

Water quality and microbial source tracking in the Panhandle estuaries

Northwest Florida Estuary Water Quality Protection and Restoration
DEP

2023 Legislative appropriation to UWF



PENSACOLA & PERDIDO BAYS
ESTUARY PROGRAM



ST. ANDREW & ST. JOSEPH BAYS
ESTUARY PROGRAM



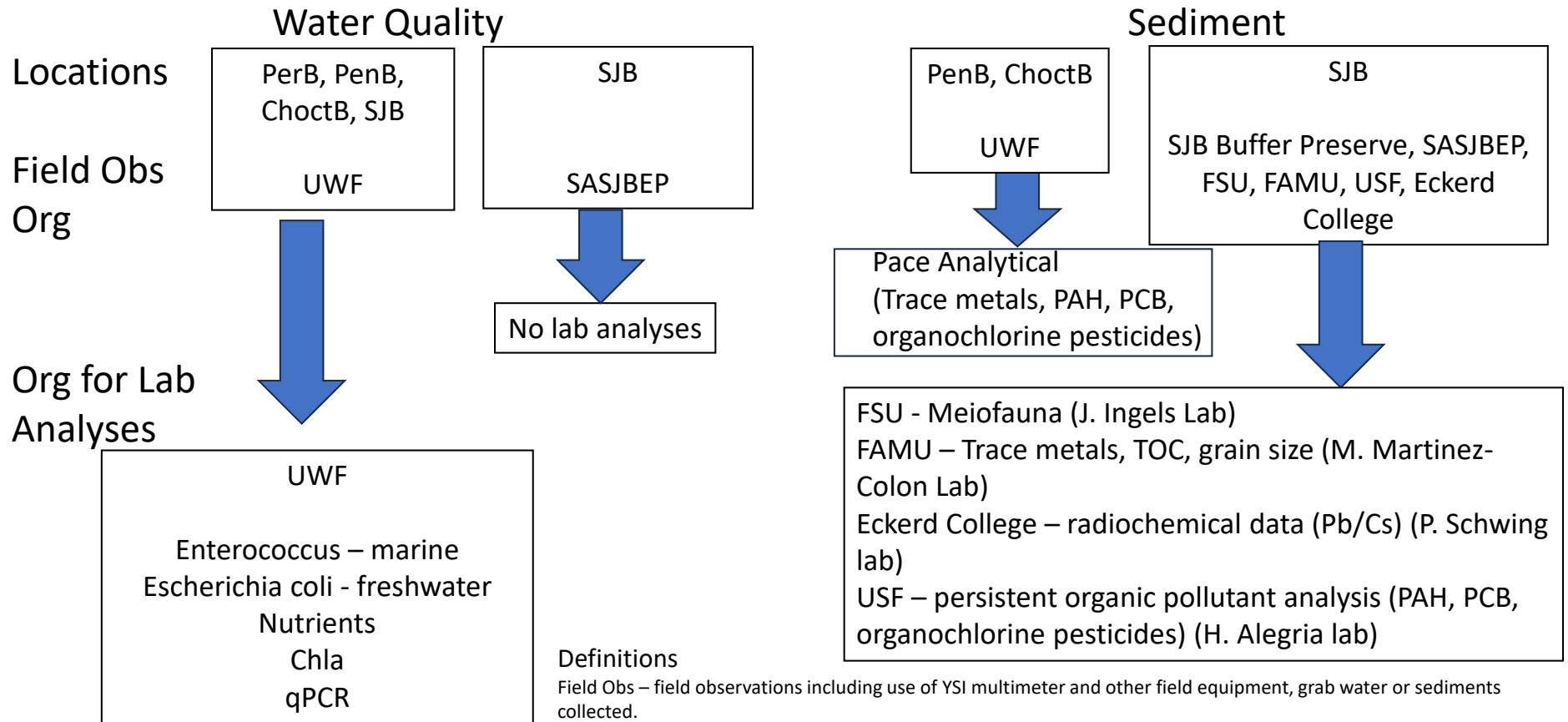
CHOCTAWHATCHEE BAY
ESTUARY PROGRAM



Goals

- Targeted water quality and sediment monitoring will be conducted for each of the three estuary programs:
 - Pensacola and Perdido Bays Estuary Program
 - Choctawhatchee Estuary Program
 - St. Andrews and St. Joseph Bays Estuary Program
- The objectives were:
 - 1) to understand the sources of fecal bacteria using microbial source tracking and relationships with nutrient inputs at priority locations within Estuary Program watersheds
 - 2) to examine benthic indicator invertebrates, sediment geochemistry and contaminant concentrations in St. Joseph, Pensacola and Choctawhatchee Bays.

Work plan



Definitions

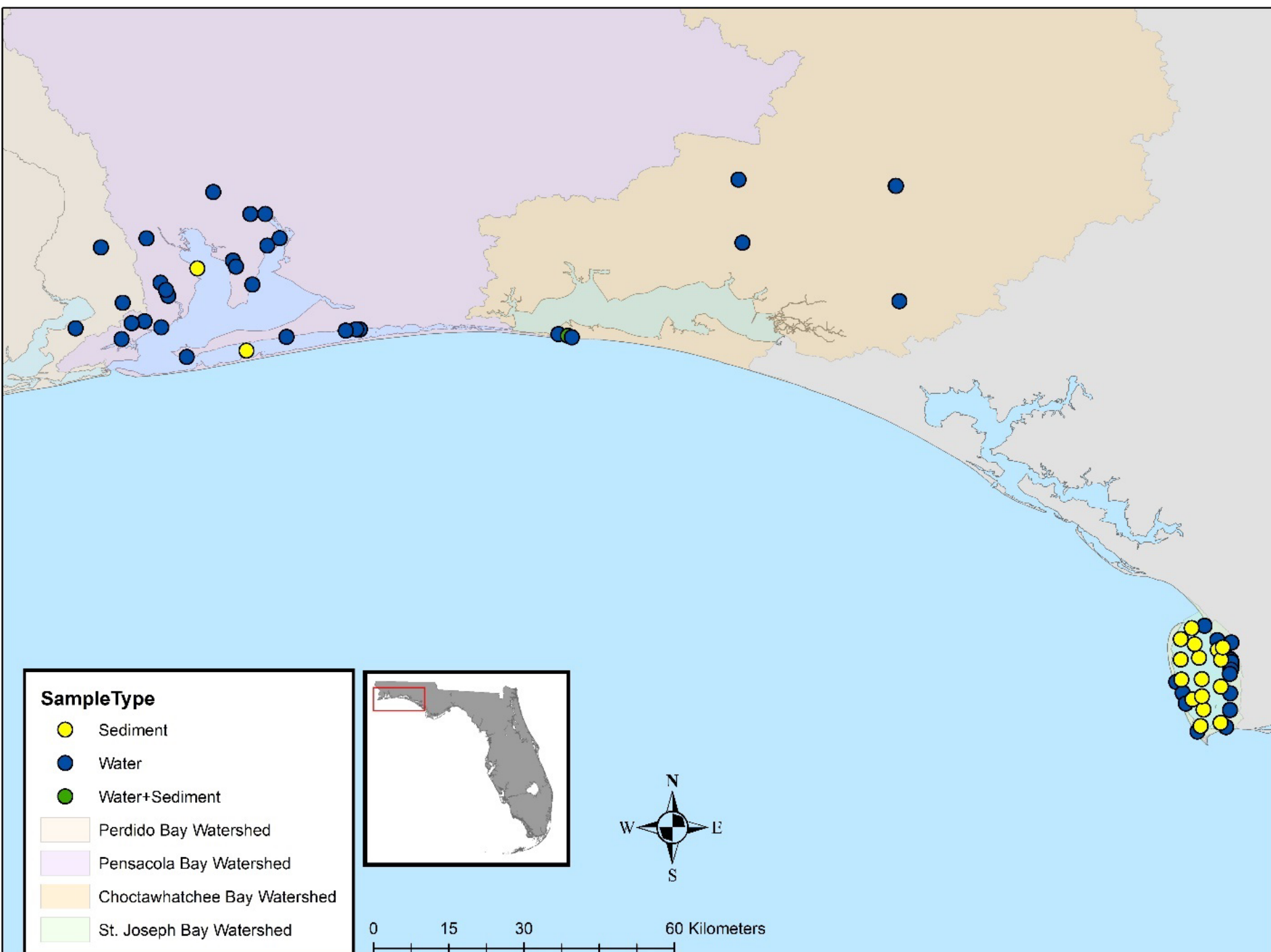
Field Obs – field observations including use of YSI multimeter and other field equipment, grab water or sediments collected.

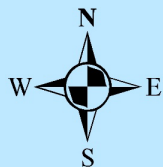
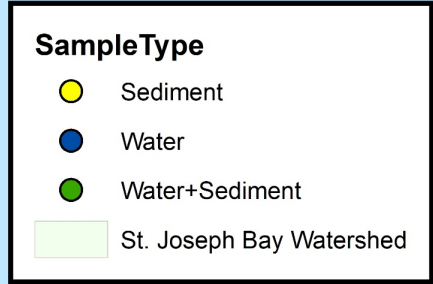
Org – Organization (UWF – University of West Florida, SASJBEP – St Andrew St Joseph Bay Estuary Program, FSU – Florida State University, FAMU – Florida A & M University, USF – University of South Florida)

Locations – PerB – Perdido Bay, PenB – Pensacola Bay, ChoctB – Choctawhatchee Bay, SJB – St Joseph Bay

Field and Laboratory Analyses

- Basic water quality parameters: temperature, salinity, conductivity, dissolved oxygen, pH, turbidity, water depth, light attenuation
- Grab water samples
 - Enterococcus (marine) and E. coli (freshwater)
 - Totals (total nitrogen, total phosphorus)
 - Dissolved (nitrate+nitrite, ammonium, dissolved inorganic phosphate)
 - Chlorophyll a
 - Color
 - Total suspended solids
- qPCR from water samples (FDEP protocols)
 - human-associated Bacteroidales (HF183)
 - dog-source Bacteroidales (DG3)
 - avian-source Bacteroidales (GFD, GULL2)

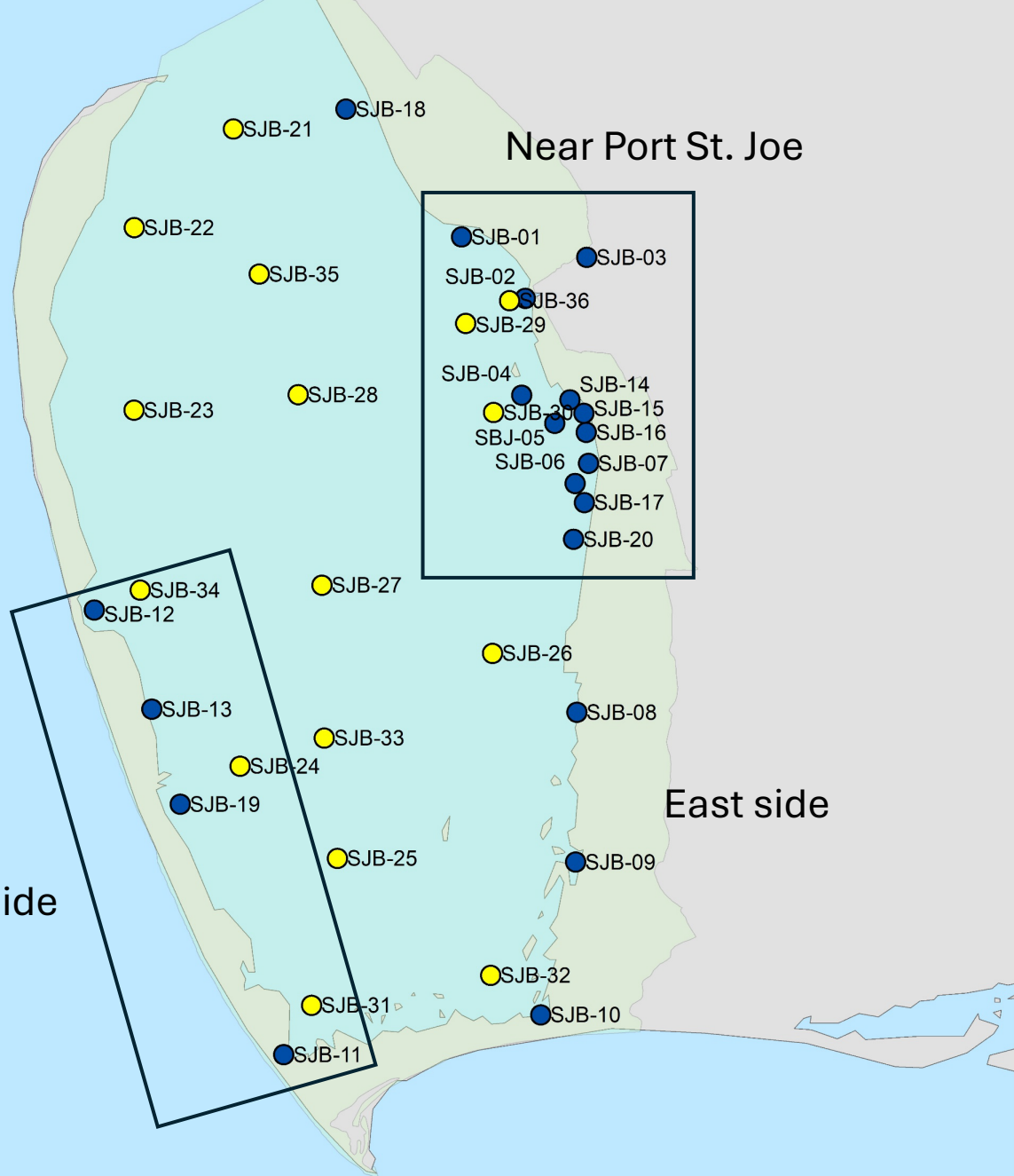




West side

Near Port St. Joe

East side



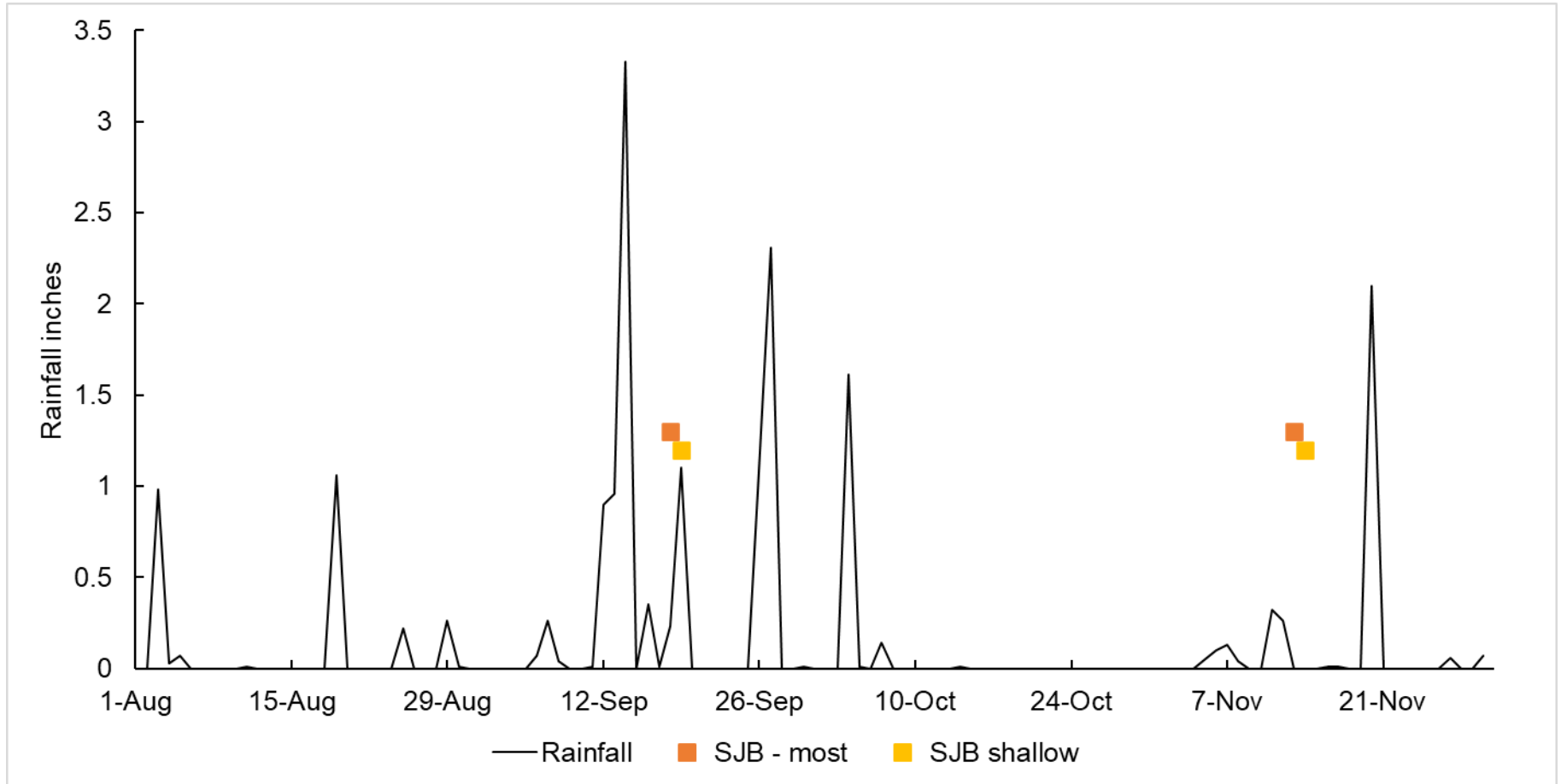
Sampling dates & sites

Dates Collected	Sites
Sept 18, 2024	SJB01-SJB07, SJB14-SJB18, SJB20
Sept 19, 2024	SJB08-SJB13, SJB19 shallowest seagrass sites
Nov 13, 2024	SJB01-SJB07, SJB14-SJB18, SJB20
Nov 14, 2024	SJB08B, SJB09B, SJB10, SJB11, SJB12 – by car

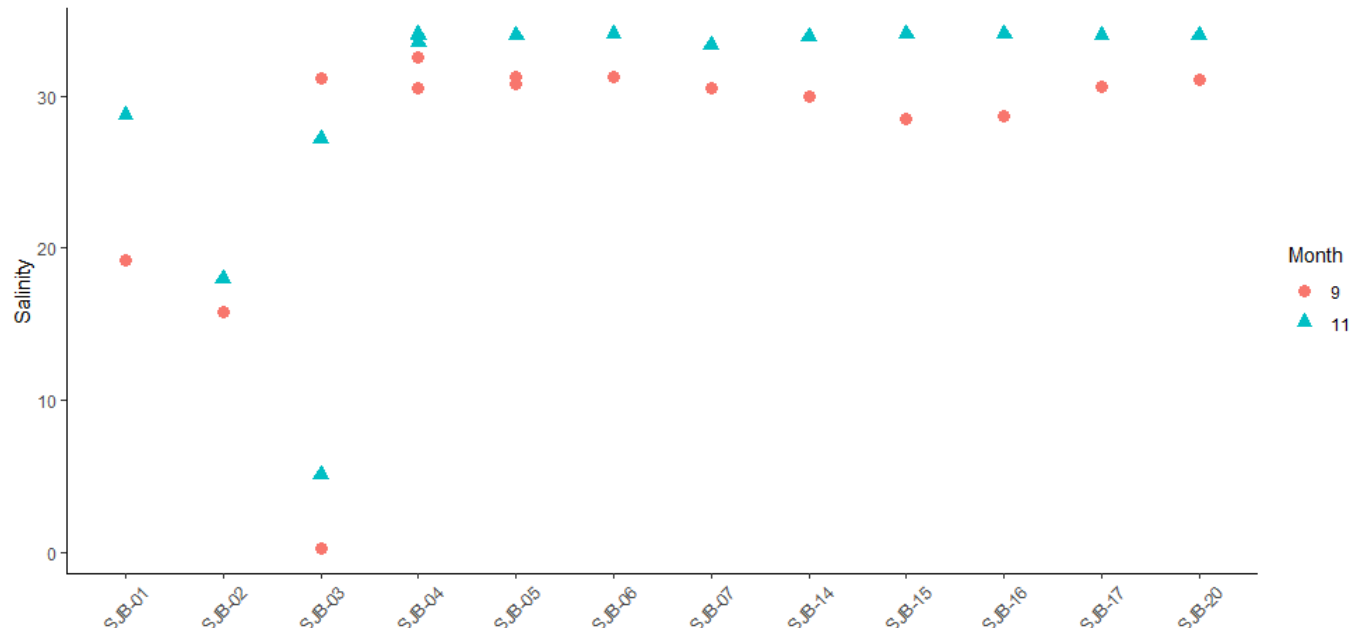
Low water/weather in November made it impossible to sample shallow sites by boat

- SJB08B in creek @ Presnell's Marina
- SJB09B creek nearest SJB Buffer Preserve Office
- SJB13, SJB19 – not sampled in November

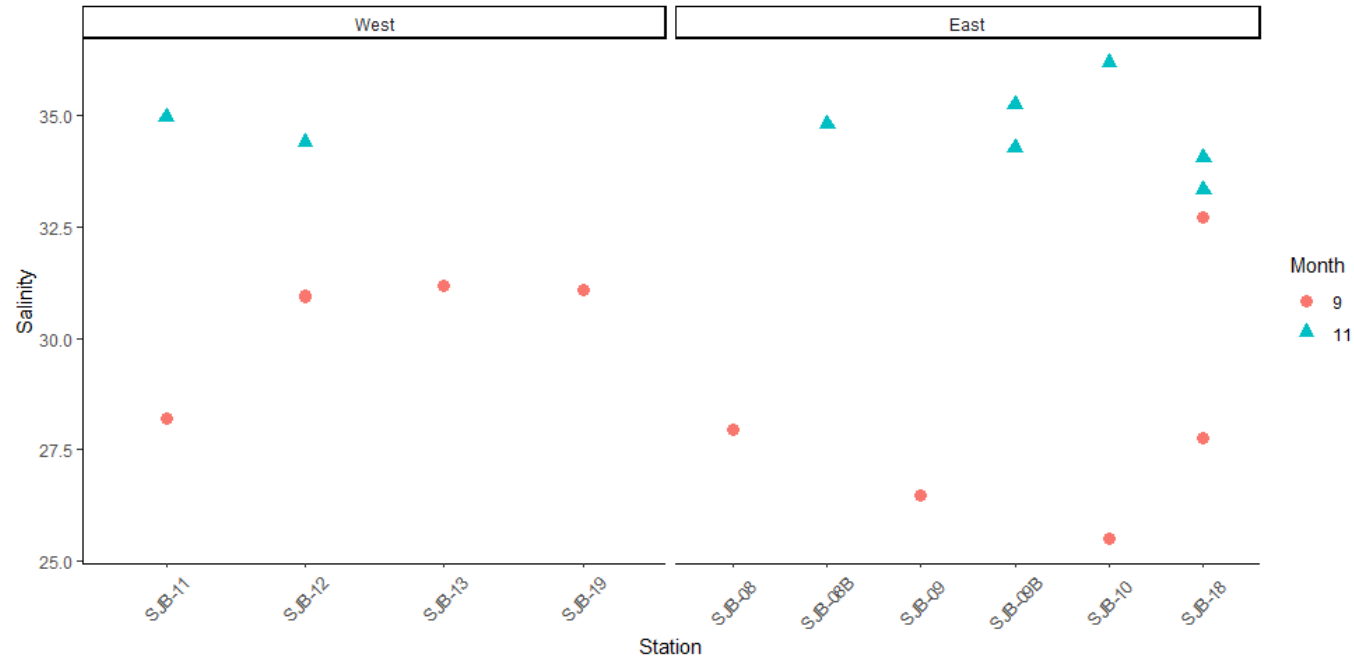
Environmental Conditions



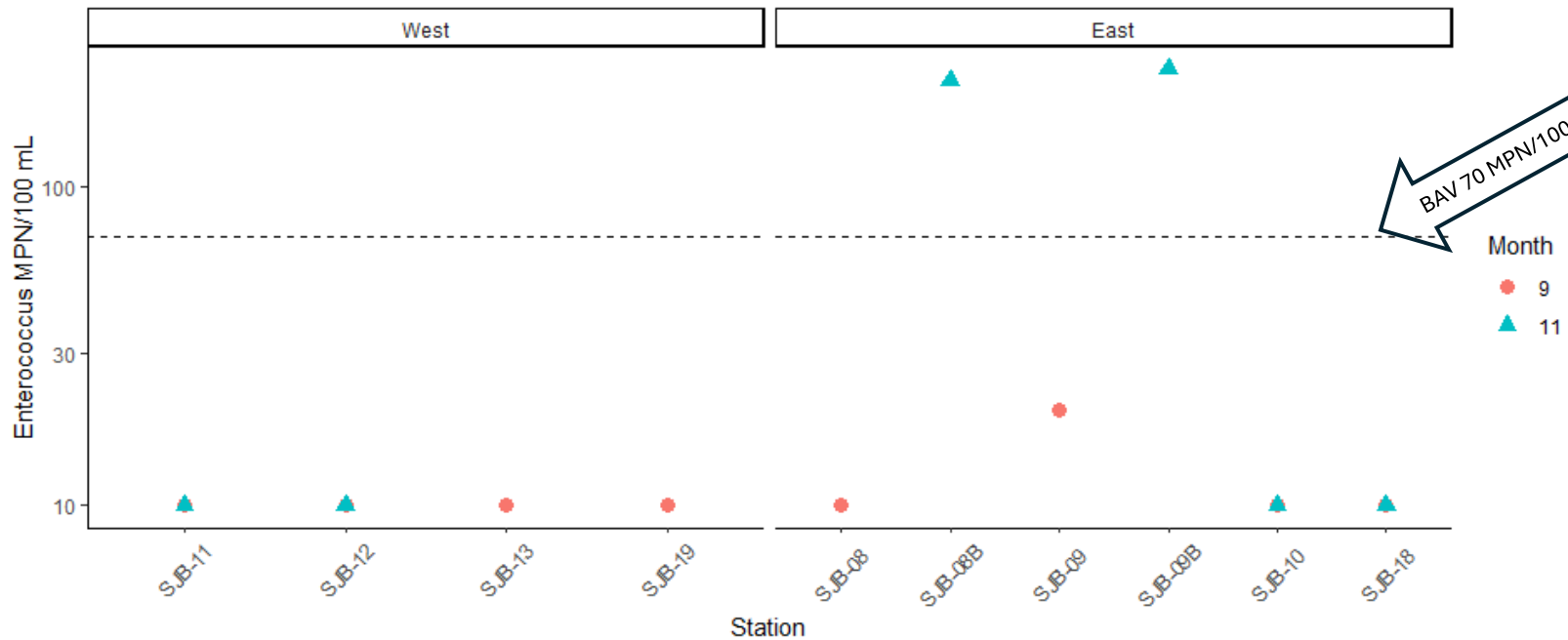
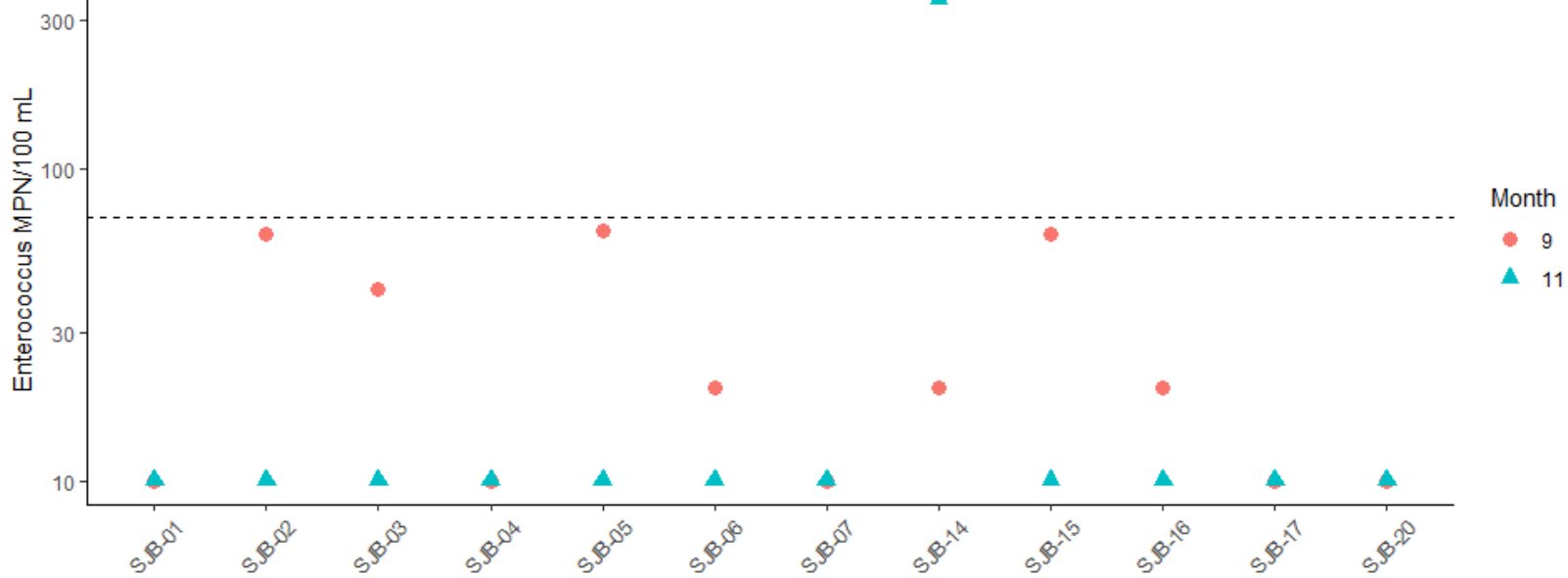
Salinity – lower in September



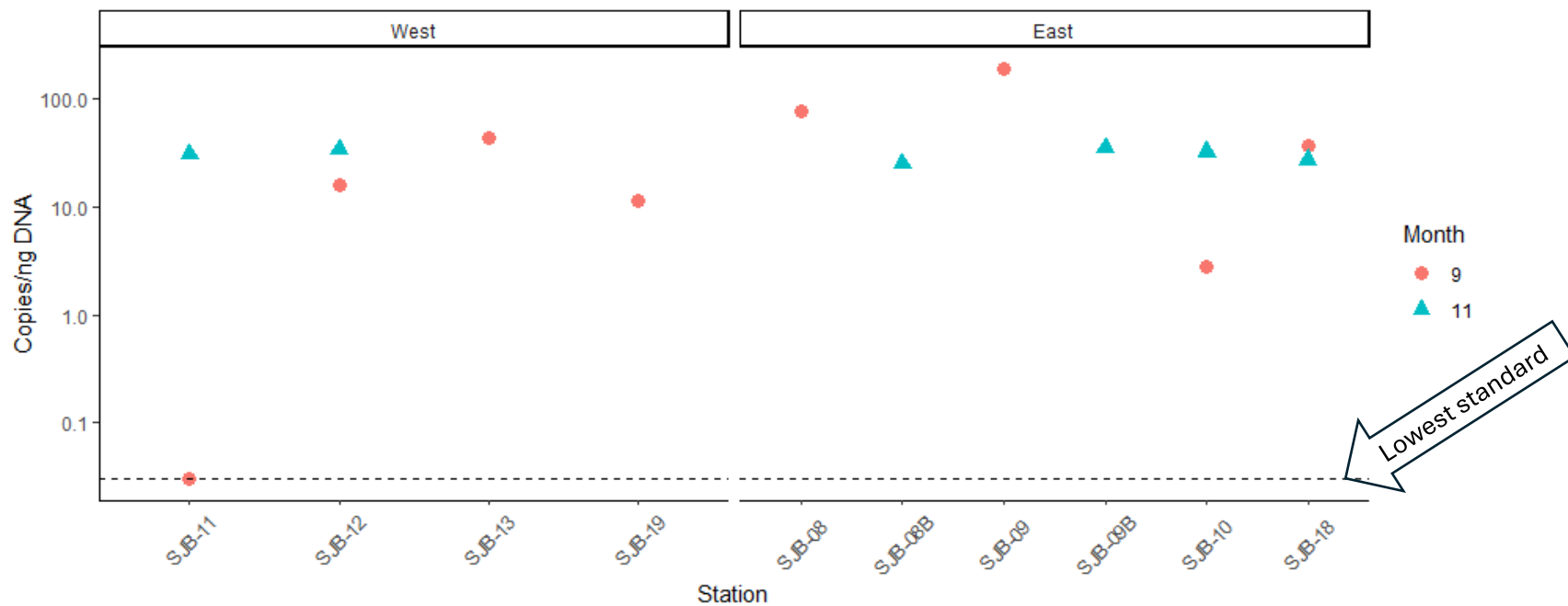
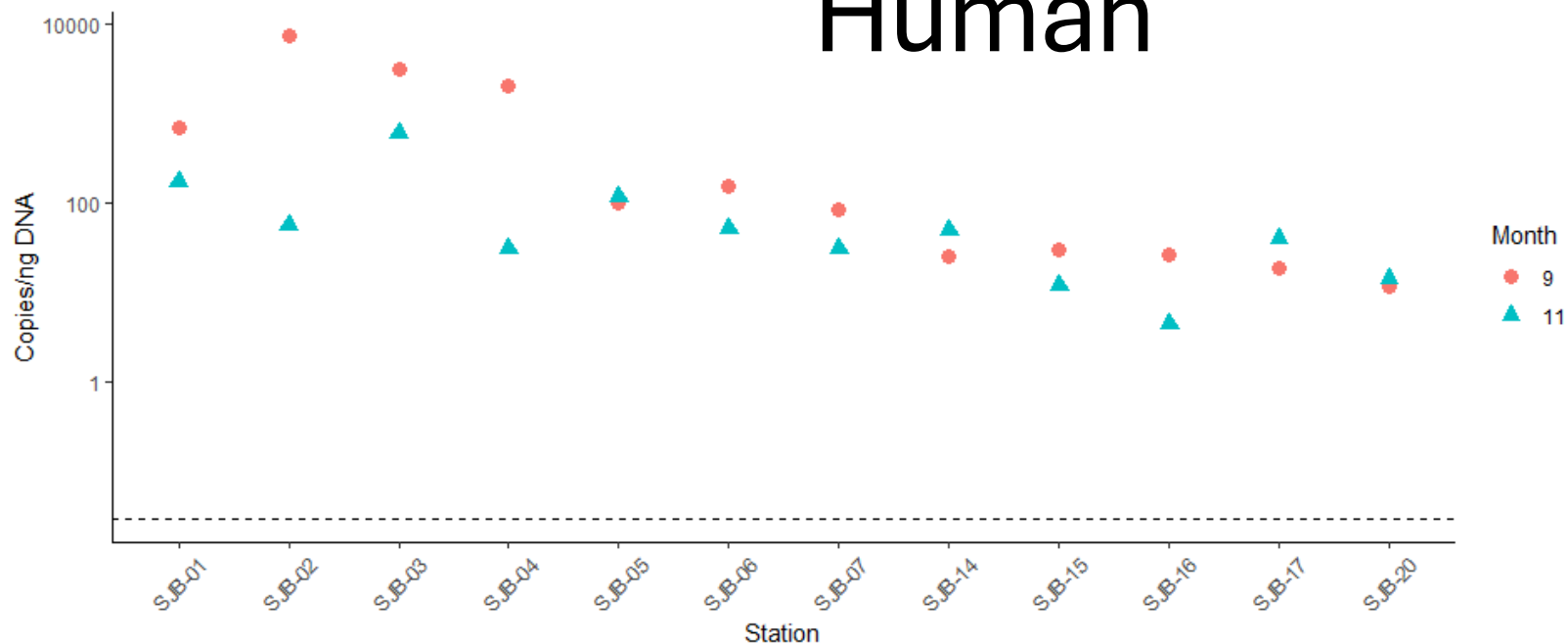
Change
in scale



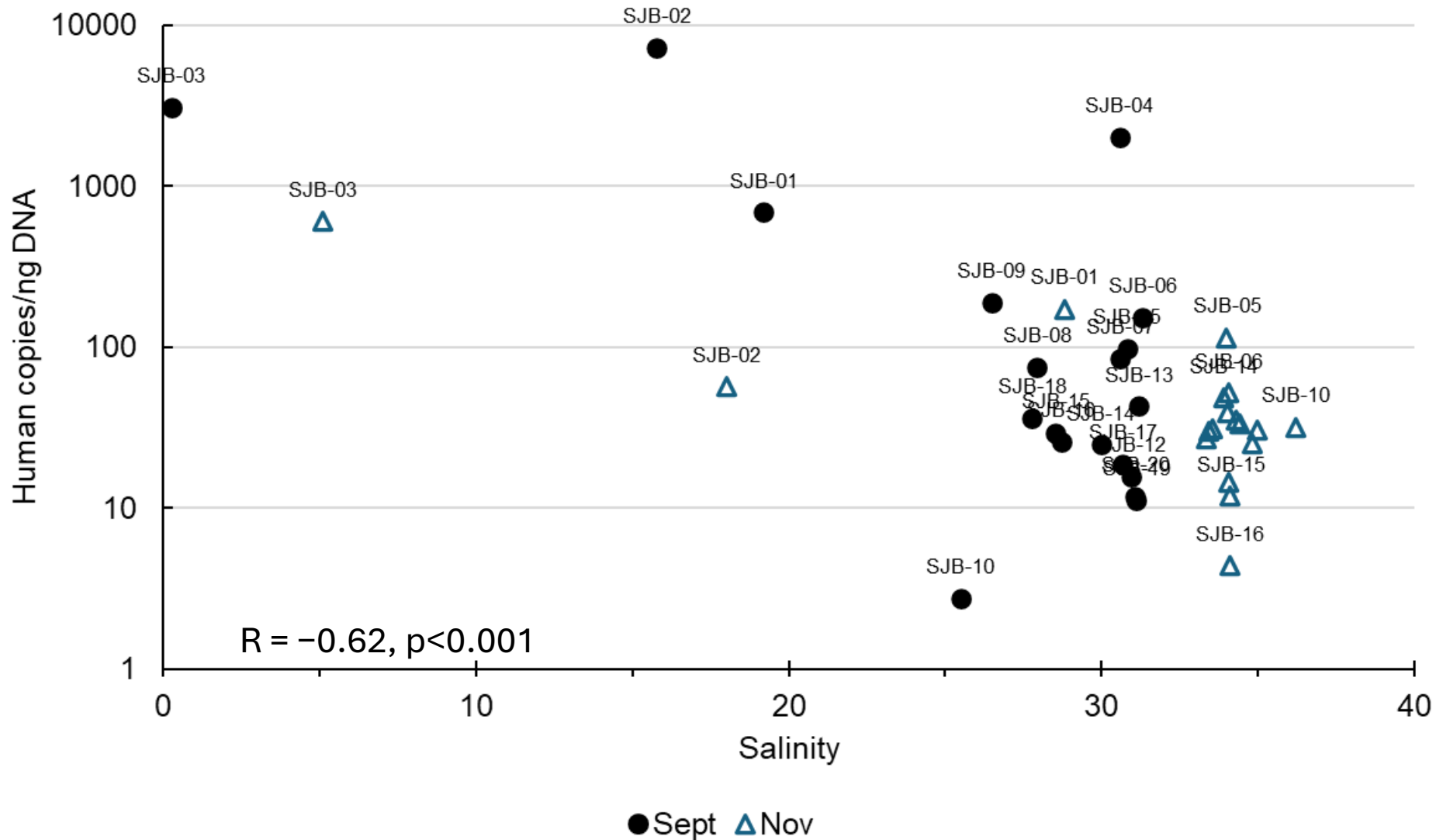
Enterococcus



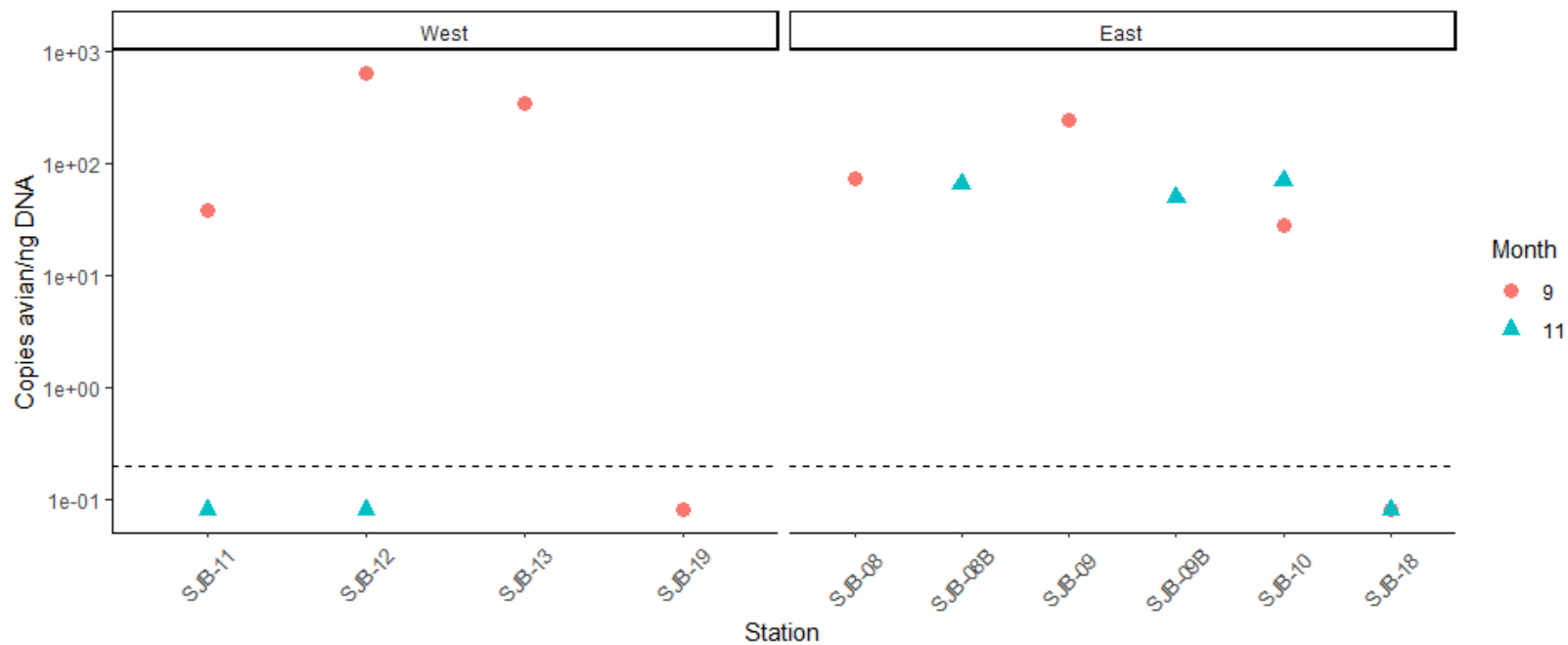
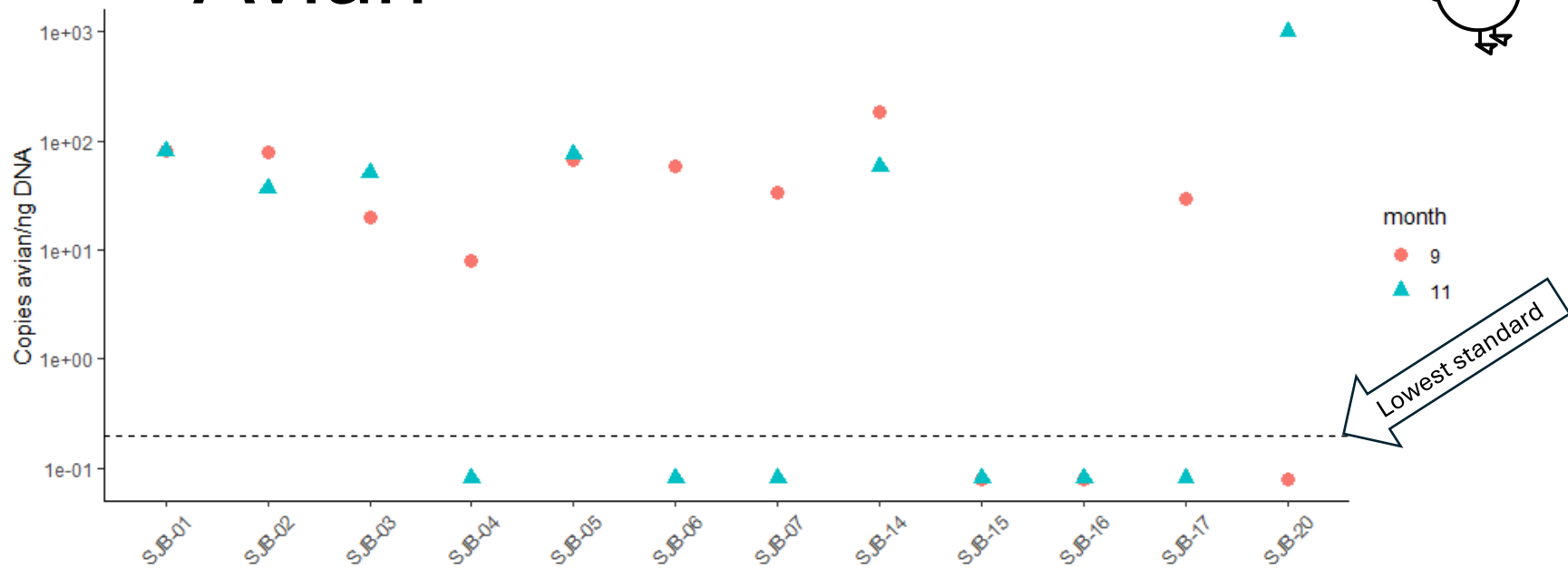
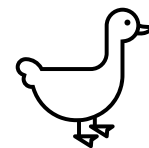
Human



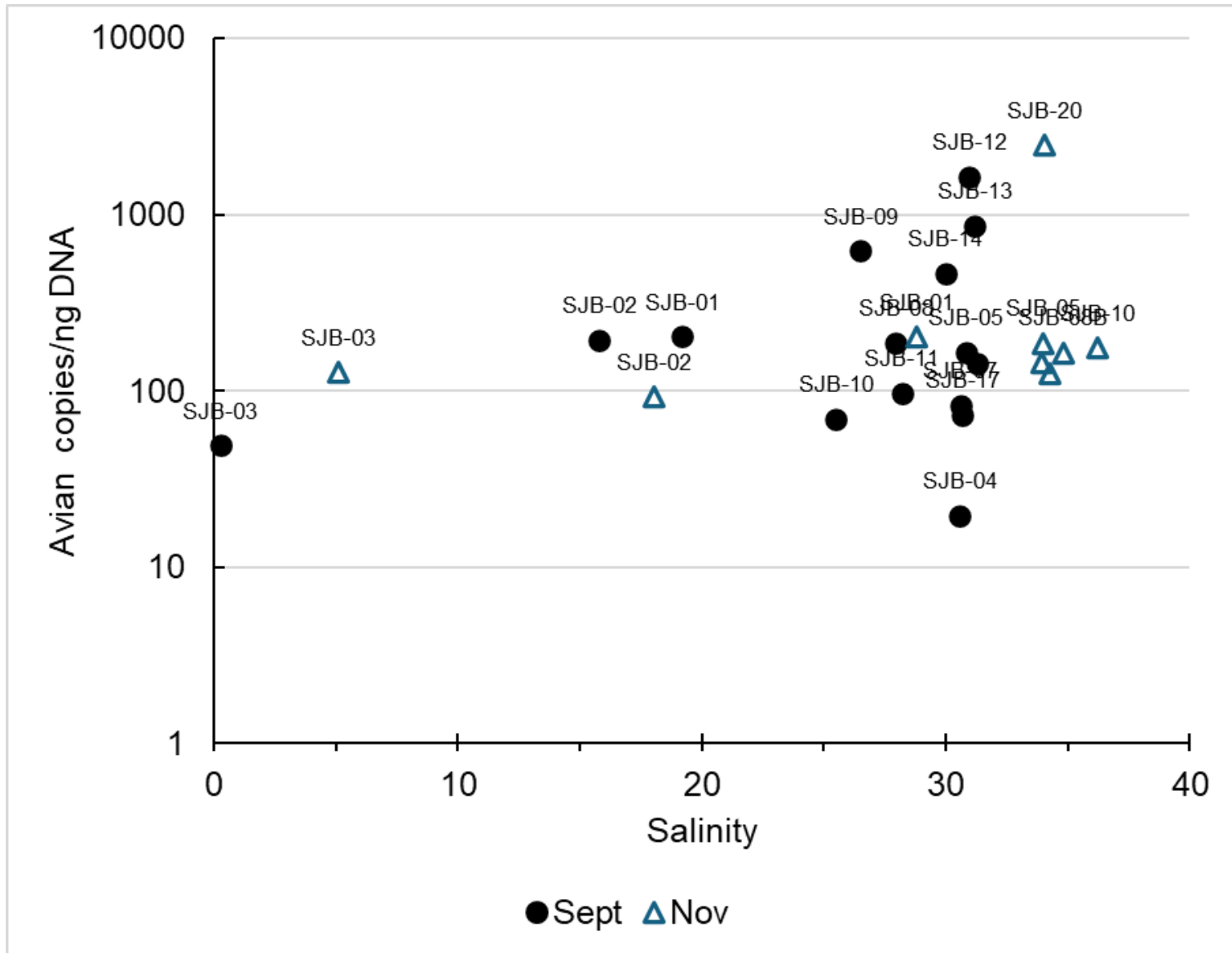
Negative relationship with salinity



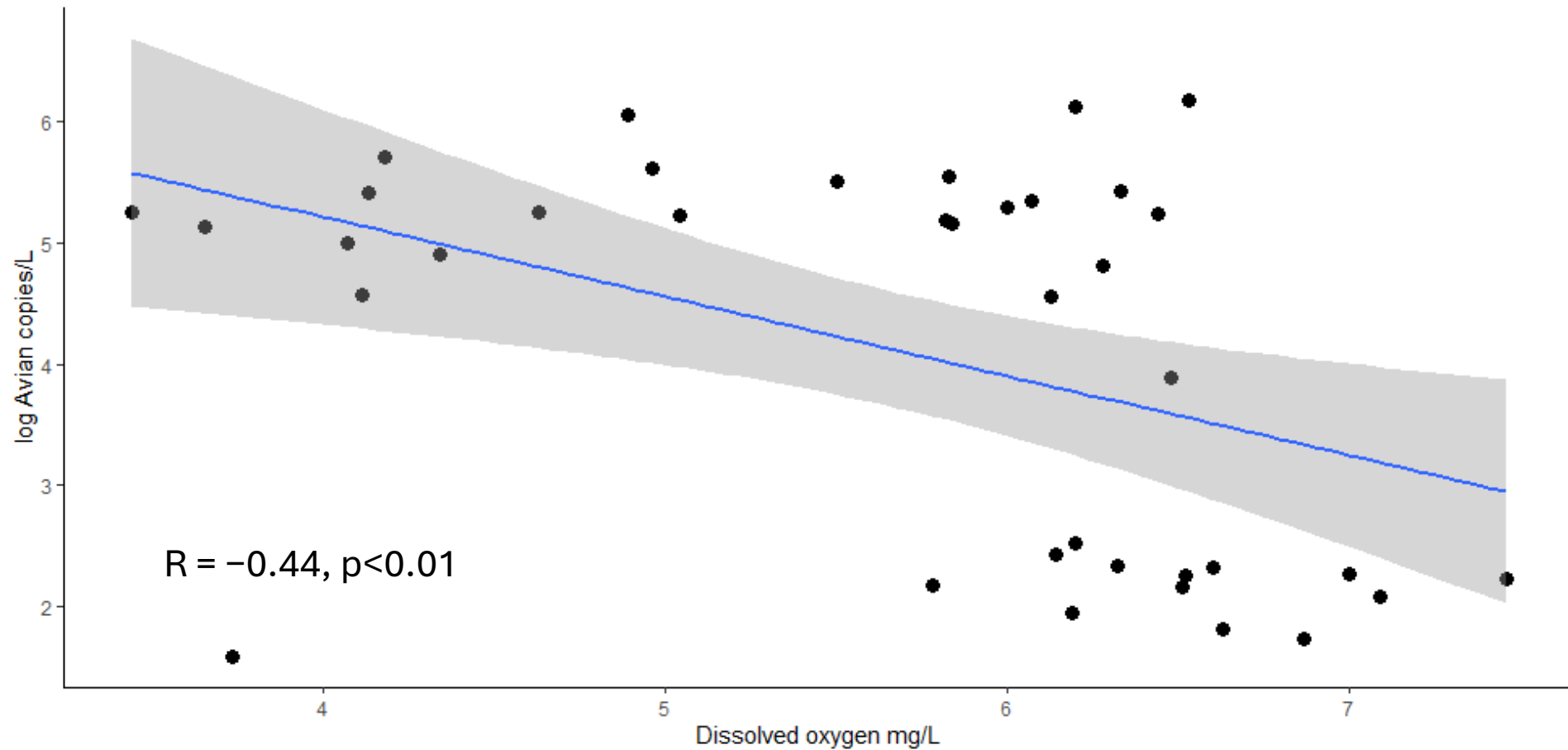
Avian



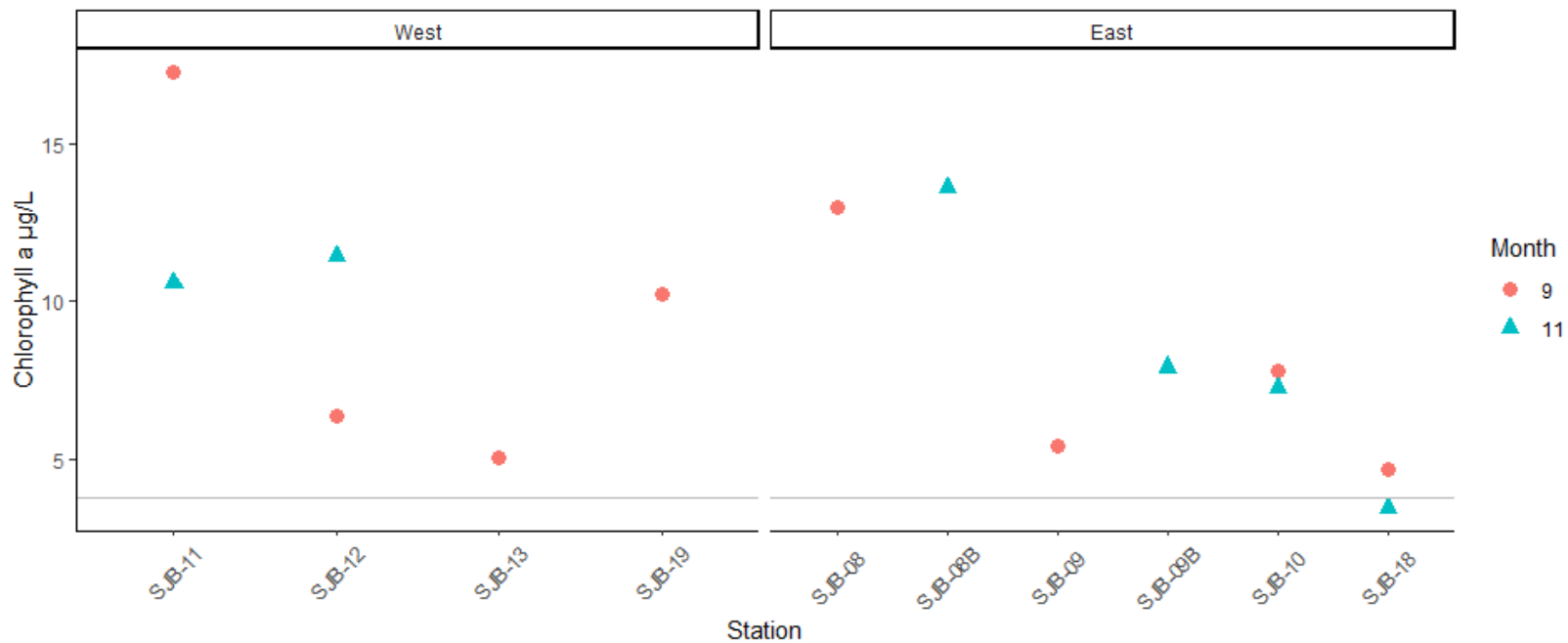
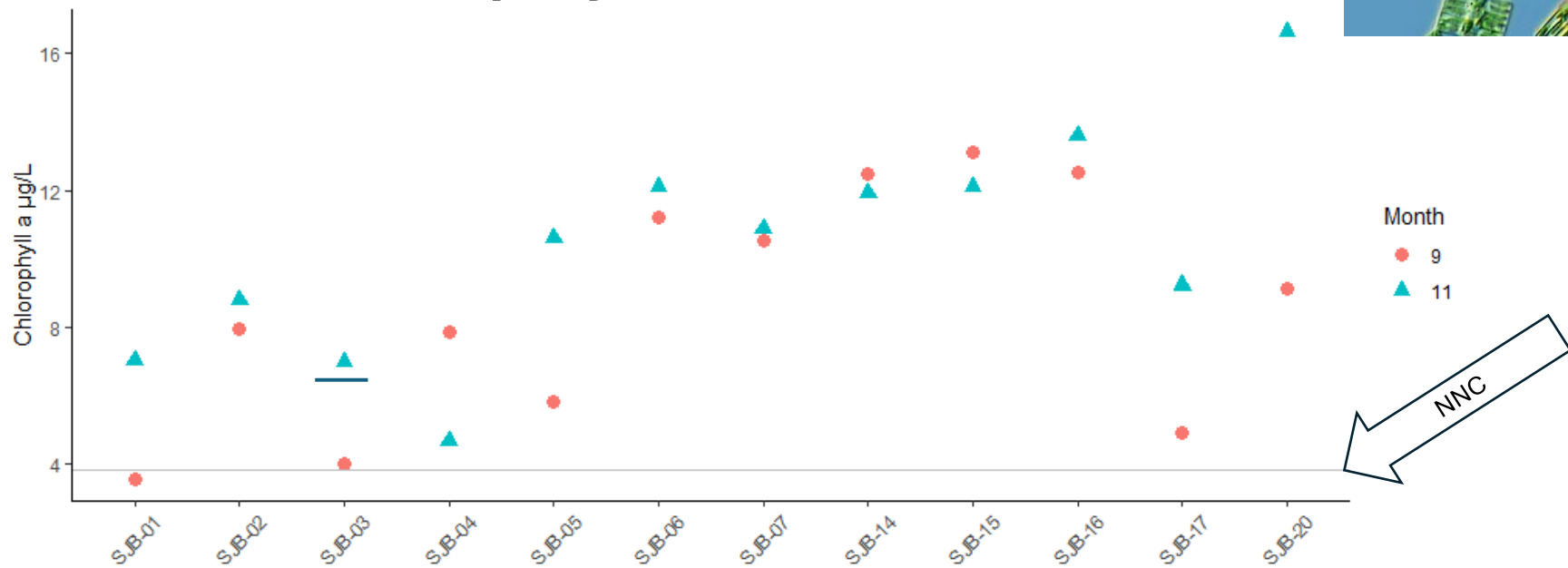
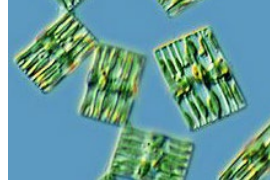
No relationship with Salinity



Negative relationship with DO

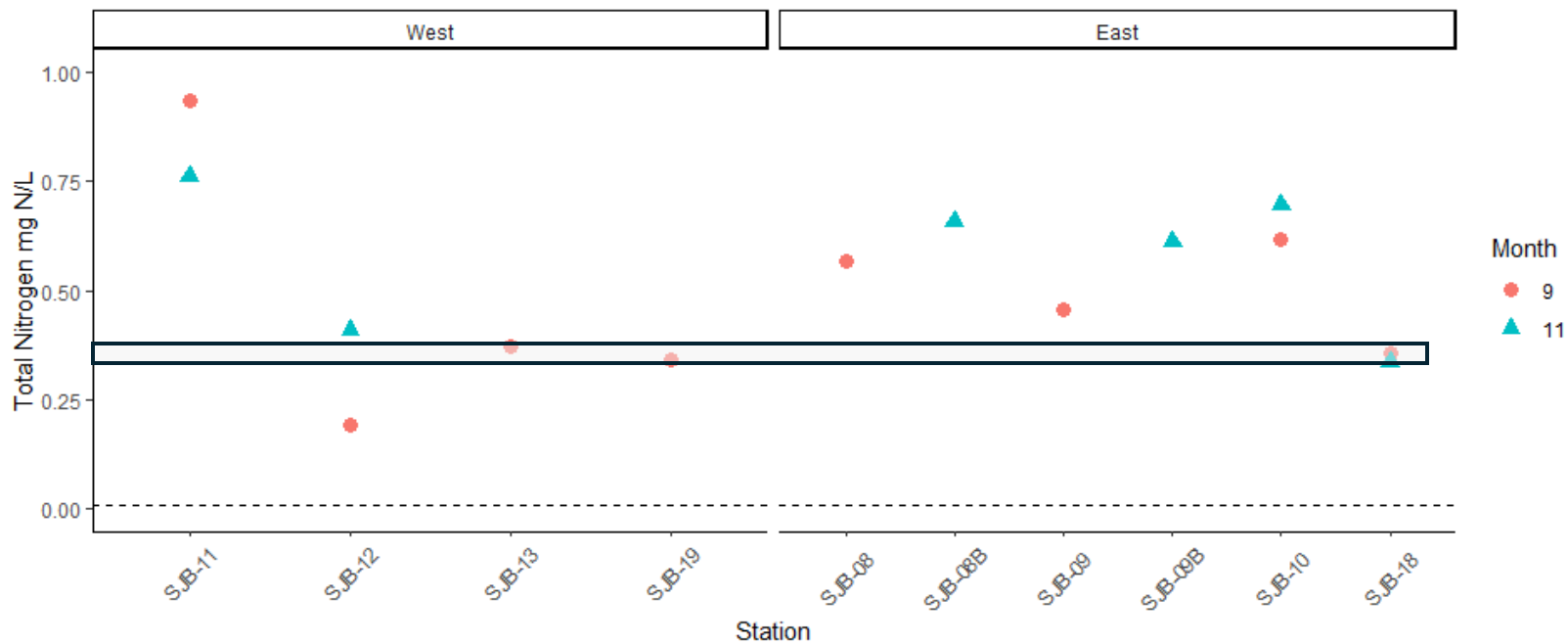
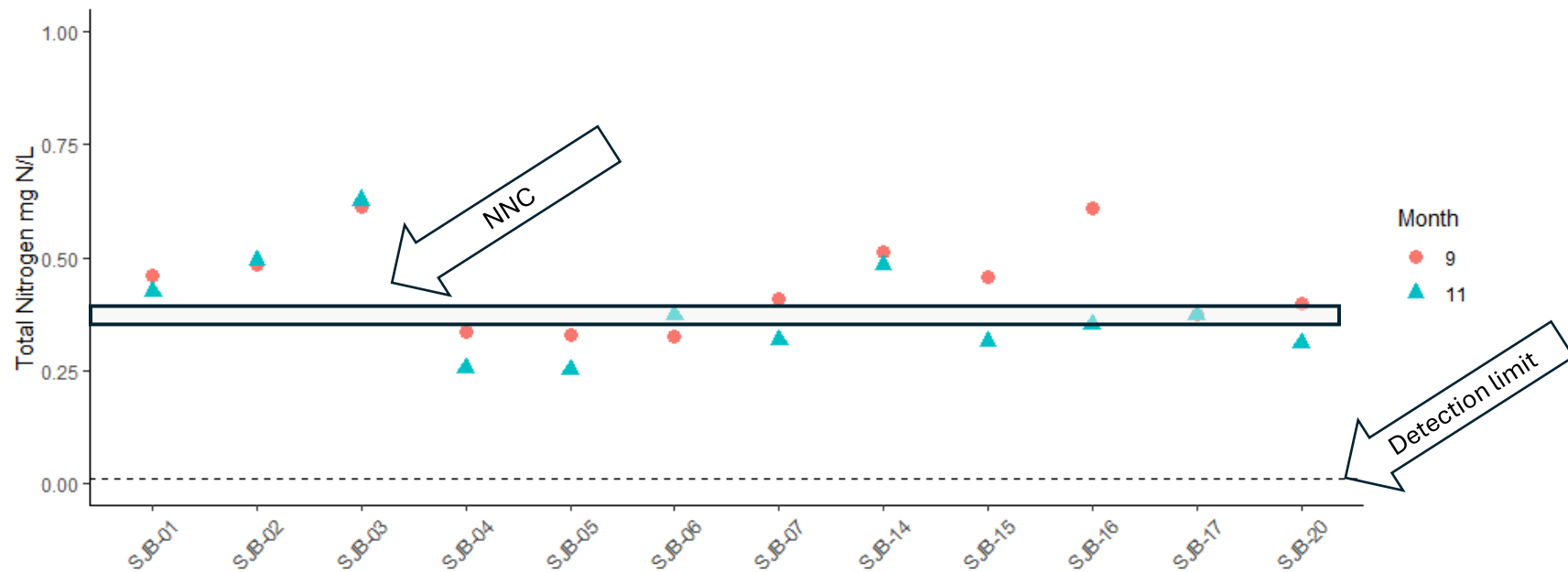


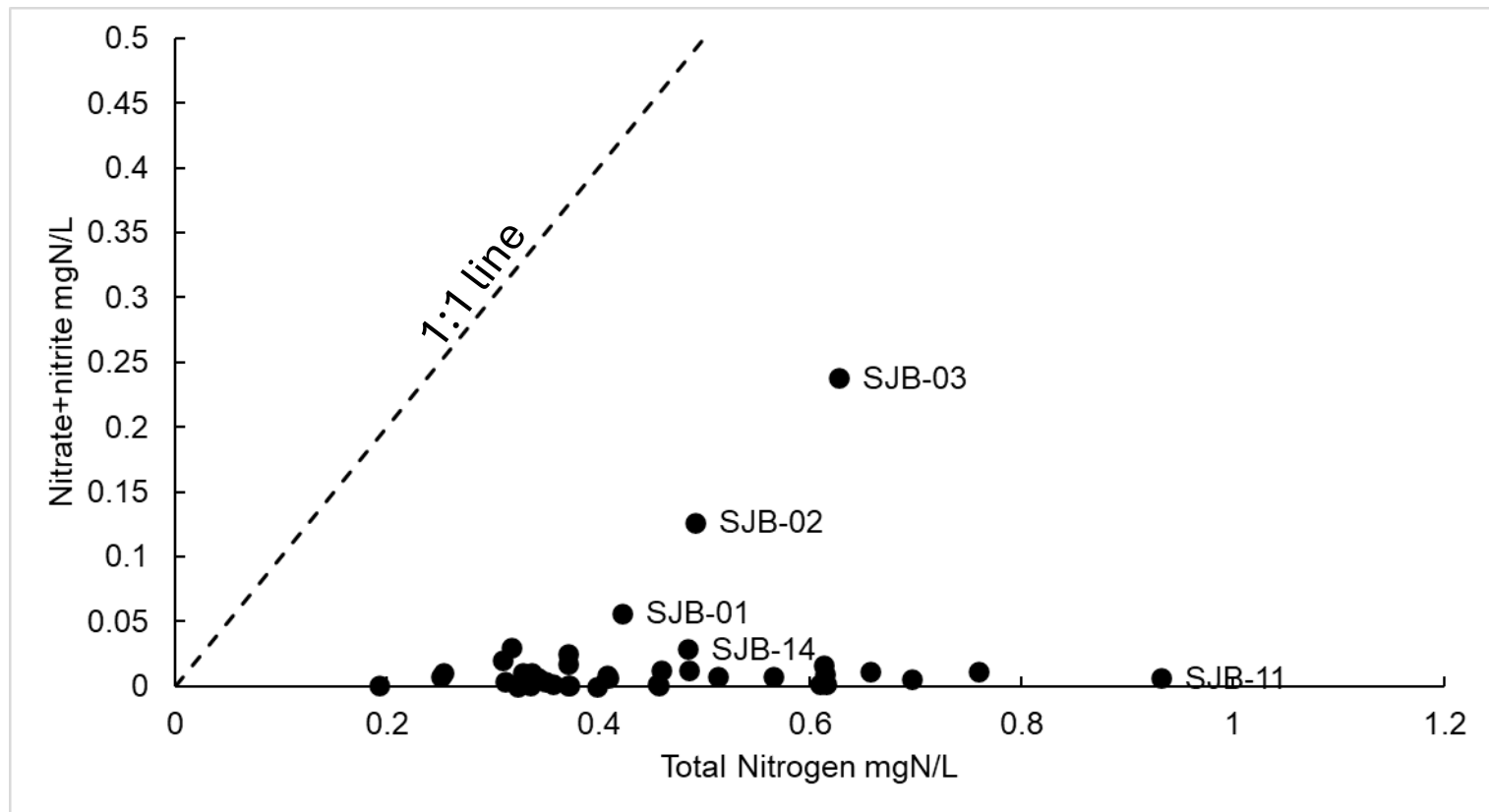
Chlorophyll a



Total Nitrogen

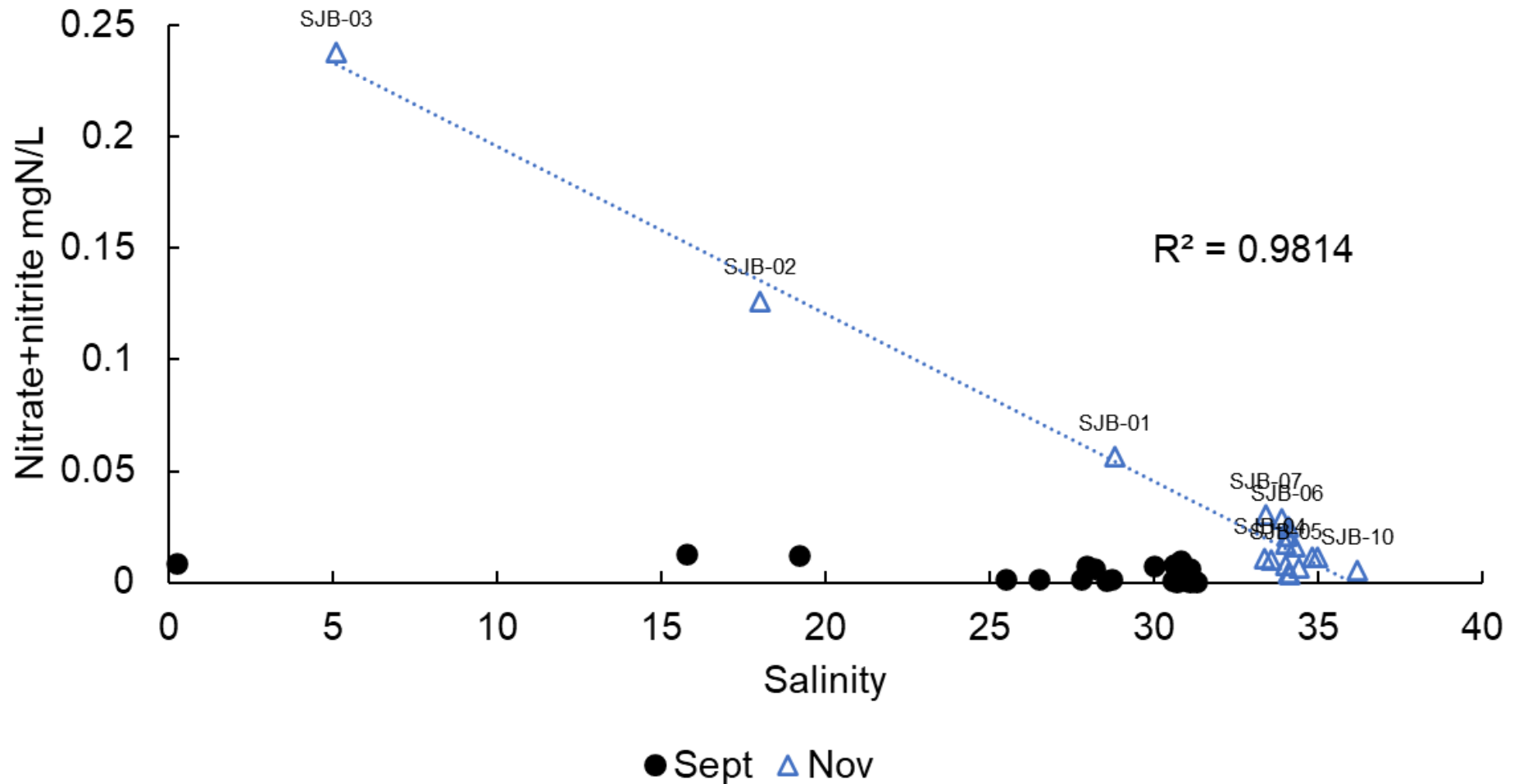
NO₃⁻, NO₂⁻,
NH₄⁺, ON



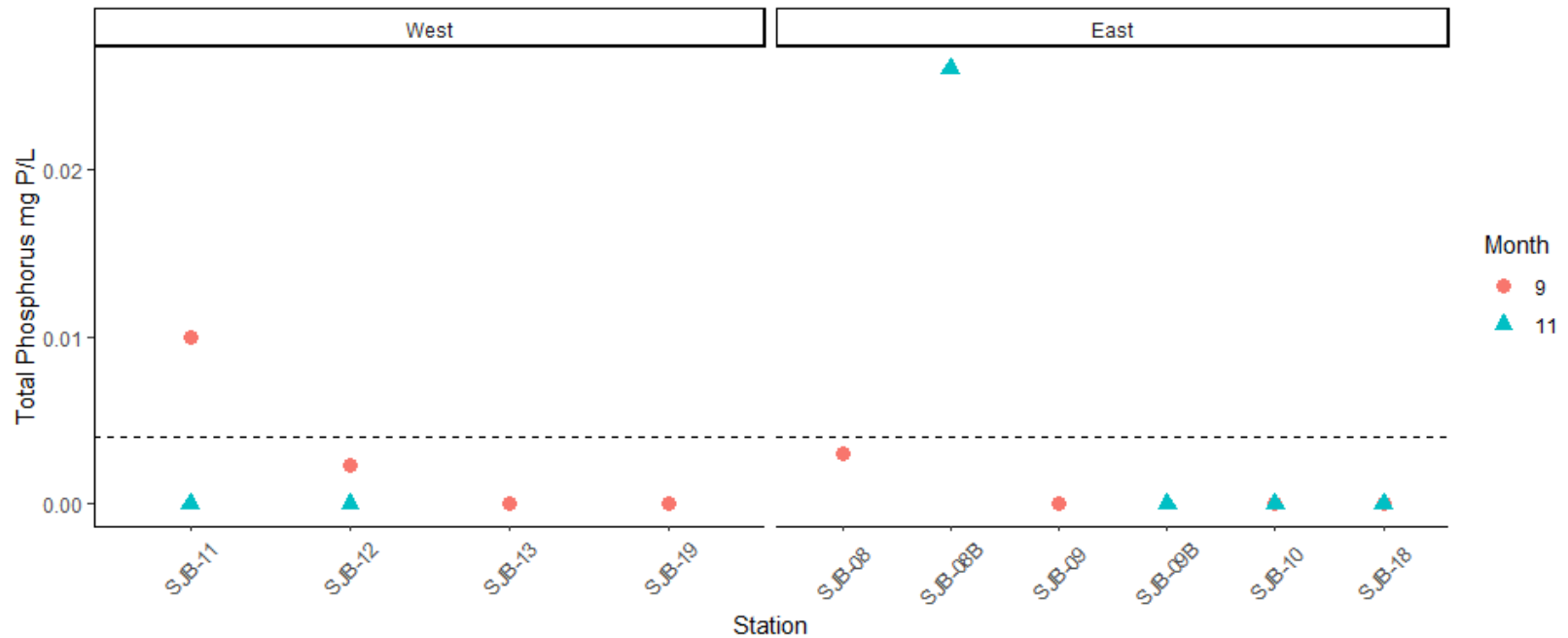
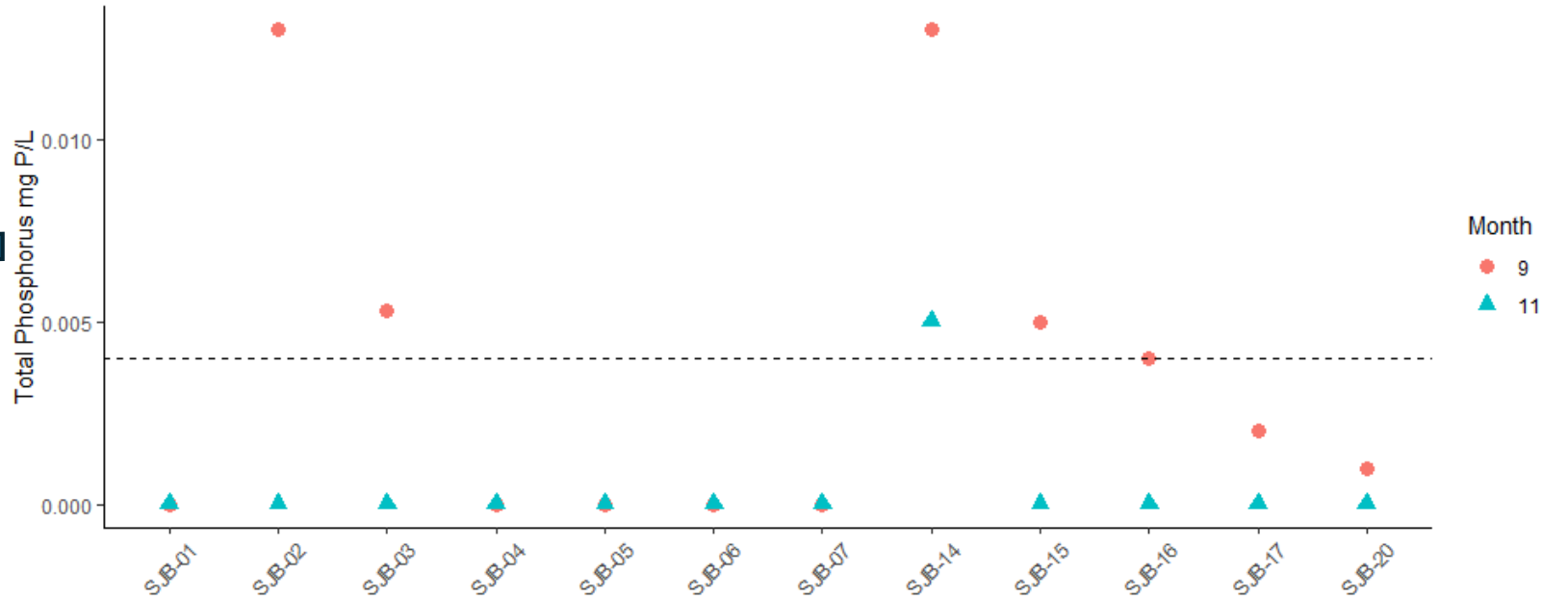


Similar results with ammonium, suggests that most of total nitrogen is organic N

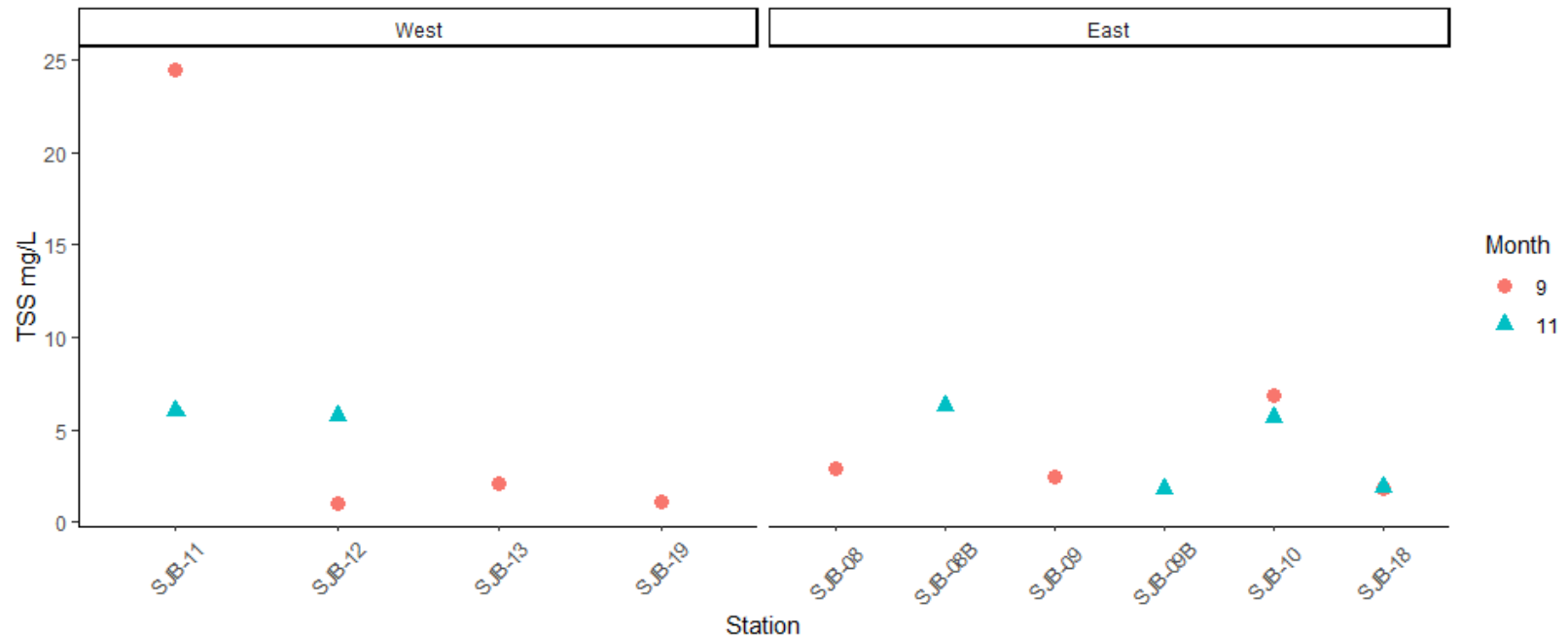
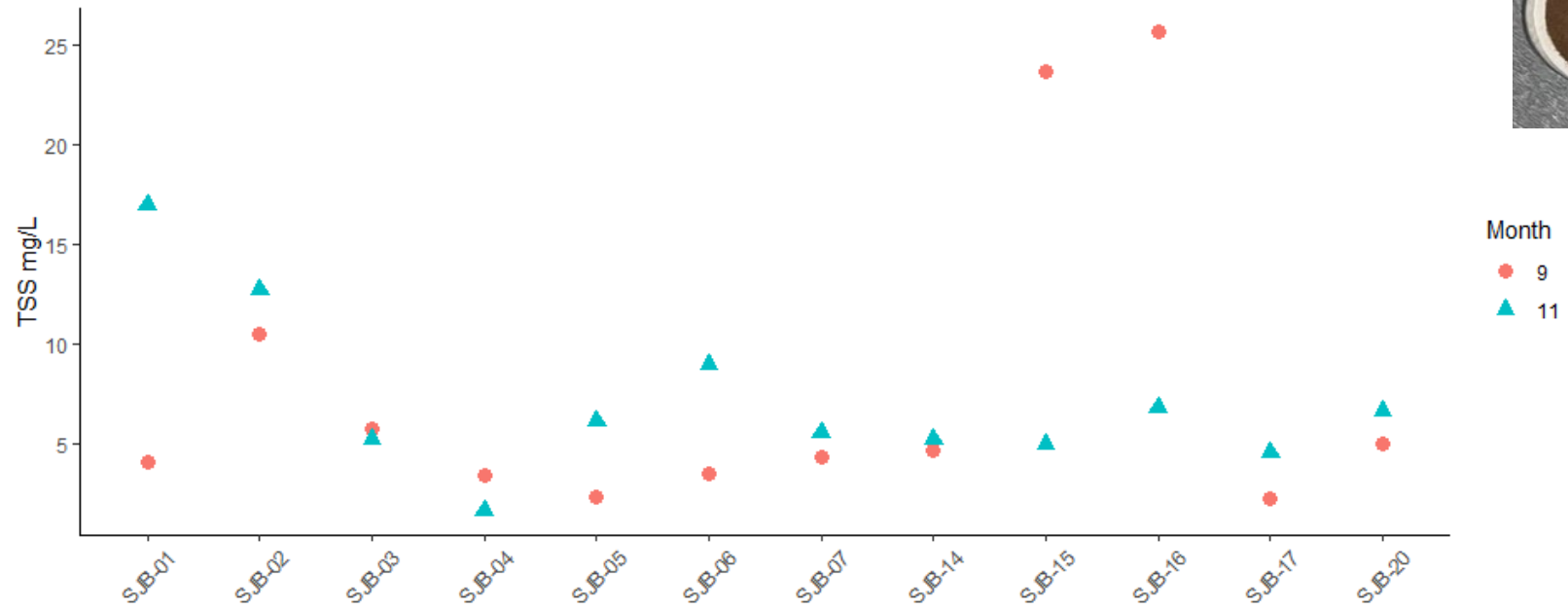
Freshwater inputs of Nitrate in November but not September



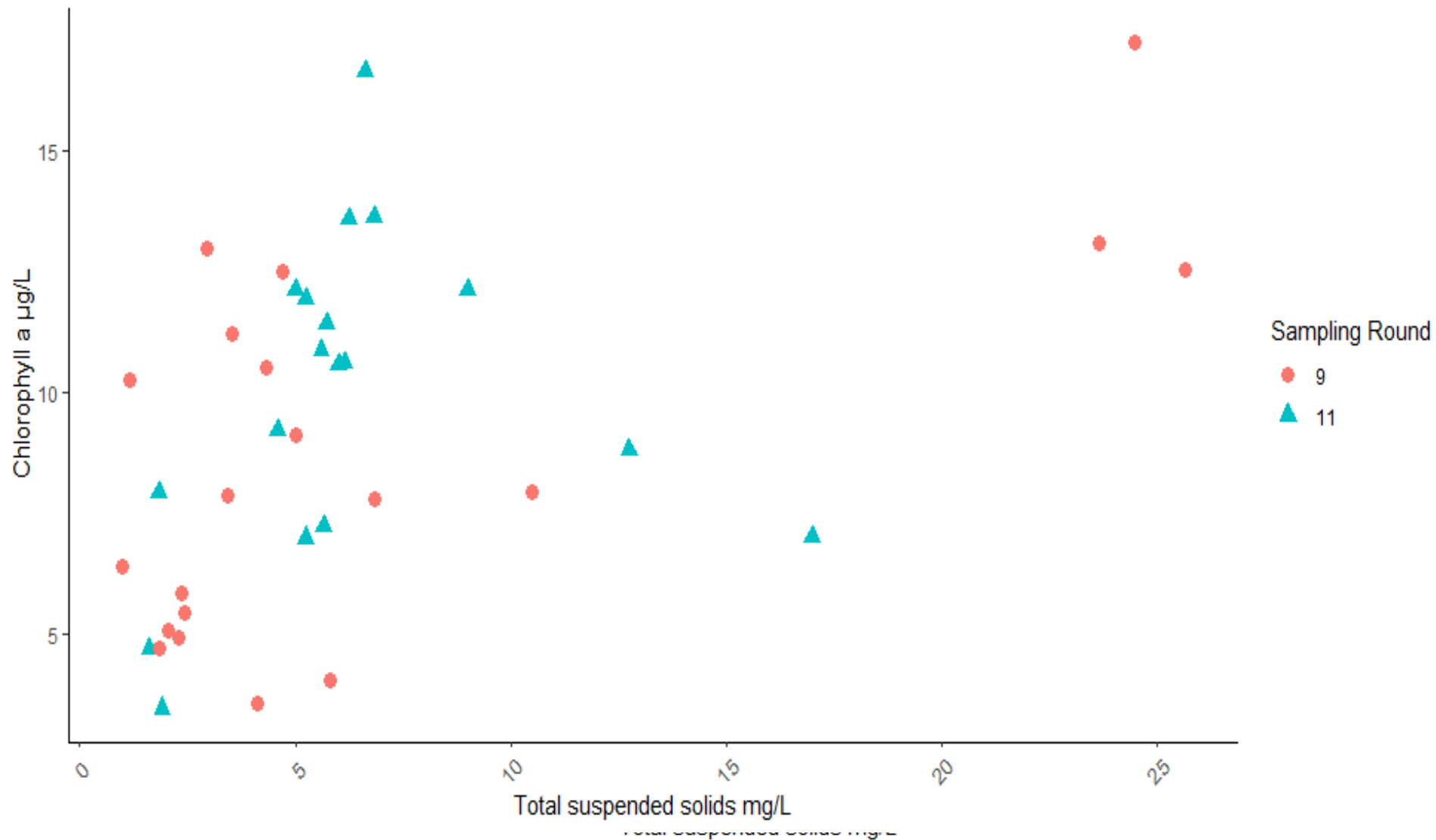
Total Phosphorus – below NNC except SJB-08B



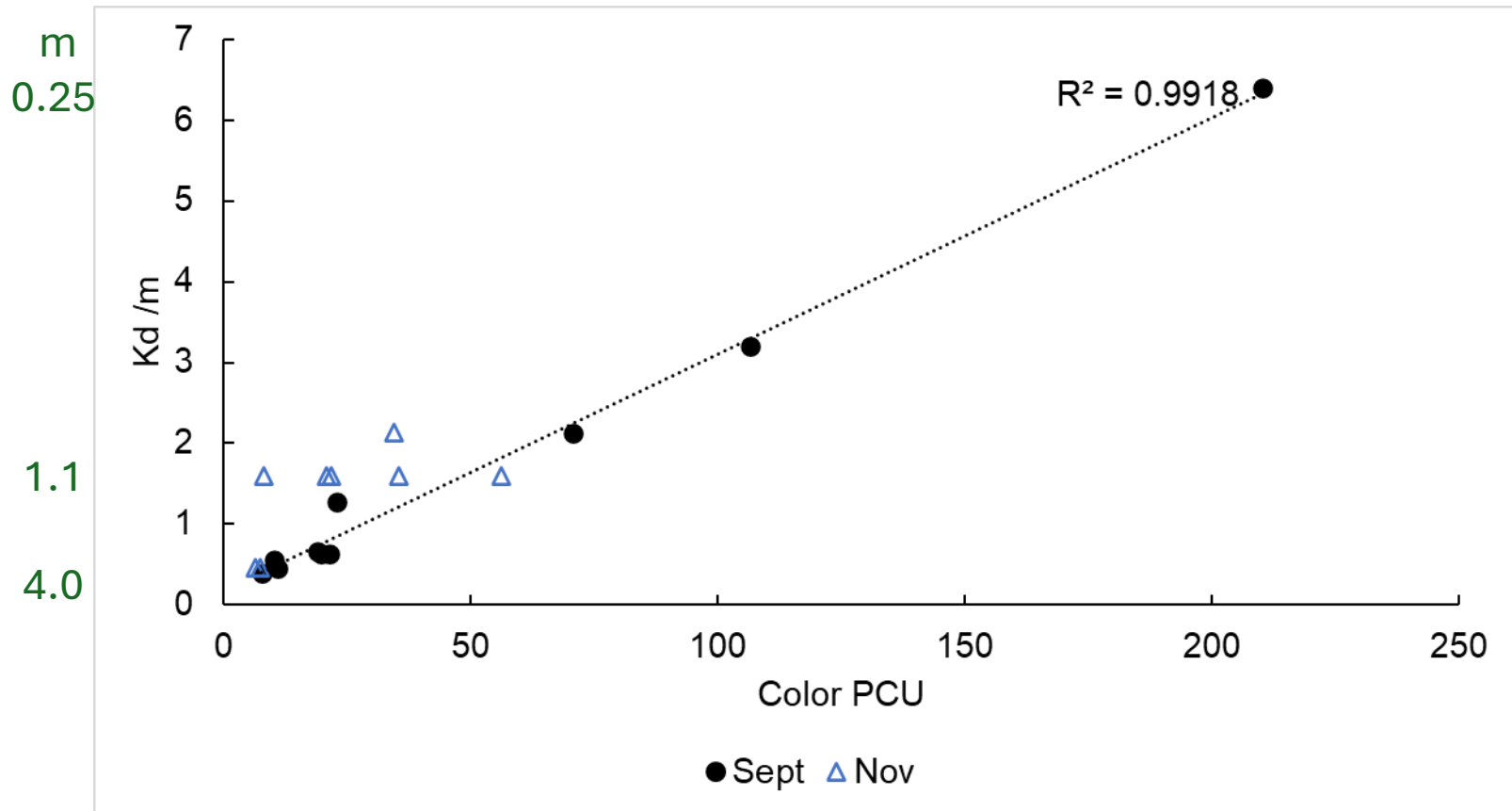
Total Suspended Solids



Chla vs TSS



Attenuation coefficient K_d determines depth of seagrass growth



Summary

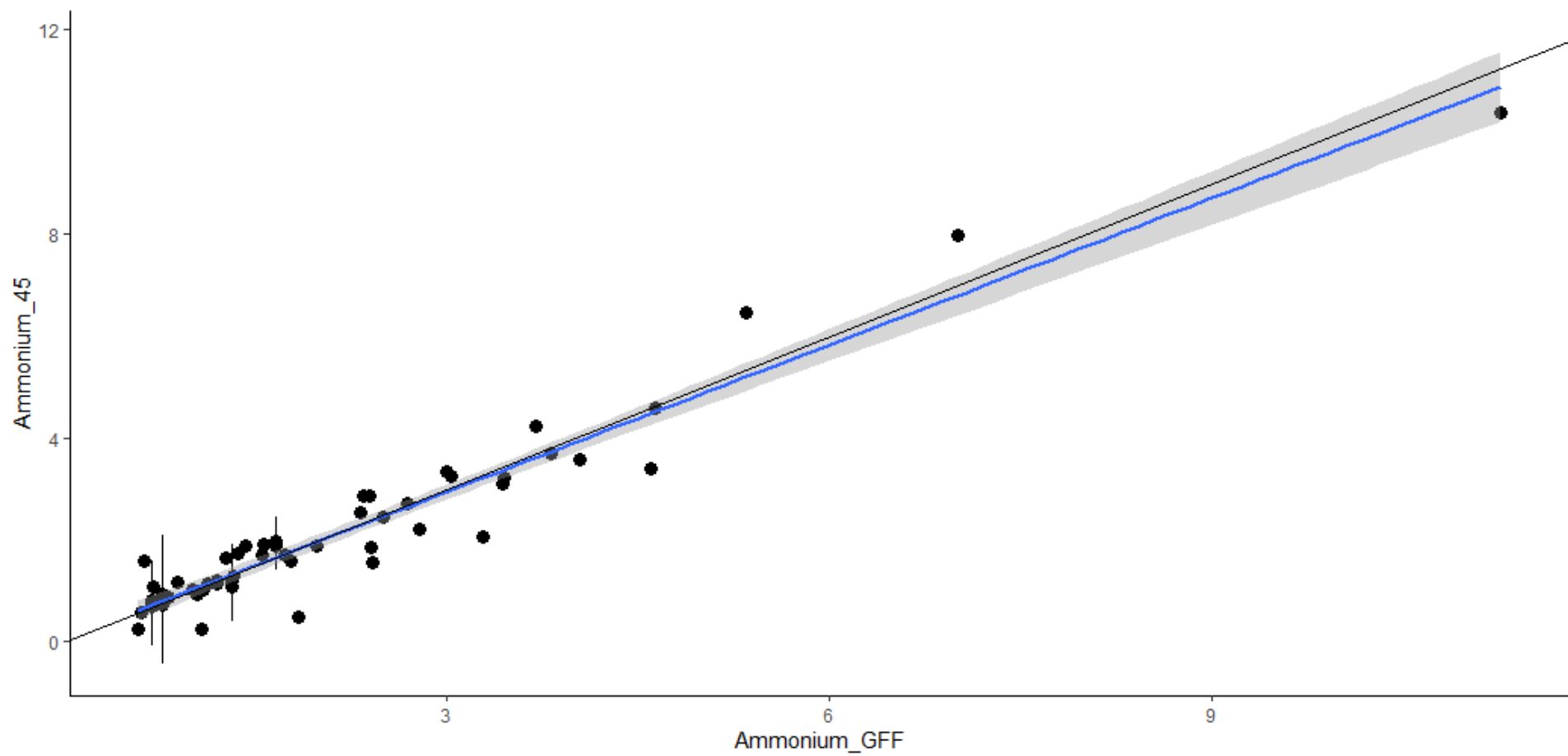
- Standard microbiology tests
 - Most levels of Enterococcus were low and below BAV criteria
 - No real seasonal pattern except for higher levels in fresher sites
- qPCR
 - Human bacteria detectable at all sites
 - Highest levels near Port St. Joe
 - Greater concentrations during September
 - Avian bacteria present at some sites, many below lowest standard
 - Not much difference between months
- Chlorophyll a
 - Often above thresholds at most sites
- Nutrient results
 - TN near NNC, mainly organic N
 - Nitrate+nitrite in freshwater (but perhaps flushed out in September)
 - TP low
- Light attenuation – maximum depth of seagrass beds
 - Strongest correlation with Color in September
 - On average seagrasses should grow to 1.1m, but may grow up to 4m in clearest areas

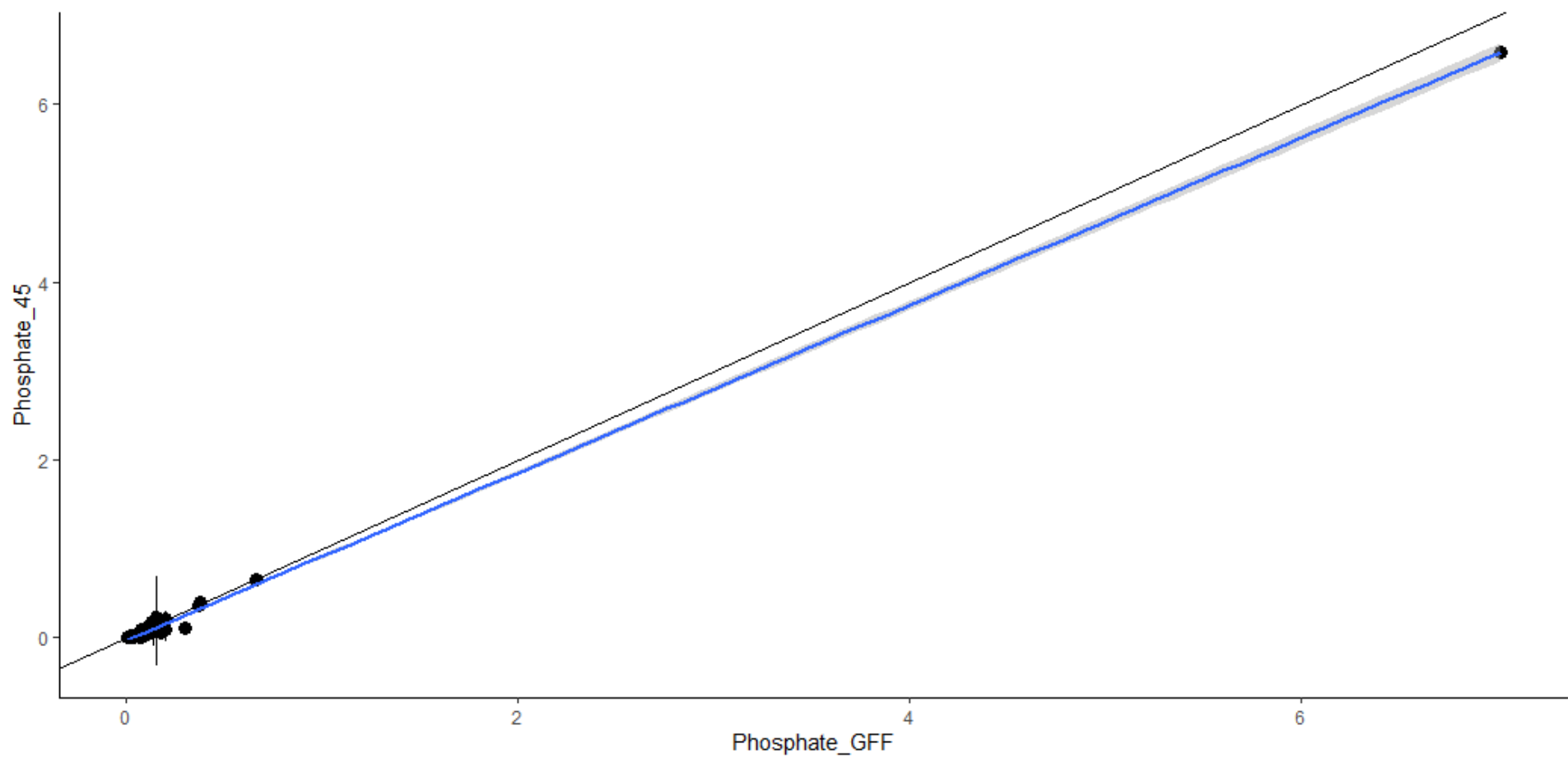
Next Steps

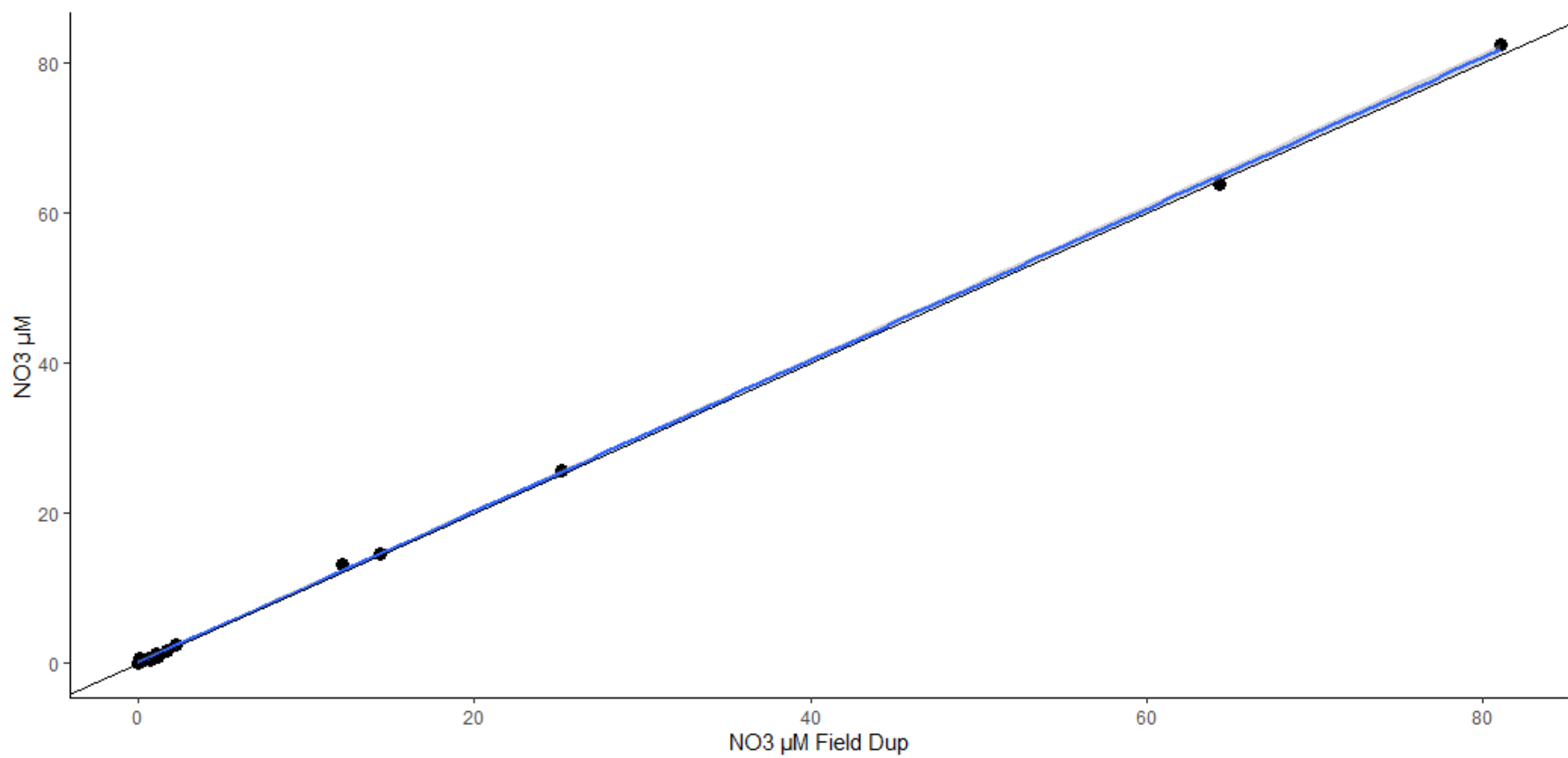
- Finish qPCR for Canine and Shorebird Bacteroides
- Comparison of water quality with literature

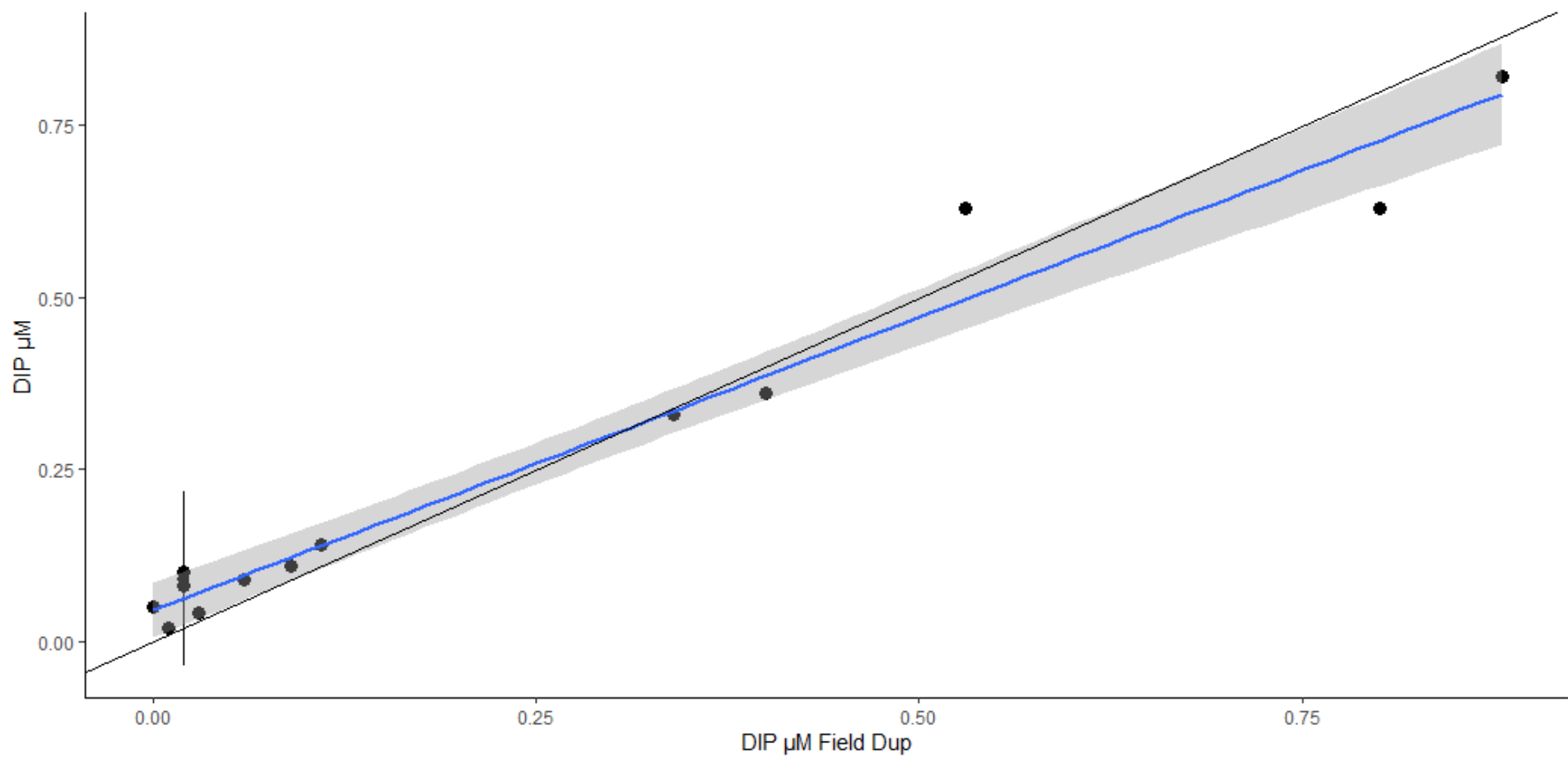
QC results

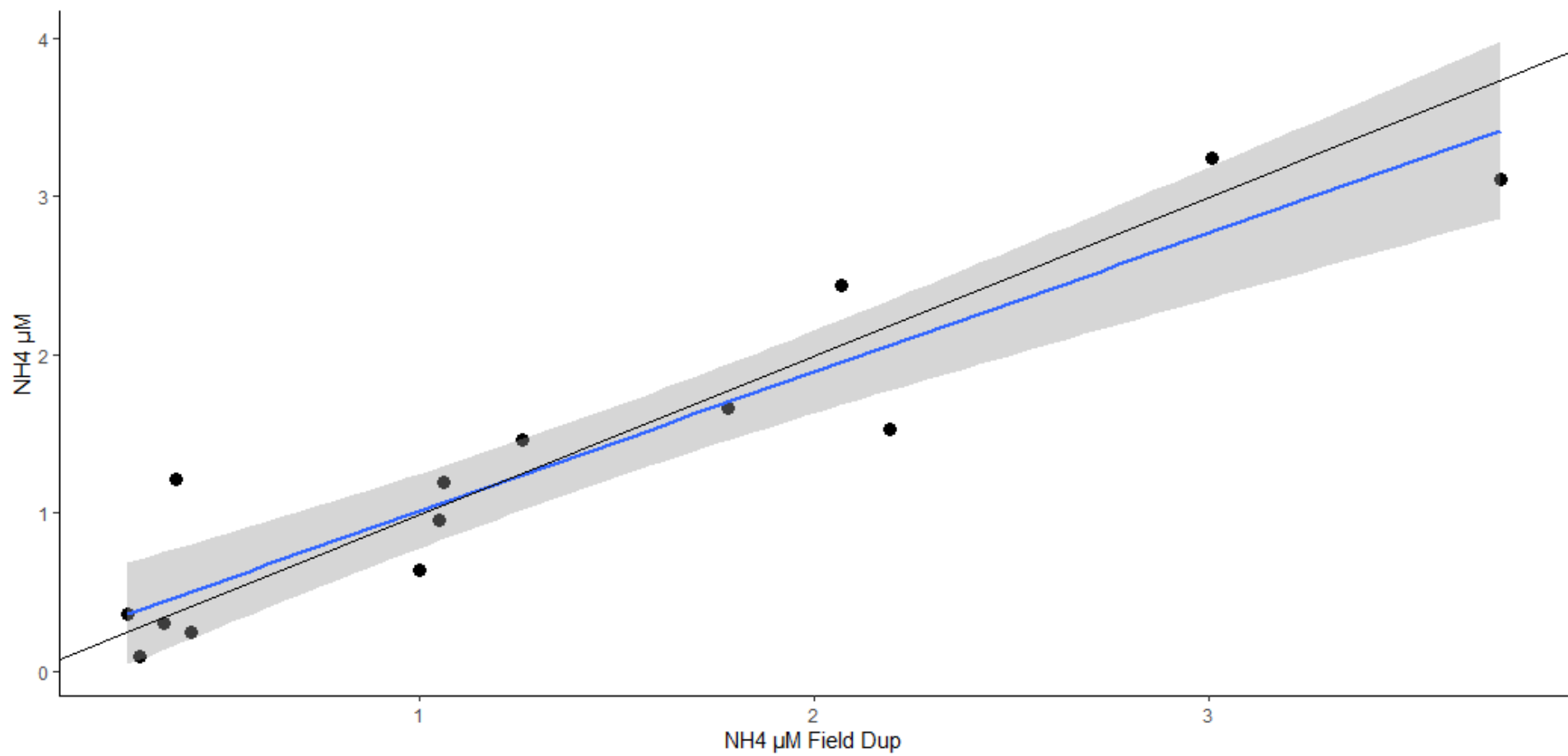
- No differences between GFF vs 0.45 μm filtration for ammonium or DIP
- Good agreement between field duplicates with samples
- Field blanks all near zero (some exceptions for color)











Field blanks

