# Annex III - STREAM: Auxiliary scripts for the conversion from the SDEF format to DG MARE Med&BS Data Call

E. Mantzouni

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```
#R general option:
options(stringsAsFactors = FALSE)

options(warn=0)

options(scipen = 999) # disable scientific notation

#chunk option
knitr::opts_chunk$set(cache=TRUE,echo=TRUE, warning=FALSE,
    message=FALSE, fig.height=6,progress=FALSE,verbose=FALSE,
        include=TRUE,dev='png',autodep=FALSE)

#load packages

library(COSTcore)
library(COSTeda)
library(COSTdbe)

library(tidyr)
library(dplyr)
library(data.table)
library(knitr)
```

## Example of use of the script B_LANDINGS

This script implements the Calculation of the raised numbers by length required for the DG MARE Med&BS Data Call, using as input file the SDEF format (CS table) and COST as the raising procedure

## Settings

```
path_in <- paste("C:\\Users\\Bitetto Isabella\\OneDrive - Coispa Tecnologia & Ricerca S.C.A.R.L\\MARE22\\STREAM\\FINAL REVISION OF DELIVERABLES\\SDEF_to_DG_MARE_MedBS", sep="")

setwd(path_in)
```

## Input Data

Validated csData and clData of the SDEF format and stratification object

```r
load("fri-TEST.Rdata")


fri_strD1 <- strIni(timeStrata="quarter", techStrata = "foCatEu5",
                   spaceStrata = "area")


fri_strD1
```

```
## An object of class "strIni"
## Slot "timeStrata":
## [1] "quarter"
##
## Slot "spaceStrata":
## [1] "area"
##
## Slot "techStrata":
## [1] "foCatEu5"
##
## Slot "tpRec":
## [[1]]
## [1] NA
##
##
## Slot "spRec":
## [[1]]
## [1] NA
##
##
## Slot "tcRec":
## [[1]]
## [1] NA
```

```r
  fri_csc <- csDataCons(fri_cs1, fri_strD1)

fri_clc <- clDataCons(fri_cl1, fri_strD1)

head(fri_csc )
```

```
## An object of class "csDataCons"
## Slot "desc":
## [1] "Unknown stock"
##
## Slot "tr":
##   PSUid     time space        technical sampType landCtry vslFlgCtry proj
## 1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 2     2 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 3     3 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 4     4 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 5     5 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 6     6 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
```

```
##   trpCode foNum daysAtSea vslId sampCtry sampMeth
## 1       2     3         1    NA COUNTRY1 Observer
## 2       1     2         1    NA COUNTRY1 Observer
## 3       3     3         1    NA COUNTRY1 Observer
## 4       4     3         1    NA COUNTRY1 Observer
## 5       5     3         1    NA COUNTRY1 Observer
## 6       8     3         1    NA COUNTRY1 Observer
##
## Slot "hh":
##   PSUid SSUid     time space        technical sampType landCtry vslFlgCtry
## 1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 2     1     2 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 3     1     3 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 4     2     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 5     2     2 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 6     3     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
##   proj trpCode staNum foVal aggLev catReg sppReg       date    foDur
## 1  DCF       2      1     V      H    All    All 2017-02-20 3.500000
## 2  DCF       2      2     V      H    All    All 2017-02-20 1.750000
## 3  DCF       2      3     V      H    All    All 2017-02-20 3.750000
## 4  DCF       1      1     V      H    All    All 2017-02-21 6.083333
## 5  DCF       1      2     V      H    All    All 2017-02-21 5.916667
## 6  DCF       3      1     V      H    All    All 2017-02-23 5.083333
##   latIni lonIni latFin lonFin foDep
## 1     NA     NA     NA     NA    NA
## 2     NA     NA     NA     NA    NA
## 3     NA     NA     NA     NA    NA
## 4     NA     NA     NA     NA    NA
## 5     NA     NA     NA     NA    NA
## 6     NA     NA     NA     NA    NA
##
## Slot "sl":
##   PSUid SSUid TSUid     time space        technical          sort sampType
## 1     1     1     3 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 2     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 DIS-HUC-NA-NA        S
## 3     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 DIS-HUC-NA-NA        S
## 4     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 5     1     1     4 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 6     1     2     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
##   landCtry vslFlgCtry proj trpCode staNum                  spp  sex   wt
## 1 COUNTRY1   COUNTRY1  DCF       2      1 Merluccius merluccius <NA> 2400
## 2 COUNTRY1   COUNTRY1  DCF       2      1 Merluccius merluccius <NA>   90
## 3 COUNTRY1   COUNTRY1  DCF       2      1       Mullus barbatus <NA>   60
## 4 COUNTRY1   COUNTRY1  DCF       2      1       Mullus barbatus <NA> 2020
## 5 COUNTRY1   COUNTRY1  DCF       2      1 Merluccius merluccius <NA>  110
## 6 COUNTRY1   COUNTRY1  DCF       2      2       Mullus barbatus <NA>  350
##   subSampWt lenCode
## 1      2400      mm
## 2        45      mm
## 3        30      mm
## 4      2020      mm
```

```
## 5       110      mm
## 6       350      mm
##
## Slot "hl":
##   PSUid SSUid TSUid     time space        technical          sort sampType
## 1     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 2     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 3     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 4     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 5     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 6     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
##   landCtry vslFlgCtry proj trpCode staNum             spp  sex lenCls
## 1 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    170
## 2 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    180
## 3 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    150
## 4 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    160
## 5 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    140
## 6 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    200
##   lenNum
## 1      7
## 2      7
## 3      7
## 4      3
## 5      7
## 6      3
##
## Slot "ca":
##   PSUid SSUid     time space        technical       sort sampType landCtry
## 1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 2     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 3     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 4     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 5     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 6     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
##   vslFlgCtry proj trpCode staNum                   spp sex
## 1   COUNTRY1  DCF       2      1 Merluccius merluccius   U
## 2   COUNTRY1  DCF       2      1       Mullus barbatus   U
## 3   COUNTRY1  DCF       2      1       Mullus barbatus   U
## 4   COUNTRY1  DCF       2      1 Merluccius merluccius   U
## 5   COUNTRY1  DCF       2      1       Mullus barbatus   U
## 6   COUNTRY1  DCF       2      1       Mullus barbatus   U
##                       stock lenCls age fishId lenCode ageMeth plusGrp otoWt
## 1 Merluccius merluccius_22    170  NA     20      mm     OWR    <NA>    NA
## 2       Mullus barbatus_22    130  NA     37      mm     OWR    <NA>    NA
## 3       Mullus barbatus_22    170  NA      7      mm     OWR    <NA>    NA
## 4 Merluccius merluccius_22    160  NA     19      mm     OWR    <NA>    NA
## 5       Mullus barbatus_22    160  NA     36      mm     OWR    <NA>    NA
## 6       Mullus barbatus_22    110  NA     22      mm     OWR    <NA>    NA
##   otoSide indWt matMeth matScale matStage
## 1    <NA>    NA    <NA>     <NA>     <NA>
## 2    <NA>    NA    <NA>     <NA>     <NA>
```

```
## 3    <NA>    NA    <NA>     <NA>     <NA>
## 4    <NA>    NA    <NA>     <NA>     <NA>
## 5    <NA>    NA    <NA>     <NA>     <NA>
## 6    <NA>    NA    <NA>     <NA>     <NA>
```

```
head(fri_clc)
```

```
## An object of class "clDataCons"
## Slot "desc":
## [1] "Unknown stock"
##
## Slot "cl":
##   landCtry vslFlgCtry     time space        technical
## 1 COUNTRY1   COUNTRY1 9999 - 1 GSA99 GNS_-1_VL1218_-1
## 2 COUNTRY1   COUNTRY1 9999 - 1 GSA99 LLS_-1_VL1218_-1
## 3 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL1824_-1
## 4 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL1824_-1
## 5 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL2440_-1
## 6 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL2440_-1
##                   taxon landCat commCatScl commCat unallocCatchWt
## 1 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 2 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 3 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 4       Mullus barbatus     HUC       <NA>    <NA>             NA
## 5 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 6       Mullus barbatus     HUC       <NA>    <NA>             NA
##   misRepCatchWt landWt landMult landValue
## 1            NA     46        1        NA
## 2            NA    140        1        NA
## 3            NA   2151        1        NA
## 4            NA   2285        1        NA
## 5            NA  32979        1        NA
## 6            NA   9144        1        NA
```

```
# extract COUNTRY  and YEAR
COUNTRY<-unique(fri_cl1@cl$landCtry)
YEAR=unique(fri_cl1@cl$year)
```

DG MARE Med&BS LANDINGS Table template

```
lan.temp2<- read.table("xxx_LANDINGS.csv",sep=",",header=T)
```

```
head(lan.temp2)
```

```
##   [1] ID                 COUNTRY            YEAR
##   [4] QUARTER            VESSEL_LENGTH      GEAR
##   [7] MESH_SIZE_RANGE    FISHERY            AREA
##  [10] SPECON             SPECIES            LANDINGS
##  [13] UNIT               LENGTHCLASS0       LENGTHCLASS1
##  [16] LENGTHCLASS2       LENGTHCLASS3       LENGTHCLASS4
##  [19] LENGTHCLASS5       LENGTHCLASS6       LENGTHCLASS7
##  [22] LENGTHCLASS8       LENGTHCLASS9       LENGTHCLASS10
```

```
##  [25] LENGTHCLASS11       LENGTHCLASS12       LENGTHCLASS13
##  [28] LENGTHCLASS14       LENGTHCLASS15       LENGTHCLASS16
##  [31] LENGTHCLASS17       LENGTHCLASS18       LENGTHCLASS19
##  [34] LENGTHCLASS20       LENGTHCLASS21       LENGTHCLASS22
##  [37] LENGTHCLASS23       LENGTHCLASS24       LENGTHCLASS25
##  [40] LENGTHCLASS26       LENGTHCLASS27       LENGTHCLASS28
##  [43] LENGTHCLASS29       LENGTHCLASS30       LENGTHCLASS31
##  [46] LENGTHCLASS32       LENGTHCLASS33       LENGTHCLASS34
##  [49] LENGTHCLASS35       LENGTHCLASS36       LENGTHCLASS37
##  [52] LENGTHCLASS38       LENGTHCLASS39       LENGTHCLASS40
##  [55] LENGTHCLASS41       LENGTHCLASS42       LENGTHCLASS43
##  [58] LENGTHCLASS44       LENGTHCLASS45       LENGTHCLASS46
##  [61] LENGTHCLASS47       LENGTHCLASS48       LENGTHCLASS49
##  [64] LENGTHCLASS50       LENGTHCLASS51       LENGTHCLASS52
##  [67] LENGTHCLASS53       LENGTHCLASS54       LENGTHCLASS55
##  [70] LENGTHCLASS56       LENGTHCLASS57       LENGTHCLASS58
##  [73] LENGTHCLASS59       LENGTHCLASS60       LENGTHCLASS61
##  [76] LENGTHCLASS62       LENGTHCLASS63       LENGTHCLASS64
##  [79] LENGTHCLASS65       LENGTHCLASS66       LENGTHCLASS67
##  [82] LENGTHCLASS68       LENGTHCLASS69       LENGTHCLASS70
##  [85] LENGTHCLASS71       LENGTHCLASS72       LENGTHCLASS73
##  [88] LENGTHCLASS74       LENGTHCLASS75       LENGTHCLASS76
##  [91] LENGTHCLASS77       LENGTHCLASS78       LENGTHCLASS79
##  [94] LENGTHCLASS80       LENGTHCLASS81       LENGTHCLASS82
##  [97] LENGTHCLASS83       LENGTHCLASS84       LENGTHCLASS85
## [100] LENGTHCLASS86       LENGTHCLASS87       LENGTHCLASS88
## [103] LENGTHCLASS89       LENGTHCLASS90       LENGTHCLASS91
## [106] LENGTHCLASS92       LENGTHCLASS93       LENGTHCLASS94
## [109] LENGTHCLASS95       LENGTHCLASS96       LENGTHCLASS97
## [112] LENGTHCLASS98       LENGTHCLASS99       LENGTHCLASS100_PLUS
## <0 rows> (or 0-length row.names)
```

Communication Table for FISHERY

```
fishery<- read.table("communicationTable_for_fishery.csv",sep=";",header=T)

head(fishery)
```

```
##   SDEF_codification DGMARE_Med_BS_codification
## 1               MOL                        MOL
## 2               DES                     DEMSP
## 3               DWS                        DWS
## 4               MDD                        MDD
## 5               SPF                        SPF
## 6               FIF                        FIF
```

Auxiliary table: species_LAN.csv

```
# species file : selected species with FAO three alpha code

sel_spe <-read.table("species_LANDINGS.csv",sep=";",header=T)
```

```r
head(sel_spe)
```

```
##                 SPECIES SPE   GSA LC_RANGE lanEstim_methodDesc SPECON
## 1 Merluccius merluccius HKE GSA99       10          analytical      .
## 2       Mullus barbatus MUT GSA99       10          analytical      .
```

## Data analysis- raising

Analysis by stock

```r
for (i in 1:dim(sel_spe)[1]) {

  STK<- sel_spe$SPECIES[i]

  AREA <- sel_spe$GSA[i]

    fri_csc1<- subset(fri_csc, space==sel_spe$GSA[i],table="ca",link=T)
  fri_clc1<- subset(fri_clc, space==sel_spe$GSA[i],table="cl")

  # The first step is to create the empty object, that will be given
  # the appropriate values for the descritor  fields.

  lanEstim <-
    dbeObject(
      desc = paste(STK, AREA,"Landings", sep="_"),
      species = STK,
      catchCat = "LAN",
      strataDesc = fri_strD1,
      methodDesc = sel_spe$lanEstim_methodDesc[i]
    )

  # the only arguments to pass to the function are the dbe object,
  # the consolidated cs and cl datasets.

      if ( sel_spe$lanEstim_methodDesc[i]=="analytical"){
lanEstim <- RaiseLgth(lanEstim, fri_csc1, fri_clc1,incl.precision =F)
     } else {
  lanEstim <- RaiseLgthBoot(lanEstim, fri_csc1, fri_clc1,
                            incl.precision =F,B=15)
}


  # totalW\$estim : total weight,
aa <-lanEstim@totalW$estim

aa$value<- aa$value/1000 # tons

aa<- rename(aa, "totalW"=value)
```

```r
# lenStruc\$estim : numbers-at-length estimates

 bb<- lanEstim@lenStruc$estim

  # define LCs and UNIT len
UNIT <- as.character( unique(fri_csc@ca$lenCode[fri_csc@ca$spp==STK]) )

if (UNIT %in% c("mm", "MM")& sel_spe$LC_RANGE[i]==10) {
bb$length<-as.numeric(bb$length)/10
UNIT1<-"CM"
}

 if (UNIT %in% c("mm", "MM") & sel_spe$LC_RANGE[i]==1) {
bb$length<-as.numeric(bb$length)
UNIT1<- "MM"
 }

  if (UNIT %in% c("mm", "MM")& sel_spe$LC_RANGE[i]==5) {
bb$length<-as.numeric(bb$length)/10
UNIT1<-"CM"
 }

  if (UNIT %in% c("cm", "CM") ) {
bb$length<-as.numeric(bb$length)
UNIT1<- "CM"
 }

  bb$length<- plyr::round_any( bb$length,1,floor)

 bb$value<- bb$value/1000 # '000 ind

 ab=left_join(bb,aa ,by = c("time", "space", "technical"))

 ab<- ab %>% separate(technical, c("gear","FISHERY", "VL","MESH_SIZE_RANGE"),
                      sep = "_",remove=T)

 ab$length<- as.numeric(as.character(ab$length))

 ab<- ab%>% group_by(time,   space , gear  ,FISHERY, VL,MESH_SIZE_RANGE  ) %>%
   mutate(minlc=min(length,na.rm=T),maxlc=max(length,na.rm=T))

   # matrix with all combinations of "time"   "space"  "gear"   "VL"
 # "length" ,"MESH_SIZE_RANGE"

 dt <- as.data.table(ab)

  dt[,c(1:7)][is.na(dt[,c(1:7)])]<- -1

seq_l <-  seq(0, max(dt$length,na.rm = T), by = 1) #
```

```r
  dt$id<- paste(dt$time,dt$space,dt$gear,dt$FISHERY,dt$VL,
                dt$MESH_SIZE_RANGE,sep=":")

  dt1<- dt[, list(length = seq_l), by = id]

  dt1<- dt1 %>% separate(id, c("time", "space", "gear", "FISHERY","VL",
                               "MESH_SIZE_RANGE"), sep = ":")


  ab[is.na(ab)]<- -1

  dt2<- left_join(dt1,ab)
  dt2$stock<- STK

  ##

  dt3 <- data.table::dcast(dt2,as.formula(paste(paste(names(dt2)[! names(dt2) %in%
                   c("length","value")], collapse='+'), "length", sep="~")),
                   value.var = "value")


  dt3=dt3[complete.cases(dt3[,c(7:9)]), ]

dt3 <- dt3 %>% separate(time, c("Year","Quarter")," - ")

  dt3$MESH_SIZE_RANGE<-as.character(dt3$MESH_SIZE_RANGE)


  # numbers at LC : NA-->0
dt3<- dt3 %>% mutate_at(vars( -(Year:stock) ),
          funs( if_else( is.na(.), 0, .) ) )


  LANDINGS <- data.frame(

    ID = NA ,
    COUNTRY = COUNTRY ,
    YEAR = YEAR ,
    QUARTER =dt3$Quarter,
    VESSEL_LENGTH = dt3$VL,
    GEAR = dt3$gear,
    MESH_SIZE_RANGE = dt3$MESH_SIZE_RANGE,
    FISHERY =  dt3$FISHERY ,
    AREA = sel_spe$GSA[i],
    SPECON = -1 ,
    SPECIES = STK ,
    LANDINGS = dt3$totalW ,
    UNIT = UNIT1
  )
```

```
  LANDINGS<-left_join(LANDINGS,dt3[,-c(1,3,8:11)],by=c( "QUARTER"  ="Quarter" ,
                                  "GEAR"="gear" ,  "VESSEL_LENGTH" = "VL"  ,
                                  "MESH_SIZE_RANGE","FISHERY" ))

  # take care of number of Length classes (max is 100 acc. to DG MARE Med&BS templ
ate)
  zz<-dim(LANDINGS[-c(1:13)])[2]
  names(LANDINGS)[-c(1:13)]<- paste("LENGTHCLASS",seq(0,zz-1,1),sep="")


  if(zz>=100){

    LANDINGS$LENGTHCLASS100_PLUS<- rowSums(LANDINGS[,!1:113])

   LANDINGS<-LANDINGS %>% select(ID:LENGTHCLASS99,LENGTHCLASS100_PLUS)
  }



    # FISHERY to DG MARE Med&BS codification
  LANDINGS$FISHERY <- fishery$SDEF_codification[match(LANDINGS$FISHERY ,
                                    fishery$DGMARE_Med_BS_codification)]

  # species to FAO three alpha code and set ID (COUNTRY, AREA, GEAR, VESSEL_LENGTH
,
  # MESH_SIZE_RANGE,QUARTER, SPECIES)

  land.tab <-LANDINGS %>% mutate(SPECIES=sel_spe$SPE[match(SPECIES,sel_spe$SPECIES
)],
                                 ID = paste(COUNTRY, AREA, GEAR,FISHERY, VESSEL_L
ENGTH,
                             MESH_SIZE_RANGE,YEAR, QUARTER, SPECIES, sep = "_"))

  lan.temp2<-bind_rows(lan.temp2,land.tab)


lan.temp2[,-c(1:13)][is.na(lan.temp2[,-c(1:13)])] <- 0

}
```

## Output

```
lan.temp2 <- lan.temp2[, 2:ncol(lan.temp2)]
write.table(format(lan.temp2,digits=3,scientific=F), file = "LANDINGS.csv",
            row.names=FALSE,sep=";",na="-1")

head(lan.temp2)
```

```
##    COUNTRY YEAR QUARTER VESSEL_LENGTH GEAR MESH_SIZE_RANGE FISHERY  AREA
## 1 COUNTRY1 9999       1        VL2440  OTB              -1    NONE GSA99
## 2 COUNTRY1 9999       3        VL0612  GNS              -1    NONE GSA99
## 3 COUNTRY1 9999       3        VL2440  OTB              -1    NONE GSA99
## 4 COUNTRY1 9999       4        VL0006  GNS              -1    NONE GSA99
## 5 COUNTRY1 9999       4        VL0612  GNS              -1    NONE GSA99
## 6 COUNTRY1 9999       4        VL0612  GTR              -1    NONE GSA99
##   SPECON SPECIES   LANDINGS UNIT LENGTHCLASS0 LENGTHCLASS1 LENGTHCLASS2
## 1     -1     HKE 241.996000   CM            0            0            0
## 2     -1     HKE 140.230571   CM            0            0            0
## 3     -1     HKE 196.598000   CM            0            0            0
## 4     -1     HKE  10.177558   CM            0            0            0
## 5     -1     HKE  87.679445   CM            0            0            0
## 6     -1     HKE   2.382747   CM            0            0            0
##   LENGTHCLASS3 LENGTHCLASS4 LENGTHCLASS5 LENGTHCLASS6 LENGTHCLASS7
## 1            0            0            0            0            0
## 2            0            0            0            0            0
## 3            0            0            0            0            0
## 4            0            0            0            0            0
## 5            0            0            0            0            0
## 6            0            0            0            0            0
##   LENGTHCLASS8 LENGTHCLASS9 LENGTHCLASS10 LENGTHCLASS11 LENGTHCLASS12
## 1            0            0             0            0            0
## 2            0            0             0            0            0
## 3            0            0             0            0            0
## 4            0            0             0            0            0
## 5            0            0             0            0            0
## 6            0            0             0            0            0
##   LENGTHCLASS13 LENGTHCLASS14 LENGTHCLASS15 LENGTHCLASS16 LENGTHCLASS17
## 1             0      0.000000     19.793306     24.827583     73.370333
## 2             0      0.000000      0.000000      0.000000      0.000000
## 3             0      4.138302      8.188831     17.894727     20.699818
## 4             0      0.000000      0.000000      0.000000      0.000000
## 5             0      0.000000      2.836237      1.134495      3.403485
## 6             0      0.000000      0.000000      0.000000      0.000000
##   LENGTHCLASS18 LENGTHCLASS19 LENGTHCLASS20 LENGTHCLASS21 LENGTHCLASS22
## 1     144.63101    170.341556   152.4106110     188.78637   115.6763957
## 2       0.00000      0.000000     0.0000000       0.00000    19.2228335
## 3      24.95705     34.569465    52.1754254      65.54129    51.2356341
## 4       0.00000      0.000000     0.0000000       0.00000     1.7191821
## 5       6.64339      7.962294     5.9055523      11.74862    15.5695889
## 6       0.00000      0.000000     0.1604868       0.00000     0.1604868
##   LENGTHCLASS23 LENGTHCLASS24 LENGTHCLASS25 LENGTHCLASS26 LENGTHCLASS27
## 1   144.5208194    86.5762343   125.5708742   129.9463867   110.9232050
## 2     0.0000000     0.0000000     0.0000000     0.0000000     0.0000000
## 3    53.7350790    64.4316644    63.9193107    43.7347026    38.3000654
## 4     0.0000000     1.7191821     3.4383642     3.4383642     1.7191821
## 5    17.7096472    24.4611394    32.0892633    32.0962731    37.2363491
## 6     0.1604868     0.1604868     0.1604868     0.1604868     0.3209735
##   LENGTHCLASS28 LENGTHCLASS29 LENGTHCLASS30 LENGTHCLASS31 LENGTHCLASS32
## 1     109.01789    52.6093754    50.0200945    42.1897758    22.8384296
```

```
## 2       0.00000    19.2228335    19.2228335    38.4456671    38.4456671
## 3      29.49994    42.5713246    27.4307910    32.6078231    23.4171370
## 4       0.00000     1.7191821     3.4383642     0.0000000     0.0000000
## 5      26.28628    18.0104432    23.4942145    14.2945541    13.5494027
## 6       0.00000     0.3209735     0.4814603     0.1604868     0.6419471
##   LENGTHCLASS33 LENGTHCLASS34 LENGTHCLASS35 LENGTHCLASS36 LENGTHCLASS37
## 1    25.8835535    25.8835535    16.7481817     7.6128099     12.180496
## 2    38.4456671    38.4456671    38.4456671    38.4456671     19.222834
## 3    31.0538825    25.3616402    26.5250182    22.6443216     13.586593
## 4     1.7191821     1.7191821     0.0000000     1.7191821      0.000000
## 5    14.8379526    11.9465417     8.1090350    15.3843710      7.432411
## 6     0.1604868     0.3209735     0.1604868     0.1604868      0.000000
##   LENGTHCLASS38 LENGTHCLASS39 LENGTHCLASS40 LENGTHCLASS41 LENGTHCLASS42
## 1     13.703058     6.0902479     6.0902479     4.5676859      1.522562
## 2      0.000000     0.0000000     0.0000000    19.2228335      0.000000
## 3     12.680820     9.9635015     6.5980152    11.1268795      9.963501
## 4      1.719182     0.0000000     0.0000000     0.0000000      0.000000
## 5      6.974540     5.5392491     2.2689900     2.1357642      4.729399
## 6      0.000000     0.8024339     0.4814603     0.4814603      0.000000
##   LENGTHCLASS43 LENGTHCLASS44 LENGTHCLASS45 LENGTHCLASS46 LENGTHCLASS47
## 1     3.0451239     7.6128099      0.000000      0.000000     0.0000000
## 2     0.0000000    19.2228335     19.222834      0.000000     0.0000000
## 3     6.3404100     3.6230915      2.717319      2.717319     1.8115457
## 4     0.0000000     1.7191821      0.000000      0.000000     0.0000000
## 5     2.4604090     1.8931615      0.000000      1.325914     1.1344950
## 6     0.1604868     0.1604868      0.000000      0.000000     0.1604868
##   LENGTHCLASS48 LENGTHCLASS49 LENGTHCLASS50 LENGTHCLASS51 LENGTHCLASS52
## 1     4.5676859     0.0000000      0.000000     0.0000000     0.0000000
## 2    19.2228335     0.0000000      0.000000     0.0000000     0.0000000
## 3     0.9057729     3.6230915      1.811546     0.9057729     0.9057729
## 4     3.4383642     0.0000000      0.000000     0.0000000     0.0000000
## 5     0.5672475     0.5672475      0.000000     0.0000000     0.0000000
## 6     0.0000000     0.0000000      0.000000     0.0000000     0.0000000
##   LENGTHCLASS53 LENGTHCLASS54 LENGTHCLASS55 LENGTHCLASS56 LENGTHCLASS57
## 1     0.0000000     0.0000000     0.0000000      0.000000     0.0000000
## 2     0.0000000     0.0000000     0.0000000      0.000000     0.0000000
## 3     0.0000000     0.9057729     0.0000000      1.811546     0.9057729
## 4     0.0000000     0.0000000     0.0000000      0.000000     0.0000000
## 5     0.5672475     0.0000000     0.0000000      0.000000     0.0000000
## 6     0.0000000     0.0000000     0.1604868      0.000000     0.0000000
##   LENGTHCLASS58 LENGTHCLASS59 LENGTHCLASS60 LENGTHCLASS61 LENGTHCLASS62
## 1      0.000000      0.000000      0.000000     0.0000000             0
## 2      0.000000      0.000000      0.000000     0.0000000             0
## 3      1.811546      2.717319      1.811546     0.9057729             0
## 4      0.000000      0.000000      0.000000     0.0000000             0
## 5      0.000000      0.000000      0.000000     0.0000000             0
## 6      0.000000      0.000000      0.000000     0.0000000             0
##   LENGTHCLASS63 LENGTHCLASS64 LENGTHCLASS65 LENGTHCLASS66 LENGTHCLASS67
## 1     1.5225620     0.0000000             0             0     0.0000000
## 2     0.0000000     0.0000000             0             0     0.0000000
## 3     0.9057729     0.9057729             0             0     0.9057729
```

```
## 4     0.0000000     0.0000000             0             0     0.0000000
## 5     0.0000000     0.0000000             0             0     0.0000000
## 6     0.0000000     0.0000000             0             0     0.0000000
##   LENGTHCLASS68 LENGTHCLASS69 LENGTHCLASS70 LENGTHCLASS71 LENGTHCLASS72
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS73 LENGTHCLASS74 LENGTHCLASS75 LENGTHCLASS76 LENGTHCLASS77
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS78 LENGTHCLASS79 LENGTHCLASS80 LENGTHCLASS81 LENGTHCLASS82
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS83 LENGTHCLASS84 LENGTHCLASS85 LENGTHCLASS86 LENGTHCLASS87
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS88 LENGTHCLASS89 LENGTHCLASS90 LENGTHCLASS91 LENGTHCLASS92
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS93 LENGTHCLASS94 LENGTHCLASS95 LENGTHCLASS96 LENGTHCLASS97
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS98 LENGTHCLASS99 LENGTHCLASS100_PLUS
## 1             0             0                  0
## 2             0             0                  0
## 3             0             0                  0
## 4             0             0                  0
```

```
## 5             0             0                    0
## 6             0             0                    0
```

# Raising of the length distributions by ID of the discards

E. Mantzouni

Wed Jul 17 09:33:29 2019

```
#R general option:
options(stringsAsFactors = FALSE)

options(warn=0)

options(scipen = 999) # disable scientific notation

#chunk option
knitr::opts_chunk$set(cache=TRUE,echo=TRUE, warning=FALSE,
    message=FALSE, fig.height=6,progress=FALSE,verbose=FALSE,
        include=TRUE,dev='png',autodep=FALSE)

#load packages

library(COSTcore)
library(COSTeda)
library(COSTdbe)
library(tidyr)
library(dplyr)
library(data.table)
library(knitr)
```

## Example of use of the script C_DISCARDS

### Settings

```
path_in <- paste("C:\\Users\\Bitetto Isabella\\OneDrive - Coispa Tecnologia & Ricerca S.C.A.R.L\\MARE22\\STREAM\\FINAL REVISION OF DELIVERABLES\\SDEF_to_DG_MARE_MedBS", sep="")
setwd(path_in)
```

### Input Data

Validated csData , ceData, and clData

```
load("fri-TEST.Rdata")

head(fri_cs1@hh$foCatEu5)
```

```
## [1] "OTB_-1_VL2440_-1" "OTB_-1_VL2440_-1" "OTB_-1_VL2440_-1"
## [4] "OTB_-1_VL2440_-1" "OTB_-1_VL2440_-1" "OTB_-1_VL2440_-1"

head(fri_cl1@cl$foCatEu5)

## [1] "GNS_-1_VL1218_-1" "LLS_-1_VL1218_-1" "OTB_-1_VL1824_-1"
## [4] "OTB_-1_VL1824_-1" "OTB_-1_VL2440_-1" "OTB_-1_VL2440_-1"

head(fri_cev@ce$foCatEu5)

## [1] "FPN_-1_VL0006_-1" "FPN_-1_VL0006_-1" "FPN_-1_VL0006_-1"
## [4] "FPN_-1_VL0006_-1" "FPN_-1_VL0006_-1" "FPN_-1_VL0006_-1"

fri_strD1 <- strIni(timeStrata="quarter", techStrata = "foCatEu5",
                    spaceStrata = "area")

fri_strD1

## An object of class "strIni"
## Slot "timeStrata":
## [1] "quarter"
##
## Slot "spaceStrata":
## [1] "area"
##
## Slot "techStrata":
## [1] "foCatEu5"
##
## Slot "tpRec":
## [[1]]
## [1] NA
##
##
## Slot "spRec":
## [[1]]
## [1] NA
##
##
## Slot "tcRec":
## [[1]]
## [1] NA

fri_csc <- csDataCons(fri_cs1, fri_strD1)
fri_clc <- clDataCons(fri_cl1, fri_strD1)
fri_cec <- ceDataCons(fri_cev, fri_strD1)


head(fri_csc )

## An object of class "csDataCons"
## Slot "desc":
## [1] "Unknown stock"
##
```

```
## Slot "tr":
##   PSUid     time space        technical sampType landCtry vslFlgCtry proj
## 1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 2     2 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 3     3 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 4     4 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 5     5 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 6     6 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
##   trpCode foNum daysAtSea vslId sampCtry sampMeth
## 1       2     3         1    NA COUNTRY1 Observer
## 2       1     2         1    NA COUNTRY1 Observer
## 3       3     3         1    NA COUNTRY1 Observer
## 4       4     3         1    NA COUNTRY1 Observer
## 5       5     3         1    NA COUNTRY1 Observer
## 6       8     3         1    NA COUNTRY1 Observer
##
## Slot "hh":
##   PSUid SSUid     time space        technical sampType landCtry vslFlgCtry
## 1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 2     1     2 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 3     1     3 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 4     2     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 5     2     2 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 6     3     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
##   proj trpCode staNum foVal aggLev catReg sppReg       date    foDur
## 1  DCF       2      1     V      H    All    All 2017-02-20 3.500000
## 2  DCF       2      2     V      H    All    All 2017-02-20 1.750000
## 3  DCF       2      3     V      H    All    All 2017-02-20 3.750000
## 4  DCF       1      1     V      H    All    All 2017-02-21 6.083333
## 5  DCF       1      2     V      H    All    All 2017-02-21 5.916667
## 6  DCF       3      1     V      H    All    All 2017-02-23 5.083333
##   latIni lonIni latFin lonFin foDep
## 1     NA     NA     NA     NA    NA
## 2     NA     NA     NA     NA    NA
## 3     NA     NA     NA     NA    NA
## 4     NA     NA     NA     NA    NA
## 5     NA     NA     NA     NA    NA
## 6     NA     NA     NA     NA    NA
##
## Slot "sl":
##   PSUid SSUid TSUid     time space        technical          sort sampType
## 1     1     1     3 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 2     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 DIS-HUC-NA-NA        S
## 3     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 DIS-HUC-NA-NA        S
## 4     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 5     1     1     4 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 6     1     2     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
##   landCtry vslFlgCtry proj trpCode staNum                  spp  sex   wt
## 1 COUNTRY1   COUNTRY1  DCF       2      1 Merluccius merluccius <NA> 2400
## 2 COUNTRY1   COUNTRY1  DCF       2      1 Merluccius merluccius <NA>   90
## 3 COUNTRY1   COUNTRY1  DCF       2      1       Mullus barbatus <NA>   60
```

```
## 4 COUNTRY1   COUNTRY1  DCF       2      1       Mullus barbatus <NA> 2020
## 5 COUNTRY1   COUNTRY1  DCF       2      1 Merluccius merluccius <NA>  110
## 6 COUNTRY1   COUNTRY1  DCF       2      2       Mullus barbatus <NA>  350
##   subSampWt lenCode
## 1      2400      mm
## 2        45      mm
## 3        30      mm
## 4      2020      mm
## 5       110      mm
## 6       350      mm
##
## Slot "hl":
##   PSUid SSUid TSUid     time space        technical          sort sampType
## 1     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 2     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 3     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 4     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 5     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 6     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
##   landCtry vslFlgCtry proj trpCode staNum             spp  sex lenCls
## 1 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    170
## 2 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    180
## 3 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    150
## 4 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    160
## 5 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    140
## 6 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    200
##   lenNum
## 1      7
## 2      7
## 3      7
## 4      3
## 5      7
## 6      3
##
## Slot "ca":
##   PSUid SSUid     time space        technical       sort sampType landCtry
## 1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 2     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 3     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 4     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 5     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 6     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
##   vslFlgCtry proj trpCode staNum                   spp sex
## 1   COUNTRY1  DCF       2      1 Merluccius merluccius   U
## 2   COUNTRY1  DCF       2      1       Mullus barbatus   U
## 3   COUNTRY1  DCF       2      1       Mullus barbatus   U
## 4   COUNTRY1  DCF       2      1 Merluccius merluccius   U
## 5   COUNTRY1  DCF       2      1       Mullus barbatus   U
## 6   COUNTRY1  DCF       2      1       Mullus barbatus   U
##                       stock lenCls age fishId lenCode ageMeth plusGrp otoWt
## 1 Merluccius merluccius_22    170  NA     20      mm     OWR    <NA>    NA
```

```
## 2       Mullus barbatus_22    130  NA     37      mm     OWR    <NA>    NA
## 3       Mullus barbatus_22    170  NA      7      mm     OWR    <NA>    NA
## 4 Merluccius merluccius_22    160  NA     19      mm     OWR    <NA>    NA
## 5       Mullus barbatus_22    160  NA     36      mm     OWR    <NA>    NA
## 6       Mullus barbatus_22    110  NA     22      mm     OWR    <NA>    NA
##   otoSide indWt matMeth matScale matStage
## 1    <NA>    NA    <NA>     <NA>     <NA>
## 2    <NA>    NA    <NA>     <NA>     <NA>
## 3    <NA>    NA    <NA>     <NA>     <NA>
## 4    <NA>    NA    <NA>     <NA>     <NA>
## 5    <NA>    NA    <NA>     <NA>     <NA>
## 6    <NA>    NA    <NA>     <NA>     <NA>
```

```
head(fri_clc)
```

```
## An object of class "clDataCons"
## Slot "desc":
## [1] "Unknown stock"
##
## Slot "cl":
##   landCtry vslFlgCtry     time space        technical
## 1 COUNTRY1   COUNTRY1 9999 - 1 GSA99 GNS_-1_VL1218_-1
## 2 COUNTRY1   COUNTRY1 9999 - 1 GSA99 LLS_-1_VL1218_-1
## 3 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL1824_-1
## 4 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL1824_-1
## 5 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL2440_-1
## 6 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL2440_-1
##                  taxon landCat commCatScl commCat unallocCatchWt
## 1 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 2 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 3 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 4       Mullus barbatus     HUC       <NA>    <NA>             NA
## 5 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 6       Mullus barbatus     HUC       <NA>    <NA>             NA
##   misRepCatchWt landWt landMult landValue
## 1            NA     46        1        NA
## 2            NA    140        1        NA
## 3            NA   2151        1        NA
## 4            NA   2285        1        NA
## 5            NA  32979        1        NA
## 6            NA   9144        1        NA
```

```
head(fri_cec)
```

```
## An object of class "ceDataCons"
## Slot "desc":
## [1] "Unknown stock"
##
## Slot "ce":
##   vslFlgCtry     time space        technical   trpNum foNum foDur
## 1   COUNTRY1 9999 - 2 GSA99 FPN_-1_VL0006_-1 417.8571    NA    NA
## 2   COUNTRY1 9999 - 2 GSA99 FPN_-1_VL0006_-1 167.1429    NA    NA
```

```
## 3   COUNTRY1 9999 - 3 GSA99 FPN_-1_VL0006_-1 501.4286    NA    NA
## 4   COUNTRY1 9999 - 3 GSA99 FPN_-1_VL0006_-1 417.8571    NA    NA
## 5   COUNTRY1 9999 - 3 GSA99 FPN_-1_VL0006_-1 417.8571    NA    NA
## 6   COUNTRY1 9999 - 4 GSA99 FPN_-1_VL0006_-1 128.1429    NA    NA
##   effKwDays effGtDays daysAtSea
## 1   3071.25 133.71429        NA
## 2   1228.50  53.48571        NA
## 3   3685.50 160.45714        NA
## 4   3071.25 133.71429        NA
## 5   3071.25 133.71429        NA
## 6    941.85  41.00571        NA

# extract COUNTRY  and YEAR
COUNTRY<-unique(fri_cl1@cl$landCtry)
YEAR=unique(fri_cl1@cl$year)
```

DG MARE Med&BS DISCARDS Table template

```
dis.temp2<- read.table("xxx_DISCARDS.csv",sep=",",header=T)
names(dis.temp2)

##   [1] "ID"                "COUNTRY"           "YEAR"
##   [4] "QUARTER"           "VESSEL_LENGTH"     "GEAR"
##   [7] "MESH_SIZE_RANGE"   "FISHERY"           "AREA"
##  [10] "SPECON"            "SPECIES"           "DISCARDS"
##  [13] "UNIT"              "LENGTHCLASS0"      "LENGTHCLASS1"
##  [16] "LENGTHCLASS2"      "LENGTHCLASS3"      "LENGTHCLASS4"
##  [19] "LENGTHCLASS5"      "LENGTHCLASS6"      "LENGTHCLASS7"
##  [22] "LENGTHCLASS8"      "LENGTHCLASS9"      "LENGTHCLASS10"
##  [25] "LENGTHCLASS11"     "LENGTHCLASS12"     "LENGTHCLASS13"
##  [28] "LENGTHCLASS14"     "LENGTHCLASS15"     "LENGTHCLASS16"
##  [31] "LENGTHCLASS17"     "LENGTHCLASS18"     "LENGTHCLASS19"
##  [34] "LENGTHCLASS20"     "LENGTHCLASS21"     "LENGTHCLASS22"
##  [37] "LENGTHCLASS23"     "LENGTHCLASS24"     "LENGTHCLASS25"
##  [40] "LENGTHCLASS26"     "LENGTHCLASS27"     "LENGTHCLASS28"
##  [43] "LENGTHCLASS29"     "LENGTHCLASS30"     "LENGTHCLASS31"
##  [46] "LENGTHCLASS32"     "LENGTHCLASS33"     "LENGTHCLASS34"
##  [49] "LENGTHCLASS35"     "LENGTHCLASS36"     "LENGTHCLASS37"
##  [52] "LENGTHCLASS38"     "LENGTHCLASS39"     "LENGTHCLASS40"
##  [55] "LENGTHCLASS41"     "LENGTHCLASS42"     "LENGTHCLASS43"
##  [58] "LENGTHCLASS44"     "LENGTHCLASS45"     "LENGTHCLASS46"
##  [61] "LENGTHCLASS47"     "LENGTHCLASS48"     "LENGTHCLASS49"
##  [64] "LENGTHCLASS50"     "LENGTHCLASS51"     "LENGTHCLASS52"
##  [67] "LENGTHCLASS53"     "LENGTHCLASS54"     "LENGTHCLASS55"
##  [70] "LENGTHCLASS56"     "LENGTHCLASS57"     "LENGTHCLASS58"
##  [73] "LENGTHCLASS59"     "LENGTHCLASS60"     "LENGTHCLASS61"
##  [76] "LENGTHCLASS62"     "LENGTHCLASS63"     "LENGTHCLASS64"
##  [79] "LENGTHCLASS65"     "LENGTHCLASS66"     "LENGTHCLASS67"
##  [82] "LENGTHCLASS68"     "LENGTHCLASS69"     "LENGTHCLASS70"
##  [85] "LENGTHCLASS71"     "LENGTHCLASS72"     "LENGTHCLASS73"
##  [88] "LENGTHCLASS74"     "LENGTHCLASS75"     "LENGTHCLASS76"
##  [91] "LENGTHCLASS77"     "LENGTHCLASS78"     "LENGTHCLASS79"
```

```
##  [94] "LENGTHCLASS80"       "LENGTHCLASS81"       "LENGTHCLASS82"
##  [97] "LENGTHCLASS83"       "LENGTHCLASS84"       "LENGTHCLASS85"
## [100] "LENGTHCLASS86"       "LENGTHCLASS87"       "LENGTHCLASS88"
## [103] "LENGTHCLASS89"       "LENGTHCLASS90"       "LENGTHCLASS91"
## [106] "LENGTHCLASS92"       "LENGTHCLASS93"       "LENGTHCLASS94"
## [109] "LENGTHCLASS95"       "LENGTHCLASS96"       "LENGTHCLASS97"
## [112] "LENGTHCLASS98"       "LENGTHCLASS99"       "LENGTHCLASS100_PLUS"
```

```
fishery<- read.table("communicationTable_for_fishery.csv",sep=";",
                     header=T)
head(fishery)
```

```
##   SDEF_codification DGMARE_Med_BS_codification
## 1               MOL                        MOL
## 2               DES                      DEMSP
## 3               DWS                        DWS
## 4               MDD                        MDD
## 5               SPF                        SPF
## 6               FIF                        FIF
```

Auxiliary table: species_DIS.csv

```
# species file : selected species with FAO three alpha code

sel_spe <-read.table("species_DISCARDS.csv",sep=";",header=T)
head(sel_spe)
```

```
##                 SPECIES SPE   GSA LC_RANGE FISHERY type landSpp
## 1 Merluccius merluccius HKE GSA99       10      -1 trip      NA
## 2       Mullus barbatus MUT GSA99       10      -1 trip      NA
```

## Data analysis- raising

Analysis by stock

```
for (i in 1:dim(sel_spe)[1]) {

  STK<- sel_spe$SPECIES[i]

  AREA <- sel_spe$GSA[i]

    fri_csc1<- subset(fri_csc, space==sel_spe$GSA[i],table="ca",link=T)
  fri_clc1<- subset(fri_clc, space==sel_spe$GSA[i],table="cl")

    fri_cec1<- subset(fri_cec, space==sel_spe$GSA[i],table="ce")

  # The first step is to create the empty object, that will be given
    # the appropriate values for the descritor  fields.

  DIS_dbe <- dbeObject(desc= paste(STK, AREA,"Discards", sep="_"),
                       species=STK,
                       catchCat="DIS",
```

```
                        strataDesc=fri_strD1,
                        methodDesc="analytical"
                        )

  if (sel_spe$type[i]=="landings" ) {

  DIS_dbe <- totVolume(DIS_dbe,fri_csc1,fri_cec1, fri_clc1,
      type=sel_spe$type[i],val="nAtLength",landSpp=sel_spe$landSpp[i])
  } else {
     DIS_dbe <- totVolume(DIS_dbe,fri_csc1,fri_cec1, type=sel_spe$type[i],
                          val="nAtLength")
  }


  # totalW\$estim : total weight,
aa <-DIS_dbe@totalW$estim

aa$value<- aa$value/1000 # tons

aa<- rename(aa, "totalW"=value)
  # lenStruc\$estim : numbers-at-length estimates,

  bb<- DIS_dbe@lenStruc$estim

  bb$length=as.numeric(bb$length)

   # define LCs and UNIT len
 UNIT <- as.character( unique(fri_csc@ca$lenCode[fri_csc@ca$spp==STK]) )

 if (UNIT %in% c("mm", "MM")& sel_spe$LC_RANGE[i]==10) {
 bb$length<-as.numeric(bb$length)/10
 UNIT1<-"cm"
 }

  if (UNIT %in% c("mm", "MM") & sel_spe$LC_RANGE[i]==1) {
 bb$length<-as.numeric(bb$length)
 UNIT1<- "mm"
  }

   if (UNIT %in% c("mm", "MM")& sel_spe$LC_RANGE[i]==5) {
 bb$length<-as.numeric(bb$length)/10
 UNIT1<-"cm"
  }

   if (UNIT %in% c("cm", "CM") ) {
 bb$length<-as.numeric(bb$length)
 UNIT1<- "cm"
  }
   bb$length<- plyr::round_any( bb$length,1,floor)
```

```r
  bb$value<- bb$value/1000 # '000 ind

  ab=left_join(bb,aa ,by = c("time", "space", "technical"))

   ab<- ab %>% separate(technical, c("gear","FISHERY", "VL","MESH_SIZE_RANGE"),
                        sep = "_",remove=T)

  ab$length<- as.numeric(as.character(ab$length))

  ab<- ab%>% group_by(time,   space , gear  ,FISHERY, VL,MESH_SIZE_RANGE  ) %>%
    mutate(minlc=min(length,na.rm=T),maxlc=max(length,na.rm=T))

   # matrix with all combinations of "time"   "space"  "gear"   "VL"
  # "length" ,"MESH_SIZE_RANGE"

      dt <- as.data.table(ab)

   dt[,c(1:6)][is.na(dt[,c(1:6)])]<- -1

  seq_l <-  seq(0, max(dt$length,na.rm = T), by = 1) #

  dt$id<- paste(dt$time,dt$space,dt$gear,dt$FISHERY,dt$VL,
                dt$MESH_SIZE_RANGE,sep=":")

  dt1<- dt[, list(length = seq_l), by = id]

  dt1<- dt1 %>% separate(id, c("time", "space", "gear", "FISHERY","VL",
                               "MESH_SIZE_RANGE"), sep = ":")


  # ab[,`1:6]: NA-->-1
ab<- ab %>%ungroup()%>% mutate_at(vars(c(time:MESH_SIZE_RANGE) ),
          funs( ifelse( is.na(.), -1, .) ) )


  dt2<- left_join(dt1,ab)
  dt2$stock<- STK

  ##

dt3 <- data.table::dcast(dt2,as.formula(paste(paste(names(dt2)[! names(dt2) %in%
                  c("length","value")], collapse='+'), "length", sep="~")),
                  value.var = "value")

  dt3=dt3[complete.cases(dt3[,c(7:9)]), ]

dt3 <- dt3 %>% separate(time, c("Year","Quarter")," - ")

  dt3$MESH_SIZE_RANGE<-as.character(dt3$MESH_SIZE_RANGE)
```

```r
  # numbers at LC : NA-->0
dt3<- dt3 %>% mutate_at(vars( -(Year:stock) ),
          funs( if_else( is.na(.), 0, .) ) )

  DISCARDS <- data.frame(

    ID = NA ,
    COUNTRY = COUNTRY ,
    YEAR = YEAR ,
    QUARTER =dt3$Quarter,
    VESSEL_LENGTH = dt3$VL,
    GEAR = dt3$gear,
MESH_SIZE_RANGE = dt3$MESH_SIZE_RANGE,
   FISHERY= dt3$FISHERY  ,
    AREA = sel_spe$GSA[i],
    SPECON = "",
    SPECIES = STK ,
    DISCARDS = dt3$totalW ,
    UNIT = UNIT1
  )

  DISCARDS<-left_join(DISCARDS,dt3[,-c(1,3,8:11)],by=c( "QUARTER"  ="Quarter" ,
        "GEAR"="gear" ,  "VESSEL_LENGTH" = "VL"  ,"MESH_SIZE_RANGE","FISHERY" ))

  # take care of number of Length classes (max is 100 acc. to JRC template)
  zz<-dim(DISCARDS[-c(1:13)])[2]
  names(DISCARDS)[-c(1:13)]<- paste("LENGTHCLASS",seq(0,zz-1,1),sep="")

  if(zz>=100){
    DISCARDS$LENGTHCLASS100_PLUS<- rowSums(DISCARDS[,!1:113],na.rm = T)
     DISCARDS<-DISCARDS %>% select(ID:LENGTHCLASS99,LENGTHCLASS100_PLUS)
  }

   # FISHERY to DG MARE Med&BS specification
  DISCARDS$FISHERY <- fishery$SDEF_codification[match(DISCARDS$FISHERY ,
                                    fishery$DGMARE_Med_BS_codification)]

  # species to FAO three aòpha code and set ID (COUNTRY, AREA, GEAR,
  # VESSEL_LENGTH,  MESH_SIZE_RANGE,QUARTER, SPECIES)

dis.tab <-DISCARDS %>% mutate(SPECIES=sel_spe$SPE[match(SPECIES,sel_spe$SPECIES)],
           ID = paste(COUNTRY, AREA, GEAR,FISHERY, VESSEL_LENGTH,
                      MESH_SIZE_RANGE,YEAR, QUARTER, SPECIES, sep = "_"))

 dis.temp2<-bind_rows(dis.temp2,dis.tab)

  # col after 13: set -1 or NA to 0
dis.temp2[,-c(1:13)][is.na(dis.temp2[,-c(1:13)])] <- 0
```

```
dis.temp2<-setDT(dis.temp2)
for (jj in c(14:114)) set(dis.temp2, i = which(dis.temp2[[jj]]==-1), j = jj, v = 0
)

dis.temp2<-setDF(dis.temp2)

}
```

## Output

```
write.table(format(dis.temp2,digits=3,scientific=F),
        file = "DISCARDS.csv",row.names=FALSE,sep=";",na="-1")

head(dis.temp2)
```

```
##                                           ID  COUNTRY YEAR QUARTER
## 1 COUNTRY1_GSA99_OTB_NONE_VL2440_-1_9999_1_HKE COUNTRY1 9999       1
## 2 COUNTRY1_GSA99_GNS_NONE_VL0612_-1_9999_3_HKE COUNTRY1 9999       3
## 3 COUNTRY1_GSA99_OTB_NONE_VL2440_-1_9999_3_HKE COUNTRY1 9999       3
## 4 COUNTRY1_GSA99_FPO_NONE_VL0612_-1_9999_4_HKE COUNTRY1 9999       4
## 5 COUNTRY1_GSA99_GNS_NONE_VL0006_-1_9999_4_HKE COUNTRY1 9999       4
## 6 COUNTRY1_GSA99_GNS_NONE_VL0612_-1_9999_4_HKE COUNTRY1 9999       4
##   VESSEL_LENGTH GEAR MESH_SIZE_RANGE FISHERY  AREA SPECON SPECIES DISCARDS
## 1        VL2440  OTB              -1    NONE GSA99            HKE 5.738667
## 2        VL0612  GNS              -1    NONE GSA99            HKE 0.000000
## 3        VL2440  OTB              -1    NONE GSA99            HKE 8.398101
## 4        VL0612  FPO              -1    NONE GSA99            HKE 0.000000
## 5        VL0006  GNS              -1    NONE GSA99            HKE 1.388400
## 6        VL0612  GNS              -1    NONE GSA99            HKE 2.693500
##   UNIT LENGTHCLASS0 LENGTHCLASS1 LENGTHCLASS2 LENGTHCLASS3 LENGTHCLASS4
## 1   cm            0            0            0            0            0
## 2   cm            0            0            0            0            0
## 3   cm            0            0            0            0            0
## 4   cm            0            0            0            0            0
## 5   cm            0            0            0            0            0
## 6   cm            0            0            0            0            0
##   LENGTHCLASS5 LENGTHCLASS6 LENGTHCLASS7 LENGTHCLASS8 LENGTHCLASS9
## 1            0            0            0      0.00000      0.00000
## 2            0            0            0      0.00000      0.00000
## 3            0            0            0     16.53608     73.01889
## 4            0            0            0      0.00000      0.00000
## 5            0            0            0      0.00000      0.00000
## 6            0            0            0      0.00000      0.00000
##   LENGTHCLASS10 LENGTHCLASS11 LENGTHCLASS12 LENGTHCLASS13 LENGTHCLASS14
## 1        0.0000        3.2000    11.2000000     37.333333    77.8666667
## 2        0.0000        0.0000     0.0000000      0.000000     0.0000000
## 3      164.6176      209.2093   152.5407338    112.594013    41.0615130
## 4        0.0000        0.0000     0.0000000      0.000000     0.0000000
## 5        0.0000        0.0000     0.0000000      0.000000     0.0000000
## 6        0.0000        0.0000     0.5271038      1.054208     0.5271038
##   LENGTHCLASS15 LENGTHCLASS16 LENGTHCLASS17 LENGTHCLASS18 LENGTHCLASS19
```

```
## 1     67.733333     61.866667     20.800000     0.0000000     0.0000000
## 2      0.000000      0.000000      0.000000     0.0000000     0.0000000
## 3     15.235494      0.000000      3.158578     0.0000000     0.0000000
## 4      0.000000      0.000000      0.000000     0.0000000     0.0000000
## 5      0.000000      0.000000      0.000000     0.0000000     0.0000000
## 6      2.635519      3.162623      1.581311     0.5271038     0.5271038
##   LENGTHCLASS20 LENGTHCLASS21 LENGTHCLASS22 LENGTHCLASS23 LENGTHCLASS24
## 1     0.0000000      0.000000      0.000000     0.0000000             0
## 2     0.0000000      0.000000      0.000000     0.0000000             0
## 3     0.0000000      0.000000      0.000000     0.0000000             0
## 4     0.0000000      0.000000      0.000000     0.0000000             0
## 5     0.0000000      0.000000      0.000000     3.6536842             0
## 6     0.5271038      1.581311      1.054208     0.5271038             0
##   LENGTHCLASS25 LENGTHCLASS26 LENGTHCLASS27 LENGTHCLASS28 LENGTHCLASS29
## 1      0.000000      0.000000      0.000000      0.000000      0.000000
## 2      0.000000      0.000000      0.000000      0.000000      0.000000
## 3      0.000000      0.000000      0.000000      0.000000      0.000000
## 4      0.000000      0.000000      0.000000      0.000000      0.000000
## 5      0.000000      0.000000      0.000000      3.653684      0.000000
## 6      3.162623      1.581311      2.108415      1.581311      2.635519
##   LENGTHCLASS30 LENGTHCLASS31 LENGTHCLASS32 LENGTHCLASS33 LENGTHCLASS34
## 1      0.000000     0.0000000     0.0000000      0.000000             0
## 2      0.000000     0.0000000     0.0000000      0.000000             0
## 3      0.000000     0.0000000     0.0000000      0.000000             0
## 4      0.000000     0.0000000     0.0000000      0.000000             0
## 5      0.000000     0.0000000     0.0000000      3.653684             0
## 6      1.581311     0.5271038     0.5271038      0.000000             0
##   LENGTHCLASS35 LENGTHCLASS36 LENGTHCLASS37 LENGTHCLASS38 LENGTHCLASS39
## 1             0             0             0     0.0000000             0
## 2             0             0             0     0.0000000             0
## 3             0             0             0     0.0000000             0
## 4             0             0             0     0.0000000             0
## 5             0             0             0     0.0000000             0
## 6             0             0             0     0.5271038             0
##   LENGTHCLASS40 LENGTHCLASS41 LENGTHCLASS42 LENGTHCLASS43 LENGTHCLASS44
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS45 LENGTHCLASS46 LENGTHCLASS47 LENGTHCLASS48 LENGTHCLASS49
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS50 LENGTHCLASS51 LENGTHCLASS52 LENGTHCLASS53 LENGTHCLASS54
## 1             0             0             0             0             0
## 2             0             0             0             0             0
```

```
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS55 LENGTHCLASS56 LENGTHCLASS57 LENGTHCLASS58 LENGTHCLASS59
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS60 LENGTHCLASS61 LENGTHCLASS62 LENGTHCLASS63 LENGTHCLASS64
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS65 LENGTHCLASS66 LENGTHCLASS67 LENGTHCLASS68 LENGTHCLASS69
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS70 LENGTHCLASS71 LENGTHCLASS72 LENGTHCLASS73 LENGTHCLASS74
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS75 LENGTHCLASS76 LENGTHCLASS77 LENGTHCLASS78 LENGTHCLASS79
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS80 LENGTHCLASS81 LENGTHCLASS82 LENGTHCLASS83 LENGTHCLASS84
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS85 LENGTHCLASS86 LENGTHCLASS87 LENGTHCLASS88 LENGTHCLASS89
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
```

```
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS90 LENGTHCLASS91 LENGTHCLASS92 LENGTHCLASS93 LENGTHCLASS94
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS95 LENGTHCLASS96 LENGTHCLASS97 LENGTHCLASS98 LENGTHCLASS99
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS100_PLUS
## 1                   0
## 2                   0
## 3                   0
## 4                   0
## 5                   0
## 6                   0
```

## Example of use of the script A_CATCH

### Settings

```
path_in <- paste("C:\\Users\\Bitetto Isabella\\OneDrive - Coispa Tecnologia & Ricerca S.C.A.R.L\\MARE22\\STREAM\\FINAL REVISION OF DELIVERABLES\\SDEF_to_DG_MARE_MedBS", sep="")

setwd(path_in)
```

### Input Data

Validated csData , ceData, and clData

```
load("fri-TEST.Rdata")
```

```
head(fri_cs1@hh$foCatEu5)
```

```
## [1] "OTB_-1_VL2440_-1" "OTB_-1_VL2440_-1" "OTB_-1_VL2440_-1"
## [4] "OTB_-1_VL2440_-1" "OTB_-1_VL2440_-1" "OTB_-1_VL2440_-1"
```

```
head(fri_cl1@cl$foCatEu5)
```

```
## [1] "GNS_-1_VL1218_-1" "LLS_-1_VL1218_-1" "OTB_-1_VL1824_-1"
## [4] "OTB_-1_VL1824_-1" "OTB_-1_VL2440_-1" "OTB_-1_VL2440_-1"

head(fri_cev@ce$foCatEu5)

## [1] "FPN_-1_VL0006_-1" "FPN_-1_VL0006_-1" "FPN_-1_VL0006_-1"
## [4] "FPN_-1_VL0006_-1" "FPN_-1_VL0006_-1" "FPN_-1_VL0006_-1"

fri_strD1 <- strIni(timeStrata="quarter", techStrata = "foCatEu5",spaceStrata = "a
rea")

fri_strD1

## An object of class "strIni"
## Slot "timeStrata":
## [1] "quarter"
##
## Slot "spaceStrata":
## [1] "area"
##
## Slot "techStrata":
## [1] "foCatEu5"
##
## Slot "tpRec":
## [[1]]
## [1] NA
##
##
## Slot "spRec":
## [[1]]
## [1] NA
##
##
## Slot "tcRec":
## [[1]]
## [1] NA

fri_csc <- csDataCons(fri_cs1, fri_strD1)

fri_clc <- clDataCons(fri_cl1, fri_strD1)

fri_cec <- ceDataCons(fri_cev, fri_strD1)

head(fri_csc )

## An object of class "csDataCons"
## Slot "desc":
## [1] "Unknown stock"
##
## Slot "tr":
##   PSUid     time space        technical sampType landCtry vslFlgCtry proj
## 1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
```

```
## 2     2 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 3     3 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 4     4 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 5     5 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
## 6     6 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1  DCF
##   trpCode foNum daysAtSea vslId sampCtry sampMeth
## 1       2     3         1    NA COUNTRY1 Observer
## 2       1     2         1    NA COUNTRY1 Observer
## 3       3     3         1    NA COUNTRY1 Observer
## 4       4     3         1    NA COUNTRY1 Observer
## 5       5     3         1    NA COUNTRY1 Observer
## 6       8     3         1    NA COUNTRY1 Observer
##
## Slot "hh":
##   PSUid SSUid     time space        technical sampType landCtry vslFlgCtry
## 1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 2     1     2 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 3     1     3 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 4     2     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 5     2     2 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
## 6     3     1 9999 - 1 GSA99 OTB_-1_VL2440_-1        S COUNTRY1   COUNTRY1
##   proj trpCode staNum foVal aggLev catReg sppReg       date    foDur
## 1  DCF       2      1     V      H    All    All 2017-02-20 3.500000
## 2  DCF       2      2     V      H    All    All 2017-02-20 1.750000
## 3  DCF       2      3     V      H    All    All 2017-02-20 3.750000
## 4  DCF       1      1     V      H    All    All 2017-02-21 6.083333
## 5  DCF       1      2     V      H    All    All 2017-02-21 5.916667
## 6  DCF       3      1     V      H    All    All 2017-02-23 5.083333
##   latIni lonIni latFin lonFin foDep
## 1     NA     NA     NA     NA    NA
## 2     NA     NA     NA     NA    NA
## 3     NA     NA     NA     NA    NA
## 4     NA     NA     NA     NA    NA
## 5     NA     NA     NA     NA    NA
## 6     NA     NA     NA     NA    NA
##
## Slot "sl":
##   PSUid SSUid TSUid     time space        technical          sort sampType
## 1     1     1     3 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 2     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 DIS-HUC-NA-NA        S
## 3     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 DIS-HUC-NA-NA        S
## 4     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 5     1     1     4 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 6     1     2     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
##   landCtry vslFlgCtry proj trpCode staNum                  spp  sex   wt
## 1 COUNTRY1   COUNTRY1  DCF       2      1 Merluccius merluccius <NA> 2400
## 2 COUNTRY1   COUNTRY1  DCF       2      1 Merluccius merluccius <NA>   90
## 3 COUNTRY1   COUNTRY1  DCF       2      1       Mullus barbatus <NA>   60
## 4 COUNTRY1   COUNTRY1  DCF       2      1       Mullus barbatus <NA> 2020
## 5 COUNTRY1   COUNTRY1  DCF       2      1 Merluccius merluccius <NA>  110
## 6 COUNTRY1   COUNTRY1  DCF       2      2       Mullus barbatus <NA>  350
```

```
##   subSampWt lenCode
## 1      2400      mm
## 2        45      mm
## 3        30      mm
## 4      2020      mm
## 5       110      mm
## 6       350      mm
##
## Slot "hl":
##   PSUid SSUid TSUid     time space        technical          sort sampType
## 1     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 2     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 3     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 4     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 5     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
## 6     1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA-NA        S
##   landCtry vslFlgCtry proj trpCode staNum             spp  sex lenCls
## 1 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    170
## 2 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    180
## 3 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    150
## 4 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    160
## 5 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    140
## 6 COUNTRY1   COUNTRY1  DCF       2      1 Mullus barbatus <NA>    200
##   lenNum
## 1      7
## 2      7
## 3      7
## 4      3
## 5      7
## 6      3
##
## Slot "ca":
##   PSUid SSUid     time space        technical       sort sampType landCtry
## 1     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 2     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 3     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 4     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 5     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
## 6     1     1 9999 - 1 GSA99 OTB_-1_VL2440_-1 LAN-HUC-NA        S COUNTRY1
##   vslFlgCtry proj trpCode staNum                  spp sex
## 1   COUNTRY1  DCF       2      1 Merluccius merluccius   U
## 2   COUNTRY1  DCF       2      1       Mullus barbatus   U
## 3   COUNTRY1  DCF       2      1       Mullus barbatus   U
## 4   COUNTRY1  DCF       2      1 Merluccius merluccius   U
## 5   COUNTRY1  DCF       2      1       Mullus barbatus   U
## 6   COUNTRY1  DCF       2      1       Mullus barbatus   U
##                       stock lenCls age fishId lenCode ageMeth plusGrp otoWt
## 1 Merluccius merluccius_22    170  NA     20      mm     OWR    <NA>    NA
## 2       Mullus barbatus_22    130  NA     37      mm     OWR    <NA>    NA
## 3       Mullus barbatus_22    170  NA      7      mm     OWR    <NA>    NA
## 4 Merluccius merluccius_22    160  NA     19      mm     OWR    <NA>    NA
```

```
## 5       Mullus barbatus_22    160  NA     36      mm     OWR    <NA>    NA
## 6       Mullus barbatus_22    110  NA     22      mm     OWR    <NA>    NA
##   otoSide indWt matMeth matScale matStage
## 1    <NA>    NA    <NA>     <NA>     <NA>
## 2    <NA>    NA    <NA>     <NA>     <NA>
## 3    <NA>    NA    <NA>     <NA>     <NA>
## 4    <NA>    NA    <NA>     <NA>     <NA>
## 5    <NA>    NA    <NA>     <NA>     <NA>
## 6    <NA>    NA    <NA>     <NA>     <NA>
```

```
head(fri_clc)
```

```
## An object of class "clDataCons"
## Slot "desc":
## [1] "Unknown stock"
##
## Slot "cl":
##   landCtry vslFlgCtry     time space        technical
## 1 COUNTRY1   COUNTRY1 9999 - 1 GSA99 GNS_-1_VL1218_-1
## 2 COUNTRY1   COUNTRY1 9999 - 1 GSA99 LLS_-1_VL1218_-1
## 3 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL1824_-1
## 4 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL1824_-1
## 5 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL2440_-1
## 6 COUNTRY1   COUNTRY1 9999 - 1 GSA99 OTB_-1_VL2440_-1
##                  taxon landCat commCatScl commCat unallocCatchWt
## 1 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 2 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 3 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 4       Mullus barbatus     HUC       <NA>    <NA>             NA
## 5 Merluccius merluccius     HUC       <NA>    <NA>             NA
## 6       Mullus barbatus     HUC       <NA>    <NA>             NA
##   misRepCatchWt landWt landMult landValue
## 1            NA     46        1        NA
## 2            NA    140        1        NA
## 3            NA   2151        1        NA
## 4            NA   2285        1        NA
## 5            NA  32979        1        NA
## 6            NA   9144        1        NA
```

```
head(fri_cec)
```

```
## An object of class "ceDataCons"
## Slot "desc":
## [1] "Unknown stock"
##
## Slot "ce":
##   vslFlgCtry     time space        technical   trpNum foNum foDur
## 1   COUNTRY1 9999 - 2 GSA99 FPN_-1_VL0006_-1 417.8571    NA    NA
## 2   COUNTRY1 9999 - 2 GSA99 FPN_-1_VL0006_-1 167.1429    NA    NA
## 3   COUNTRY1 9999 - 3 GSA99 FPN_-1_VL0006_-1 501.4286    NA    NA
## 4   COUNTRY1 9999 - 3 GSA99 FPN_-1_VL0006_-1 417.8571    NA    NA
## 5   COUNTRY1 9999 - 3 GSA99 FPN_-1_VL0006_-1 417.8571    NA    NA
```

```
## 6   COUNTRY1 9999 - 4 GSA99 FPN_-1_VL0006_-1 128.1429    NA    NA
##   effKwDays effGtDays daysAtSea
## 1   3071.25 133.71429        NA
## 2   1228.50  53.48571        NA
## 3   3685.50 160.45714        NA
## 4   3071.25 133.71429        NA
## 5   3071.25 133.71429        NA
## 6    941.85  41.00571        NA

# extract COUNTRY  and YEAR
COUNTRY<-unique(fri_cl1@cl$landCtry)
YEAR=unique(fri_cl1@cl$year)
```

DG MARE Med&BS DISCARDS Table template

```
catch.temp2<- read.table("xxx_CATCH.csv",sep=",",header=T)

names(catch.temp2)

##   [1] "ID"                                "COUNTRY"
##   [3] "YEAR"                              "QUARTER"
##   [5] "VESSEL_LENGTH"                     "GEAR"
##   [7] "MESH_SIZE_RANGE"                   "FISHERY"
##   [9] "AREA"                              "SPECON"
##  [11] "SPECIES"                           "LANDINGS"
##  [13] "DISCARDS"                          "NO_SAMPLES_LANDINGS"
##  [15] "NO_LENGTH_MEASUREMENTS_LANDINGS" "NO_AGE_MEASUREMENTS_LANDINGS"
##  [17] "NO_SAMPLES_DISCARDS"               "NO_LENGTH_MEASUREMENTS_DISCARDS"
##  [19] "NO_AGE_MEASUREMENTS_DISCARDS"    "NO_SAMPLES_CATCH"
##  [21] "NO_LENGTH_MEASUREMENTS_CATCH"    "NO_AGE_MEASUREMENTS_CATCH"
##  [23] "MIN_AGE"                           "MAX_AGE"
##  [25] "AGE_0"                             "AGE_0_NO_LANDED"
##  [27] "AGE_0_MEAN_WEIGHT_LANDED"          "AGE_0_MEAN_LENGTH_LANDED"
##  [29] "AGE_0_NO_DISCARD"                  "AGE_0_MEAN_WEIGHT_DISCARD"
##  [31] "AGE_0_MEAN_LENGTH_DISCARD"         "AGE_1"
##  [33] "AGE_1_NO_LANDED"                   "AGE_1_MEAN_WEIGHT_LANDED"
##  [35] "AGE_1_MEAN_LENGTH_LANDED"          "AGE_1_NO_DISCARD"
##  [37] "AGE_1_MEAN_WEIGHT_DISCARD"         "AGE_1_MEAN_LENGTH_DISCARD"
##  [39] "AGE_2"                             "AGE_2_NO_LANDED"
##  [41] "AGE_2_MEAN_WEIGHT_LANDED"          "AGE_2_MEAN_LENGTH_LANDED"
##  [43] "AGE_2_NO_DISCARD"                  "AGE_2_MEAN_WEIGHT_DISCARD"
##  [45] "AGE_2_MEAN_LENGTH_DISCARD"         "AGE_3"
##  [47] "AGE_3_NO_LANDED"                   "AGE_3_MEAN_WEIGHT_LANDED"
##  [49] "AGE_3_MEAN_LENGTH_LANDED"          "AGE_3_NO_DISCARD"
##  [51] "AGE_3_MEAN_WEIGHT_DISCARD"         "AGE_3_MEAN_LENGTH_DISCARD"
##  [53] "AGE_4"                             "AGE_4_NO_LANDED"
##  [55] "AGE_4_MEAN_WEIGHT_LANDED"          "AGE_4_MEAN_LENGTH_LANDED"
##  [57] "AGE_4_NO_DISCARD"                  "AGE_4_MEAN_WEIGHT_DISCARD"
##  [59] "AGE_4_MEAN_LENGTH_DISCARD"         "AGE_5"
##  [61] "AGE_5_NO_LANDED"                   "AGE_5_MEAN_WEIGHT_LANDED"
##  [63] "AGE_5_MEAN_LENGTH_LANDED"          "AGE_5_NO_DISCARD"
##  [65] "AGE_5_MEAN_WEIGHT_DISCARD"         "AGE_5_MEAN_LENGTH_DISCARD"
```

```
##  [67] "AGE_6"                          "AGE_6_NO_LANDED"
##  [69] "AGE_6_MEAN_WEIGHT_LANDED"       "AGE_6_MEAN_LENGTH_LANDED"
##  [71] "AGE_6_NO_DISCARD"               "AGE_6_MEAN_WEIGHT_DISCARD"
##  [73] "AGE_6_MEAN_LENGTH_DISCARD"      "AGE_7"
##  [75] "AGE_7_NO_LANDED"                "AGE_7_MEAN_WEIGHT_LANDED"
##  [77] "AGE_7_MEAN_LENGTH_LANDED"       "AGE_7_NO_DISCARD"
##  [79] "AGE_7_MEAN_WEIGHT_DISCARD"      "AGE_7_MEAN_LENGTH_DISCARD"
##  [81] "AGE_8"                          "AGE_8_NO_LANDED"
##  [83] "AGE_8_MEAN_WEIGHT_LANDED"       "AGE_8_MEAN_LENGTH_LANDED"
##  [85] "AGE_8_NO_DISCARD"               "AGE_8_MEAN_WEIGHT_DISCARD"
##  [87] "AGE_8_MEAN_LENGTH_DISCARD"      "AGE_9"
##  [89] "AGE_9_NO_LANDED"                "AGE_9_MEAN_WEIGHT_LANDED"
##  [91] "AGE_9_MEAN_LENGTH_LANDED"       "AGE_9_NO_DISCARD"
##  [93] "AGE_9_MEAN_WEIGHT_DISCARD"      "AGE_9_MEAN_LENGTH_DISCARD"
##  [95] "AGE_10"                         "AGE_10_NO_LANDED"
##  [97] "AGE_10_MEAN_WEIGHT_LANDED"      "AGE_10_MEAN_LENGTH_LANDED"
##  [99] "AGE_10_NO_DISCARD"              "AGE_10_MEAN_WEIGHT_DISCARD"
## [101] "AGE_10_MEAN_LENGTH_DISCARD"     "AGE_11"
## [103] "AGE_11_NO_LANDED"               "AGE_11_MEAN_WEIGHT_LANDED"
## [105] "AGE_11_MEAN_LENGTH_LANDED"      "AGE_11_NO_DISCARD"
## [107] "AGE_11_MEAN_WEIGHT_DISCARD"     "AGE_11_MEAN_LENGTH_DISCARD"
## [109] "AGE_12"                         "AGE_12_NO_LANDED"
## [111] "AGE_12_MEAN_WEIGHT_LANDED"      "AGE_12_MEAN_LENGTH_LANDED"
## [113] "AGE_12_NO_DISCARD"              "AGE_12_MEAN_WEIGHT_DISCARD"
## [115] "AGE_12_MEAN_LENGTH_DISCARD"     "AGE_13"
## [117] "AGE_13_NO_LANDED"               "AGE_13_MEAN_WEIGHT_LANDED"
## [119] "AGE_13_MEAN_LENGTH_LANDED"      "AGE_13_NO_DISCARD"
## [121] "AGE_13_MEAN_WEIGHT_DISCARD"     "AGE_13_MEAN_LENGTH_DISCARD"
## [123] "AGE_14"                         "AGE_14_NO_LANDED"
## [125] "AGE_14_MEAN_WEIGHT_LANDED"      "AGE_14_MEAN_LENGTH_LANDED"
## [127] "AGE_14_NO_DISCARD"              "AGE_14_MEAN_WEIGHT_DISCARD"
## [129] "AGE_14_MEAN_LENGTH_DISCARD"     "AGE_15"
## [131] "AGE_15_NO_LANDED"               "AGE_15_MEAN_WEIGHT_LANDED"
## [133] "AGE_15_MEAN_LENGTH_LANDED"      "AGE_15_NO_DISCARD"
## [135] "AGE_15_MEAN_WEIGHT_DISCARD"     "AGE_15_MEAN_LENGTH_DISCARD"
## [137] "AGE_16"                         "AGE_16_NO_LANDED"
## [139] "AGE_16_MEAN_WEIGHT_LANDED"      "AGE_16_MEAN_LENGTH_LANDED"
## [141] "AGE_16_NO_DISCARD"              "AGE_16_MEAN_WEIGHT_DISCARD"
## [143] "AGE_16_MEAN_LENGTH_DISCARD"     "AGE_17"
## [145] "AGE_17_NO_LANDED"               "AGE_17_MEAN_WEIGHT_LANDED"
## [147] "AGE_17_MEAN_LENGTH_LANDED"      "AGE_17_NO_DISCARD"
## [149] "AGE_17_MEAN_WEIGHT_DISCARD"     "AGE_17_MEAN_LENGTH_DISCARD"
## [151] "AGE_18"                         "AGE_18_NO_LANDED"
## [153] "AGE_18_MEAN_WEIGHT_LANDED"      "AGE_18_MEAN_LENGTH_LANDED"
## [155] "AGE_18_NO_DISCARD"              "AGE_18_MEAN_WEIGHT_DISCARD"
## [157] "AGE_18_MEAN_LENGTH_DISCARD"     "AGE_19"
## [159] "AGE_19_NO_LANDED"               "AGE_19_MEAN_WEIGHT_LANDED"
## [161] "AGE_19_MEAN_LENGTH_LANDED"      "AGE_19_NO_DISCARD"
## [163] "AGE_19_MEAN_WEIGHT_DISCARD"     "AGE_19_MEAN_LENGTH_DISCARD"
## [165] "AGE_20_PLUS"                    "AGE_20_PLUS_NO_LANDED"
## [167] "AGE_20_PLUS_MEAN_WEIGHT_LANDED" "AGE_20_PLUS_MEAN_LENGTH_LANDED"
```

```
## [169] "AGE_20_PLUS_NO_DISCARD"          "AGE_20_PLUS_MEAN_WEIGHT_DISCARD"
## [171] "AGE_20_PLUS_MEAN_LENGTH_DISCARD"
```

Auxiliary table: species_DIS.csv

```
# species file : selected species with FAO three alpha code

sel_spe <-read.table("species_CATCH.csv",sep=";",header=T, na.strings = c("", "-1"
," ", ".","NA") )
head(sel_spe)

##                 SPECIES SPE LC_RANGE   GSA typeALK mcrs specon_catch type
## 1 Merluccius merluccius HKE       10 GSA99   fixed   NA           NA trip
## 2       Mullus barbatus MUT       10 GSA99   fixed   70           NA trip
## 3 Merluccius merluccius HKE       10 GSA99   fixed  110           NA trip
##   landSpp lanEstim_methodDesc methodDesc_LAN.age.wght
## 1      NA          analytical              analytical
## 2      NA          analytical              analytical
## 3      NA          analytical              analytical
##   methodDesc_LAN.len.age methodDesc_DIS.age.wght methodDesc_DIS.len.age
## 1             analytical              analytical             analytical
## 2             analytical              analytical             analytical
## 3             analytical              analytical             analytical
##   adjust_L.w.a adjust_D.w.a adjust_L.len.a adjust_D.len.a
## 1         TRUE        FALSE           TRUE          FALSE
## 2        FALSE         TRUE          FALSE           TRUE
## 3         TRUE        FALSE           TRUE          FALSE

fishery<- read.table("communicationTable_for_fishery.csv",sep=";",header=T)

head(fishery)

##   SDEF_codification DGMARE_Med_BS_codification
## 1               MOL                        MOL
## 2               DES                      DEMSP
## 3               DWS                        DWS
## 4               MDD                        MDD
## 5               SPF                        SPF
## 6               FIF                        FIF
```

## Checking data

Check if there are stocks with no age data and impute “-1”, otherwise the bpEstim() method for length at age gives error :

```
# get col w. all=NA by spp
aa=fri_csc@ca %>% group_by(spp) %>% summarize_all(~all(is.na(.)))

# to make it run for len if age=NA, impute age =="-1"
fri_csc@ca$age[fri_csc@ca$spp %in% aa$spp[aa$age==TRUE]]=-1

### error if sp-quarter-gear-VL not found in both CS and CL
```

## Data analysis- raising

Analysis by stock

```
for (i in 1:dim(sel_spe)[1]) {

  STK<- sel_spe$SPECIES[i]

  AREA <- sel_spe$GSA[i]

  fri_csc1<- subset(fri_csc, space==sel_spe$GSA[i],table="ca",link=T)
  fri_clc1<- subset(fri_clc, space==sel_spe$GSA[i],table="cl")

  fri_cec1<- subset(fri_cec, space==sel_spe$GSA[i],table="ce")

# Estimating age structure LAN -  ----------------------------------


 lanEstim <-
   dbeObject(
     desc = paste(STK, "Landings.str", sep="_"),
     species = STK,
     catchCat = "LAN",
     strataDesc = fri_strD1,
     methodDesc = sel_spe$lanEstim_methodDesc[i]
   )

    # length str LAN

if ( sel_spe$lanEstim_methodDesc[i]=="analytical"){
  lanEstim <- RaiseLgth(lanEstim, fri_csc1, fri_clc1,incl.precision =F)
} else {
  lanEstim <- RaiseLgthBoot(lanEstim, fri_csc1, fri_clc1,incl.precision =F,B=15)
}

# subset lenstruc for MCRS

if (!is.na(sel_spe$mcrs[i]) & sel_spe$mcrs[i]!=".") {
  lanEstim@lenStruc$estim =
  lanEstim@lenStruc$estim[as.numeric(lanEstim@lenStruc$estim$length) <= sel_spe$mc
rs[i],]
  lanEstim@lenVar = lanEstim@lenVar[as.numeric(lanEstim@lenVar$length) <= sel_spe$
mcrs[i],]
}

 #########>>>>>>>>>>>>> Estimation of total numbers-at-age from market sampling

 lanEstim <- RaiseAge(lanEstim, fri_csc1, fri_clc1, type = sel_spe$typeALK[i],
                      strataDesc = fri_strD1)
```

```r
 # Estimating age structure DIS - ------------------------------------------

 DIS_dbe <- dbeObject(desc= paste(STK, AREA,"Discards", sep="_"),
                      species=STK,
                      catchCat="DIS",
                      strataDesc=fri_strD1,
                      methodDesc="analytical")

 # discards raising

  if (sel_spe$type[i]=="landings" ) {
      DIS_dbe <- totVolume(DIS_dbe,fri_csc1,fri_cec1, fri_clc1,
                           type=sel_spe$type[i],landSpp=sel_spe$landSpp[i])
  } else {
     DIS_dbe <- totVolume(DIS_dbe,fri_csc1,fri_cec1, type=sel_spe$type[i])
  }

  DIS_dbe <- RaiseAge(DIS_dbe, fri_csc1, fri_clc1,type = sel_spe$typeALK[i],
                      strataDesc = fri_strD1)

# CATCH1 :  cols ID: MAX_AGE ----------------------------------------------------
---

# NO SAMPLES ----------------------------------------------------------------------
-

### No Samples == No trips (see ANNEX2- DG MARE Med&BS data call spec.).
# Note: dbe estimates n.samples as trips*fo , thus the estimation must be based on
HL

  newhl<-mergecsData(fri_cs1)@hl %>%
    rename("space"=area, "technical"=foCatEu5) %>%
    mutate(time=paste(year, quarter, sep=" - ")) %>% filter( spp==STK)

  if (!is.na(sel_spe$mcrs[i]) & sel_spe$mcrs[i]!=".") { # MCRS

no.samples<- data.frame(newhl) %>% filter(lenCls<=sel_spe$mcrs[i]) %>%
  dplyr::group_by(time,space,technical,catchCat)%>%
  summarize(value=n_distinct(trpCode))

 no.samples<- no.samples%>% spread(catchCat,value)

  L.no.samples<- no.samples%>% select(-DIS)%>% rename("value"=LAN)
  D.no.samples<- no.samples%>% select(-LAN)%>% rename("value"=DIS)

  } else {

    no.samples<- data.frame(newhl) %>%
      dplyr::group_by(time,space,technical,catchCat)%>%
      summarize(value=n_distinct(trpCode))
```

```
    no.samples<- no.samples%>% spread(catchCat,value)

         L.no.samples<- no.samples%>% select(-DIS)%>% rename("value"=LAN)
     D.no.samples<- no.samples%>% select(-LAN)%>% rename("value"=DIS)
}

# MCRS : no age and len measur. for LAN < MCRS----------------------

  if (!is.na(sel_spe$mcrs[i]) & sel_spe$mcrs[i]!="."){

 # No age measurements LAN

  newca <- mergecsData(fri_cs1)@ca %>%
    rename("space"=area, "technical"=foCatEu5) %>%
    mutate(time=paste(year, quarter, sep=" - ")) %>% filter( spp==STK)

  no.age.meas.lan.mcrs<- data.frame(newca) %>%
    filter(lenCls<=sel_spe$mcrs[i]&!is.na(age)&catchCat=="LAN" )%>%
    dplyr::group_by(time,space,technical)%>% summarize(value=n())

  # remove technical if all ==NA
  no.age.meas.lan.mcrs<- no.age.meas.lan.mcrs[,!apply(is.na(no.age.meas.lan.mcrs),
2, all)]

  # No len measurements LAN

     no.len.meas.lan.mcrs<- data.frame(newca) %>%
       filter(lenCls<=sel_spe$mcrs[i]&!is.na(lenCls)&catchCat=="LAN")%>%
       dplyr::group_by(time,space,technical)%>% summarize(value=n())

  }

### end

# separate merge for age samples: may not have technical strata (use : space, time
)

   if (!is.na(sel_spe$mcrs[i]) & sel_spe$mcrs[i]!=".") {
     # if mcrs use no.age.meas.lan.mcrs
     list.age.smp<-list(no.age.meas.lan.mcrs,DIS_dbe@nMeas$age)
   } else{
     list.age.smp<-list(lanEstim@nMeas$age,DIS_dbe@nMeas$age)
   }

  names(list.age.smp)<-c("L.nmeas.age", "D.nmeas.age")
  list.age.smp.merge = data.table::rbindlist(list.age.smp,id=T)
  age.smp= spread(list.age.smp.merge,key=.id,value=value)

 # list all remaining output tables (excl. age meas & no samples)
```

```
if (!is.na(sel_spe$mcrs[i]) & sel_spe$mcrs[i]!=".") { # if mcrs use no.len.meas.la
n.mcrs

list2<- list(no.len.meas.lan.mcrs,DIS_dbe@nMeas$len,lanEstim@totalN$estim,
            lanEstim@totalW$estim ,DIS_dbe@totalW$estim ,DIS_dbe@totalN$estim,
            L.no.samples,D.no.samples)

   } else {

           list2<- list(lanEstim@nMeas$len,DIS_dbe@nMeas$len,
                    lanEstim@totalN$estim,lanEstim@totalW$estim,
                    DIS_dbe@totalW$estim ,DIS_dbe@totalN$estim,
                    L.no.samples,D.no.samples)
   }

names(list2)<-c("LnMeas.len","DnMeas.len","LtotalN","LtotalW","totalWDIS",
                "totalNDIS","L.no.samples","D.no.samples")

list3=append(list.age.smp,list2)
list..merge = data.table::rbindlist(list3,id=T,fill=T)

all.merge= spread(list..merge,key=.id,value=value)

all.merge <- all.merge%>% mutate( "stock"=STK) %>% select(stock,everything())

# delete rows (age...) with no "technical": a number should be given only
# if it relates to this fishery only
# (see DG MARE Med&BS Data Call specificatin - Annex 2 - Catch)

all.merge<-  all.merge[complete.cases(all.merge$technical), ]

aa.len <- all.merge
aa.len$totalN=all.merge$LtotalN/1000 # '000 ind
aa.len$totalW=all.merge$LtotalW/1000 # tons

aa.len$totalNDIS=all.merge$totalNDIS/1000 # '000 ind
aa.len$totalWDIS=all.merge$totalWDIS/1000 # tons

# AgeStruc : n.at.age LAN / DIS ----------------------------------------

# landings
bb<-lanEstim@ageStruc$estim

bb$value=bb$value/1000 # '000 ind

bb<-rename(bb, "n.at.age"=value)

# discards
bbd<-DIS_dbe@ageStruc$estim
```

```r
bbd$value=bbd$value/1000 # '000 ind

bbd<-rename(bbd, "DIS.n.at.age"=value)

ab<- left_join(bb,bbd) %>% left_join(aa.len)


ab<- ab %>% separate(technical, c("gear","FISHERY", "VL","MESH_SIZE_RANGE"),
                     sep = "_")

# min age/ max age-------------------------------------------------------------


ab$age <- as.numeric(as.character(ab$age))

ab <- ab%>% group_by(time,   space , gear,FISHERY  , VL ,MESH_SIZE_RANGE ) %>%
  mutate(minage=min(age,na.rm=T),maxage=max(age,na.rm=T))

ab <- ab %>% separate(time, c("Year","Quarter")," - ",remove=F)

# ### >>>>>>>>>. catch1: info by row -------------------------------------


catch1= data.frame(
  ID = NA ,
  COUNTRY =COUNTRY ,
  YEAR = YEAR ,
  QUARTER = ab$Quarter ,
  VESSEL_LENGTH = ab$VL ,
  GEAR = ab$gear ,
  MESH_SIZE_RANGE = ab$MESH_SIZE_RANGE ,
  FISHERY = ab$FISHERY[i] ,
  AREA = AREA ,
  SPECON = sel_spe$specon_catch[i] ,
  SPECIES = STK ,
  LANDINGS = ab$totalW , # MCRS: meanW.at.age * n.at.age
  DISCARDS = ab$totalWDIS,
  NO_SAMPLES_LANDINGS =ab$L.no.samples, # = TRIPS
  NO_LENGTH_MEASUREMENTS_LANDINGS = ab$LnMeas.len ,
  NO_AGE_MEASUREMENTS_LANDINGS = ab$L.nmeas.age ,
  NO_SAMPLES_DISCARDS = ab$D.no.samples , # = TRIPS
  NO_LENGTH_MEASUREMENTS_DISCARDS = ab$DnMeas.len ,
  NO_AGE_MEASUREMENTS_DISCARDS = ab$D.nmeas.age,
  NO_SAMPLES_CATCH = 0,
  NO_LENGTH_MEASUREMENTS_CATCH = 0,
  NO_AGE_MEASUREMENTS_CATCH = 0 ,
  MIN_AGE = ab$minage ,
  MAX_AGE = ab$maxage
)
```

```r
# if mcrs delete LANDINGS: estimated below
if (!is.na(sel_spe$mcrs[i]) & sel_spe$mcrs[i]!="."){
  catch1<-catch1 %>% select(-LANDINGS)
}

# ### >>>>>>>>>. catch1: no samples & no meas.  -------------------------

# NO_SAMPLES_CATCH - NO_LENGTH_MEASUREMENTS_CATCH -NO_AGE_MEASUREMENTS_CATCH

catch1 <- catch1 %>% mutate(
  NO_SAMPLES_CATCH = rowSums( cbind (NO_SAMPLES_LANDINGS , NO_SAMPLES_DISCARDS),
                              na.rm=TRUE),
  NO_LENGTH_MEASUREMENTS_CATCH = rowSums( cbind (NO_LENGTH_MEASUREMENTS_DISCARDS ,
                                                 NO_LENGTH_MEASUREMENTS_LANDINGS),
                                          na.rm=TRUE),

  NO_AGE_MEASUREMENTS_CATCH=rowSums( cbind (NO_AGE_MEASUREMENTS_DISCARDS,
                                            NO_AGE_MEASUREMENTS_LANDINGS),
                                     na.rm=TRUE)) %>% distinct()

# ############ >>>>>> LAN- DIS n.at.age ----------------------------------


# matrix with all combinations of "time" "space"  "gear" "VL"
# "MESH_SIZE_RANGE" "length"

ab[,c(1:8)][is.na(ab[,c(1:8)])]<-1

dt <- as.data.table(ab )

seq_l <-  try(seq(0, 19, by = 1),silent=T)
if(class(seq_l)=="try-error"){seq_l=-1}

  dt$id<- paste(dt$time,dt$space,dt$gear,dt$FISHERY,dt$VL,dt$MESH_SIZE_RANGE,
                sep=":")
  dt1<- dt[, list(age = seq_l), by = id]
  dt1<- dt1 %>% separate(id, c("time", "space", "gear", "FISHERY",
                               "VL","MESH_SIZE_RANGE"), sep = ":")

   dt2=left_join(dt1,ab %>% select("time" , "space", "gear" , "FISHERY",
                                   "VL" , "MESH_SIZE_RANGE","age","n.at.age",
                                   "DIS.n.at.age","stock" ))

  dt2$stock=STK

#  MEAN LENGTH LAND, MEAN WEIGHT LAND ----------------------------------

#####>>>>>>>>>>> LAN weight at age!!
```

```r
wtEstim_An <-
  dbeObject(
    desc = "Weights at age",
    species = STK,
    catchCat = "LAN",
    param = "weight",
    strataDesc = fri_strD1, # strBP,
    methodDesc = sel_spe$methodDesc_LAN.age.wght[i]
  )



if(sel_spe$methodDesc_LAN.age.wght[i]=="analytical") {
  wtEstim_An <- bpEstim(wtEstim_An, fri_csc1, adjust = sel_spe$adjust_L.w.a[i])
 } else{
  wtEstim_An <- bpBoot(wtEstim_An, fri_csc1, adjust = sel_spe$adjust_L.w.a[i])
}

# # LAN mean weight at age ------------------------------------------------

cc=wtEstim_An@ageStruc$estim

cc$value<- cc$value/1000 # g ->kg

cc$age=as.numeric(as.character(cc$age))
cc=rename(cc, "meanW.at.age"=value)
cc=cc %>% separate(technical, c("gear", "FISHERY","VL","MESH_SIZE_RANGE"),
                   sep = "_")

# LAN length at age -----------------------------------------------------

LEstim_An <-
  dbeObject(
    desc = "Length at age",
    species = STK,
    catchCat = "LAN",
    param = "length",
    strataDesc = fri_strD1, # strBP,
    methodDesc = sel_spe$methodDesc_LAN.len.age[i]
  )


if(sel_spe$methodDesc_LAN.len.age[i]=="analytical") {
LEstim_An <-  bpEstim(LEstim_An, fri_csc1, adjust = sel_spe$adjust_L.len.a[i])

 } else{
  LEstim_An <-  bpBoot(LEstim_An, fri_csc1, adjust = sel_spe$adjust_L.len.a[i])
}

# LAN mean length at age ------------------------------------------------
```

```r
ff=LEstim_An@ageStruc$estim

UNIT <- unique(fri_csc1@ca$lenCode[fri_csc1@ca$spp==STK])
if (UNIT=="mm" || "MM"){
  ff$value <- ff$value/10  # mm-> cm
}


ff$age=as.numeric(as.character(ff$age))
ff=rename(ff, "meanL.at.age"=value)
ff=ff %>% separate(technical, c("gear","FISHERY", "VL","MESH_SIZE_RANGE"),
                   sep = "_")


# MEAN LENGTH DISCARD, MEAN WEIGHT DISCARD ------------------------------

# DIS weight at age -----------------------------------------------------


DwtEstim_An <-
  dbeObject(
    desc = "Weights at age",
    species = STK,
    catchCat = "DIS",
    param = "weight",
    strataDesc = fri_strD1, # strBP,
    methodDesc = sel_spe$methodDesc_DIS.age.wght[i]
  )


if(sel_spe$methodDesc_DIS.age.wght[i]=="analytical") {
  DwtEstim_An <- bpEstim(DwtEstim_An, fri_csc1, adjust = sel_spe$adjust_D.w.a[i])
} else{
  DwtEstim_An <- bpBoot(DwtEstim_An, fri_csc1, adjust = sel_spe$adjust_D.w.a[i])
}

# DIS mean weight at age
ccD=DwtEstim_An@ageStruc$estim

ccD$value <- ccD$value/1000 # g -> kg

ccD$age=as.numeric(as.character(ccD$age))
ccD=rename(ccD, "DmeanW.at.age"=value)
ccD=ccD %>% separate(technical, c("gear", "FISHERY","VL","MESH_SIZE_RANGE"),
                     sep = "_")

# DIS length at age -----------------------------------------------------

DLEstim_An <-
```

```
  dbeObject(
    desc = " Length at age",
    species = STK,
    catchCat = "DIS",
    param = "length",
    strataDesc = fri_strD1, # strBP,
    methodDesc = sel_spe$methodDesc_DIS.len.age[i]
  )

if(sel_spe$methodDesc_DIS.len.age[i]=="analytical") {
  DLEstim_An <- bpEstim(DLEstim_An, fri_csc1, adjust = sel_spe$adjust_D.len.a[i])
 } else{
 DLEstim_An <- bpBoot(DLEstim_An, fri_csc1, adjust = sel_spe$adjust_D.len.a[i])
 }

####### >> DIS mean length at age
ffD=DLEstim_An@ageStruc$estim

UNIT <- unique(fri_csc1@ca$lenCode[fri_csc1@ca$spp==STK])
if (UNIT=="mm" || "MM"){
ffD$value <- ffD$value/10  # mm-> cm
}

ffD$age=as.numeric(as.character(ffD$age))
ffD=rename(ffD, "DmeanL.at.age"=value)
ffD=ffD %>% separate(technical, c("gear", "FISHERY","VL","MESH_SIZE_RANGE"),
                     sep = "_")

# ## combine: w.age, l.age, no.age (LAN- DIS)... to get CATCH cols --------

l3=list(dt2,cc,ff,ccD,ffD)

l3=lapply(l3, function(x){ x[,c(1:6)][is.na(x[,c(1:6)])]<- -1;return(x)})


cfdt2=Reduce(function(x, y) merge(x, y, by = c("time", "space",  "gear" ,
          "FISHERY","VL","MESH_SIZE_RANGE" ,"age"  ),all.x=T), l3)

dt3 = try(data.table::dcast(setDT(distinct(cfdt2)),
                            time + space + gear +FISHERY+ VL+MESH_SIZE_RANGE ~ age
,
                            value.var = c("n.at.age","DIS.n.at.age","meanW.at.age"
,
                                "meanL.at.age","DmeanW.at.age","DmeanL.at.age",
                                "age" )),silent=T)

# if mcrs
# Landings= meanW.at.age*n.at.age
if (!is.na(sel_spe$mcrs[i]) & sel_spe$mcrs[i]!="."){
```

```r
  # tonnes
landings <- cfdt2 %>% mutate(LANDINGS= meanW.at.age*n.at.age) %>%
  select(time, space, gear, FISHERY, VL, MESH_SIZE_RANGE,LANDINGS)

landings <- landings[!is.na(landings$LANDINGS ), ]

dt3<-left_join(dt3,landings)

}

## rename col to match CATCH

names(dt3)[grep("DIS.n.at.age", names(dt3)) ]<-paste("AGE",
              0:(length(grep("DIS.n.at.age", names(dt3)))-1),"NO_DISCARD",sep="_")

names(dt3)[grep("n.at.age", names(dt3)) ]<-paste("AGE",
              0:(length(grep("n.at.age", names(dt3)))-1),"NO_LANDED",sep="_")

names(dt3)[grep("DmeanW.at.age", names(dt3)) ]<-paste("AGE",
              0:(length(grep("DmeanW.at.age", names(dt3)))-1),"MEAN_WEIGHT_DISCARD
",
              sep="_")

names(dt3)[grep("DmeanL.at.age", names(dt3)) ]<-paste("AGE",
              0:(length(grep("DmeanL.at.age", names(dt3)))-1),"MEAN_LENGTH_DISCARD
",
              sep="_")

names(dt3)[grep("meanW.at.age", names(dt3)) ]<-paste("AGE",
              0:(length(grep("meanW.at.age", names(dt3)))-1),"MEAN_WEIGHT_LANDED",
              sep="_")

names(dt3)[grep("meanL.at.age", names(dt3)) ]<-paste("AGE",
              0:(length(grep("meanL.at.age", names(dt3)))-1),"MEAN_LENGTH_LANDED",
              sep="_")

names(dt3)[grep("age.1", names(dt3))]<-paste("AGE",
              0:(length(grep("age.1", names(dt3)))-1),sep="_")

dt3 <- dt3 %>% separate(time, c("Year","Quarter")," - ",remove=T)


############\\

# FINAL CATCH TAB ----------------------------------------------------------

catch1<- catch1 %>% mutate_at(vars( c(ID:SPECIES) ),
          funs( ifelse( is.na(.), -1, .) ) )
```

```
dt3<- dt3 %>% mutate_at(vars( c(Year:MESH_SIZE_RANGE) ),
          funs( ifelse( is.na(.), -1, .) ) )

catch1$YEAR=as.character(catch1$YEAR)
catch1$FISHERY=as.character(catch1$FISHERY)
catch.tab <- left_join(catch1,dt3,by=c( "QUARTER"  ="Quarter" ,  "YEAR"="Year",
                  "AREA"="space", "GEAR"="gear" ,  "VESSEL_LENGTH" = "VL" ,
                  "MESH_SIZE_RANGE","FISHERY"  ))

 # FISHERY to DG MARE Med&BS codification
  catch.tab$FISHERY <- fishery$SDEF_codification[match(catch.tab$FISHERY ,
                                     fishery$DGMARE_Med_BS_codification)]

  # species to FAO three alpha code and set ID (COUNTRY, AREA, GEAR, VESSEL_LENGTH
,
  # MESH_SIZE_RANGE,QUARTER, SPECIES)
 catch.tab <- catch.tab %>%
   mutate(SPECIES=sel_spe$SPE[match(SPECIES,sel_spe$SPECIES)],
    ID = paste(COUNTRY, AREA, GEAR,FISHERY, VESSEL_LENGTH, MESH_SIZE_RANGE,
               YEAR, QUARTER, SPECIES, sep = "_"))

catch.tab$YEAR=as.numeric(catch.tab$YEAR)
catch.temp2<-bind_rows(catch.temp2,catch.tab)

}
```

## Output

```
  # col after 12: set -1 or NA to 0
catch.temp2[,-c(1:11)][is.na(catch.temp2[,-c(1:11)])] <- 0

catch.temp2<-setDT(catch.temp2)
for (jj in c(12:171)) set(catch.temp2, i = which(catch.temp2[[jj]]==-1),
                          j = jj, v = 0)

catch.temp2<-setDF(catch.temp2)

write.table(catch.temp2, file = "CATCH.csv",row.names=FALSE,sep=";",
            na="-1")

head(catch.temp2)

##                                             ID  COUNTRY YEAR QUARTER
## 1 COUNTRY1_GSA99_OTB_NONE_VL2440_-1_9999_1_HKE COUNTRY1 9999       1
## 2 COUNTRY1_GSA99_GNS_NONE_VL0612_-1_9999_3_HKE COUNTRY1 9999       3
## 3 COUNTRY1_GSA99_OTB_NONE_VL2440_-1_9999_3_HKE COUNTRY1 9999       3
## 4 COUNTRY1_GSA99_GNS_NONE_VL0006_-1_9999_4_HKE COUNTRY1 9999       4
## 5 COUNTRY1_GSA99_GNS_NONE_VL0612_-1_9999_4_HKE COUNTRY1 9999       4
## 6 COUNTRY1_GSA99_GTR_NONE_VL0612_-1_9999_4_HKE COUNTRY1 9999       4
##   VESSEL_LENGTH GEAR MESH_SIZE_RANGE FISHERY  AREA SPECON SPECIES
```

```
## 1        VL2440  OTB              -1    NONE GSA99     -1     HKE
## 2        VL0612  GNS              -1    NONE GSA99     -1     HKE
## 3        VL2440  OTB              -1    NONE GSA99     -1     HKE
## 4        VL0006  GNS              -1    NONE GSA99     -1     HKE
## 5        VL0612  GNS              -1    NONE GSA99     -1     HKE
## 6        VL0612  GTR              -1    NONE GSA99     -1     HKE
##     LANDINGS  DISCARDS NO_SAMPLES_LANDINGS NO_LENGTH_MEASUREMENTS_LANDINGS
## 1 241.996000 5.7386667                  6                             990
## 2 140.230571 0.0000000                  2                              20
## 3 196.598000 8.3981013                 11                            1247
## 4  10.177558 1.3884000                  4                              18
## 5  87.679445 2.6935003                 34                             657
## 6   2.382747 0.5006894                 30                              54
##   NO_AGE_MEASUREMENTS_LANDINGS NO_SAMPLES_DISCARDS
## 1                            0                   6
## 2                            0                   0
## 3                            0                  11
## 4                            0                   1
## 5                            0                   9
## 6                            0                   6
##   NO_LENGTH_MEASUREMENTS_DISCARDS NO_AGE_MEASUREMENTS_DISCARDS
## 1                             158                           0
## 2                               0                           0
## 3                             566                           0
## 4                               3                           0
## 5                              55                           0
## 6                               8                           0
##   NO_SAMPLES_CATCH NO_LENGTH_MEASUREMENTS_CATCH NO_AGE_MEASUREMENTS_CATCH
## 1               12                         1148                         0
## 2                2                           20                         0
## 3               22                         1813                         0
## 4                5                           21                         0
## 5               43                          712                         0
## 6               36                           62                         0
##   MIN_AGE MAX_AGE AGE_0 AGE_0_NO_LANDED AGE_0_MEAN_WEIGHT_LANDED
## 1       0       5     0     843.1723427              0.06205808
## 2       0       3     0      12.0142710              0.07634600
## 3       0       5     0     259.8784047              0.02516775
## 4       0       4     0       4.1846456              0.10845659
## 5       0       4     0      80.1428431              0.09104605
## 6       0       3     0       0.6587253              0.10588056
##   AGE_0_MEAN_LENGTH_LANDED AGE_0_NO_DISCARD AGE_0_MEAN_WEIGHT_DISCARD
## 1                 20.65193        67.733333                0.06217778
## 2                 22.00000         0.000000                0.02465982
## 3                 14.17963       787.972292                0.02465982
## 4                 24.17651         3.653684                0.03872180
## 5                 22.30149        12.243183                0.03872180
## 6                 24.08543         0.000000                0.03872180
##   AGE_0_MEAN_LENGTH_DISCARD AGE_1 AGE_1_NO_LANDED AGE_1_MEAN_WEIGHT_LANDED
## 1                  20.66667     1      674.988360                0.1611525
## 2                  14.02727     1      154.873488                0.2537027
```

```
## 3                  14.02727     1      460.251467                0.1669250
## 4                  15.74194     1       15.502594                0.1976597
## 5                  15.74194     1      217.383326                0.1889448
## 6                  15.74194     1        2.608883                0.2201388
##   AGE_1_MEAN_LENGTH_LANDED AGE_1_NO_DISCARD AGE_1_MEAN_WEIGHT_DISCARD
## 1                 28.12088         0.000000                 0.1650500
## 2                 31.59069         0.000000                 0.1828965
## 3                 27.29795         0.000000                 0.1828965
## 4                 29.55358         6.576632                 0.1914079
## 5                 28.97150        11.859835                 0.1914079
## 6                 30.46054         1.112643                 0.1914079
##   AGE_1_MEAN_LENGTH_DISCARD AGE_2 AGE_2_NO_LANDED AGE_2_MEAN_WEIGHT_LANDED
## 1                  28.35000     2      130.922358                0.3723365
## 2                  28.11538     2      150.288995                0.3443452
## 3                  28.11538     2      132.648716                0.3820961
## 4                  29.01471     2        4.381310                0.3785201
## 5                  29.01471     2       47.558245                0.3911659
## 6                  29.01471     2        1.707482                0.4578178
##   AGE_2_MEAN_LENGTH_LANDED AGE_2_NO_DISCARD AGE_2_MEAN_WEIGHT_DISCARD
## 1                 36.66217        0.0000000                 0.3918095
## 2                 35.13610        0.0000000                 0.3789413
## 3                 36.34099        0.0000000                 0.3789413
## 4                 36.51664        0.7307368                 0.4064423
## 5                 36.88426        0.6708593                 0.4064423
## 6                 38.93109        0.1788176                 0.4064423
##   AGE_2_MEAN_LENGTH_DISCARD AGE_3 AGE_3_NO_LANDED AGE_3_MEAN_WEIGHT_LANDED
## 1                  37.19048     3       7.1052892                0.5340000
## 2                  36.27500     3      48.0570838                0.7162028
## 3                  36.27500     3      35.2480868                0.7249392
## 4                  37.36667     3       2.5787732                1.0823878
## 5                  37.36667     3      12.6647254                0.7583605
## 6                  37.36667     3       0.8024339                0.8602206
##   AGE_3_MEAN_LENGTH_LANDED AGE_3_NO_DISCARD AGE_3_MEAN_WEIGHT_DISCARD
## 1                 42.32727         0.000000                 0.6838182
## 2                 45.92308         0.000000                 0.7623153
## 3                 44.93343         0.000000                 0.7623153
## 4                 49.59184         0.000000                 0.8041833
## 5                 44.95651         0.000000                 0.8041833
## 6                 46.96346         0.960317                 0.8041833
##   AGE_3_MEAN_LENGTH_DISCARD AGE_4 AGE_4_NO_LANDED AGE_4_MEAN_WEIGHT_LANDED
## 1                  45.72727     4       0.0000000                 0.000000
## 2                  45.57895     4       0.0000000                 0.000000
## 3                  45.57895     4      13.4507270                 1.530725
## 4                  45.70833     4       0.8595911                 1.050696
## 5                  45.70833     4       0.8674070                 1.260696
## 6                  45.70833     4       0.0000000                 1.228488
##   AGE_4_MEAN_LENGTH_LANDED AGE_4_NO_DISCARD AGE_4_MEAN_WEIGHT_DISCARD
## 1                  0.00000                0                  1.131250
## 2                  0.00000                0                  1.620727
## 3                 56.02192                0                  1.620727
## 4                 51.12000                0                  1.460415
```

```
## 5                 52.69554                0                  1.460415
## 6                 53.06459                0                  1.460415
##   AGE_4_MEAN_LENGTH_DISCARD AGE_5 AGE_5_NO_LANDED AGE_5_MEAN_WEIGHT_LANDED
## 1                  53.50000     5        4.567686                  0.68900
## 2                  57.09091     5        0.000000                  0.00000
## 3                  57.09091     5        2.400298                  1.85392
## 4                  55.46154     5        0.000000                  1.30700
## 5                  55.46154     5        0.000000                  0.00000
## 6                  55.46154     5        0.000000                  0.00000
##   AGE_5_MEAN_LENGTH_LANDED AGE_5_NO_DISCARD AGE_5_MEAN_WEIGHT_DISCARD
## 1                 48.00000                0                   1.37450
## 2                  0.00000                0                   2.04452
## 3                 61.15508                0                   2.04452
## 4                 54.00000                0                   2.18600
## 5                  0.00000                0                   2.18600
## 6                  0.00000                0                   2.18600
##   AGE_5_MEAN_LENGTH_DISCARD AGE_6 AGE_6_NO_LANDED AGE_6_MEAN_WEIGHT_LANDED
## 1                  55.66667     6               0                         0
## 2                  63.10000     6               0                         0
## 3                  63.10000     6               0                         0
## 4                  62.62500     6               0                         0
## 5                  62.62500     6               0                         0
## 6                  62.62500     6               0                         0
##   AGE_6_MEAN_LENGTH_LANDED AGE_6_NO_DISCARD AGE_6_MEAN_WEIGHT_DISCARD
## 1                        0                0                 1.517000
## 2                        0                0                 2.804000
## 3                        0                0                 2.804000
## 4                        0                0                 3.177754
## 5                        0                0                 3.177754
## 6                        0                0                 3.177754
##   AGE_6_MEAN_LENGTH_DISCARD AGE_7 AGE_7_NO_LANDED AGE_7_MEAN_WEIGHT_LANDED
## 1                  59.00000     7               0                         0
## 2                  69.50000     7               0                         0
## 3                  69.50000     7               0                         0
## 4                  71.07692     7               0                         0
## 5                  71.07692     7               0                         0
## 6                  71.07692     7               0                         0
##   AGE_7_MEAN_LENGTH_LANDED AGE_7_NO_DISCARD AGE_7_MEAN_WEIGHT_DISCARD
## 1                        0                0                   0.0000
## 2                        0                0                   0.0000
## 3                        0                0                   0.0000
## 4                        0                0                   3.4315
## 5                        0                0                   3.4315
## 6                        0                0                   3.4315
##   AGE_7_MEAN_LENGTH_DISCARD AGE_8 AGE_8_NO_LANDED AGE_8_MEAN_WEIGHT_LANDED
## 1                   0.00000     8               0                         0
## 2                   0.00000     8               0                         0
## 3                   0.00000     8               0                         0
## 4                  74.07143     8               0                         0
## 5                  74.07143     8               0                         0
## 6                  74.07143     8               0                         0
```

```
##   AGE_8_MEAN_LENGTH_LANDED AGE_8_NO_DISCARD AGE_8_MEAN_WEIGHT_DISCARD
## 1                        0                0                    0.0000
## 2                        0                0                    3.6825
## 3                        0                0                    3.6825
## 4                        0                0                    5.2066
## 5                        0                0                    5.2066
## 6                        0                0                    5.2066
##   AGE_8_MEAN_LENGTH_DISCARD AGE_9 AGE_9_NO_LANDED AGE_9_MEAN_WEIGHT_LANDED
## 1                       0.0     9               0                        0
## 2                      76.5     9               0                        0
## 3                      76.5     9               0                        0
## 4                      82.8     9               0                        0
## 5                      82.8     9               0                        0
## 6                      82.8     9               0                        0
##   AGE_9_MEAN_LENGTH_LANDED AGE_9_NO_DISCARD AGE_9_MEAN_WEIGHT_DISCARD
## 1                        0                0                    0.000
## 2                        0                0                    0.000
## 3                        0                0                    0.000
## 4                        0                0                    6.195
## 5                        0                0                    6.195
## 6                        0                0                    6.195
##   AGE_9_MEAN_LENGTH_DISCARD AGE_10 AGE_10_NO_LANDED
## 1                         0     10                0
## 2                         0     10                0
## 3                         0     10                0
## 4                        87     10                0
## 5                        87     10                0
## 6                        87     10                0
##   AGE_10_MEAN_WEIGHT_LANDED AGE_10_MEAN_LENGTH_LANDED AGE_10_NO_DISCARD
## 1                         0                         0                 0
## 2                         0                         0                 0
## 3                         0                         0                 0
## 4                         0                         0                 0
## 5                         0                         0                 0
## 6                         0                         0                 0
##   AGE_10_MEAN_WEIGHT_DISCARD AGE_10_MEAN_LENGTH_DISCARD AGE_11
## 1                          0                          0     11
## 2                          0                          0     11
## 3                          0                          0     11
## 4                          0                          0     11
## 5                          0                          0     11
## 6                          0                          0     11
##   AGE_11_NO_LANDED AGE_11_MEAN_WEIGHT_LANDED AGE_11_MEAN_LENGTH_LANDED
## 1                0                         0                         0
## 2                0                         0                         0
## 3                0                         0                         0
## 4                0                         0                         0
## 5                0                         0                         0
## 6                0                         0                         0
##   AGE_11_NO_DISCARD AGE_11_MEAN_WEIGHT_DISCARD AGE_11_MEAN_LENGTH_DISCARD
## 1                 0                         0                         0
```

```
## 2                 0                          0                           0
## 3                 0                          0                           0
## 4                 0                          0                           0
## 5                 0                          0                           0
## 6                 0                          0                           0
##   AGE_12 AGE_12_NO_LANDED AGE_12_MEAN_WEIGHT_LANDED
## 1     12                0                         0
## 2     12                0                         0
## 3     12                0                         0
## 4     12                0                         0
## 5     12                0                         0
## 6     12                0                         0
##   AGE_12_MEAN_LENGTH_LANDED AGE_12_NO_DISCARD AGE_12_MEAN_WEIGHT_DISCARD
## 1                         0                 0                         0
## 2                         0                 0                         0
## 3                         0                 0                         0
## 4                         0                 0                         0
## 5                         0                 0                         0
## 6                         0                 0                         0
##   AGE_12_MEAN_LENGTH_DISCARD AGE_13 AGE_13_NO_LANDED
## 1                          0     13                0
## 2                          0     13                0
## 3                          0     13                0
## 4                          0     13                0
## 5                          0     13                0
## 6                          0     13                0
##   AGE_13_MEAN_WEIGHT_LANDED AGE_13_MEAN_LENGTH_LANDED AGE_13_NO_DISCARD
## 1                         0                          0                 0
## 2                         0                          0                 0
## 3                         0                          0                 0
## 4                         0                          0                 0
## 5                         0                          0                 0
## 6                         0                          0                 0
##   AGE_13_MEAN_WEIGHT_DISCARD AGE_13_MEAN_LENGTH_DISCARD AGE_14
## 1                          0                          0     14
## 2                          0                          0     14
## 3                          0                          0     14
## 4                          0                          0     14
## 5                          0                          0     14
## 6                          0                          0     14
##   AGE_14_NO_LANDED AGE_14_MEAN_WEIGHT_LANDED AGE_14_MEAN_LENGTH_LANDED
## 1                0                         0                         0
## 2                0                         0                         0
## 3                0                         0                         0
## 4                0                         0                         0
## 5                0                         0                         0
## 6                0                         0                         0
##   AGE_14_NO_DISCARD AGE_14_MEAN_WEIGHT_DISCARD AGE_14_MEAN_LENGTH_DISCARD
## 1                 0                          0                          0
## 2                 0                          0                          0
## 3                 0                          0                          0
```

```
## 4                 0                           0                            0
## 5                 0                           0                            0
## 6                 0                           0                            0
##   AGE_15 AGE_15_NO_LANDED AGE_15_MEAN_WEIGHT_LANDED
## 1     15                0                          0
## 2     15                0                          0
## 3     15                0                          0
## 4     15                0                          0
## 5     15                0                          0
## 6     15                0                          0
##   AGE_15_MEAN_LENGTH_LANDED AGE_15_NO_DISCARD AGE_15_MEAN_WEIGHT_DISCARD
## 1                         0                 0                          0
## 2                         0                 0                          0
## 3                         0                 0                          0
## 4                         0                 0                          0
## 5                         0                 0                          0
## 6                         0                 0                          0
##   AGE_15_MEAN_LENGTH_DISCARD AGE_16 AGE_16_NO_LANDED
## 1                          0     16                0
## 2                          0     16                0
## 3                          0     16                0
## 4                          0     16                0
## 5                          0     16                0
## 6                          0     16                0
##   AGE_16_MEAN_WEIGHT_LANDED AGE_16_MEAN_LENGTH_LANDED AGE_16_NO_DISCARD
## 1                         0                          0                 0
## 2                         0                          0                 0
## 3                         0                          0                 0
## 4                         0                          0                 0
## 5                         0                          0                 0
## 6                         0                          0                 0
##   AGE_16_MEAN_WEIGHT_DISCARD AGE_16_MEAN_LENGTH_DISCARD AGE_17
## 1                          0                          0     17
## 2                          0                          0     17
## 3                          0                          0     17
## 4                          0                          0     17
## 5                          0                          0     17
## 6                          0                          0     17
##   AGE_17_NO_LANDED AGE_17_MEAN_WEIGHT_LANDED AGE_17_MEAN_LENGTH_LANDED
## 1                0                         0                         0
## 2                0                         0                         0
## 3                0                         0                         0
## 4                0                         0                         0
## 5                0                         0                         0
## 6                0                         0                         0
##   AGE_17_NO_DISCARD AGE_17_MEAN_WEIGHT_DISCARD AGE_17_MEAN_LENGTH_DISCARD
## 1                 0                          0                          0
## 2                 0                          0                          0
## 3                 0                          0                          0
## 4                 0                          0                          0
## 5                 0                          0                          0
```

```
## 6                 0                           0                            0
##   AGE_18 AGE_18_NO_LANDED AGE_18_MEAN_WEIGHT_LANDED
## 1     18                0                         0
## 2     18                0                         0
## 3     18                0                         0
## 4     18                0                         0
## 5     18                0                         0
## 6     18                0                         0
##   AGE_18_MEAN_LENGTH_LANDED AGE_18_NO_DISCARD AGE_18_MEAN_WEIGHT_DISCARD
## 1                         0                0                          0
## 2                         0                0                          0
## 3                         0                0                          0
## 4                         0                0                          0
## 5                         0                0                          0
## 6                         0                0                          0
##   AGE_18_MEAN_LENGTH_DISCARD AGE_19 AGE_19_NO_LANDED
## 1                          0     19                0
## 2                          0     19                0
## 3                          0     19                0
## 4                          0     19                0
## 5                          0     19                0
## 6                          0     19                0
##   AGE_19_MEAN_WEIGHT_LANDED AGE_19_MEAN_LENGTH_LANDED AGE_19_NO_DISCARD
## 1                         0                         0                0
## 2                         0                         0                0
## 3                         0                         0                0
## 4                         0                         0                0
## 5                         0                         0                0
## 6                         0                         0                0
##   AGE_19_MEAN_WEIGHT_DISCARD AGE_19_MEAN_LENGTH_DISCARD AGE_20_PLUS
## 1                          0                          0          0
## 2                          0                          0          0
## 3                          0                          0          0
## 4                          0                          0          0
## 5                          0                          0          0
## 6                          0                          0          0
##   AGE_20_PLUS_NO_LANDED AGE_20_PLUS_MEAN_WEIGHT_LANDED
## 1                     0                              0
## 2                     0                              0
## 3                     0                              0
## 4                     0                              0
## 5                     0                              0
## 6                     0                              0
##   AGE_20_PLUS_MEAN_LENGTH_LANDED AGE_20_PLUS_NO_DISCARD
## 1                              0                     0
## 2                              0                     0
## 3                              0                     0
## 4                              0                     0
## 5                              0                     0
## 6                              0                     0
##   AGE_20_PLUS_MEAN_WEIGHT_DISCARD AGE_20_PLUS_MEAN_LENGTH_DISCARD
```

```
## 1                                  0                                  0
## 2                                  0                                  0
## 3                                  0                                  0
## 4                                  0                                  0
## 5                                  0                                  0
## 6                                  0                                  0
```

## Example of use of the script ML

This script implements the Calculation of maturity at length, required for the DG MARE Med&BS Data Call, using as input file the SDEF format (CS table) and COST as the raising procedure

## Settings

```
path <- paste("C:\\Users\\Bitetto Isabella\\OneDrive - Coispa Tecnologia & Ricerca S.C.A.R.L\\MARE22\\STREAM\\FINAL REVISION OF DELIVERABLES\\SDEF_to_DG_MARE_MedBS", sep="")

setwd(path)

knitr::opts_knit$set(root.dir = path)
```

## Input Data

csData of the SDEF format

```
load("fri_cs_test.Rdata")
head( fri_cs@ca)

##     sampType landCtry vslFlgCtry year    proj trpCode staNum quarter month
## 58         V COUNTRY1   COUNTRY1 9999 PROJECT       3    999       1     2
## 105        V COUNTRY1   COUNTRY1 9999 PROJECT       7    999       1     2
## 106        V COUNTRY1   COUNTRY1 9999 PROJECT       2    999       1     2
## 107        V COUNTRY1   COUNTRY1 9999 PROJECT       6    999       1     2
## 122        V COUNTRY1   COUNTRY1 9999 PROJECT      10    999       1     2
## 127        V COUNTRY1   COUNTRY1 9999 PROJECT       5    999       3     7
##                  spp sex catchCat landCat commCatScl commCat stock  area
## 58  Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 105 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 106 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 107 Mullus barbatus   F      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 122 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 127 Mullus barbatus   F      LAN     HUC       <NA>    <NA>  <NA> GSA99
##     rect subRect lenCls age fishId lenCode ageMeth plusGrp otoWt otoSide
## 58  <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 105 <NA> THR-LIM     90   0      1      mm    <NA>    <NA>    NA    <NA>
## 106 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 107 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 122 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 127 <NA> THR-LIM    180   3      1      mm    <NA>    <NA>    NA    <NA>
##     indWt matMeth matScale matStage
```

```
## 58  18.00    <NA>   MEDITS        2
## 105 11.10    <NA>   MEDITS        1
## 106 13.80    <NA>   MEDITS        1
## 107 17.30    <NA>   MEDITS        2
## 122 17.76    <NA>   MEDITS        2
## 127 68.12    <NA>   MEDITS        4

# extract COUNTRY
COUNTRY<-unique(fri_cs@ca$landCtry)
```

stratification: spatial only

```
fri_strD <- strIni(spaceStrata="area")
```

DG MARE Med&BS ML Table template

```
ml.temp2<- read.table("xxx_ML.csv",sep=",",header=T)
names(ml.temp2)

##  [1] "COUNTRY"     "AREA"        "START_YEAR"  "END_YEAR"    "SPECIES"
##  [6] "SEX"         "LENGTHCLASS" "UNIT"        "SAMPLE_SIZE" "PRM"
## [11] "METHOD_USED"
```

Auxiliary table: species_BIO_ML.csv

```
# auxiliary Table
sel_spe<-read.table( "species_BIO_ML.csv", header=TRUE, sep=";",
                     row.names=NULL)
head(sel_spe)

##                  SPECIES SPE   GSA SEX START_YEAR END_YEAR IMMATURE
## 1 Merluccius merluccius HKE GSA99   M       9999     9999   0_1_2a
## 2       Mullus barbatus MUT GSA99 M_F       9999     9999        1
##        MAT_METHOD methodDesc nboot
## 1 macroscopically analytical     .
## 2 macroscopically  bootstrap    10

sel_spe<- sel_spe %>%
    mutate(SEX = strsplit(as.character(SEX), "_")) %>%
    unnest(SEX)

imm=sel_spe%>%separate(IMMATURE,c("a", "b","c","d"),
                       extra = "drop", fill = "right",sep="_")
```

## Checking data

Check if there are stocks with no age data and impute “-1”, otherwise the bpEstim() method for maturity at length gives error :

```
# get col w. all=NA by spp
aa<- fri_cs@ca %>% group_by(spp) %>% summarize_all(~all(is.na(.)))

# aa$spp[aa$age==FALSE] # spp with age data
```

```
# impute "-1" if a stock has no age data

fri_cs@ca$age[fri_cs@ca$spp %in% aa$spp[aa$age==TRUE]]<- -1
```

Set immature stages based on Input Auxiliary Table

```
# get col w. all=NA by spp
aa<- fri_cs@ca %>% group_by(spp) %>% summarize_all(~all(is.na(.)))

# if no matScale is spcified, impute "-1"
fri_cs@ca$matScale[fri_cs@ca$spp %in% aa$spp[aa$matScale==TRUE]]<- "-1"
```

## Data analysis

Analysis by stock

```
for (i in 1:dim(sel_spe)[1]) {

  STK<- sel_spe$SPECIES[i]

  fri_cs1<- subset(fri_cs, year%in% seq(sel_spe$START_YEAR[i],
                       sel_spe$END_YEAR[i],by=1),table="ca",link=T)


       # set immature stages as "I"
if (na.omit(unique(fri_cs1@ca$matScale[fri_cs1@ca$spp==STK &
                 fri_cs1@ca$area==sel_spe$GSA[i]])))!="1-7") {
  fri_cs1@ca$matStage[fri_cs1@ca$spp==STK & fri_cs1@ca$area==sel_spe$GSA[i] &
              fri_cs1@ca$matStage %in% imm[i,6:9][!is.na(imm[i, 6:9])]]="I"

} else{ #if "1-7" matScale is used, immature (I)==1
  fri_cs1@ca$matStage[fri_cs1@ca$spp==STK & fri_cs1@ca$area==sel_spe$GSA[i] &
                        fri_cs1@ca$matStage ==1]="I"

}

# sample size

if (sel_spe$SEX[i]=="C"){

    fri_csv <- csDataVal(fri_cs1)

    # get sample size

    nml<- data.frame(fri_cs1@ca) %>% filter(!is.na(matStage))%>%
      dplyr::group_by(area,spp,lenCls)%>% summarize(SAMPLE_SIZE=n())


} else {
```

```
   fri_cs1=subset(fri_cs1,sex==sel_spe$SEX[i],table="ca",link=T)
  fri_csv <- csDataVal(fri_cs1)

  # get sample size
  nml<- data.frame(fri_cs1@ca) %>% filter(!is.na(matStage))%>%
    dplyr::group_by(area,spp,lenCls,sex)%>% summarize(SAMPLE_SIZE=n())

}



    fri_csv1<- subSetSpp(fri_csv, STK)
   fri_csv1<- subset(fri_csv1, area%in% sel_spe$GSA[i],table="ca")

  fri_csc1 <- csDataCons(fri_csv1, fri_strD)

  fri_csc1@ca$matStage=as.character(fri_csc1@ca$matStage)


MS_MAT_An<-dbeObject(desc="Maturity-at-length",species=STK,
               param="maturity",strataDesc=fri_strD,
              methodDesc=sel_spe$methodDesc[i],nboot=sel_spe$nboot[i])

if (sel_spe$methodDesc[i]=="bootstrap"){
MS_MAT_An<-bpBoot(MS_MAT_An,fri_csc1,adjust=F,immature.scale="I")

} else { # analytical
MS_MAT_An<-bpEstim(MS_MAT_An,fri_csc1,adjust=F,immature.scale="I")
}

pp=dbePlot(MS_MAT_An,elmt="lenStruc$estim",ylab="Maturity ratio",
           main=paste("Maturity ratio-at-length estimates
                      for",STK,sel_spe$SEX[i],sel_spe$GSA[i],sel_spe$START_YEAR[i]
,
                      sel_spe$END_YEAR[i],sep=" "))

#  pdf(file="p.pdf")
# print(pp)

dfML <-
  data.frame(
    COUNTRY =COUNTRY ,
    AREA = sel_spe$GSA[i],
    START_YEAR = sel_spe$START_YEAR[i] ,
    END_YEAR = sel_spe$END_YEAR[i] ,
    SPECIES = STK ,
    SEX = sel_spe$SEX[i],
    UNIT = unique(fri_csc1@ca$lenCode) ,
    LENGTHCLASS =  as.numeric(as.character(MS_MAT_An@lenStruc[["estim"]][["length"
]] )),
```

```
    PRM = MS_MAT_An@lenStruc[["estim"]][["value"]] ,
    METHOD_USED = sel_spe$MAT_METHOD[i]
  )

# get sample size


if (sel_spe$SEX[i]=="C"){

dfML <-  dfML %>%
           left_join(nml, by = c("AREA" = 'area', 'SPECIES' = 'spp',
                                 "LENGTHCLASS"="lenCls")) %>%
  mutate(SPECIES =  sel_spe$SPE[i])
# FAO three alpha code species code

} else{

  dfML <-  dfML %>%
           left_join(nml, by = c("AREA" = 'area', 'SPECIES' = 'spp',
                                 "SEX"="sex","LENGTHCLASS"="lenCls")) %>%
  mutate(SPECIES =  sel_spe$SPE[i])
  # FAO three alpha code species code

}


ml.temp2<- bind_rows(ml.temp2,na.omit(dfML))

}

## csData subset by species European hake Merluccius merluccius
## New data set consists of 21 trip records
## 74 length records
## and 368 age or maturity records
## csData subset by species Red mullet Mullus barbatus
## New data set consists of 19 trip records
## 28 length records
## and 329 age or maturity records
## csData subset by species Red mullet Mullus barbatus
## New data set consists of 20 trip records
## 33 length records
## and 759 age or maturity records
```

## Output

```
# export DG MARE Med&BS ML table
write.table(format(ml.temp2,digits=3, scientific=F),
            file=paste("ML.csv",sep=""),dec=".",sep=",",
            col.names=TRUE,row.names=FALSE,na="-1")

head(ml.temp2)
```

```
##    COUNTRY  AREA START_YEAR END_YEAR SPECIES SEX LENGTHCLASS UNIT
## 1 COUNTRY1 GSA99       9999     9999     HKE   M          90   mm
## 2 COUNTRY1 GSA99       9999     9999     HKE   M         100   mm
## 3 COUNTRY1 GSA99       9999     9999     HKE   M         110   mm
## 4 COUNTRY1 GSA99       9999     9999     HKE   M         120   mm
## 5 COUNTRY1 GSA99       9999     9999     HKE   M         130   mm
## 6 COUNTRY1 GSA99       9999     9999     HKE   M         140   mm
##   SAMPLE_SIZE PRM     METHOD_USED
## 1           4   0 macroscopically
## 2           5   0 macroscopically
## 3          11   0 macroscopically
## 4          21   0 macroscopically
## 5          12   0 macroscopically
## 6           4   0 macroscopically
```

## Example of use of the script MA

This script implements the Calculation of maturity at age, required for the JRC MED &BS Data Call, using as input file the SDEF format (CS table) and COST as the raising proceedure

### Settings

```
path <- paste("C:\\Users\\Bitetto Isabella\\OneDrive - Coispa Tecnologia & Ricerca S.C.A.R.L\\MARE22\\STREAM\\FINAL REVISION OF DELIVERABLES\\SDEF_to_DG_MARE_MedBS", sep="")
setwd(path)
```

### Input Data

csData of the SDEF format and estimate sample size

```
load("fri_cs_test.Rdata")
head( fri_cs@ca)
```

```
##     sampType landCtry vslFlgCtry year    proj trpCode staNum quarter month
## 58         V COUNTRY1   COUNTRY1 9999 PROJECT       3    999       1     2
## 105        V COUNTRY1   COUNTRY1 9999 PROJECT       7    999       1     2
## 106        V COUNTRY1   COUNTRY1 9999 PROJECT       2    999       1     2
## 107        V COUNTRY1   COUNTRY1 9999 PROJECT       6    999       1     2
## 122        V COUNTRY1   COUNTRY1 9999 PROJECT      10    999       1     2
## 127        V COUNTRY1   COUNTRY1 9999 PROJECT       5    999       3     7
##                  spp sex catchCat landCat commCatScl commCat stock  area
## 58  Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 105 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 106 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 107 Mullus barbatus   F      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 122 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 127 Mullus barbatus   F      LAN     HUC       <NA>    <NA>  <NA> GSA99
##     rect subRect lenCls age fishId lenCode ageMeth plusGrp otoWt otoSide
## 58  <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 105 <NA> THR-LIM     90   0      1      mm    <NA>    <NA>    NA    <NA>
```

```
## 106 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 107 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 122 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 127 <NA> THR-LIM    180   3      1      mm    <NA>    <NA>    NA    <NA>
##     indWt matMeth matScale matStage
## 58  18.00    <NA>   MEDITS        2
## 105 11.10    <NA>   MEDITS        1
## 106 13.80    <NA>   MEDITS        1
## 107 17.30    <NA>   MEDITS        2
## 122 17.76    <NA>   MEDITS        2
## 127 68.12    <NA>   MEDITS        4

# extract COUNTRY
COUNTRY<-unique(fri_cs@ca$landCtry)
```

stratification: spatial only

```
fri_strD <- strIni(spaceStrata="area")
```

DG MARE Med&BS MA Table template

```
ma.temp2<- read.table("xxx_MA.csv",sep=",",header=T)
names(ma.temp2)

##  [1] "COUNTRY"     "AREA"        "START_YEAR"  "END_YEAR"    "SPECIES"
##  [6] "SEX"         "AGECLASS"    "SAMPLE_SIZE" "PRM"         "METHOD_USED"
```

Auxiliary table: species_BIO_MA.csv

```
# species file : selected species with FAO three alpha code

sel_spe<-read.table( "species_BIO_MA.csv", header=TRUE, sep=";",row.names=NULL)

head(sel_spe)

##                 SPECIES SPE   GSA SEX START_YEAR END_YEAR IMMATURE
## 1 Merluccius merluccius HKE GSA99   M       9999     9999   0_1_2a
## 2       Mullus barbatus MUT GSA99 M_F       9999     9999        1
##        MAT_METHOD methodDesc nboot adjust
## 1 macroscopically analytical     .   TRUE
## 2 macroscopically  bootstrap    10  FALSE

sel_spe<- sel_spe %>%
    mutate(SEX = strsplit(as.character(SEX), "_")) %>%
    unnest(SEX)

imm=sel_spe%>%separate(IMMATURE,c("a", "b","c","d"), extra = "drop",
                       fill = "right",sep="_")
```

## Checking data

Set immature stages based on Auxiliary Table

```r
# get col w. all=NA by spp
aa<- fri_cs@ca %>% group_by(spp) %>% summarize_all(~all(is.na(.)))


# if no matScale is spcified, impute "-1"
fri_cs@ca$matScale[fri_cs@ca$spp %in% aa$spp[aa$matScale==TRUE]]<- "-1"
```

## Data analysis- raising

Analysis by stock

```r
for (i in 1:dim(sel_spe)[1]) {


 STK<- sel_spe$SPECIES[i]

 fri_cs1<- subset(fri_cs, year%in% seq(sel_spe$START_YEAR[i],
                     sel_spe$END_YEAR[i],by=1),table="ca",link=T)


       # set immature stages as "I"
if (na.omit(unique(fri_cs1@ca$matScale[fri_cs1@ca$spp==STK &
              fri_cs1@ca$area==sel_spe$GSA[i]]))!="1-7") {
  fri_cs1@ca$matStage[fri_cs1@ca$spp==STK & fri_cs1@ca$area==sel_spe$GSA[i] &
                   fri_cs1@ca$matStage %in% imm[i,6:9][!is.na(imm[i, 6:9])]]="I"

} else{ #if "1-7" matScale is used, immature (I)==1
  fri_cs1@ca$matStage[fri_cs1@ca$spp==STK & fri_cs1@ca$area==sel_spe$GSA[i] &
                        fri_cs1@ca$matStage ==1]="I"

}

# sample size

if (sel_spe$SEX[i]=="C"){

    fri_csv <- csDataVal(fri_cs1)

    # get sample size

    nml<- data.frame(fri_cs1@ca) %>% filter(!is.na(matStage)& !is.na(age))%>%
      dplyr::group_by(area,spp,age)%>% summarize(SAMPLE_SIZE=n())


} else {


   fri_cs1=subset(fri_cs1,sex==sel_spe$SEX[i],table="ca",link=T)
  fri_csv <- csDataVal(fri_cs1)
```

```r
  # get sample size
  nml<- data.frame(fri_cs1@ca) %>% filter(!is.na(matStage)& !is.na(age))%>%
    dplyr::group_by(area,spp,age,sex)%>% summarize(SAMPLE_SIZE=n())

}



     fri_csv1<- subSetSpp(fri_csv, STK)
   fri_csv1<- subset(fri_csv1, area%in% sel_spe$GSA[i],table="ca")

  fri_csc1 <- csDataCons(fri_csv1, fri_strD)

  fri_csc1@ca$matStage=as.character(fri_csc1@ca$matStage)


MS_MAT_An<-dbeObject(desc=" Maturity-at-age",species=STK,param="maturity",
                     strataDesc=fri_strD,methodDesc=sel_spe$methodDesc[i],
                     nboot=sel_spe$nboot[i])


if (sel_spe$methodDesc[i]=="bootstrap"){
MS_MAT_An<-bpBoot(MS_MAT_An,fri_csc1,adjust=sel_spe$adjust[i],immature.scale="I")

} else { # analytical
MS_MAT_An<-bpEstim(MS_MAT_An,fri_csc1,adjust=sel_spe$adjust[i],immature.scale="I")
}



dfMA <-
  data.frame(

    COUNTRY =COUNTRY ,
    AREA = unique(MS_MAT_An@ageStruc[["estim"]][["space"]] ),
    START_YEAR = sel_spe$START_YEAR[i] ,
    END_YEAR = sel_spe$END_YEAR[i] ,
    SPECIES = STK ,
    SEX = sel_spe$SEX[i],

    AGECLASS =  as.numeric(as.character(MS_MAT_An@ageStruc[["estim"]][["age"]] )),

    PRM = MS_MAT_An@ageStruc[["estim"]][["value"]] ,
    METHOD_USED = sel_spe$MAT_METHOD[i]

  )

if (sel_spe$SEX[i]=="C"){

dfMA <-  dfMA %>%
```

```
          left_join(nml, by = c("AREA" = 'area', 'SPECIES' = 'spp',
                                "AGECLASS"="age")) %>%   mutate(SPECIES =  sel_spe$SPE[
i])
                                # FAO three alpha code
} else{

  dfMA <-  dfMA %>%
          left_join(nml, by = c("AREA" = 'area', 'SPECIES' = 'spp',
                                 "SEX"="sex","AGECLASS"="age")) %>%
                                 mutate(SPECIES =  sel_spe$SPE[i])
                                  # FAO three alpha code


}

ma.temp2<- bind_rows(ma.temp2,na.omit(dfMA))

}
```

```
## csData subset by species European hake Merluccius merluccius
## New data set consists of 21 trip records
## 74 length records
## and 368 age or maturity records
## csData subset by species Red mullet Mullus barbatus
## New data set consists of 19 trip records
## 28 length records
## and 329 age or maturity records
## csData subset by species Red mullet Mullus barbatus
## New data set consists of 20 trip records
## 33 length records
## and 759 age or maturity records
```

## Output

```
# export DG MARE Med&BS MA table
write.table(format(ma.temp2,digits=3, scientific=F), file=paste("MA.csv",sep=""),
            dec=".",sep=",",col.names=TRUE, row.names=FALSE,na="-1")

head(ma.temp2)
```

```
##    COUNTRY  AREA START_YEAR END_YEAR SPECIES SEX AGECLASS SAMPLE_SIZE
## 1 COUNTRY1 GSA99       9999     9999     HKE   M        0          67
## 2 COUNTRY1 GSA99       9999     9999     HKE   M        1         107
## 3 COUNTRY1 GSA99       9999     9999     HKE   M        2          51
## 4 COUNTRY1 GSA99       9999     9999     HKE   M        3          17
## 5 COUNTRY1 GSA99       9999     9999     MUT   M        0          14
## 6 COUNTRY1 GSA99       9999     9999     MUT   M        1         133
##         PRM     METHOD_USED
## 1 0.4072577 macroscopically
## 2 0.9801666 macroscopically
## 3 1.0000000 macroscopically
## 4 1.0000000 macroscopically
```

```
## 5 1.0000000 macroscopically
## 6 0.9789111 macroscopically
```

## Example of use of the script SRL

This script implements the Calculation of sex ratio at length, required for the DG MARE Med&BS Data Call, using as input file the SDEF format (CS table) and COST as the raising proceedure

## Settings

```
path <- paste("C:\\Users\\Bitetto Isabella\\OneDrive - Coispa Tecnologia & Ricerca S.C.A.R.L\\MARE22\\STREAM\\FINAL REVISION OF DELIVERABLES\\SDEF_to_DG_MARE_MedBS", sep="")

setwd(path)
```

## Input Data

csData of the SDEF format

```
load("fri_cs_test.Rdata")
head( fri_cs@ca)
```

```
##     sampType landCtry vslFlgCtry year    proj trpCode staNum quarter month
## 58         V COUNTRY1   COUNTRY1 9999 PROJECT       3    999       1     2
## 105        V COUNTRY1   COUNTRY1 9999 PROJECT       7    999       1     2
## 106        V COUNTRY1   COUNTRY1 9999 PROJECT       2    999       1     2
## 107        V COUNTRY1   COUNTRY1 9999 PROJECT       6    999       1     2
## 122        V COUNTRY1   COUNTRY1 9999 PROJECT      10    999       1     2
## 127        V COUNTRY1   COUNTRY1 9999 PROJECT       5    999       3     7
##                  spp sex catchCat landCat commCatScl commCat stock  area
## 58  Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 105 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 106 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 107 Mullus barbatus   F      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 122 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 127 Mullus barbatus   F      LAN     HUC       <NA>    <NA>  <NA> GSA99
##     rect subRect lenCls age fishId lenCode ageMeth plusGrp otoWt otoSide
## 58  <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 105 <NA> THR-LIM     90   0      1      mm    <NA>    <NA>    NA    <NA>
## 106 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 107 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 122 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 127 <NA> THR-LIM    180   3      1      mm    <NA>    <NA>    NA    <NA>
##     indWt matMeth matScale matStage
## 58  18.00    <NA>   MEDITS        2
## 105 11.10    <NA>   MEDITS        1
## 106 13.80    <NA>   MEDITS        1
## 107 17.30    <NA>   MEDITS        2
## 122 17.76    <NA>   MEDITS        2
## 127 68.12    <NA>   MEDITS        4
```

```
# extract COUNTRY
COUNTRY<-unique(fri_cs@ca$landCtry)
```

stratification: spatial only

```
fri_strD <- strIni(spaceStrata="area")
```

DG MARE Med&BS SRL Table template

```
srl.temp2<- read.table("xxx_SRL.csv",sep=",",header=T)

names(srl.temp2)

## [1] "COUNTRY"     "AREA"        "START_YEAR"  "END_YEAR"    "SPECIES"
## [6] "LENGTHCLASS" "UNIT"        "SEX_RATIO"   "COMMENTS"
```

Auxilliary table: species_BIO_SRL.csv

```
# species file : selected species with FAO three alpha code

sel_spe<-read.table( "species_BIO_SRL.csv", header=TRUE, sep=";",row.names=NULL)

head(sel_spe)

##                 SPECIES SPE   GSA START_YEAR END_YEAR methodDesc nboot
## 1 Merluccius merluccius HKE GSA99       9999     9999 analytical     .
## 2       Mullus barbatus MUT GSA99       9999     9999  bootstrap    10
##   COMMENTS
## 1       NA
## 2       NA
```

## Checking data

Check if there are stocks with no age data and impute "-1", otherwise the bpEstim() method for sex ratio at length gives error :

```
# get col w. all=NA by spp
aa<- fri_cs@ca %>% group_by(spp) %>% summarize_all(~all(is.na(.)))

aa$spp[aa$age==FALSE] # spp with age data

## [1] "Merluccius merluccius" "Mullus barbatus"

# impute "-1" if a stock has no age data
fri_cs@ca$age[fri_cs@ca$spp %in% aa$spp[aa$age==TRUE]]<- -1
```

## Data analysis- raising

Analysis by stock

```
for (i in 1:dim(sel_spe)[1]) {

  STK<- sel_spe$SPECIES[i]
```

```
    fri_cs1<- subset(fri_cs, year%in% seq(sel_spe$START_YEAR[i],
                     sel_spe$END_YEAR[i],by=1),table="ca",link=T)

# Validate- consolidate
fri_csv <- csDataVal(fri_cs1)
fri_csc<- csDataCons(fri_csv, fri_strD)

  fri_csc1<- subset(fri_csc, space==sel_spe$GSA[i],table="ca")

MS_SEX_An<-dbeObject(desc="SEX-ratio",species=STK,param="sex",
                     strataDesc=fri_strD,methodDesc=sel_spe$methodDesc[i],
                     nboot=sel_spe$nboot[i])


if (sel_spe$methodDesc[i]=="bootstrap"){
MS_SEX_An<-bpBoot(MS_SEX_An,fri_csc1,adjust=F)
} else {
MS_SEX_An<-bpEstim(MS_SEX_An,fri_csc1,adjust=F)
}

dfSRL <-
  data.frame(

    COUNTRY = COUNTRY ,
    AREA = MS_SEX_An@lenStruc[["estim"]][["space"]] ,
     START_YEAR = sel_spe$START_YEAR[i] ,
    END_YEAR = sel_spe$END_YEAR[i] ,
    SPECIES = STK ,

   UNIT = unique(fri_cs@ca$lenCode[fri_cs@ca$spp==STK]) ,
    LENGTHCLASS =  as.character(MS_SEX_An@lenStruc[["estim"]][["length"]] ),

    SEX_RATIO = MS_SEX_An@lenStruc[["estim"]][["value"]],
    COMMENTS = sel_spe$COMMENTS[i]
  )

dfSRL<-dfSRL %>% mutate(SPECIES=sel_spe$SPE[match(STK,sel_spe$SPECIES)])

dfSRL <- dfSRL[complete.cases(dfSRL[ , -which(names(dfSRL) %in% c("COMMENTS"))]),]

srl.temp2=bind_rows(srl.temp2,dfSRL)


}
```

## Output

```
# export DG MARE Med&BS SRL table
write.table(format(srl.temp2,digits=3, scientific=F),
```

```
        file="SRL.csv",dec=".",sep=",",col.names=TRUE,row.names=FALSE,na="-1")

head(srl.temp2)

##    COUNTRY  AREA START_YEAR END_YEAR SPECIES LENGTHCLASS UNIT  SEX_RATIO
## 1 COUNTRY1 GSA99       9999     9999     HKE          80   mm 1.00000000
## 2 COUNTRY1 GSA99       9999     9999     HKE          90   mm 0.00000000
## 3 COUNTRY1 GSA99       9999     9999     HKE         100   mm 0.00000000
## 4 COUNTRY1 GSA99       9999     9999     HKE         110   mm 0.21428571
## 5 COUNTRY1 GSA99       9999     9999     HKE         120   mm 0.08695652
## 6 COUNTRY1 GSA99       9999     9999     HKE         130   mm 0.40000000
##   COMMENTS
## 1       NA
## 2       NA
## 3       NA
## 4       NA
## 5       NA
## 6       NA
```

## Example of use of the script SRA

This script implements the Calculation of sex ratio at age, required for the DG MARE Med&BS Data Call, using as input file the SDEF format (CS table) and COST as the raising proceedure

## Settings

```
path <- paste("C:\\Users\\Bitetto Isabella\\OneDrive - Coispa Tecnologia & Ricerca S.C.A.R.L\\MARE22\\STREAM\\FINAL REVISION OF DELIVERABLES\\SDEF_to_DG_MARE_MedBS", sep="")

setwd(path)
```

## Input Data

csData of the SDEF format

```
load("fri_cs_test.Rdata")

head( fri_cs@ca)

##     sampType landCtry vslFlgCtry year    proj trpCode staNum quarter month
## 58         V COUNTRY1   COUNTRY1 9999 PROJECT       3    999       1     2
## 105        V COUNTRY1   COUNTRY1 9999 PROJECT       7    999       1     2
## 106        V COUNTRY1   COUNTRY1 9999 PROJECT       2    999       1     2
## 107        V COUNTRY1   COUNTRY1 9999 PROJECT       6    999       1     2
## 122        V COUNTRY1   COUNTRY1 9999 PROJECT      10    999       1     2
## 127        V COUNTRY1   COUNTRY1 9999 PROJECT       5    999       3     7
##                  spp sex catchCat landCat commCatScl commCat stock  area
## 58  Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 105 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 106 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
```

```
## 107 Mullus barbatus   F      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 122 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 127 Mullus barbatus   F      LAN     HUC       <NA>    <NA>  <NA> GSA99
##     rect subRect lenCls age fishId lenCode ageMeth plusGrp otoWt otoSide
## 58  <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 105 <NA> THR-LIM     90   0      1      mm    <NA>    <NA>    NA    <NA>
## 106 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 107 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 122 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 127 <NA> THR-LIM    180   3      1      mm    <NA>    <NA>    NA    <NA>
##     indWt matMeth matScale matStage
## 58  18.00    <NA>   MEDITS        2
## 105 11.10    <NA>   MEDITS        1
## 106 13.80    <NA>   MEDITS        1
## 107 17.30    <NA>   MEDITS        2
## 122 17.76    <NA>   MEDITS        2
## 127 68.12    <NA>   MEDITS        4
```

```
# extract COUNTRY
COUNTRY<-unique(fri_cs@ca$landCtry)
```

stratification: spatial only

```
fri_strD <- strIni(spaceStrata="area")
```

DG MARE Med&BS SRA Table template

```
sra.temp2<- read.table("xxx_SRA.csv",sep=",",header=T)

names(sra.temp2)
```

```
## [1] "COUNTRY"    "AREA"       "START_YEAR" "END_YEAR"   "SPECIES"
## [6] "AGECLASS"   "SEX_RATIO"  "COMMENTS"
```

Auxilliary table: species_BIO_SRA.csv

```
# species file : selected species with FAO three alpha code

sel_spe<-read.table( "species_BIO_SRA.csv", header=TRUE, sep=";",row.names=NULL)

head(sel_spe)
```

```
##                 SPECIES SPE   GSA START_YEAR END_YEAR COMMENTS methodDesc
## 1 Merluccius merluccius HKE GSA99       9999     9999       NA analytical
## 2       Mullus barbatus MUT GSA99       9999     9999       NA  bootstrap
##   nboot adjust
## 1     .  FALSE
## 2    10  FALSE
```

## Data analysis- raising

Analysis by stock

```r
for (i in 1:dim(sel_spe)[1]) {

  STK<- sel_spe$SPECIES[i]

    fri_cs1<- subset(fri_cs, year%in% seq(sel_spe$START_YEAR[i],
                                          sel_spe$END_YEAR[i],by=1),table="ca",lin
k=T)

# Validate- consolidate
fri_csv <- csDataVal(fri_cs1)
fri_csc<- csDataCons(fri_csv, fri_strD)

  fri_csc1<- subset(fri_csc, space==sel_spe$GSA[i],table="ca")

MS_SEX_An<-dbeObject(desc="SEX-ratio",species=STK,param="sex",
                     strataDesc=fri_strD,methodDesc=sel_spe$methodDesc[i],
                     nboot=sel_spe$nboot[i])


if (sel_spe$methodDesc[i]=="bootstrap"){
MS_SEX_An<-bpBoot(MS_SEX_An,fri_csc1,adjust=sel_spe$adjust[i])
} else {
MS_SEX_An<-bpEstim(MS_SEX_An,fri_csc1,adjust=sel_spe$adjust[i])
}

dfSRA <-
  data.frame(

    COUNTRY = COUNTRY ,
    AREA = MS_SEX_An@ageStruc[["estim"]][["space"]] ,
     START_YEAR = sel_spe$START_YEAR[i] ,
    END_YEAR = sel_spe$END_YEAR[i] ,
    SPECIES = STK ,
    AGECLASS =  MS_SEX_An@ageStruc[["estim"]][["age"]] ,
    SEX_RATIO = MS_SEX_An@ageStruc[["estim"]][["value"]],
    COMMENTS = sel_spe$COMMENTS[i]
  )


dfSRA<-dfSRA %>% mutate(SPECIES=sel_spe$SPE[match(STK,sel_spe$SPECIES)])

dfSRA <- dfSRA[complete.cases(dfSRA[, -which(names(dfSRA) %in% c("COMMENTS"))]),]

dfSRA$AGECLASS <- as.numeric(as.character(dfSRA$AGECLASS))

sra.temp2=bind_rows(sra.temp2, dfSRA)


}
```

## Output

```
# export DG MARE Med&BS SRA table
write.table(format(sra.temp2,digits=3, scientific=F),
            file="SRA.csv",dec=".",sep=",",col.names=TRUE,
            row.names=FALSE,na="-1")

head(sra.temp2)
```

```
##    COUNTRY  AREA START_YEAR END_YEAR SPECIES AGECLASS SEX_RATIO COMMENTS
## 1 COUNTRY1 GSA99       9999     9999     HKE        0 0.4765625       NA
## 2 COUNTRY1 GSA99       9999     9999     HKE        1 0.6310345       NA
## 3 COUNTRY1 GSA99       9999     9999     HKE        2 0.6871166       NA
## 4 COUNTRY1 GSA99       9999     9999     HKE        3 0.8172043       NA
## 5 COUNTRY1 GSA99       9999     9999     HKE        4 0.9493671       NA
## 6 COUNTRY1 GSA99       9999     9999     HKE        5 0.9454545       NA
```

## Example of use of the script ALK

This script implements the Calculation of the age length key, required for the DG MARE Med&BS Data Call, using as input file the SDEF format (CS table) and COST as the raising procedure
Additional methods exist for filling in the potential gaps for length classes

## Settings

```
path <- paste("C:\\Users\\Bitetto Isabella\\OneDrive - Coispa Tecnologia & Ricerca S.C.A.R.L\\MARE22\\STREAM\\FINAL REVISION OF DELIVERABLES\\SDEF_to_DG_MARE_MedBS", sep="")

setwd(path)
```

## Input Data

csData of the SDEF format

```
load("fri_cs_test.Rdata")
head( fri_cs@ca)
```

```
##     sampType landCtry vslFlgCtry year    proj trpCode staNum quarter month
## 58         V COUNTRY1   COUNTRY1 9999 PROJECT       3    999       1     2
## 105        V COUNTRY1   COUNTRY1 9999 PROJECT       7    999       1     2
## 106        V COUNTRY1   COUNTRY1 9999 PROJECT       2    999       1     2
## 107        V COUNTRY1   COUNTRY1 9999 PROJECT       6    999       1     2
## 122        V COUNTRY1   COUNTRY1 9999 PROJECT      10    999       1     2
## 127        V COUNTRY1   COUNTRY1 9999 PROJECT       5    999       3     7
##                  spp sex catchCat landCat commCatScl commCat stock  area
## 58  Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 105 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 106 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 107 Mullus barbatus   F      LAN     HUC       <NA>    <NA>  <NA> GSA99
## 122 Mullus barbatus   M      LAN     HUC       <NA>    <NA>  <NA> GSA99
```

```
## 127 Mullus barbatus   F      LAN     HUC       <NA>    <NA>  <NA> GSA99
##     rect subRect lenCls age fishId lenCode ageMeth plusGrp otoWt otoSide
## 58  <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 105 <NA> THR-LIM     90   0      1      mm    <NA>    <NA>    NA    <NA>
## 106 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 107 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 122 <NA> THR-LIM    110   0      1      mm    <NA>    <NA>    NA    <NA>
## 127 <NA> THR-LIM    180   3      1      mm    <NA>    <NA>    NA    <NA>
##     indWt matMeth matScale matStage
## 58  18.00    <NA>   MEDITS        2
## 105 11.10    <NA>   MEDITS        1
## 106 13.80    <NA>   MEDITS        1
## 107 17.30    <NA>   MEDITS        2
## 122 17.76    <NA>   MEDITS        2
## 127 68.12    <NA>   MEDITS        4

# extract COUNTRY
COUNTRY<-unique(fri_cs@ca$landCtry)
```

stratification: spatial only

```
fri_strD <- strIni(spaceStrata="area")
```

DG MARE Med&BS ALK Table template

```
alk.temp2<- read.table("xxx_ALK.csv",sep=",",header=T)
head(alk.temp2)

##   [1] COUNTRY
##   [2] AREA
##   [3] START_YEAR
##   [4] END_YEAR
##   [5] SPECON
##   [6] SPECIES
##   [7] SEX
##   [8] APPLY_TO_CATCHES_FILE
##   [9] TOTAL_NUMBER_OF_HARD_STRUCTURE_READ_BY_AGE
##  [10] CV
##  [11] UNIT
##  [12] AGE
##  [13] LENGTHCLASS0
##  [14] LENGTHCLASS1
##  [15] LENGTHCLASS2
##  [16] LENGTHCLASS3
##  [17] LENGTHCLASS4
##  [18] LENGTHCLASS5
##  [19] LENGTHCLASS6
##  [20] LENGTHCLASS7
##  [21] LENGTHCLASS8
##  [22] LENGTHCLASS9
##  [23] LENGTHCLASS10
##  [24] LENGTHCLASS11
```

```
##  [25] LENGTHCLASS12
##  [26] LENGTHCLASS13
##  [27] LENGTHCLASS14
##  [28] LENGTHCLASS15
##  [29] LENGTHCLASS16
##  [30] LENGTHCLASS17
##  [31] LENGTHCLASS18
##  [32] LENGTHCLASS19
##  [33] LENGTHCLASS20
##  [34] LENGTHCLASS21
##  [35] LENGTHCLASS22
##  [36] LENGTHCLASS23
##  [37] LENGTHCLASS24
##  [38] LENGTHCLASS25
##  [39] LENGTHCLASS26
##  [40] LENGTHCLASS27
##  [41] LENGTHCLASS28
##  [42] LENGTHCLASS29
##  [43] LENGTHCLASS30
##  [44] LENGTHCLASS31
##  [45] LENGTHCLASS32
##  [46] LENGTHCLASS33
##  [47] LENGTHCLASS34
##  [48] LENGTHCLASS35
##  [49] LENGTHCLASS36
##  [50] LENGTHCLASS37
##  [51] LENGTHCLASS38
##  [52] LENGTHCLASS39
##  [53] LENGTHCLASS40
##  [54] LENGTHCLASS41
##  [55] LENGTHCLASS42
##  [56] LENGTHCLASS43
##  [57] LENGTHCLASS44
##  [58] LENGTHCLASS45
##  [59] LENGTHCLASS46
##  [60] LENGTHCLASS47
##  [61] LENGTHCLASS48
##  [62] LENGTHCLASS49
##  [63] LENGTHCLASS50
##  [64] LENGTHCLASS51
##  [65] LENGTHCLASS52
##  [66] LENGTHCLASS53
##  [67] LENGTHCLASS54
##  [68] LENGTHCLASS55
##  [69] LENGTHCLASS56
##  [70] LENGTHCLASS57
##  [71] LENGTHCLASS58
##  [72] LENGTHCLASS59
##  [73] LENGTHCLASS60
##  [74] LENGTHCLASS61
##  [75] LENGTHCLASS62
```

```
##  [76] LENGTHCLASS63
##  [77] LENGTHCLASS64
##  [78] LENGTHCLASS65
##  [79] LENGTHCLASS66
##  [80] LENGTHCLASS67
##  [81] LENGTHCLASS68
##  [82] LENGTHCLASS69
##  [83] LENGTHCLASS70
##  [84] LENGTHCLASS71
##  [85] LENGTHCLASS72
##  [86] LENGTHCLASS73
##  [87] LENGTHCLASS74
##  [88] LENGTHCLASS75
##  [89] LENGTHCLASS76
##  [90] LENGTHCLASS77
##  [91] LENGTHCLASS78
##  [92] LENGTHCLASS79
##  [93] LENGTHCLASS80
##  [94] LENGTHCLASS81
##  [95] LENGTHCLASS82
##  [96] LENGTHCLASS83
##  [97] LENGTHCLASS84
##  [98] LENGTHCLASS85
##  [99] LENGTHCLASS86
## [100] LENGTHCLASS87
## [101] LENGTHCLASS88
## [102] LENGTHCLASS89
## [103] LENGTHCLASS90
## [104] LENGTHCLASS91
## [105] LENGTHCLASS92
## [106] LENGTHCLASS93
## [107] LENGTHCLASS94
## [108] LENGTHCLASS95
## [109] LENGTHCLASS96
## [110] LENGTHCLASS97
## [111] LENGTHCLASS98
## [112] LENGTHCLASS99
## [113] LENGTHCLASS100_PLUS
## [114] COMMENTS
## <0 rows> (or 0-length row.names)
```

Auxiliary table: species_BIO_ALK.csv

```
# species file : selected species with FAO three alpha code

sel_spe<-read.table( "species_BIO_ALK.csv", header=TRUE, sep=";",row.names=NULL)

head(sel_spe)
```

```
##                 SPECIES SPE   GSA SEX START_YEAR END_YEAR LC_RANGE
## 1 Merluccius merluccius HKE GSA99   C       9999     9999       10
## 2       Mullus barbatus MUT GSA99 F_M       9999     9999       10
```

```
##   APPLY_TO_CATCHES_FILE  typeALK valueALK methodDesc_LAN.len.age adjust
## 1                     Y stepIncr       10             analytical   TRUE
## 2                     N stepIncr       10             analytical  FALSE
##   SPECON COMMENTS
## 1     NA       NA
## 2     NA       NA
```

```
sel_spe<- sel_spe %>%
  mutate(SEX = strsplit(as.character(SEX), "_")) %>%
  unnest(SEX)
```

## Data analysis- raising

Analysis by stock

```
for (i in 1:dim(sel_spe)[1]) {

  STK<- sel_spe$SPECIES[i]

  fri_cs1<- subset(fri_cs, year%in% seq(sel_spe$START_YEAR[i],
                   sel_spe$END_YEAR[i],by=1),table="ca",link=T)

  #  estimate sample size (number of otoliths per stock, sex and age)
  if (sel_spe$SEX[i]=="C"){

    fri_csv <- csDataVal(fri_cs1)

    nml<- data.frame(fri_cs1@ca) %>% filter(!is.na(age))%>%
      dplyr::group_by(area,spp,age)%>%
      summarize(TOTAL_NUMBER_OF_HARD_STRUCTURE_READ_BY_AGE=n())

  } else { # ALK for selected sex

    fri_cs1=subset(fri_cs1,sex==sel_spe$SEX[i],table="ca",link=T)
    fri_csv <- csDataVal(fri_cs1)

    # get sample size: number of otoliths
    nml<- data.frame(fri_cs1@ca) %>% filter(!is.na(age))%>%
      dplyr::group_by(area,spp,age,sex)%>%
      summarize(TOTAL_NUMBER_OF_HARD_STRUCTURE_READ_BY_AGE=n())

  }


  fri_csv1<- subSetSpp(fri_csv, STK)
  fri_csv1<- subset(fri_csv1, area%in% sel_spe$GSA[i],table="ca",link=T)
  fri_csc1 <- csDataCons(fri_csv1, fri_strD)

  ## ### CV from individual length-at-age
LEstim_An <-
```

```
dbeObject(
desc = "Length at age",
species = STK,
catchCat = "LAN",
param = "length",
strataDesc = fri_strD, # ,
methodDesc = "analytical"   #sel_spe$methodDesc_LAN.len.age[i]
)


if(sel_spe$methodDesc_LAN.len.age[i]=="analytical") {
LEstim_An <-  bpEstim(LEstim_An, fri_csc1, adjust = sel_spe$adjust[i])

} else{
LEstim_An <-  bpBoot(LEstim_An, fri_csc1, adjust = sel_spe$adjust[i])

}


## ALK

  res1 <- alkLgthRec(fri_csc1,type=sel_spe$typeALK[i],value=sel_spe$valueALK[i],
                     update=F, preview=F,postview = F)

  if (sel_spe$typeALK[i]=="fillALKmult"){
    fri_csc2 <- fillALKmult(fri_csc1,STK,p=10,trace=T)
    res1 <- alkLgthRec(fri_csc2,update=F, preview=F,postview = F,
                       value=sel_spe$valueALK[i])
  }

  dfALK <-
    data.frame(
      COUNTRY =COUNTRY ,
      AREA =sel_spe$GSA[i],
      START_YEAR = unique(sel_spe$START_YEAR[i]) ,
      END_YEAR = unique( sel_spe$END_YEAR[i]) ,
      SPECIES = STK ,
      SEX = sel_spe$SEX[i],
      UNIT = unique(fri_cs1@ca$lenCode[fri_cs1@ca$spp==STK]) ,
      SPECON=  -1,
      APPLY_TO_CATCHES_FILE= unique( sel_spe$APPLY_TO_CATCHES_FILE[i]),
      CV=NA,
      AGE = as.numeric(colnames(res1$alk)),
      COMMENTS= sel_spe$COMMENTS[i],
         LENGTHCLASS100_PLUS=0
    )

  # get sample size

  if (sel_spe$SEX[i]=="C"){
```

```
    dfALK <-  dfALK %>%
      left_join(nml, by = c("AREA" = 'area', 'SPECIES' = 'spp',"AGE"="age")) %>%
      mutate(SPECIES =  sel_spe$SPE[i])
    # FAO Three alpha code
  } else{

    dfALK <-  dfALK %>%
      left_join(nml, by = c("AREA" = 'area', 'SPECIES' = 'spp',"AGE"="age",
                            "SEX"="sex")) %>%
      mutate(SPECIES =  sel_spe$SPE[i])
    # FAO Three alpha code

  }


  aa=data.frame(res1$alk)
  names(aa)=colnames(res1$alk)

    aa=aa%>% mutate(LC=rownames(res1$alk))

    ## fix LC
   UNIT <- as.character( unique(fri_csc1@ca$lenCode[fri_csc1@ca$spp==STK]) )

 if (UNIT %in% c("mm", "MM")& sel_spe$LC_RANGE[i]==10) {
 aa$LC<-as.numeric(aa$LC)/10
 UNIT1<-"cm"
 }

  if (UNIT %in% c("mm", "MM") & sel_spe$LC_RANGE[i]==1) {
 aa$LC<-as.numeric(aa$LC)
 UNIT1<- "mm"
  }

   if (UNIT %in% c("mm", "MM")& sel_spe$LC_RANGE[i]==5) {
 aa$LC<-as.numeric(aa$LC)/10
 UNIT1<-"cm"
  }

   if (UNIT %in% c("cm", "CM") ) {
 aa$LC<-as.numeric(aa$LC)
 UNIT1<- "cm"
  }

   aa$LC<- plyr::round_any( aa$LC,1,floor)
###

  dfALK$UNIT<-UNIT1

  aa1=aa %>%  gather(age, n.at.len, -LC)
```

```r
  aa1 <- as.data.table(aa1)

  seq_l <-  seq(0, max(aa$LC,na.rm = T), by = 1) #
  dt1<- aa1[, list(LC = seq_l), by = age]


  dt2<- left_join(dt1,aa1)

   dt3 <- data.table::dcast(dt2,as.formula(paste(paste(names(dt2)[! names(dt2)
                      %in% c("LC","n.at.len")], collapse='+'), "LC", sep="~")),
                      value.var = "n.at.len")

   dt3$age=as.numeric(dt3$age)


  dt3<- dt3 %>% mutate_at(vars( -(age) ),
          funs( if_else( is.na(.), 0, .) ) )

  dfALK<-left_join(dfALK,dt3,by=c("AGE"="age"))

  ## CV
 # LEstim_An @ageNum$ cv

  LEstim_An@ageNum[["cv"]]$age=as.numeric(LEstim_An@ageNum[["cv"]]$age)

   dfALK<- dfALK%>% left_join(LEstim_An@ageNum[["cv"]]%>% select(age,value),
                by=c( "AGE"="age"))%>% mutate(CV=value)%>% select(-c(value))

  # take care of number of Length classes (max is 100 acc. to DG MARE Med&BS templ
ate)
  zz<-dim(dfALK[-c(1:14)])[2]
  names(dfALK)[-c(1:14)]<- paste("LENGTHCLASS",seq(0,zz-1,1),sep="")


  if(zz>=100){
    dfALK$LENGTHCLASS100_PLUS<- rowSums(dfALK[,-c(1:114)])
  }

   dfALK<-dfALK%>% select(one_of(as.vector(names(alk.temp2))))

  alk.temp2<- bind_rows(alk.temp2,(dfALK))

 alk.temp2[,-c(1:13,114)][is.na(alk.temp2[,-c(1:13,114)])] <- 0


  # export updated CsDataCons

  if (sel_spe$APPLY_TO_CATCHES_FILE[i] == "Y") {
```

```
    if (sel_spe$typeALK[i] == "fillALKmult") {
      fri_csc2 <- fillALKmult(fri_csc1, STK, p = 10, trace = T)

      save(fri_csc2,
           file = paste("upd", STK, sel_spe$SEX[i], sel_spe$GSA[i], ".Rdata", sep
="_"))

    } else{
      res1 <-
        alkLgthRec(
          fri_csc1,
          type = sel_spe$typeALK[i],
          value = sel_spe$valueALK[i],
          update = T,
          preview = F,
          postview = F
        )

      save(res1,
           file = paste("upd", STK, sel_spe$SEX[i], sel_spe$GSA[i], ".Rdata", sep
=
                        "_"))
    }

  }

}
```

```
## csData subset by species European hake Merluccius merluccius
## New data set consists of 197 trip records
## 6573 length records
## and 23481 age or maturity records
## csData subset by species Red mullet Mullus barbatus
## New data set consists of 20 trip records
## 33 length records
## and 759 age or maturity records
## csData subset by species Red mullet Mullus barbatus
## New data set consists of 19 trip records
## 28 length records
## and 329 age or maturity records
```

## Output

```
# export DG MARE Med&BS ALK table
write.table(format(alk.temp2,digits=3, scientific=F),
    file="ALK.csv",dec=".",sep=",",col.names=TRUE,
    row.names=FALSE,na="-1")

head(alk.temp2)
```

```
##    COUNTRY  AREA START_YEAR END_YEAR SPECON SPECIES SEX
## 1 COUNTRY1 GSA99       9999     9999     -1     HKE   C
```

```
## 2 COUNTRY1 GSA99       9999     9999     -1     HKE   C
## 3 COUNTRY1 GSA99       9999     9999     -1     HKE   C
## 4 COUNTRY1 GSA99       9999     9999     -1     HKE   C
## 5 COUNTRY1 GSA99       9999     9999     -1     HKE   C
## 6 COUNTRY1 GSA99       9999     9999     -1     HKE   C
##   APPLY_TO_CATCHES_FILE TOTAL_NUMBER_OF_HARD_STRUCTURE_READ_BY_AGE
## 1                     Y                                       337
## 2                     Y                                       293
## 3                     Y                                       165
## 4                     Y                                        94
## 5                     Y                                        79
## 6                     Y                                        55
##            CV UNIT AGE LENGTHCLASS0 LENGTHCLASS1 LENGTHCLASS2 LENGTHCLASS3
## 1          NA   cm   0            0            0           39           40
## 2 0.018500742   cm   1            0            0            0            0
## 3 0.007583819   cm   2            0            0            0            0
## 4 0.007301511   cm   3            0            0            0            0
## 5 0.008633827   cm   4            0            0            0            0
## 6 0.011211429   cm   5            0            0            0            0
##   LENGTHCLASS4 LENGTHCLASS5 LENGTHCLASS6 LENGTHCLASS7 LENGTHCLASS8
## 1           22           23           21           17           18
## 2            0            0            0            0            0
## 3            0            0            0            0            0
## 4            0            0            0            0            0
## 5            0            0            0            0            0
## 6            0            0            0            0            0
##   LENGTHCLASS9 LENGTHCLASS10 LENGTHCLASS11 LENGTHCLASS12 LENGTHCLASS13
## 1           12             6            10             0            12
## 2            0             1             1             0             0
## 3            0             0             0             0             0
## 4            0             0             0             0             0
## 5            0             0             0             0             0
## 6            0             0             0             0             0
##   LENGTHCLASS14 LENGTHCLASS15 LENGTHCLASS16 LENGTHCLASS17 LENGTHCLASS18
## 1             8            12            10             7             6
## 2             9             7             4             9            23
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS19 LENGTHCLASS20 LENGTHCLASS21 LENGTHCLASS22 LENGTHCLASS23
## 1             0             1             0             0             0
## 2            25            38            27            21             0
## 3             0             0             0             1             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS24 LENGTHCLASS25 LENGTHCLASS26 LENGTHCLASS27 LENGTHCLASS28
## 1             0             0             0             0             0
## 2            25            28            28            20            12
## 3             7             3             9            13            10
```

```
## 4              0              0              0              0              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS29 LENGTHCLASS30 LENGTHCLASS31 LENGTHCLASS32 LENGTHCLASS33
## 1              0              0              0              0              0
## 2              5              6              1              3              0
## 3             17             19             17             25             13
## 4              0              0              1              3              0
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS34 LENGTHCLASS35 LENGTHCLASS36 LENGTHCLASS37 LENGTHCLASS38
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0             13              5              2              6
## 4              0              4              7             17              5
## 5              0              0              0              0              0
## 6              0              0              0              0              0
##   LENGTHCLASS39 LENGTHCLASS40 LENGTHCLASS41 LENGTHCLASS42 LENGTHCLASS43
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              3              1              0              1              0
## 4              9              7             10              6              6
## 5              1              1              5              2              2
## 6              0              0              0              1              2
##   LENGTHCLASS44 LENGTHCLASS45 LENGTHCLASS46 LENGTHCLASS47 LENGTHCLASS48
## 1              0              1              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              6              0              3              5              0
## 5              5              0              6              3              7
## 6              0              0              0              1              2
##   LENGTHCLASS49 LENGTHCLASS50 LENGTHCLASS51 LENGTHCLASS52 LENGTHCLASS53
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              1              3              1              0              0
## 5              3              6              5              4              7
## 6              2              1              6              1              3
##   LENGTHCLASS54 LENGTHCLASS55 LENGTHCLASS56 LENGTHCLASS57 LENGTHCLASS58
## 1              0              0             10              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              4              3              0              5              4
## 6              2              5              0              4              1
##   LENGTHCLASS59 LENGTHCLASS60 LENGTHCLASS61 LENGTHCLASS62 LENGTHCLASS63
## 1              0              0              0              0              0
## 2              0              0              0              0              0
## 3              0              0              0              0              0
## 4              0              0              0              0              0
## 5              1              2              1              1              1
```

```
## 6              7              3              5              1              4
##   LENGTHCLASS64 LENGTHCLASS65 LENGTHCLASS66 LENGTHCLASS67 LENGTHCLASS68
## 1             0             0             0            18             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             1             2             0             0             0
##   LENGTHCLASS69 LENGTHCLASS70 LENGTHCLASS71 LENGTHCLASS72 LENGTHCLASS73
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             1             0             0             0
##   LENGTHCLASS74 LENGTHCLASS75 LENGTHCLASS76 LENGTHCLASS77 LENGTHCLASS78
## 1             0             0             0             0            17
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS79 LENGTHCLASS80 LENGTHCLASS81 LENGTHCLASS82 LENGTHCLASS83
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS84 LENGTHCLASS85 LENGTHCLASS86 LENGTHCLASS87 LENGTHCLASS88
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS89 LENGTHCLASS90 LENGTHCLASS91 LENGTHCLASS92 LENGTHCLASS93
## 1            27             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS94 LENGTHCLASS95 LENGTHCLASS96 LENGTHCLASS97 LENGTHCLASS98
## 1             0             0             0             0             0
## 2             0             0             0             0             0
## 3             0             0             0             0             0
## 4             0             0             0             0             0
## 5             0             0             0             0             0
## 6             0             0             0             0             0
##   LENGTHCLASS99 LENGTHCLASS100_PLUS COMMENTS
```

```
## 1              0                     0       NA
## 2              0                     0       NA
## 3              0                     0       NA
## 4              0                     0       NA
## 5              0                     0       NA
## 6              0                     0       NA
```