

Long term changes in length distribution and age structure of mackerel sampled during the triennial mackerel egg surveys

THASSYA C. DOS SANTOS SCHMIDT

GERSOM COSTAS

Western and Southern mackerel components

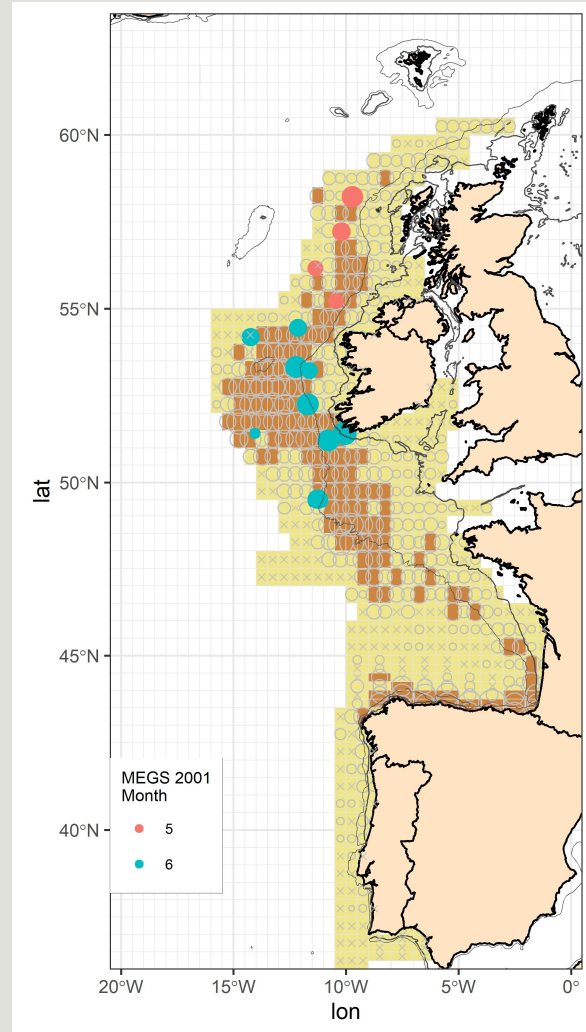
Years of sampling: 1987 – 2019 (triennial survey)
- Data presented: 2001 - 2019

Period: January to July

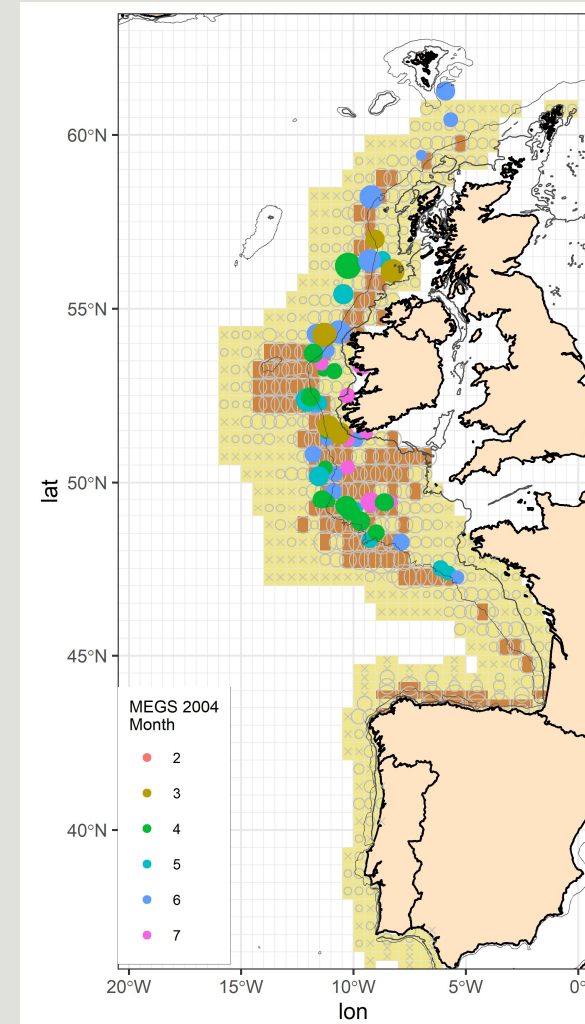
Area: Eastern North Atlantic from Gulf of Cadiz to the Faroe Islands and Iceland along the continental shelf and the North Sea

Parameters: length, weight, maturity stage (Walsh scale), age

2001



2004



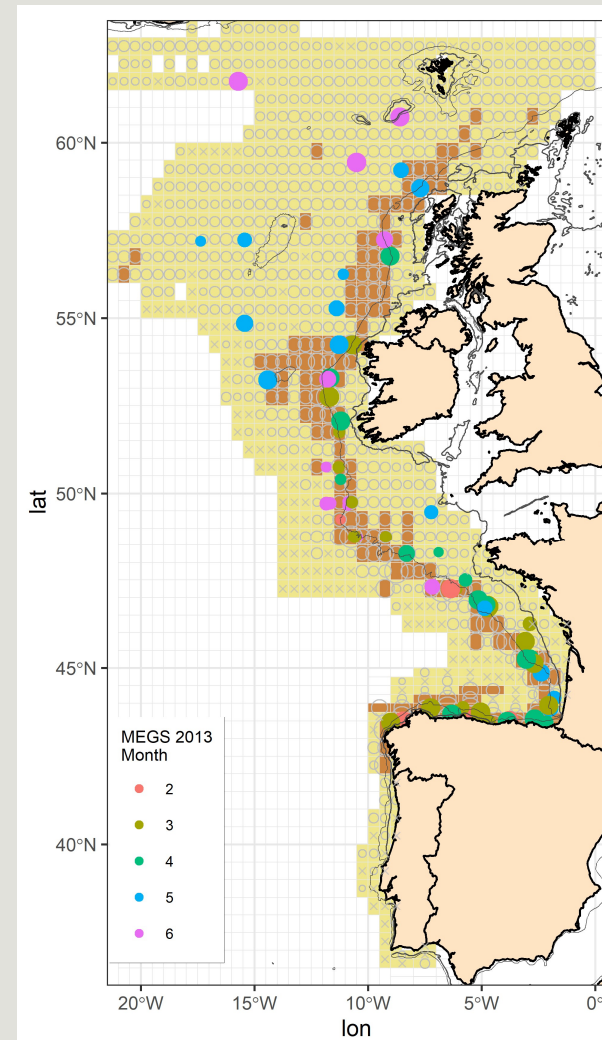
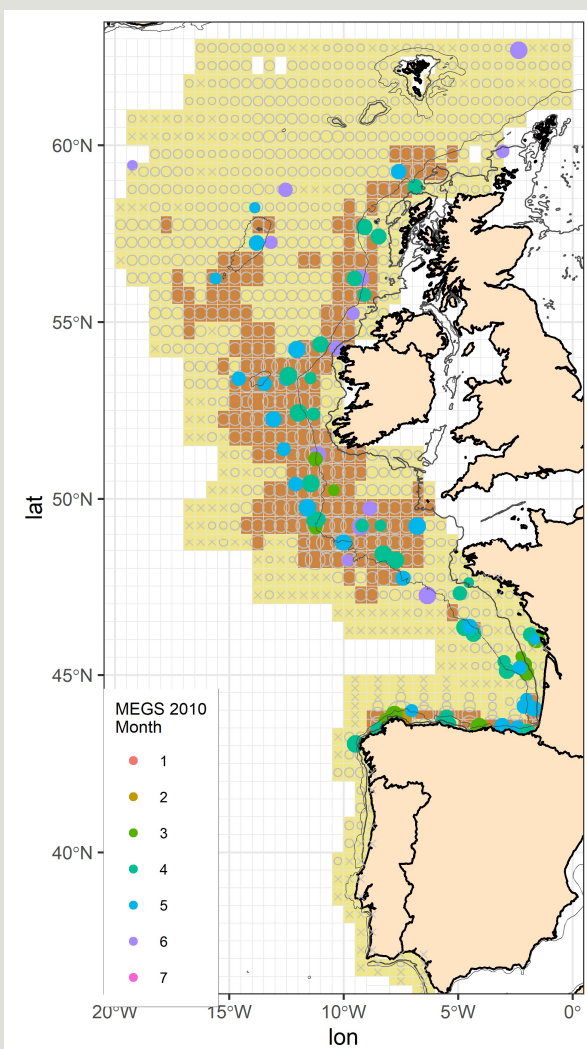
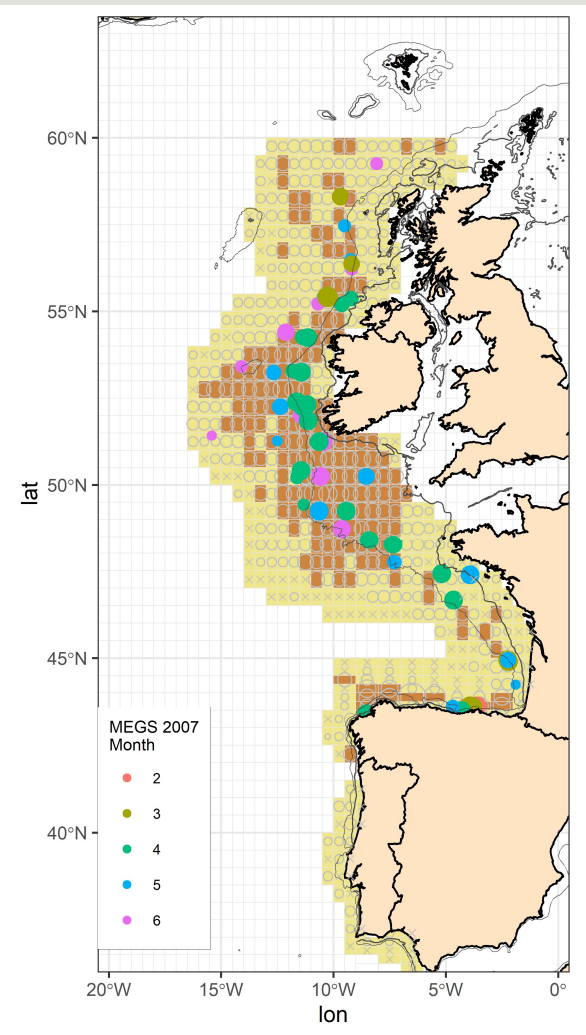
Background color: coverage area

Shaded rectangles: 75% of egg production

2007

2010

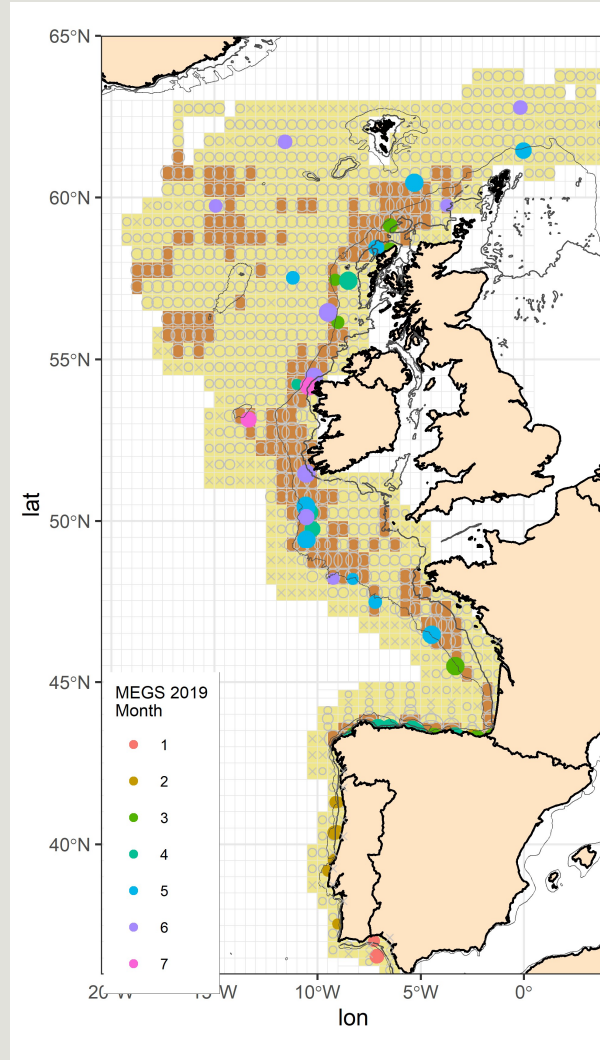
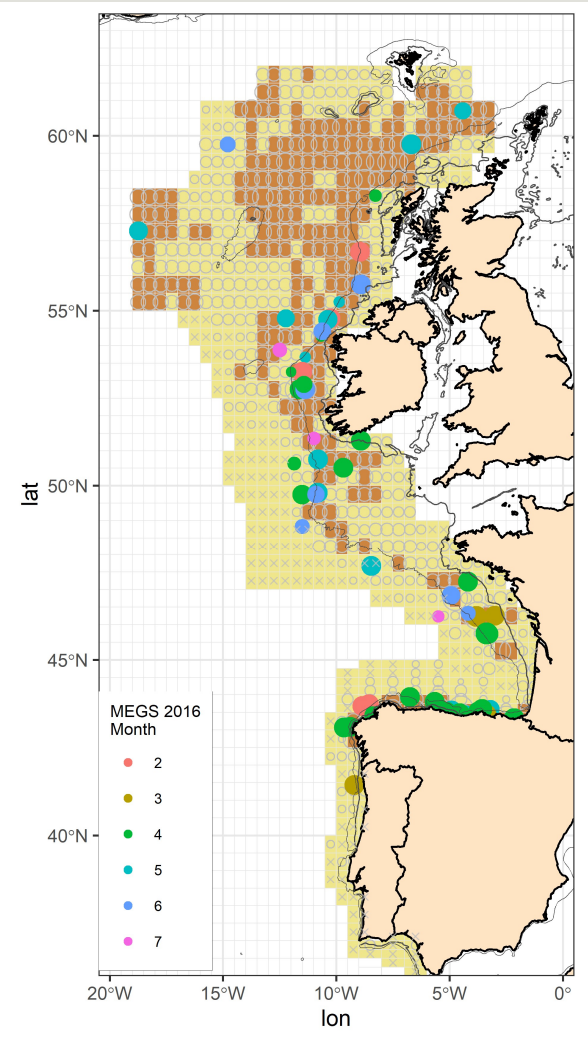
2013



Background color: coverage area
Shaded rectangles: 75% of egg production

2016

2019



Background color: coverage area
Shaded rectangles: 75% of egg production

Biological data: Western and Southern mackerel components

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
2001	0	0	0	0	162	646	0	808
2004	0	101	621	726	350	656	182	2636
2007	0	446	685	1636	449	466	0	3682
2010	181	1427	551	1641	971	594	409	5774
2013	0	579	1362	1083	613	474	0	4111
2016	0	495	441	1913	795	419	28	4091
2019	26	164	802	1161	618	415	137	3323

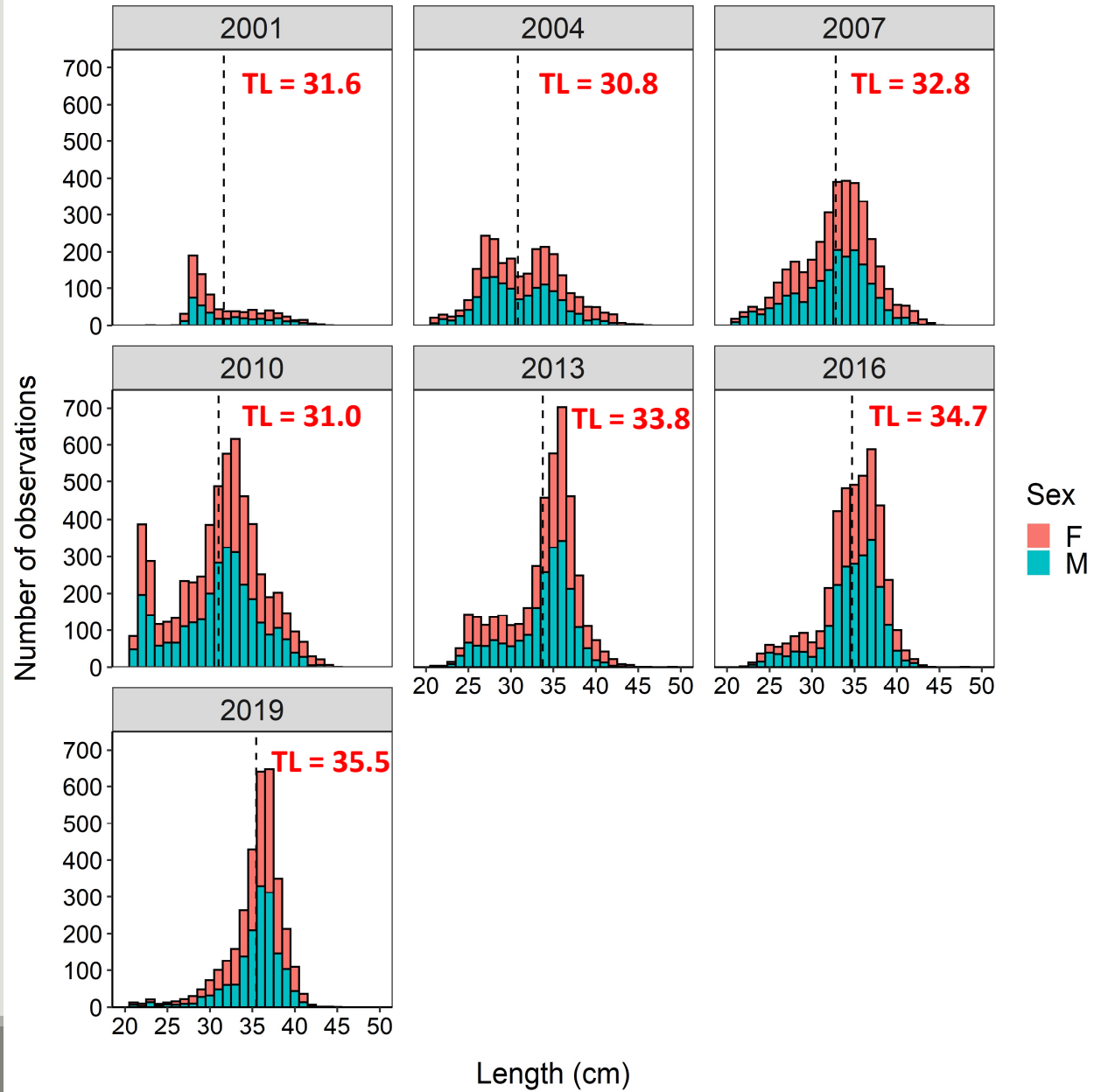
Biological data: Western and Southern mackerel components

Age data available

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
2001	0	0	0	0	17	30	0	47
2004	0	0	0	0	49	29	0	78
2007	0	0	0	100	160	255	0	515
2010	0	0	50	28	316	132	0	526
2013	0	44	237	303	317	343	0	1244
2016	0	297	145	675	703	222	28	2070
2019	0	100	432	748	617	212	119	2228

Length distribution: Western and Southern mackerel components

Interannual variation in length distribution and mean length



Length distribution: Western and Southern mackerel components

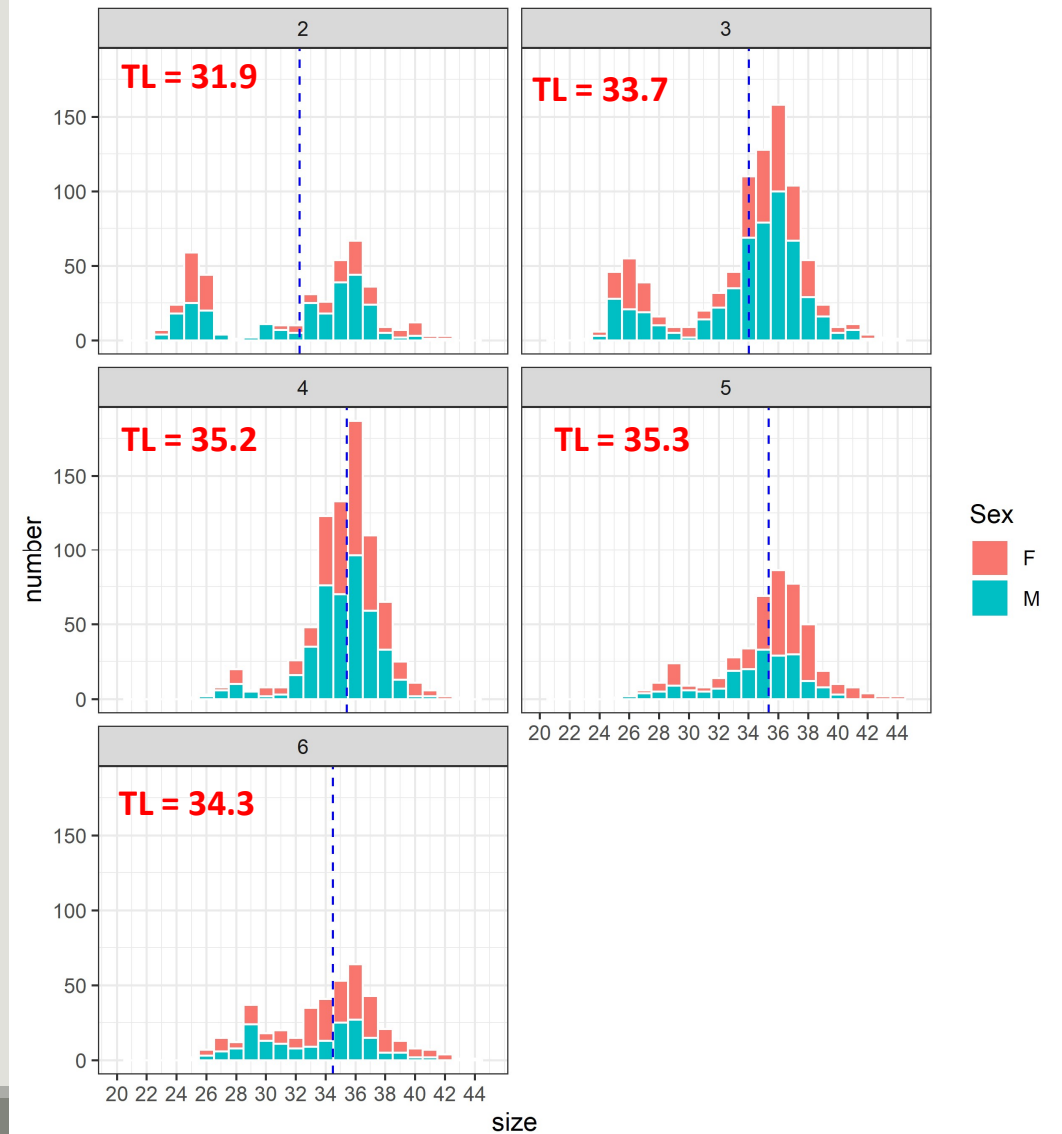
Length distribution per month in 2013

- Selected just fish at stages 4 to 6 (Walsh maturity scale)
- Mean length variation among months

Table 3.5 Sexual maturity scale proposed by Walsh *et al.* (1990) for mackerel, also used for horse mackerel.

Stage	State	External appearance
1	Immature	Gonads small. Ovaries wine red and clear, torpedo shaped. Males pale, flattened and transparent.
2	Early ripening	Gonads occupying 1/4 to 3/4 body cavity. Opaque eggs visible in ovaries giving pale pink to yellowish colouration, largest eggs without oil globule. Testes off-white, milt not running.
3	Late ripening / Partly spent (early)	Gonads occupying 3/4 to almost filling body cavity. Ovaries yellow to orange. Largest eggs may have oil globules. Testes creamy white.
4	Ripe	Testes filling body cavity, milt freely running. Ovaries characterized by externally visible hyaline eggs no matter how few or how early the stage of hydration. Ovaries with hyaline eggs only in the lumen are not included. Ovary size variable from full to 1/4.
5	Partly spent (late)	Gonads occupying 3/4 to <1/4 body cavity. Ovaries slacker than in stage 3 and often bloodshot. Testes with free running milt and shrivelled at anus end.
6	Spent / Recovering spent	Gonads occupying 1/4 or less of body cavity. Ovaries reddish and often murky in appearance, sometimes with a scattering or patch of opaque eggs. Testes opaque with brownish tint and no trace of milt.

Length distribution by month 2013 (Walsh:4-6)

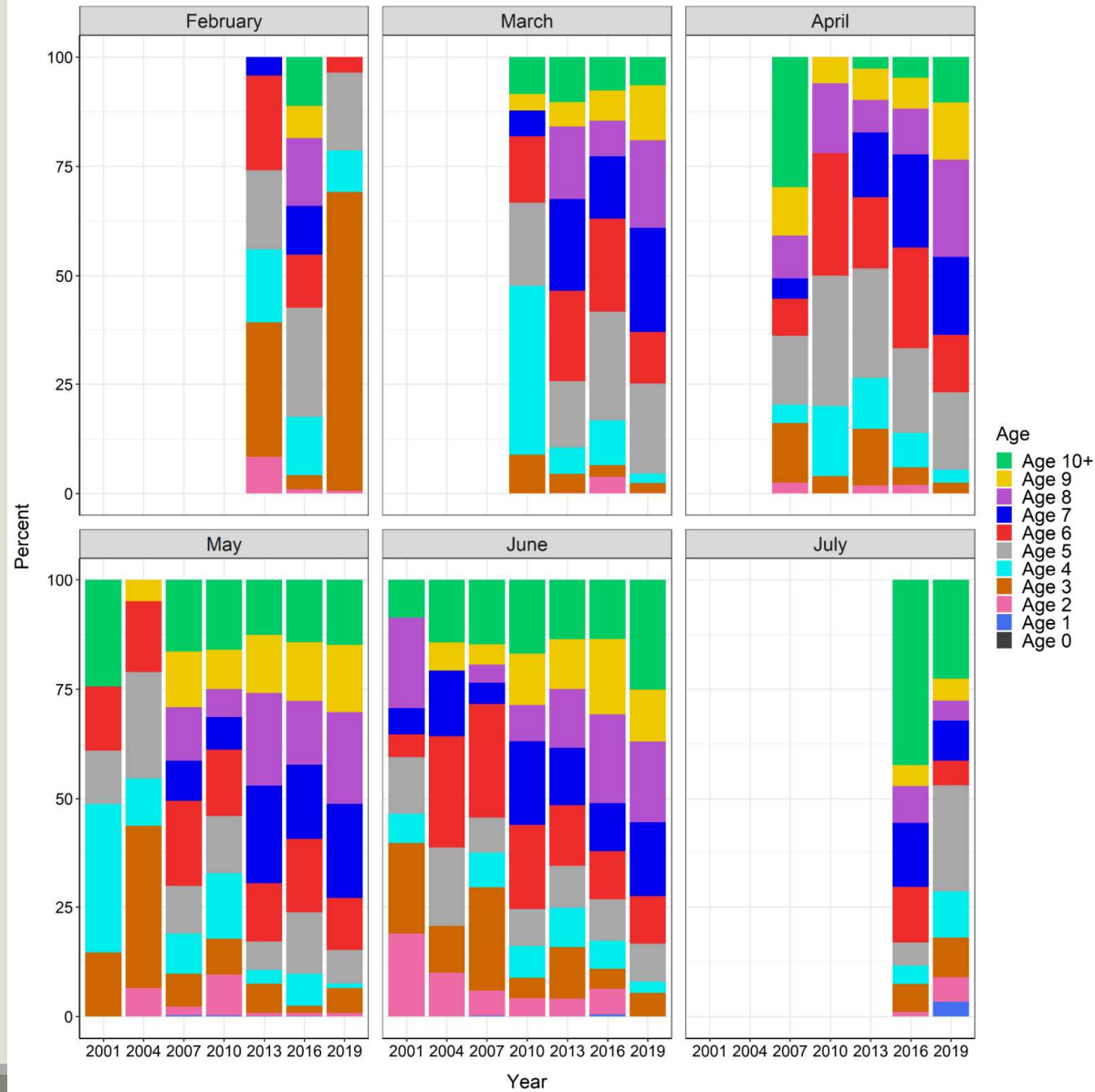


Age structure: Western and Southern mackerel components



The percentage of younger fish has decreased, and older fish, increased over the years

~ 75% of mackerel caught from February to April are up to 7 years old, from May onwards the frequency has decreased to 50% (mainly in the latest years of the time series)



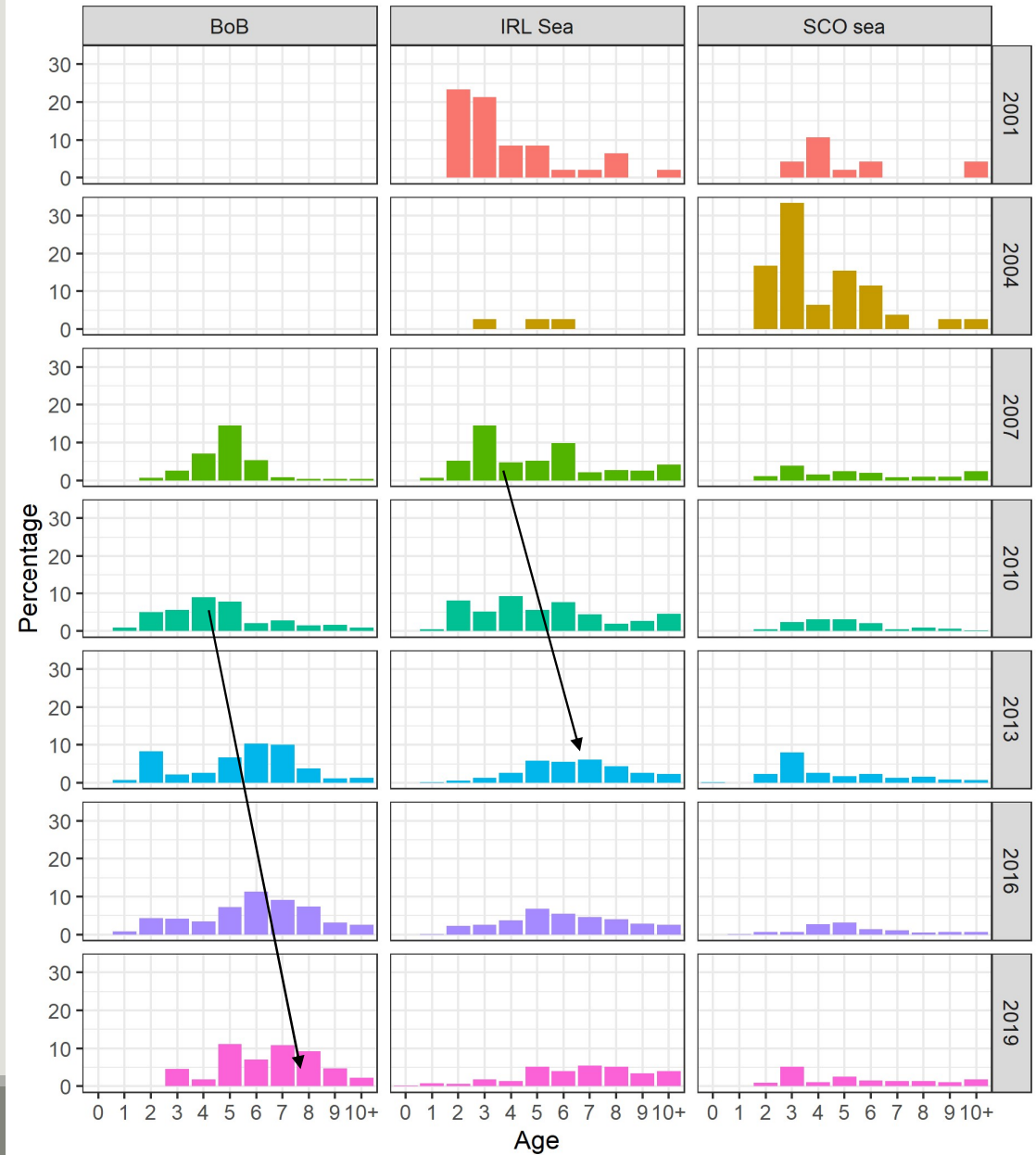
Age structure: Western and Southern mackerel components

Age distribution by area

Spawning area divided into 3 areas

1. Bay of Biscay (BoB; $> 48^{\circ}\text{N}$)
2. Ireland Sea (IRL Sea; $> 48^{\circ}$ and $< 55^{\circ}\text{N}$)
3. Scotland Sea (SCO Sea; $> 55^{\circ}\text{N}$)

BoB more older fish being collected over the years, same for Ireland Sea



North Sea mackerel component

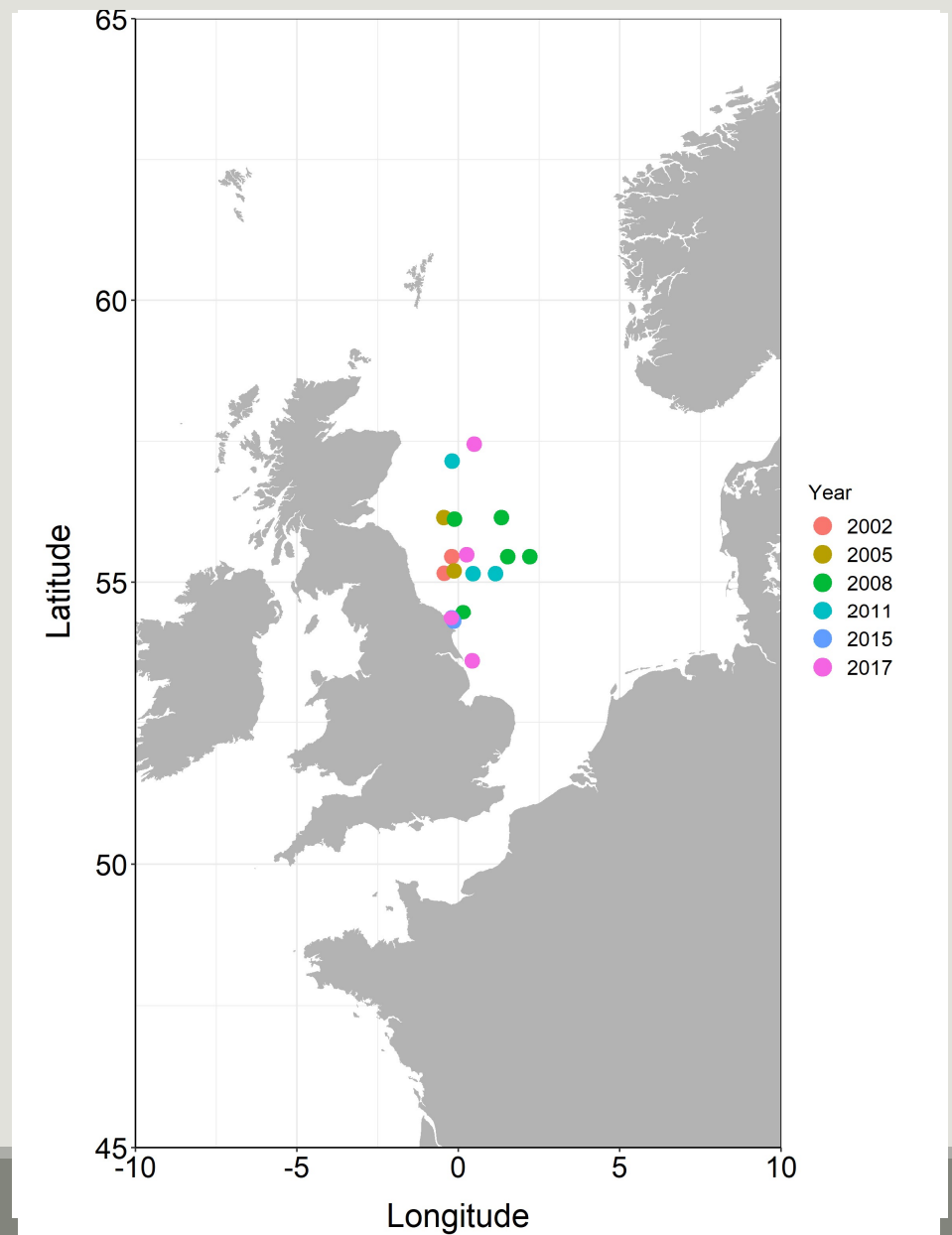
Period: May or June

Year	May	June
2002	0	50
2005	0	19
2008	0	36
2011	16	43

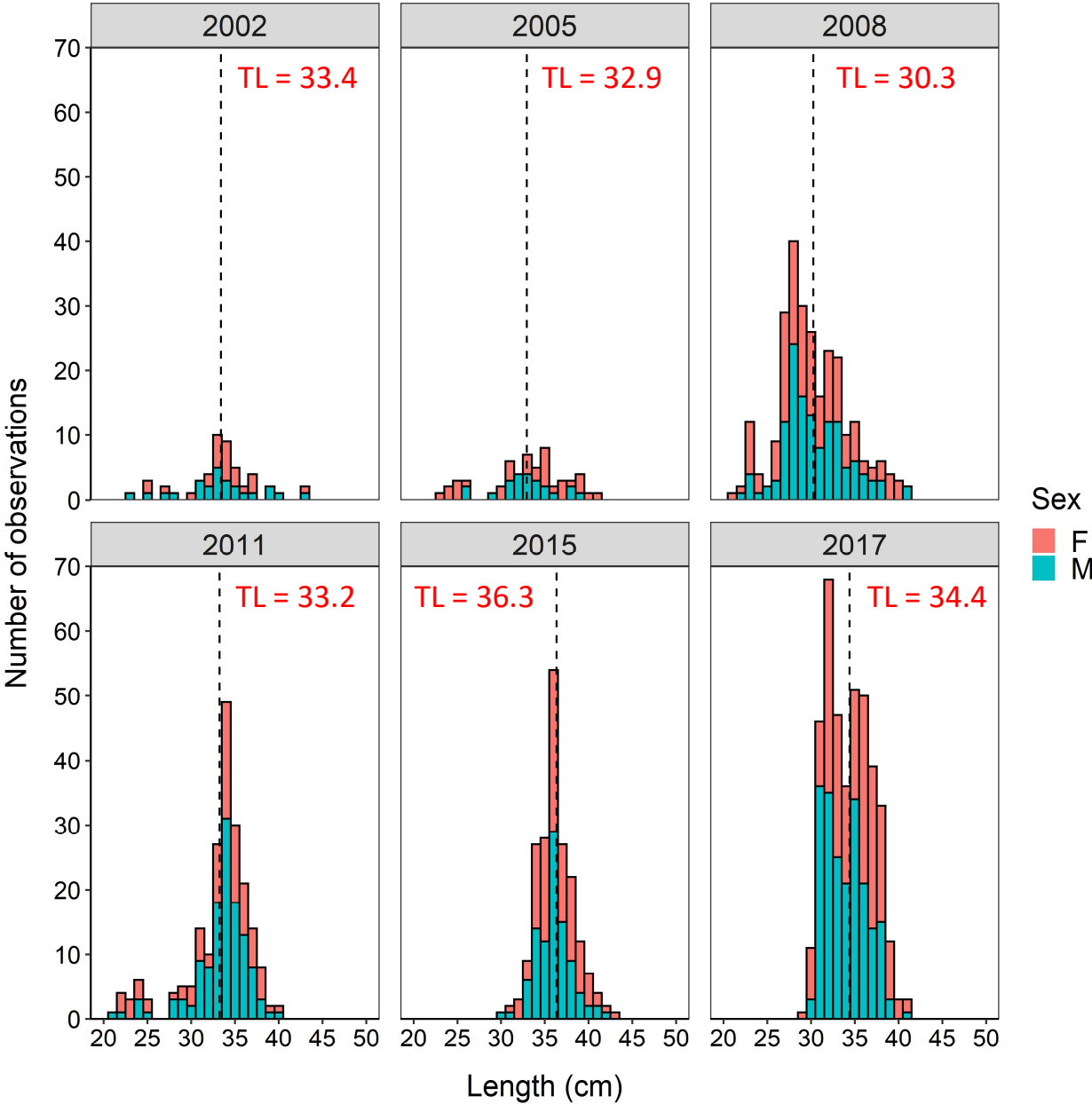
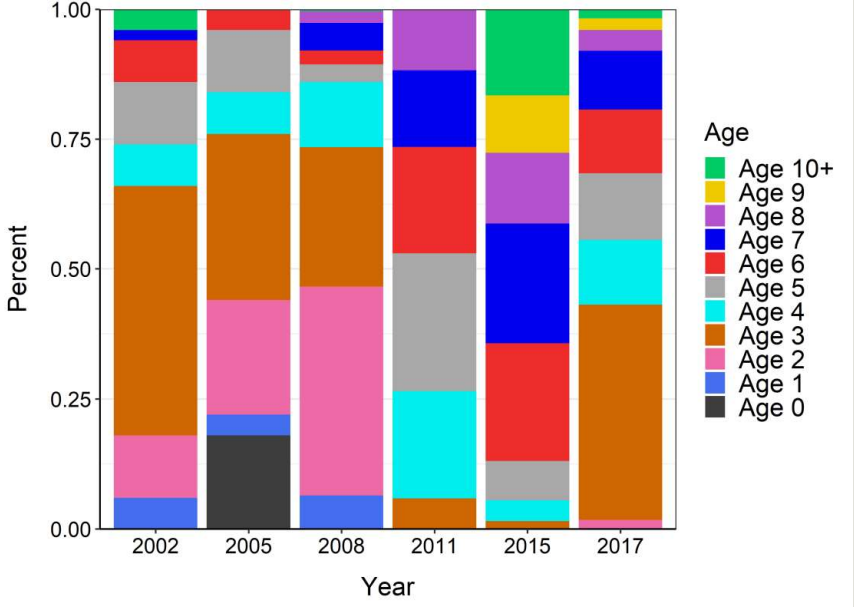


Year	May	June
2002	0	50
2005	0	56
2008	0	264
2011	101	108
2015	0	200
2017	0	400

Data just from the Netherlands



Length distribution and age structure: North Sea mackerel component



Final remarks

Coverage area and number of fish increased over the years

Mackerel mean length varies over the years, and among months within a year.

Decrease of the number of younger fish by month over the years

IMPORTANT:

Review the data base: will include some new data information (e.g. Gear data from Scotland, Norway data from North Sea survey (2002 – 2011), updated data from IEO)

- Data missing - e.g. sampling position, age data

The data need to be carefully interpreted since different gears have been used for each participating country/institute

Research collaboration “Mackerel year class spatiotemporal dynamic”



From Berge et al., 2015

22 scientists, from 12 institutes and universities in 11 countries, working with 10 time series on mackerel distribution, from 1980s onward, to describe distribution of different year classes for all seasons (feeding-wintering-spawning) from age 0 until it fades out at old age.

October 2020 meeting, split into 3 sub-groups:

- **Spawning Dynamic and Overwintering** – Chair Aril Slotte,
- **Juvenile Dynamic** – Chair Teunis Jansen,
- **Summer Feeding Dynamic** – Chair Anna Olafsdóttir.

Sub-groups aim to present preliminary results to whole research collaboration in middle of December.

Thank you for your attention!

Questions?