

# Density Dependence

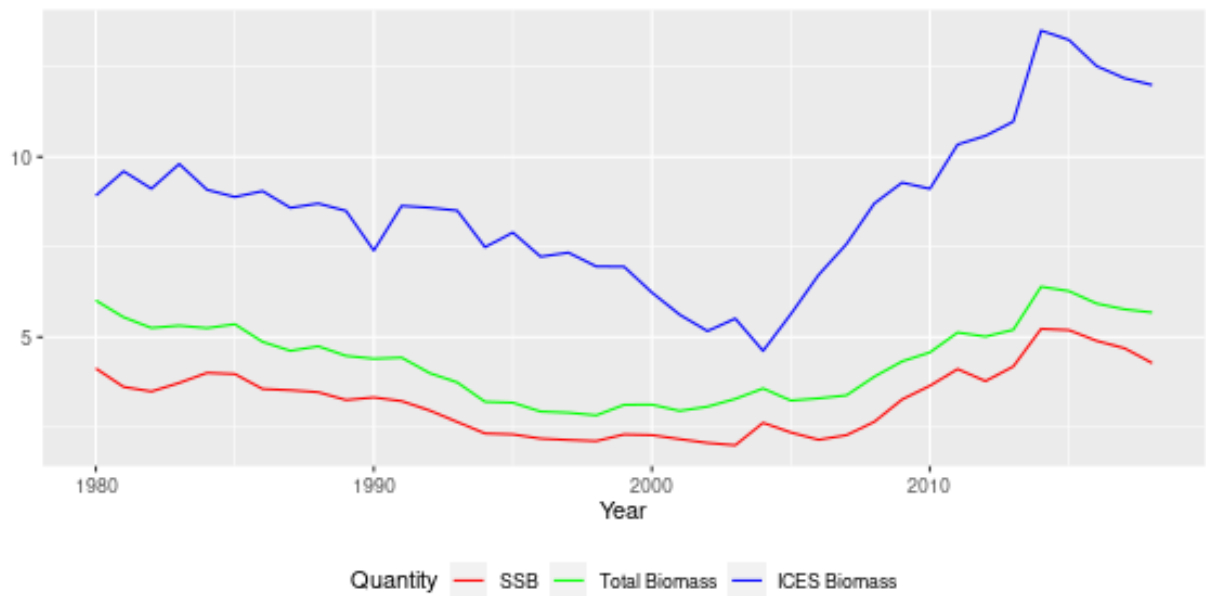
Summary

L Kell

13 December, 2022

Error in get\_dropbox() : could not find function "get\_dropbox"

## Mackerel



**Figure 1** Time series

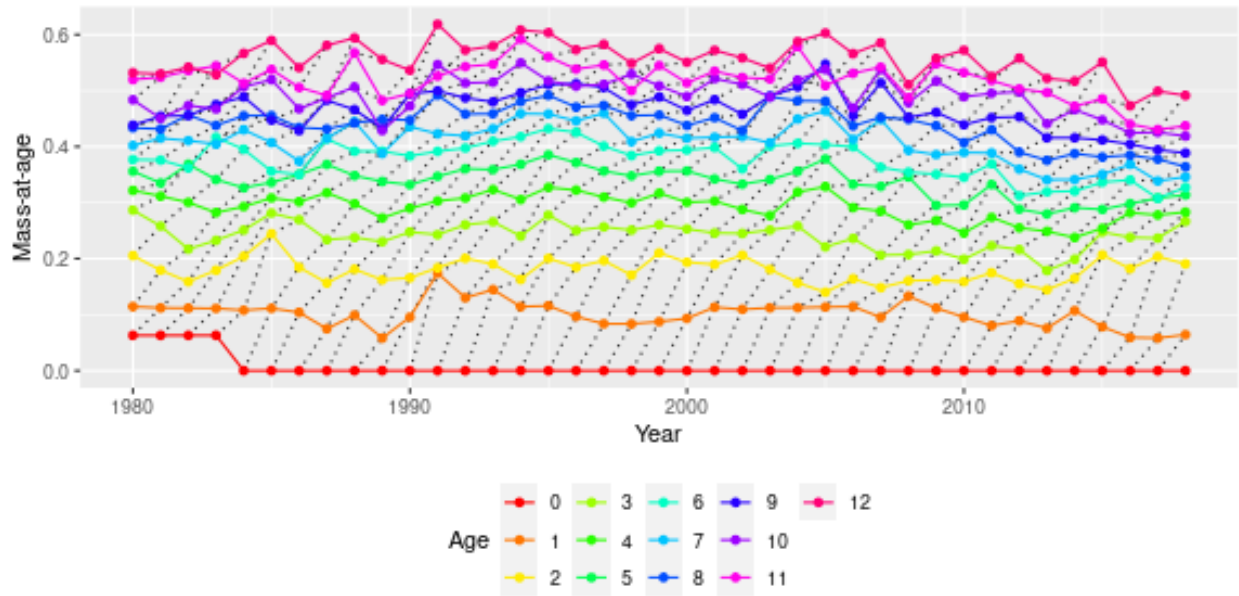


Figure 2 Mass-at-age

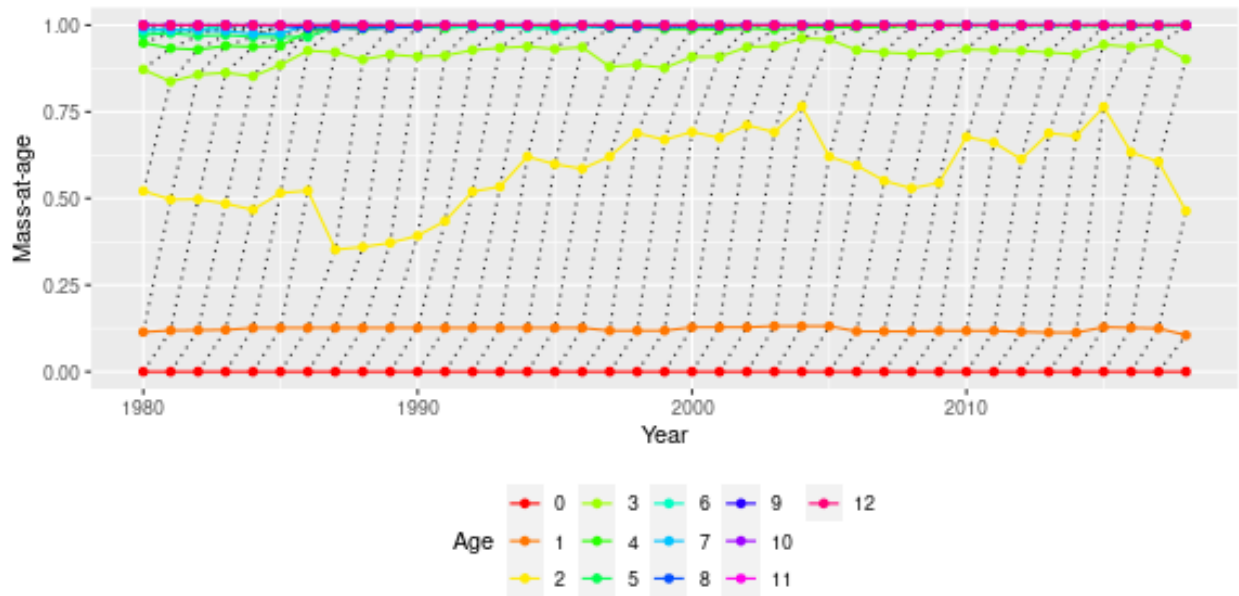


Figure 3 Maturity-at-age

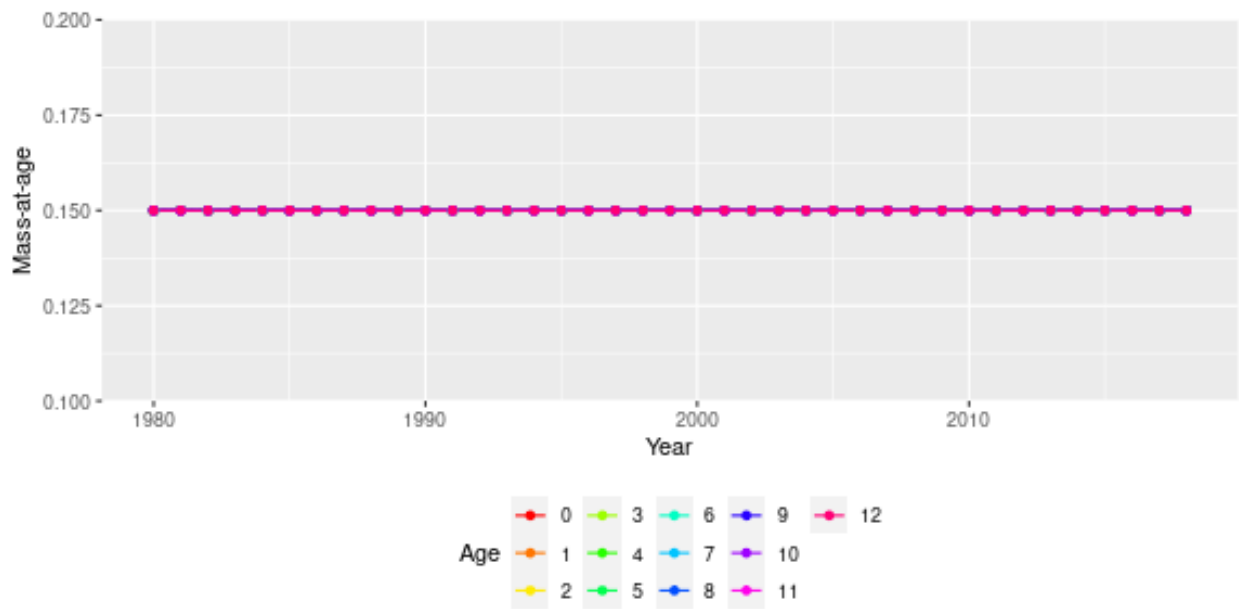


Figure 4 M-at-age

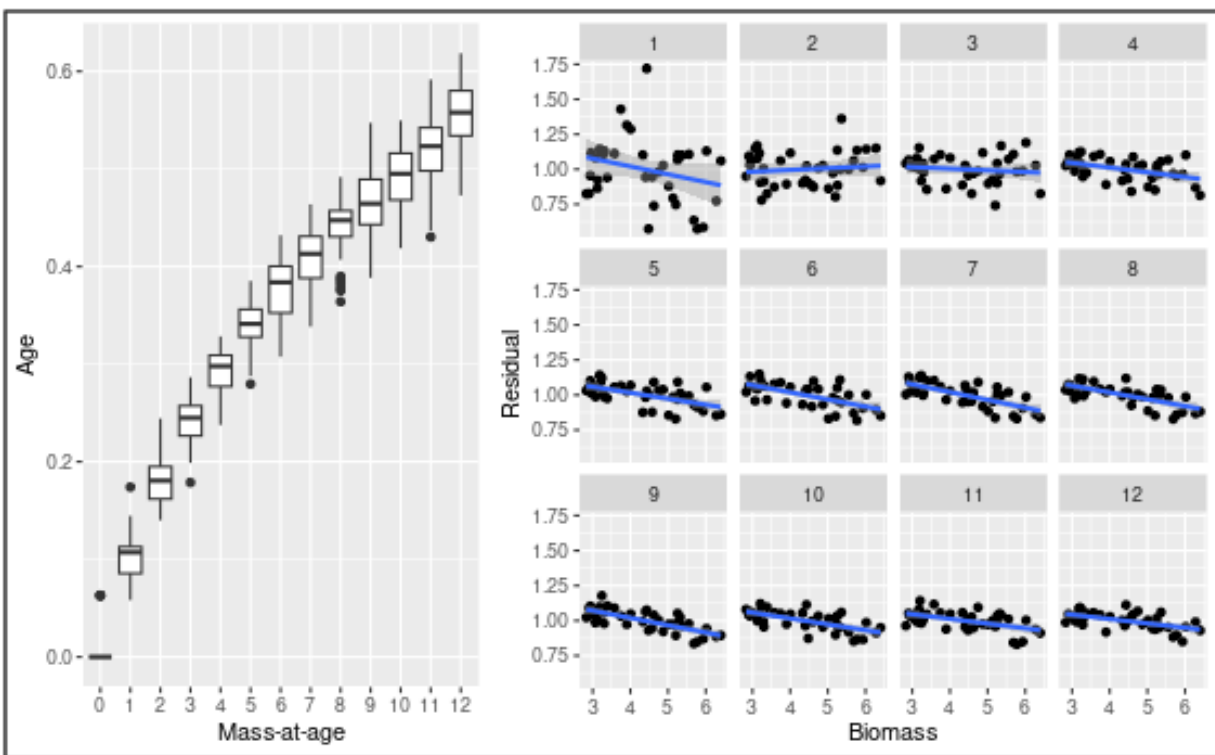


Figure 5 Mass-at-age, summary

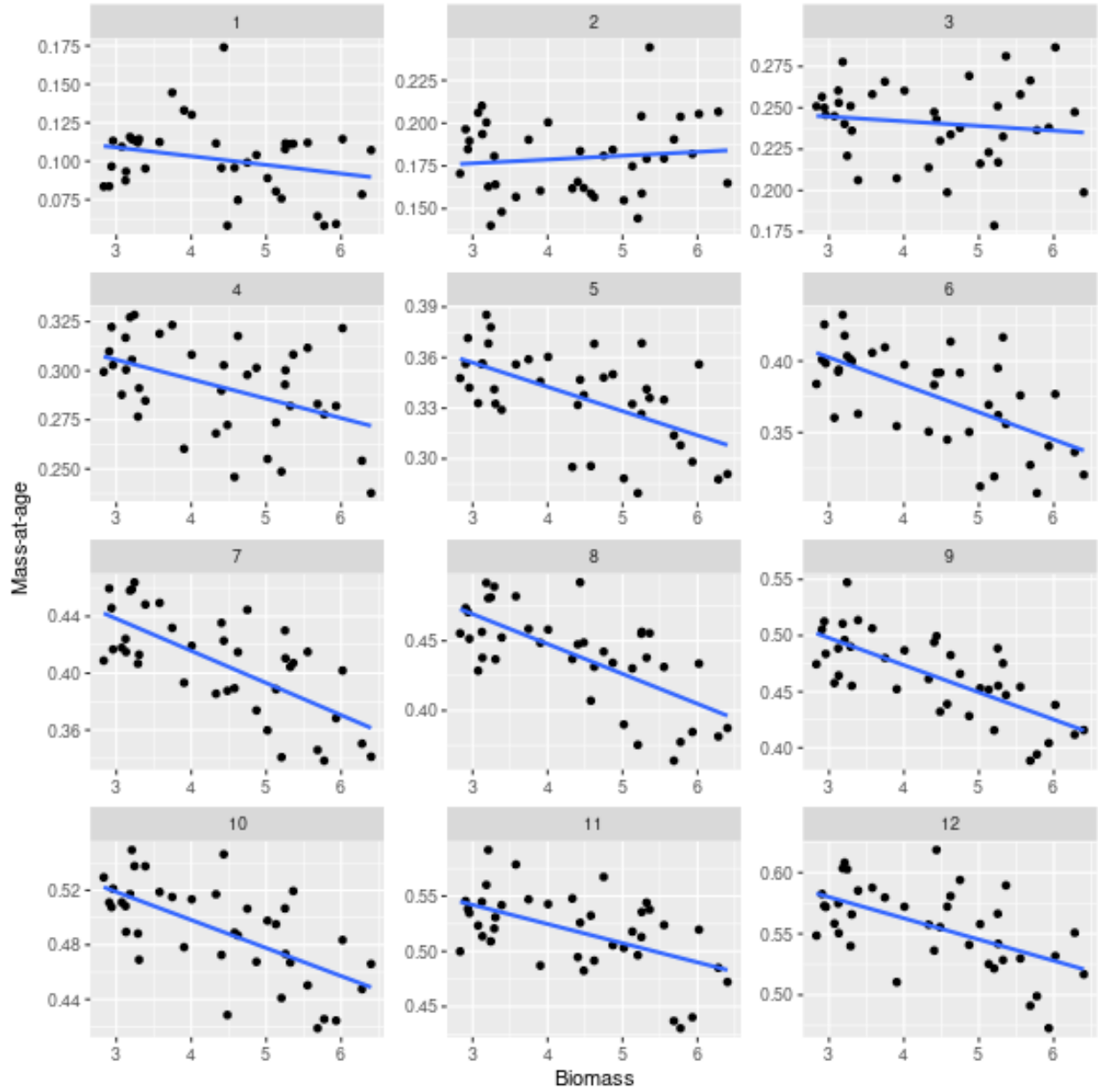
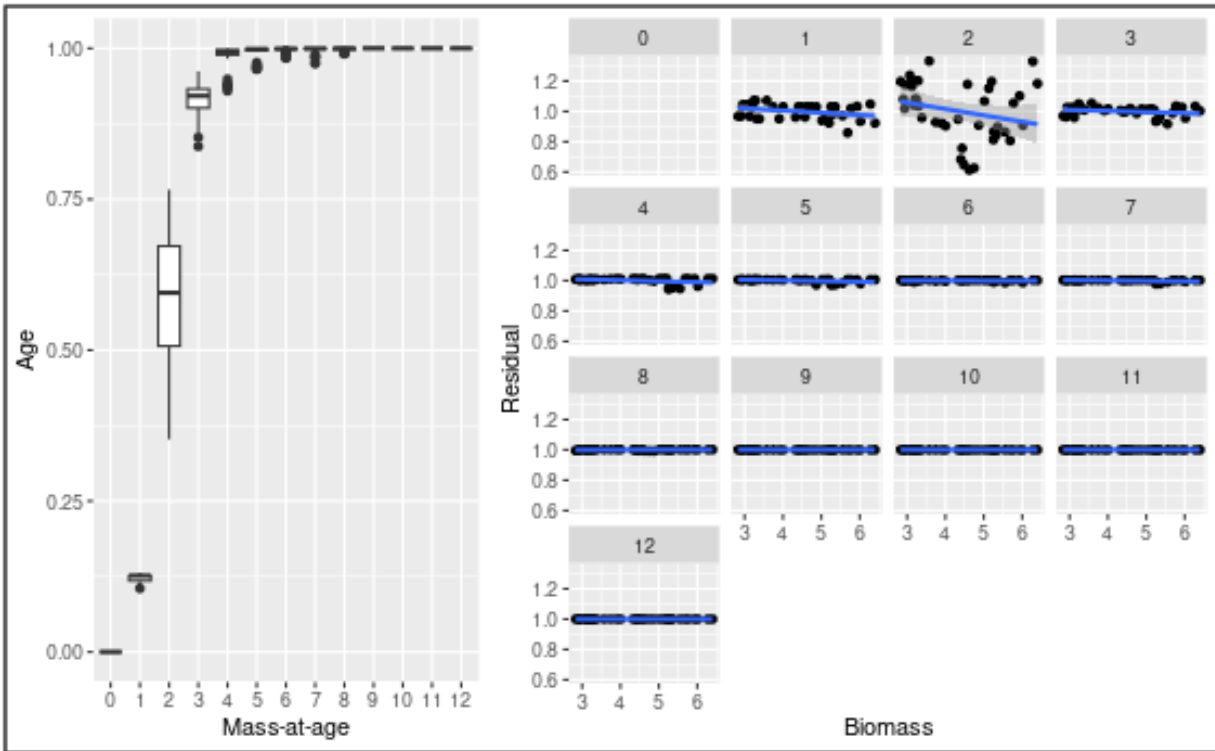
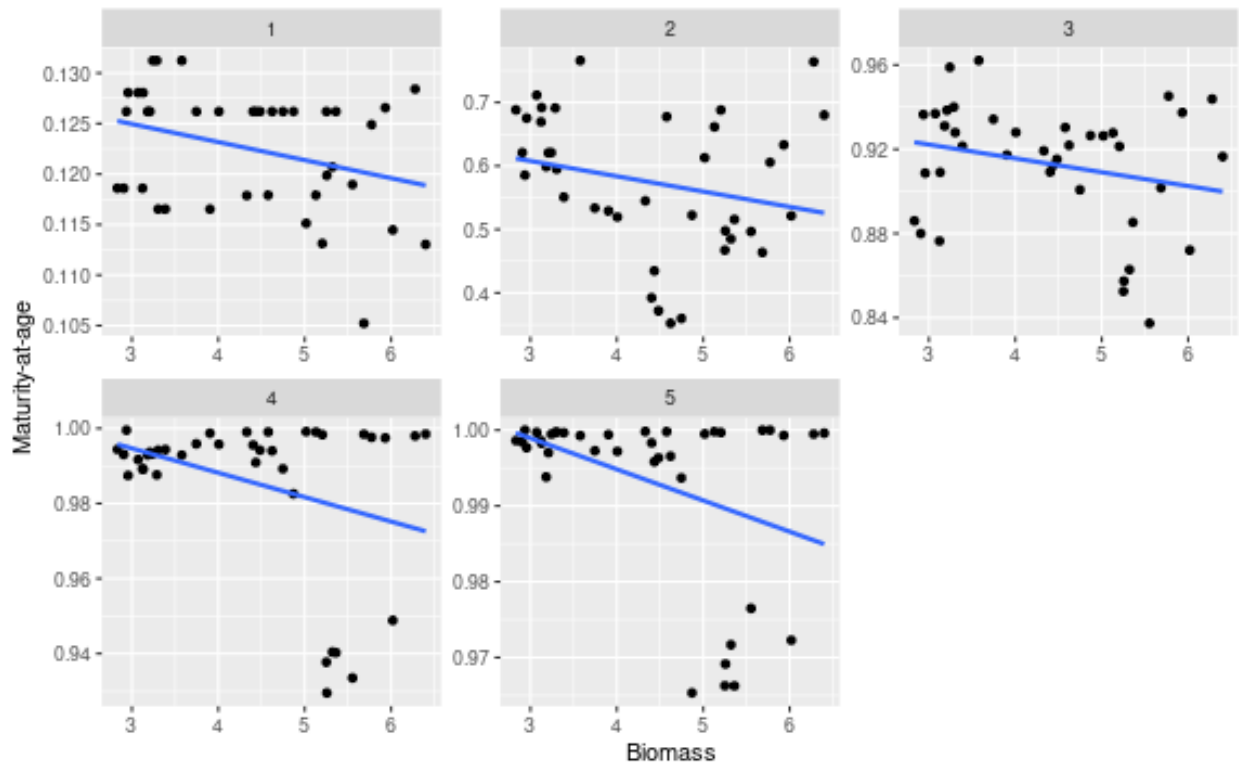


Figure 6 Mass-at-age v Biomass



**Figure 7** Maturity-at-age, summary



**Figure 8** Maturity-at-age v Biomass

Family: gaussian

Link function: identity

Formula:

data ~ s(tb, bs = "tp") + age

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	0.006462	0.004258	1.518	0.13
age1	0.094724	0.006021	15.731	<2e-16 ***
age2	0.173084	0.006021	28.744	<2e-16 ***
age3	0.234345	0.006021	38.918	<2e-16 ***
age4	0.285574	0.006021	47.426	<2e-16 ***
age5	0.330820	0.006021	54.940	<2e-16 ***
age6	0.369769	0.006021	61.409	<2e-16 ***
age7	0.400927	0.006021	66.583	<2e-16 ***
age8	0.433322	0.006021	71.963	<2e-16 ***
age9	0.458213	0.006021	76.097	<2e-16 ***
age10	0.484169	0.006021	80.407	<2e-16 ***
age11	0.511844	0.006021	85.003	<2e-16 ***
age12	0.549800	0.006021	91.307	<2e-16 ***

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

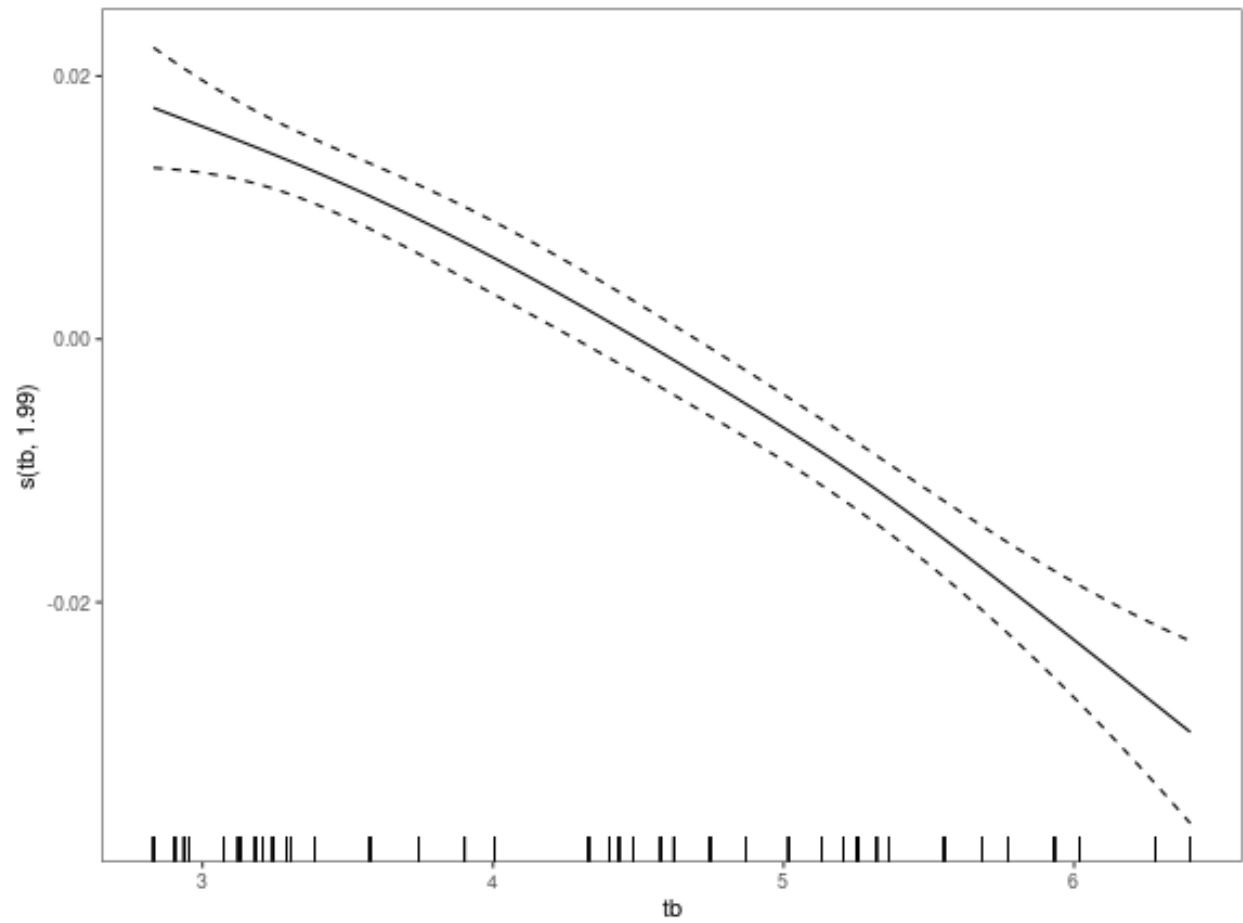
	edf	Ref.df	F	p-value
s(tb)	1.994	1.994	71.48	<2e-16 ***

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.974

Scale est. = 0.00070703 n = 507



## Blue whiting

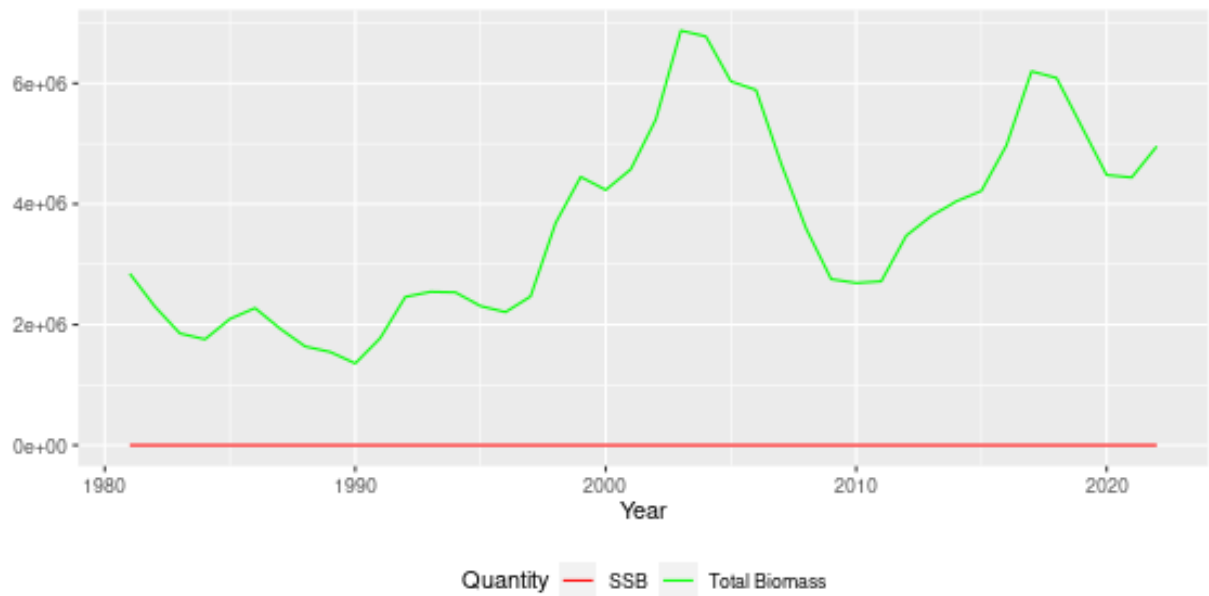


Figure 9 Time series

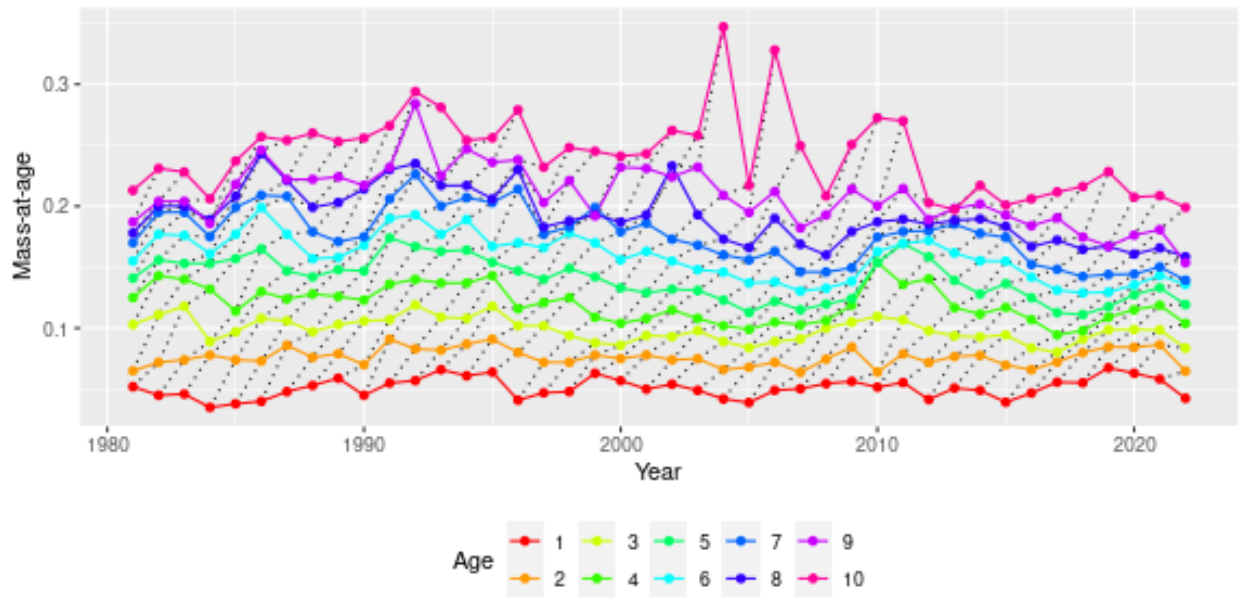


Figure 10 Mass-at-age

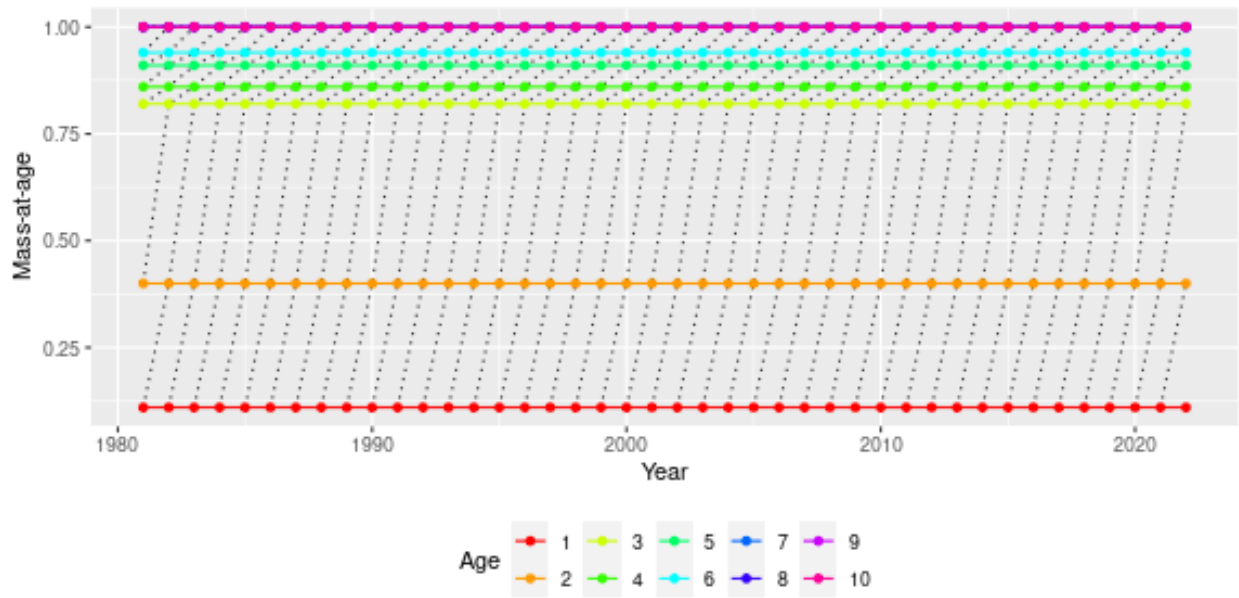


Figure 11 Maturity-at-age



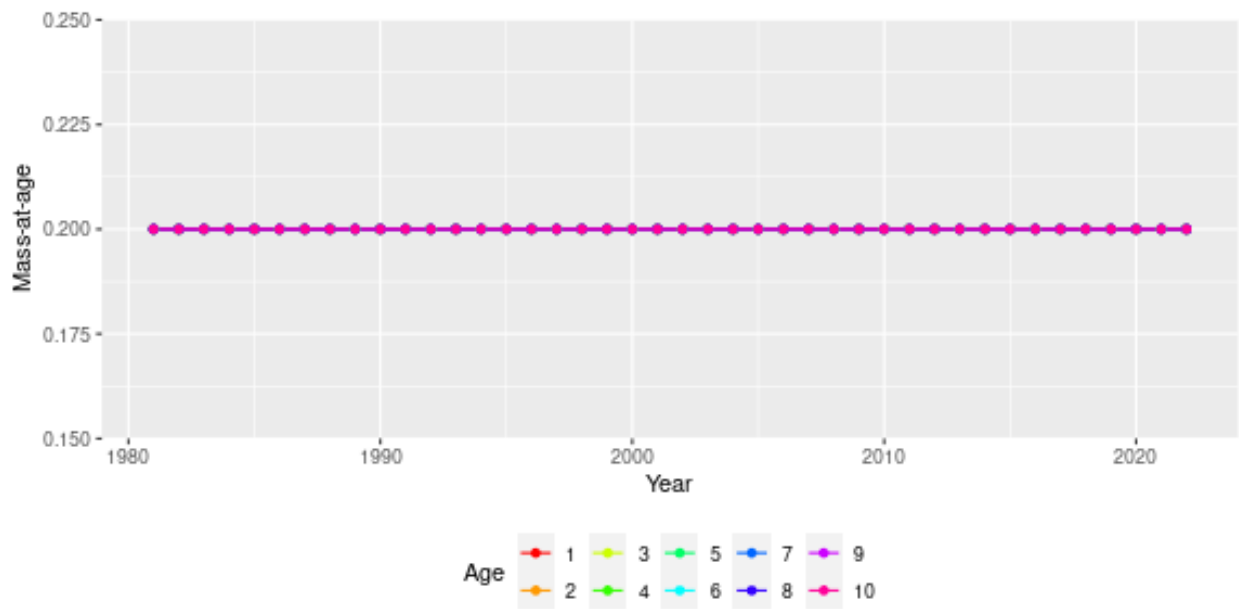


Figure 12 M-at-age

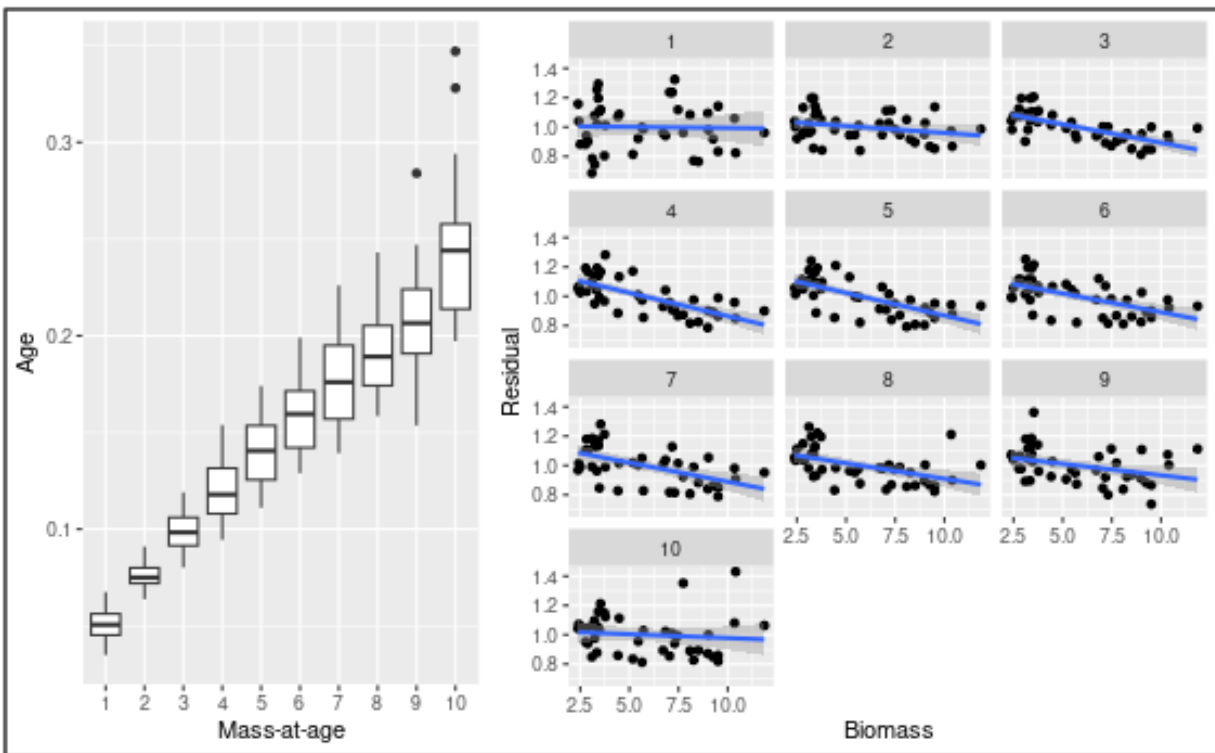


Figure 13 Mass-at-age, summary

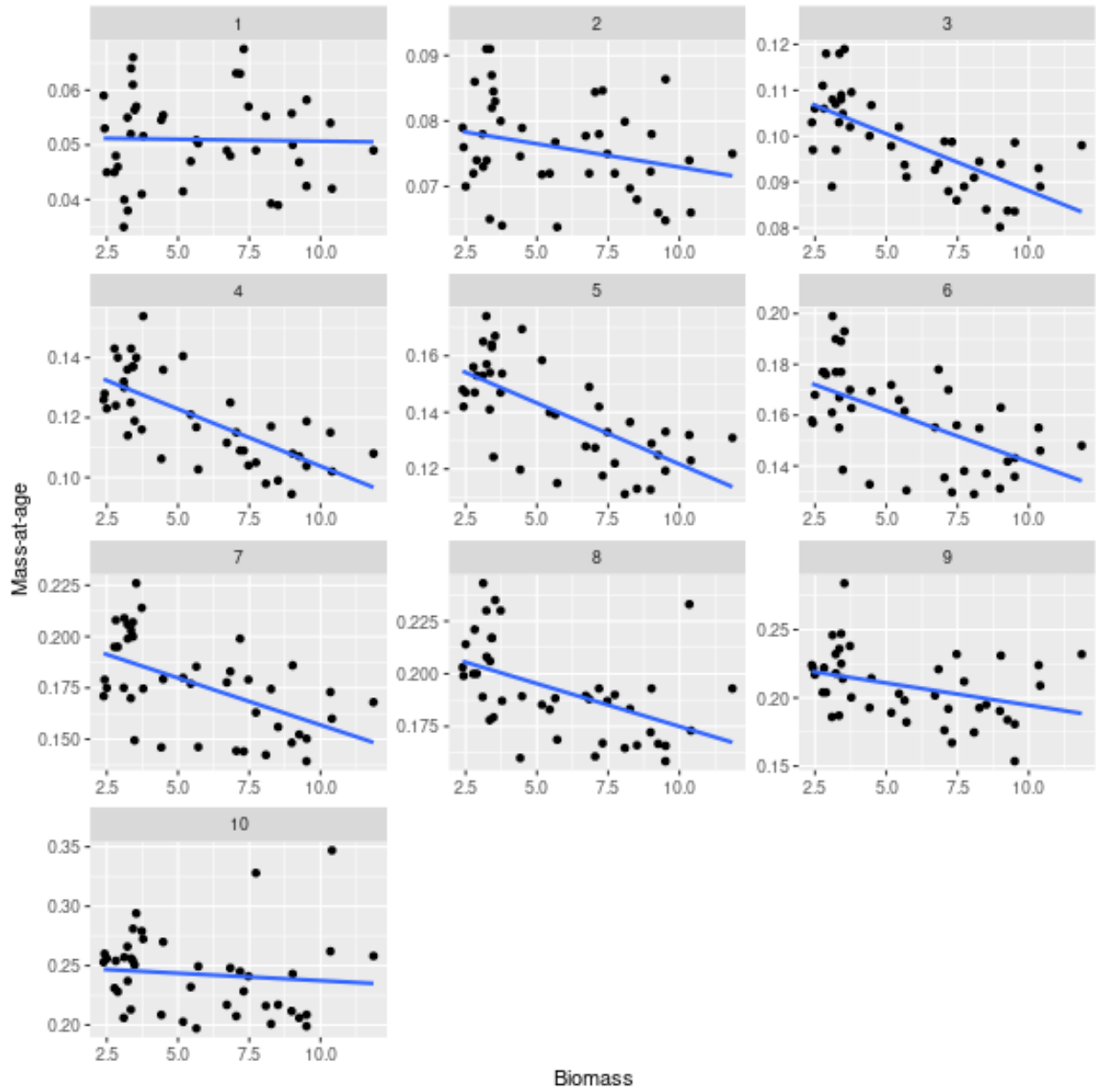
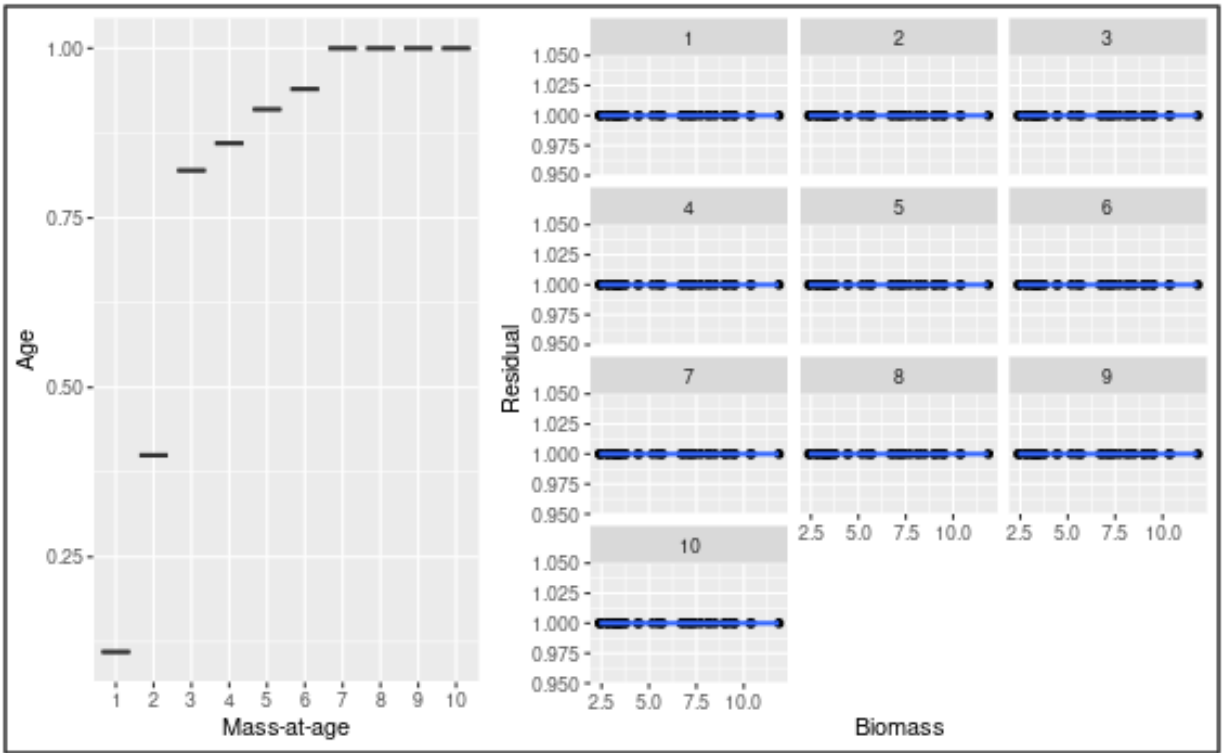
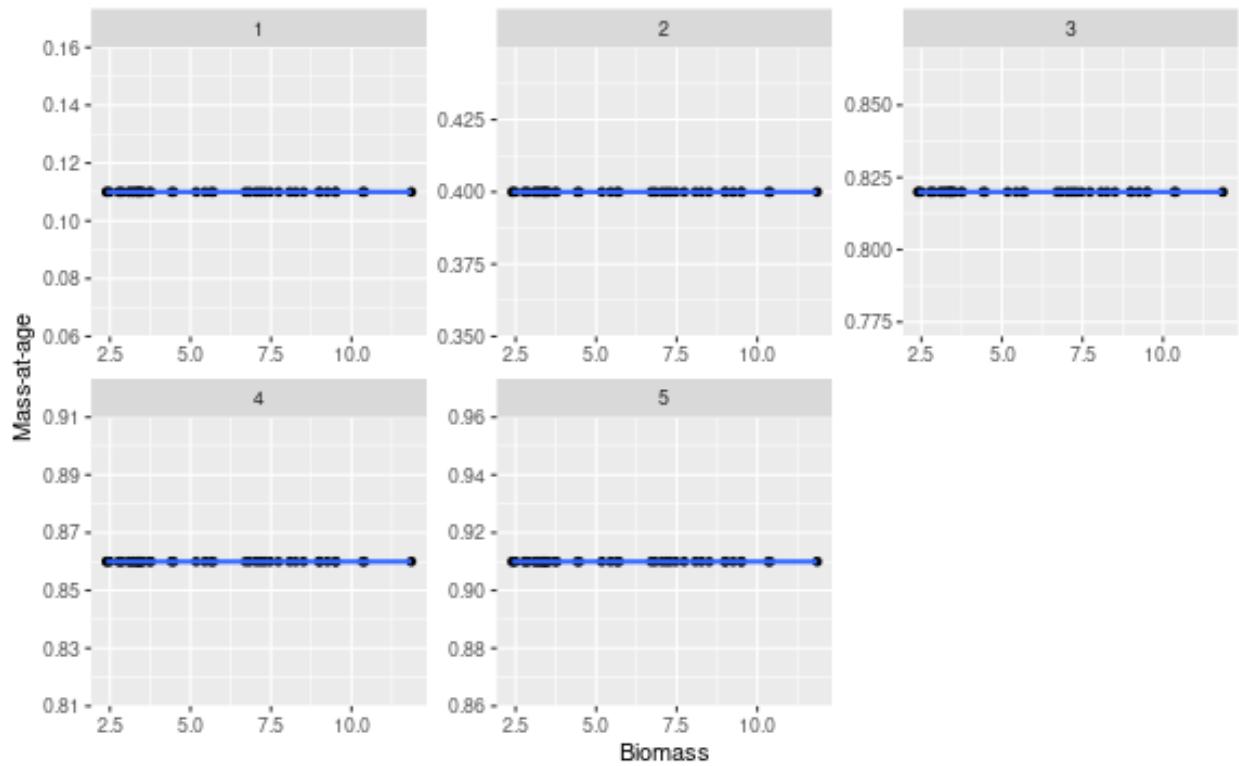


Figure 14 Mass-at-age v Biomass



**Figure 15** Maturity-at-age, summary



**Figure 16** Mass-at-age v Biomass

Family: gaussian

Link function: identity

Formula:

data ~ s(tb) + age

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	0.050977	0.002641	19.306	< 2e-16 ***
age2	0.025007	0.003734	6.697	7.17e-11 ***
age3	0.047683	0.003734	12.769	< 2e-16 ***
age4	0.069012	0.003734	18.481	< 2e-16 ***
age5	0.089083	0.003734	23.855	< 2e-16 ***
age6	0.107861	0.003734	28.884	< 2e-16 ***
age7	0.125442	0.003734	33.592	< 2e-16 ***
age8	0.141297	0.003734	37.837	< 2e-16 ***
age9	0.157475	0.003734	42.170	< 2e-16 ***
age10	0.191685	0.003734	51.331	< 2e-16 ***

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

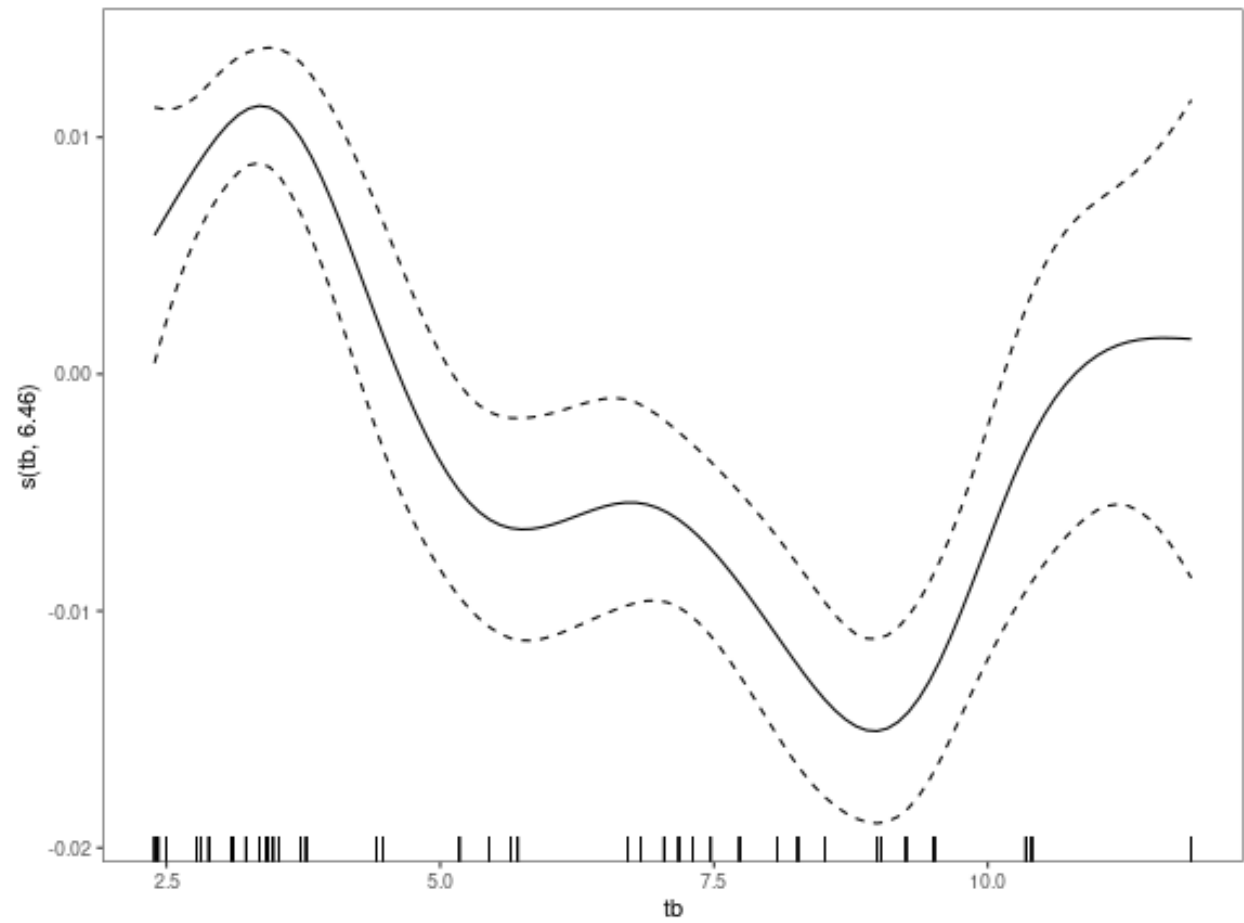
	edf	Ref.df	F	p-value
s(tb)	6.461	6.461	20.22	<2e-16 ***

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.921

Scale est. = 0.00029285 n = 420



Funding

References