MT project

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Introduction:

This project is to explore the number of reefs in particular ecoregions, which are Ningaloo and Exmouth to Broome. Use exploratory data analysis to clean and organize the data, and then choose relative useful dataset. Compared the differences of numbers of taxon by graphs and regression. And find out what factors will influence on particular reef.

```
df <- read.csv(file = "Bar-chart.csv",header = TRUE,sep = ",")
MyData <- read.csv(file = "data1.csv" ,header = TRUE, sep = ",")
Data1 <- unique(MyData$Ecoregion)
num_Taxon <- MyData %>% count(Taxon)
num_Date <- MyData %>% count(SurveyDate)
Total_Ningaloo <- MyData %>% filter(Ecoregion == "Ningaloo")
Total_Broome <- MyData %>% filter(Ecoregion == "Exmouth to Broome")
Ning_Taxon <- Total_Ningaloo %>% count(Taxon)
Broo_Taxon <- Total_Broome %>% count(Taxon)
```

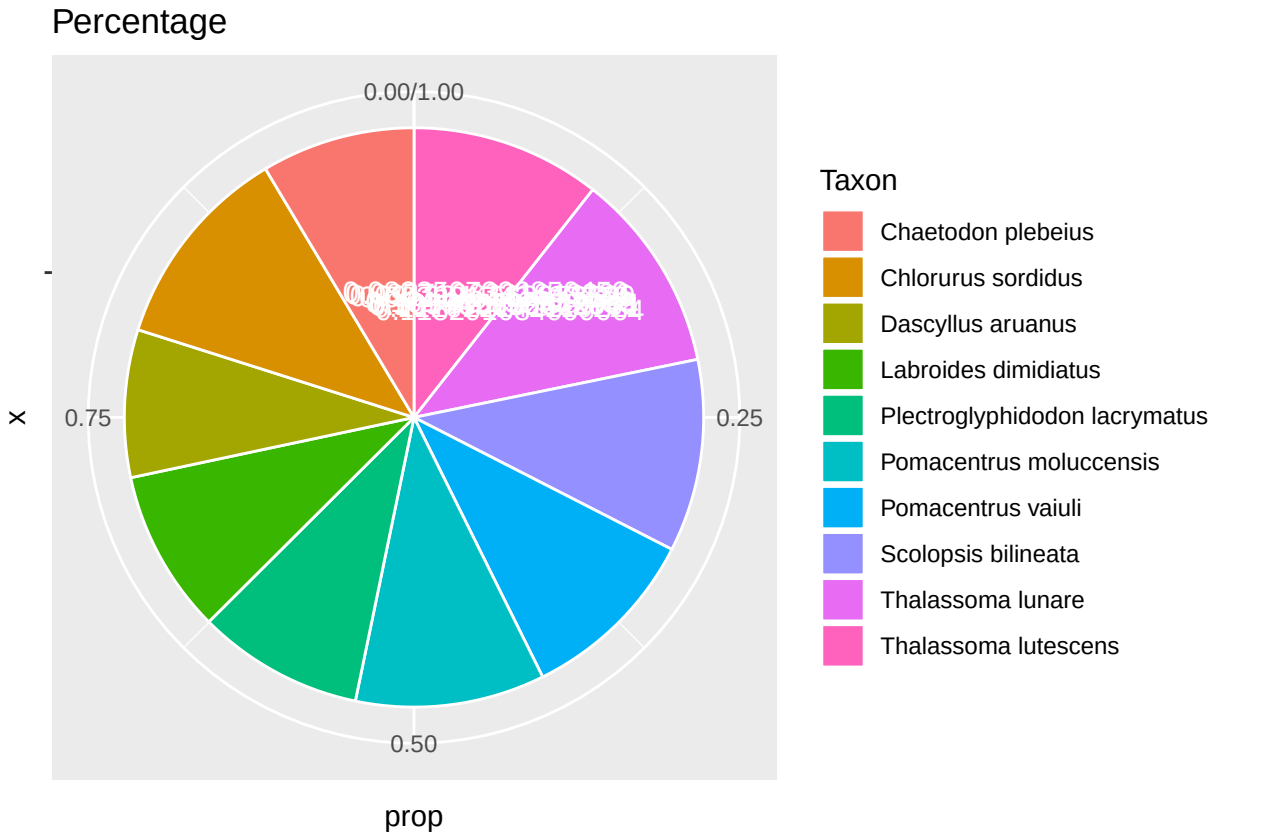
Extract data from Global reef fish dataset. After explored data features, I found that the whole data has two ecoregions.So, I wanted to find the differences of taxon between these two ecoregions.Then, I divided the whole data into two parts.

EDA:

```
Ning_Taxon <- Ning_Taxon[with(Ning_Taxon,order(-n)),]
Ning_Taxon_10 <- Ning_Taxon[1:10,]
New_Ning_Taxon_10 <- Ning_Taxon_10 %>% mutate(prop = n/sum(n))
New_Ning_Taxon_10
```

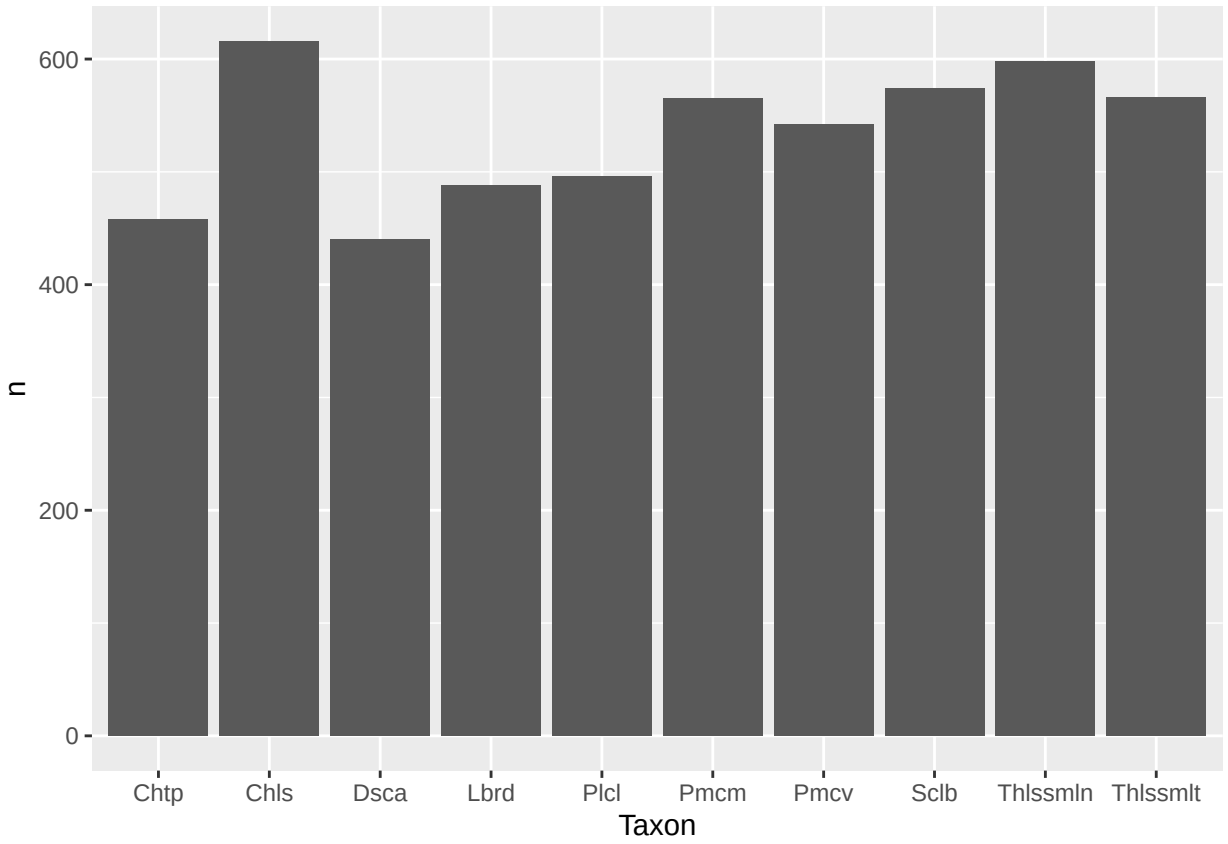
```
## # A tibble: 10 x 3
##    Taxon                           n   prop
##    <fct>                       <int>  <dbl>
##  1 Chlorurus sordidus            616 0.115
##  2 Thalassoma lunare             598 0.112
##  3 Scolopsis bilineata           574 0.107
##  4 Thalassoma lutescens          566 0.106
##  5 Pomacentrus moluccensis       565 0.106
##  6 Pomacentrus vaiuli            542 0.101
##  7 Plectroglyphidodon lacrymatus 496 0.0928
##  8 Labroides dimidiatus          488 0.0913
##  9 Chaetodon plebeius            458 0.0857
## 10 Dascyllus aruanus             440 0.0824
```

```
ggplot(New_Ning_Taxon_10,aes(x = "", y = prop, fill = Taxon))+
  geom_bar(width = 1, stat = "identity", color = "white")+
  coord_polar("y", start = 0)+
  geom_text(aes(y = prop,label = prop), color = "white")+
  labs(title = "Percentage")
```



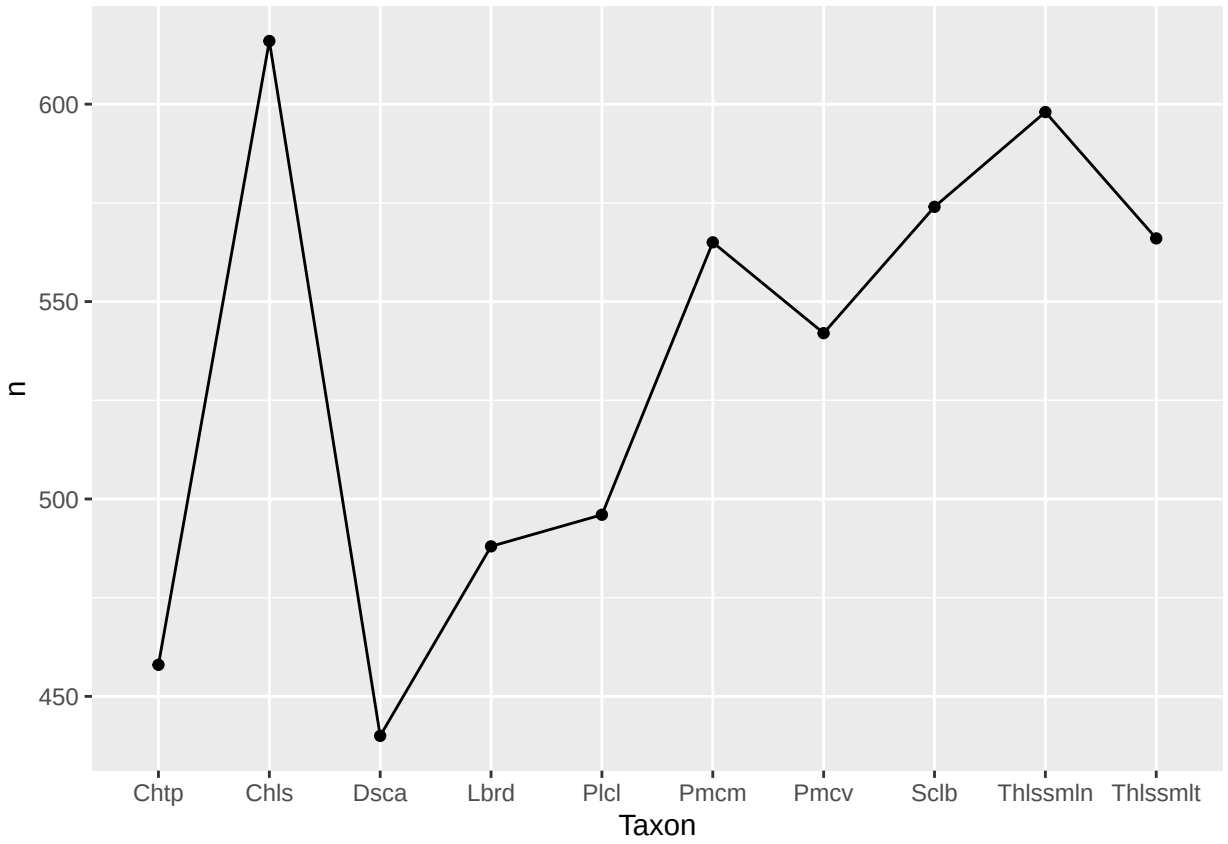
Pick the top 10 taxon in each regions, because there are lots of taxon in each, and then use graphs to analyze. But, unfortunately, the pie chart of ggplot has problems (the data overlapped).

```
ggplot(New_Ning_Taxon_10,aes(x=Taxon,y=n))+
  geom_bar(stat = "identity")+
  scale_x_discrete(labels = abbreviate)
```



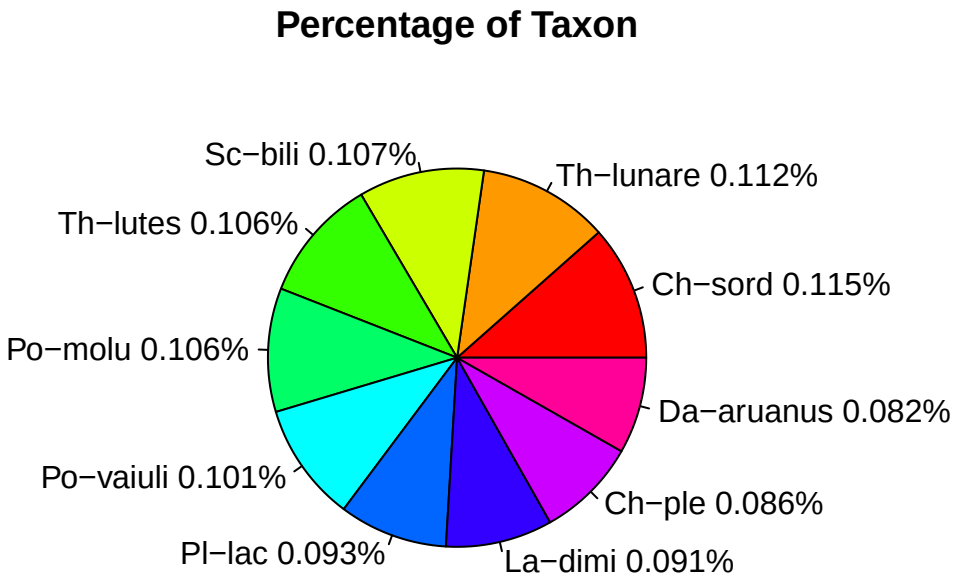
Using bar-chart to find out the differences of numbers between 10 taxon.

```
ggplot(data = New_Ning_Taxon_10, aes(x=Taxon, y= n, group = 1))+
  geom_line()+
  geom_point()+
  scale_x_discrete(labels = abbreviate)
```



Line chart is likely to show the differences clearly.

```
slices <- New_Ning_Taxon_10$prop
lbls <- c("Ch-sord","Th-lunare","Sc-bili","Th-lutes","Po-molu","Po-vaiuli","Pl-lac","La-dimi","Ch-ple",
pct <-round(New_Ning_Taxon_10$prop,3)
lbls <- paste(lbls,pct)
lbls <- paste(lbls,"%",sep = "")
pie(slices,labels = lbls, col = rainbow(length(lbls)),main = "Percentage of Taxon")
```

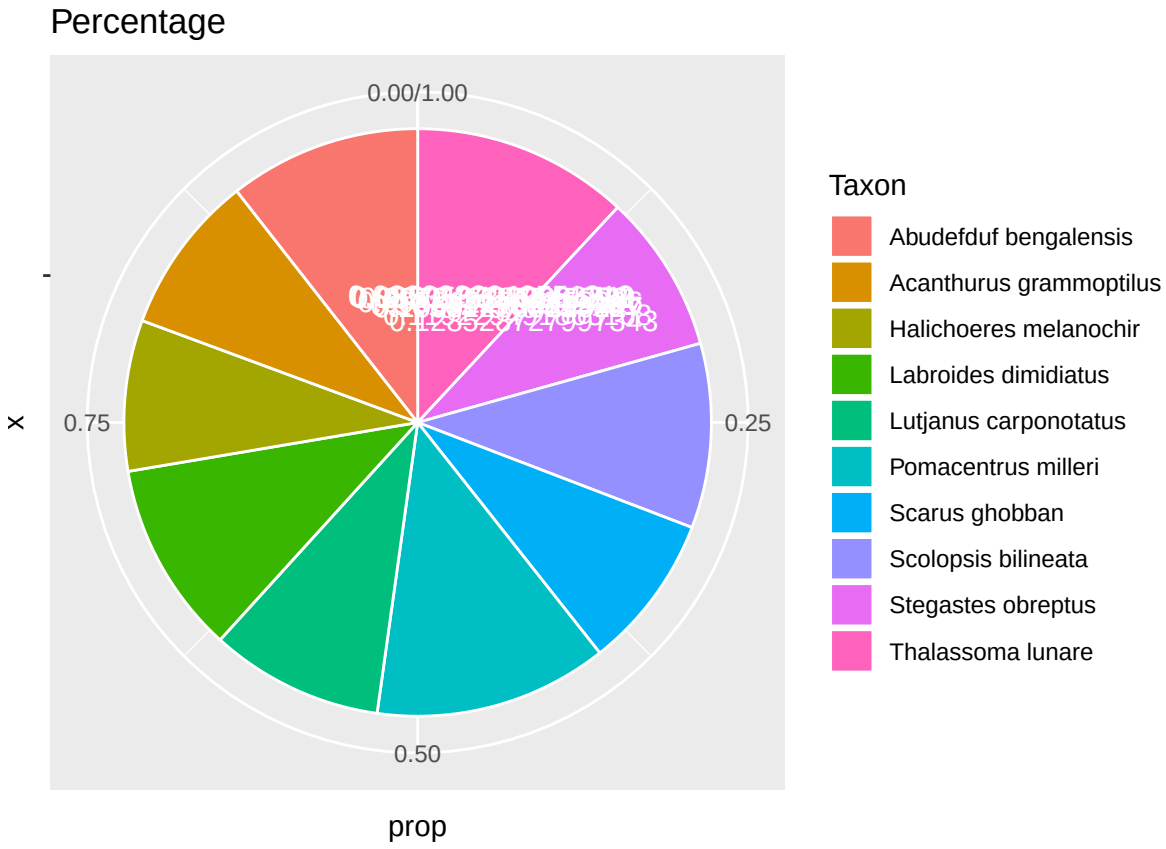


If the subset coveres only 10 taxon, and find out the proportion of these 10 taxon.

```
Broo_Taxon <- Broo_Taxon[with(Broo_Taxon,order(-n)),]
Broo_Taxon_10 <- Broo_Taxon[1:10,]
New_Broo_Taxon_10 <- Broo_Taxon_10 %>% mutate(prop = n/sum(n))
New_Broo_Taxon_10
```

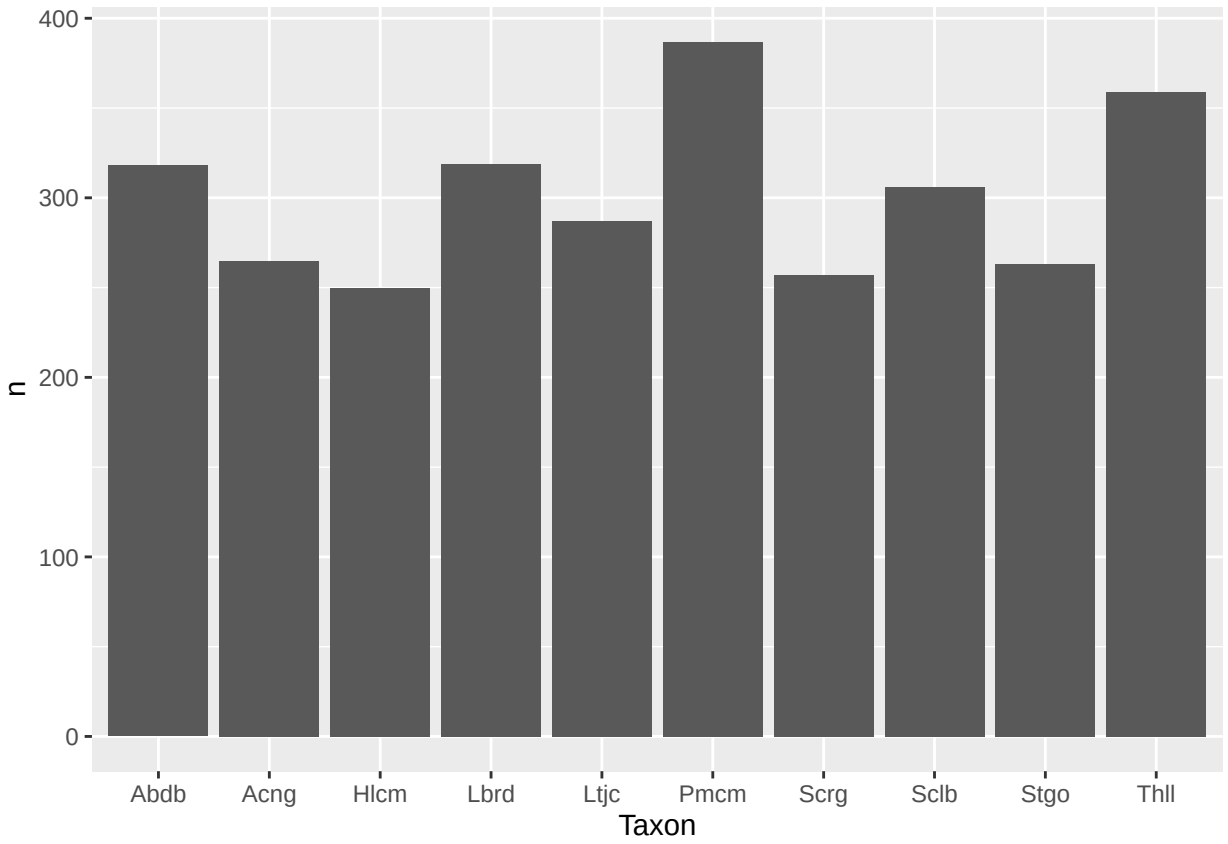
```
## # A tibble: 10 x 3
##    Taxon                      n   prop
##    <fct>                  <int>  <dbl>
##  1 Pomacentrus milleri      387 0.129
##  2 Thalassoma lunare        359 0.119
##  3 Labroides dimidiatus     319 0.106
##  4 Abudefduf bengalensis    318 0.106
##  5 Scolopsis bilineata      306 0.102
##  6 Lutjanus carponotatus    287 0.0953
##  7 Acanthurus grammoptilus  265 0.0880
##  8 Stegastes obreptus       263 0.0873
##  9 Scarus ghobban           257 0.0854
## 10 Halichoeres melanochir   250 0.0830
```

```
ggplot(New_Broo_Taxon_10,aes(x = "", y = prop, fill = Taxon))+
  geom_bar(width = 1, stat = "identity", color = "white")+
  coord_polar("y", start = 0)+
  geom_text(aes(y = prop,label = prop), color = "white")+
  labs(title = "Percentage")
```



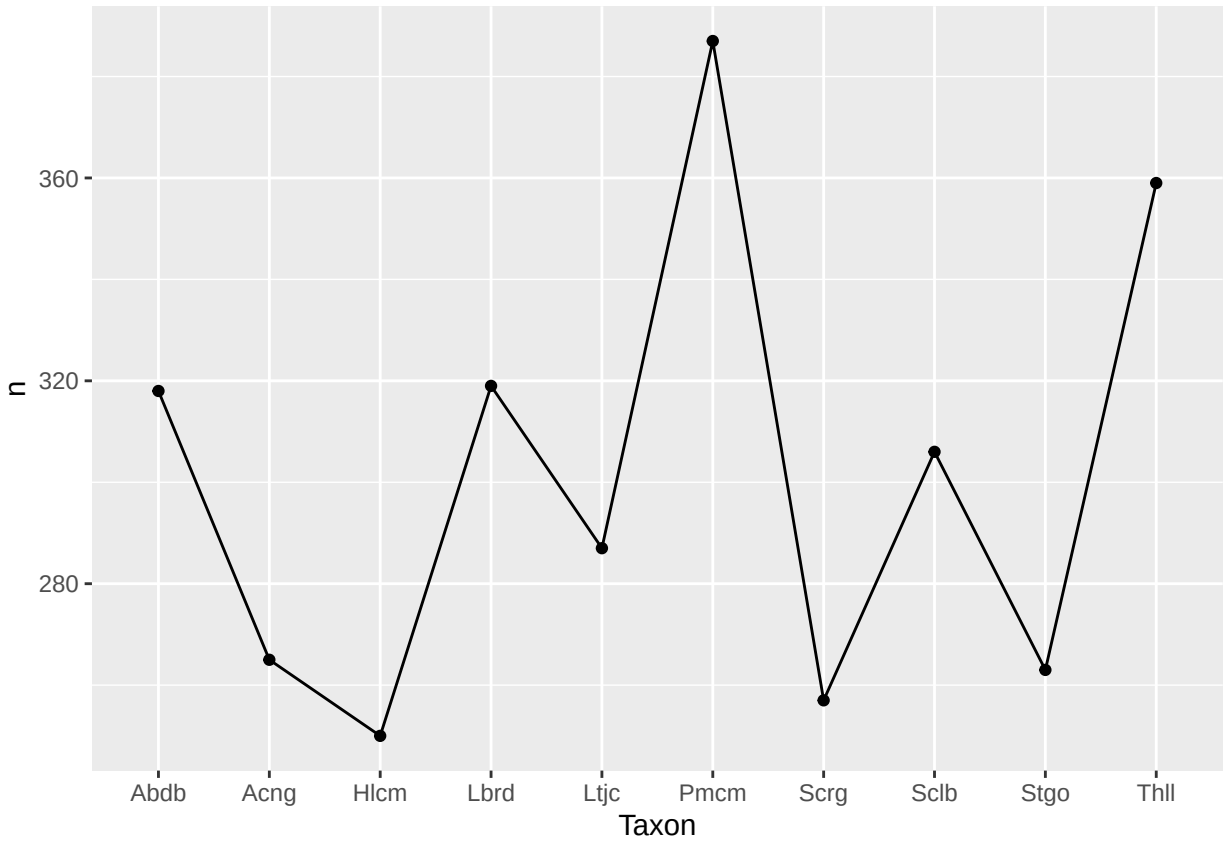
The same as above mentioned, the ggplot of pie-chart has problem of overlapped.

```
ggplot(New_Broo_Taxon_10,aes(x=Taxon,y=n))+
  geom_bar(stat = "identity")+
  scale_x_discrete(labels = abbreviate)
```

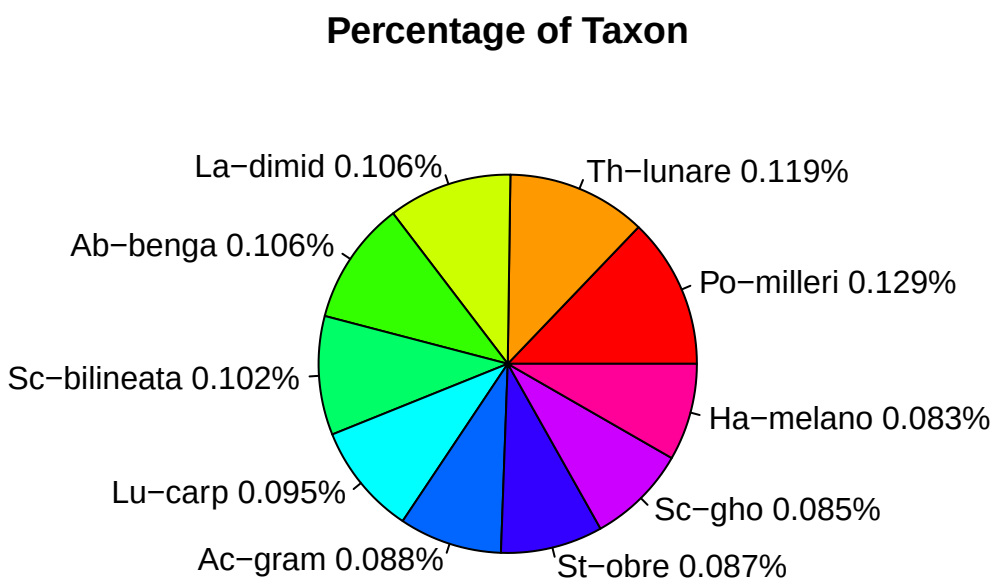


Using bar chart to find out the features of top 10 taxon.

```
ggplot(data = New_Broo_Taxon_10, aes(x=Taxon, y= n, group = 1))+
  geom_line()+
  geom_point()+
  scale_x_discrete(labels = abbreviate)
```




```
slices <- New_Broo_Taxon_10$prop
lbls <- c("Po-milleri","Th-lunare","La-dimid","Ab-benga","Sc-bilineata","Lu-carp","Ac-gram","St-obre","
pct <-round(New_Broo_Taxon_10$prop,3)
lbls <- paste(lbls,pct)
lbls <- paste(lbls,"%",sep = "")
pie(slices,labels = lbls, col = rainbow(length(lbls)),main = "Percentage of Taxon")
```



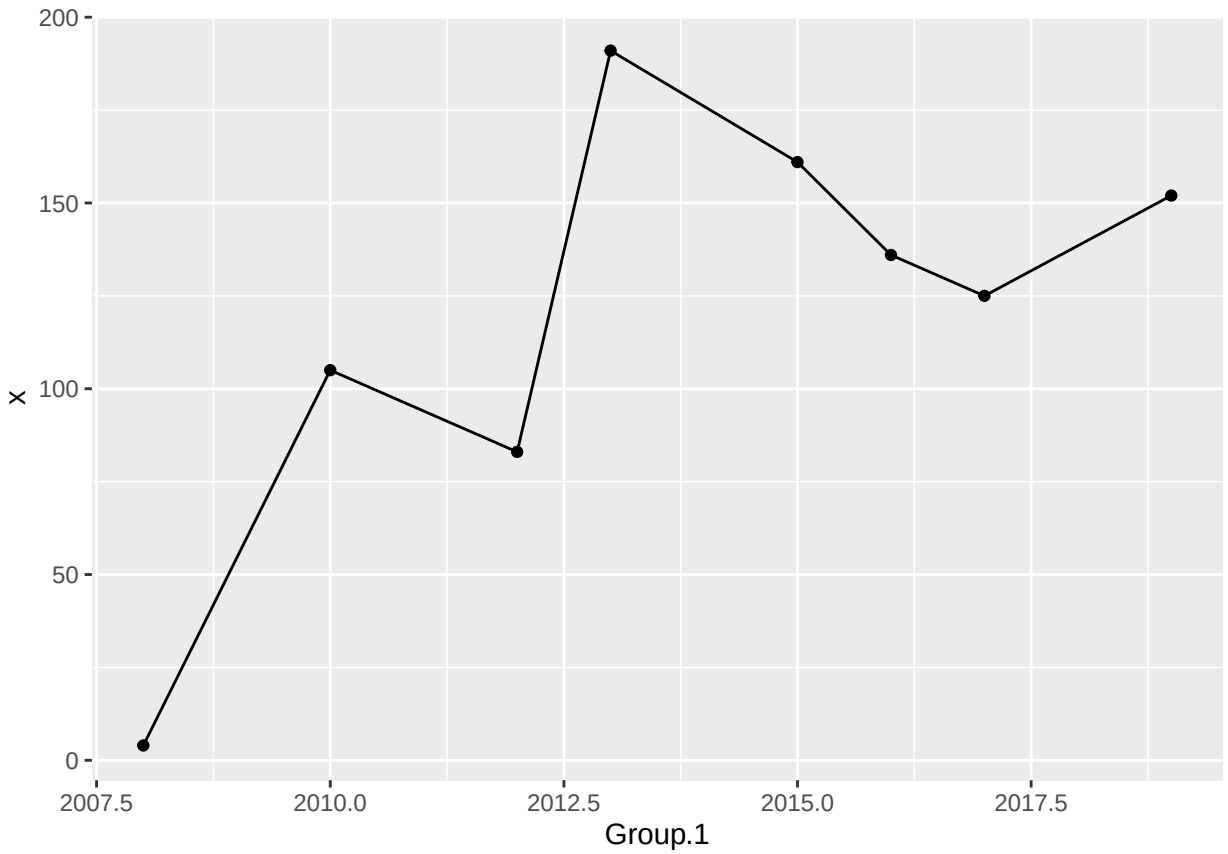
Using pie-chart to find out the proportion of these 10 taxon in Exmouth to Broome region.

```
data_Th_lunare <- MyData %>% filter(Taxon == "Thalassoma lunare")
num_date_Th_lunare <- data_Th_lunare %>% count(SurveyDate)
New_num_date_Th_lunare <- num_date_Th_lunare %>% mutate(year(num_date_Th_lunare$SurveyDate))
names(New_num_date_Th_lunare)[names(New_num_date_Th_lunare) == "year(num_date_Th_lunare$SurveyDate)"] <-
year_Th <- unique(New_num_date_Th_lunare$year)
sum_Th <- aggregate(New_num_date_Th_lunare$n, by=list(New_num_date_Th_lunare$year), FUN = sum)
sum_Th
```

```
##   Group.1   x
## 1    2008   4
## 2    2010 105
## 3    2012  83
## 4    2013 191
## 5    2015 161
## 6    2016 136
## 7    2017 125
## 8    2019 152
```

After compared graphs in Ningaloo and Exmouth to Broome, I found that a taxon named "Thalassoma lunare appeared in both region, so I extracted the data of"Thalassoma lunare", and wanted to find the trend of this species.

```
ggplot(data = sum_Th,aes(x=Group.1,y=x,group=1))+
  geom_line()+
  geom_point()
```



The trend of "Thalassoma lunare" in 11 years.

Regression Model:

```
Data <- read.csv(file = "Data_Th.csv",header = TRUE, sep = ",")
summary(Data)
```

```
##              Ecoregion                  Site       SurveyDate
##  Exmouth to Broome:359   Bundegi SZ North : 32   Min.   :2008
##  Ningaloo         :598   Bundegi SZ South : 31   1st Qu.:2013
##                          Dugong           : 31   Median :2015
##                          Bruboodjoo       : 30   Mean   :2015
##                          Coral Bay Central: 28   3rd Qu.:2017
##                          Monck Head       : 28   Max.   :2019
##                          (Other)          :777
##      Depth                       Taxon
##  Min.   : 1.000   Thalassoma lunare:957
##  1st Qu.: 2.300
##  Median : 3.300
##  Mean   : 4.126
##  3rd Qu.: 5.100
##  Max.   :18.000
##
```

```
a <- Data$Ecoregion
b <- Data$Site
c <- Data$SurveyDate
d <- Data$Depth
glm.fit <- glm(Taxon~a+b+c+d,family = binomial(link = "logit"),data = Data,control = list(maxit=100))
glm.fit
```

```
##
## Call:  glm(formula = Taxon ~ a + b + c + d, family = binomial(link = "logit"),
##     data = Data, control = list(maxit = 100))
##
## Coefficients:
##                      (Intercept)                         aNingaloo
##                        -2.957e+01                        -3.688e-14
##                   bAirlie island         bAirlie Island inner reef
##                         4.043e-14                         3.337e-14
##       bBarrow Island deep south               bBarrow Island East
##                        -2.112e-15                         1.196e-13
##     bBarrow Island Port Central                  bBarrow NE bommie
##                         2.585e-14                         1.196e-13
##                    bBedout north            bBedout porites bommie
##                        -1.434e-14                         3.549e-14
##                bBedout reef edge               bBedout Reef sunset
##                         3.549e-14                        -6.464e-15
##                 bBedout reef top                      bBills Bay 1
##                        -3.878e-14                         8.408e-14
##                      bBruboodjoo                          bBundegi
##                         4.738e-14                         2.062e-14
##                      bBundegi RZ                 bBundegi SZ North
##                         1.377e-14                         2.408e-14
##                bBundegi SZ South                   bCardabia Patch
##                         5.577e-14                         1.756e-13
##     bCoral Bay (Sanctuary zone)                bCoral Bay Central
```

```
##                     4.990e-14                     1.130e-13
##                bCoral Bay DEC1            bCoral Bay Offshore
##                     1.228e-13                     3.020e-13
##             bCorneliesse Shoal               bDead Tree Beach
##                     3.695e-13                     1.180e-15
##              bDelambre Inner 1              bDelambre Inner 3
##                     9.049e-14                     7.275e-14
##            bDelambre Outside 3                   bDelay Point
##                     3.549e-14                     3.445e-14
##   bDons Point West Lewis Island                       bDugong
##                    -2.701e-14                     5.035e-14
##             bEnderby I West Pt                   bEnderby NE
##                     7.370e-14                    -9.197e-15
##                bEnderby SW Bay              bEnderby West Rock
##                     2.209e-14                     3.468e-14
##              bGeneva Bay North            bGeographe Shoals N
##                     3.737e-14                     2.231e-13
##           bGeographe Shoals NW                    bGoodwyn N
##                     2.844e-13                     3.549e-14
##                    bGoodwyn NW             bGoodwyn South Bay
##                     6.806e-14                     2.585e-14
##                   bGoodwyn Sth            bHamersley Inside 1
##                     7.310e-14                     1.692e-14
##                bJonquil Island                 bKate s Corner
##                     9.167e-15                    -1.411e-15
##                    bKendrew 2             bLegendre Inside 3
##                     2.585e-14                     1.034e-13
##            bLegendre Outside 1           bLittle Mangrove Bay
##                     1.034e-13                     5.200e-14
##                      bMalus Is                     bMaud RZ1
##                     2.370e-14                     2.037e-12
##                     bMaud RZ2               bMaud SZ external
##                     1.343e-13                     6.382e-14
##                   bMaud SZ Nth                    bMonck Bowl
##                     4.104e-14                     1.327e-13
##                    bMonck Head              bMonck Head Inner
##                     4.143e-14                     6.878e-14
##              bMonck Head North              bMonck Head Outer
##                     4.946e-14                     8.015e-14
##                bMonck Head Sth                   bMonck Wall
##                     5.688e-14                     1.526e-13
##    bMontebellos Central Lagoon         bMontebellos East Rock
##                    -6.011e-27                     3.549e-14
##                bMontebellos SE              bMontebellos South
##                     1.401e-13                     2.585e-14
##        bNorth Cormorant Island       bNorth Muiron Island East
##                    -6.475e-27                     7.174e-14
##        bNorth Muiron Island NE              bNorth West Island
##                     7.799e-14                    -6.236e-27
##          bNorth West Island NW                   bNth Bundegi
##                     3.549e-14                    -3.688e-14
##                    bNth Muiron               bNW Island Lagoon
##                     1.322e-13                     2.750e-14
##               bOld 9 Buoy Reef          bOutside Yalobia North
```

```
##                       2.271e-13                       2.721e-13
##          bOutside Yalobia South               bOyster rocks buoy
##                       3.141e-13                       2.131e-13
##             bOyster rocks south                        bPelican
##                       2.192e-13                       5.798e-14
##                    bPelican Nth                bPoint Maud Inner
##                       6.267e-14                       7.697e-14
##                bPoint Maud Outer                    bRick s Folly
##                       6.012e-14                       2.585e-14
##                     bRubble Is                 bSailfish North 1
##                       5.361e-14                       6.404e-14
##                bSailfish South 2  bSouth Muiron Island NE Channel
##                       2.585e-14                       6.727e-14
##                 bSouth West Reef              bStephenson Channel
##                       7.520e-15                       1.293e-14
##                    bSth Bundegi                       bSth Muiron
##                      -1.338e-14                       1.856e-13
##                bSW West Lewis Is            bTrimouille Island NE
##                      -6.805e-15                       2.585e-14
##           bTrimouille Island SE  bTurquoise Bay (Sanctuary zone)
##                       2.585e-14                       6.279e-15
##                  bVaranus Island            bVaranus Island north
##                       1.401e-13                       1.196e-13
##           bVaranus North bommie              bVaranus Port limit
##                       8.567e-14                       1.196e-13
##                   bW Lewis Is NW                       bWest Reef
##                      -8.443e-15                               NA
##                  bYalobia Bommie                  bYalobia Passage
##                       1.800e-13                       1.118e-13
##                   bYalobia South                               c
##                       1.488e-13                      -9.788e-15
##                               d
##                      -2.585e-14
##
## Degrees of Freedom: 956 Total (i.e. Null);  851 Residual
## Null Deviance:       0
## Residual Deviance: 2.767e-10     AIC: 212
```

```
glm.fit2 <- glm(Taxon~a+c+d,family = binomial(link = "logit"),data = Data,control = list(maxit=100))
glm.fit2
```

```
##
## Call:  glm(formula = Taxon ~ a + c + d, family = binomial(link = "logit"),
##     data = Data, control = list(maxit = 100))
##
## Coefficients:
## (Intercept)    aNingaloo            c            d
##  -2.957e+01    4.208e-14   -2.217e-15   -6.299e-15
##
## Degrees of Freedom: 956 Total (i.e. Null);  953 Residual
## Null Deviance:       0
## Residual Deviance: 2.767e-10     AIC: 8
```

After clean data, I picked 4 variables to fix the logistic model. But from the output, the coefficients of Ecoregion,Site, SurveyDate and Depth are pretty tiny. So, these variables do not have siginificant influence on

Thalassoma lunare.But only for these two models, the second one may be better, because of smaller AIC value.