Preliminary analysis of the Patagonian toothfish fishing data of the Del Cano Rise SIOFA

Delegation of the European Union

Sarralde R[1], Massiot-Granier F[2], Selles J[2], Soeffker M[3]

[1] *Instituto Español de Oceanografía, Centro Oceanográfico de Canarias, Vía Espaldón Dársena Pesquera PCL8, 38180 SC de Tenerife, Spain.*

[2] *Laboratoire de Biologie des Organismes et des Ecosystèmes Aquatiques (BOREA), Museum national d'Histoire naturelle, 43 rue Cuvier 75005 Paris, France.*

[3] *Centre for Environment, Fisheries & Aquaculture Science, Lowestoft NR33 0HT, United Kingdom*

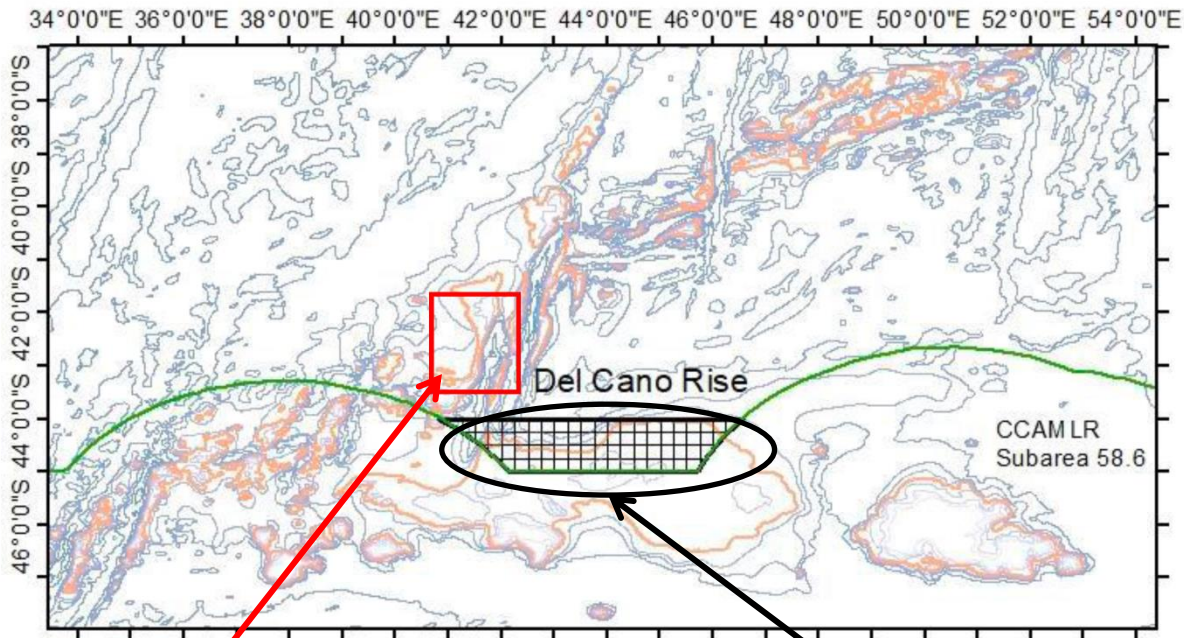*5th Meeting of the Southern Indian Ocean Fisheries Agreement (SIOFA) Scientific Committee*

Area outside the study area- South of the West Indian Ridge: **9**% of the remaining catch

The red block has not been included in the analysis because of the geographical discontinuity
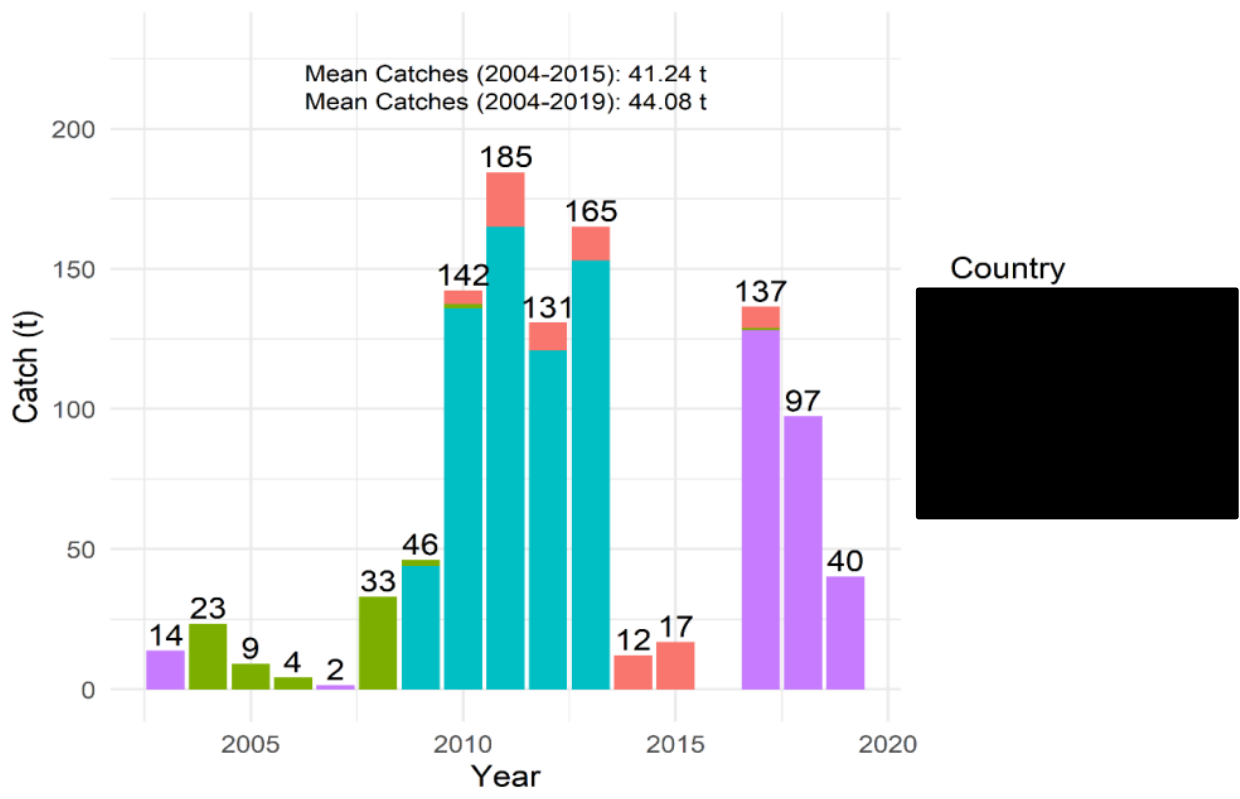
Area of study, gridded in black- Del Cano area: **91**% of the total toothfish catch within the 51.7 area

Mean Catches (2004-2015): 41.24 t
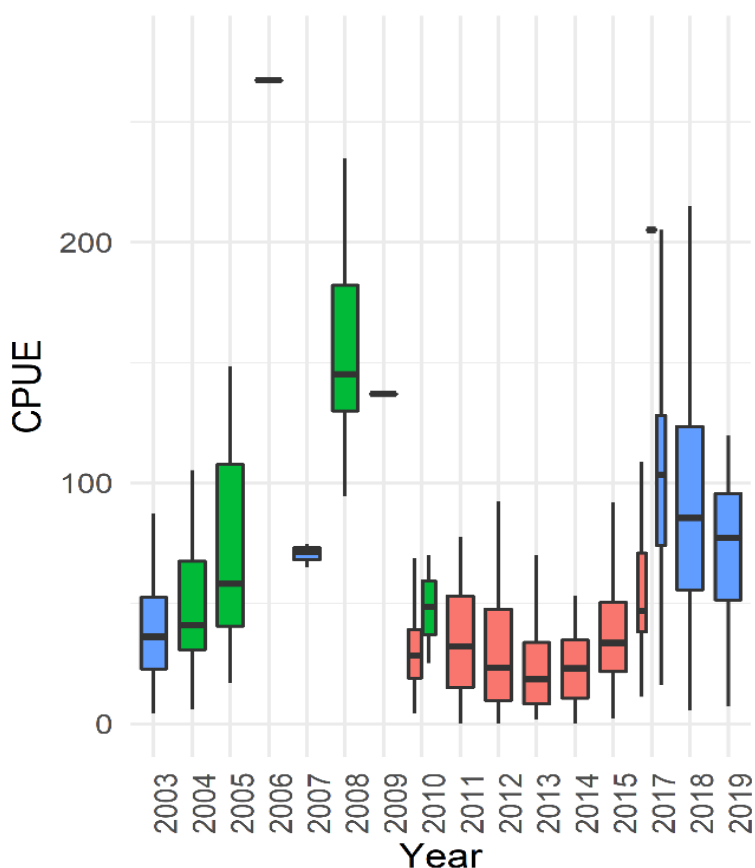Mean Catches (2004-2019): 44.08 t

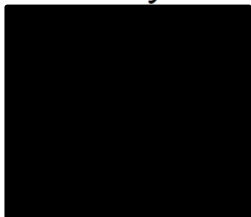Fishing data were collected by vessels flagged to four countries: Spain, France, Japan, and Korea.

Data available are relatively heterogeneous in quantity and quality, especially data collected before 2010

CONTEXT

Annual CPUE ranges from 23 to 267 kg/1000 hooks, with the highest CPUE in 2006, 2008 and 2009 and the lowest in 2013, 2014 and 2015

The French CPUE is significantly lower than the Spanish or Japanese vessels, WHY?
- temporal changes in the availability of the resource?
- differences in fishing strategies between countries?

Objective : provide a better understanding of the impact of these fisheries and the two events of higher fishing effort on the Del Cano Rise Patagonian toothfish stock.

1. Develop preliminary proxies of fish biomass based on depletion analysis;

2. Explore temporal trends of fish biomass based on CPUE standardization and data poor modeling approach.

1. DEPLETION ANALYSIS

A depletion approach has been explored with data from Spanish vessels from 2017 to 2019. French fleet data from 2010 to 2017 has been further used as an additional depletion indicator in some small areas
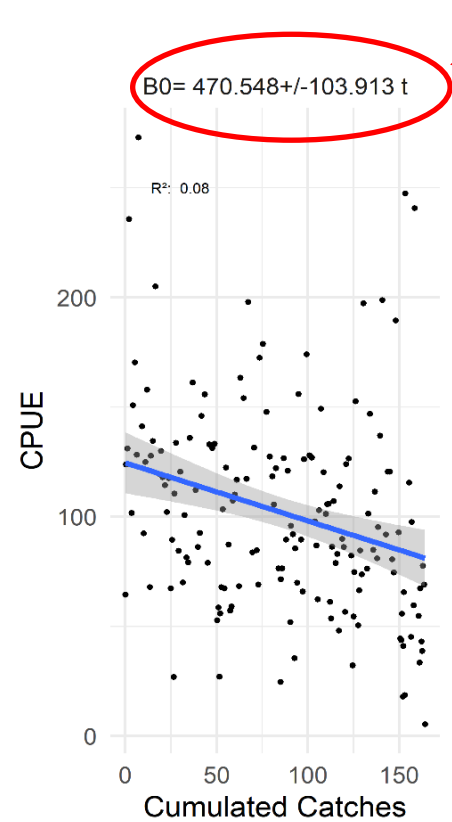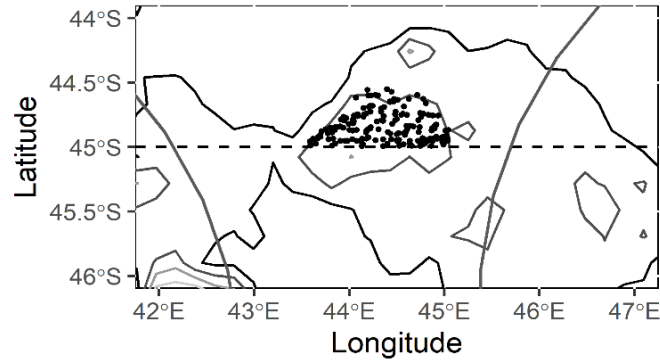
B_0 by the end of 2017

B0= 470.548+/-103.913 t

R^2: 0.08

CPUE data from 2019 shows that the population in the area did not recover to its 2017 level (less than 64 kg/1000 hooks on average), suggesting that with the given fishing effort, at this location the stock may need more than a year to return to pre-exploitation levels.
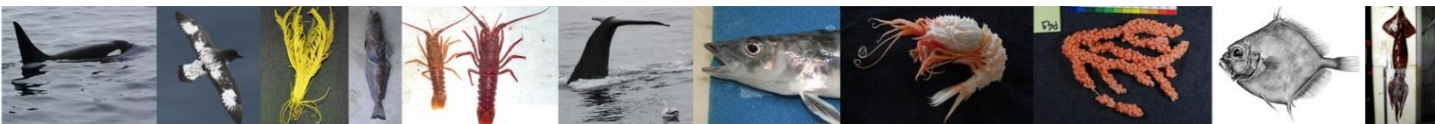
Local depletion series

| Subarea	Year	Number of vessels in depletion area	Number of vessels used in depletion area	Fishable area (km²)	Mean depth (m)	Initial CPUE (kg/1000 hooks)	Patagonian toothfish initial density estimates (kg/km²)
A22	2013	1 French vessel Potential Korean vessels (unconfirmed)	1	371	1175	55.0	8.5
A22	2017-18	2 Spanish vessels	1	659	1240	64.5	223.0
A32	2014	1 French vessel	1	562	1364	34.8	6.1
A32	2015	2 French vessels	1	340	1318	29.1	19.0
A32	2017-18	1 French vessel 1 Spanish vessel	1	785	1373	123.8	225.0
B	2011	1 French vessel Potential Korean vessels (unconfirmed)	1	454	1621	215.3	10.9
A12	2017-18	1 Spanish vessel	1	377	1350	133.2	182.0
C	2018	1 Spanish vessel	1	292	1657	195.8	279.0

Concurrent fishing of French and Korean vessels in the period 2009 - 2013 in the area???

Due to the large variability of the densities with depletion analyses , estimates of fish densities and pristine abundances are not likely to be accurate without specific sampling design.

2. CPUE STANDARDIZATION

Two periods of decrease/ concurrent with the largest catches in the area (Korean data were not included in the CPUE standardisation)
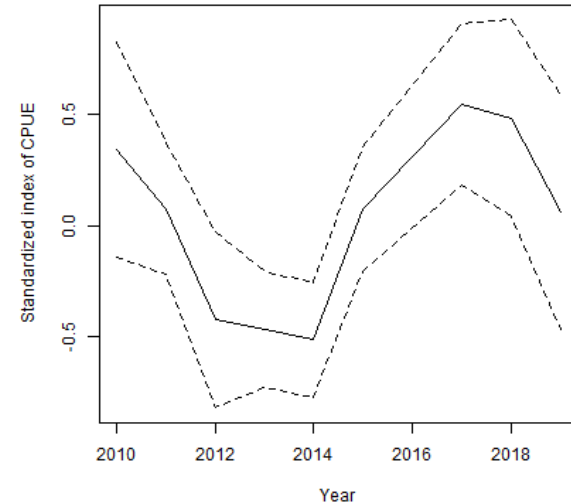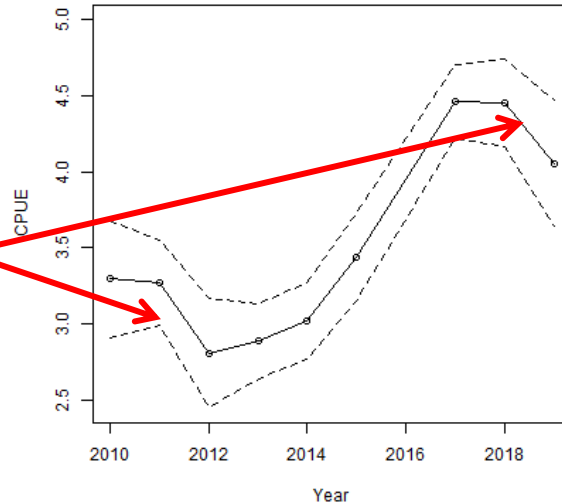
CPUE kg/1000 hooks (left) and standardized index of CPUE scaled to a geometric mean of 1 (right).

▪ It has not been possible to estimate a vessel effect due to the lack of spatio-temporal overlap in fishing distribution;

▪ Only part of the catches taken in this region had associated effort data at the needed spatio-temporal scale
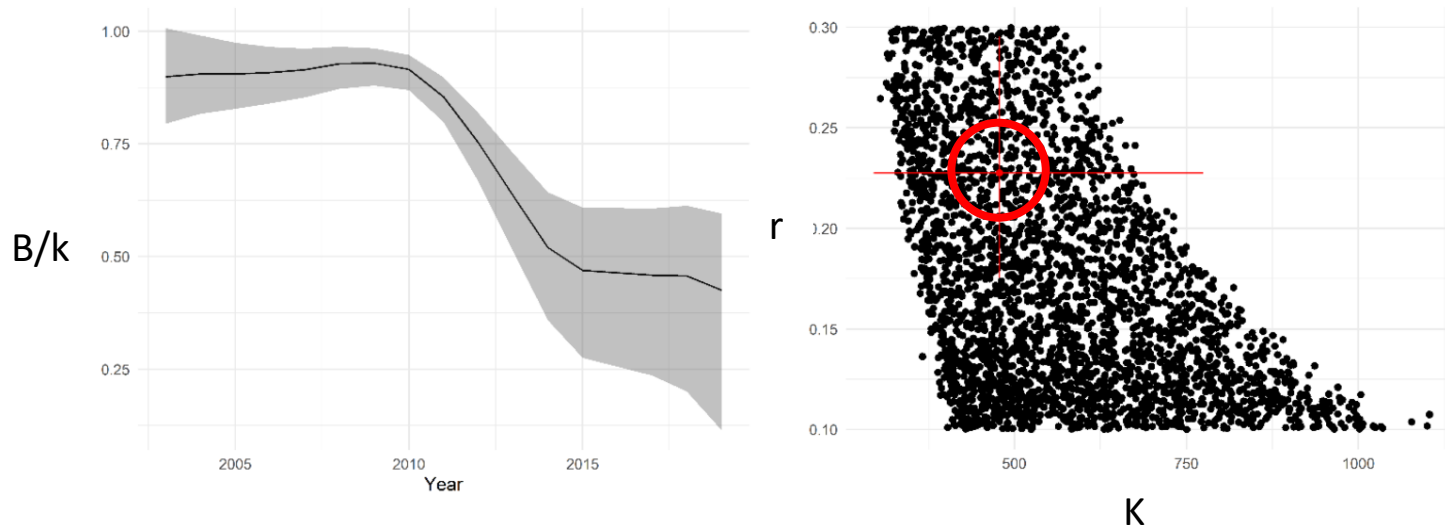
Combined effect of soak time and fishing depth by country shows important discrepancies in the CPUE relationship

2. DATA POOR ASSESSMENT MODELS

Two approaches but in an early stage. More development and data are needed in order to estimate sustainable catch limits
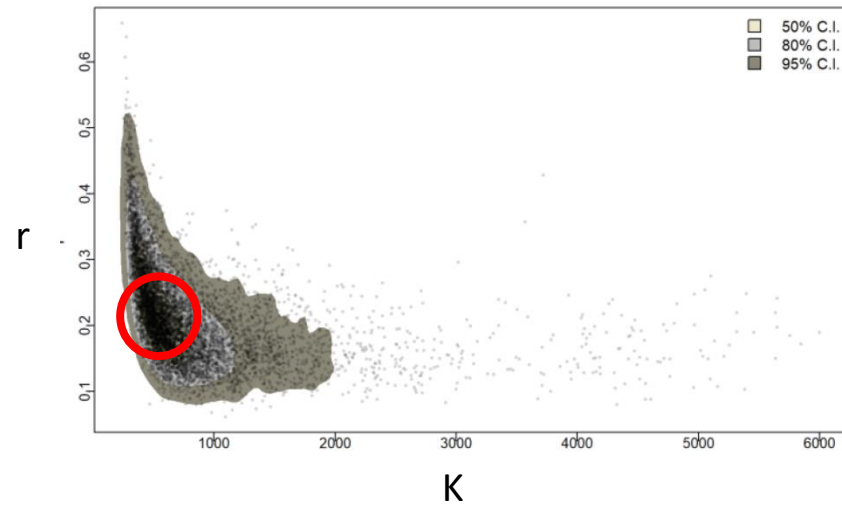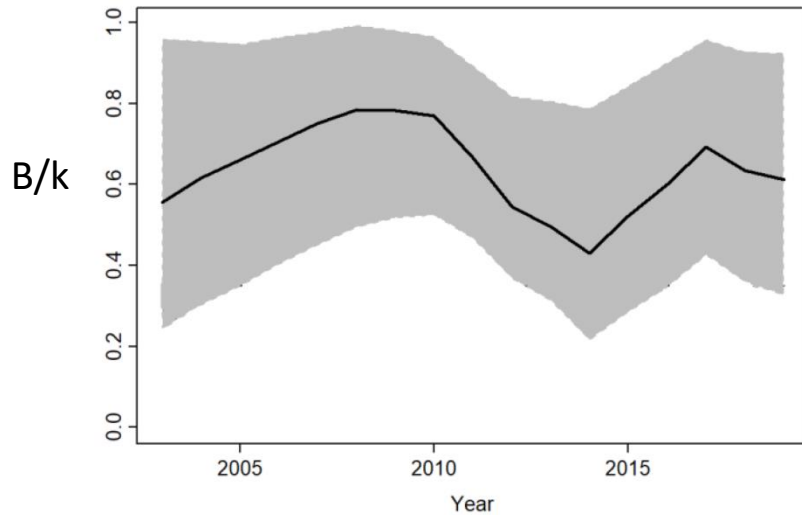
CMSY model – only catch data

CMSY predictions of relative biomass B/K (bold curve) from 2003 to 2019 with 2.5th and 95th percentiles (left), and viable r-k pairs for Del Cano Rise toothfish (right) considering that 91.1% of the Korean catches occurred in the Del Cano SIOFA area.

JABBA model – catch data and CPUE based abundance index

JABBA estimates of relative biomass B/K (bold curve) with 2.5th and 95th percentiles (left from 2003 to 2019), and posterior distributions of r-k pairs for Del Cano Rise toothfish (right) considering that 91.1% of the Korean catches occurred in the Del Cano SIOFA area.

Both data-poor modelling approaches show that the local biomass of toothfish responded to the exerted fishing effort.

Preliminary analysis suggest that had this level of fishing pressure been maintained over a longer time period, the stock would likely have decreased beyond the point of recovery

CONCLUSION

- Data from the past 17 years but different level of information detail and aggregation (improved in recent years with the development of standardized data collection templates)

- Two events of higher fishing effort in the Del Cano SIOFA area that impacted the CPUE and the estimated stock status (2009-2013 and 2017-2019)

- At the 2019 SIOFA Meeting of the Parties (MoP), a regional catch limit in the Del Cano area of 55 tonnes was adopted, with reference to the average catches from 2003 to 2015 but does not, to date, have agreed on biomass reference points or management targets for Patagonian toothfish

- Neighbouring CCAMLR convention area with integrated assessment based in tag-recapture when possible, or through a CPUE over a seabed area methodology on poor data areas.

- Recommendation from the MoP in 2019 was that by its meeting in 2022 latest, the SC should be able to provide advice and recommendations on biologically appropriate catch limits for toothfish populations in SIOFA.

RECOMMANDATIONS

To provide sounds recommendations on biologically appropriate catch limits and be able to assess the local toothfish stock and its relation to adjacent areas, we therefore recommend

1. The spread of fishing effort spatially and stratified across depth over as large a range as possible for the Del Cano region to obtain the information necessary to determine the potential for this fishery, avoid over-concentration of catch and effort, and attain representative toothfish biological data for biomass estimation and population characteristics

2. The update of the longline observer data template to include a record sheet for tag releases on toothfish

3. The development of a longer-term fishery-based research plan for the Del Cano region