Table S1: Parameter estimates for (1) the linear model describing the relationship between growth increment and day of capture; and (2) the generalised additive mixed effects model for the age:otolith distance relationship. Significant effects at the 5% level are shown in bold.

Model	Predictors	Estimates	SE	p
1	(Intercept)	**87.94**	**4.29**	**<0.001**
	Day of capture	**0.98**	**0.10**	**<0.001**
	Observations	62		
	R2 / R2 adjusted	0.64 / 0.63		
2	(Intercept)	**77.79**	**0.59**	**<0.001**
	Random Effects			
	σ2	10.89		
	σ2 ID	19.89		
	ICC	0.65		
	N ID	62		
	Observations	691		
	R2	0.99		

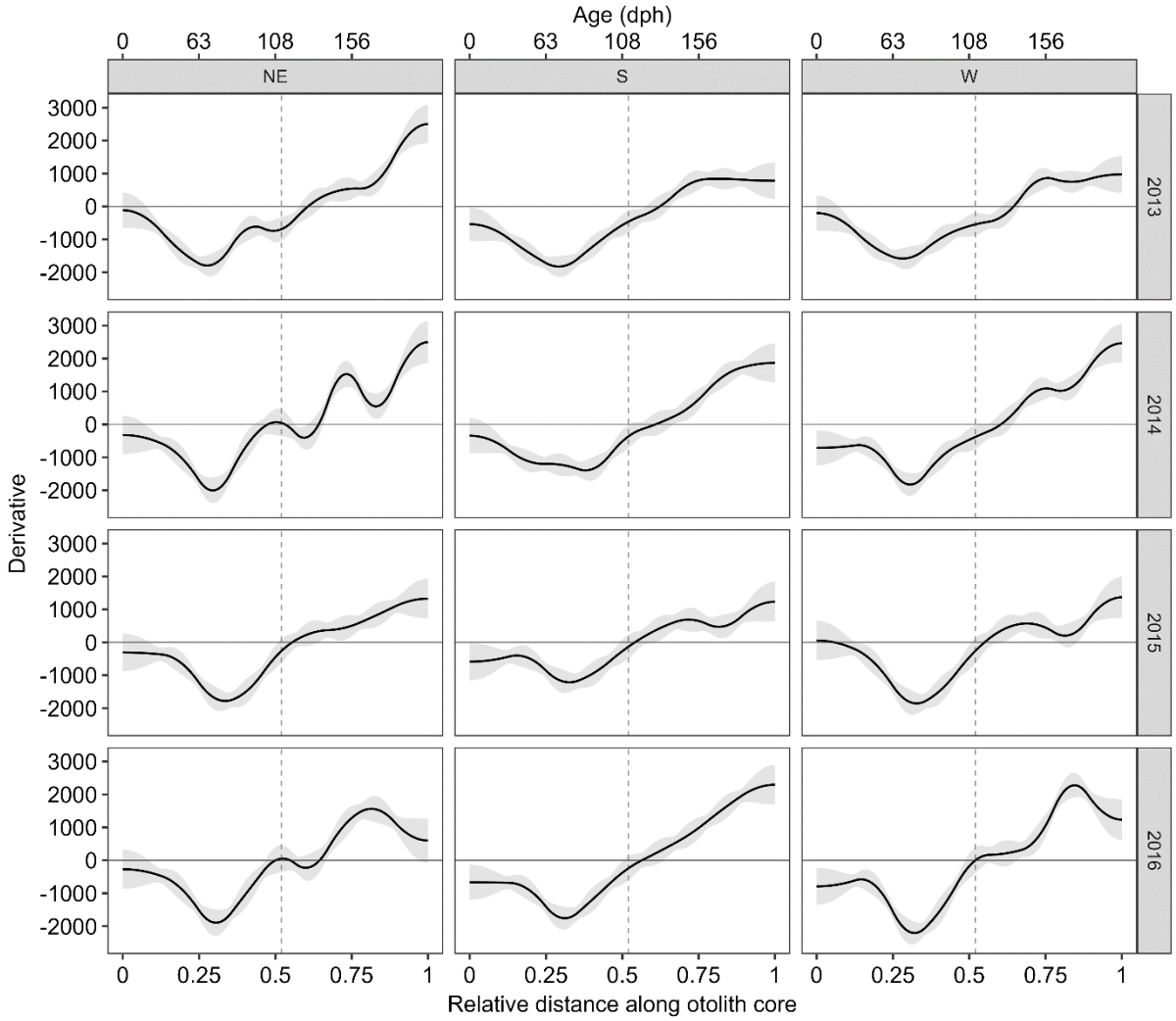

Fig. S1: The first derivative of the GAM smoother showing the time-series relationship between Sr:Ca ratios across Patagonian toothfish otolith cores sampled from three areas around the Falkland Islands. The solid lines indicate the first derivative of smoother line, and the grey ribbon represents the 95% simultaneous confidence intervals. The dashed vertical line reflects the hyaline zone identified during otolith microstructure age readings.

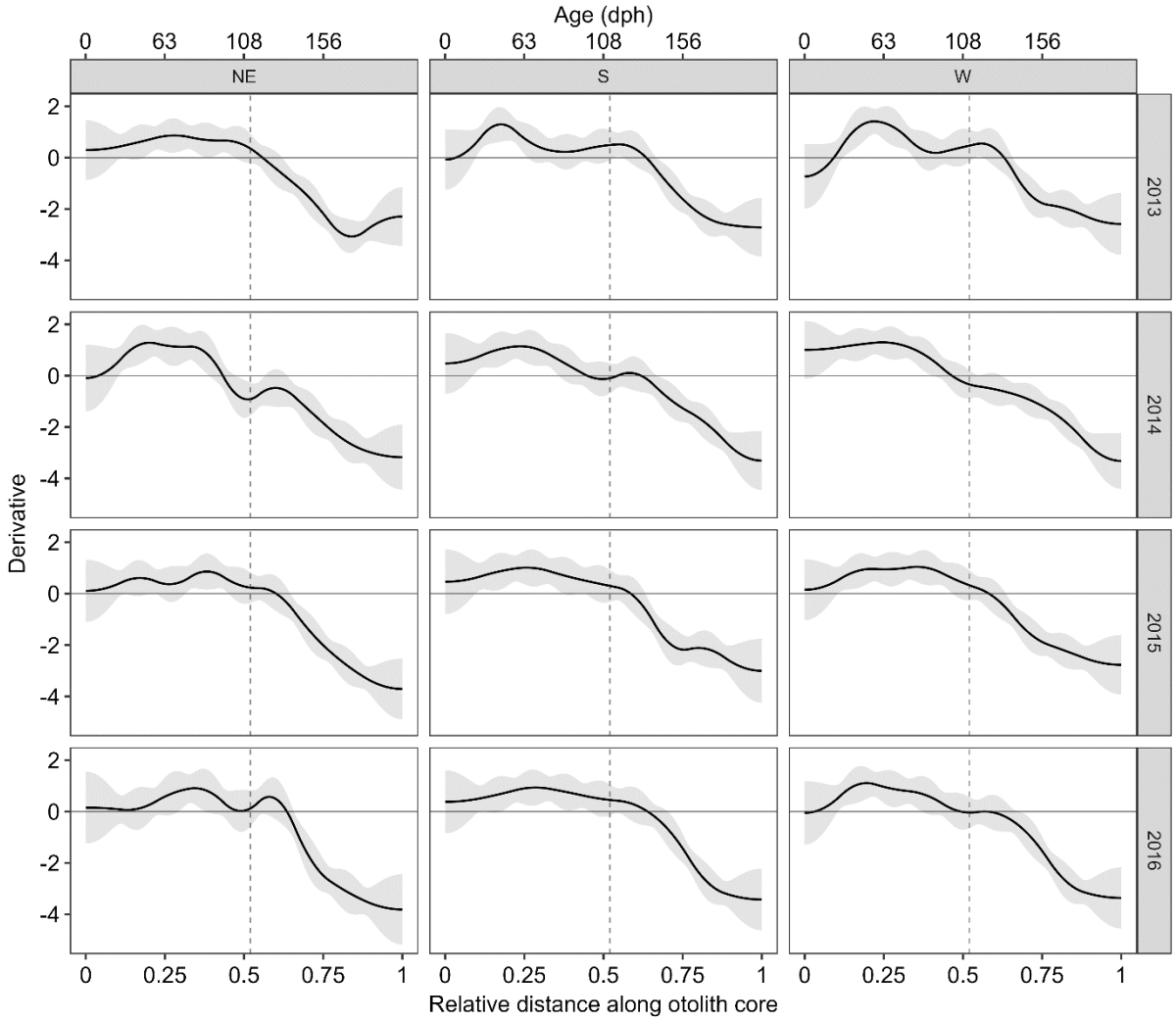

Fig. S2: The first derivative of the GAM smoother showing the time-series relationship between Mn:Ca ratios across Patagonian toothfish otolith cores. The solid line indicates the first derivative of smoother line, and the grey ribbon represents the 95% simultaneous confidence intervals. The dashed vertical line reflects the hyaline zone identified during otolith microstructure age readings.

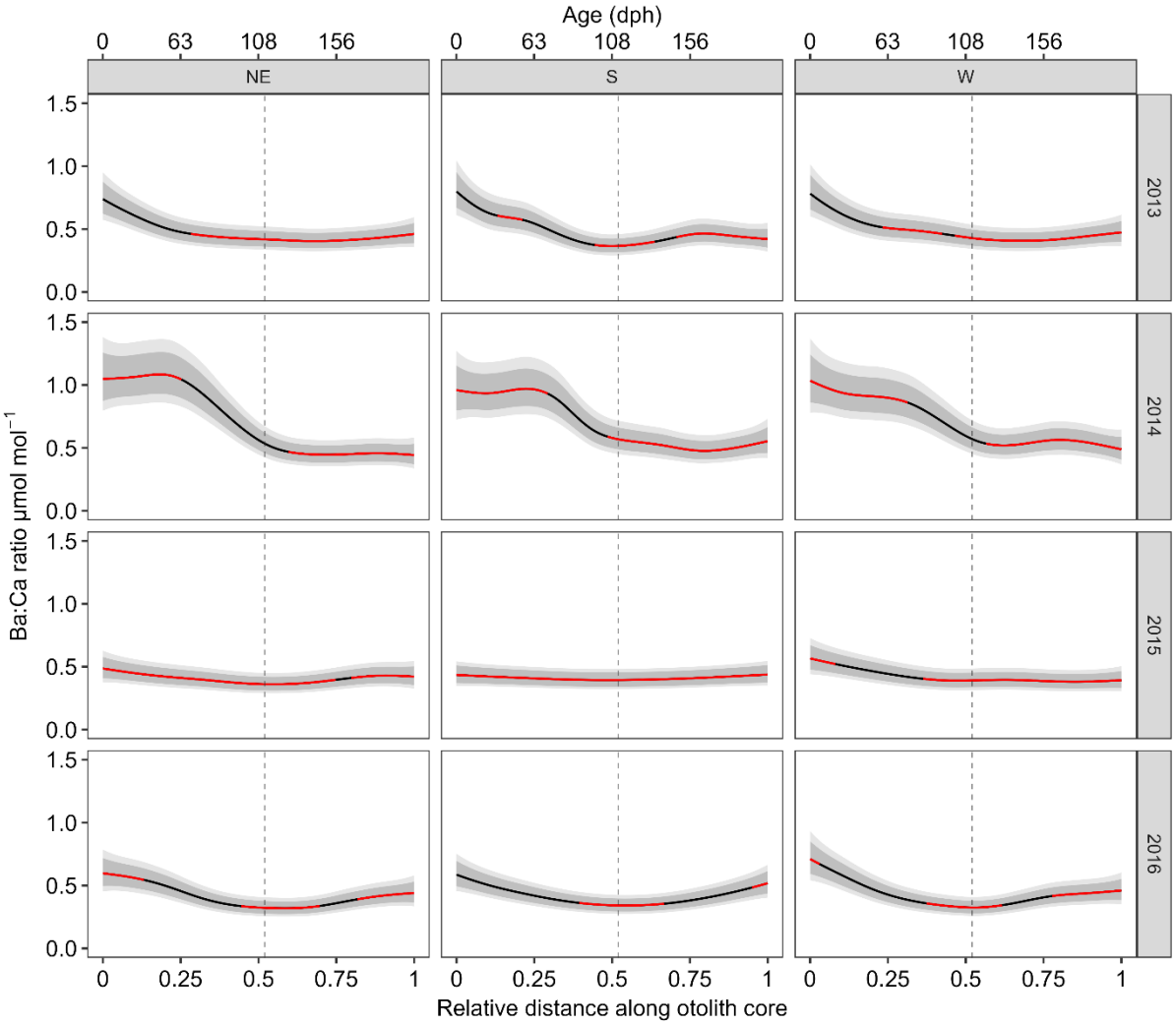

Fig. S3: Partial effect plots showing the marginal relationships between Ba:Ca ratios taken across the core of juvenile Patagonian toothfish otoliths sampled at three areas around the Falkland Islands (deviance explained = 36.8%). The solid lines represent the GAM smoothers for each area, and the grey ribbons represent the 95%-point (dark) and simultaneous (light) confidence intervals. The black lines indicate significant positive or negative trends (life-history shifts), and red lines indicate life-history thresholds. The dashed vertical line reflects the hyaline zone identified during otolith microstructure age readings.

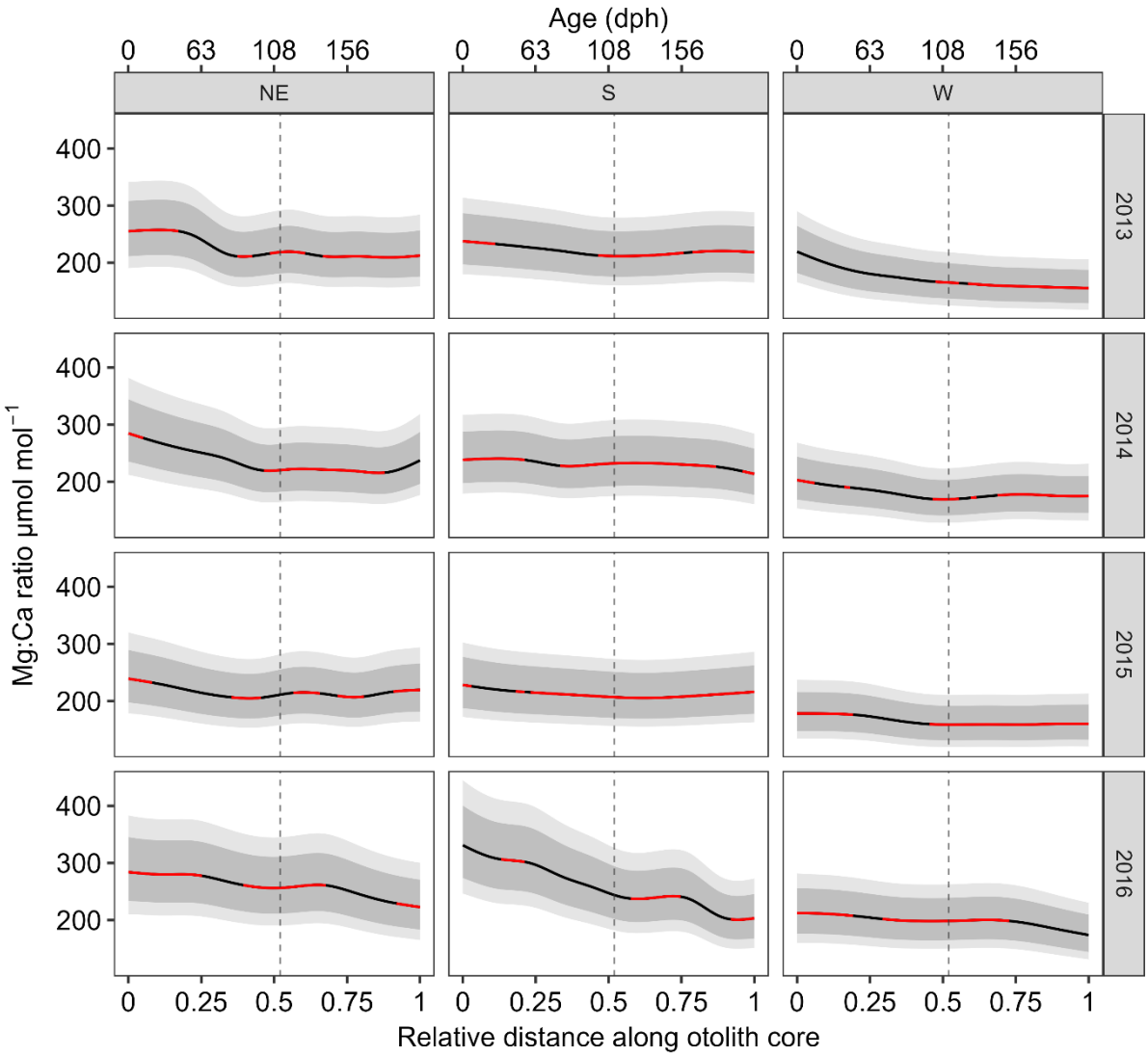

Fig. S4: Partial effect plots showing the marginal relationships between Mg:Ca ratios taken across the core of juvenile Patagonian toothfish otoliths sampled at three areas around the Falkland Islands (deviance explained = 93.7%). The solid lines represent the GAM smoothers for each area, and the grey ribbons represent the 95%-point (dark) and simultaneous (light) confidence intervals. The black lines indicate significant positive or negative trends (life-history shifts), and red lines indicate life-history thresholds. The dashed vertical line reflects the hyaline zone identified during otolith microstructure age readings.

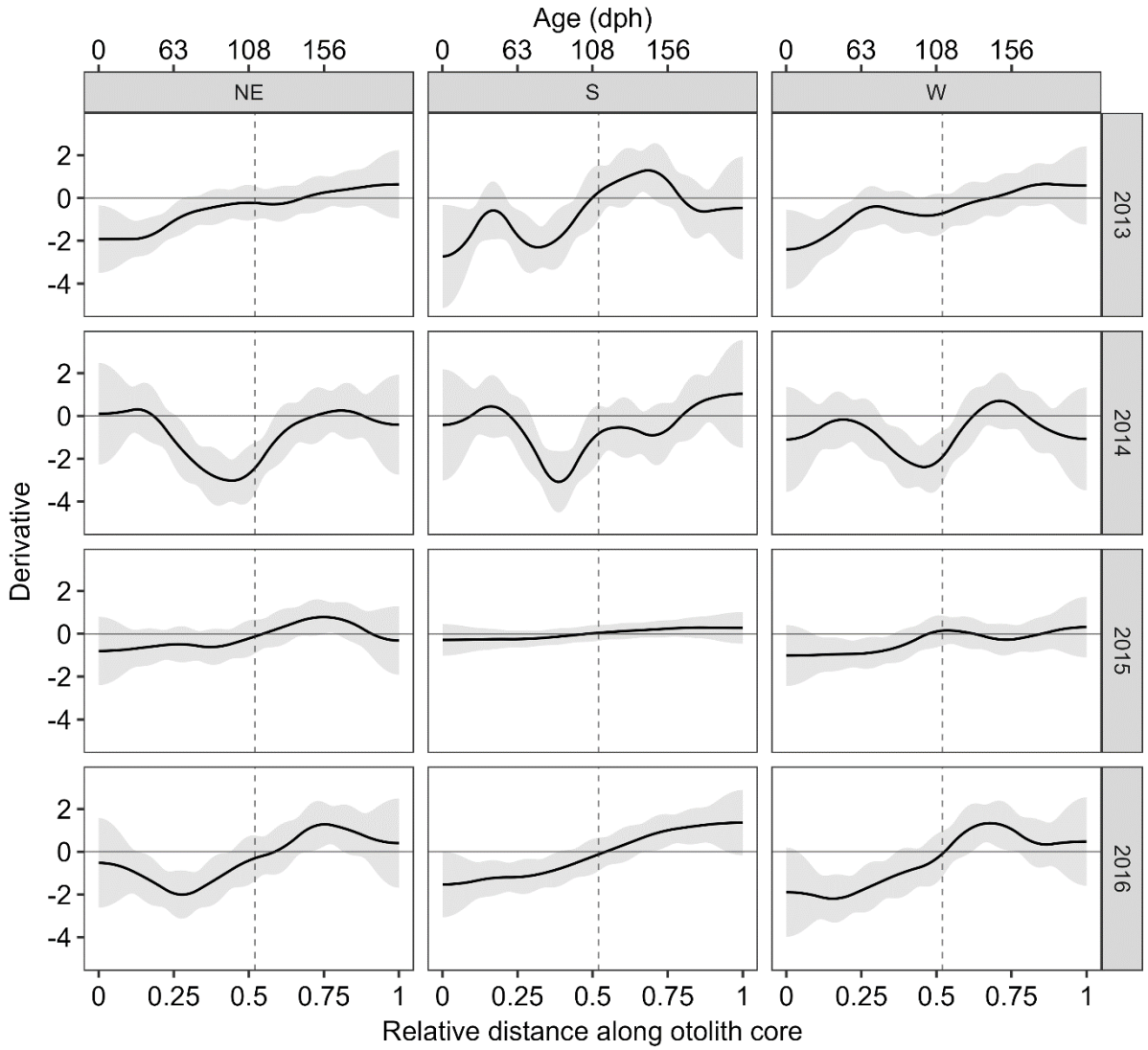

Fig. S5: The first derivative of the GAM smoother showing the time-series relationship between Ba:Ca ratios across Patagonian toothfish otolith cores sampled from three areas around the Falkland Islands. The solid lines indicate the first derivative of smoother line, and the grey ribbon represents the 95% simultaneous confidence intervals. The dashed vertical line reflects the hyaline zone identified during otolith microstructure age readings.

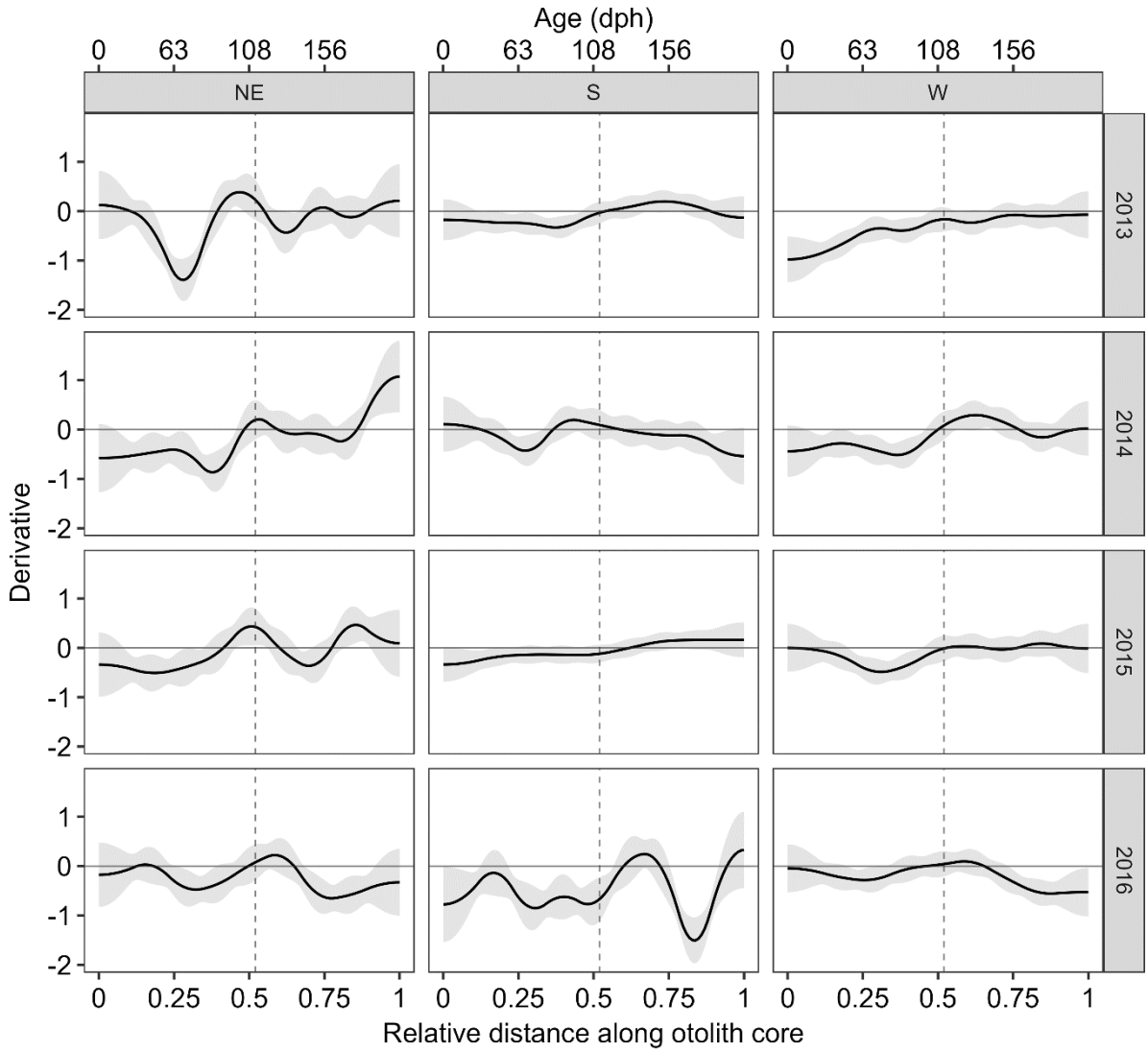

Fig. S6: The first derivative of the GAM smoother showing the time-series relationship between Mg:Ca ratios across Patagonian toothfish otolith cores sampled from different areas around the Falkland Islands. The solid lines indicate the first derivative of smoother line, and the grey ribbon represents the 95% simultaneous confidence intervals. The dashed vertical line reflects the hyaline zone identified during otolith microstructure age readings.