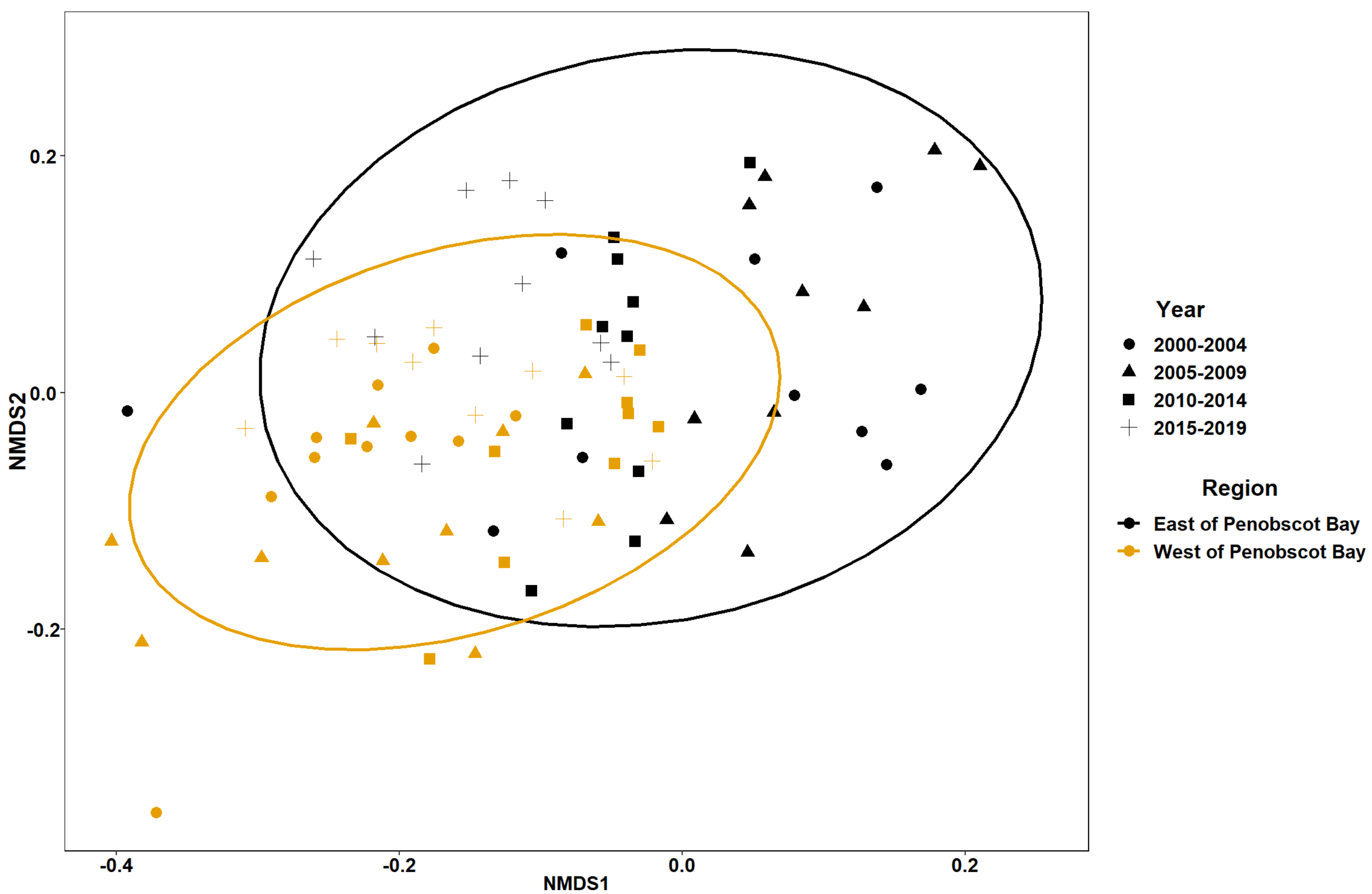
Plots

Region

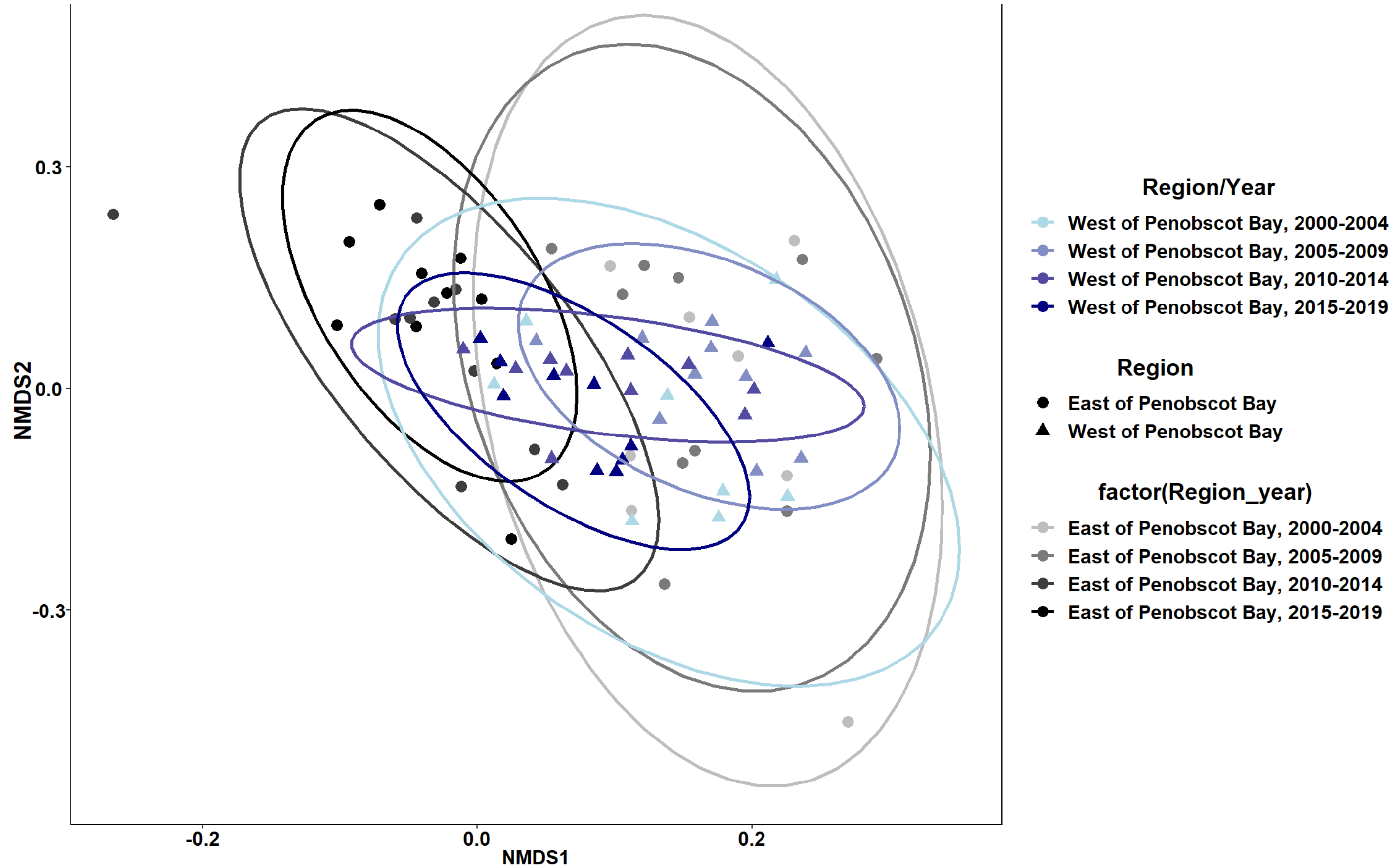
Spring



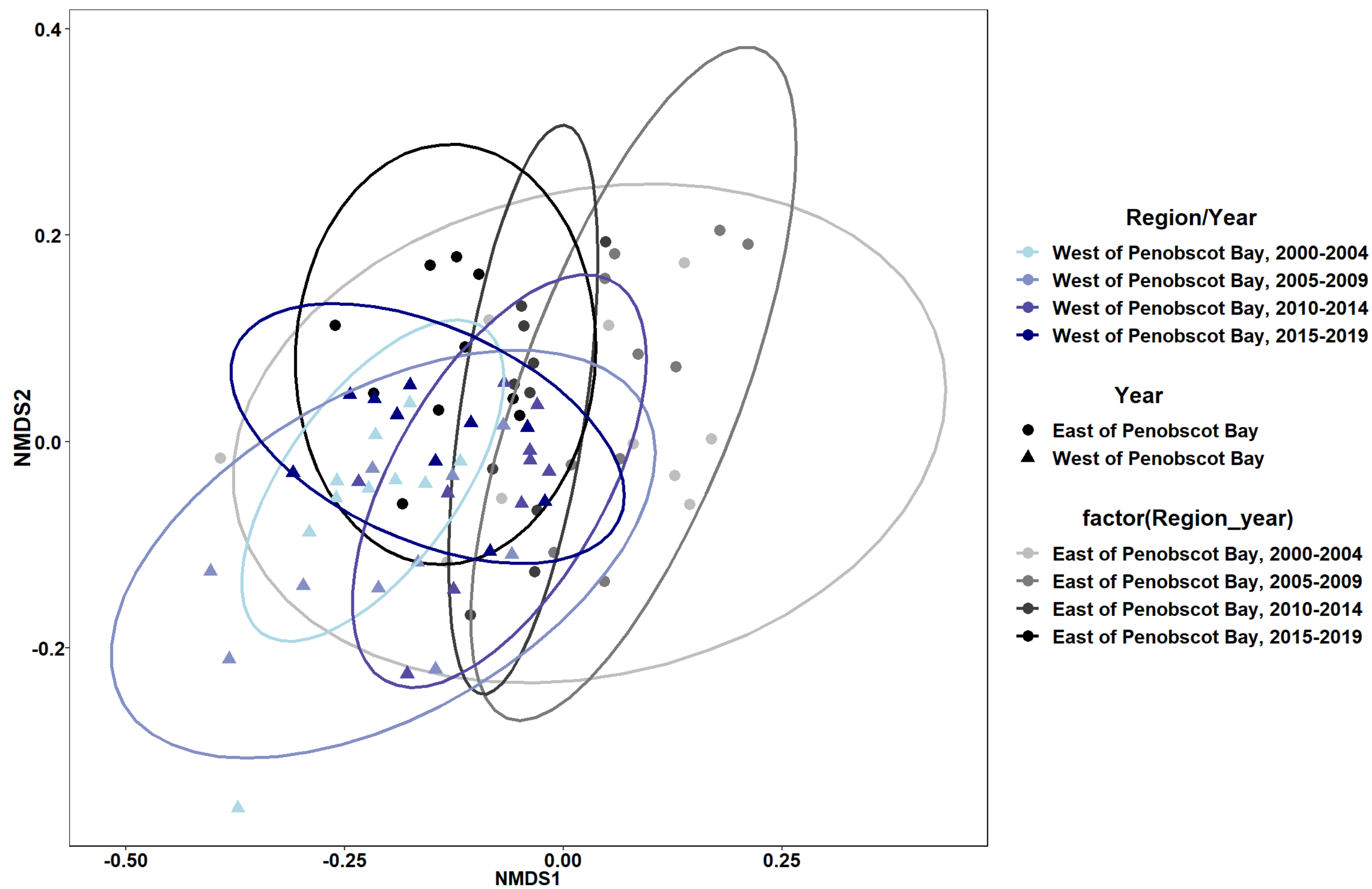
Fall



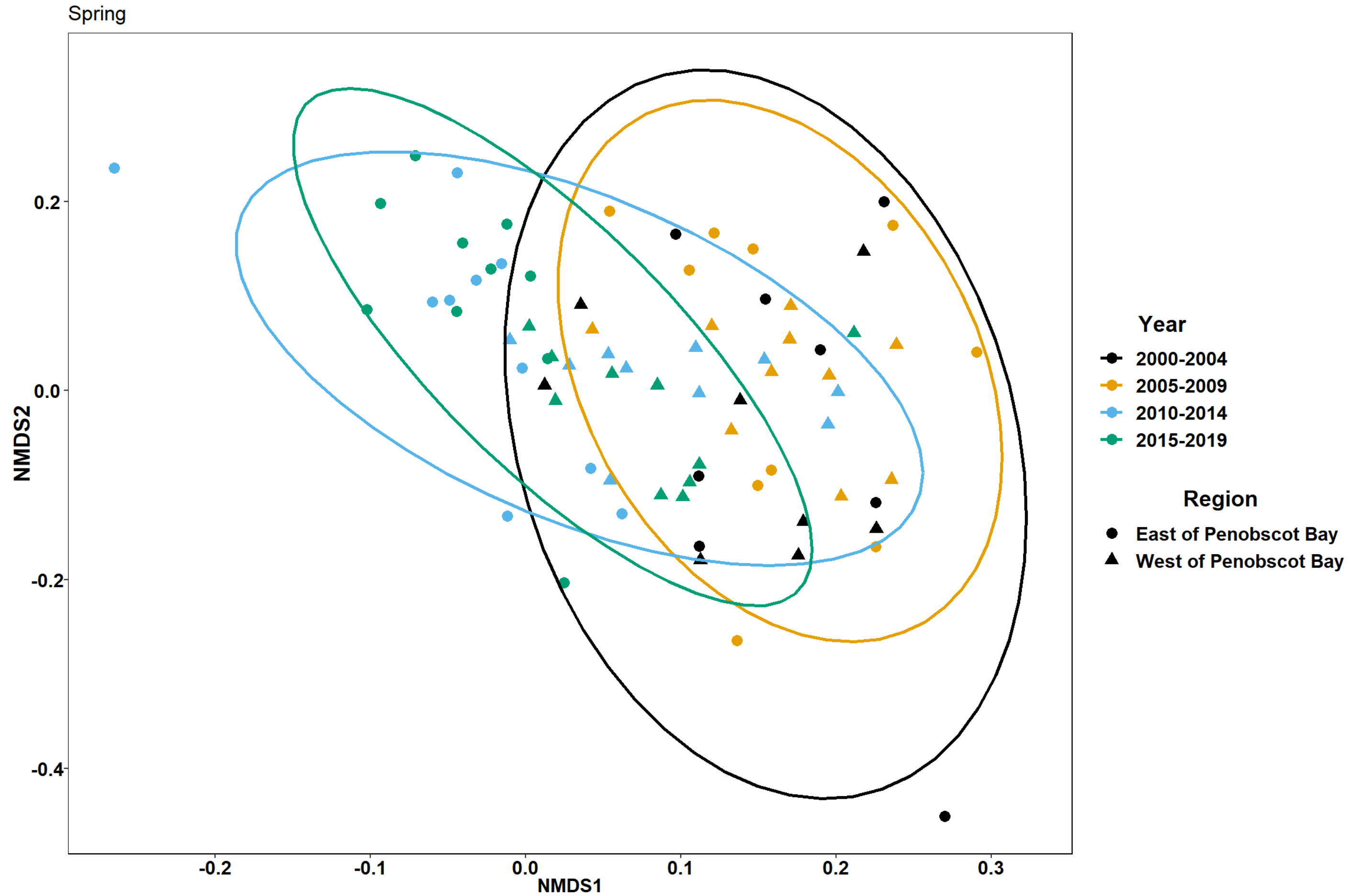
Spring


0.3
0.0
-0.3
NMDS2
-0.2
0.0
0.2
NMDS1
Region/Year
West of Penobscot Bay, 2000-2004
West of Penobscot Bay, 2005-2009
West of Penobscot Bay, 2010-2014
West of Penobscot Bay, 2015-2019
Region
East of Penobscot Bay
West of Penobscot Bay
factor(Region_year)
East of Penobscot Bay, 2000-2004
East of Penobscot Bay, 2005-2009
East of Penobscot Bay, 2010-2014
East of Penobscot Bay, 2015-2019

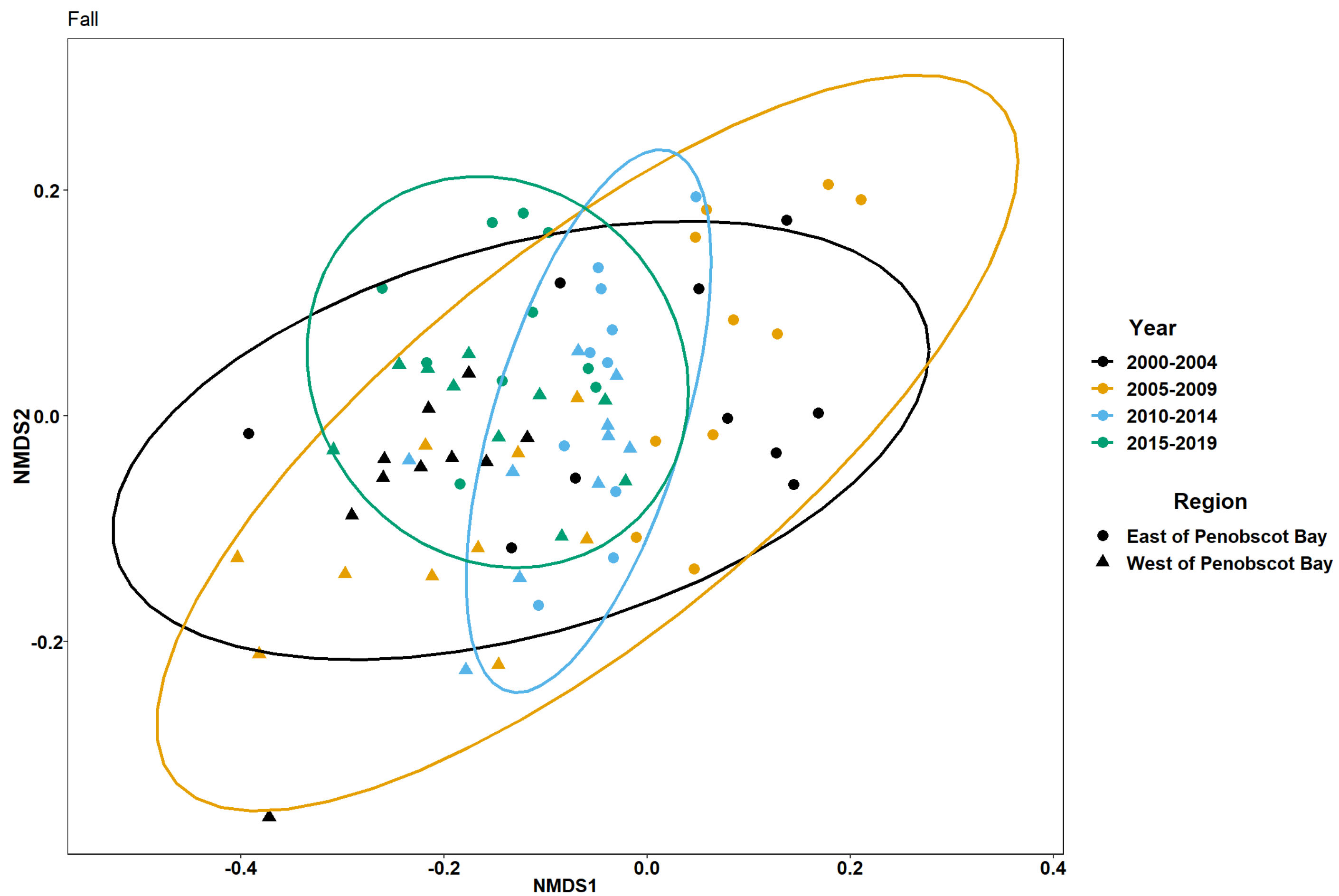
Fall


0.4
0.2
0.0
-0.2
NMDS2
-0.50
-0.25
0.00
0.25
NMDS1
Region/Year
West of Penobscot Bay, 2000-2004
West of Penobscot Bay, 2005-2009
West of Penobscot Bay, 2010-2014
West of Penobscot Bay, 2015-2019
Year
East of Penobscot Bay
West of Penobscot Bay
factor(Region_year)
East of Penobscot Bay, 2000-2004
East of Penobscot Bay, 2005-2009
East of Penobscot Bay, 2010-2014
East of Penobscot Bay, 2015-2019

Time



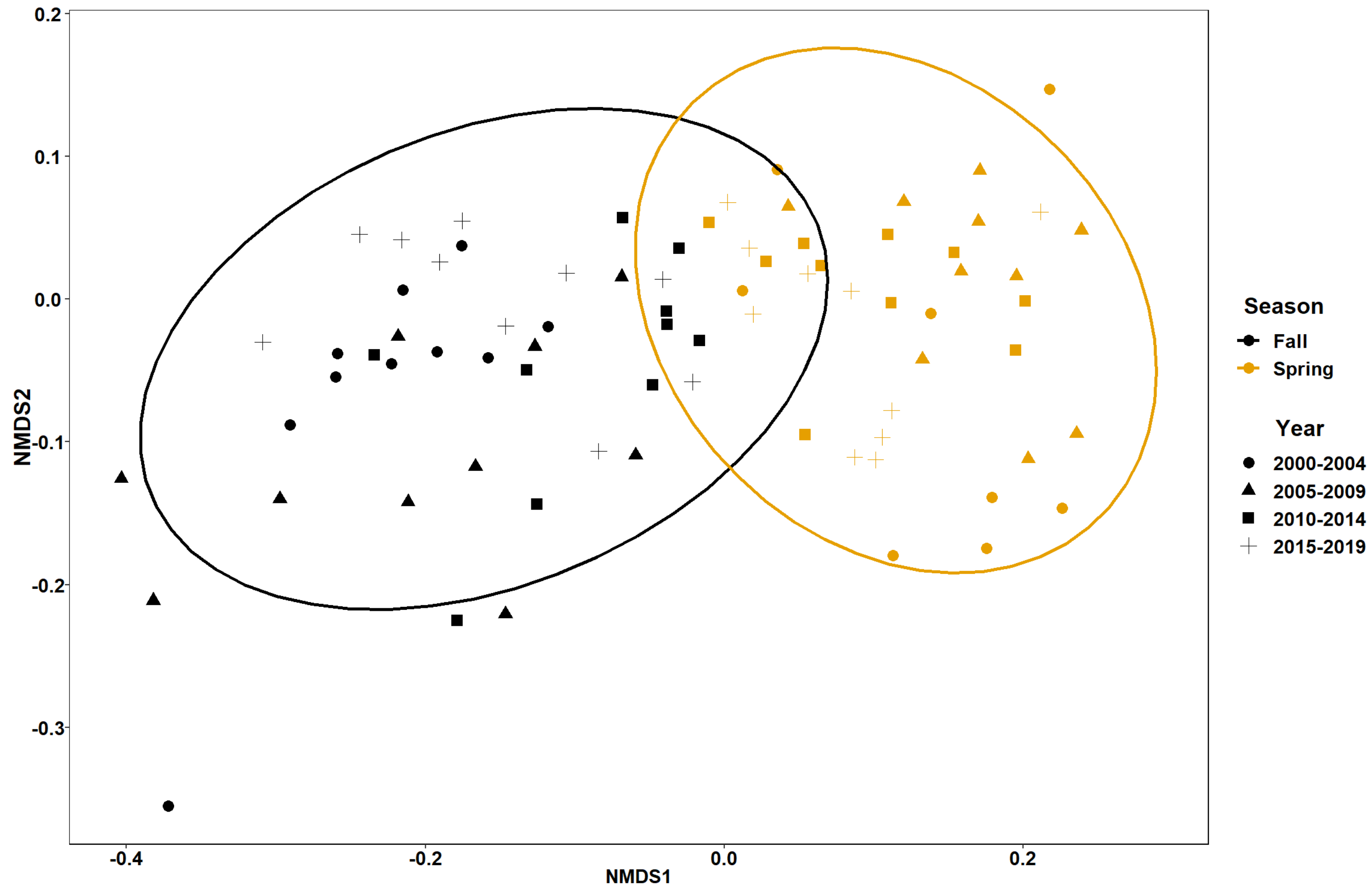
Spring
NMDS2
NMDS1
0.2
0.0
-0.2
-0.4
-0.2
-0.1
0.0
0.1
0.2
0.3
Year
2000-2004
2005-2009
2010-2014
2015-2019
Region
East of Penobscot Bay
West of Penobscot Bay



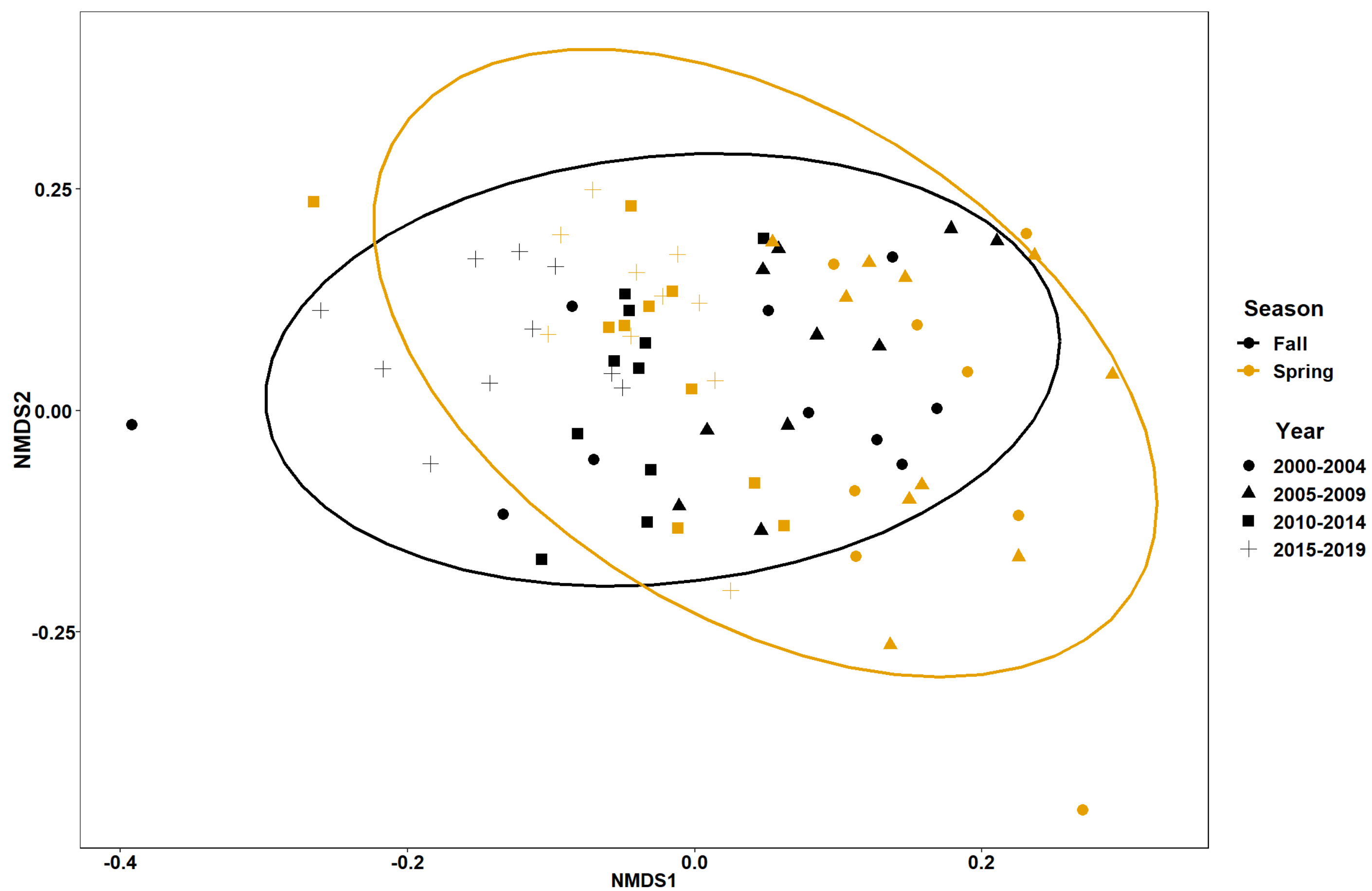
Fall
NMDS2
NMDS1
0.2
0.0
-0.2
-0.4
-0.2
0.0
0.2
0.4
Year
2000-2004
2005-2009
2010-2014
2015-2019
Region
East of Penobscot Bay
West of Penobscot Bay

Season

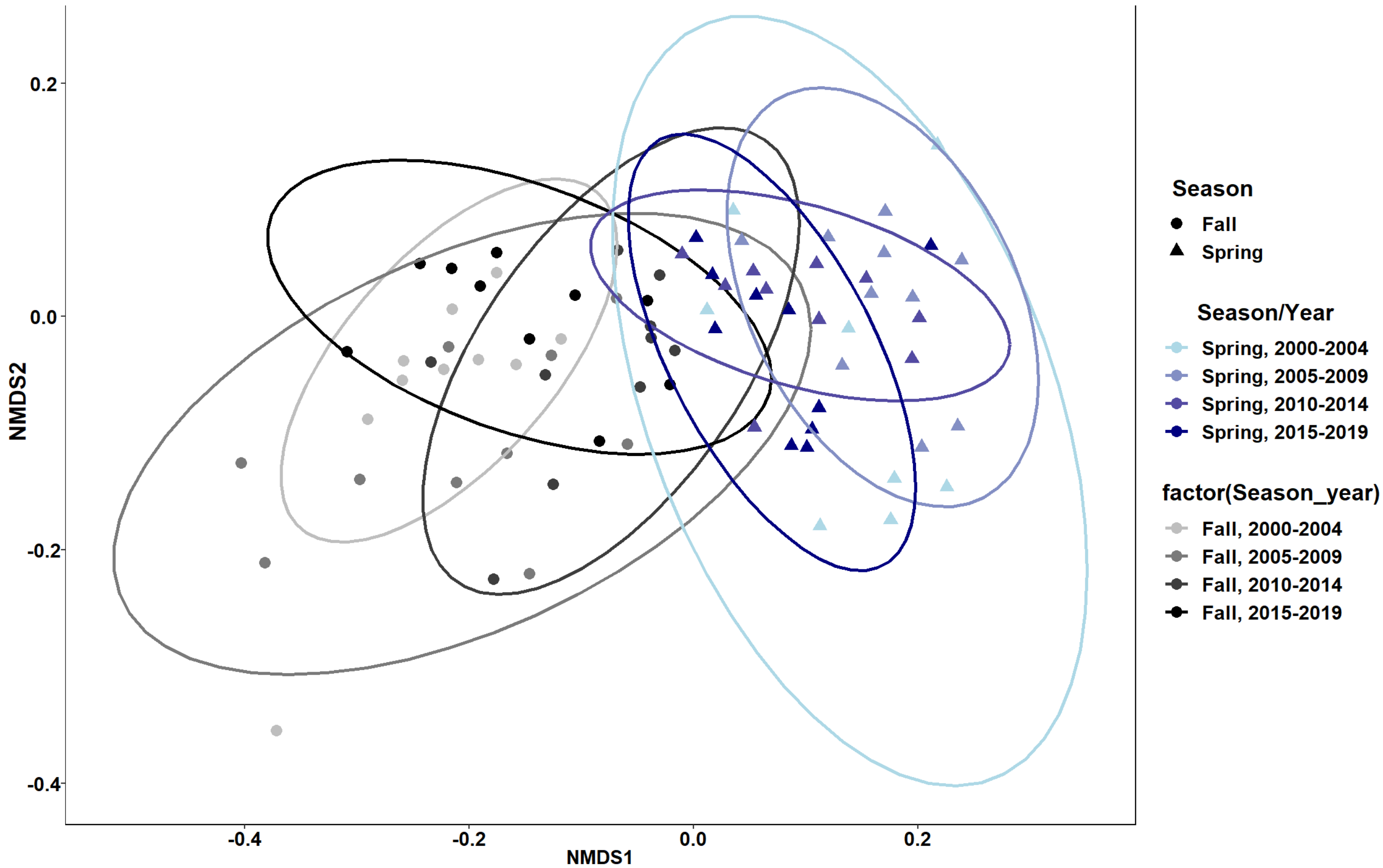
West



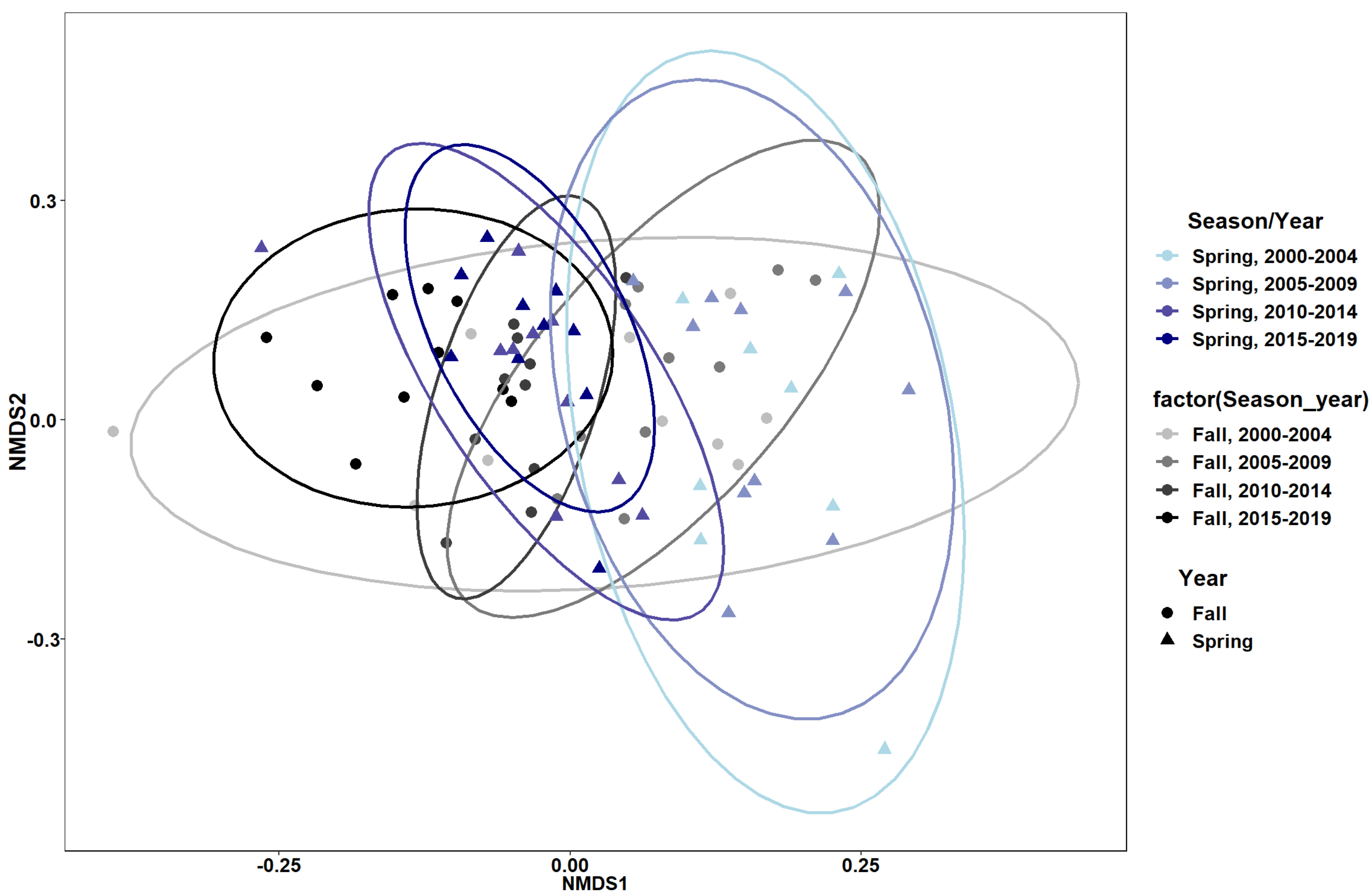
East



West


NMDS2
0.2
0.0
-0.2
-0.4
NMDS1
-0.4
-0.2
0.0
0.2
Season
Fall
Spring
Season/Year
Spring, 2000-2004
Spring, 2005-2009
Spring, 2010-2014
Spring, 2015-2019
factor(Season_year)
Fall, 2000-2004
Fall, 2005-2009
Fall, 2010-2014
Fall, 2015-2019

East


NMDS2
0.3
0.0
-0.3
NMDS1
-0.25
0.00
0.25
Season/Year
Spring, 2000-2004
Spring, 2005-2009
Spring, 2010-2014
Spring, 2015-2019
factor(Season_year)
Fall, 2000-2004
Fall, 2005-2009
Fall, 2010-2014
Fall, 2015-2019
Year
Fall
Spring