Deep-water rose shrimp (DPS, Parapenaeus longirostris)

in GSA 1 (Northern Alboran Sea, Western Mediterranean)

Ad hoc contract 2579 - Data preparation for EWG 25-09

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Contents

Ad hoc contract 2579

Background information

In the context of discussions during STECF Plenary 24-03 and STECF Plenary 25-01 and 25- 02, it was identified the need to give to EWG 25-09 more time to evaluate the stocks assessment models. On this basis it was agreed that data preparations for the stock assessments should be anticipated and finalized before the EWG.

The objective of this ad hoc contract is to update existing stock assessment input files for the stock/s DPS 1 in order for it to be ready for the assessment runs with the notable inclusion of 2024 relevant data stemming from the 2025 Med & BS DCF Data call.

Terms Of Reference

The TORs for the stock DPS 1 given in this hoc contract are as follows:

ToR 1. To compile and provide the most updated information on stock identification and boundaries, length and age composition, growth, maturity, feeding, essential fish habitats including spawning grounds and seasonality as well as natural mortality.

ToR 2. To compile and provide complete sets of annual data on landings and discards as well as the standardized MEDITS Index for the longest time series available up to and including 2024, including length frequency distribution over time. To provide a complete and updated stock assessment input file in the format of those used in 2024.

Report

1 TOR 1

ToR 1. To compile and provide the most updated information on stock identification and boundaries, length and age composition, growth, maturity, feeding, essential fish habitats including spawning grounds and seasonality as well as natural mortality.

1.1 Data source and Methods

Data used in this report were derived from catch sampling. In EU, data is collected based on the provisions of the European Union Data Collection Regime (DCR)/Framework (DCF; EC 93/2010).

The data used to compile the stock assessment input file were the raw DCF input files provided to EWG 25_09 and stored in the SharePoint. Before process the data all past reports regarding DPS1 were scrutinized to check data consistence about the data processing.

To process the data both R codes developed by ewg 24_09 and 25_01 were used.

In addition new R codes were developed and adapted to optimize the data analysis process and check data consistence through the time series.

1.2 Loading

We load the landings' LFDs aggregated by GSA, gear, and quarter using an aggregation code.

This code is subsequently used to build and manipulate objects, leveraging the area dimension of the FLR object.

The code used to aggregate the data is defined as follows: area=as.factor(paste(species,EMU,gsa,gear2,"q",quarter,sep="."))

We load the LFD already converted in FLquant. where:

hke.land.len & hke.disc.len # landings/discards @len by gsa,gear (sex combined)

hke.land.len.qrt & hke.disc.len.qrt # landings/discards @len by gsa,gear,quarter (sex combined)

```r
load(file=paste0(Robjsdir,"DPS.LFD_all.flq.Rdata"),verbose = T)
```

```
## Loading objects:
##   dps.land.len
##   dps.land.len.qrt
##   dps.land.len.qrt.OTB
##   dps.disc.len
##   dps.disc.len.qrt
##   dps.disc.len.qrt.OTB
```

1.3 Stock Identity and boundaries

Stock units for Mediterranean demersal species are geographically defined as Geographical Sub-Areas (GSAs). These areas are used by both the General Fisheries Commission for the Mediterranean (GFCM) and the Scientific, Technical and Economic Committee for Fisheries (STECF) to assess and manage fish stocks. GSAs provide a framework linking biological characteristics to management practices, and genetic studies have confirmed their usefulness in reflecting biological reality (Spedicato et al., 2022; doi: 10.2926/909535).

For the deep-water rose shrimp, studies aimed at defining the stock unit in the western Mediterranean do not show a clear pattern. In the absence of such evidence, for assessment and management purposes the DPS has been assumed to be confined within the boundaries of GSA 1. However, assessments have sometimes been conducted jointly with adjacent GSAs (e.g., GSAs 1, 3, and 4 by GFCM; GSAs 1, 5, 6, and 7 by STECF and GFCM). In recent years, STECF EWG has assessed DPS in EMU 1 by separating GSA 1 from GSAs 5, 6, and 7 (Table 1).

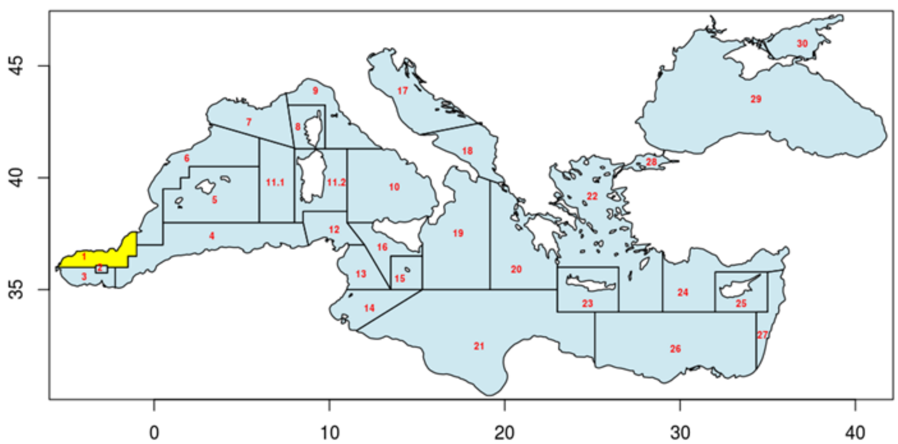


Figure 1: Map of GSA 1

Table 1: Stock assessment STECF reports related to DPS 1

DPS1	GSA	YEAR	STECF.EWG	DOI
YES	1	2017	EWG 16-17	https://doi.org/10.2760/015005
NO	1567	2018	EWG 18-12	https://doi.org/10.2760/838965
NO	1567	2019	EWG 19-10	https://doi.org/10.2760/5399
NO	1567	2020	EWG 20-09	https://doi.org/10.2760/286667
YES	1	2021	EWG 21-11	https://doi.org/10.2760/046729
YES	1	2022	EWG 22-09	https://doi.org/10.2760/00380
YES	1	2023	EWG 23-09	https://doi.org/10.2760/995295
YES	1	2024	EWG 24-10	https://doi.org/10.2760/9293847

1.4 Length composition

Landings LFDs in the GSA 01 show broad modes spanning ~22–27 mm CL, with tails to >40 mm CL; length distributions vary by year but consistently cover juvenile to adult sizes (Figure 2). Discards are reported with low numbers in 2022 and 2024, and for only a quarter (3 in 2022, and 1 in 2024). Discards were considered negligible for DPS in GSA 1.

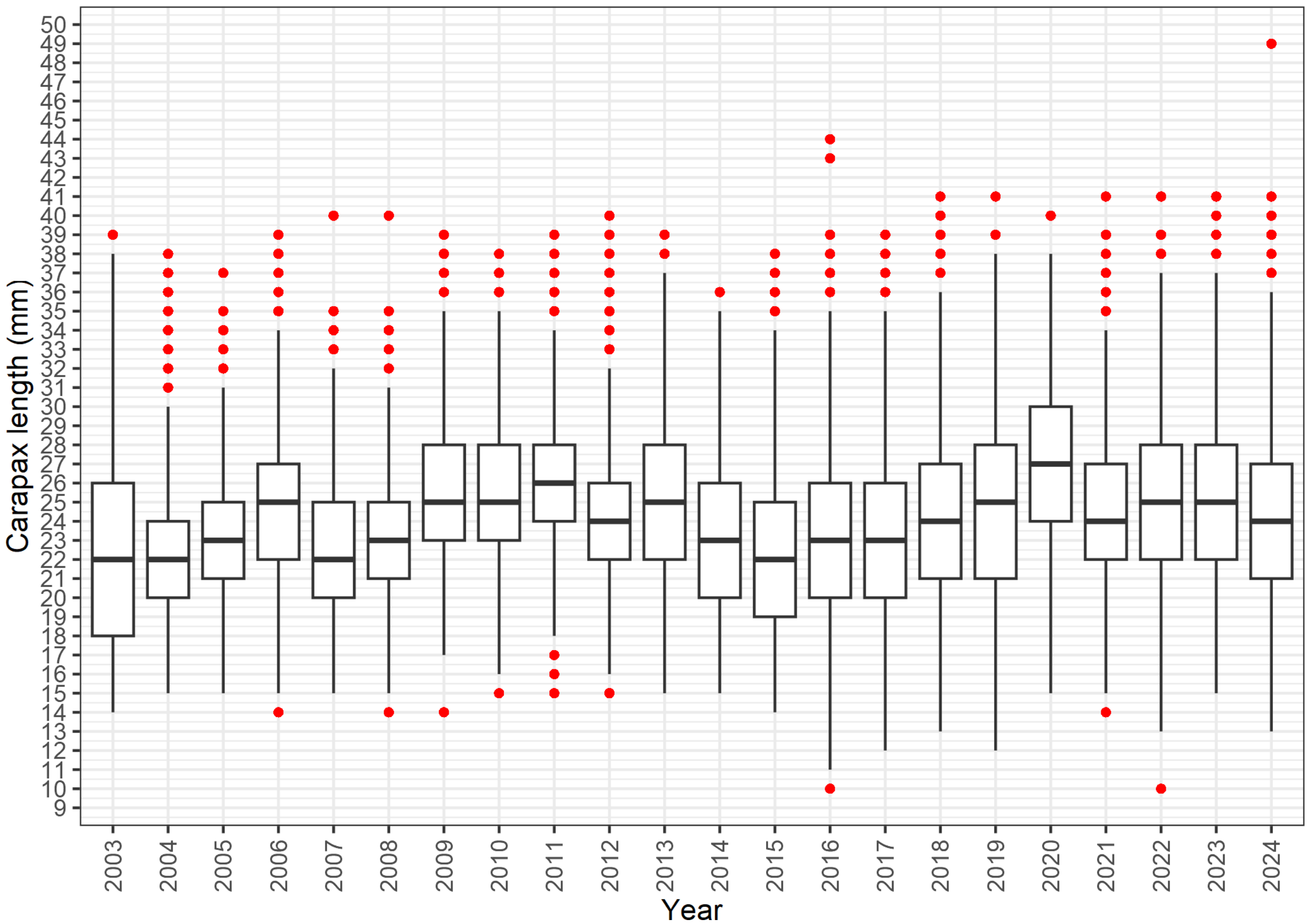


Figure 2: DPS 1: Boxplot of Landings at length

The length data coverage information by quarter is good and show that, along with the time series is consistent (Figure 3).

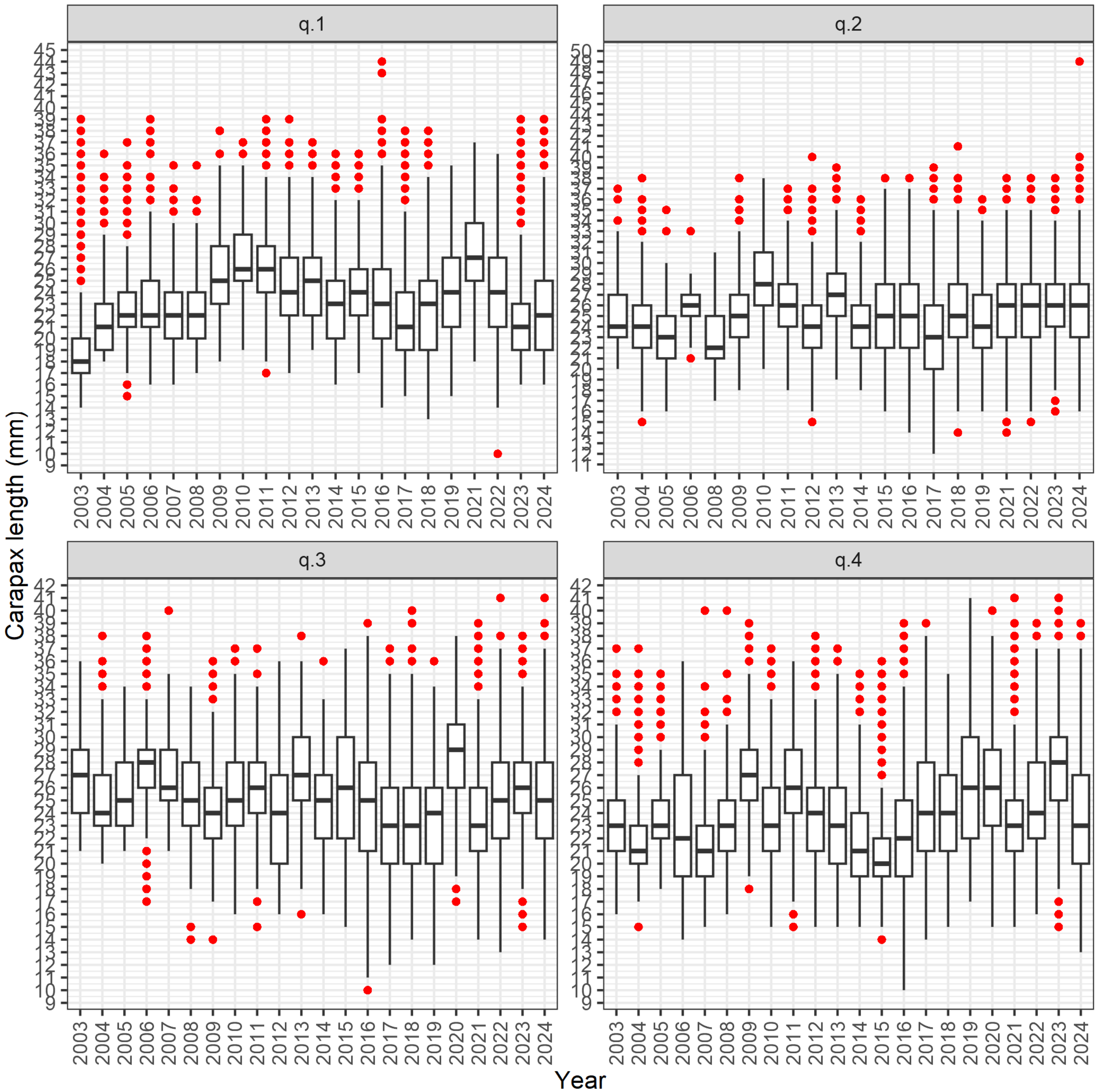


Figure 3: DPS 1: Boxplot of Landings at length by quarter

By building a year × length matrix for each group (Q1-4 vs Q2-3) and applying a PERMANOVA test we found that the length distributions in quarters 1+4 are significantly different from those in quarters 2+3, even though the effect is weak (Pr(>F) = 0.036, R^2 = 0.066, i.e. About 6.6% of the total variation in the data is explained by the difference between the two quarter groups) (Table 2). So that, the difference exists and is statistically significant, but it is not very large (most of the variability still lies within groups / across years).

Table 2: PERMANOVA results (adonis2)

	Df	**SumOfSqs**	**R2**	**F**	**Pr(>F)**
Model	1	0.4330824	0.0661286	2.97407	0.034
Residual	42	6.1160154	0.9338714	NA	NA
Total	43	6.5490978	1.0000000	NA	NA

1.5 Growth models and parameters

The data reported throught DCF, their median value and the values used from EWG 21-11 onward are reported bewlow (Figure 4, Table 3).

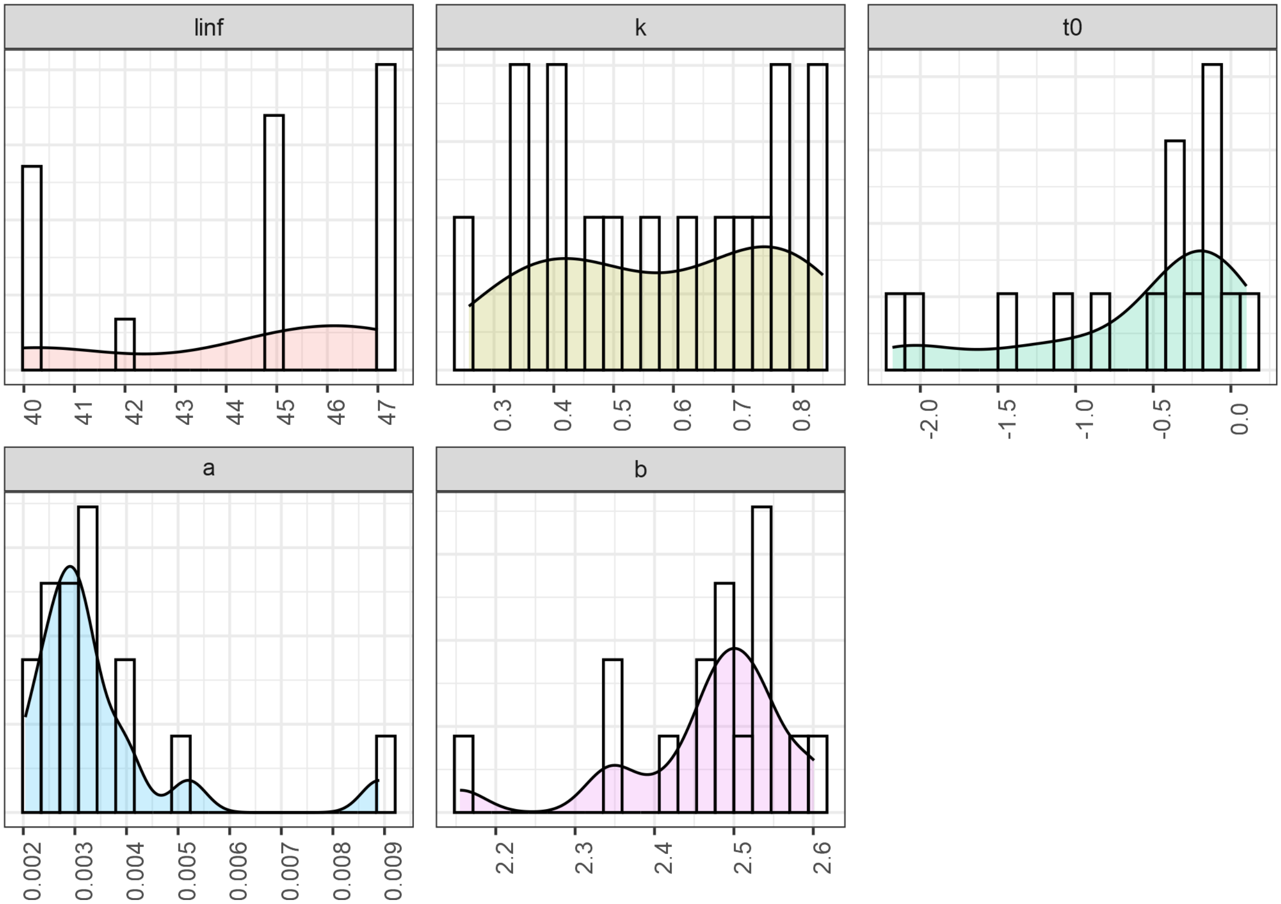


Figure 4: Growth Parameters variability

Table 3: Growth Parameters from DCF

year	linf	k	t0	a	b
2004	42	0.6190	-0.080	0.00250	2.53200
2007	45	0.3990	0.100	0.00204	2.60100
2010	45	0.3440	-0.060	0.00308	2.48300
2011	47	0.7100	-0.440	0.00319	2.47400
2012	45	0.5600	-0.140	0.00296	2.50300
2013	47	0.8500	-0.040	0.00265	2.53100
2014	45	0.7900	-0.390	0.00341	2.45800
2015	45	0.7900	-0.390	0.00262	2.53000
2016	47	0.8300	-0.300	0.00300	2.49000
2017	47	0.7600	-0.190	0.00890	2.15500
2018	47	0.6890	-0.120	0.00400	2.34700
2020	47	0.2580	-1.980	0.00219	2.59280
2021	40	0.4100	-1.430	0.00390	2.41420
2022	40	0.3300	-2.180	0.00314	2.47779
2023	40	0.4600	-1.080	0.00520	2.34350
2024	40	0.4900	-0.810	0.00272	2.52845
Guijarro et al.	40	0.6900	-0.230	0.00190	2.61000
Median values	45	0.5895	-0.345	0.00304	2.48650

The resulting growth curves indicated a different pattern across the years (Figure 5). Growth parameters in GSAs 1 for deep-water rose shrimp using the parameters of last years appeared as an outliers that would need to be carefully re-considered applying standard methods of modal progression analysis. The suggestion for the assessment of EWG 25-09 is to keep going using the growth parameters from Guijarro et al. 2009 (Table 4).

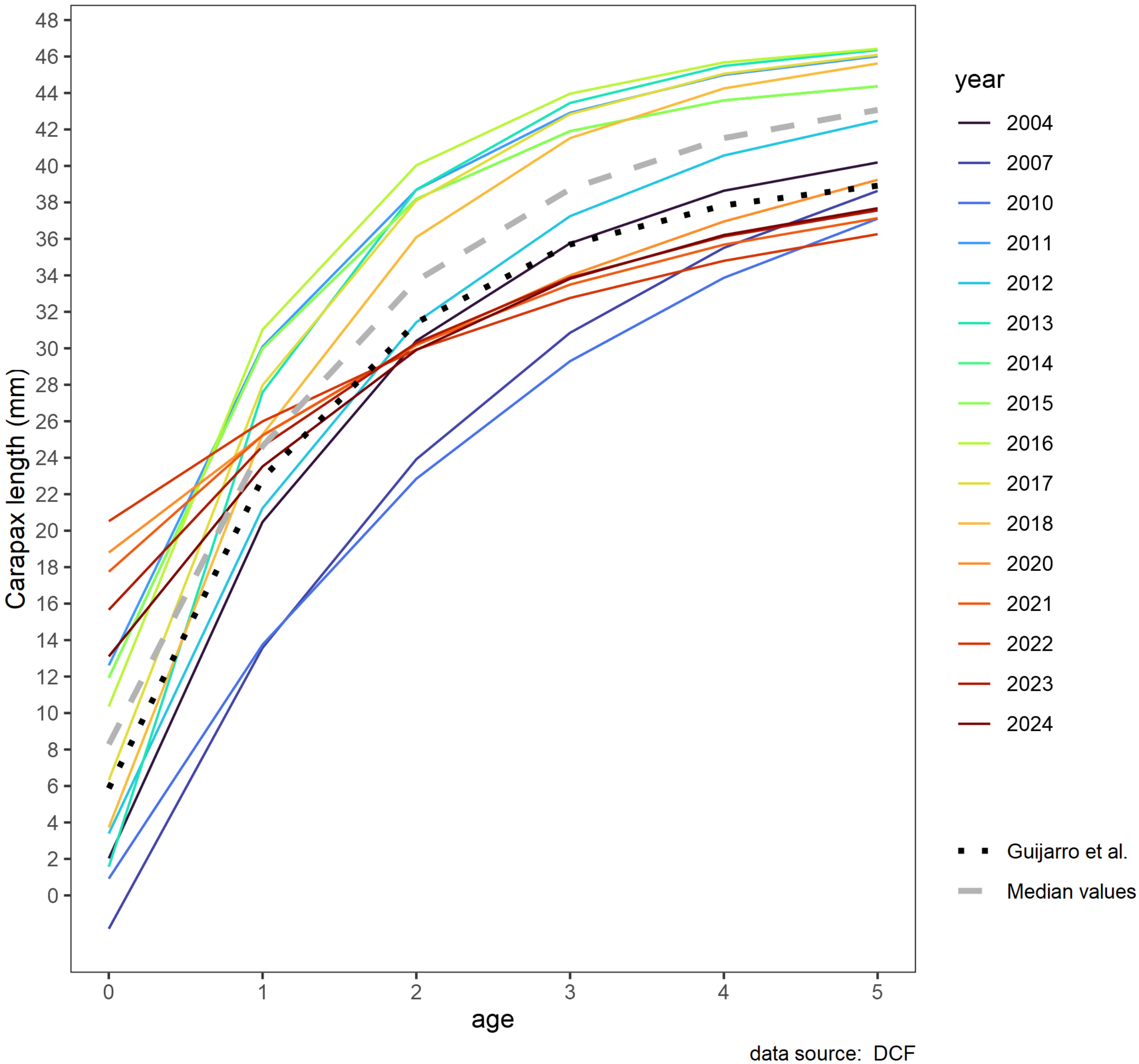


Figure 5: Growth parameters for DPS 1 by DCF

1.6 Age composition by deterministic slicing

Using the growth parameters from Guijarro et al. 2009 (Table 4),

Table 4: Growth Parameters for slicing

linf	k	t0
40	0.69	-0.23

we constructed the von Bertalanffy growth object with the Individual Growth class (a4aGr) from FLa4a, applying a t_0 correction.

```
## An object of class "FLPar"
## params
##  linf     k    t0
## 40.00  0.69  0.27
## units:  mm yr^-1 year
```

As an example, the following plot (Figure 6) shows the effect of deterministic slicing by quarter in 2024, with and without the t_0 correction.

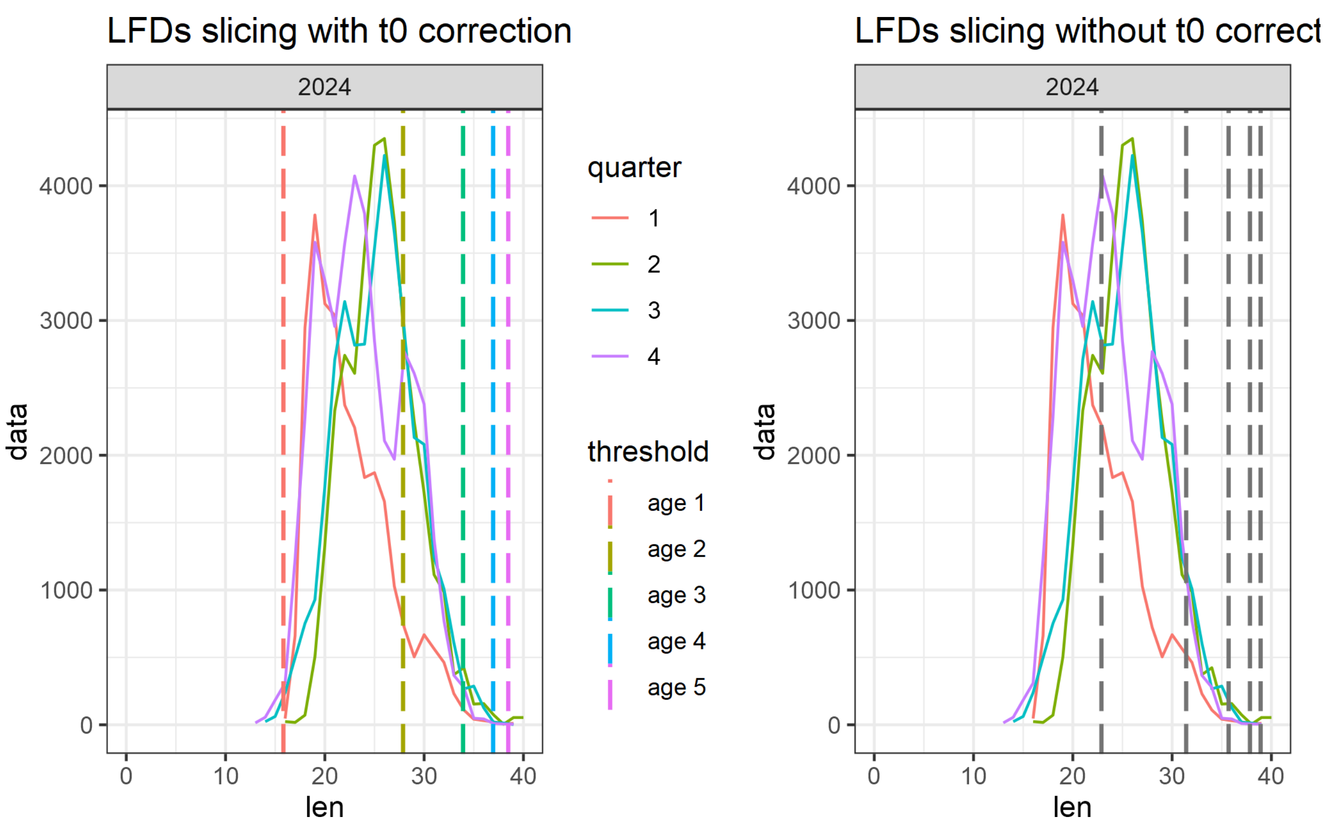


Figure 6: Tresholds for the deterministic slicing on the LFDs by quarter with and without t0 correction

The following figures show the t_0 correction applied across all years (Figure 7) and the results of deterministic slicing in terms of age structure (Figure 8).

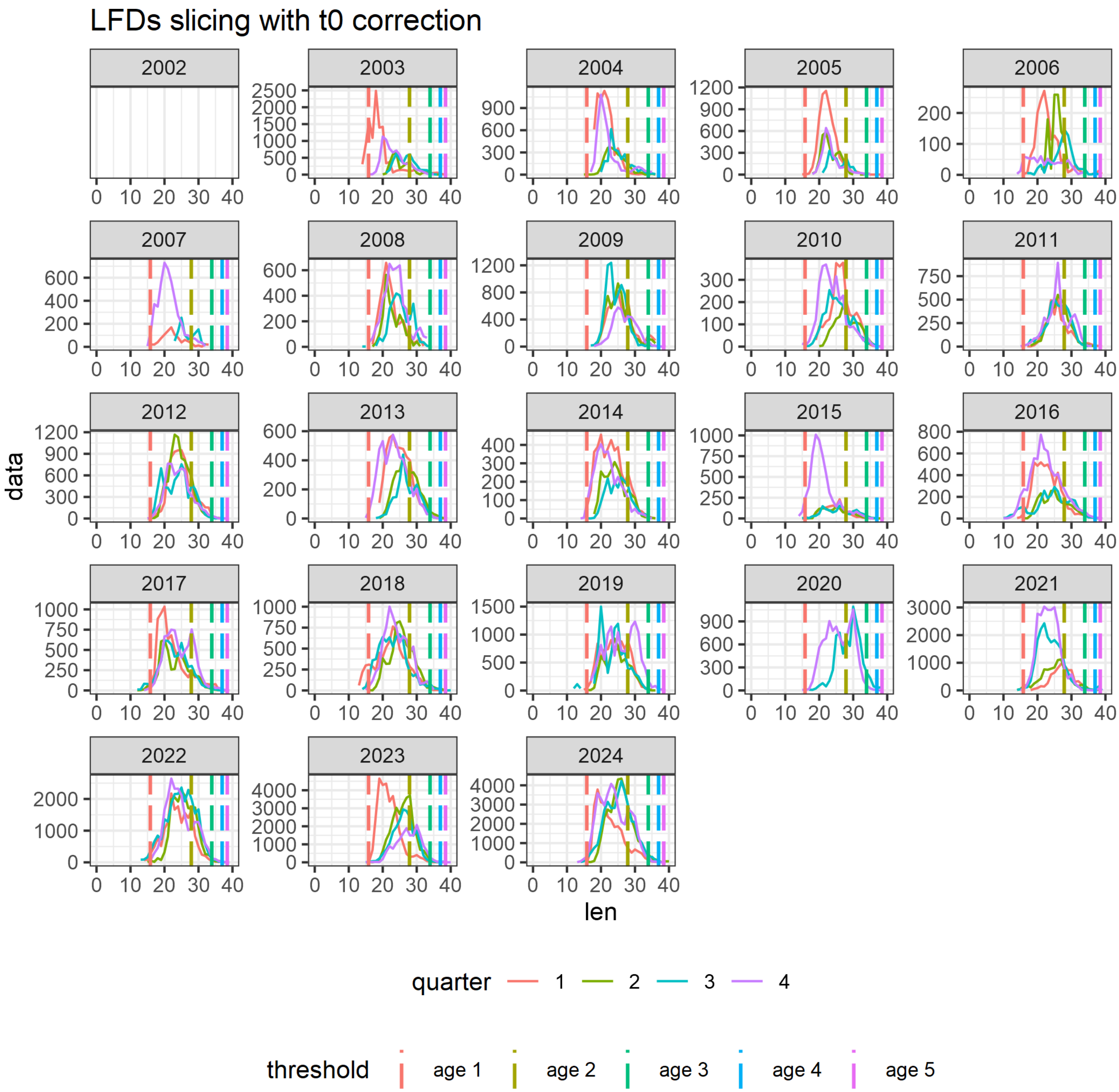


Figure 7: Tresholds for the deterministic slicing on the LFDs by quarter

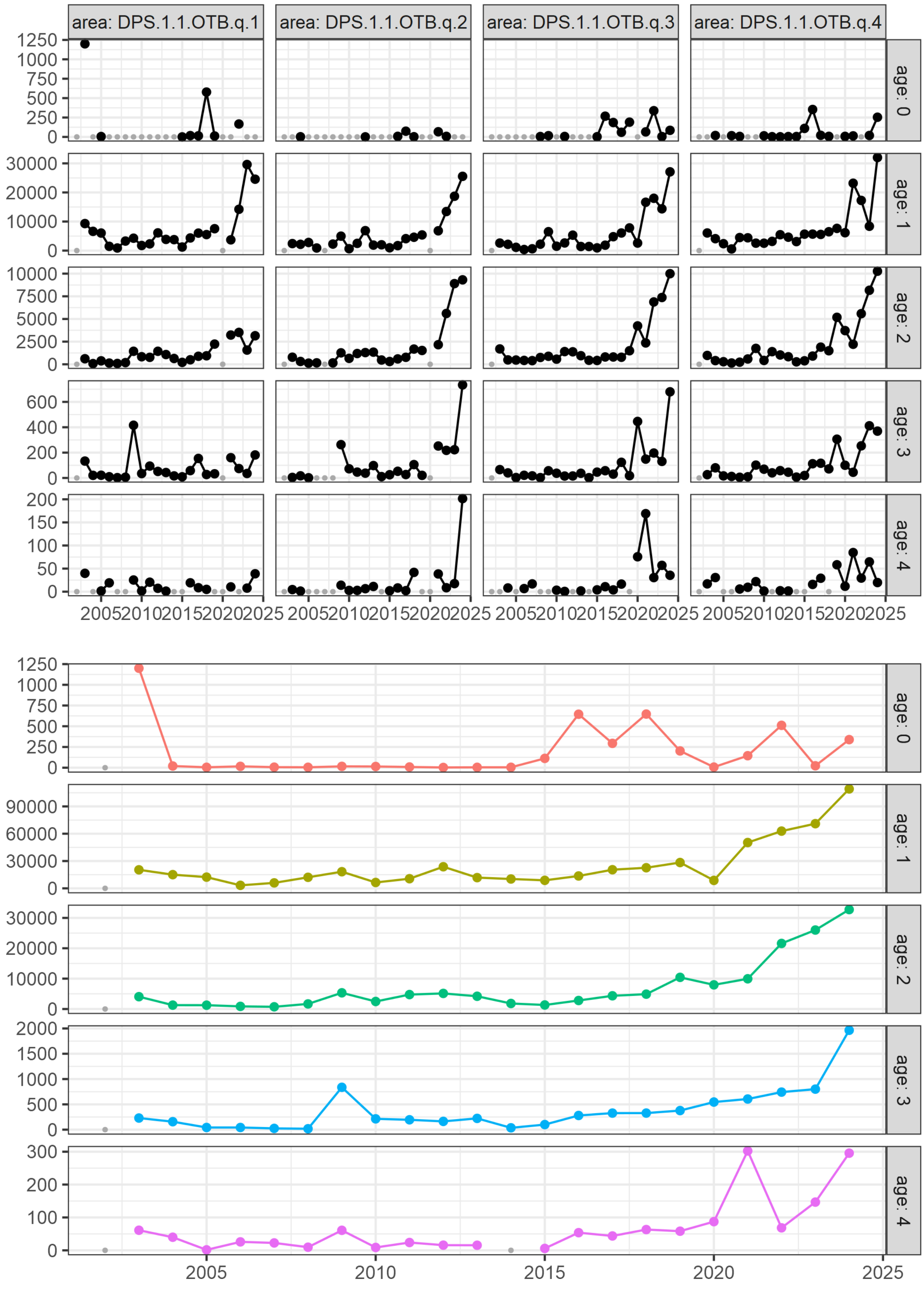


Figure 8: Age composition from the deterministic slicing

1.7 Maturity

No specific information on DPS maturity in GSA 1 is available from the DCF. For the assessment, maturity was assumed based on the values used in the previous STECF report. These values are consistent with observations from other western Mediterranean GSAs, where all individuals older than age 1 are mature, and only a small fraction of age-0 individuals are mature (5).

Table 5: Maturity vector

	2002
0	0.022
1	1.000
2	1.000
3	1.000
4	0.022

Using the information available from Medits in GSA1 a maturity ogive shows that L50 is ~17.8 mm CL (female).

From literature we found that size at first maturity: reported around ~21 mm CL (female) (see GFCM SAF biological table).

1.8 Feeding (trophic ecology)

No specific information on DPS feeding for GSA 1 is available. From literature is reported:

- Diet: demersal/benthic feeder—bivalves (clams), mysids, small crangonids, and other benthos;

1.9 essential fish habitats including spawning grounds and seasonality

No specific information on DPS EFH for GSA 1 is available. • Spawning seasonality: prolonged/near-year-round with a peak in summer in the Alboran documentation; broader Mediterranean reviews also describe two peaks between late spring and early autumn. • Spawning area: shelf and upper slope; • nursery: continental shelf. • habitat: mud to muddy sands on the shelf and slope; • juveniles occur shallower (~100–300 m), larger individuals typically deeper >350 m.

1.10 Natural mortality (M)

In all assessments conducted by STECF EWGs for DPS in GSA 1 and EMU 1, a natural mortality vector (M) was estimated using ProdBiom (Abella, 1997). The specific M vectors applied by the EWGs have varied over the years (Figure 9).

								M	M-at-age												
Sex	GSA	Ref. year	Linf	K	T0	a	b	Method	0	1	2	3	4	Slicing method	Fcur	F Age	FMSY	Assessment method	EWG (report)	EWG YEAR	Note
combined	1	2012	45	0.39	0.1			Prodbiom	1.25	0.82	0.39	0.28	0.22	L2AGE	0.43	1-3	0.26	XSA	17-02 (17-07)		
combined	1	2015	45	0.39	0.1			Prodbiom	1.72	0.97	0.82	0.76	NA		0.78	1-3	0.8	XSA	17-02 (17-07)		
combined	1	2015	45	0.39	0.102	0.00306	2.49061	Prodbiom	1.72	0.97	0.82	0.76	0.72	statistical slicing	0.78	1-3	0.87	XSA only GSA1 all WM gsas	16-17 (17-06)	2016	GP from STECF EWG 13-09 Maturity 0 0.13 0.50 0.88 0.99
combined	1	2017	47	0.76	-0.19	0.0089	2.155	Prodbiom	1.52	0.84	0.7	0.65						XSA and a4aall WM GSAs201	18-12	2018	ASSESSMENT NOT ACEPTED ICES category 3 stock advice is applied Maturity 0 1 1 1
combined	1	2018	47	0.689	-0.12	0.004	2.347	Prodbiom	1.52	0.84	0.7	0.65						XSA and a4aall WM GSAs201	19-10	2019	ASSESSMENT NOT ACEPTED ICES category 3 stock advice is applied
combined	1	2017	47	0.76	-0.19	0.0089	2.155	Prodbiom	1.52	0.84	0.7	0.65						XSA and a4aall WM GSAs201	20-09	2020	the a4a and XSA models were accepted as indicative of trends ICES category 3 stock advice is applied
combined	1	2017	47	0.76	-0.19	0.0089	2.155	Prodbiom	1.52	0.84	0.7	0.65						A4A all WM GSAs 2018 Index advice	21-11	2021	the a4a and XSA models were accepted as indicative of trends ICES category 3 stock advice is applied
combined	1	2017	40	0.69	-0.23	0.0019	2.61	Prodbiom	2.05	1.06	0.57	0.4		L2AGE (t0 +0.5)	0.87	1-2		A4A only GSA 1	21-11	2021	the a4a was not accepted for advice The maturity vector is changed Maturity 0.022 1 1 1
combined	1	2021	40	0.69	-0.23	0.0019	2.61	Prodbiom	2.05	1.06	0.57	0.4		L2AGE (t0 +0.5)	0.87	1-2	0.99	A4A only GSA 1	22-09	2022	the a4a was not accepted for advice The maturity vector is changed Maturity 0.022 1 1 1
combined	1	2022	40	0.69	-0.23	0.0019	2.61	Prodbiom	2.05	1.06	0.57	0.4		L2AGE (t0 +0.5)	0.97	1-2	1.01	A4A only GSA 1	23-09	2023	the a4a was not accepted for advice The maturity vector is changed Maturity 0.022 1 1 1
combined	1	2023	40	0.69	-0.23	0.0019	2.61	Prodbiom	2.05	1.06	0.57	0.4		L2AGE (t0 +0.5)	0.99	1-2	1.02	A4A only GSA 1	24-10	2024	the a4a was not accepted for advice The maturity vector is changed Maturity 0.022 1 1 1

Figure 9: M-at-age vectors used in different assessments through the years

Since EWG 21-11, the natural mortality vector (Table 6) has remained unchanged. In that meeting, the group adopted the vector previously applied in a GFCM assessment, which is based on a sex-combined M curve estimated with ProdBiom and the parameters reported in Table 4.

Table 6: Natural Mortaliy vector

	2002
0	2.05
1	1.06
2	0.57
3	0.40
4	2.05

Using the $computing_G FCM_M vector$ script we compute different M values using the growth parameters (see Table 4 and some other specific settings:

l50=17.8 # Length at 50% of maturity

T1=13 # Sea Temperature in Pauly equation first value

T2=13.5 # Sea Temperature in Pauly equation second value

T3=14 # Sea Temperature in Pauly equation third value

min_l <- 10 # minimum length in LFD

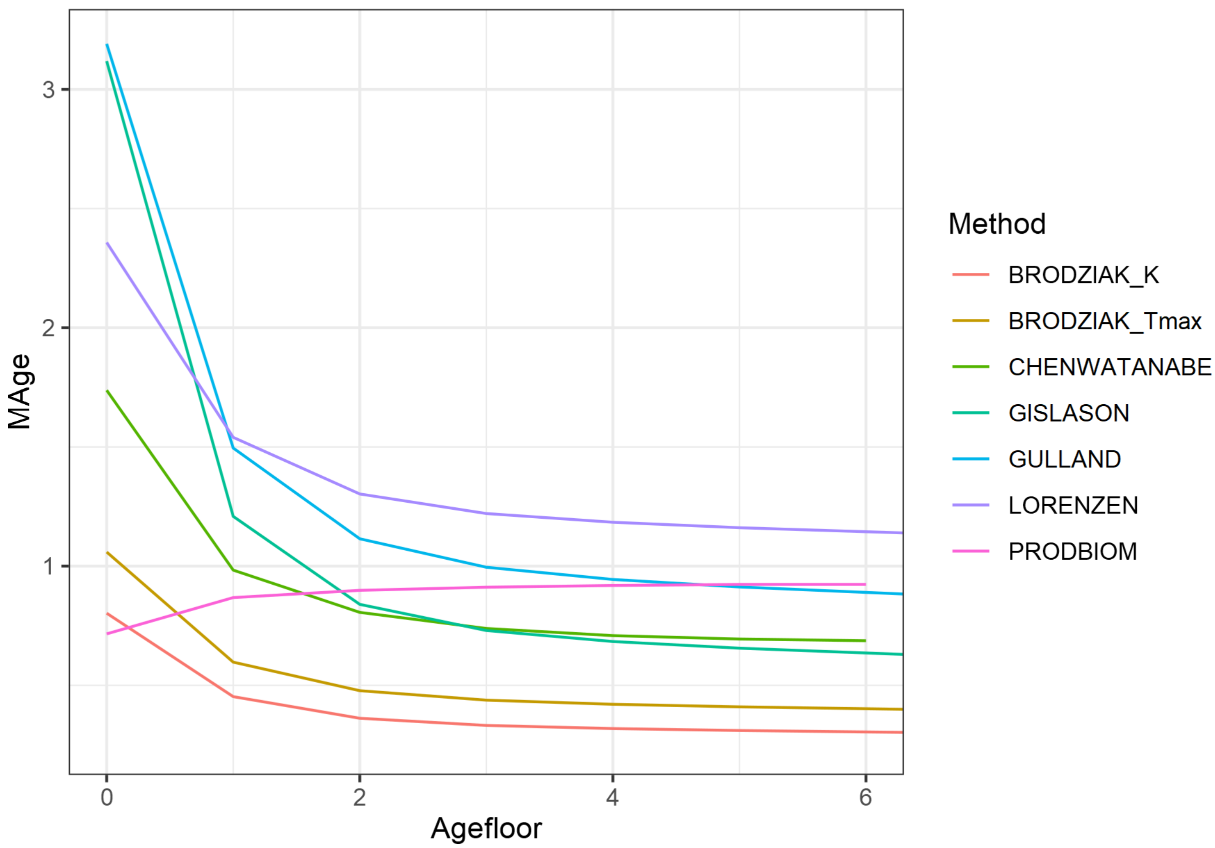
max_l <- 49 # maximum lengh in LFD

step <- 1 # length class step

Methods agreed to run mean vector

Meth <- c("GULLAND", "PRODBIOM","LORENZEN","BRODZIAK_Tmax",

"BRODZIAK_K","CHENWATANABE","GISLASON")



The resulting M vector is:

Table 7: Mortaliy vector as mean of all methods

Agefloor	M
0	1.8546522
1	1.0207030
2	0.8286168
3	0.7664318
4	0.7396945

we exclude the Mortality from prodBiom reported in Table 8,

Table 8: Mortaliy from prodBiom

	Agefloor	Method	MAge
10	0	PRODBIOM	0.7158499
23	1	PRODBIOM	0.8680509
31	2	PRODBIOM	0.8984911
39	3	PRODBIOM	0.9115369
47	4	PRODBIOM	0.9187845
55	5	PRODBIOM	0.9233967
58	6	PRODBIOM	0.9233967

and we estimate again the mean M value (Table 9)

Table 9: Mortaliy vector as mean of all methods but removing prodBiom

Agefloor	M
0	1.3382481
1	1.0211444
2	0.8055170
3	0.7348365
4	0.7041110

2 TOR 2

ToR 2. To compile and provide complete sets of annual data on landings and discards as well as the standardized MEDITS Index for the longest time series available up to and including 2024, including length frequency distribution over time. To provide a complete and updated stock assessment input file in the format of those used in 2024.

2.1 Data source and Methods

The data used to compile the stock assessment input file were the raw DCF datasets provided to EWG 25-09 and stored in SharePoint. All data were filtered for DPS in GSA 1 and processed using the scripts available in the SCRIPTs folder on SharePoint. Specifically, the scripts contained in subfolders 1.1 to 1.6 were applied to check data quality, fill gaps, and generate the input files for the assessment. Some additional R code has been drafted to optimize the analysis and will be finalized during the meeting, following presentation and discussion in plenary.

2.2 stock object

The main issues identified concern the procedure previously used to generate the input data. When using the script Creating_stk_sexcombined.R, the zerochecked function automatically fills in data for the first year (2002), although length distributions are not available for either landings or discards. This procedure should be discussed in plenary to decide whether 2003, rather than 2002, should be considered as the initial year for the assessment. In addition, plenary discussion is needed to determine whether discards (which are negligible) should be included in the construction of catches. An FLStocks object (Figures 10, 11, 12) has been prepared to cover all the scenarios that will be explored and discussed during the meeting.

The second issue concerns the natural mortality (M) vector. As already explained in TOR 1, because the approach in previous EWGs was to update the information only with the latest year of data, the M vector was never revised. To address this, we have prepared different natural mortality vectors in the form of FLQuant objects (Figure 13, Table 10), which will be used to conduct a sensitivity analysis on the effect of alternative M values in the assessment.

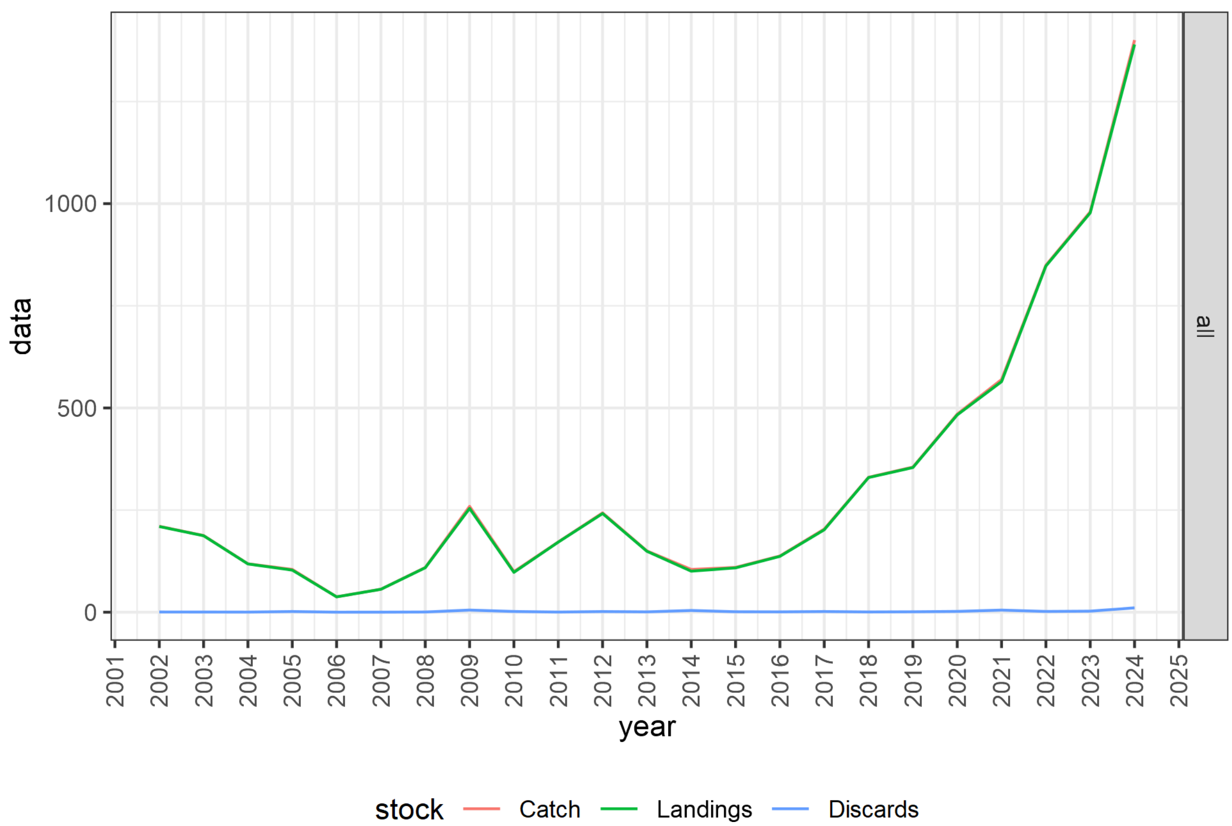


Figure 10: DPS 1: FLStocks prepared for the EWG 25-09. Total catch, landings and discards

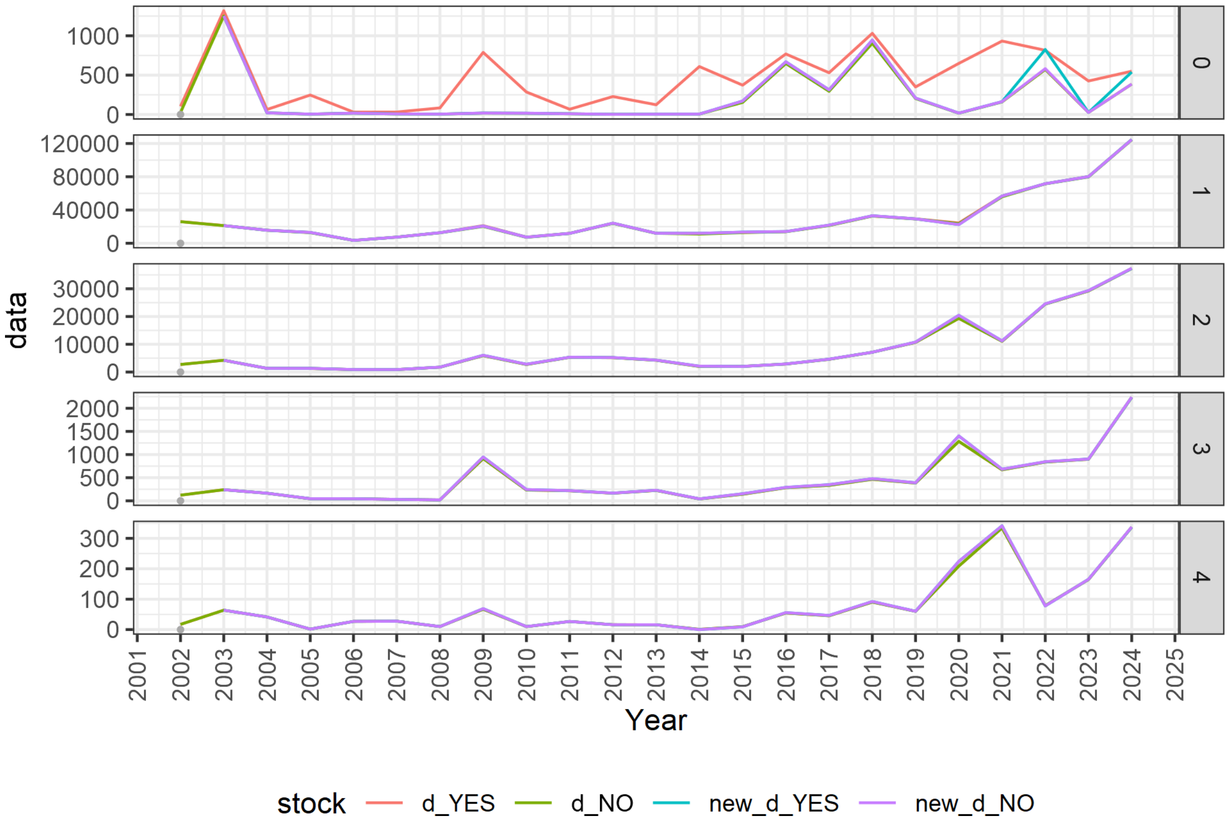


Figure 11: DPS 1: FLStocks prepared for the EWG 25-09. Catch.n slots.

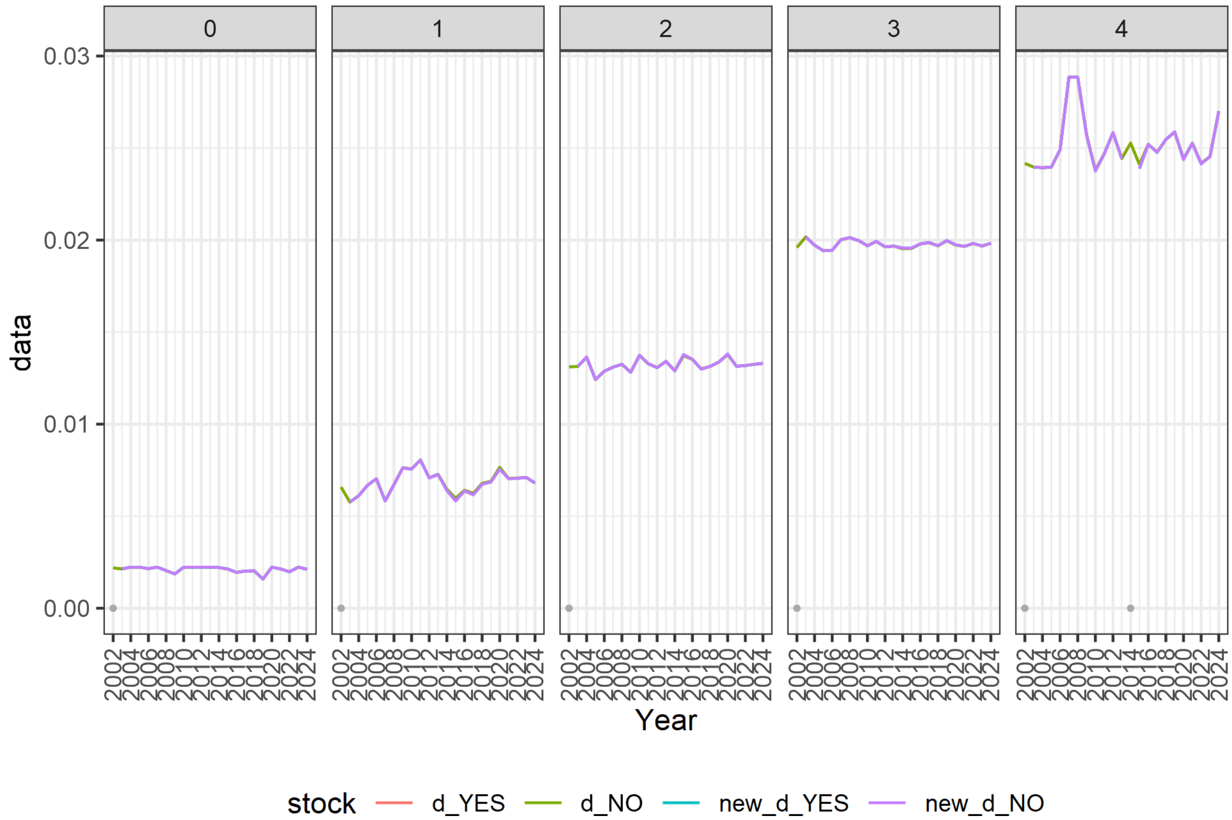


Figure 12: DPS 1: FLStocks prepared for the EWG 25-09. Catch.wt slots.

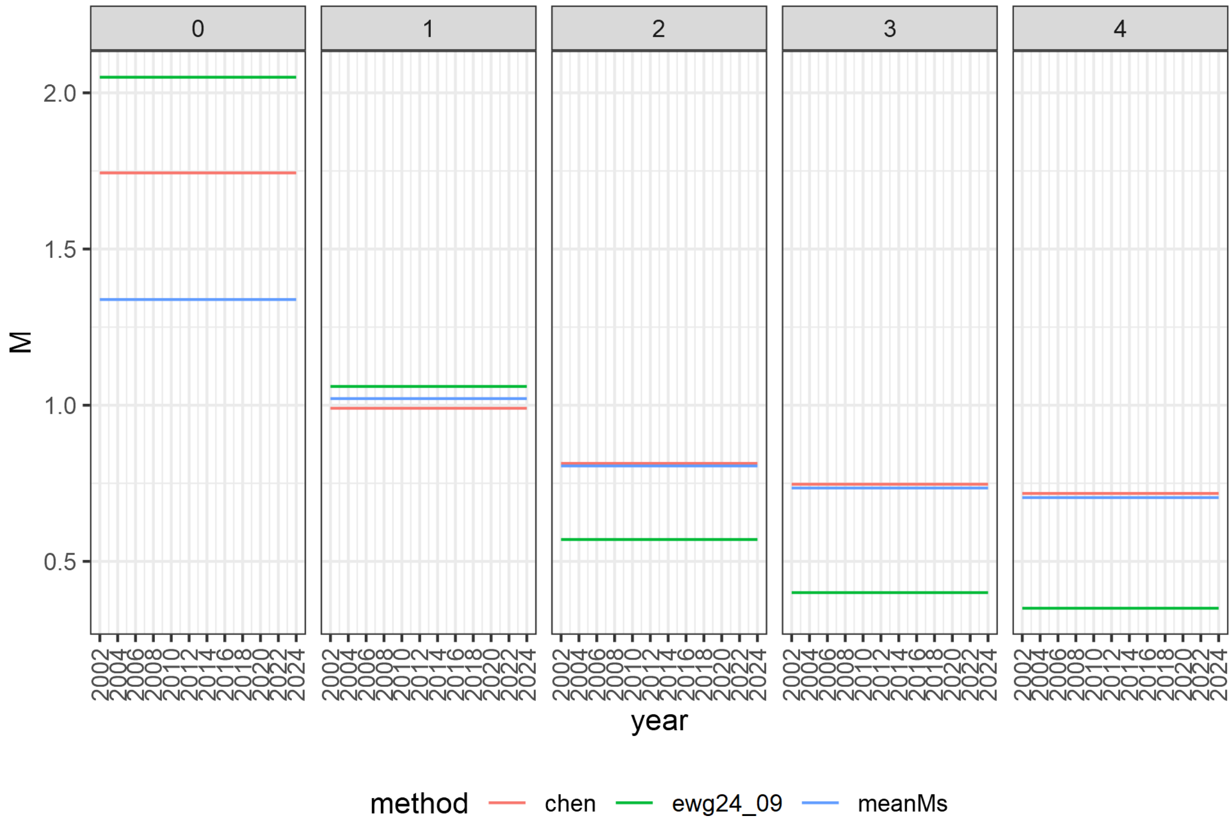


Figure 13: DPS 1: different M vector to be tested

Table 10: Mortaliy vector to be explored

age	chen	ewg24_09	meanMs
0	1.744	2.05	1.338
1	0.990	1.06	1.021
2	0.814	0.57	0.806
3	0.747	0.40	0.735
4	0.717	0.35	0.704

2.3 index object (Medits)

No major issues were identified in the construction of the index object, with the exception of the missing data for 2020. The object was developed in accordance with the standard methodology (Figure 14, Table 11)

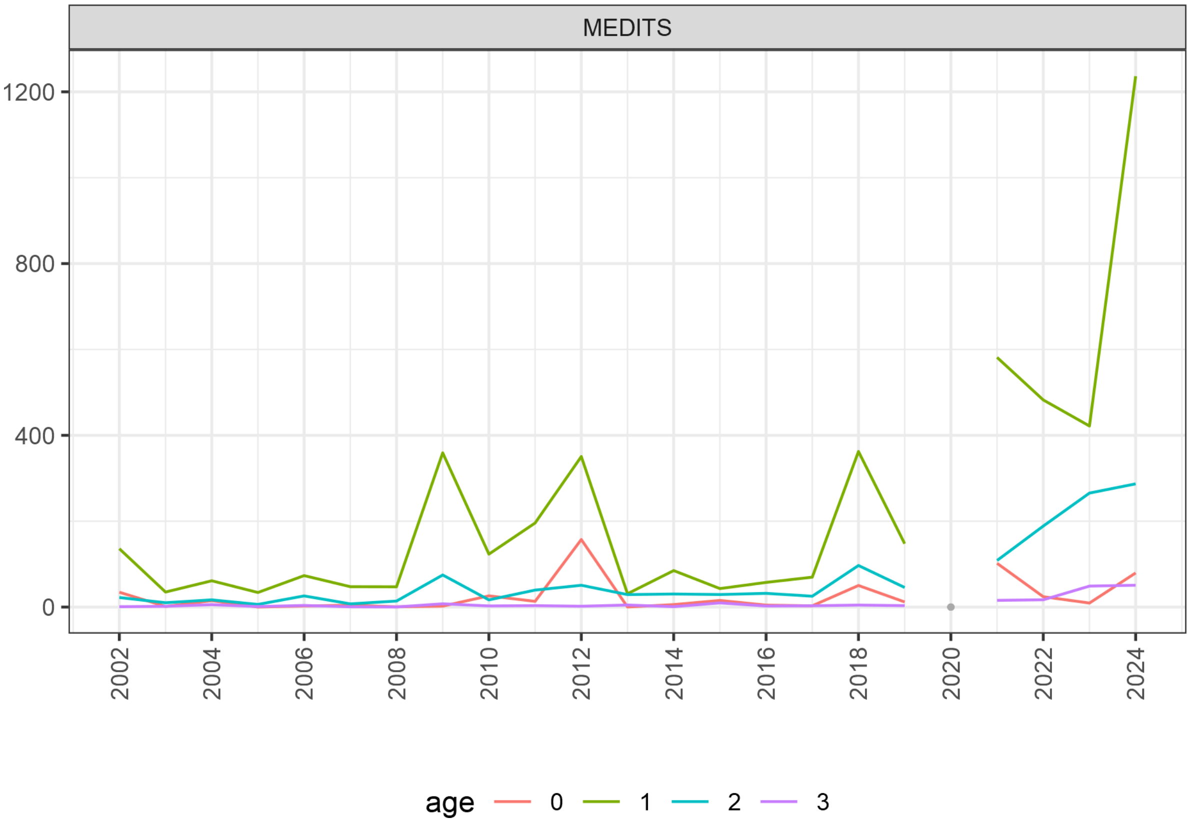


Figure 14: DPS 1: Medits data at age

Table 11: Medits input data

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
0	34.55	1.48	14.90	0.14	2.55	4.40	0.61	2.23	26.18	13.34	157.31	0.28	5.77	15.47
1	135.92	35.03	61.23	33.97	73.28	47.47	47.24	359.21	123.34	195.83	350.59	31.06	85.01	43.07
2	22.27	10.10	16.82	6.19	26.01	7.46	14.00	74.74	16.76	39.58	50.77	29.07	30.45	29.24
3	0.87	1.78	5.68	1.23	3.82	0.68	0.31	7.63	2.70	3.38	1.94	4.84	0.96	9.68

3 Conclusion

All output files generated during the data preparation process will be uploaded to the SharePoint repository. This will ensure full traceability of the procedures applied, transparency in the data workflow, and accessibility for all members of the working group. Based on the issues identified, it is suggested that the next step should not be a simple update of the assessment, but rather a comprehensive revision, in order to ensure consistency, robustness, and alignment with the most recent methodological standards.