MyDas

Stock prioritisation

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Choice of stocks and justification

- The wiki has a summary stocks from the original call, however, the actual stocks still have to be chosen. This could be done based on a variety of justifications, e.g. commercial value of the stocks, ecological importance, or based on catch compostion of fleets. Stocks could also be selected based on productivity, i.e. stocks that are low in productivity relative to target species are more likely to be below B_{MSY}. Alternatively stocks could be selected based on susceptibility, i.e. are there found in the same area as the fishing metiers/fleets/gears.
- Preparation of data:

```
library(DBI)
```

```
## Warning: package 'DBI' was built under R version 3.3.2
```

```
library(RPostgreSQL)
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 3.3.2
```

```
library(plyr)
library(reshape)
library(maptools)
```

```
## Warning: package 'maptools' was built under R version 3.3.2
```

```
## Warning: package 'sp' was built under R version 3.3.2
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.3.2
```

```
library(ggrepel)
```

```
## Warning: package 'ggrepel' was built under R version 3.3.2
```

```
library(RColorBrewer)
options(scipen = 999)


drv  = dbDriver("PostgreSQL")

con  = dbConnect(drv, host = 'postgresql-seascope.csffkpr9jjjn.eu-west-2.rds.amazonaws.com',
                 dbname='mydasDev',
                 port = 5432,
                 user = 'MydasApplication',
                 password = 'gmit2017!')

stecf            = dbGetQuery(con,"SELECT * FROM data_stecflandings")
land2016         = subset(stecf, year %in% c(2008:2016))
```

```
#remove area 4bc etc
land2016$flag    = ifelse(land2016$species %in% "LIN" & land2016$latitude <57.5 & land2016$area %in% "4
land2016         = subset(land2016, flag==0)
land2016         = subset(land2016, !(area %in% "6B RFMO"))
area             = dbGetQuery(con,"SELECT * FROM div_area")

#ices division isnt broken down by division in North sea
land2016$division = ifelse(land2016$area %in% "4", "4A", land2016$division)
#convert in order to join and sum with landings
area$division     = ifelse(area$division %in% c("12A","12B","12C"), "12",
                    ifelse(area$division %in% c("14A","14B"), "14", area$division))
#areas not in euro zone so remove
area              = subset(area, !(area_27 %in% c("8.d.1","7.k.1","7.c.1","6.b.1","7.j.1")))

totarea           = ddply(area, .(division), summarise, totareakm=sum(area_km2))

allareas          = inner_join(land2016, totarea)

allland           = ddply(allareas, .(year, country, gear, mesh, stock, speciesgp, length), summarise,
allland           = subset(allland, totland >0)
alllandarea       = ddply(allareas, .(year, country, gear, mesh, stock, speciesgp, length,  ices_rectang
allareatot        = ddply(alllandarea, .(year, country, gear, mesh, stock, speciesgp, length), summarise
combi             = inner_join(allland, allareatot)

divarea           = ddply(allareas, .(stock, division), summarise, area=unique(totareakm))
allstockarea      = ddply(divarea, .(stock), summarise, stockarea=sum(area))

overlap           = inner_join(combi, allstockarea)
overlap$olap_percent   = (overlap$totfleetarea/overlap$stockarea)*100


catch             = dbGetQuery(con,"SELECT * FROM data_stecf_aer_cpuedays")
catch$price       = catch$totval/catch$totctch
price_sum         = ddply(catch, .(year, speciesgp), summarise, price=mean(price))

overlap           = inner_join(price_sum, overlap)
```

- Susceptibility

```
#horizontal overlap categories 3 highest 1 lowest
overlap$score_olap = ifelse(overlap$olap_percent >30, 3,
                     ifelse(overlap$olap_percent >10 & overlap$olap_percent <30, 2,
                     ifelse(overlap$olap_percent <10, 1,  0)))
#price scoring ategories 3 highest 1 lowest
overlap$score_price = ifelse(overlap$price >1.25, 3,
                      ifelse(overlap$price >0.8 & overlap$price <1.25, 2,
                      ifelse(overlap$price <0.8, 1,  0)))

#catchability groupings 3 high, 2 medium 1 low
overlap$score_catch = ifelse(overlap$gear %in% c("BEAM") & overlap$speciesgp %in% c("BLL","TUR","GUG","S
                      ifelse(overlap$gear %in% c("OTTER") & overlap$speciesgp %in% c("BLL","TUR", "SKA",
                      ifelse(overlap$gear %in% c("OTTER") & overlap$speciesgp %in% c("GUG"),2,
                      ifelse(overlap$gear %in% c("GILL") & overlap$speciesgp %in% c("POK","POL"), 3,
                      ifelse(overlap$gear %in% c("GILL") & overlap$speciesgp %in% c("LIN", "TUR"), 2,
```

```
                    ifelse(overlap$gear %in% c("LONGLINE") & overlap$speciesgp %in% c("LIN"), 3,
                    ifelse(overlap$gear %in% c("LONGLINE") & overlap$speciesgp %in% c("POL"), 2,
                    ifelse(overlap$gear %in% c("PEL_TRAWL") & overlap$speciesgp %in% c("SPR"), 3,
                    ifelse(overlap$gear %in% c("GILL") & overlap$speciesgp %in% c("POK","POL"), 3, 1)))


#Determination of susceptibility scores, adopted from Hobday et al. (2011)
#Evidence of post-capture release and survival =1, discarded but survivorship unknown =2, majority dead
overlap$score_postc = ifelse(overlap$speciesgp %in% c("SKA", "POK"), 1,
                    ifelse(overlap$speciesgp %in% c("BLL","TUR","POL", "LIN", "JOD"), 2,  3))

#calculate susceptibility

overlap$S          = (((overlap$score_postc*overlap$score_olap*overlap$score_price*overlap$score_catch)
```

- Productivity

```
# 3 low productivity 1 high productivity
#< 5 years 5-15 years > 15 years
overlap$tm_score    = ifelse(overlap$speciesgp %in% c("GUG", "POL", "POK", "TUR", "BLL", "SPR", "JOD"),
                      ifelse(overlap$speciesgp %in% c("SKA","LIN"), 2, 3))
#> 20,000 eggs per year 100 - 20,000 eggs per year < 100 eggs per year
overlap$fec_score   = ifelse(overlap$speciesgp %in% c("SKA"), 3,
                      ifelse(overlap$speciesgp %in% c("SPR"), 2, 1))
#Broadcast spawner Demersal egg layer Live bearer
overlap$repro_score = ifelse(overlap$speciesgp %in% c("SKA"), 2, 1)
#< 2.75 2.75 - 3.25 > 3.25
overlap$troph_score = ifelse(overlap$speciesgp %in% c("SPR"), 2, 3)
#< 40 cm 40-200 cm > 200 cm
overlap$lmat_score  = ifelse(overlap$speciesgp %in% c("SPR", "BLL", "JOD", "GUG"), 1, 2)
#< 100 cm 100-300 cm > 300 cm
overlap$linf_score  = ifelse(overlap$speciesgp %in% c("SPR", "BLL", "JOD", "GUG", "TUR", "POL"), 1, 2)
#calculate productivity
overlap$P           = ((overlap$tm_score+overlap$fec_score+overlap$repro_score+overlap$troph_score+overl
```

[link]http://www.montereybayaquarium.org/-/m/C3EE8C68DA2A47B18A64BE6DBA72F76F.pdf

- Vulnerability

```
overlap$V           = sqrt(overlap$P^2 + overlap$S^2)
```

- Ranking index giving equal Weight to the mean Value of landings and vulnerability

```
overlap$speciesgp   = tolower(overlap$speciesgp)
overlap$value       = overlap$price*overlap$totland*1000
```

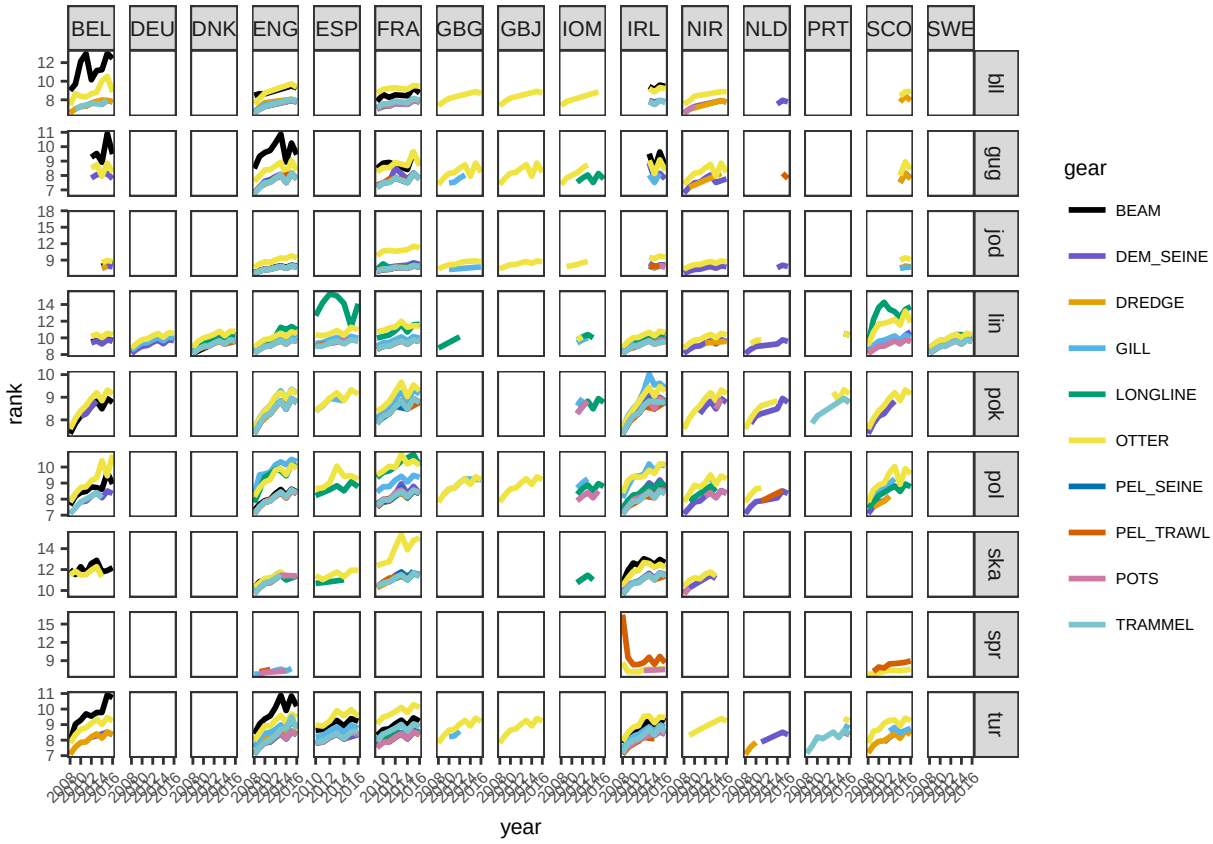
- Additive combination (ranking variable = scaled landings Value + scaled vulnerability) results in linear equal ranking lines over Value and vulnerability.

```
meanvals      = ddply(overlap, .(year,country,gear, stock, mesh, length), summarise, mnval=mean(value))
totvals       = ddply(meanvals, .(year), summarise, sdval=sd(mnval))
getv          = inner_join(totvals, meanvals)
getv          = na.omit(getv)
allv          = inner_join(overlap, getv)
getvW         = ddply(allv, .(year), summarise, sdwV= sd(V))
allvs         = inner_join(getvW, allv)
```

```
allvs$rank = (allvs$mnval/allvs$sdval)+(allvs$V/allvs$sdwV)
rnkspc     =  ddply(allvs, .(year,country,gear, speciesgp), summarise, rank = mean(rank, na.rm=T), val=
```

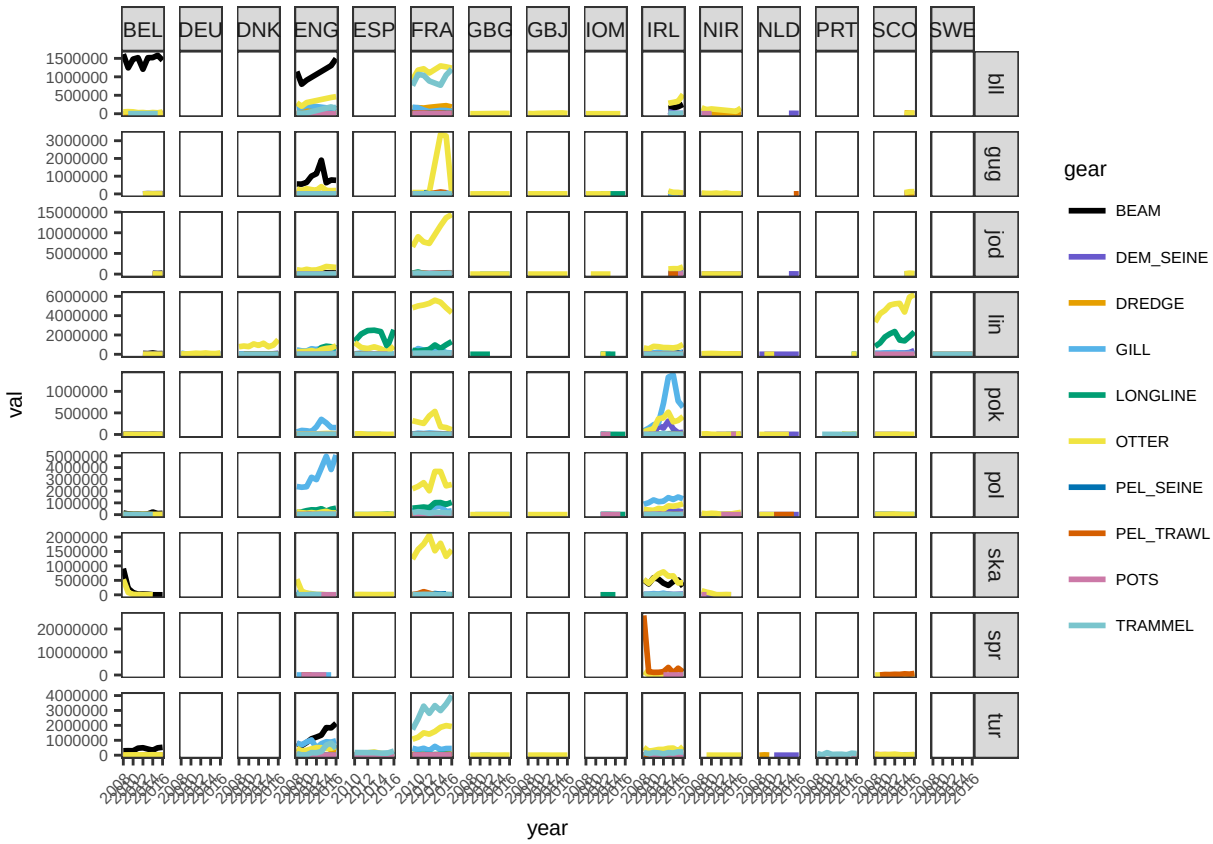
- Plot of ranking of variables by country, stock and gear

```
ggplot(subset(rnkspc, !(gear %in% "NONE")) , aes(year, rank, group=gear, colour=gear)) + geom_line(size=
  theme( text = element_text(size=8), strip.text.x = element_text(size = 8),strip.text.y = element_text
         panel.grid.major = element_blank(), panel.grid.minor = element_blank(), axis.text.x = element_
```



- Plot of value (€) of variables by country, stock and gear

```
ggplot(subset(rnkspc, !(gear %in% "NONE")) , aes(year, val, group=gear, colour=gear)) + geom_line(size=
  theme( text = element_text(size=8), strip.text.x = element_text(size = 8),strip.text.y = element_text
         panel.grid.major = element_blank(), panel.grid.minor = element_blank(), axis.text.x = element_
```


BEL
DEU
DNK
ENG
ESP
FRA
GBG
GBJ
IOM
IRL
NIR
NLD
PRT
SCO
SWE
bll
gug
jod
lin
pok
pol
ska
spr
tur
val
year
gear
BEAM
DEM_SEINE
DREDGE
GILL
LONGLINE
OTTER
PEL_SEINE
PEL_TRAWL
POTS
TRAMMEL