

Photo : NFM

WKMSYSPICT2
benchmark (09-
13/01/2023):
North sea Striped red
mullet -
mur.27.3a47d

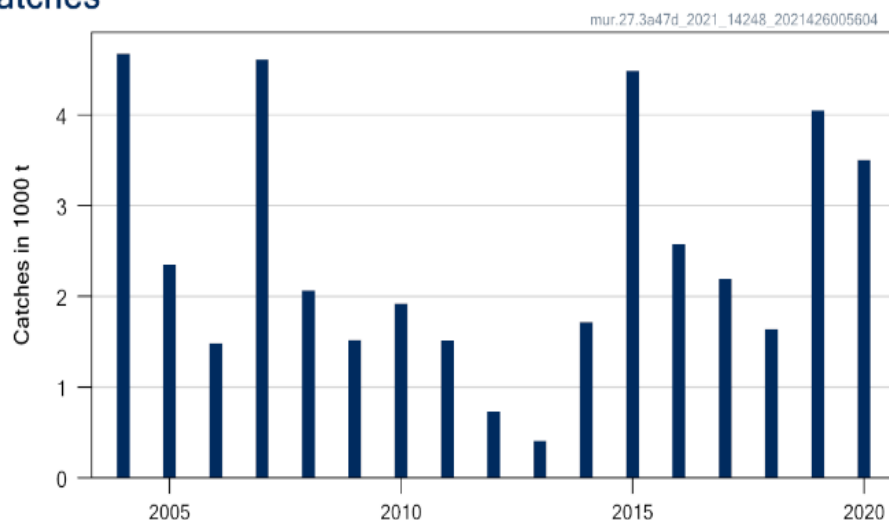
BACKGROUND

Previous to 2021 assessment based on biomass trend from age based model a4a as an ICES category 3 stock.

Last Advice 2021 (no advice in 2019): biennial advice

Downgraded the stock in 2021 to ICES category 5:

Catches



- Lack of age and length sampling
- Issue with CGFS survey (7d)
- Issue with age based model a4a

Management:

- No TAC, no MCRS

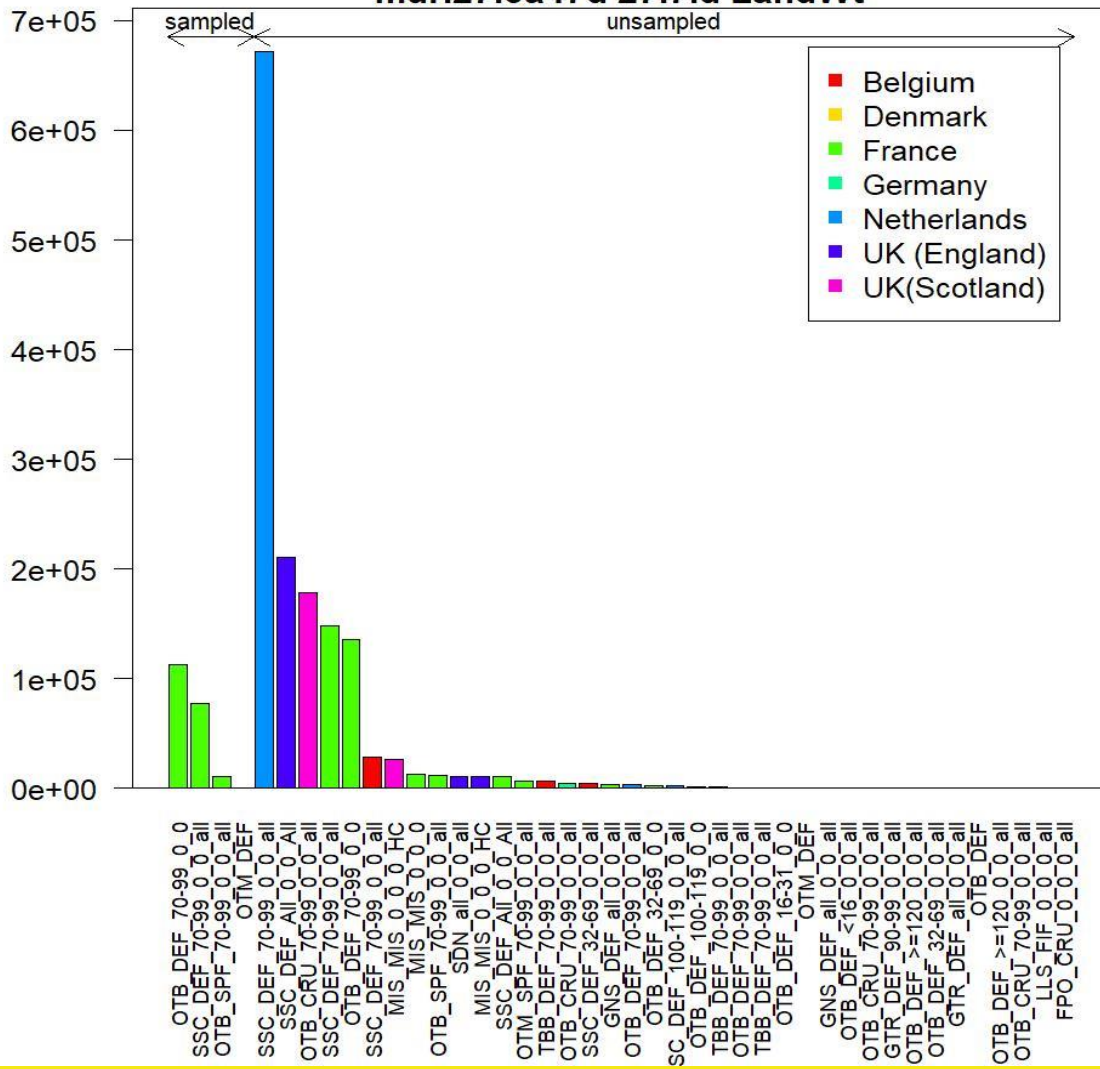
Average catch (2004–2020)	2438 tonnes	
Discard rate	Negligible	
Precautionary buffer	Applied	0.8
Catch advice *	1950 tonnes	
Landings corresponding to the catch advice	1950 tonnes	

* Average catch (2004–2020) × precautionary buffer

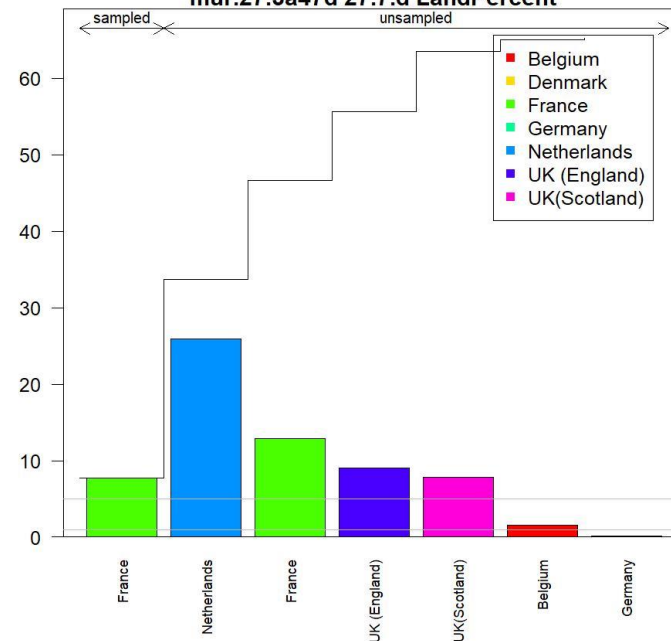
Assessment issues

- Low sampling coverage for age data from around 40% of total landings in 2014 to 8% in 2021 mostly in 7d from French Fleets

mur.27.3a47d 27.7.d LandWt

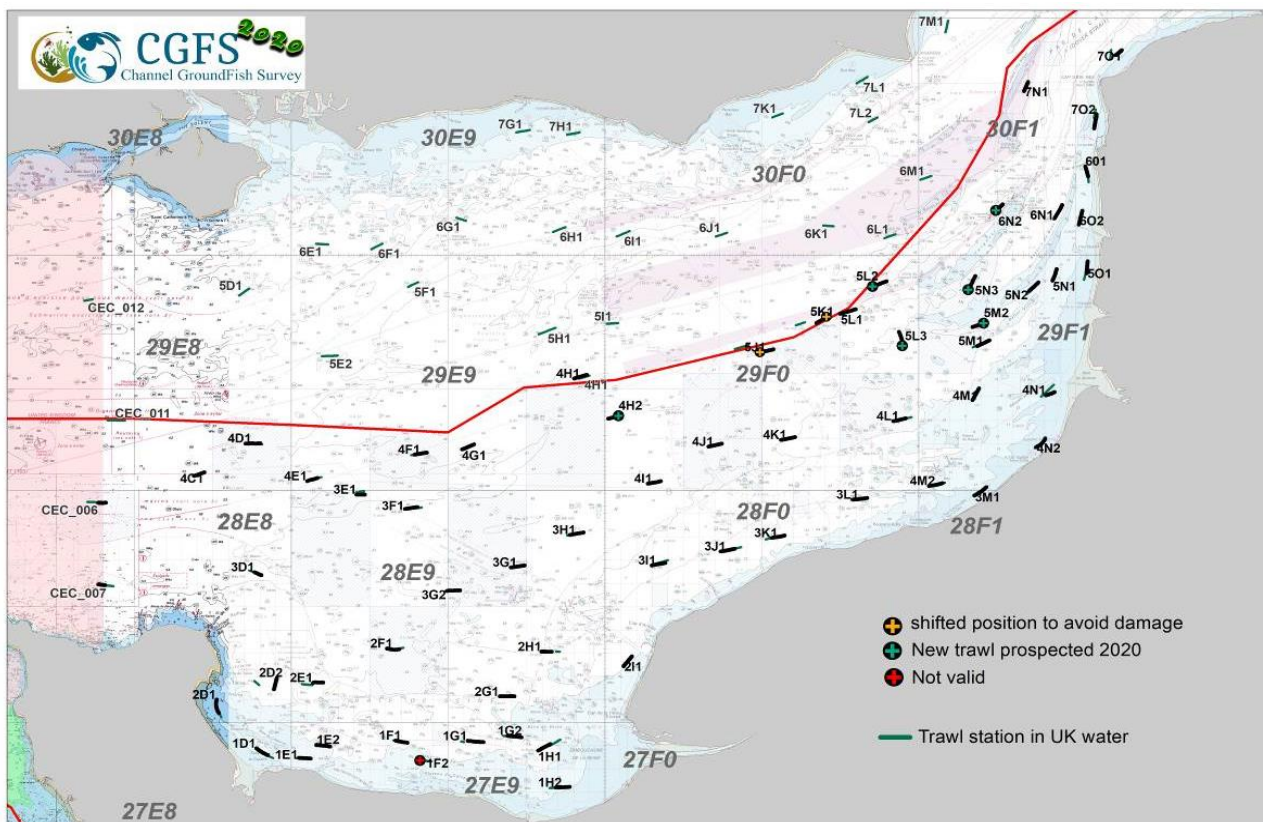


mur.27.3a47d 27.7.d LandPercent



Assessment issues

- During 2020 and 2021 assessment, unrealistic Harvest rate produced by a4a (tried to explore new a4a formulation)
- Issues with CGFS index at age calculation and sampling in 2020 (UK EEZ not covered)



WKMSYSPiCT2 main ToRs

1. Collate necessary data and information for the application of the surplus production model SPiCT
 - Official and ICES Landings
 - Age and length frequency data
 - Exploitable biomass indices (IBTS Q1 & 3, BTS Q3, CGFS Q4 surveys)
 - Review biological parameters

2. Review the available data and make recommendations on most appropriate series to be used
 - Try to combine Q3 and 4 surveys

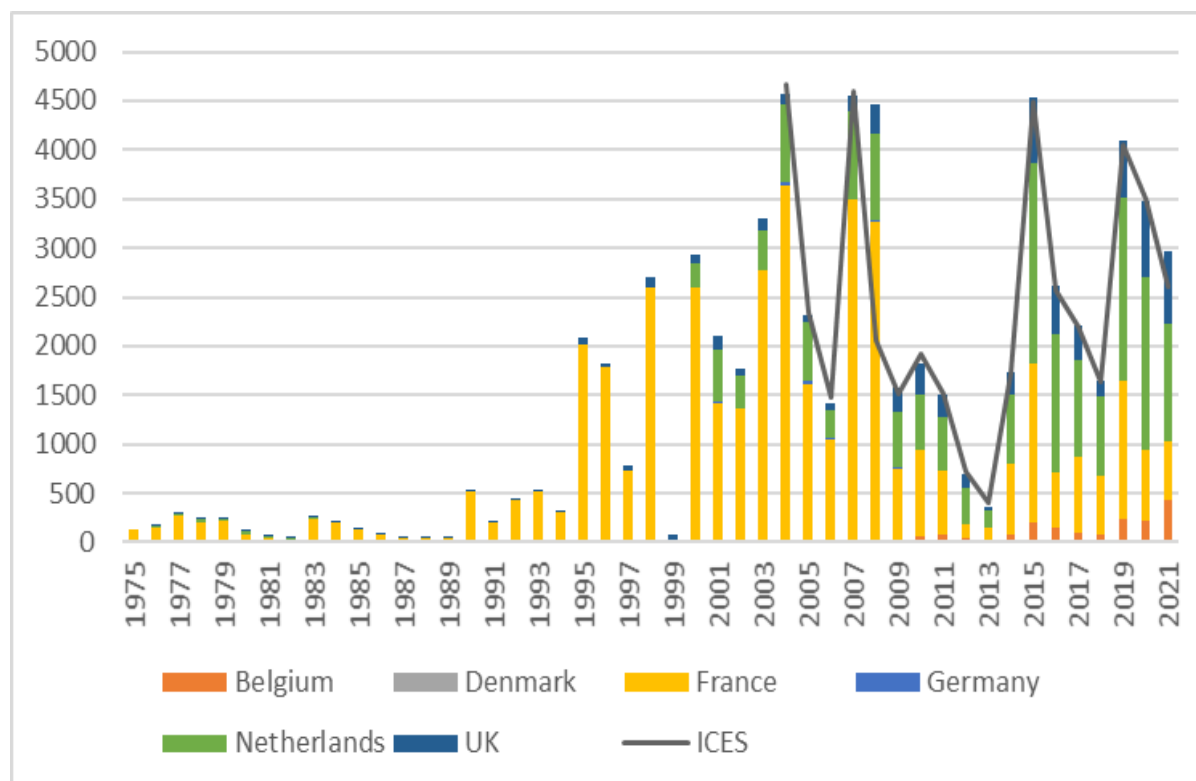
3. Apply the SPiCT methodology and determine the appropriateness of the data and the methodology to determine stock status
 - Test model from 1991-2021 and 2004-2021

4. For stocks where the methodology is appropriate, determine the methods to derive the parameters for the catch forecast using the harvest control rule for providing MSY advice using SPiCT

Available data: SPiCT

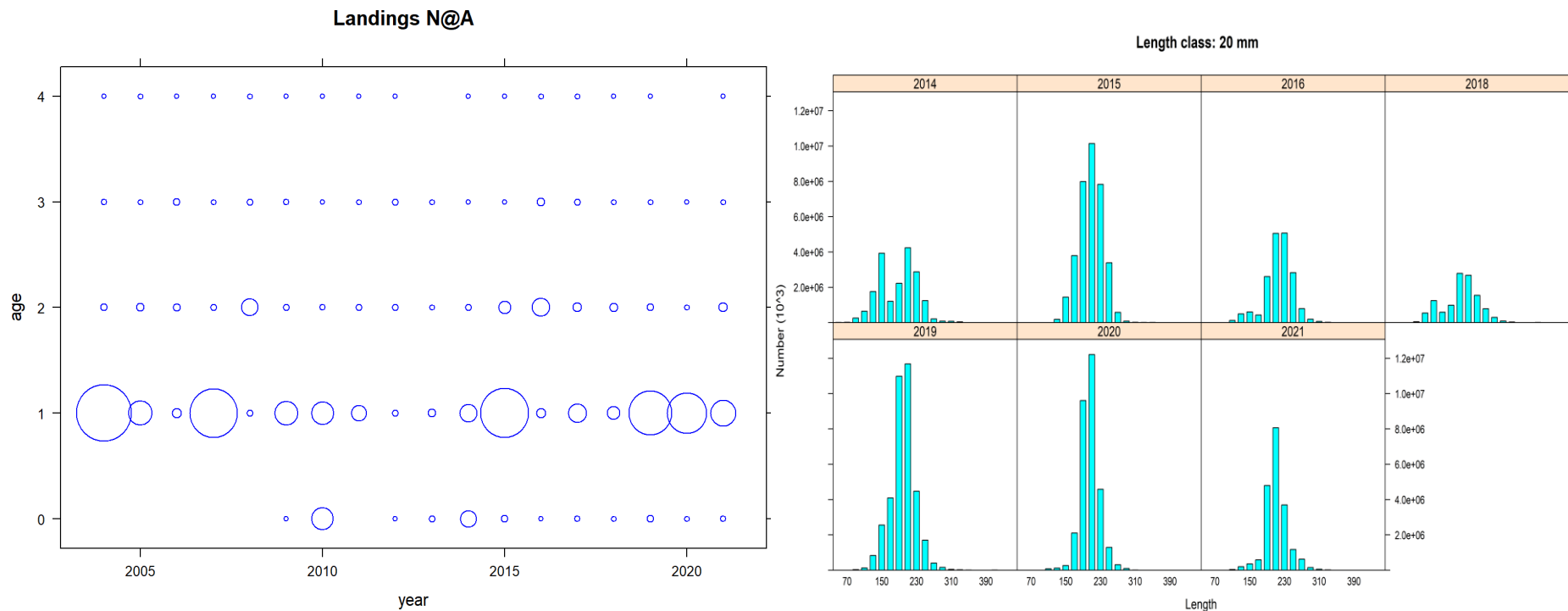
Catch:

- Age structured landings from 2004-onwards from ICES InterCatch
- Length structured landings from 2014-onwards in ICES InterCatch
- Discards information available but considered negligible and not processed in ICES InterCatch
- Official Landings from 1958-onwards (mostly France before 2000, before 1990 only few)
- Lack of French data in 1999



Available data: SPiCT

- Age and length frequencies: Mostly age 1 in landings



Available data: SPiCT

Survey data:

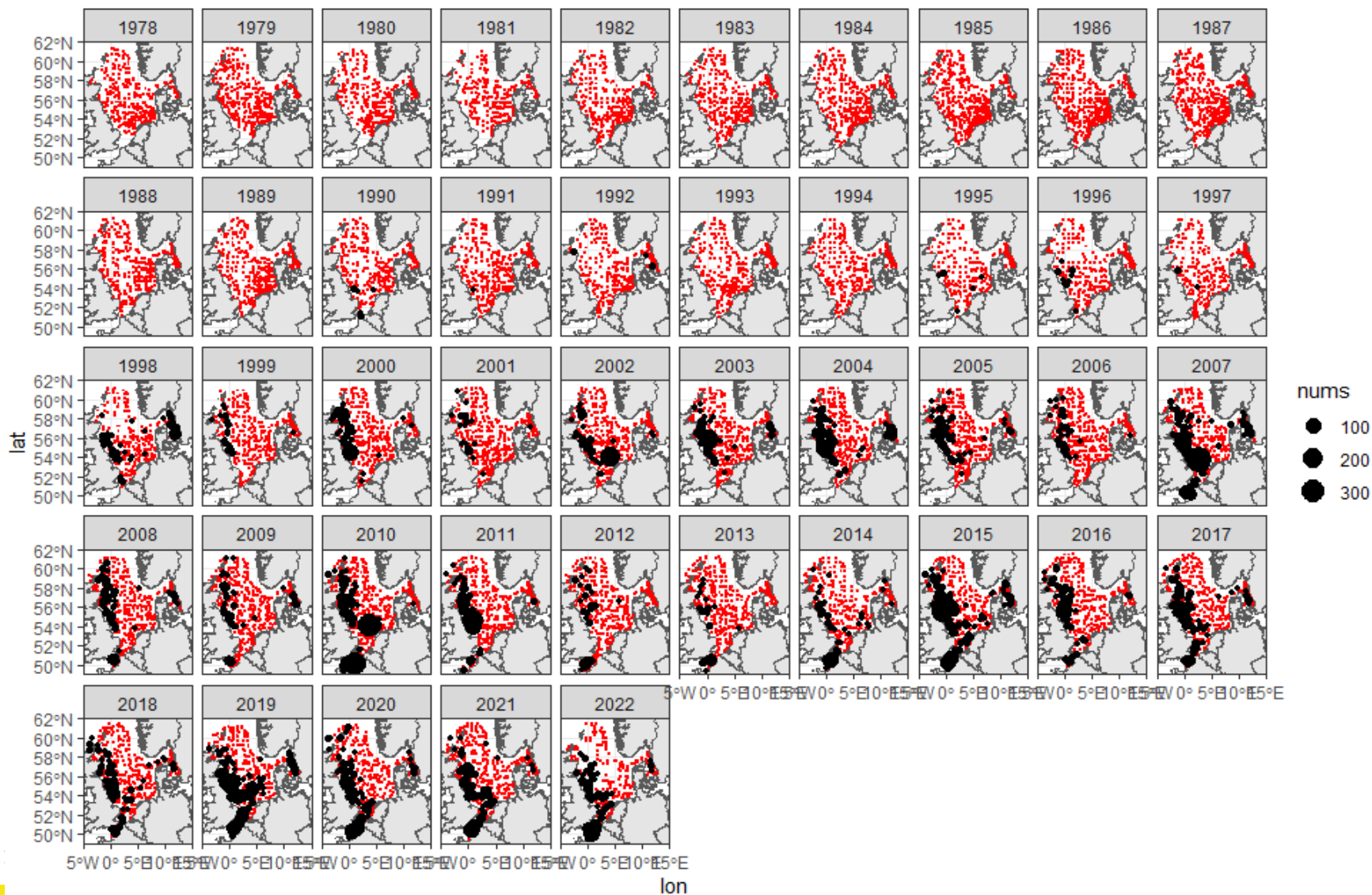
- IBTS Q1 area 4-7d from 1978 (same gear as CGFS in southern NS)
- IBTS Q3 area 4 from 1991
- BTS in Q3 area 4-7d from 1985
- Q4 CGFS in 7d from 1988 size-structured and age-structured from 2006

WKMSYSPiCT2 Data evaluation

- Try to Combine Q3 & 4
- Model Q1 separately

Survey data: Q1 IBTS in 4, 7d,3a from 1978

- Data filtering: Only use 1990-2022



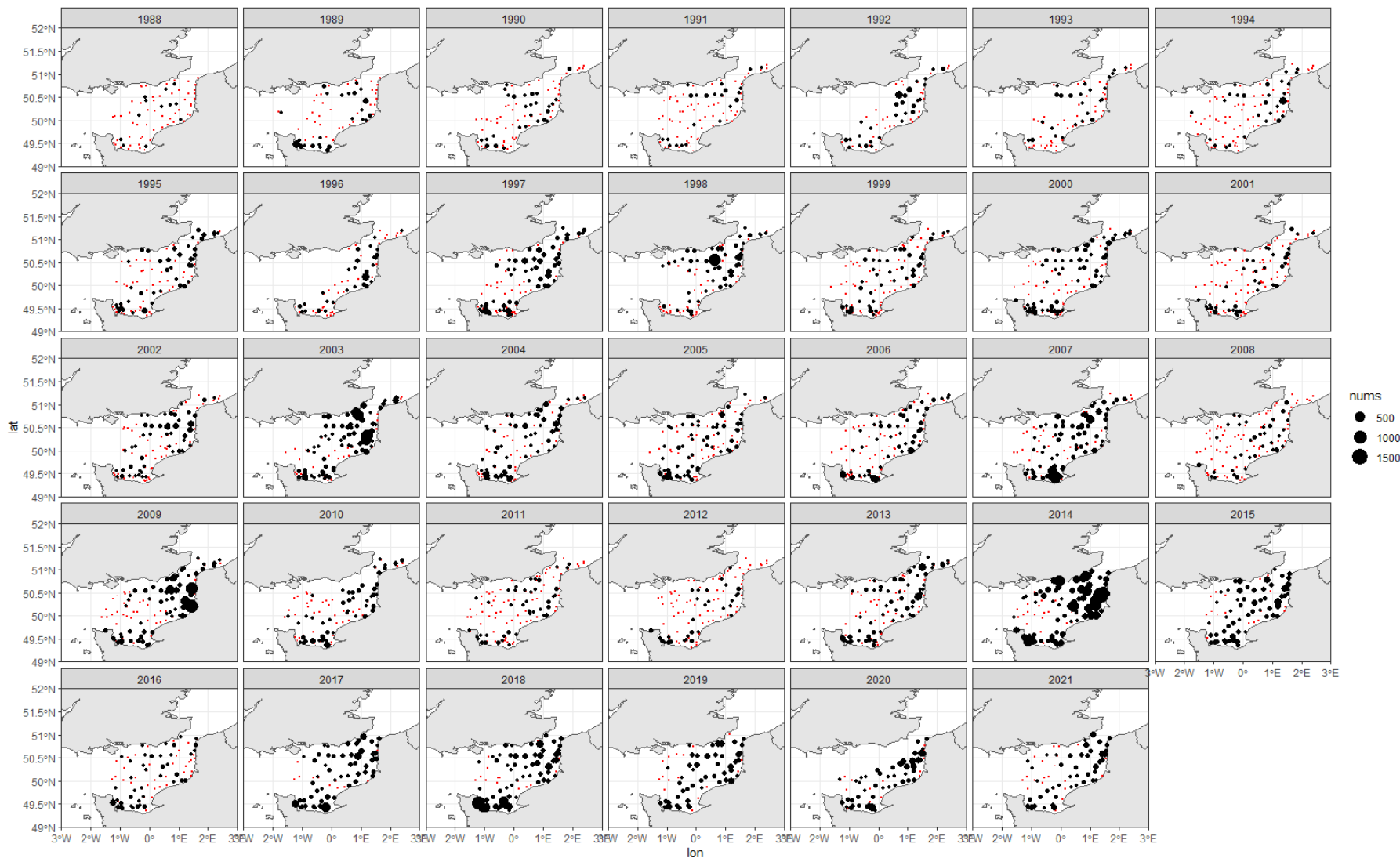
Survey data: Q3 IBTS in 4 & 3a from 1991



Survey data: Q3 BTS in 4 and 7d from 1985

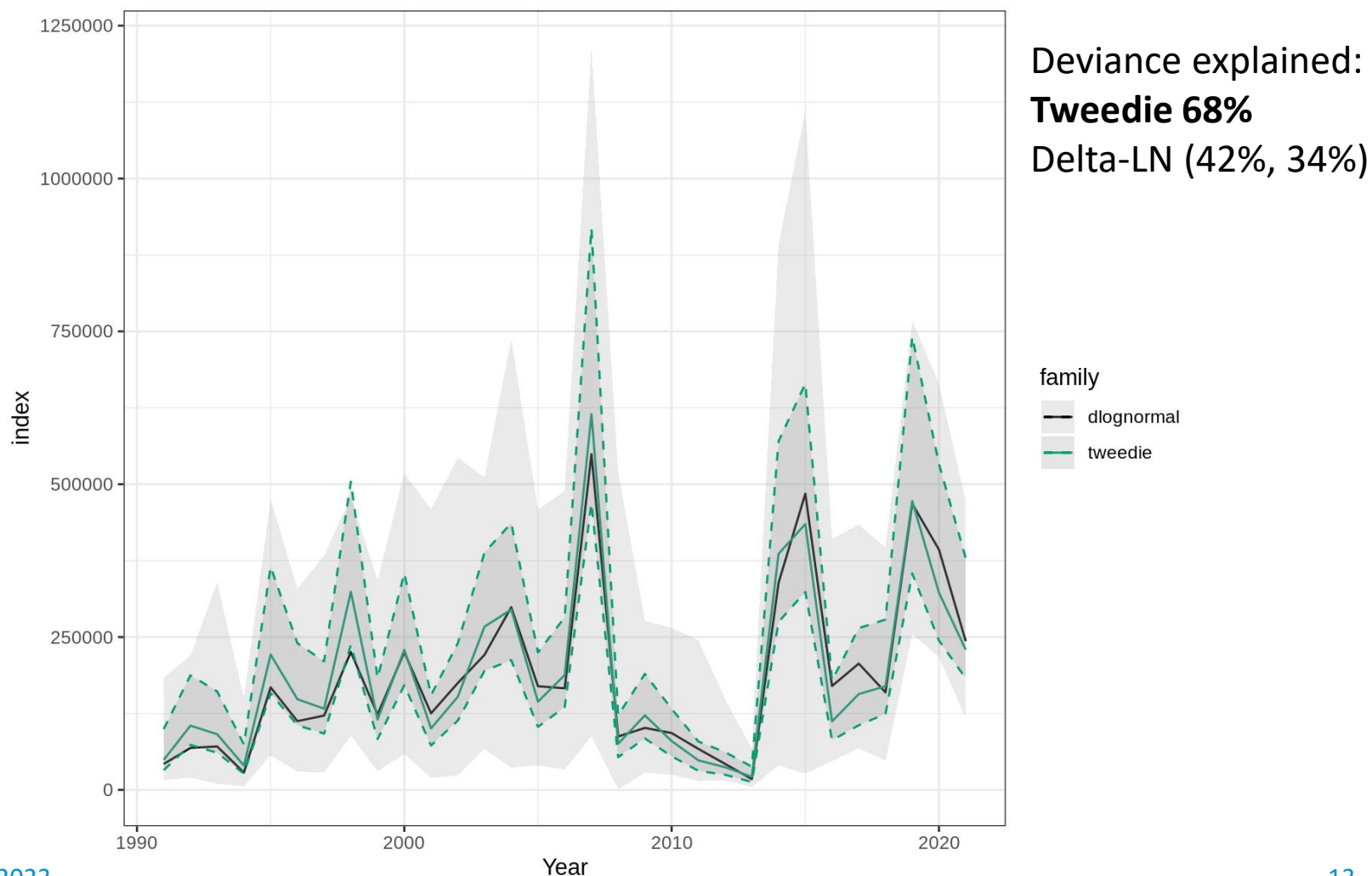


Survey data: Q4 CGFS in 7d from 1988



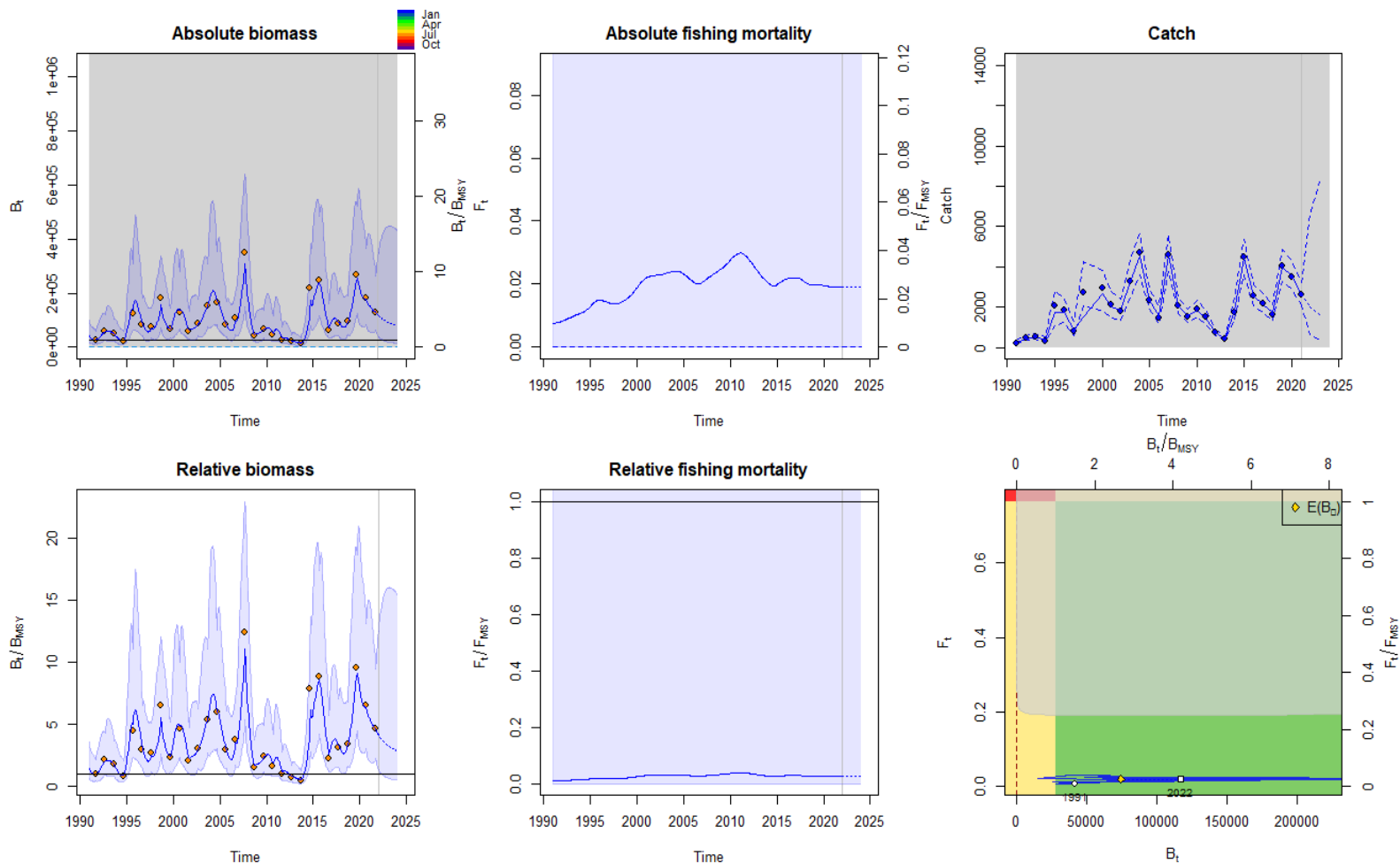
Survey data: Combining Q3-4 surveys

Exploitable biomass index calculation: Tweedie / delta-LN GAMM index on fish below 13 cm



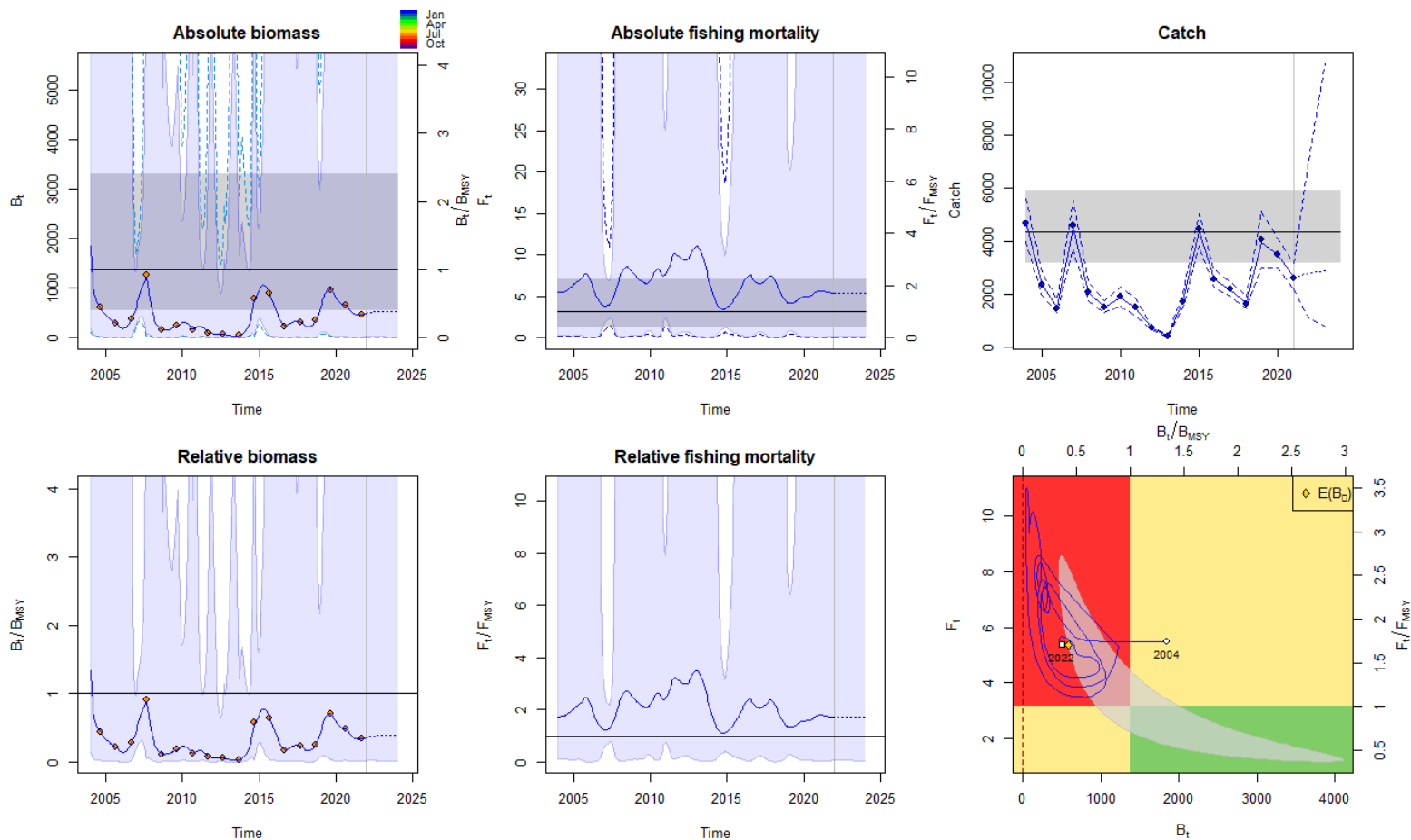
Stock assessment from 1991-2021 using SPICT

Data used: Landings + Q34 survey index 1991-2021



Stock assessment from 2004-2021 using SPiCT

Data used: Landings (IC) + Q34 survey index 2004-2021



Stock assessment from SPiCT: conclusion

- Issue to define reference points and to assess Fishing mortality
- Stock dynamics highly influenced by recruitment
- Hypothesis of productivity changes through time (especially in the early part of the time series)
- SPiCT methodology is not appropriate to assess North Sea striped red mullet stock status and to produce catch advice

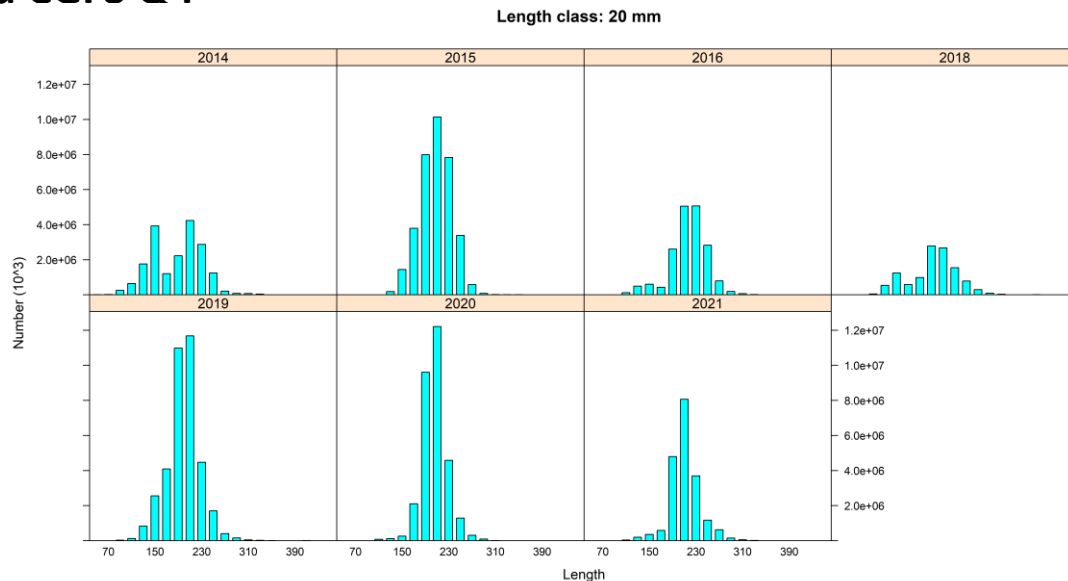
Recommendation from WKMSYSPiCT (Still awaiting ICES approval)

- Possibility to use assessment methodology for ICES category 3 stocks using life history traits of the stock, length frequency of landings and Q3-4 surveys biomass index.
- Future research: investigate SS3 assessment methodology to allow change in productivity in the model

Category 3 assessment methodology

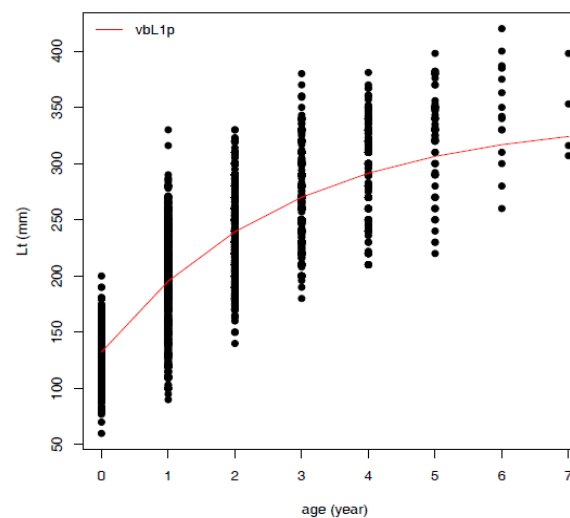
- Survey index, IBTS-BTS Q3 and CGFS Q4

- Landings length frequencies



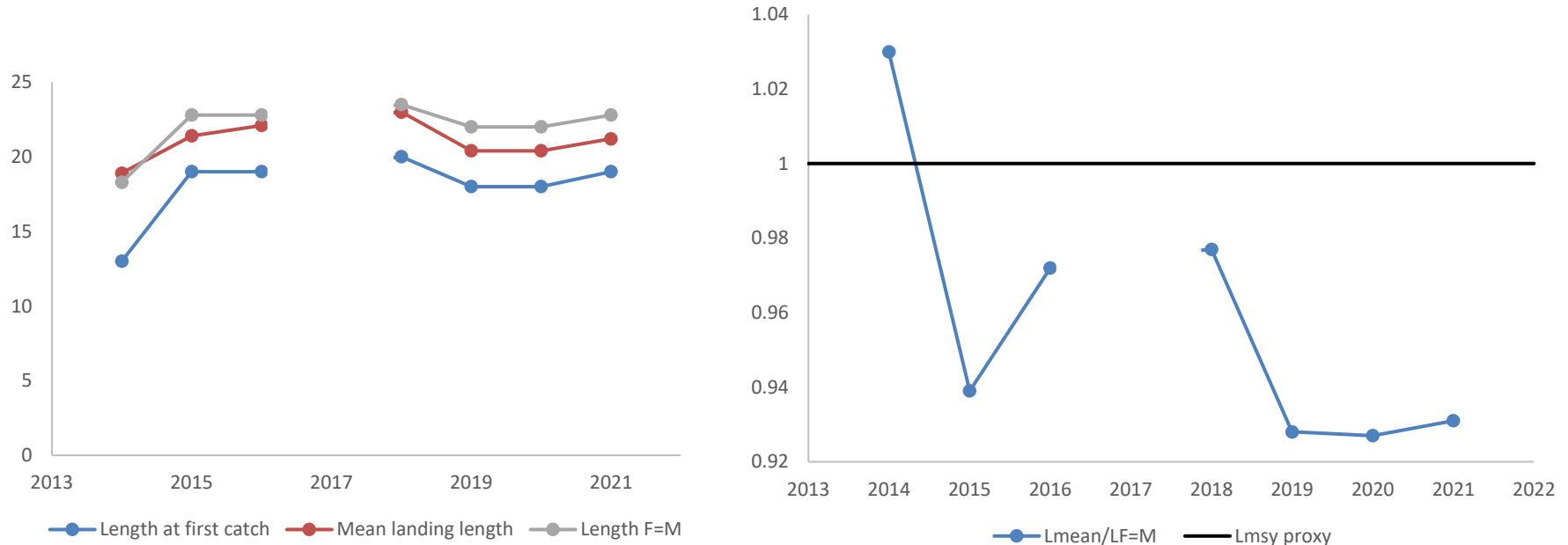
- Data on growth and maturity from French sampling program:

- Length infinity: 34.1 cm (ICES, in prep)
- Length at maturity: 16.2 cm (Mahé et al., 2013)
- Growth parameter (K): 0.36



Category 3 assessment methodology: stock status based on LBI

MSY length proxy: $L_{F=M} = 0.25 L_{inf} + 0.75 L_c$



$$F_{\text{proxyMSY}} = \text{Landings}_{2014} / I_{2014} \text{ when } L_{\text{mean}}/L_{F=M} > 1$$

$$\text{Catch advice} = \text{Survey Q3-4 index}_{2022} \times F_{\text{proxyMSY}} \times b \times m \text{ (ICES Chr rule as } K=0.36)$$

With b index relative to trigger value, $\min\{I_{2022}/I_{\text{trigger}}, 1\}$

Index trigger value ($I_{\text{trigger}} = 1.4 * I_{\text{loss}}$)

m: Precautionary multiplier to maintain biomass above Blim with 95% probability

Thank for your
attention.



Survey data: modeling combined Q3-4 surveys and IBTS Q1 survey

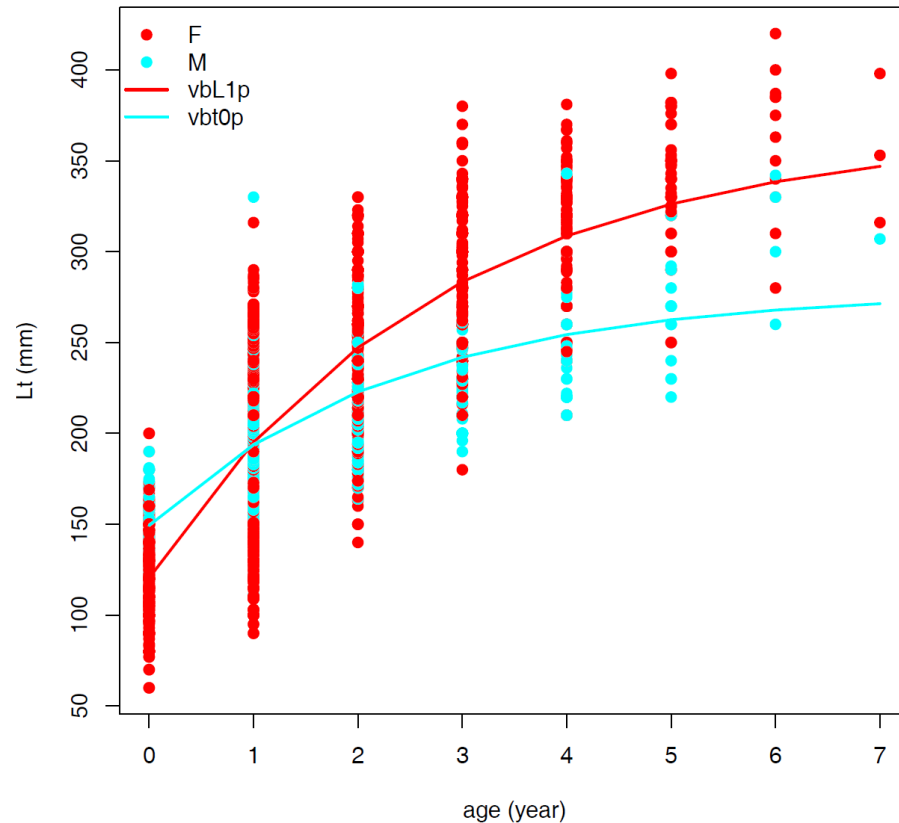
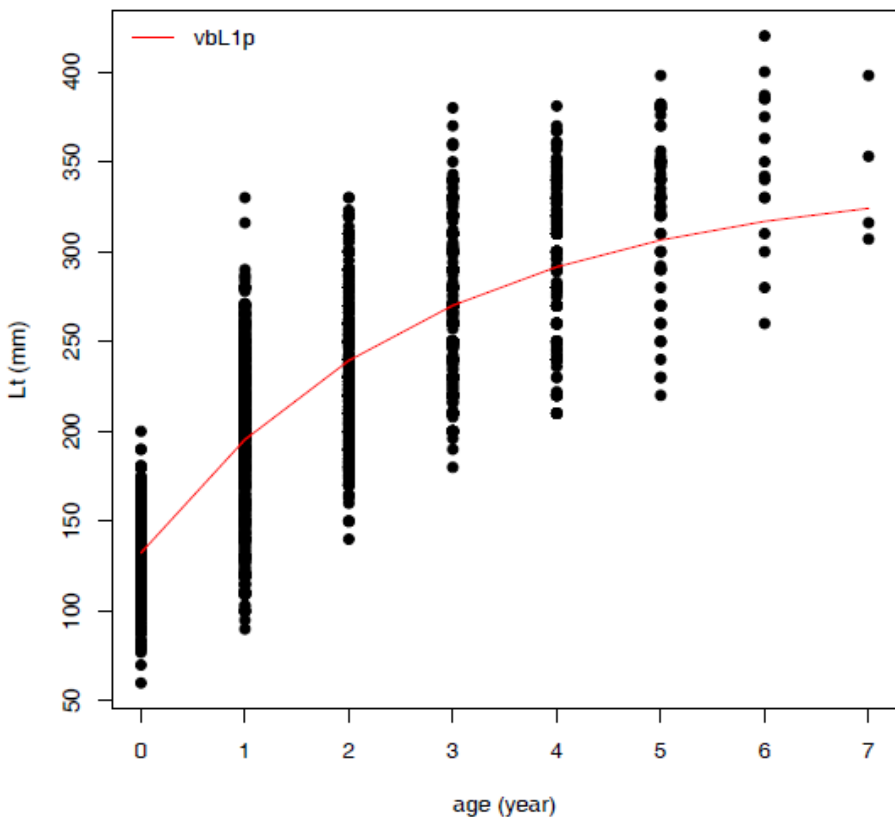
Exploitable biomass index calculation Q3-4 1991-2021 & Q1 1990-2021

- Use individuals above 12 cm as only 2.5% commercial landings below 13cm
- Use Tweedie GAMM, tested
- Full model tested with :

```
HaulWgt ~ Year+
  s(lon,lat,k=kvec[a],bs='ts') +
  ti(lon,lat,ctime,d=c(2,1),k=c(kvec[a],5),bs=c('tp','cs')) +
  Gear + s(CountryShip,bs='re',by=dum) +
  s(timeOfYear,bs='cc') +
  s(TimeShotHour,bs='cc') +
  s(Depth,bs='ts') +
  offset(log(SweptArea))
```

Growth parameters (K, Loo, t0, tmax)

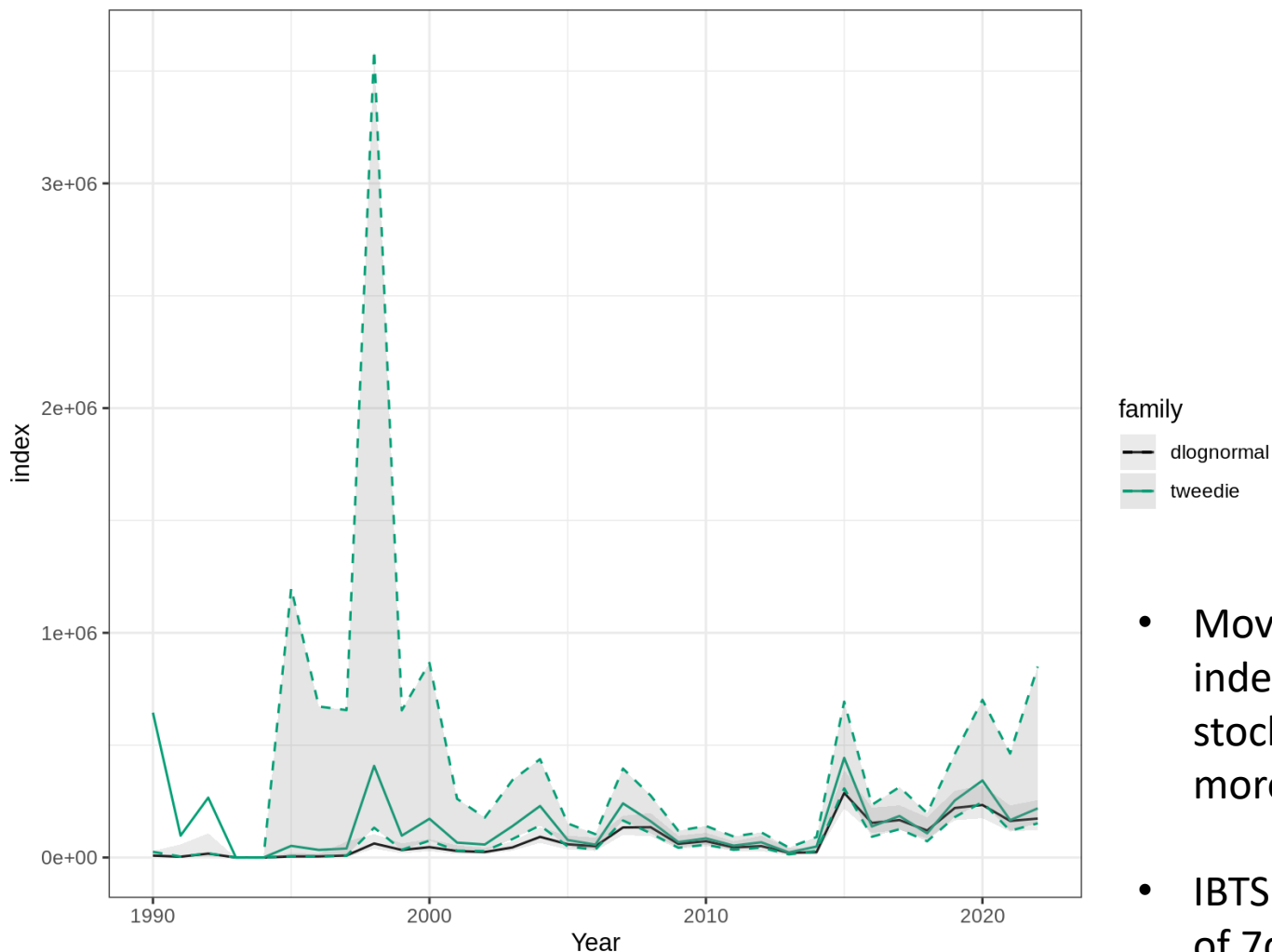
- Based on 2006-2021 French survey data and commercial sampling



Fish number	TL (mm) max	TL (mm) min	Age min	Age max	Growth model	TL ∞	K	To	TL1	AIC
5328	420	127.865	0	7	vbp	272,48	1,25			57996,94
5328	420	127.865	0	7	vbt0p	340,66	0,36	-1,36		53049,15
5328	420	127.865	0	7	vbL1p	340,84	0,36	NA	195,41	53049,15
5328	420	127.865	0	7	log.p	307,98	0,74	NA	137,64	53160,62

Survey data: IBTS Q1 surveys

Exploitable biomass index calculation: Tweedie / delta-LN index



- Move forward using Q3-4 index, covering the entire stock area and included more samples.
- IBTS Q1 only includes part of 7d since 2007