Supplement S2 R Script for harvest numbers, GAM models and plotting

```
# Harvest numbers - spline models and plots
library(readxl)
library(mgcv)

all <- read_excel("maindata.xlsx",sheet = "ALL")
bb <- read_excel("maindata.xlsx",sheet = "BB")
bs <- read_excel("maindata.xlsx",sheet = "BS")
cs <- read_excel("maindata.xlsx",sheet = "CS")
ds <- read_excel("maindata.xlsx",sheet = "DS")
eg <- read_excel("maindata.xlsx",sheet = "EG")
fb <- read_excel("maindata.xlsx",sheet = "FB")
gb <- read_excel("maindata.xlsx",sheet = "GB")
kb <- read_excel("maindata.xlsx",sheet = "KB")
ls <- read_excel("maindata.xlsx",sheet = "LS")
mc <- read_excel("maindata.xlsx",sheet = "MC")
nb <- read_excel("maindata.xlsx",sheet = "NB")
nw <- read_excel("maindata.xlsx",sheet = "NW")
sb <- read_excel("maindata.xlsx",sheet = "SB")
sh <- read_excel("maindata.xlsx",sheet = "SH")
vm <- read_excel("maindata.xlsx",sheet = "VM")
wh <- read_excel("maindata.xlsx",sheet = "WH")

bb$rate <- (bb$Tot/bb$popsize)*100
bs$rate <- (bs$Tot/bs$popsize)*100
cs$rate <- (cs$Tot/cs$popsize)*100
ds$rate <- (ds$Tot/ds$popsize)*100
eg$rate <- (eg$Tot/eg$popsize)*100
fb$rate <- (fb$Tot/fb$popsize)*100
gb$rate <- (gb$Tot/gb$popsize)*100
kb$rate <- (kb$Tot/kb$popsize)*100
ls$rate <- (ls$Tot/ls$popsize)*100
mc$rate <- (mc$Tot/mc$popsize)*100
nb$rate <- (nb$Tot/nb$popsize)*100
nw$rate <- (nw$Tot/nw$popsize)*100
sb$rate <- (sb$Tot/sb$popsize)*100
sh$rate <- (sh$Tot/sh$popsize)*100
vm$rate <- (vm$Tot/vm$popsize)*100
wh$rate <- (wh$Tot/wh$popsize)*100

m.all <- gamm(Tot~s(Year),family=quasipoisson,data=all,
              correlation=corAR1(value=0.5,fixed=T))
m.bb <- gamm(Tot~s(Year,k=6),family=quasipoisson,data=bb,
             correlation=corAR1(value=0.5,fixed=T))
m.bs <- gam(Tot~s(Year,k=6),family=quasipoisson,data=bs,na.omit=T)
m.cs <- gam(Tot~s(Year,k=6),family=quasipoisson,data=cs)
m.ds <- gamm(Tot~s(Year,k=6),family=quasipoisson,data=ds,
            correlation=corAR1(value=0.5,fixed=T))
m.eg <- gamm(Tot~s(Year,k=6),family=quasipoisson,data=eg,
            correlation=corAR1(value=0.5,fixed=T))
m.fb <- gam(Tot~s(Year,k=6),family=quasipoisson,data=fb)
m.gb <- gam(Tot~s(Year,k=6),family=quasipoisson,data=gb)
m.kb <- gam(Tot~s(Year,k=6),family=quasipoisson,data=kb)
m.ls <- gam(Tot~s(Year,k=6),family=quasipoisson,data=ls)
m.mc <- gamm(Tot~s(Year,k=6),family=quasipoisson,data=mc,
            correlation=corAR1(value=0.5,fixed=T))
m.nw <- gam(Tot~s(Year,k=6),family=quasipoisson,data=nw)
m.nb <- gam(Tot~s(Year,k=6),family=quasipoisson,data=nb)
m.sb <- gamm(Tot~s(Year,k=6),family=quasipoisson,data=sb,
            correlation=corAR1(value=0.5,fixed=T))
m.sh <- gam(Tot~s(Year,k=6),family=quasipoisson,data=sh)
m.vm <- gam(Tot~s(Year,k=6),family=quasipoisson,data=vm)
m.wh <- gam(Tot~s(Year,k=6),family=quasipoisson,data=wh)

mall <- summary(m.all$gam)
mbb <- summary(m.bb$gam)
mbs <- summary(m.bs)
mcs <- summary(m.cs)
mds <- summary(m.ds$gam)
meg <- summary(m.eg$gam)
mfb <- summary(m.fb)
mgb <- summary(m.gb)
mkb <- summary(m.kb)
mls <- summary(m.ls)
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```
mmc <- summary(m.mc$gam)
mnw <- summary(m.nw)
mnb <- summary(m.nb)
msb <- summary(m.sb$gam)
msh <- summary(m.sh)
mvm <- summary(m.vm)
mwh <- summary(m.wh)

YearP=seq(1970,2018,by=1)

mall.pred=predict(m.all$gam,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mbb.pred=predict(m.bb$gam,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mbs.pred=predict(m.bs,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mcs.pred=predict(m.cs,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mds.pred=predict(m.ds$gam,newdata=data.frame(Year=YearP),type="response",se.fit=T)
meg.pred=predict(m.eg$gam,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mfb.pred=predict(m.fb,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mgb.pred=predict(m.gb,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mkb.pred=predict(m.kb,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mls.pred=predict(m.ls,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mmc.pred=predict(m.mc$gam,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mnb.pred=predict(m.nb,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mnw.pred=predict(m.nw,newdata=data.frame(Year=YearP),type="response",se.fit=T)
msb.pred=predict(m.sb$gam,newdata=data.frame(Year=YearP),type="response",se.fit=T)
msh.pred=predict(m.sh,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mvm.pred=predict(m.vm,newdata=data.frame(Year=YearP),type="response",se.fit=T)
mwh.pred=predict(m.wh,newdata=data.frame(Year=YearP),type="response",se.fit=T)

## Graphical parameters
sym <- c(21,19,19)
clr <- c("black","black","red")

## ALL POPULATIONS
plot(YearP, mall.pred$fit, type="l", ylim=c(500,1400),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.9,las=1)
polygon(c(YearP,YearP[49:1]),c(mall.pred$fit-
2*mall.pred$se.fit,(mall.pred$fit+2*mall.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
points(all$Year,all$Tot,col='black',pch=21,cex=2.5)
lines(YearP,mall.pred$fit+2*mall.pred$se.fit,lty="dotted",col="black")
lines(YearP,mall.pred$fit-2*mall.pred$se.fit,lty="dotted",col="black")
mtext('ALL POPULATIONS', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mall$r.sq
edf <- mall$edf
pval <- mall$s.table[,"p-value"]
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval, dig = 3))))
yoff_vec <- c(0.4, 2.4, 2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## BAFFIN BAY
plot(YearP, mbb.pred$fit, type="l", ylim=c(0,310),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mbb.pred$fit-
2*mbb.pred$se.fit,(mbb.pred$fit+2*mbb.pred$se.fit)[49:1]),
#        angle = c(-45, 45), density=30,col=rgb(0.4,0.4,0.4,0.6))
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx01 <- ifelse(is.na(bb$rate),1,ifelse(bb$rate <= 4.5,2,3))
points(bb$Year,bb$Tot,pch=sym[idx01],col=clr[idx01],cex=1.8)
lines(YearP,mbb.pred$fit+2*mbb.pred$se.fit,lty="dotted",col="black")
lines(YearP,mbb.pred$fit-2*mbb.pred$se.fit,lty="dotted",col="black")
mtext('BAFFIN BAY', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mbb$r.sq
edf <- mbb$edf
pval <- mbb$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
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for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=-1, y=1, cex=1.5,
       yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## BARENTS SEA
plot(YearP, mbs.pred$fit, type="l", ylim=c(0,550),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mbs.pred$fit-
2*mbs.pred$se.fit,(mbs.pred$fit+2*mbs.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx02 <- ifelse(is.na(bs$rate),1,ifelse(bs$rate <= 4.5,2,3))
points(bs$Year,bs$Tot,pch=sym[idx02],col=clr[idx02],cex=1.8)
lines(YearP,mbs.pred$fit+2*mbs.pred$se.fit,lty="dotted",col="black")
lines(YearP,mbs.pred$fit-2*mbs.pred$se.fit,lty="dotted",col="black")
mtext('BARENTS SEA', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mbs$r.sq
edf <- mbs$edf
pval <- mbs$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## CHUKCHI SEA
plot(YearP, mcs.pred$fit, type="l", ylim=c(0,240),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mcs.pred$fit-
2*mcs.pred$se.fit,(mcs.pred$fit+2*mcs.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx03 <- ifelse(is.na(cs$rate),1,ifelse(cs$rate <= 4.5,2,3))
points(cs$Year,cs$Tot,pch=sym[idx03],col=clr[idx03],cex=1.8)
lines(YearP,mcs.pred$fit+2*mcs.pred$se.fit,lty="dotted",col="black")
lines(YearP,mcs.pred$fit-2*mcs.pred$se.fit,lty="dotted",col="black")
mtext('CHUKCHI SEA', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mcs$r.sq
edf <- mcs$edf
pval <- mcs$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## DAVIS STRAIT
plot(YearP, mds.pred$fit, type="l", ylim=c(25,140),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mds.pred$fit-
2*mds.pred$se.fit,(mds.pred$fit+2*mds.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx04 <- ifelse(is.na(ds$rate),1,ifelse(ds$rate <= 4.5,2,3))
points(ds$Year,ds$Tot,pch=sym[idx04],col=clr[idx04],cex=1.8)
lines(YearP,mds.pred$fit+2*mds.pred$se.fit,lty="dotted",col="black")
lines(YearP,mds.pred$fit-2*mds.pred$se.fit,lty="dotted",col="black")
mtext('DAVIS STRAIT', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mds$r.sq
edf <- mds$edf
pval <- mds$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
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yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=-1, y=1, cex=1.5,
                          yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## EAST GREENLAND
plot(YearP, meg.pred$fit, type="l", ylim=c(40,140),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(meg.pred$fit-
2*meg.pred$se.fit,(meg.pred$fit+2*meg.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx05 <- ifelse(is.na(eg$rate),1,ifelse(eg$rate <= 4.5,2,3))
points(eg$Year,eg$Tot,pch=sym[idx05],col=clr[idx05],cex=1.8)
lines(YearP,meg.pred$fit+2*meg.pred$se.fit,lty="dotted",col="black")
lines(YearP,meg.pred$fit-2*meg.pred$se.fit,lty="dotted",col="black")
mtext('EAST GREENLAND', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- meg$r.sq
edf <- meg$edf
pval <- meg$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                          yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## FOXE BASIN
plot(YearP, mfb.pred$fit, type="l", ylim=c(10,210),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mfb.pred$fit-
2*mfb.pred$se.fit,(mfb.pred$fit+2*mfb.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx06 <- ifelse(is.na(fb$rate),1,ifelse(fb$rate <= 4.5,2,3))
points(fb$Year,fb$Tot,pch=sym[idx06],col=clr[idx06],cex=1.8)
lines(YearP,mfb.pred$fit+2*mfb.pred$se.fit,lty="dotted",col="black")
lines(YearP,mfb.pred$fit-2*mfb.pred$se.fit,lty="dotted",col="black")
mtext('FOXE BASIN', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mfb$r.sq
edf <- mfb$edf
pval <- mfb$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                          yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## GULF OF BOOTHIA
plot(YearP, mgb.pred$fit, type="l", ylim=c(10,90),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mgb.pred$fit-
2*mgb.pred$se.fit,(mgb.pred$fit+2*mgb.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx07 <- ifelse(is.na(gb$rate),1,ifelse(gb$rate <= 4.5,2,3))
points(gb$Year,gb$Tot,pch=sym[idx07],col=clr[idx07],cex=1.8)
lines(YearP,mgb.pred$fit+2*mgb.pred$se.fit,lty="dotted",col="black")
lines(YearP,mgb.pred$fit-2*mgb.pred$se.fit,lty="dotted",col="black")
mtext('GULF OF BOOTHIA', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mgb$r.sq
edf <- mgb$edf
pval <- mgb$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
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             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=-1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## KANE BASIN
plot(YearP, mkb.pred$fit, type="l", ylim=c(0,60),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mkb.pred$fit-
2*mkb.pred$se.fit,(mkb.pred$fit+2*mkb.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx08 <- ifelse(is.na(kb$rate),1,ifelse(kb$rate <= 4.5,2,3))
points(kb$Year,kb$Tot,pch=sym[idx08],col=clr[idx08],cex=1.8)
lines(YearP,mkb.pred$fit+2*mkb.pred$se.fit,lty="dotted",col="black")
lines(YearP,mkb.pred$fit-2*mkb.pred$se.fit,lty="dotted",col="black")
mtext('KANE BASIN', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mkb$r.sq
edf <- mkb$edf
pval <- mkb$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## LANCASTER SOUND
plot(YearP, mls.pred$fit, type="l", ylim=c(65,130),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mls.pred$fit-
2*mls.pred$se.fit,(mls.pred$fit+2*mls.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx09 <- ifelse(is.na(ls$rate),1,ifelse(ls$rate <= 4.5,2,3))
points(ls$Year,ls$Tot,pch=sym[idx09],col=clr[idx09],cex=1.8)
lines(YearP,mls.pred$fit+2*mls.pred$se.fit,lty="dotted",col="black")
lines(YearP,mls.pred$fit-2*mls.pred$se.fit,lty="dotted",col="black")
mtext('LANCASTER SOUND', side=3, line=0.8, at=1969,adj=0,cex=1.4)
mtext('Number of harvested bears', side=2, line=5, at=100,adj=0,cex=2.4)

r2 <- mls$r.sq
edf <- mls$edf
pval <- mls$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## M'CLINTOCK CHANNEL
plot(YearP, mmc.pred$fit, type="l", ylim=c(0,65),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mmc.pred$fit-
2*mmc.pred$se.fit,(mmc.pred$fit+2*mmc.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx10 <- ifelse(is.na(mc$rate),1,ifelse(mc$rate <= 4.5,2,3))
points(mc$Year,mc$Tot,pch=sym[idx10],col=clr[idx10],cex=1.8)
lines(YearP,mmc.pred$fit+2*mmc.pred$se.fit,lty="dotted",col="black")
lines(YearP,mmc.pred$fit-2*mmc.pred$se.fit,lty="dotted",col="black")
mtext('M`CLINTOCK CHANNEL', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mmc$r.sq
edf <- mmc$edf
pval <- mmc$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
```

```
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## NORTHERN BEAUFORT SEA
plot(YearP, mnb.pred$fit, type="l", ylim=c(20,65),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mnb.pred$fit-
2*mnb.pred$se.fit,(mnb.pred$fit+2*mnb.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx11 <- ifelse(is.na(nb$rate),1,ifelse(nb$rate <= 4.5,2,3))
points(nb$Year,nb$Tot,pch=sym[idx11],col=clr[idx11],cex=1.8)
lines(YearP,mnb.pred$fit+2*mnb.pred$se.fit,lty="dotted",col="black")
lines(YearP,mnb.pred$fit-2*mnb.pred$se.fit,lty="dotted",col="black")
mtext('NORTHERN BEAUFORT SEA', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mnb$r.sq
edf <- mnb$edf
pval <- mnb$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=-1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## NORWEGIAN BAY
plot(YearP, mnw.pred$fit, type="l", ylim=c(0,12),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mnw.pred$fit-
2*mnw.pred$se.fit,(mnw.pred$fit+2*mnw.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx12 <- ifelse(is.na(nw$rate),1,ifelse(nw$rate <= 4.5,2,3))
points(nw$Year,nw$Tot,pch=sym[idx12],col=clr[idx12],cex=1.8)
lines(YearP,mnw.pred$fit+2*mnw.pred$se.fit,lty="dotted",col="black")
lines(YearP,mnw.pred$fit-2*mnw.pred$se.fit,lty="dotted",col="black")
mtext('NORWEGIAN BAY', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mnw$r.sq
edf <- mnw$edf
pval <- mnw$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## SOUTHERN BEAUFORT SEA
plot(YearP, msb.pred$fit, type="l", ylim=c(0,130),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(msb.pred$fit-
2*msb.pred$se.fit,(msb.pred$fit+2*msb.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx13 <- ifelse(is.na(sb$rate),1,ifelse(sb$rate <= 4.5,2,3))
points(sb$Year,sb$Tot,pch=sym[idx13],col=clr[idx13],cex=1.8)
lines(YearP,msb.pred$fit+2*msb.pred$se.fit,lty="dotted",col="black")
lines(YearP,msb.pred$fit-2*msb.pred$se.fit,lty="dotted",col="black")
mtext('SOUTHERN BEAUFORT SEA', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- msb$r.sq
edf <- msb$edf
pval <- msb$s.table[,"p-value"]
pval
```

```
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## SOUTHERN HUDSON BAY
plot(YearP, msh.pred$fit, type="l", ylim=c(0,150),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(msh.pred$fit-
2*msh.pred$se.fit,(msh.pred$fit+2*msh.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx14 <- ifelse(is.na(sh$rate),1,ifelse(sh$rate <= 4.5,2,3))
points(sh$Year,sh$Tot,pch=sym[idx14],col=clr[idx14],cex=1.8)
lines(YearP,msh.pred$fit+2*msh.pred$se.fit,lty="dotted",col="black")
lines(YearP,msh.pred$fit-2*msh.pred$se.fit,lty="dotted",col="black")
mtext('SOUTHERN HUDSON BAY', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- msh$r.sq
edf <- msh$edf
pval <- msh$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=-1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## VISCOUNT MELVILLE SOUND
plot(YearP, mvm.pred$fit, type="l", ylim=c(0,13),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mvm.pred$fit-
2*mvm.pred$se.fit,(mvm.pred$fit+2*mvm.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx15 <- ifelse(is.na(vm$rate),1,ifelse(vm$rate <= 4.5,2,3))
points(vm$Year,vm$Tot,pch=sym[idx15],col=clr[idx15],cex=1.8)
lines(YearP,mvm.pred$fit+2*mvm.pred$se.fit,lty="dotted",col="black")
lines(YearP,mvm.pred$fit-2*mvm.pred$se.fit,lty="dotted",col="black")
mtext('VISCOUNT MELVILLE SOUND', side=3, line=0.8, at=1969,adj=0,cex=1.4)
mtext('Year', side=1, line=4.1, at=1955,adj=0,cex=2.4)

r2 <- mvm$r.sq
edf <- mvm$edf
pval <- mvm$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## WESTERN HUDSON BAY
plot(YearP, mwh.pred$fit, type="l", ylim=c(0,95),xlim=c(1970,2020),
     xlab="", ylab=" ",lwd=1.6,las=1)
polygon(c(YearP,YearP[49:1]),c(mwh.pred$fit-
2*mwh.pred$se.fit,(mwh.pred$fit+2*mwh.pred$se.fit)[49:1]),
        col=rgb(0.6,0.6,0.6,0.2),border=NA)
idx16 <- ifelse(is.na(wh$rate),1,ifelse(wh$rate <= 4.5,2,3))
points(wh$Year,wh$Tot,pch=sym[idx16],col=clr[idx16],cex=1.8)
lines(YearP,mwh.pred$fit+2*mwh.pred$se.fit,lty="dotted",col="black")
lines(YearP,mwh.pred$fit-2*mwh.pred$se.fit,lty="dotted",col="black")
mtext('WESTERN HUDSON BAY', side=3, line=0.8, at=1969,adj=0,cex=1.4)

r2 <- mwh$r.sq
edf <- mwh$edf
```

```
pval <- mwh$s.table[,"p-value"]
pval
pval.t <-ifelse(pval<0.0001,"<0.0001",paste("",format(pval, nsmall=3)))
labs <- list(bquote(italic(R)^2 == .(format(r2, dig = 2))),
             bquote("edf" == .(format(edf, dig = 2))),
             bquote(italic(p) == .(format(pval.t, dig = 2))))
yoff_vec <- c(0.2, 2.8, 2.2)
for (i in 1:3) {
   plotrix::corner.label(labs[[i]], x=1, y=1, cex=1.5,
                         yoff = cumsum(yoff_vec)[i]*strheight("m"))
}

## Layout
par(mar=c(4.8, 7.5, 2.2, 0) + 0.2)
par(cex.lab=1.3,cex.axis=1.9)
mat <- matrix(c(1,1,2,3,1,1,4,5,
                6:9,10:13,14:17),nrow=5,ncol=4,byrow=T)
layout(mat)
```