MixingDepthComboPlot

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2023-11-22

# Initial stuff, including loading packages and importing data

##loading packages

library(here)  
library(rstatix)  
library(ggplot2)  
library(tidyverse)  
library(dplyr)  
library(ggpubr)

## loading files

# Tell R where files are stored  
here::i\_am("scripts/MixingDepthComboPlot.Rmd")  
  
# Load Files  
a <- readr::read\_csv(here("data/MillMixingDepthCV.csv"))  
b <- readr::read\_csv(here("data/BishopMixingDepthCV.csv"))  
c <- readr::read\_csv(here("data/CedarMixingDepthCV.csv"))  
d <- readr::read\_csv(here("data/CrookedWMixingDepthCV.csv"))  
e <- readr::read\_csv(here("data/LilApMixingDepthCV.csv"))  
f <- readr::read\_csv(here("data/WalshMixingDepthCV.csv"))

## Making the six-panel plot

Bishop <- na.omit(b)  
bmix <- as.factor(Bishop$MixingDepth)  
bcv <- Bishop$CV  
  
col2 <- c("1"= "#C6DBEF", "2"= "#9ECAE1", "3"="#6BAED6", "4"="#4292C6","5"= "#2171B5","6"= "#08519C","7"= "#08308B", "10"= "#08316C")  
  
CVbishop <- ggplot(data=Bishop,aes(x=as.factor(bmix),y=bcv, fill=as.factor(bmix))) +  
 geom\_jitter(color="black", size=0.4, alpha=0.9) +  
 geom\_boxplot(alpha=0.6)+  
 scale\_y\_continuous(limits = c(0,4.5), breaks = seq(0,4.5,.5))+  
 scale\_x\_discrete(breaks=seq(0,10,1))+  
 scale\_fill\_manual(name="Mixing Depth", values = col2)+  
 theme\_bw() +  
 theme(panel.border = element\_blank(),   
 panel.grid.major = element\_blank(),  
 panel.grid.minor = element\_blank(),   
 axis.line = element\_line(colour = "black"))+  
 ggtitle("Bishop (0.751)") +  
 labs(x = ("Mixing Depth (m)"), y=("Patchiness"))+  
 theme(plot.title = element\_text(face = "bold",size = 14)) +  
 theme(axis.text=element\_text(size=12, face = "bold"),   
 axis.title=element\_text(size=14,face="bold")) +  
 theme(legend.position = "bottom")  
  
  
##################  
Mill <- na.omit(a)  
mmix <- as.factor(Mill$MixingDepth)  
mcv <- Mill$CV  
  
CVmill <- ggplot(data=Mill,aes(x=as.factor(mmix),y=mcv, fill=as.factor(mmix))) +  
 geom\_jitter(color="black", size=0.4, alpha=0.9) +  
 geom\_boxplot(alpha=0.6)+  
 scale\_y\_continuous(limits = c(0,3.5), breaks = seq(0,3.5,.5))+  
 scale\_x\_discrete(breaks=seq(0,5,1))+  
 scale\_fill\_manual(name="Mixing Depth", values = col2)+  
 theme\_bw() +  
 theme(panel.border = element\_blank(),   
 panel.grid.major = element\_blank(),  
 panel.grid.minor = element\_blank(),   
 axis.line = element\_line(colour = "black"))+  
 ggtitle("Mill (0.821)") +  
 labs(x = ("Mixing Depth (m)"), y=("Patchiness"))+  
 theme(plot.title = element\_text(face = "bold",size = 14)) +  
 theme(axis.text=element\_text(size=12, face = "bold"),   
 axis.title=element\_text(size=14,face="bold")) +  
 theme(legend.position = "none")  
  
  
  
#################  
Cedar <- na.omit(c)  
cmix <- as.factor(Cedar$MixingDepth)  
ccv <- Cedar$CV  
  
CVcedar <- ggplot(data=Cedar,aes(x=as.factor(cmix),y=ccv, fill=as.factor(cmix))) +  
 geom\_jitter(color="black", size=0.4, alpha=0.9) +  
 geom\_boxplot(alpha=0.6)+  
 scale\_y\_continuous(limits = c(0,3.5), breaks = seq(0,3.5,.5))+  
 scale\_x\_discrete(breaks=seq(0,6,1))+  
 scale\_fill\_manual(name="Mixing Depth", values = col2)+  
 theme\_bw() +  
 theme(panel.border = element\_blank(),   
 panel.grid.major = element\_blank(),  
 panel.grid.minor = element\_blank(),   
 axis.line = element\_line(colour = "black"))+  
 ggtitle("Cedar (0.507)") +  
 labs(x = ("Mixing Depth (m)"), y=("Patchiness"))+  
 theme(plot.title = element\_text(face = "bold",size = 14)) +  
 theme(axis.text=element\_text(size=12, face = "bold"),   
 axis.title=element\_text(size=14,face="bold")) +  
 theme(legend.position = "none")  
  
  
  
##############  
  
CW <- na.omit(d)  
cwmix <- as.factor(CW$MixingDepth)  
cwcv <- CW$CV  
  
  
CVcw <- ggplot(data=CW,aes(x=as.factor(cwmix),y=cwcv, fill=as.factor(cwmix))) +  
 geom\_jitter(color="black", size=0.4, alpha=0.9) +  
 geom\_boxplot(alpha=0.6)+  
 scale\_y\_continuous(limits = c(0,3.5), breaks = seq(0,3.5,.5))+  
 scale\_x\_discrete(breaks=seq(0,6,1))+  
 scale\_fill\_manual(name="Mixing Depth", values = col2)+  
 theme\_bw() +  
 theme(panel.border = element\_blank(),   
 panel.grid.major = element\_blank(),  
 panel.grid.minor = element\_blank(),   
 axis.line = element\_line(colour = "black"))+  
 ggtitle("Crooked W (0.949)") +  
 labs(x = ("Mixing Depth (m)"), y=("Patchiness"))+  
 theme(plot.title = element\_text(face = "bold",size = 14)) +  
 theme(axis.text=element\_text(size=12, face = "bold"),   
 axis.title=element\_text(size=14,face="bold")) +  
 theme(legend.position = "none")  
  
  
  
#################  
  
LilAp <- na.omit(e)  
lmix <- as.factor(LilAp$MixingDepth)  
lcv <- LilAp$CV  
  
my\_comparisons <- list(c("1", "5"))  
  
CVlilap <- ggplot(data=LilAp,aes(x=as.factor(lmix),y=lcv, fill=as.factor(lmix))) +  
 geom\_jitter(color="black", size=0.4, alpha=0.9) +  
 geom\_boxplot(alpha=0.6)+  
 scale\_y\_continuous(limits = c(0,3.5), breaks = seq(0,3.5,.5))+  
 scale\_x\_discrete(breaks=seq(0,5,1))+  
 scale\_fill\_manual(name="Mixing Depth", values = col2)+  
 theme\_bw() +  
 theme(panel.border = element\_blank(),   
 panel.grid.major = element\_blank(),  
 panel.grid.minor = element\_blank(),   
 axis.line = element\_line(colour = "black"))+  
 ggtitle("Little Appleton (0.181)") +  
 labs(x = ("Mixing Depth (m)"), y=("Patchiness"))+  
 theme(plot.title = element\_text(face = "bold",size = 14)) +  
 theme(axis.text=element\_text(size=12, face = "bold"),   
 axis.title=element\_text(size=14,face="bold")) +  
 theme(legend.position = "none")+   
 stat\_compare\_means(method="wilcox.test", paired=FALSE, comparisons = my\_comparisons, hide.ns=FALSE) # Add pairwise comparisons p-value  
  
  
  
  
################  
  
Walsh <- na.omit(f)  
wmix <- as.factor(Walsh$`Mixing Depth`)  
wcv <- Walsh$CV  
  
my\_comparisons2 <- list(c("1", "5"))  
  
  
CVwalsh <- ggplot(data=Walsh,aes(x=as.factor(wmix),y=wcv, fill=as.factor(wmix))) +  
 geom\_jitter(color="black", size=0.4, alpha=0.9) +  
 geom\_boxplot(alpha=0.6)+  
 ##geom\_violin() +  
 scale\_y\_continuous(limits = c(0,3.5), breaks = seq(0,3.5,.5))+  
 scale\_x\_discrete(breaks=seq(0,5,1))+  
 scale\_fill\_manual(name="Mixing Depth", values = col2)+  
 theme\_bw() +  
 theme(panel.border = element\_blank(),   
 panel.grid.major = element\_blank(),  
 panel.grid.minor = element\_blank(),   
 axis.line = element\_line(colour = "black"))+  
 ggtitle("Walsh (0.296)") +  
 labs(x = ("Mixing Depth (m)"), y=("Patchiness"))+  
 theme(plot.title = element\_text(face = "bold",size = 14)) +  
 theme(axis.text=element\_text(size=12, face = "bold"),   
 axis.title=element\_text(size=14,face="bold")) +  
 theme(legend.position = "none")+   
 stat\_compare\_means(method="wilcox.test", paired=FALSE, comparisons = my\_comparisons2, hide.ns=FALSE) # Add pairwise comparisons p-value  
  
  
  
################  
combined = ggarrange(CVbishop, CVcedar,CVcw, CVlilap, CVmill, CVwalsh,  
 nrow = 2, ncol = 3,  
 common.legend = TRUE,  
 legend = "bottom")  
  
#### saving combined plot  
ggsave(here("figures", "CombinedMixingDepthBoxplot.jpg"), combined, width = 10, height = 7, dpi = 300)

##Wilcoxon Tests

##Cedar  
cmix <- as.factor(Cedar$MixingDepth)  
cr <- as.factor(Cedar$Round)  
ccv <- Cedar$CV  
cp <- Cedar$Parasite  
  
## creating a data frame  
cdf1<- data.frame(cr,cp,cmix, ccv)  
  
## Wilcoxon Test  
ctest<-compare\_means(ccv ~ cmix, data = cdf1, method="wilcox.test", paired = FALSE)  
ctest

## # A tibble: 10 x 8  
## .y. group1 group2 p p.adj p.format p.signif method   
## <chr> <chr> <chr> <dbl> <dbl> <chr> <chr> <chr>   
## 1 ccv 1 2 0.497 1 0.50 ns Wilcoxon  
## 2 ccv 1 3 0.539 1 0.54 ns Wilcoxon  
## 3 ccv 1 4 0.744 1 0.74 ns Wilcoxon  
## 4 ccv 1 6 0.347 1 0.35 ns Wilcoxon  
## 5 ccv 2 3 0.875 1 0.87 ns Wilcoxon  
## 6 ccv 2 4 0.762 1 0.76 ns Wilcoxon  
## 7 ccv 2 6 0.427 1 0.43 ns Wilcoxon  
## 8 ccv 3 4 0.963 1 0.96 ns Wilcoxon  
## 9 ccv 3 6 0.261 1 0.26 ns Wilcoxon  
## 10 ccv 4 6 0.623 1 0.62 ns Wilcoxon

##ns for all combinations

##Mill  
mmix <- as.factor(Mill$MixingDepth)  
mr <- as.factor(Mill$Round)  
mcv <- Mill$CV  
mp <- Mill$Parasite  
  
## creating a data frame  
mdf1<- data.frame(mr,mp,mmix, mcv)  
  
## Wilcoxon Test  
mtest<-compare\_means(mcv ~ mmix, data = mdf1, method="wilcox.test", paired = FALSE)  
mtest

## # A tibble: 10 x 8  
## .y. group1 group2 p p.adj p.format p.signif method   
## <chr> <chr> <chr> <dbl> <dbl> <chr> <chr> <chr>   
## 1 mcv 1 2 0.463 1 0.463 ns Wilcoxon  
## 2 mcv 1 3 0.841 1 0.841 ns Wilcoxon  
## 3 mcv 1 4 0.133 1 0.133 ns Wilcoxon  
## 4 mcv 1 5 0.255 1 0.255 ns Wilcoxon  
## 5 mcv 2 3 0.553 1 0.553 ns Wilcoxon  
## 6 mcv 2 4 0.0753 0.75 0.075 ns Wilcoxon  
## 7 mcv 2 5 0.211 1 0.211 ns Wilcoxon  
## 8 mcv 3 4 0.383 1 0.383 ns Wilcoxon  
## 9 mcv 3 5 0.754 1 0.754 ns Wilcoxon  
## 10 mcv 4 5 0.898 1 0.898 ns Wilcoxon

##Crooked W  
cwmix <- as.factor(CW$MixingDepth)  
cwr <- as.factor(CW$Round)  
cwcv <- CW$CV  
cwp <- CW$Parasite  
  
## creating a data frame  
cwdf1<- data.frame(cwr,cwp,cwmix, cwcv)  
  
## Wilcoxon Test  
cwtest<-compare\_means(cwcv ~ cwmix, data = cwdf1, method="wilcox.test", paired = FALSE)  
cwtest

## # A tibble: 6 x 8  
## .y. group1 group2 p p.adj p.format p.signif method   
## <chr> <chr> <chr> <dbl> <dbl> <chr> <chr> <chr>   
## 1 cwcv 2 3 0.350 1 0.35 ns Wilcoxon  
## 2 cwcv 2 4 1 1 1.00 ns Wilcoxon  
## 3 cwcv 2 5 0.270 1 0.27 ns Wilcoxon  
## 4 cwcv 3 4 0.504 1 0.50 ns Wilcoxon  
## 5 cwcv 3 5 0.657 1 0.66 ns Wilcoxon  
## 6 cwcv 4 5 0.413 1 0.41 ns Wilcoxon

##ns for all combinations

##Bishop  
bmix <- as.factor(Bishop$MixingDepth)  
br <- as.factor(Bishop$Round)  
bcv <- Bishop$CV  
bp <- Bishop$Parasite  
  
## creating a data frame  
bdf1<- data.frame(br,bp,bmix, bcv)  
  
## Wilcoxon Test  
btest<-compare\_means(bcv ~ bmix, data = bdf1, method="wilcox.test", paired = FALSE)  
btest

## # A tibble: 15 x 8  
## .y. group1 group2 p p.adj p.format p.signif method   
## <chr> <chr> <chr> <dbl> <dbl> <chr> <chr> <chr>   
## 1 bcv 1 2 0.304 1 0.30 ns Wilcoxon  
## 2 bcv 1 3 0.978 1 0.98 ns Wilcoxon  
## 3 bcv 1 4 0.579 1 0.58 ns Wilcoxon  
## 4 bcv 1 7 0.953 1 0.95 ns Wilcoxon  
## 5 bcv 1 10 0.594 1 0.59 ns Wilcoxon  
## 6 bcv 2 3 0.271 1 0.27 ns Wilcoxon  
## 7 bcv 2 4 0.113 1 0.11 ns Wilcoxon  
## 8 bcv 2 7 0.540 1 0.54 ns Wilcoxon  
## 9 bcv 2 10 0.381 1 0.38 ns Wilcoxon  
## 10 bcv 3 4 0.461 1 0.46 ns Wilcoxon  
## 11 bcv 3 7 0.735 1 0.74 ns Wilcoxon  
## 12 bcv 3 10 0.760 1 0.76 ns Wilcoxon  
## 13 bcv 4 7 0.513 1 0.51 ns Wilcoxon  
## 14 bcv 4 10 0.953 1 0.95 ns Wilcoxon  
## 15 bcv 7 10 0.841 1 0.84 ns Wilcoxon

##Walsh  
wmix <- as.factor(Walsh$`Mixing Depth`)  
wr <- as.factor(Walsh$Round)  
wcv <- Walsh$CV  
wp <- Walsh$Parasite  
  
## creating a data frame  
wdf1<- data.frame(wr,wp,wmix, wcv)  
  
## Wilcoxon Test  
wtest<-compare\_means(wcv ~ wmix, data = wdf1, method="wilcox.test", paired = FALSE)  
wtest

## # A tibble: 10 x 8  
## .y. group1 group2 p p.adj p.format p.signif method   
## <chr> <chr> <chr> <dbl> <dbl> <chr> <chr> <chr>   
## 1 wcv 1 2 0.785 1 0.785 ns Wilcoxon  
## 2 wcv 1 3 0.801 1 0.801 ns Wilcoxon  
## 3 wcv 1 4 0.227 1 0.227 ns Wilcoxon  
## 4 wcv 1 5 0.0260 0.26 0.026 \* Wilcoxon  
## 5 wcv 2 3 0.709 1 0.709 ns Wilcoxon  
## 6 wcv 2 4 0.186 1 0.186 ns Wilcoxon  
## 7 wcv 2 5 0.0737 0.66 0.074 ns Wilcoxon  
## 8 wcv 3 4 0.310 1 0.310 ns Wilcoxon  
## 9 wcv 3 5 0.0753 0.66 0.075 ns Wilcoxon  
## 10 wcv 4 5 0.768 1 0.768 ns Wilcoxon

##LilAp  
lmix <- as.factor(LilAp$MixingDepth)  
lr <- as.factor(LilAp$Round)  
lcv <- LilAp$CV  
lp <- LilAp$Parasite  
  
## creating a data frame  
ldf1<- data.frame(lr,lp,lmix, lcv)  
  
## Wilcoxon Test  
ltest<-compare\_means(lcv ~ lmix, data = ldf1, method="wilcox.test", paired = FALSE)  
ltest

## # A tibble: 3 x 8  
## .y. group1 group2 p p.adj p.format p.signif method   
## <chr> <chr> <chr> <dbl> <dbl> <chr> <chr> <chr>   
## 1 lcv 1 2 0.341 0.34 0.34 ns Wilcoxon  
## 2 lcv 1 5 0.0302 0.091 0.03 \* Wilcoxon  
## 3 lcv 2 5 0.148 0.3 0.15 ns Wilcoxon