

## FigyTab\_ANEXO\_II\_Sensibilidad

```
library(knitr) # para generar reporte Rmarkdown
library(stringr)
library(reshape)
library(dplyr)
library(ggplot2)
library(ggthemes) # para ggplot
library(patchwork) # para unir gráficos de ggplot
library(strucchange) # libreria utilizada para análisis de quiebres

dir.Fig      <- "Figuras/" # carpeta de las figuras utilizadas y generadas en este estudio
fig          <- c("pdf") # formato de figuras generadas por este código
dir.0        <- getwd() # directorio de trabajo
dir.1        <- paste(dir.0, "/codigos_admb", sep="") # carpeta de códigos ADMB
dir.2        <- paste(dir.0, "/Retrospectivobase", sep="") # carpeta de códigos ADMB
dir.3        <- paste(dir.0, "/Retrospectivoalternativo", sep="") # carpeta de códigos ADMB
dir.4        <- paste(dir.0, "/Verosimilitudalternativo", sep="") # carpeta de códigos ADMB
dir.5        <- paste(dir.0, "/Verosimilitudbase", sep="") # carpeta de códigos ADMB

dir.fun      <- paste(dir.0, "/funciones/", sep="") # carpeta de funciones utilizadas en este informe
source(paste(dir.fun, "functions.R", sep="")) # funciones para leer .dat y .rep
source(paste(dir.fun, "Fn_PBRs.R", sep="")) # funciones para leer .dat y .rep

setwd(dir.1)
#Asesoría septiembre 2020 MODELO BASE
data.0      <- lisread(paste(dir.1, "MTT0920.dat", sep="/"));
names(data.0) <- str_trim(names(data.0), side="right")
rep0        <- reptoRlist("MTT0920.rep")
std0        <- read.table("MTT0920.std", header=T, sep=" ", na="NA", fill=T)

#Asesoría junio 2021 MODELO BASE
data.1      <- lisread(paste(dir.1, "MTT0621.dat", sep="/"));
names(data.1) <- str_trim(names(data.1), side="right")
rep1        <- reptoRlist("MTT0621.rep")
std1        <- read.table("MTT0621.std", header=T, sep=" ", na="NA", fill=T)

#####
# AREGLOS DE DATOS
#####

library(patchwork)

yrs      <- rep1$Years
nyrs     <- length(yrs)
lasty    <- yrs[nyrs]
cvCB     <- data.1$Ind[,7]
cvcpue   <- data.1$Ind[,5]
cvdes    <- data.1$Ind[,3]
```

```

Bcru_obs_jun<-rep1$Bcru_obs      ;Bcru_obs_jun[Bcru_obs_jun==0] <- NA
CPUE_obs_jun<-rep1$CPUE_obs      ;CPUE_obs_jun[CPUE_obs_jun==0] <- NA
Desemb_obs_jun<-rep1$Desemb_obs ;Desemb_obs_jun[Desemb_obs_jun==0] <- NA

Bcru_obs_sept<-rep0$Bcru_obs      ;Bcru_obs_sept[Bcru_obs_sept==0] <- NA
CPUE_obs_sept<-rep0$CPUE_obs      ;CPUE_obs_sept[CPUE_obs_sept==0] <- NA
Desemb_obs_sept<-rep0$Desemb_obs ;Desemb_obs_sept[Desemb_obs_sept==0] <- NA

ind_jun  <- cbind(c(Bcru_obs_jun), c(CPUE_obs_jun), c(Desemb_obs_jun))
colnames(ind_jun) <- c('Biomasa_Crucero', 'CPUE', 'Desembarques')

ind_sept <- cbind(c(Bcru_obs_sept,NA), c(CPUE_obs_sept,NA), c(Desemb_obs_sept,NA))
colnames(ind_sept) <- c('Biomasa_Crucero', 'CPUE', 'Desembarques')

junio  <- data.frame(ind_jun) %>% mutate (Asesoría='junio_2021') %>%
  mutate (yrs= yrs) %>% melt(id.var=c('yrs', 'Asesoría'))
sept   <- data.frame(ind_sept) %>% mutate (Asesoría='septiembre_2020') %>%
  mutate (yrs= yrs) %>% melt(id.var=c('yrs', 'Asesoría'))

base1 <- data.frame(rbind(junio, sept))

#####
# GRAFICAS
#####

f1 <- ggplot(base1 %>% filter(Asesoría!='observado', variable=='Biomasa_Crucero'),
  aes(yrs,value/1000000)) +
  geom_line(aes(colour=Asesoría,linetype = Asesoría), size=1) +
  scale_colour_manual(values=c('red','black')) +
  geom_point(data = base1 %>% filter(Asesoría=='observado',
    variable=='Biomasa_Crucero'),
    aes(yrs,value/1000000), shape = 19, colour = 'gray30') +
  scale_x_continuous(breaks = seq(from = 1985, to = 2020, by = 2)) +
  labs(title='Biomasa de Crucero', x = 'Año', y = 'Toneladas (millones)') +
  theme_bw(base_size=9)

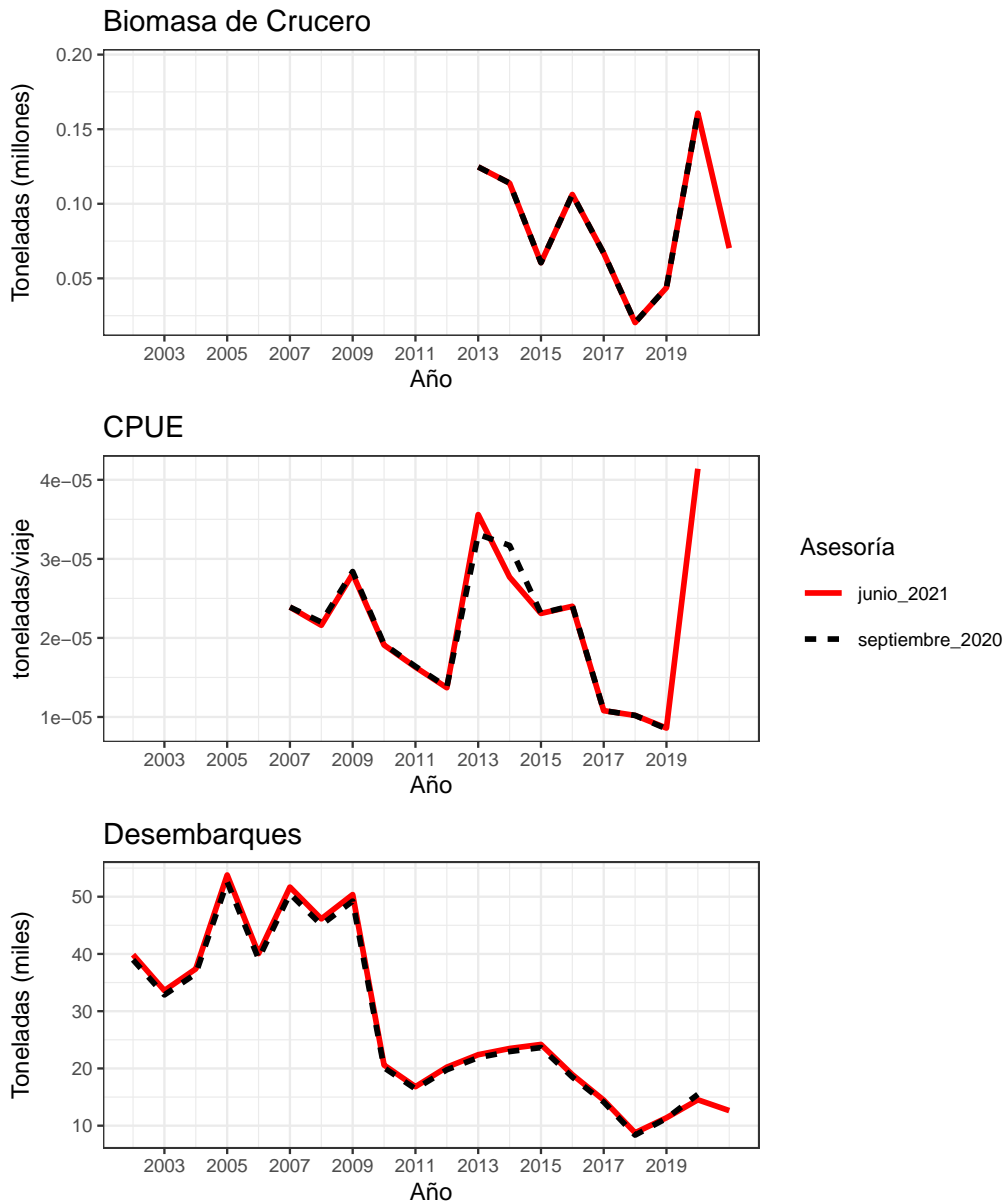
f2 <- ggplot(base1 %>% filter(Asesoría!='observado', variable=='CPUE'),
  aes(yrs,value/1000000)) +
  geom_line(aes(colour=Asesoría,linetype = Asesoría), size=1) +
  scale_colour_manual(values=c('red','black')) +
  geom_point(data = base1 %>% filter(Asesoría=='observado',
    variable=='CPUE'),
    aes(yrs,value/1000000), shape = 19, colour = 'gray30') +
  scale_x_continuous(breaks = seq(from = 1985, to = 2020, by = 2)) +
  labs(title='CPUE', x = 'Año', y = 'toneladas/viaje') +
  theme_bw(base_size=9)

f3 <- ggplot(base1 %>% filter(Asesoría!='observado', variable=='Desembarques'),
  aes(yrs,value/1000)) +

```

```
geom_line(aes(colour=Asesoría, linetype = Asesoría), size=1) +
scale_colour_manual(values=c('red','black')) +
geom_point(data = base1 %>% filter(Asesoría=='observado',
                                variable=='Desembarques'),
aes(yrs,value/1000), shape = 19, colour = 'gray30') +
scale_x_continuous(breaks = seq(from = 1985, to = 2020, by = 2)) +
labs(title='Desembarques', x = 'Año', y = 'Toneladas (miles)') +
theme_bw(base_size=9)
```

```
f1/f2/f3 + plot_layout(guides="collect")
```



```
Tallas<-rep1$Tallas
Tallasflota_jun<-rep1$Propfl_obs[nyrs-1,]
Tallasflota_sept<-rep0$Propfl_obs[nyrs-1,]
```

```

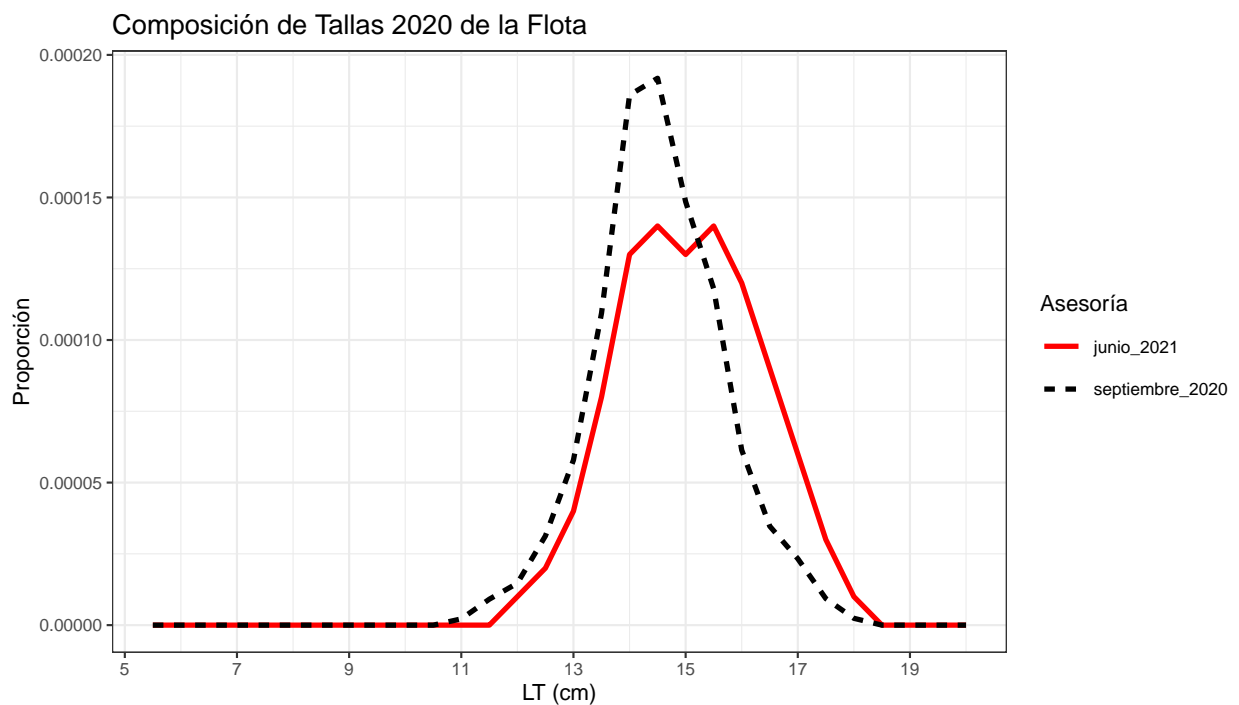
Tjunio <- data.frame(Tallasflota_jun) %>% mutate (Asesoría='junio_2021') %>%
  mutate (Tallas= Tallas) %>% melt(id.var=c('Tallas', 'Asesoría'))
Tsept <- data.frame(Tallasflota_sept) %>% mutate (Asesoría='septiembre_2020') %>%
  mutate (Tallas= Tallas) %>% melt(id.var=c('Tallas', 'Asesoría'))

Tbase1 <- data.frame(rbind(Tjunio, Tsept))

f1<-ggplot(Tbase1 %>% filter(Asesoría!='observado'),
  aes(Tallas,value/1000)) +
  geom_line(aes(colour=Asesoría,linetype = Asesoría), size=1) +
  scale_colour_manual(values=c('red','black')) +
  scale_x_continuous(breaks = seq(from = 5, to = 20, by = 2)) +
  labs(title='Composición de Tallas 2020 de la Flota', x = 'LT (cm)', y = 'Proporción') +
  theme_bw(base_size=9)

```

f1



```

Tallas<-rep1$Tallas
Tallascru_jun<-rep1$Propcru_obs[nyrs,]
Tallascru_sept<-rep(NA,length(Tallas))

Tjunio <- data.frame(Tallascru_jun) %>% mutate (Asesoría='junio_2021') %>%
  mutate (Tallas= Tallas) %>% melt(id.var=c('Tallas', 'Asesoría'))
Tsept <- data.frame(Tallascru_sept) %>% mutate (Asesoría='septiembre_2020') %>%
  mutate (Tallas= Tallas) %>% melt(id.var=c('Tallas', 'Asesoría'))

Tbase1 <- data.frame(rbind(Tjunio, Tsept))

f1<-ggplot(Tbase1 %>% filter(Asesoría!='observado'),

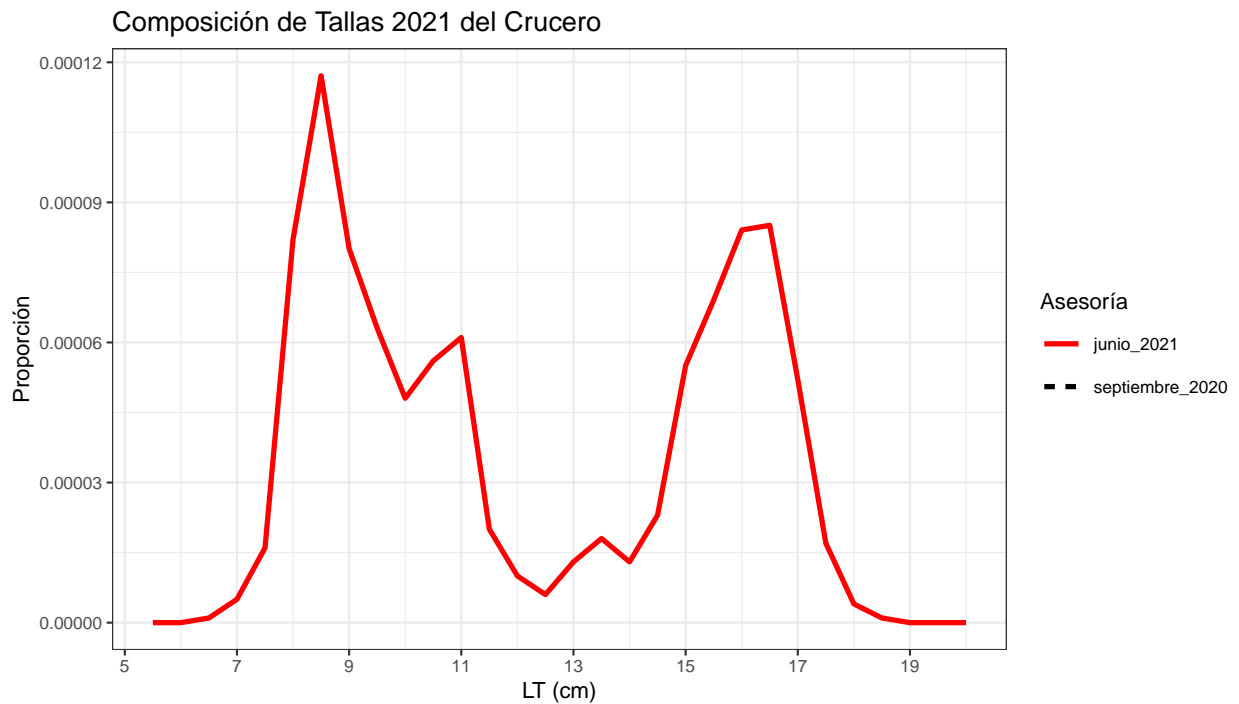
```

```

aes(Tallas,value/1000)) +
geom_line(aes(colour=Asesoría,linetype = Asesoría), size=1) +
scale_colour_manual(values=c('red','black')) +
scale_x_continuous(breaks = seq(from = 5, to = 20, by = 2)) +
labs(title='Composición de Tallas 2021 del Crucero', x = 'LT (cm)', y = 'Proporción') +
theme_bw(base_size=9)

```

f1



```

Carpeta<-"./Sensibilidad_al_update_junio21"
dir<-paste(dir.0,Carpeta,sep="")

setwd(dir)
admb<-"MTT0920"
#####

years      <- rep1$Years
nyears     <- length(years)
retros     <- seq(1,7)
nretros    <- length(retros)

retroR     <- matrix(0,nrow=nyears,ncol=nretros)
retroBD    <- matrix(0,nrow=nyears,ncol=nretros)
retroBT    <- matrix(0,nrow=nyears,ncol=nretros)
retroF     <- matrix(0,nrow=nyears,ncol=nretros)
retroBD_BDrms <- matrix(0,nrow=nyears,ncol=nretros)

for(i in 1:(nretros-2)){
  rep <- reptoRlist(paste(admb,"s",i,".rep",sep=""))

```

```

std <- read.table(paste(admb,"s",i,".std",sep=""),header=T,sep=" ",na="NA",fill=T)
retroR[,i] <- c(rep$Reclutamiento,NA)
retroBD[,i] <- c(rep$Biomasa_desovante,NA)
retroBT[,i] <- c(rep$Biomasa_total,NA)
retroF[,i] <- c(rep$F,NA)
retroBD_BDrms[,i] <-c(subset(std,name=="RPR")$value,NA)
}

```

## Warning in lapply(X = X, FUN = FUN, ...): NAs introduced by coercion

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## Warning in lapply(X = X, FUN = FUN, ...): NAs introduced by coercion

```

for(i in 6:(nretros)){
  rep <- reptoRlist(paste(admb,"s",i,".rep",sep=""))
  std <- read.table(paste(admb,"s",i,".std",sep=""),header=T,sep=" ",na="NA",fill=T)
  retroR[,i] <- c(rep$Reclutamiento)
  retroBD[,i] <- c(rep$Biomasa_desovante)
  retroBT[,i] <- c(rep$Biomasa_total)
  retroF[,i] <- c(rep$F)
  retroBD_BDrms[,i] <-subset(std,name=="RPR")$value
}

```

## Warning in lapply(X = X, FUN = FUN, ...): NAs introduced by coercion

## Warning in lapply(X = X, FUN = FUN, ...): NAs introduced by coercion

*# Diferencia relativa con caso base actual*

```

rel.diff.r <- matrix(NA, nrow=nyears, ncol=(nretros))
rel.diff.ssb <- matrix(NA, nrow=nyears, ncol=(nretros))
rel.diff.bt <- matrix(NA, nrow=nyears, ncol=(nretros))
rel.diff.f <- matrix(NA, nrow=nyears, ncol=(nretros))
rel.diff.bd_bdrms <- matrix(NA, nrow=nyears, ncol=(nretros))

```

```

for(j in 1:nretros){
  rel.diff.r[,j] <- (retroR[,j])-retroR[,1])/retroR[,1]
  rel.diff.ssb[,j] <- (retroBD[,j])-retroBD[,1])/retroBD[,1]
  rel.diff.bt[,j] <- (retroBT[,j])-retroBT[,1])/retroBT[,1]
  rel.diff.f[,j] <- (retroF[,j])-retroF[,1])/retroF[,1]
  rel.diff.bd_bdrms[,j] <- (retroBD_BDrms[,j])-retroBD_BDrms[,1])/retroBD_BDrms[,1]
}

```

```

datR <- data.frame(years=years,
  S1=rel.diff.r[,1],
  S2=rel.diff.r[,2],
  S3=rel.diff.r[,3],
  S4=rel.diff.r[,4],
  S5=rel.diff.r[,5],
  S6=rel.diff.r[,6],
  S7=rel.diff.r[,7])%>%

```

```

mutate(Series=rep("Reclutamientos",nyears))%>%
melt(id.var=c('years', 'Series'))

datBT <- data.frame(years=years,
                    S1=rel.diff.bt[,1],
                    S2=rel.diff.bt[,2],
                    S3=rel.diff.bt[,3],
                    S4=rel.diff.bt[,4],
                    S5=rel.diff.bt[,5],
                    S6=rel.diff.bt[,6],
                    S7=rel.diff.bt[,7])%>%
mutate(Series=rep("Biomasa_total",nyears))%>%
melt(id.var=c('years', 'Series'))

datBD <- data.frame(years=years,
                    S1=rel.diff.ssb[,1],
                    S2=rel.diff.ssb[,2],
                    S3=rel.diff.ssb[,3],
                    S4=rel.diff.ssb[,4],
                    S5=rel.diff.ssb[,5],
                    S6=rel.diff.ssb[,6],
                    S7=rel.diff.ssb[,7])%>%
mutate(Series=rep("Biomasa_desovante",nyears))%>%
melt(id.var=c('years', 'Series'))

datF <- data.frame(years=years,
                    S1=rel.diff.f[,1],
                    S2=rel.diff.f[,2],
                    S3=rel.diff.f[,3],
                    S4=rel.diff.f[,4],
                    S5=rel.diff.f[,5],
                    S6=rel.diff.f[,6],
                    S7=rel.diff.f[,7])%>%
mutate(Series=rep("Mortalidad_por_pesca",nyears))%>%
melt(id.var=c('years', 'Series'))

data <- data.frame(rbind(datR,datBT,datBD,datF))

#####
# GRAFICAS
#####
f1<- ggplot(data %>% filter(Series=="Reclutamientos"),
            aes(years,value)) + ylim(-0.30, 0.30) +
geom_line(aes(colour=variable), size=0.3)+
labs(x = '', y = 'Diferencia relativa',colour='Asesorías') +
scale_x_continuous(breaks = seq(from = 1990, to = 2021, by = 5)) +
scale_colour_manual(values=seq(1,7,1))+
theme_bw(base_size=9) +
ggtitle('Reclutamientos')+
theme(plot.title = element_text(hjust = 0.5),legend.position="none")

f2<- ggplot(data %>% filter(Series=="Biomasa_total"),
            aes(years,value)) + ylim(-0.30, 0.30) +
geom_line(aes(colour=variable), size=0.3)+

```

```

labs(x = '', y = 'Diferencia relativa',colour='Asesorías') +
scale_x_continuous(breaks = seq(from = 1990, to = 2021, by = 5)) +
scale_colour_manual(values=seq(1,7,1))+
theme_bw(base_size=9) +
ggtitle('Biomasa total')+
theme(plot.title = element_text(hjust = 0.5),legend.position="none")

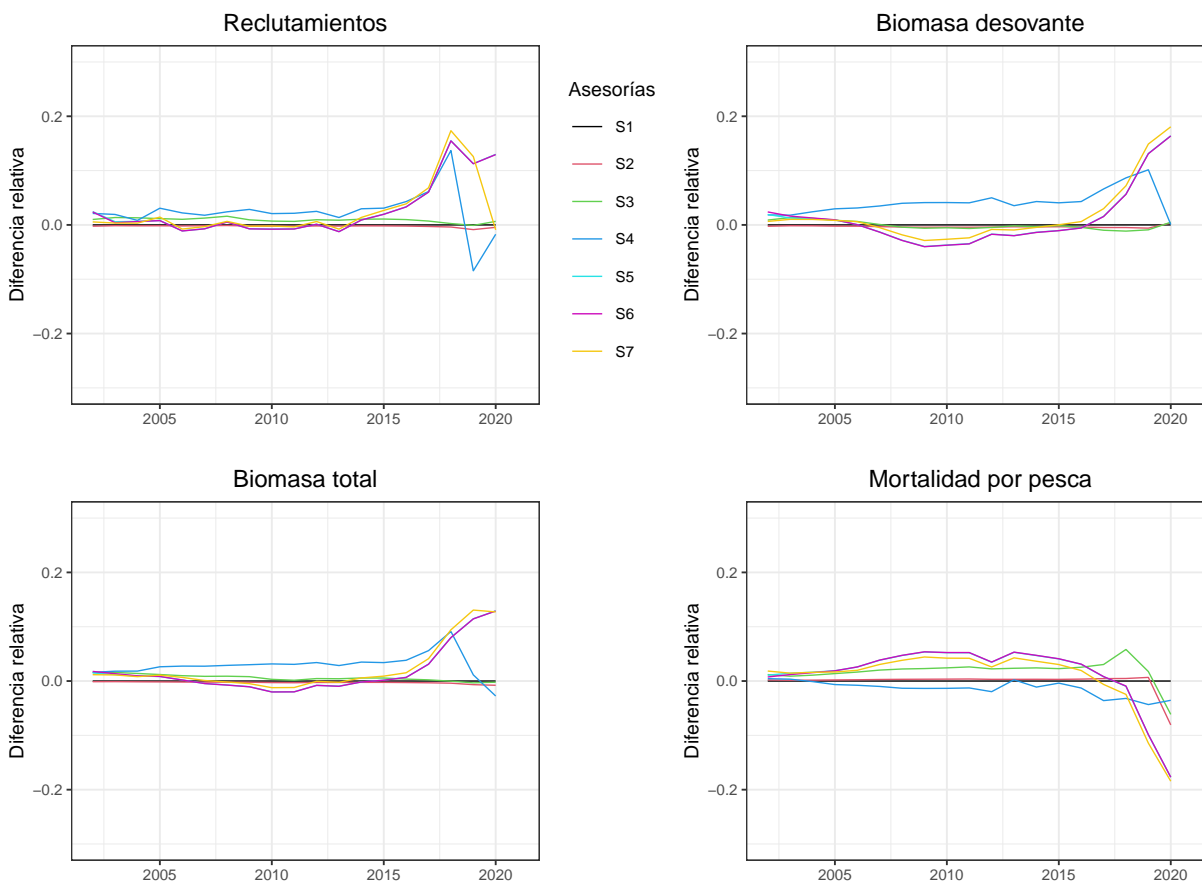
f3<- ggplot(data %>% filter(Series=="Biomasa_desovante"),
          aes(years,value)) +  ylim(-0.30, 0.30) +
geom_line(aes(colour=variable), size=0.3)+
labs(x = '', y = 'Diferencia relativa',colour='Asesorías') +
scale_x_continuous(breaks = seq(from = 1990, to = 2021, by = 5)) +
scale_colour_manual(values=seq(1,7,1))+
theme_bw(base_size=9) +
ggtitle('Biomasa desovante')+
theme(plot.title = element_text(hjust = 0.5),legend.position="left")

f4<- ggplot(data %>% filter(Series=="Mortalidad_por_pesca"),
          aes(years,value)) +
  ylim(-0.30, 0.30) +
geom_line(aes(colour=variable), size=0.3)+
labs(x = '', y = 'Diferencia relativa',colour='Asesorías') +
scale_x_continuous(breaks = seq(from = 1990, to = 2021, by = 5)) +
scale_colour_manual(values=seq(1,7,1))+
theme_bw(base_size=9) +
ggtitle('Mortalidad por pesca')+
theme(plot.title = element_text(hjust = 0.5),legend.position="none")

(f1/f2) | (f3/f4)

```





```
kable(data.frame(indicador=rep("Rt",nyears),years=years,retroR))
```

indicador	years	X1	X2	X3	X4	X5	X6	X7
Rt	2002	6279.72	6264.81	6342.66	6412.38	6432.93	6429.29	6314.60
Rt	2003	9191.00	9177.90	9315.86	9367.92	9244.73	9228.47	9222.09
Rt	2004	13264.30	13242.20	13437.60	13374.90	13349.70	13346.70	13307.20
Rt	2005	20281.70	20250.00	20516.60	20905.60	20444.40	20441.60	20573.40
Rt	2006	8369.45	8353.22	8455.40	8554.37	8277.43	8276.03	8305.40
Rt	2007	8651.36	8638.11	8760.06	8805.12	8590.04	8589.29	8624.02
Rt	2008	10848.00	10835.60	11021.60	11109.10	10906.90	10906.30	10918.50
Rt	2009	6789.41	6775.65	6852.76	6983.17	6740.97	6739.90	6772.86
Rt	2010	5311.60	5299.34	5348.83	5422.12	5270.75	5269.94	5300.68
Rt	2011	5564.11	5550.28	5599.93	5683.19	5523.16	5522.21	5543.88
Rt	2012	14058.00	14031.50	14191.70	14408.80	14076.00	14074.60	14145.50
Rt	2013	2520.90	2515.41	2542.71	2555.28	2489.89	2489.37	2501.26
Rt	2014	12318.90	12297.20	12448.70	12684.70	12430.80	12429.60	12489.00
Rt	2015	3317.14	3311.18	3352.91	3419.54	3382.50	3382.00	3405.46
Rt	2016	2550.45	2544.99	2575.49	2659.95	2635.26	2634.86	2649.26
Rt	2017	4984.22	4969.83	5019.65	5289.99	5285.76	5285.04	5324.47
Rt	2018	3550.68	3536.96	3559.57	4036.80	4100.63	4099.91	4166.38
Rt	2019	10586.10	10494.50	10576.60	9691.33	11779.70	11777.80	11917.60
Rt	2020	2377.60	2366.95	2393.05	2336.62	2686.29	2685.36	2356.00
Rt	2021	NA	NA	NA	NA	NA	7588.31	5474.80

```
kable(data.frame(indicador=rep("Rt.diff",nyears),years=years,round(rel.diff.r,2)))
```

indicador	years	X1	X2	X3	X4	X5	X6	X7
Rt.diff	2002	0	0.00	0.01	0.02	0.02	0.02	0.01
Rt.diff	2003	0	0.00	0.01	0.02	0.01	0.00	0.00
Rt.diff	2004	0	0.00	0.01	0.01	0.01	0.01	0.00
Rt.diff	2005	0	0.00	0.01	0.03	0.01	0.01	0.01
Rt.diff	2006	0	0.00	0.01	0.02	-0.01	-0.01	-0.01
Rt.diff	2007	0	0.00	0.01	0.02	-0.01	-0.01	0.00
Rt.diff	2008	0	0.00	0.02	0.02	0.01	0.01	0.01
Rt.diff	2009	0	0.00	0.01	0.03	-0.01	-0.01	0.00
Rt.diff	2010	0	0.00	0.01	0.02	-0.01	-0.01	0.00
Rt.diff	2011	0	0.00	0.01	0.02	-0.01	-0.01	0.00
Rt.diff	2012	0	0.00	0.01	0.02	0.00	0.00	0.01
Rt.diff	2013	0	0.00	0.01	0.01	-0.01	-0.01	-0.01
Rt.diff	2014	0	0.00	0.01	0.03	0.01	0.01	0.01
Rt.diff	2015	0	0.00	0.01	0.03	0.02	0.02	0.03
Rt.diff	2016	0	0.00	0.01	0.04	0.03	0.03	0.04
Rt.diff	2017	0	0.00	0.01	0.06	0.06	0.06	0.07
Rt.diff	2018	0	0.00	0.00	0.14	0.15	0.15	0.17
Rt.diff	2019	0	-0.01	0.00	-0.08	0.11	0.11	0.13
Rt.diff	2020	0	0.00	0.01	-0.02	0.13	0.13	-0.01
Rt.diff	2021	NA	NA	NA	NA	NA	NA	NA

```
kable(data.frame(indicador=rep("BT",nyears),years=years,retroBT))
```

indicador	years	X1	X2	X3	X4	X5	X6	X7
BT	2002	194918.0	194680.0	197999.0	198043.0	197829.0	198365.0	197197.0
BT	2003	200800.0	200571.0	203975.0	204446.0	203185.0	203511.0	203055.0
BT	2004	210788.0	210489.0	213728.0	214643.0	212717.0	212817.0	212494.0
BT	2005	266799.0	266369.0	269989.0	273795.0	269042.0	269045.0	269680.0
BT	2006	252551.0	252076.0	255042.0	259490.0	253055.0	253030.0	254245.0
BT	2007	207379.0	206952.0	209171.0	213043.0	206435.0	206406.0	207577.0
BT	2008	176058.0	175698.0	177623.0	181133.0	174769.0	174744.0	175738.0
BT	2009	150359.0	150030.0	151570.0	154878.0	148785.0	148761.0	149632.0
BT	2010	107454.0	107143.0	107787.0	110841.0	105314.0	105291.0	106142.0
BT	2011	99342.1	99031.5	99484.5	102392.0	97382.1	97359.1	98158.6
BT	2012	146178.0	145798.0	146841.0	151150.0	145028.0	144999.0	146100.0
BT	2013	140569.0	140197.0	141165.0	144576.0	139238.0	139213.0	140236.0
BT	2014	149189.0	148828.0	150027.0	154396.0	148957.0	148931.0	150039.0
BT	2015	135135.0	134802.0	135881.0	139723.0	135356.0	135334.0	136354.0
BT	2016	90698.1	90444.1	91018.9	94162.8	91314.7	91296.9	92081.1
BT	2017	74463.8	74223.0	74627.1	78630.0	76783.4	76766.9	77529.4
BT	2018	70331.4	70054.6	70313.6	76741.7	75967.3	75950.1	76962.2
BT	2019	110237.0	109503.0	109868.0	111484.0	122875.0	122848.0	124638.0
BT	2020	113795.0	112904.0	113546.0	110658.0	128494.0	128465.0	128277.0
BT	2021	NA	NA	NA	NA	NA	122379.0	108909.0

```
kable(data.frame(indicador=rep("BD",nyears),years=years,retroBD))
```

indicador	years	X1	X2	X3	X4	X5	X6	X7
BD	2002	40951.4	40849.6	41315.8	41707.8	41733.7	41929.4	41213.4
BD	2003	57096.5	57007.1	57865.9	58120.0	57826.9	58022.9	57681.6
BD	2004	57102.0	57006.0	57800.3	58481.4	57740.0	57827.6	57677.6
BD	2005	58821.2	58690.3	59321.3	60563.5	59364.8	59377.8	59314.5
BD	2006	77956.9	77772.3	78451.4	80387.3	77998.9	77991.6	78421.9
BD	2007	61494.2	61298.9	61541.2	63637.7	60688.6	60675.6	61185.5
BD	2008	40283.3	40126.0	40114.8	41887.3	39142.2	39130.7	39547.0
BD	2009	31676.5	31542.4	31483.1	32977.9	30416.4	30406.9	30767.6
BD	2010	30535.2	30409.0	30372.6	31791.4	29403.3	29394.1	29728.1
BD	2011	29096.8	28972.0	28904.7	30279.4	28088.9	28079.4	28404.9
BD	2012	31431.6	31305.5	31284.3	33001.1	30899.9	30889.3	31171.2
BD	2013	46501.3	46341.4	46418.3	48146.9	45587.0	45575.4	46065.4
BD	2014	39131.0	38986.0	38999.6	40815.1	38599.8	38588.7	38952.6
BD	2015	42500.6	42357.1	42440.1	44229.2	42060.0	42049.6	42512.3
BD	2016	32793.0	32665.6	32645.3	34202.7	32613.0	32604.2	32993.1
BD	2017	19677.1	19582.0	19484.0	20977.9	19986.4	19979.3	20263.9
BD	2018	20680.2	20579.1	20444.0	22471.0	21851.4	21844.4	22170.5
BD	2019	24775.7	24628.0	24550.9	27289.9	28031.4	28022.7	28464.4
BD	2020	38349.2	38484.0	38536.4	38377.3	44640.5	44628.7	45275.4
BD	2021	NA	NA	NA	NA	NA	41209.9	39749.4

```
kable(data.frame(indicador=rep("BD.diff",nyears),years=years,round(rel.diff.ssb,2)))
```

indicador	years	X1	X2	X3	X4	X5	X6	X7
BD.diff	2002	0	0.00	0.01	0.02	0.02	0.02	0.01
BD.diff	2003	0	0.00	0.01	0.02	0.01	0.02	0.01
BD.diff	2004	0	0.00	0.01	0.02	0.01	0.01	0.01
BD.diff	2005	0	0.00	0.01	0.03	0.01	0.01	0.01
BD.diff	2006	0	0.00	0.01	0.03	0.00	0.00	0.01
BD.diff	2007	0	0.00	0.00	0.03	-0.01	-0.01	-0.01
BD.diff	2008	0	0.00	0.00	0.04	-0.03	-0.03	-0.02
BD.diff	2009	0	0.00	-0.01	0.04	-0.04	-0.04	-0.03
BD.diff	2010	0	0.00	-0.01	0.04	-0.04	-0.04	-0.03
BD.diff	2011	0	0.00	-0.01	0.04	-0.03	-0.03	-0.02
BD.diff	2012	0	0.00	0.00	0.05	-0.02	-0.02	-0.01
BD.diff	2013	0	0.00	0.00	0.04	-0.02	-0.02	-0.01
BD.diff	2014	0	0.00	0.00	0.04	-0.01	-0.01	0.00
BD.diff	2015	0	0.00	0.00	0.04	-0.01	-0.01	0.00
BD.diff	2016	0	0.00	0.00	0.04	-0.01	-0.01	0.01
BD.diff	2017	0	0.00	-0.01	0.07	0.02	0.02	0.03
BD.diff	2018	0	0.00	-0.01	0.09	0.06	0.06	0.07
BD.diff	2019	0	-0.01	-0.01	0.10	0.13	0.13	0.15
BD.diff	2020	0	0.00	0.00	0.00	0.16	0.16	0.18
BD.diff	2021	NA	NA	NA	NA	NA	NA	NA

```
kable(data.frame(indicador=rep("F",nyears),years=years,retroF))
```

indicador	years	X1	X2	X3	X4	X5	X6	X7
F	2002	0.493403	0.494405	0.499264	0.495589	0.498774	0.497093	0.502480

indicador	years	X1	X2	X3	X4	X5	X6	X7
F	2003	0.342980	0.343465	0.346041	0.344151	0.347904	0.347060	0.347954
F	2004	0.394266	0.394916	0.398526	0.393878	0.400665	0.400356	0.400601
F	2005	0.479449	0.480427	0.486027	0.476322	0.488488	0.488474	0.487429
F	2006	0.316877	0.317621	0.322106	0.314409	0.325060	0.325100	0.323135
F	2007	0.564667	0.566296	0.576029	0.559047	0.586359	0.586475	0.581911
F	2008	0.674416	0.676569	0.689382	0.665456	0.706155	0.706322	0.700167
F	2009	0.883464	0.886423	0.903705	0.871448	0.930757	0.930981	0.922582
F	2010	0.355950	0.357200	0.364600	0.351162	0.374516	0.374614	0.370934
F	2011	0.310689	0.311853	0.318763	0.306732	0.326876	0.326970	0.323712
F	2012	0.264742	0.265577	0.270668	0.259554	0.273916	0.273986	0.271593
F	2013	0.302481	0.303438	0.309587	0.303151	0.318494	0.318569	0.315392
F	2014	0.375407	0.376619	0.384493	0.371222	0.393040	0.393145	0.389083
F	2015	0.361497	0.362605	0.369743	0.360108	0.376238	0.376324	0.372476
F	2016	0.424240	0.425743	0.435037	0.418775	0.437334	0.437444	0.432460
F	2017	0.484830	0.486986	0.499590	0.467363	0.488656	0.488816	0.481815
F	2018	0.254721	0.255914	0.269531	0.246574	0.252278	0.252354	0.248448
F	2019	0.246693	0.248342	0.251000	0.236002	0.222304	0.222369	0.218486
F	2020	0.257286	0.236508	0.241493	0.248166	0.211709	0.211765	0.209844
F	2021	NA	NA	NA	NA	NA	0.214557	0.231305

```
kable(data.frame(indicador=rep("F.diff",nyears),years=years,round(rel.diff.f,2)))
```

indicador	years	X1	X2	X3	X4	X5	X6	X7
F.diff	2002	0	0.00	0.01	0.00	0.01	0.01	0.02
F.diff	2003	0	0.00	0.01	0.00	0.01	0.01	0.01
F.diff	2004	0	0.00	0.01	0.00	0.02	0.02	0.02
F.diff	2005	0	0.00	0.01	-0.01	0.02	0.02	0.02
F.diff	2006	0	0.00	0.02	-0.01	0.03	0.03	0.02
F.diff	2007	0	0.00	0.02	-0.01	0.04	0.04	0.03
F.diff	2008	0	0.00	0.02	-0.01	0.05	0.05	0.04
F.diff	2009	0	0.00	0.02	-0.01	0.05	0.05	0.04
F.diff	2010	0	0.00	0.02	-0.01	0.05	0.05	0.04
F.diff	2011	0	0.00	0.03	-0.01	0.05	0.05	0.04
F.diff	2012	0	0.00	0.02	-0.02	0.03	0.03	0.03
F.diff	2013	0	0.00	0.02	0.00	0.05	0.05	0.04
F.diff	2014	0	0.00	0.02	-0.01	0.05	0.05	0.04
F.diff	2015	0	0.00	0.02	0.00	0.04	0.04	0.03
F.diff	2016	0	0.00	0.03	-0.01	0.03	0.03	0.02
F.diff	2017	0	0.00	0.03	-0.04	0.01	0.01	-0.01
F.diff	2018	0	0.00	0.06	-0.03	-0.01	-0.01	-0.02
F.diff	2019	0	0.01	0.02	-0.04	-0.10	-0.10	-0.11
F.diff	2020	0	-0.08	-0.06	-0.04	-0.18	-0.18	-0.18
F.diff	2021	NA	NA	NA	NA	NA	NA	NA

```
kable(data.frame(indicador=rep("BD_BDrms",nyears),years=years,retroBD_BDrms))
```

indicador	years	X1	X2	X3	X4	X5	X6	X7
BD_BDrms	2002	1.38590	1.38580	1.38510	1.36850	1.37030	1.37030	1.37260
BD_BDrms	2003	1.93230	1.93400	1.93990	1.90700	1.89870	1.89620	1.92110

indicador	years	X1	X2	X3	X4	X5	X6	X7
BD_BDrms	2004	1.93250	1.93400	1.93770	1.91890	1.89590	1.88980	1.92090
BD_BDrms	2005	1.99060	1.99110	1.98870	1.98720	1.94920	1.94050	1.97550
BD_BDrms	2006	2.63820	2.63850	2.63010	2.63770	2.56110	2.54880	2.61180
BD_BDrms	2007	2.08110	2.07960	2.06320	2.08810	1.99270	1.98290	2.03780
BD_BDrms	2008	1.36330	1.36130	1.34480	1.37440	1.28520	1.27880	1.31710
BD_BDrms	2009	1.07200	1.07010	1.05550	1.08210	0.99871	0.99370	1.02470
BD_BDrms	2010	1.03340	1.03160	1.01820	1.04310	0.96545	0.96060	0.99009
BD_BDrms	2011	0.98471	0.98289	0.96903	0.99353	0.92229	0.91764	0.94603
BD_BDrms	2012	1.06370	1.06210	1.04880	1.08280	1.01460	1.00950	1.03820
BD_BDrms	2013	1.57370	1.57220	1.55620	1.57980	1.49680	1.48940	1.53420
BD_BDrms	2014	1.32430	1.32260	1.30750	1.33920	1.26740	1.26110	1.29730
BD_BDrms	2015	1.43830	1.43700	1.42280	1.45130	1.38100	1.37420	1.41590
BD_BDrms	2016	1.10980	1.10820	1.09440	1.12230	1.07080	1.06550	1.09880
BD_BDrms	2017	0.66592	0.66433	0.65320	0.68833	0.65625	0.65293	0.67489
BD_BDrms	2018	0.69987	0.69816	0.68538	0.73732	0.71748	0.71388	0.73839
BD_BDrms	2019	0.83847	0.83552	0.82307	0.89544	0.92040	0.91579	0.94801
BD_BDrms	2020	1.29780	1.30560	1.29190	1.25920	1.46580	1.45850	1.50790
BD_BDrms	2021	NA	NA	NA	NA	NA	1.34670	1.32390

```
kable(data.frame(indicador=rep("BD_BDrms.diff",nyears),years=years,round(rel.diff.bd_bdrms,2)))
```

indicador	years	X1	X2	X3	X4	X5	X6	X7
BD_BDrms.diff	2002	0	0.00	0.00	-0.01	-0.01	-0.01	-0.01
BD_BDrms.diff	2003	0	0.00	0.00	-0.01	-0.02	-0.02	-0.01
BD_BDrms.diff	2004	0	0.00	0.00	-0.01	-0.02	-0.02	-0.01
BD_BDrms.diff	2005	0	0.00	0.00	0.00	-0.02	-0.03	-0.01
BD_BDrms.diff	2006	0	0.00	0.00	0.00	-0.03	-0.03	-0.01
BD_BDrms.diff	2007	0	0.00	-0.01	0.00	-0.04	-0.05	-0.02
BD_BDrms.diff	2008	0	0.00	-0.01	0.01	-0.06	-0.06	-0.03
BD_BDrms.diff	2009	0	0.00	-0.02	0.01	-0.07	-0.07	-0.04
BD_BDrms.diff	2010	0	0.00	-0.01	0.01	-0.07	-0.07	-0.04
BD_BDrms.diff	2011	0	0.00	-0.02	0.01	-0.06	-0.07	-0.04
BD_BDrms.diff	2012	0	0.00	-0.01	0.02	-0.05	-0.05	-0.02
BD_BDrms.diff	2013	0	0.00	-0.01	0.00	-0.05	-0.05	-0.03
BD_BDrms.diff	2014	0	0.00	-0.01	0.01	-0.04	-0.05	-0.02
BD_BDrms.diff	2015	0	0.00	-0.01	0.01	-0.04	-0.04	-0.02
BD_BDrms.diff	2016	0	0.00	-0.01	0.01	-0.04	-0.04	-0.01
BD_BDrms.diff	2017	0	0.00	-0.02	0.03	-0.01	-0.02	0.01
BD_BDrms.diff	2018	0	0.00	-0.02	0.05	0.03	0.02	0.06
BD_BDrms.diff	2019	0	0.00	-0.02	0.07	0.10	0.09	0.13
BD_BDrms.diff	2020	0	0.01	0.00	-0.03	0.13	0.12	0.16
BD_BDrms.diff	2021	NA	NA	NA	NA	NA	NA	NA