Plots_Github

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Contents

1 Library

2 Required data sets

If problems running the plots, think about "dev.off()"

2.0.0.1 IN TEXT FIGURES

3 Figure 1 : Study area (map)

```
fig1 <- ggplot(aes(x=c(35, 85), y=c(-25, 25)), data=Ob7_NLOG) +
  geom_point(data = Ob7_NLOG, mapping = aes(x = longitude, y = latitude),
             colour = "blue", shape=1,size=1) +
  geom_map(data = world, map = world, aes(long, lat, map_id = region),
           color =  "black", fill = "lightgray", size = 0.1) +
  geom_segment(aes(x=40,y=(-10),xend=85,yend=(-10)),linetype=2)+
  xlim(min(35),max(85))+
  ylim(min(-25),max(25))+
  xlab("Longitude (deg)") +
  ylab("Latitude (deg)")+
  theme(panel.border = element_rect(fill = NA, colour = "black"))+
  theme(text = element_text(size = 15))+
  theme(axis.text.x = element_text(size = 15))+
  theme(axis.text.y = element_text(size = 15))+
  annotate(geom="text", x=81, y=-7, label="\U2265 10°S",
              color="black", fontface="bold", size=4)+ #\U2265 is the code for the >= symbol
  annotate(geom="text", x=81, y=-13, label="< 10°S",
              color="black", fontface="bold", size=4)
```

3.1 Save plot

```
ggsave(file=file.path(PATH_FIG, "Fig1_Study Area.png"), fig1,width = 10, height = 10, units = "cm")
ggsave(file=file.path(PATH_FIG, "Fig1.eps"), fig1,width = 10, height = 10, units = "cm")
```

4 Figure 2 : Yearly number of NLOG observations (histograms)

```
fig2 <- ggplot(data = Ob7_NLOG) +
  geom_bar(mapping = aes(x = year, fill=as.factor(Zone)), binwidth=0.5, color = "black", position = posi
  stat_count(aes(x = year, y=..count.., fill=as.factor(Zone), label=..count..),size = 6, geom="text", v
  ylab("Number of observations")+
  scale_x_continuous(name="Years", breaks=c(2014,2015,2016,2017,2018,2019),
                     labels = c("2014","2015","2016","2017","2018","2019"))+
  scale_fill_manual(values = c("grey48","grey86"), name = "Zone",
                    labels = c ("\U2265 10°S","< 10°S"))+
  theme(panel.border = element_rect(fill = NA, colour = "black"))+
  theme(text = element_text(size = 25))+
  theme(axis.text.x = element_text(size = 25))+
  theme(axis.text.y = element_text(size = 25))+
  theme(legend.text = element_text(size=25))+
  theme(legend.key.size = unit(1, 'cm'))
```

4.1 Save plot

```
ggsave(file=file.path(PATH_FIG, "Fig2_Nb of NLOGs.png"), fig2,width = 30, height = 18, units = "cm")
ggsave(file=file.path(PATH_FIG, "Fig2.eps"), fig2,width = 30, height = 18, units = "cm")
```

5 Figure 3 : Distribution of the environmental variables according to NLOG = 0 or NLOG > 0

5.1 SSCI - Moz

```
## SSCI
#Moz
f3.ssci.moz <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=SSCImean, y = ..density.., fill = "NLOG = 0"),
                 binwidth = 0.02, size = 1,
                 data = NLOG_VE_zero_Moz, alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=SSCImean, y = ..density.., fill = "NLOG > 0"),
                 binwidth = 0.02, size = 1,
                 data = NLOG_VE_sup_zero_Moz, alpha = 0.5)+
  scale_fill_manual(name = "NLOG abundance index (Number per observation effort)",
                    values = c("NLOG = 0" = "steelblue3", "NLOG > 0" = "yellow1"))+
  scale_x_continuous(breaks=c(0,0.1,0.2,0.3,0.4,0.5,0.6,0.7))+
  scale_y_continuous(labels = function(x) x*100*b.width)+
  xlab("Mean SSCI (m.s-1)")+
  ylab("Frequency (%)")+
  ggtitle("< 10°S")+
  theme(text = element_text(size = 20))+
  theme(plot.title = element_text(hjust = 0.5))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  annotate(geom="text", x=0.445, y=8.75, label="P = 0.099",
             color="black", fontface="bold.italic", size=6)
```

5.2 SSCI - North

```
## SSCI
#North
f3.ssci.north <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=SSCImean, y = ..density.., fill = "NLOG = 0"),
                 binwidth = 0.02, size = 1,
                 data = NLOG_VE_zero_North, alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=SSCImean, y = ..density.., fill = "NLOG > 0"),
                 binwidth = 0.02, size = 1,
                 data = NLOG_VE_sup_zero_North, alpha = 0.5)+
  scale_fill_manual(name = "NLOG abundance index (Number per observation effort)",
                    values = c("NLOG = 0" = "steelblue3", "NLOG > 0" = "yellow1"))+
  scale_x_continuous(breaks=c(0,0.1,0.2,0.3,0.4,0.5,0.6))+
```

```
  scale_y_continuous(labels = function(x) x*100*b.width)+
  xlab("Mean SSCI (m.s-1)")+
  ylab(" ")+
  ggtitle("\U2265 10°S")+ #\U2265 is the code for the >= symbol
  theme(text = element_text(size = 20))+
  theme(plot.title = element_text(hjust = 0.5))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  annotate(geom="text", x=0.62, y=4.3, label="P = 0.013",
             color="black", fontface="bold.italic", size=6)
```

5.3 SLA - Moz

```
## SLA
#Moz
f3.sla.moz <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=slamean, y = ..density.., fill = "NLOG = 0"),
                 binwidth = 0.02,  bins = 30, size = 1,
                 data = NLOG_VE_zero_Moz, alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=slamean, y = ..density.., fill = "NLOG > 0"),
                 binwidth = 0.02,  bins = 30, size = 1,
                 data = NLOG_VE_sup_zero_Moz, alpha = 0.5)+
  scale_fill_manual(name = "NLOG abundance index (Number per observation effort)",
                    values = c("NLOG = 0" = "steelblue3", "NLOG > 0" = "yellow1"))+
  scale_x_continuous(breaks=c(-0.10,-0.05,0,0.05,0.10,0.15,0.20,0.25,0.30))+
  scale_y_continuous(labels = function(x) x*100*b.width)+
  xlab("Mean SLA (m)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  annotate(geom="text", x=0.14, y=13, label="P = 0.345",
             color="black", fontface="bold.italic", size=6)
```

5.4 SLA - North

```
## SLA
#North
f3.sla.north <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=slamean, y = ..density.., fill = "NLOG = 0"),
                 binwidth = 0.02, size = 1,
                 data = NLOG_VE_zero_North, alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=slamean, y = ..density.., fill = "NLOG > 0"),
                 binwidth = 0.02, size = 1,
```

```
                data = NLOG_VE_sup_zero_North, alpha = 0.5)+
  scale_fill_manual(name = "NLOG abundance index (Number per observation effort)",
                    values = c("NLOG = 0" = "steelblue3", "NLOG > 0" = "yellow1"))+
  scale_x_continuous(breaks=c(-0.10,-0.05,0,0.05,0.10,0.15,0.20,0.25,0.30))+
  scale_y_continuous(labels = function(x) x*100*b.width)+
  xlab("Mean SLA (m)")+
  ylab(" ")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 18))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  annotate(geom="text", x=0.28, y=5, label="P = 0.292",
             color="black", fontface="bold.italic", size=6)
```

5.5 FSLE - Moz

```
## FSLE
#Moz
f3.fsle.moz <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=FSLEmean, y = ..density.., fill = "NLOG = 0"),
                 binwidth = 0.02, size = 1,
                 data = NLOG_VE_zero_Moz, alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=FSLEmean, y = ..density.., fill = "NLOG > 0"),
                 binwidth = 0.02, size = 1,
                 data = NLOG_VE_sup_zero_Moz, alpha = 0.5)+
  scale_fill_manual(name = "NLOG abundance index (Number per observation effort)",
                    values = c("NLOG = 0" = "steelblue3", "NLOG > 0" = "yellow1"))+
  scale_x_continuous(breaks=c(-0.14,-0.12,-0.10,-0.08,-0.06,-0.04,-0.02,0))+
  scale_y_continuous(labels = function(x) x*100*b.width)+
  xlab("Mean FSLE (days-1)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  annotate(geom="text", x=-0.037, y=15, label="P = 0.114",
             color="black", fontface="bold.italic", size=6)
```

5.6 FSLE - North

```
## FSLE
#North
f3.fsle.north <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=FSLEmean, y = ..density.., fill = "NLOG = 0"),
                 binwidth = 0.02, size = 1,
```

```
                data = NLOG_VE_zero_North, alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=FSLEmean, y = ..density.., fill = "NLOG > 0"),
                binwidth = 0.02, size = 1,
                data = NLOG_VE_sup_zero_North, alpha = 0.5)+
  scale_fill_manual(name = "NLOG abundance index (Number per observation effort)",
                    values = c("NLOG = 0" = "steelblue3", "NLOG > 0" = "yellow1"))+
  scale_x_continuous(breaks=c(-0.14,-0.12,-0.10,-0.08,-0.06,-0.04,-0.02,0))+
  scale_y_continuous(labels = function(x) x*100*b.width)+
  xlab("Mean FSLE (days-1)")+
  ylab(" ")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  annotate(geom="text", x=0, y=21, label="P = 0.291",
             color="black", fontface="bold.italic", size=6)
```

5.7 MN_Epi - Moz

```
## MN_Epi
#Moz
f3.mn.moz <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=MNmean, y = ..density.., fill = "NLOG = 0"),
                binwidth = 0.04,  bins = 30, size = 1,
                data = NLOG_VE_zero_Moz, alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=MNmean, y = ..density.., fill = "NLOG > 0"),
                binwidth = 0.04,  bins = 30, size = 1,
                data = NLOG_VE_sup_zero_Moz, alpha = 0.5)+
  scale_fill_manual(name = "NLOG abundance index (Number per observation effort)",
                    values = c("NLOG = 0" = "steelblue3", "NLOG > 0" = "yellow1"))+
  scale_x_continuous(breaks=c(0.25,0.50,0.75,1.00,1.25))+
  scale_y_continuous(labels = function(x) x*100*b.width)+
  xlab("Mean MN_Epi (g.m-2)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  annotate(geom="text", x=1.2, y=4.5, label="P = 0.669",
             color="black", fontface="bold.italic", size=6)
```

5.8 MN_Epi - North

```
## MN_Epi
#North
```

```
f3.mn.north <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=MNmean, y = ..density.., fill = "NLOG = 0"),
                 binwidth = 0.025, size = 1,
                 data = NLOG_VE_zero_North, alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=MNmean, y = ..density.., fill = "NLOG > 0"),
                 binwidth = 0.025, size = 1,
                 data = NLOG_VE_sup_zero_North, alpha = 0.5)+
  scale_fill_manual(name = "NLOG abundance index (Number per observation effort)",
                    values = c("NLOG = 0" = "steelblue3", "NLOG > 0" = "yellow1"))+
  scale_x_continuous(breaks=c(0.3,0.6,0.9))+
  scale_y_continuous(labels = function(x) x*100*b.width)+
  xlab("Mean MN_Epi (g.m-2)")+
  ylab(" ")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  annotate(geom="text", x=1.04, y=2.8, label="P = 0.160",
             color="black", fontface="bold.italic", size=6)
```

5.9 Chla - Moz

```
## Chla
#Moz
b.width = 0.02
f3.chla.moz <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=chlamean, y = ..density.., fill = "NLOG = 0"),
                 binwidth = b.width, bins = 30, size = 1,
                 data = NLOG_VE_zero_Moz, alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=chlamean, y = ..density.., fill = "NLOG > 0"),
                 binwidth = b.width, bins = 30, size = 1,
                 data = NLOG_VE_sup_zero_Moz, alpha = 0.5)+
  scale_fill_manual(name = "NLOG abundance index (Number per observation effort)",
                    values = c("NLOG = 0" = "steelblue3", "NLOG > 0" = "yellow1"))+
  scale_x_continuous(breaks=c(0,0.10,0.20,0.30,0.40,0.50,0.60,0.70,0.80,0.90,1))+
  scale_y_continuous(labels = function(x) x*100*b.width)+
  xlab("Mean Chl-a (mg.m-3)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  annotate(geom="text", x=0.93, y=9.1, label="P = 0.441",
             color="black", fontface="bold.italic", size=6)
```

5.10 Chla - North

```
## Chla
#North
f3.chla.north <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=chlamean, y = ..density.., fill = "NLOG = 0"),
                 binwidth = 0.02, size = 1,
                 data = NLOG_VE_zero_North, alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=chlamean, y = ..density.., fill = "NLOG > 0"),
                 binwidth = 0.02, size = 1,
                 data = NLOG_VE_sup_zero_North, alpha = 0.5)+
  scale_fill_manual(name = "NLOG abundance index (Number per observation effort)",
                    values = c("NLOG = 0" = "steelblue3", "NLOG > 0" = "yellow1"))+
  scale_x_continuous(breaks=c(0,0.10,0.20,0.30,0.40,0.50,0.60,0.70,0.80,0.90,1))+
  scale_y_continuous(labels = function(x) x*100*b.width)+
  xlab("Mean Chl-a (mg.m-3)")+
  ylab(" ")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  annotate(geom="text", x=0.69, y=6.5, label="P = 0.012",
              color="black", fontface="bold.italic", size=6)
```

##Combine plots To combine plots, put each plot in an object (a, b, c, d, e, etc...) and use "grid.arrange(a, b, c, d, e, ncol=2, nrow=3)". You can add labels and use a common legend. It is also possible to use "rremove("ylab")" to avoid the y axis text.

```
fig3 <- ggarrange(f3.ssci.moz, f3.ssci.north,
                  f3.sla.moz, f3.sla.north,
                  f3.fsle.moz,f3.fsle.north,
                  f3.mn.moz, f3.mn.north,
                  f3.chla.moz, f3.chla.north,
                  labels = c("(a)","(b)","(c)","(d)","(e)","(f)","(g)","(h)","(i)","(j)"),
                  font.label = list(size = 20),
                  label.x = 0.85,
                  label.y = 0.85,
                  ncol = 2, nrow = 5,
                  common.legend = TRUE, legend = "bottom",
                  widths = c(1, 1),
                  heights = c(1, 1))
```

5.11 Save plots

```
ggsave(file=file.path(PATH_FIG, "Fig3_Distributions of VE.png"), fig3,width = 35, height = 50, units =
ggsave(file=file.path(PATH_FIG, "Fig3.eps"), fig3,width = 35, height = 50, units = "cm")
```

6 Figure 4 : Scatter plots : NLOGs vs VE

6.1 SSCI

```
#SSCI
f4.ssci <- ggplot(NLOG_VE_sup_zero)+
  geom_point(aes(x = SSCImean, y = NLOG_stand, shape = Zone),size = 3)+
  scale_shape_manual(values = c(1, 17),label = c("\U2265 10°S","< 10°S"))+
  scale_x_continuous(breaks=c(0,0.1,0.2,0.3,0.4,0.5,0.6,0.7))+
  xlab("Mean SSCI (m.s-1)")+
  ylab("NLOG abundance index
       (Number per
       observation effort)")+
  scale_y_continuous(breaks=c(0,0.5,1,1.5,2,2.5))+
  theme(text = element_text(size = 17))+
  theme(axis.text.x = element_text(size = 18))+
  theme(axis.text.y = element_text(size = 18))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(legend.position = "none")+
  theme(legend.key.size = unit(1, 'cm'))
```

6.2 SLA

```
#SLA
f4.sla <- ggplot(NLOG_VE_sup_zero)+
  geom_point(aes(x = slamean, y = NLOG_stand, shape = Zone),size = 3)+
  scale_shape_manual(values = c(1, 17),label = c(">10°S","<10°S"))+
  scale_x_continuous(breaks=c(-0.10,-0.05,0,0.05,0.10,0.15,0.20,0.25,0.30))+
  xlab("Mean SLA (m)")+
  ylab("

       ")+
  scale_y_continuous(breaks=c(0,0.5,1,1.5,2,2.5))+
  theme(text = element_text(size = 17))+
  theme(axis.text.x = element_text(size = 16))+
  theme(axis.text.y = element_text(size = 18))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(legend.position = "none")+
  theme(legend.key.size = unit(1, 'cm'))
```

6.3 FSLE

```
#FSLE
f4.fsle <- ggplot(NLOG_VE_sup_zero)+
  geom_point(aes(x = FSLEmean, y = NLOG_stand, shape = Zone),size = 3)+
  scale_shape_manual(values = c(1, 17),label = c(">10°S","<10°S"))+
```

```
  scale_x_continuous(breaks=c(-0.14,-0.12,-0.10,-0.08,-0.06,-0.04,-0.02,0))+
  xlab("Mean FSLE (days-1)")+
  ylab("

       ")+
  scale_y_continuous(breaks=c(0,0.5,1,1.5,2,2.5))+
  theme(text = element_text(size = 17))+
  theme(axis.text.x = element_text(size = 18))+
  theme(axis.text.y = element_text(size = 18))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(legend.position = "none")+
  theme(legend.key.size = unit(1, 'cm'))
```

6.4 MN_Epi

```
#MN_Epi
f4.mn <- ggplot(NLOG_VE_sup_zero)+
  geom_point(aes(x = MNmean, y = NLOG_stand, shape = Zone),size = 3)+
  scale_shape_manual(values = c(1, 17),label = c(">10°S","<10°S"))+
  scale_x_continuous(breaks=c(0.25,0.50,0.75,1,1.25))+
  xlab("Mean MN_Epi (g.m-2)")+
  ylab("NLOG abundance index
       (Number per
       observation effort)")+
  scale_y_continuous(breaks=c(0,0.5,1,1.5,2,2.5))+
  theme(text = element_text(size = 17))+
  theme(axis.text.x = element_text(size = 18))+
  theme(axis.text.y = element_text(size = 18))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(legend.position = "none")+
  theme(legend.key.size = unit(1, 'cm'))
```

6.5 Chla

```
#Chla
f4.chla <- ggplot(NLOG_VE_sup_zero)+
  geom_point(aes(x = chlamean, y = NLOG_stand, shape = Zone),size = 3)+
  scale_shape_manual(values = c(1, 17),label = c(">10°S","<10°S"))+
  scale_x_continuous(breaks=c(0,0.10,0.20,0.30,0.40,0.50,0.60,0.70,0.80,0.90,1))+
  xlab("Mean Chl-a (mg.m-3)")+
  ylab("NLOG abundance index
       (Number per
       observation effort)")+
  scale_y_continuous(breaks=c(0,0.5,1,1.5,2,2.5))+
  theme(text = element_text(size = 17))+
  theme(axis.text.x = element_text(size = 18))+
  theme(axis.text.y = element_text(size = 18))+
```

```
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(legend.position = "none")+
  theme(legend.key.size = unit(1, 'cm'))
```

##Combine plots

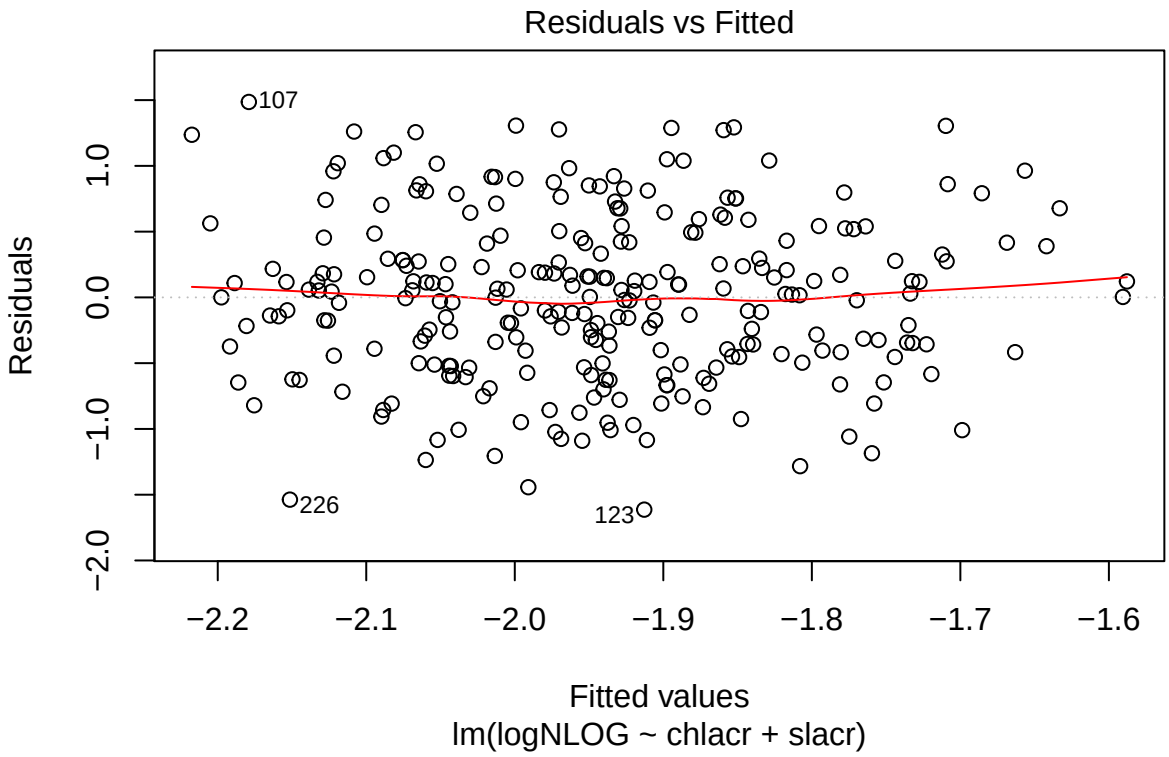
```
fig4 <- ggarrange(f4.ssci,
                  f4.sla,
                  f4.fsle,
                  f4.mn,
                  f4.chla,
          labels = c("(a)","(b)","(c)","(d)","(e)"),
                  font.label = list(size = 20),
                  label.x = 0.85,
                  label.y = 0.95,
          ncol = 2, nrow = 3,
          common.legend = TRUE, legend = "bottom")
```

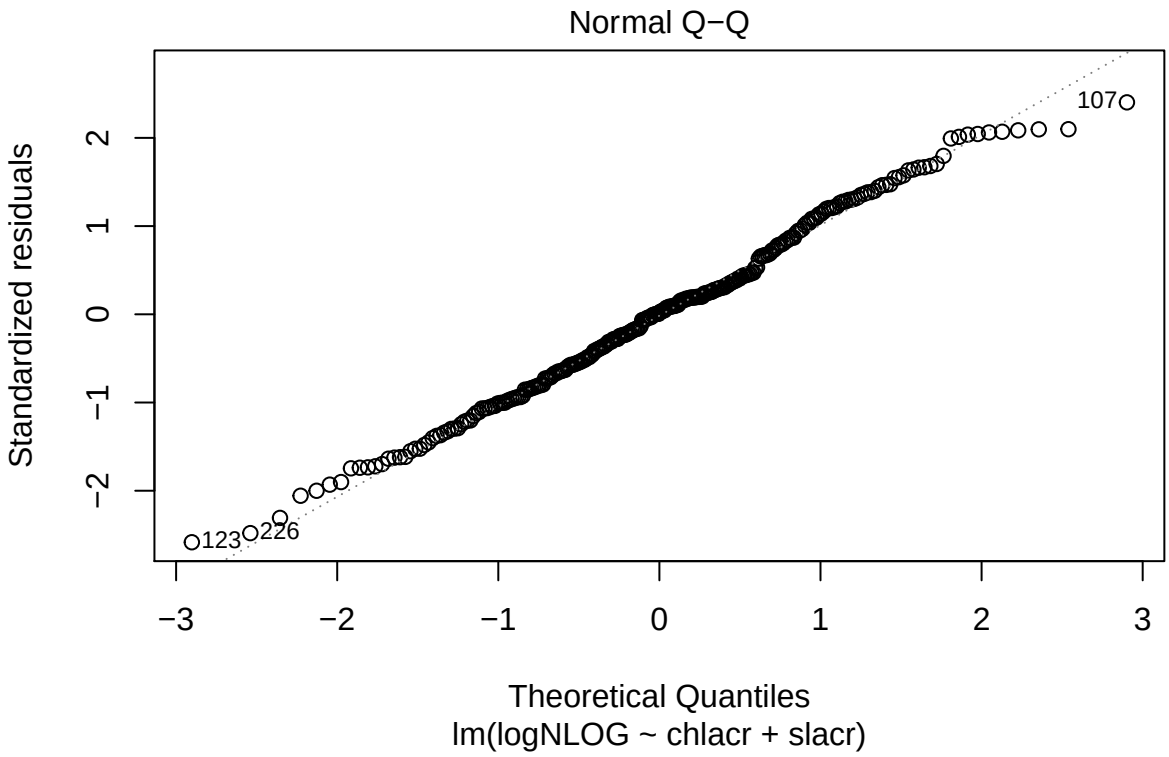
6.6 Save plots

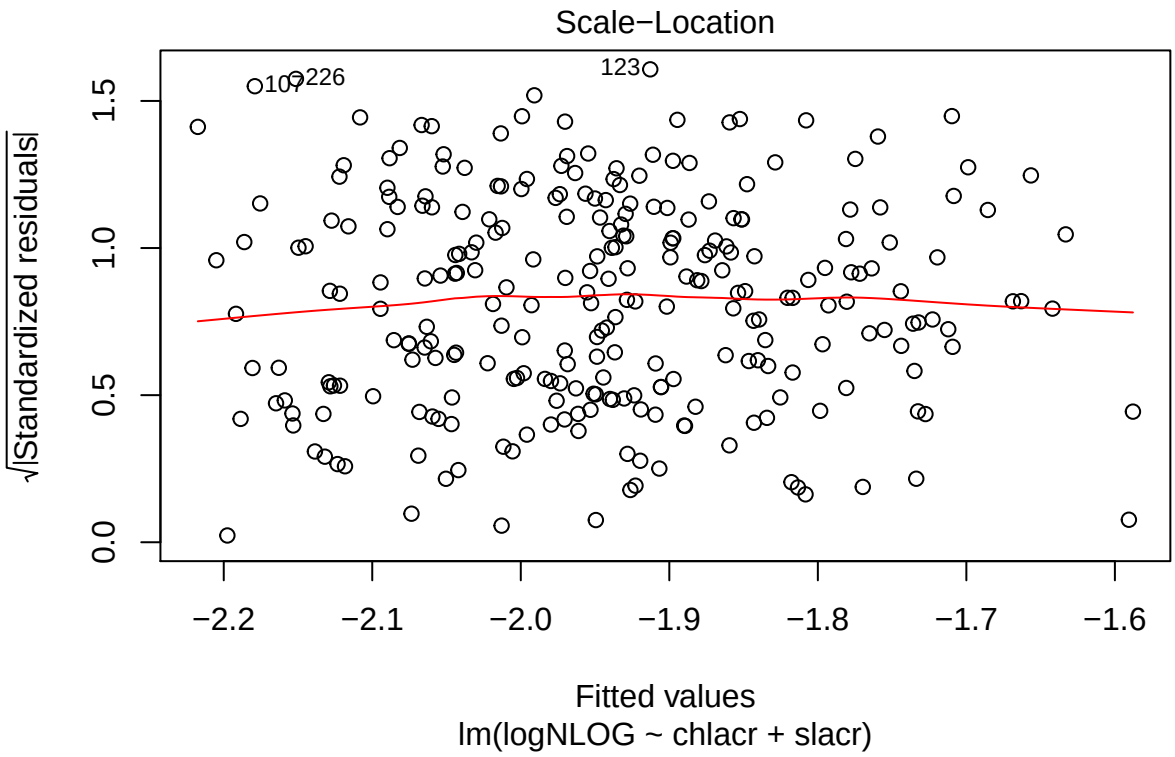
```
ggsave(file=file.path(PATH_FIG, "Fig4_Scatter plots.png"), fig4, width = 30, height = 25, units = "cm")
ggsave(file=file.path(PATH_FIG, "Fig4.eps"), fig4, width = 30, height = 25, units = "cm")
```

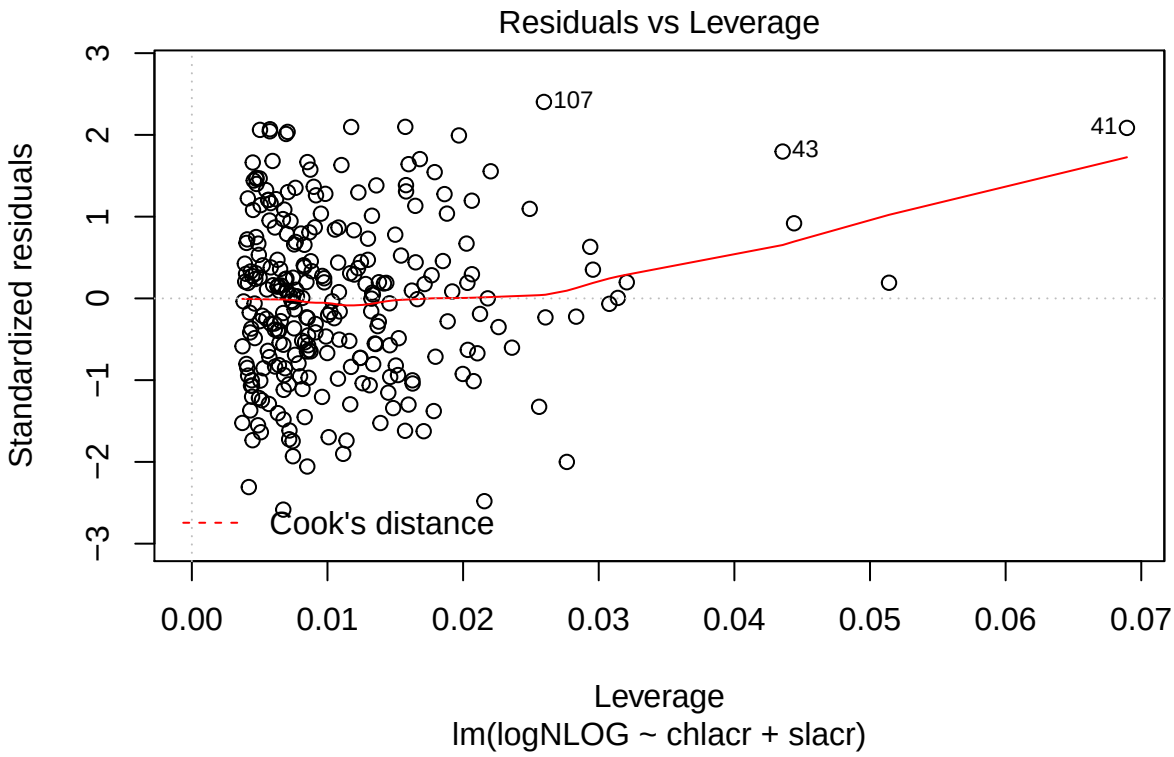
7 Figure 5 : Diagnostic plots of models

```
plot(LM4_North_chla)
```

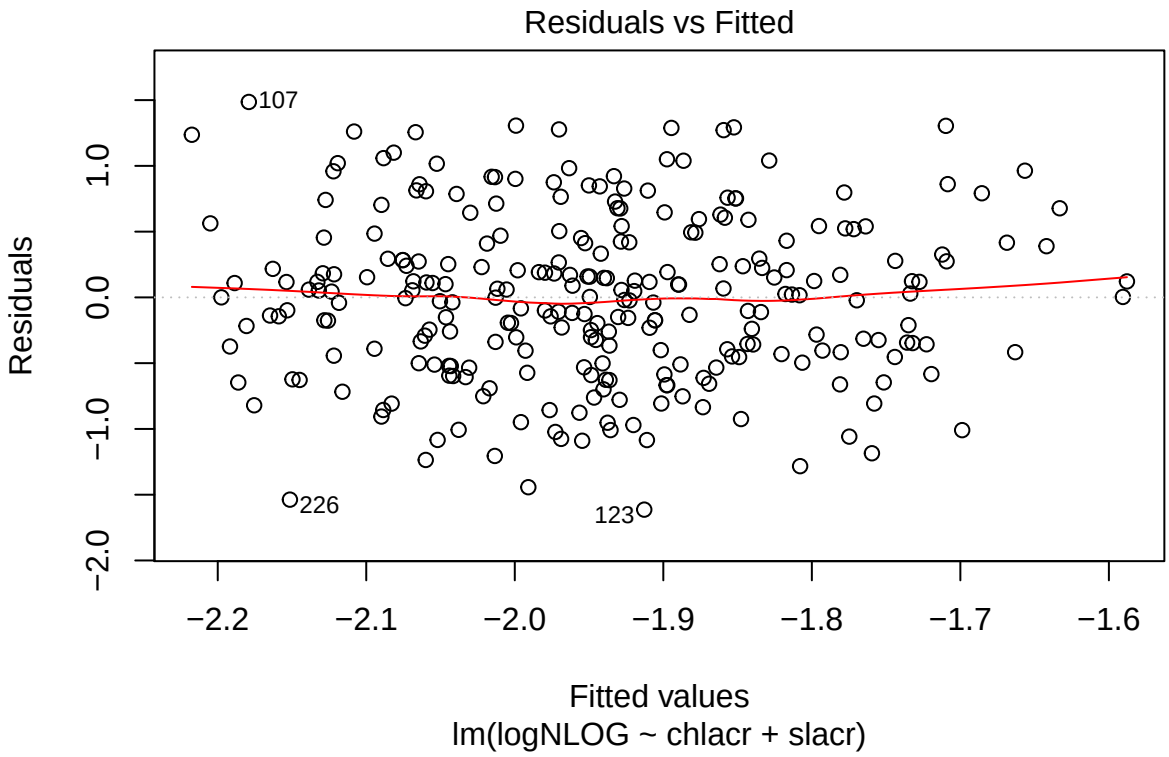

Residuals vs Fitted
Residuals
Fitted values
lm(logNLOG ~ chlacr + slacr)
107
226
123
1.0
0.0
−1.0
−2.0
−2.2
−2.1
−2.0
−1.9
−1.8
−1.7
−1.6

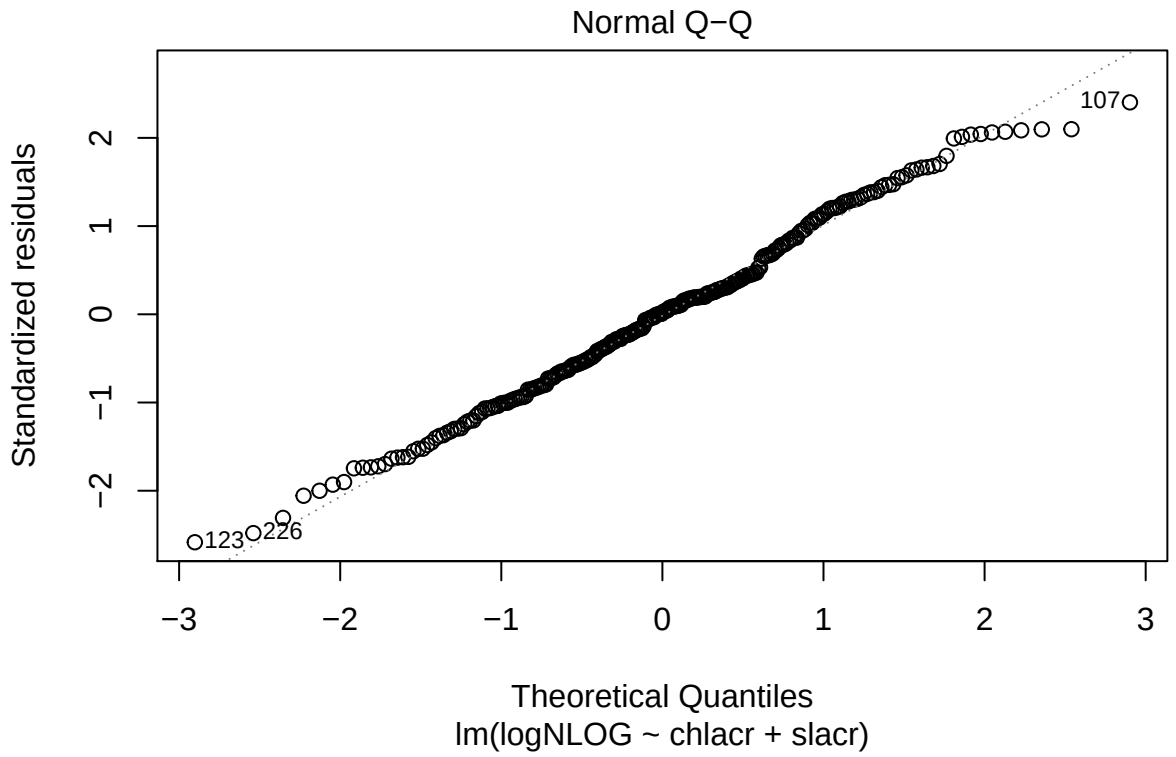

Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(logNLOG ~ chlacr + slacr)
107
123
226
−3
−2
−1
0
1
2
3


Scale−Location
√|Standardized residuals|
0.0
0.5
1.0
1.5
107
226
123
−2.2
−2.1
−2.0
−1.9
−1.8
−1.7
−1.6
Fitted values
lm(logNLOG ~ chlacr + slacr)

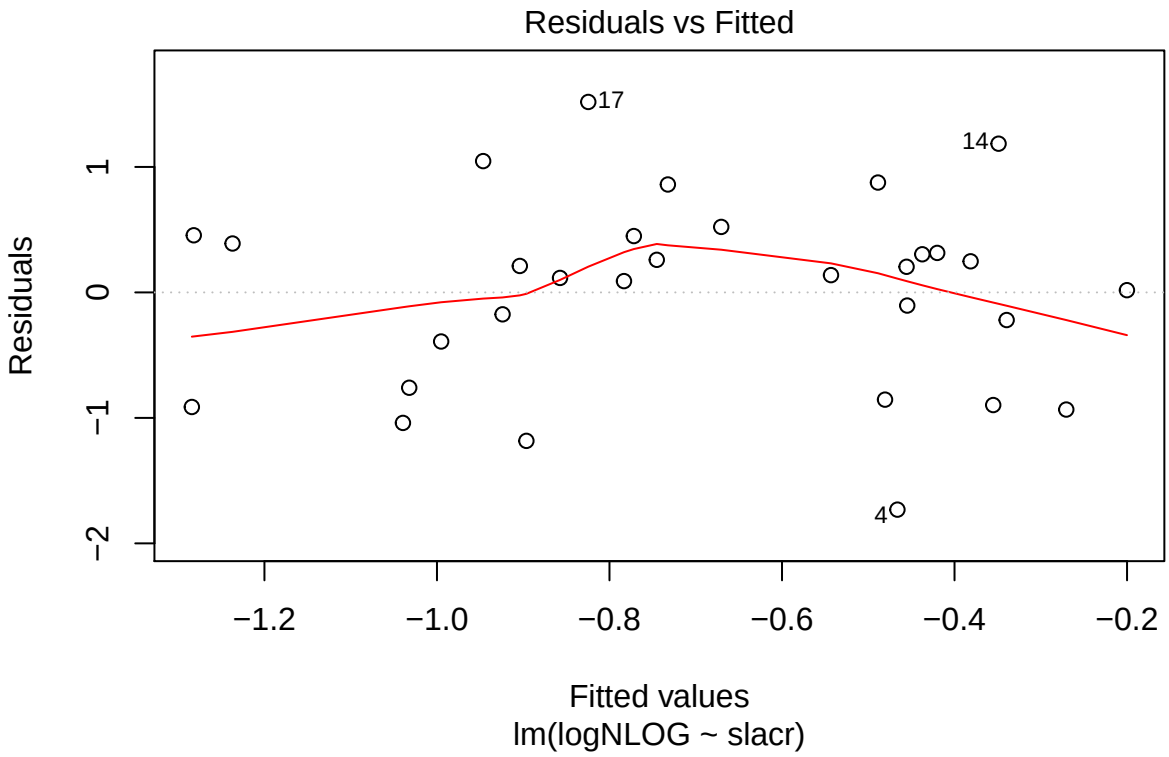


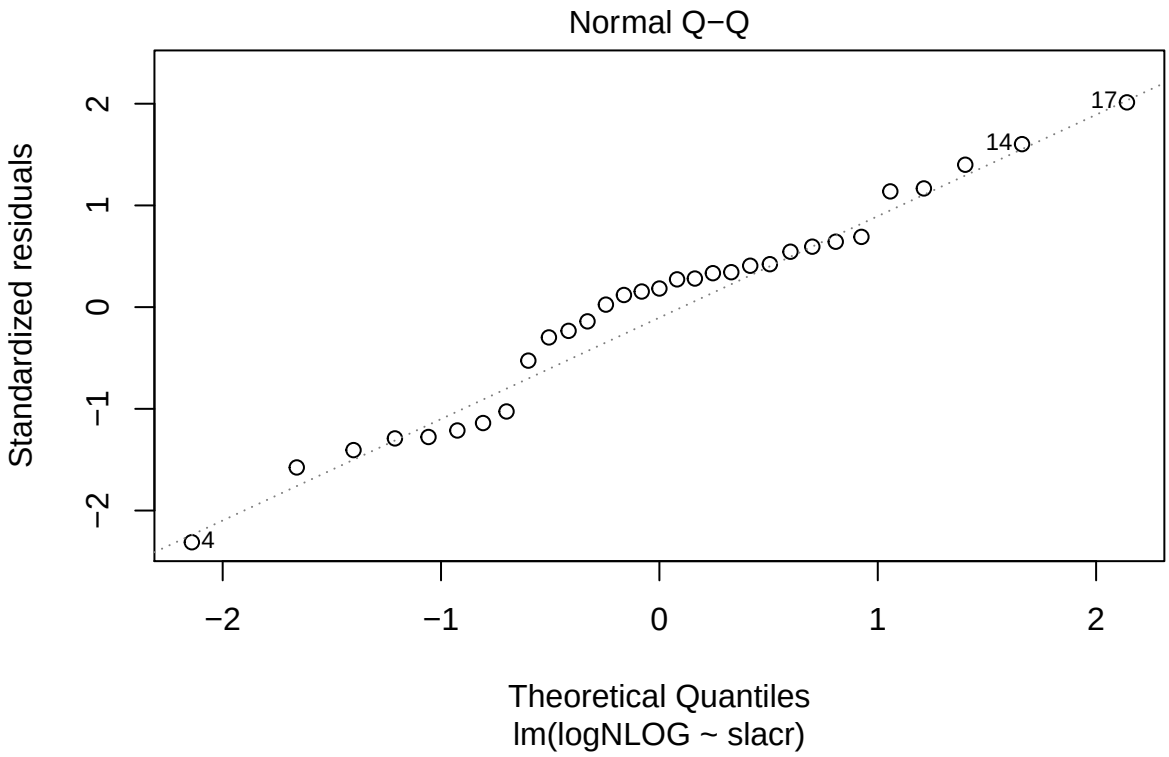

```
plot(LM4_North_chla, which=c(1,2))
```

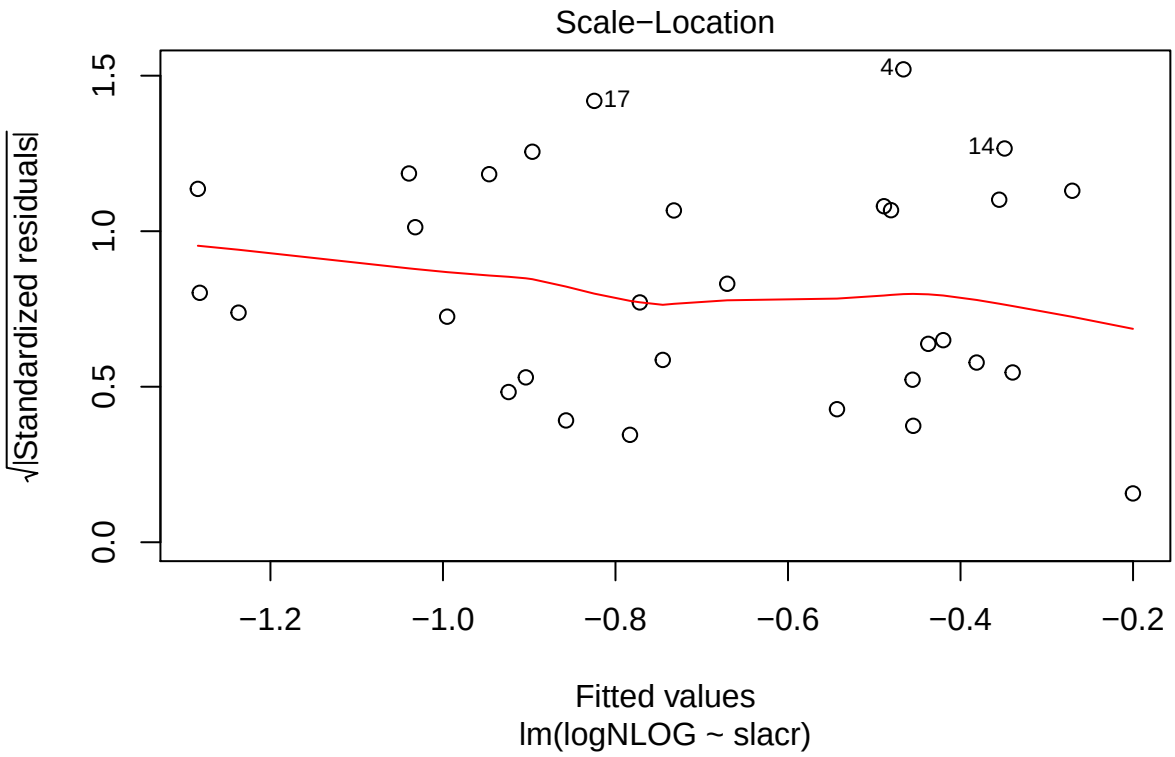

Residuals vs Fitted
Residuals
Fitted values
lm(logNLOG ~ chlacr + slacr)
107
226
123
1.0
0.0
−1.0
−2.0
−2.2
−2.1
−2.0
−1.9
−1.8
−1.7
−1.6

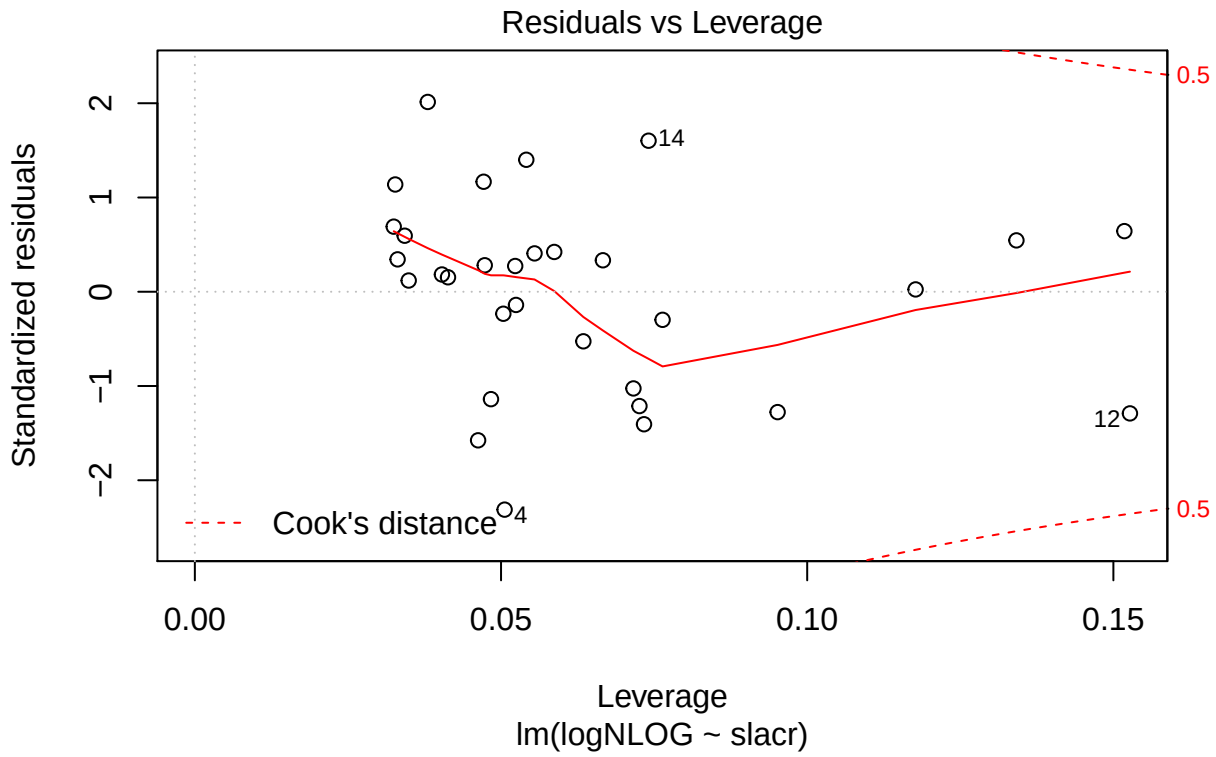



```
plot(LM5_Moz_chla)
```

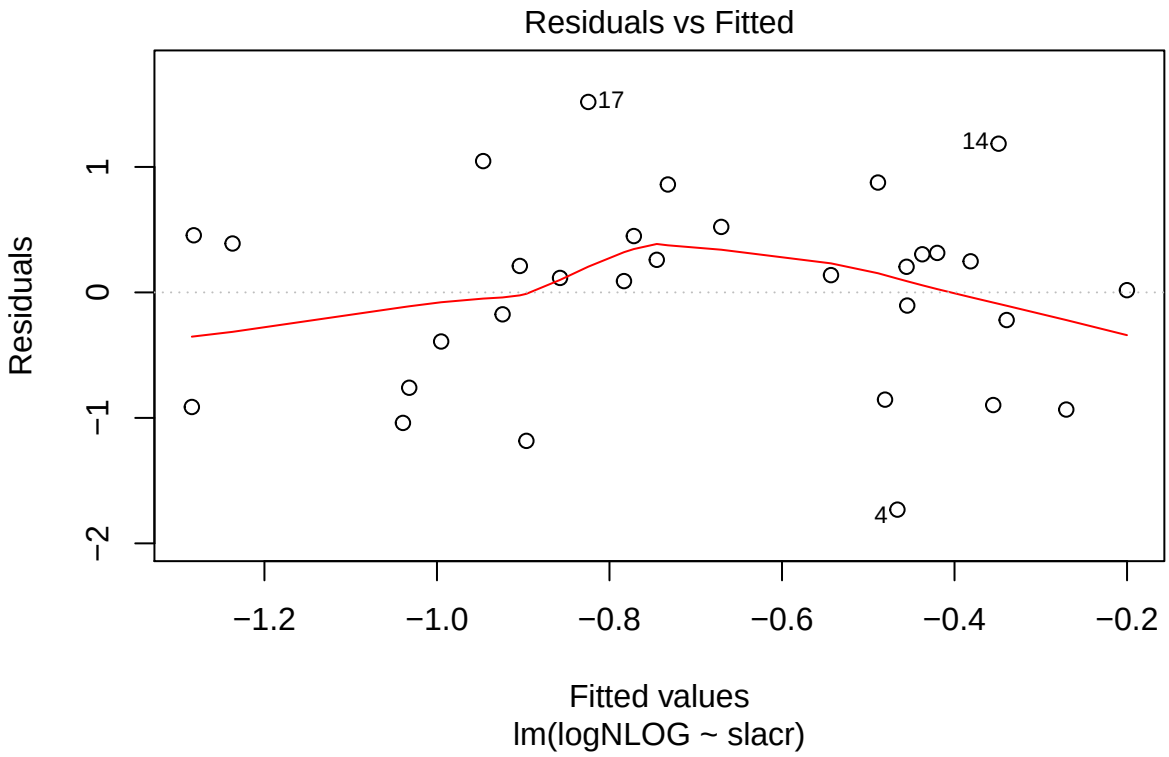

Residuals vs Fitted
17
14
4
Residuals
1
0
−1
−2
−1.2
−1.0
−0.8
−0.6
−0.4
−0.2
Fitted values
lm(logNLOG ~ slacr)

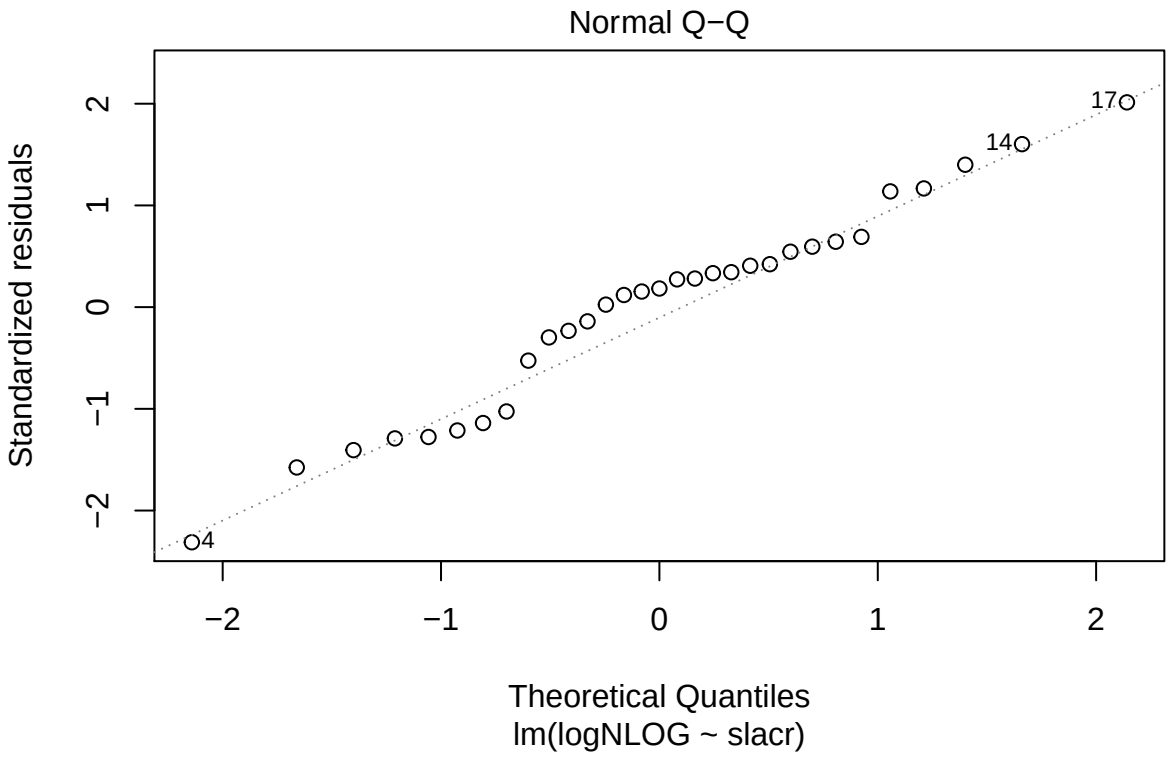

Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(logNLOG ~ slacr)
17
14
4
−2
−1
0
1
2


Scale−Location
√|Standardized residuals|
0.0
0.5
1.0
1.5
4
17
14
−1.2
−1.0
−0.8
−0.6
−0.4
−0.2
Fitted values
lm(logNLOG ~ slacr)




```
plot(LM5_Moz_chla, which=c(1,2))
```


Residuals vs Fitted
17
14
4
Residuals
1
0
−1
−2
−1.2
−1.0
−0.8
−0.6
−0.4
−0.2
Fitted values
lm(logNLOG ~ slacr)



7.0.0.1 APPENDICES FIGURES

8 Appendix A1 : Distribution of the NLOG abundance index

8.1 Before log transformation

```
#Before
f.bef <- ggplot()+
  geom_histogram(data = NLOG_VE_sup_zero, aes(x = NLOG_stand), binwidth = 0.1)+
  scale_x_continuous(breaks=c(0,0.5,1,1.5,2,2.5,3))+
  scale_y_continuous(breaks=c(0,25,50,75,100,125,150))+
  xlab("NLOG abundance index
  (Number per observation effort)")+
  ylab("Frequency (%)")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))
```

8.2 After log transformation

```
#After
f.aft <- ggplot()+
  geom_histogram(data = NLOG_VE_sup_zero, aes(x = logNLOG), binwidth = 0.25)+
  scale_x_continuous(breaks=c(-4,-3,-2,-1,0,1,2))+
  scale_y_continuous(breaks=c(0,5,10,15,20,25,30,35,40,45,50))+
  xlab("NLOG abundance index
  (Number per observation effort)")+
  ylab("Frequency (%)")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))
```

##Combine plots

```
ApxA1 <- ggarrange(f.bef, f.aft+
                     rremove("ylab"),
          labels = c("(a)", "(b)"),
          font.label = list(size = 20),
                     label.x = 0.85,
                     label.y = 0.95,
          ncol = 2, nrow = 1)
```

8.3 Save plots

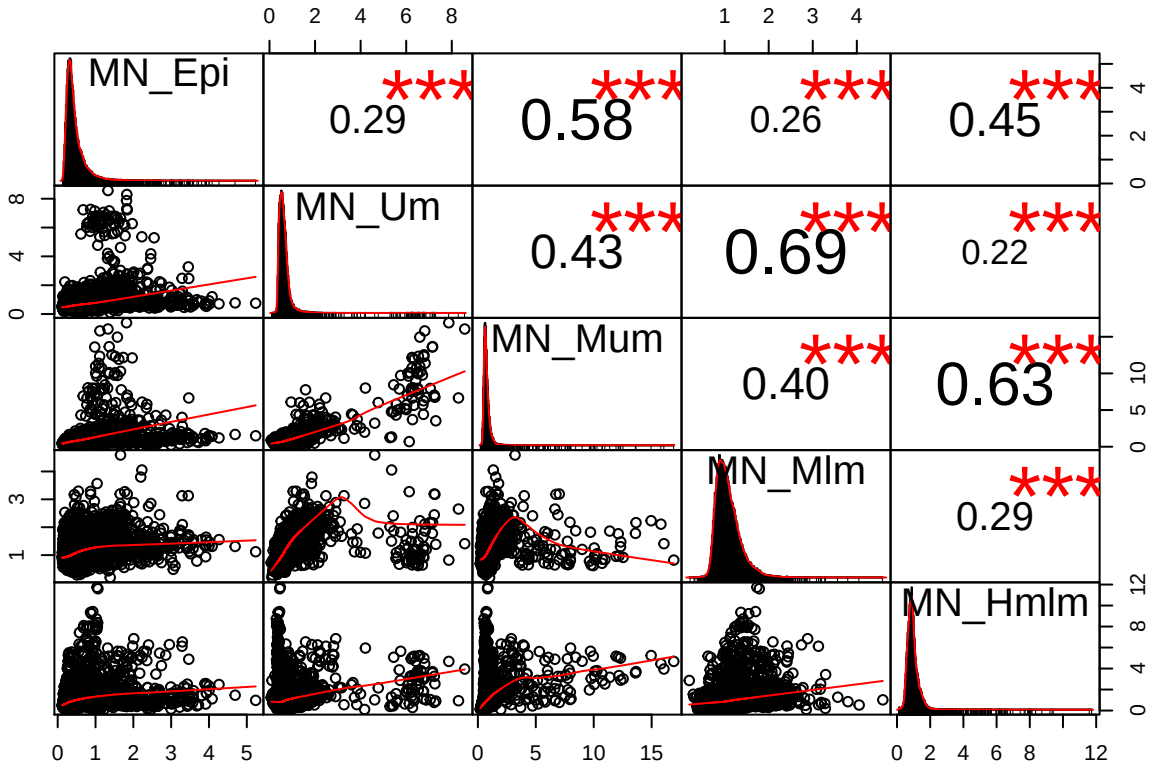
```
ggsave(file=file.path(PATH_FIG, "Appendix_A1_Aim distribution.png"), ApxA1,width = 30, height = 15, uni
ggsave(file=file.path(PATH_FIG, "Appendix_A1_Aim distribution.eps"), ApxA1,width = 30, height = 15, uni
```

9 Appendix A2 : correlation matrix of micronekton types

```
my_list <- list(dfMN_epi,dfMN_u,dfMN_mu,dfMN_ml,dfMN_hml)
df <- Reduce(function(x, y) merge(x, y, by=c("lat_grid", "lon_grid", "year", "month")), my_list)
names(df)
```

```
##  [1] "lat_grid"           "lon_grid"           "year"
##  [4] "month"              "micronec_epi"       "micronec_episd"
##  [7] "micronec_umeso"     "micronec_umesosd"   "micronec_mumeso"
## [10] "micronec_mumesosd"  "micronec_mlmeso"    "micronec_mlmesosd"
## [13] "micronec_hmlmeso"   "micronec_hmlmesosd"
```

```
my_data_mn <- df %>% dplyr::select(micronec_epi, micronec_umeso, micronec_mumeso, micronec_mlmeso, micr
colnames(my_data_mn) <- c("MN_Epi","MN_Um","MN_Mum","MN_Mlm","MN_Hmlm")
chart.Correlation(my_data_mn, histogram=TRUE, pch=20, method = "kendall")
```

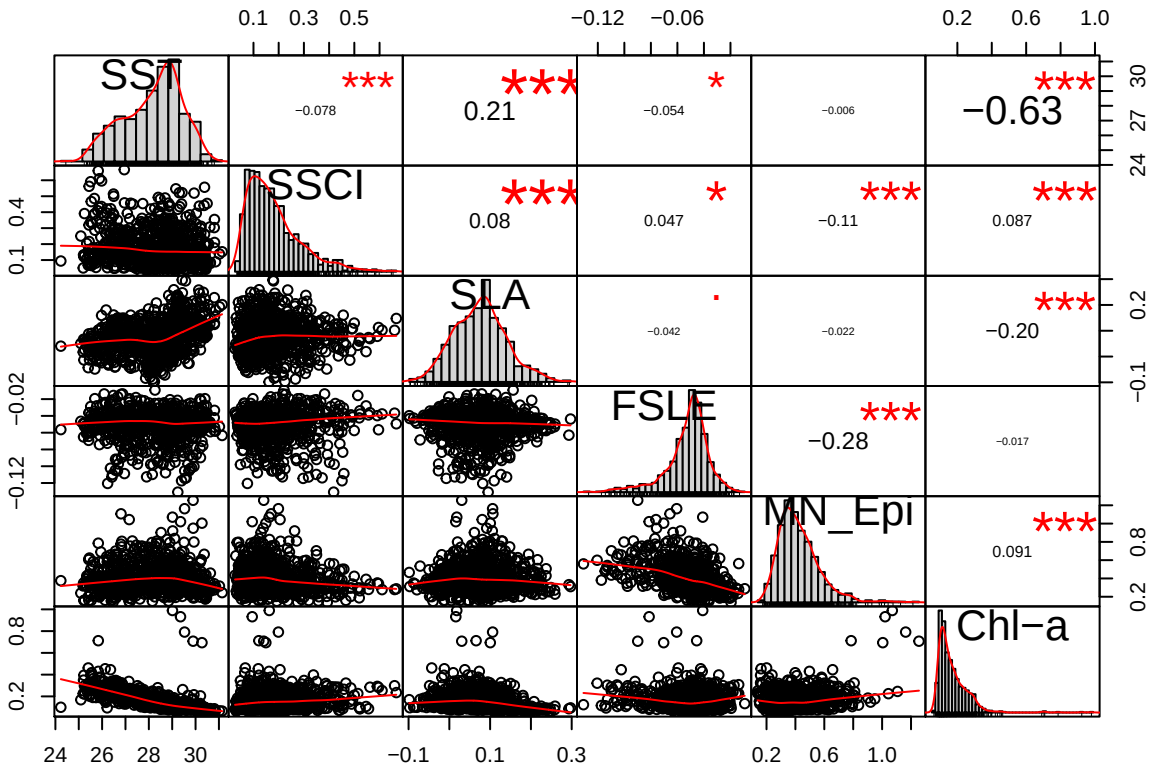


10 Appendix A3 : correlation matrix of Environmental variables (VE)

```
names(NLOG_VE)
```

```
##  [1] "lat_grid"   "lon_grid"   "year"       "month"      "NumNLOG"
##  [6] "NumOBS"     "NLOG_stand" "chlamean"   "chlasd"     "sstmean"
## [11] "sstsd"      "slamean"    "slasd"      "FSLEmean"   "FSLEsd"
## [16] "SSCImean"   "SSCIsd"     "MNmean"     "MNsd"       "Zone"
## [21] "Season"
```

```
my_data_ve <- NLOG_VE %>% dplyr::select(sstmean, SSCImean, slamean, FSLEmean, MNmean, chlamean)
colnames(my_data_ve) <- c("SST","SSCI","SLA","FSLE", "MN_Epi","Chl-a")
chart.Correlation(my_data_ve, histogram=TRUE, pch=20, method = "kendall")
```



11 Appendix A4 : Predicted vs Observed Aim values

11.1 North

```
#North
pred.north <- predict(LM4_North_chla)
NLOG_VE_sup_zero_North$pred<-pred.north
A4.north <- ggplot(NLOG_VE_sup_zero_North, aes(x = logNLOG, y = pred))+
  geom_point()+
  xlim(min(NLOG_VE_sup_zero_North$logNLOG),max(NLOG_VE_sup_zero_North$logNLOG))+
  ylim(min(NLOG_VE_sup_zero_North$logNLOG),max(NLOG_VE_sup_zero_North$logNLOG))+
  geom_abline(slope = 1, intercept = 0)+
  xlab("Observed NLOG abundance index")+
  ylab("Predicted NLOG abundance index")+
  theme(text = element_text(size = 15))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))
```

11.2 Moz

```
#Moz
pred.moz <- predict(LM5_Moz_chla)
NLOG_VE_sup_zero_Moz$pred<-pred.moz
A4.moz <- ggplot(NLOG_VE_sup_zero_Moz, aes(x = logNLOG, y = pred))+
  geom_point()+
  xlim(min(NLOG_VE_sup_zero_Moz$logNLOG),max(NLOG_VE_sup_zero_Moz$logNLOG))+
  ylim(min(NLOG_VE_sup_zero_Moz$logNLOG),max(NLOG_VE_sup_zero_Moz$logNLOG))+
  geom_abline(slope = 1, intercept = 0)+
  xlab("Observed NLOG abundance index")+
  ylab("Predicted NLOG abundance index")+
  theme(text = element_text(size = 15))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))
```

##Combine plots

```
ApxA4 <- ggarrange(A4.north, A4.moz+
                     rremove("ylab"),
          labels = c("(a)", "(b)"),
          font.label = list(size = 20),
                     label.x = 0.1,
                     label.y = 0.95,
          ncol = 2, nrow = 1)
```

11.3 Save plots

```
ggsave(file=file.path(PATH_FIG, "Appendix_A4_pred vs obs.png"), ApxA4, width = 35, height = 10, units =
ggsave(file=file.path(PATH_FIG, "Appendix_A4_pred vs obs.eps"), ApxA4,width = 35, height = 10, units =
```

12 Appendix B1 : Distribution of the environmental variables according to used data or rendom data

12.1 SSCI - Moz

```
## SSCI
#Moz
B1.ssci.moz <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=SSCImean, y = ..density.., fill = "Data used"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff[df_eff$threshold=="Fisheries" & df_eff$Zone=="Moz",], alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=SSCImean, y = ..density.., fill = "Random data"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff_new[df_eff_new$Zone=="Moz",], alpha=0.5)+
  scale_fill_manual(name = "Data used vs Random data",
                    values = c("Random data" = "yellow1", "Data used" = "steelblue"))+
  xlab("Mean SSCI (m.s-1)")+
  ylab("Frequency (%)")+
```

```
  ggtitle("< 10°S")+
    theme(text = element_text(size = 20))+
  theme(plot.title = element_text(hjust = 0.5))+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(plot.margin = grid::unit(c(0,0.75,0,0), "cm"))
```

12.2 SSCI - North

```
## SSCI
#North
B1.ssci.north <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=SSCImean, y = ..density.., fill = "Data used"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff[df_eff$threshold=="Fisheries" & df_eff$Zone=="Above_10S",], alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=SSCImean, y = ..density.., fill = "Random data"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff_new[df_eff_new$Zone=="Above_10S",], alpha=0.5)+
  scale_fill_manual(name = "Data used vs Random data",
                    values = c("Random data" = "yellow1", "Data used" = "steelblue"))+
  xlab("Mean SSCI (m.s-1)")+
  ylab("Frequency (%)")+
  ggtitle("\U2265 10°S")+ #\U2265 is the code for the >= symbol
  theme(text = element_text(size = 20))+
  theme(plot.title = element_text(hjust = 0.5))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(plot.margin = grid::unit(c(0,0.75,0,0), "cm"))
```

12.3 SLA - Moz

```
## SLA
#Moz
B1.sla.moz <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=slamean, y = ..density.., fill = "Data used"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff[df_eff$threshold=="Fisheries" & df_eff$Zone=="Moz",], alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=slamean, y = ..density.., fill = "Random data"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff_new[df_eff_new$Zone=="Moz",], alpha=0.5)+
  scale_fill_manual(name = "Data used vs Random data",
                    values = c("Random data" = "yellow1", "Data used" = "steelblue"))+
  xlab("Mean SLA (m)")+
  ylab("Frequency (%)")+
```

```
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(plot.margin = grid::unit(c(0,0.75,0,0), "cm"))
```

12.4 SLA - North

```
## SLA
#North
B1.sla.north <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=slamean, y = ..density.., fill = "Data used"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff[df_eff$threshold=="Fisheries" & df_eff$Zone=="Above_10S",], alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=slamean, y = ..density.., fill = "Random data"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff_new[df_eff_new$Zone=="Above_10S",], alpha=0.5)+
  scale_fill_manual(name = "Data used vs Random data",
                    values = c("Random data" = "yellow1", "Data used" = "steelblue"))+
  xlab("Mean SLA (m)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(plot.margin = grid::unit(c(0,0.75,0,0), "cm"))
```

12.5 FSLE - Moz

```
## FSLE
#Moz
B1.fsle.moz <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=FSLEmean, y = ..density.., fill = "Data used"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff[df_eff$threshold=="Fisheries" & df_eff$Zone=="Moz",], alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=FSLEmean, y = ..density.., fill = "Random data"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff_new[df_eff_new$Zone=="Moz",], alpha=0.5)+
  scale_fill_manual(name = "Data used vs Random data",
                    values = c("Random data" = "yellow1", "Data used" = "steelblue"))+
  xlab("Mean FSLE (days-1)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
```

```
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(plot.margin = grid::unit(c(0,0.75,0,0), "cm"))
```

12.6 FSLE - North

```
## FSLE
#North
B1.fsle.north <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=FSLEmean, y = ..density.., fill = "Data used"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff[df_eff$threshold=="Fisheries" & df_eff$Zone=="Above_10S",], alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=FSLEmean, y = ..density.., fill = "Random data"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff_new[df_eff_new$Zone=="Above_10S",], alpha=0.5)+
  scale_fill_manual(name = "Data used vs Random data",
                    values = c("Random data" = "yellow1", "Data used" = "steelblue"))+
  xlab("Mean FSLE (days-1)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(plot.margin = grid::unit(c(0,0.75,0,0), "cm"))
```

12.7 MN_Epi - Moz

```
## MN_Epi
#Moz
B1.mn.moz <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=micronec_epi, y = ..density.., fill = "Data used"),
                 binwidth = 0.04, bins = 30, size = 1,
                 data = df_eff[df_eff$threshold=="Fisheries" & df_eff$Zone=="Moz",], alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=micronec_epi, y = ..density.., fill = "Random data"),
                 binwidth = 0.04, bins = 30, size = 1,
                 data = df_eff_new[df_eff_new$Zone=="Moz",], alpha=0.5)+
  scale_fill_manual(name = "Data used vs Random data",
                    values = c("Random data" = "yellow1", "Data used" = "steelblue"))+
  xlab("Mean MN_Epi (g.m-2)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(plot.margin = grid::unit(c(0,0.75,0,0), "cm"))
```

12.8 MN_Epi - North

```
## MN_Epi
#North
B1.mn.north <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=micronec_epi, y = ..density.., fill = "Data used"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff[df_eff$threshold=="Fisheries" & df_eff$Zone=="Above_10S",], alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=micronec_epi, y = ..density.., fill = "Random data"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff_new[df_eff_new$Zone=="Above_10S",], alpha=0.5)+
  scale_fill_manual(name = "Data used vs Random data",
                    values = c("Random data" = "yellow1", "Data used" = "steelblue"))+
  xlab("Mean MN_Epi (g.m-2)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(plot.margin = grid::unit(c(0,0.75,0,0), "cm"))
```

12.9 Chla - Moz

```
## Chla
#Moz
B1.chla.moz <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=chlamean, y = ..density.., fill = "Data used"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff[df_eff$threshold=="Fisheries" & df_eff$Zone=="Moz",], alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=chlamean, y = ..density.., fill = "Random data"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff_new[df_eff_new$Zone=="Moz",], alpha=0.5)+
  scale_fill_manual(name = "Data used vs Random data",
                    values = c("Random data" = "yellow1", "Data used" = "steelblue"))+
  xlab("Mean Chl-a (mg.m-3)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(plot.margin = grid::unit(c(0,0.75,0,0), "cm"))
```

12.10 Chla - North

```
## Chla
#North
B1.chla.north <- ggplot()+
  geom_histogram(stat = 'bin', aes(x=chlamean, y = ..density.., fill = "Data used"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff[df_eff$threshold=="Fisheries" & df_eff$Zone=="Above_10S",], alpha=0.5)+
  geom_histogram(stat = 'bin', aes(x=chlamean, y = ..density.., fill = "Random data"),
                 binwidth = 0.02, bins = 30, size = 1,
                 data = df_eff_new[df_eff_new$Zone=="Above_10S",], alpha=0.5)+
  scale_fill_manual(name = "Data used vs Random data",
                    values = c("Random data" = "yellow1", "Data used" = "steelblue"))+
  xlab("Mean Chl-a (mg.m-3)")+
  ylab("Frequency (%)")+
  ggtitle(" ")+
  theme(text = element_text(size = 20))+
  theme(axis.text.x = element_text(size = 20))+
  theme(axis.text.y = element_text(size = 20))+
  theme(legend.text = element_text(size=20))+
  theme(legend.title = element_text(size=20))+
  theme(plot.margin = grid::unit(c(0,0.75,0,0), "cm"))
```

##Combine plots

```
ApxB1 <- ggarrange(B1.ssci.moz, B1.ssci.north + rremove("ylab"),
                   B1.sla.moz, B1.sla.north + rremove("ylab"),
                   B1.fsle.moz, B1.fsle.north + rremove("ylab"),
                   B1.mn.moz, B1.mn.north + rremove("ylab"),
                   B1.chla.moz, B1.chla.north + rremove("ylab"),
                   labels = c("(a)","(b)","(c)","(d)","(e)","(f)","(g)","(h)","(i)","(j)"),
                   font.label = list(size = 20),
                   label.x = 0.85,
                   label.y = 0.90,
                   ncol = 2, nrow = 5,
                   common.legend = TRUE, legend = "bottom",
                   widths = c(1, 1),
                   heights = c(1, 1))
```

12.11 Save plots

```
ggsave(file=file.path(PATH_FIG, "Appendix_B1_sampling bias.png"), ApxB1,width = 35, height = 50, units =
ggsave(file=file.path(PATH_FIG, "Appendix_B1_sampling bias.eps"), ApxB1,width = 35, height = 50, units =
```