

Interspecies comparisons of Mg/Ca ratios in limpet shells

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Abstract

This study provides a short reassessment of the use of Magnesium to Calcium (Mg/Ca) ratios in Atlantic limpet shells to determine past sea surface temperatures. While *Patella vulgata* along the Spanish shoreline has since then repeatedly produced reliable correlations between sea surface temperature and Mg/Ca ratios, this is not the case for other patelloid species. *Patella vulgata* and *Nacella deaureata* have been studied using Mg/Ca with mixed or contrary results. In this study, we present elemental maps of various such species together with stable oxygen isotope values for some of the specimens. Our dataset also includes specimens that were previously unsuccessful in providing significant correlations between ^{18}O and Mg/Ca ratios. By reassessing these previous specimens and including a wider range of modern and archaeological samples from three patelloid species (*P. vulgata*, *N. deaureata*, and *N. magellanica*) we further add to the growing set of evidence for the reliable use of Mg/Ca ratios to detect palaeotemperature change and serve as a means to determine ontogenetic age and season of capture as well as to reveal locations of interest within the growth record (i.e. annual temperature minima and maxima) for the targeted analysis using ^{18}O or clumped oxygen isotope analysis.

Keywords: Sclerochronology, Limpets, Elemental Ratio, Mg/Ca

1. Introduction

While recent studies of particularly *Patella* sp. in the Mediterranean and Southwest Europe have provided promising results (Hausmann et al., 2019; García-Escárcaga et al., 2015, 2018).

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2. Materials and Methods

2.1. Limpet specimens

2.1.1. Modern specimens

2.1.2. Archaeological specimens

2.2. Oxygen isotopes

2.3. Mg/Ca ratios

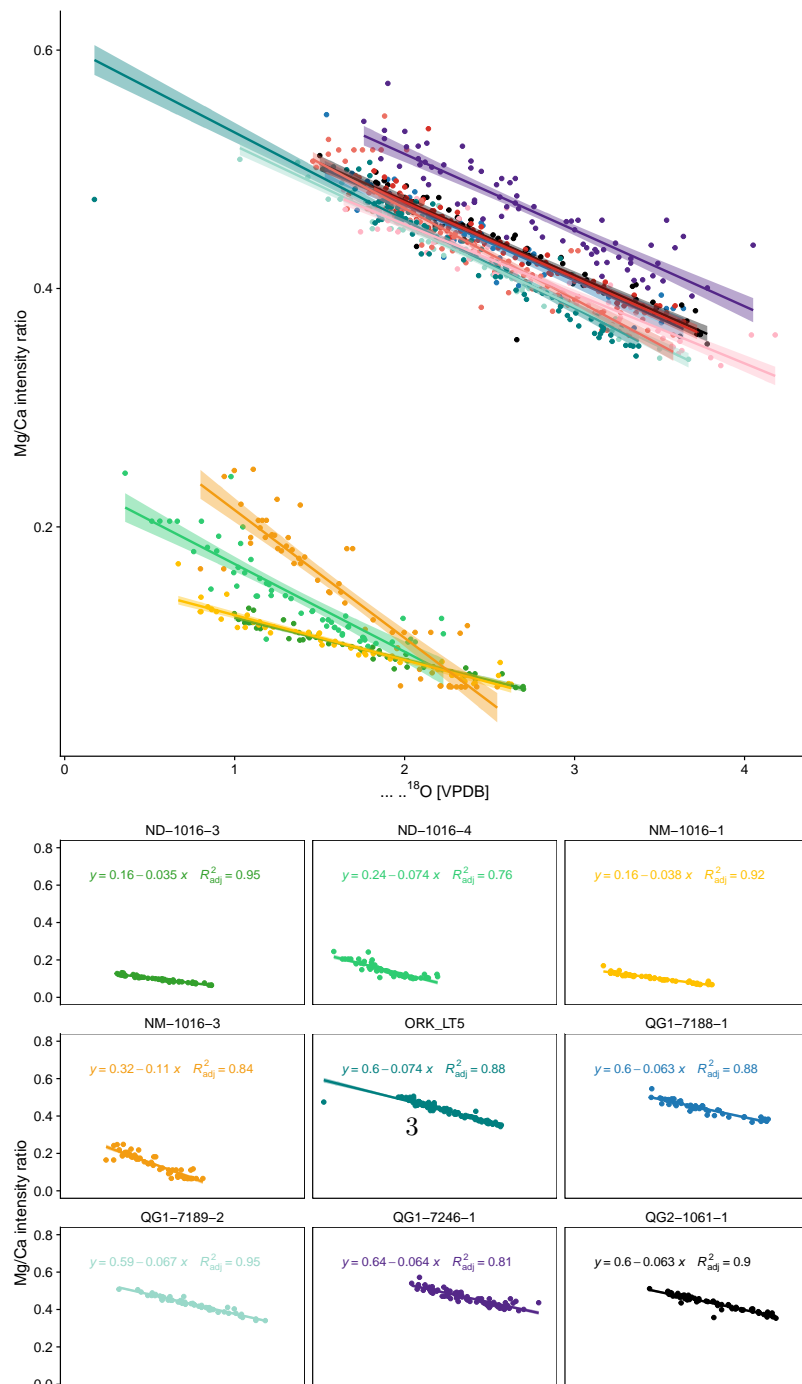
3. Results

3.1. *Patella vulgata*

3.2. *Nacella deaureata*

3.3. *Nacella magellanica*

4.



5. Discussion

5.1. Other correlations

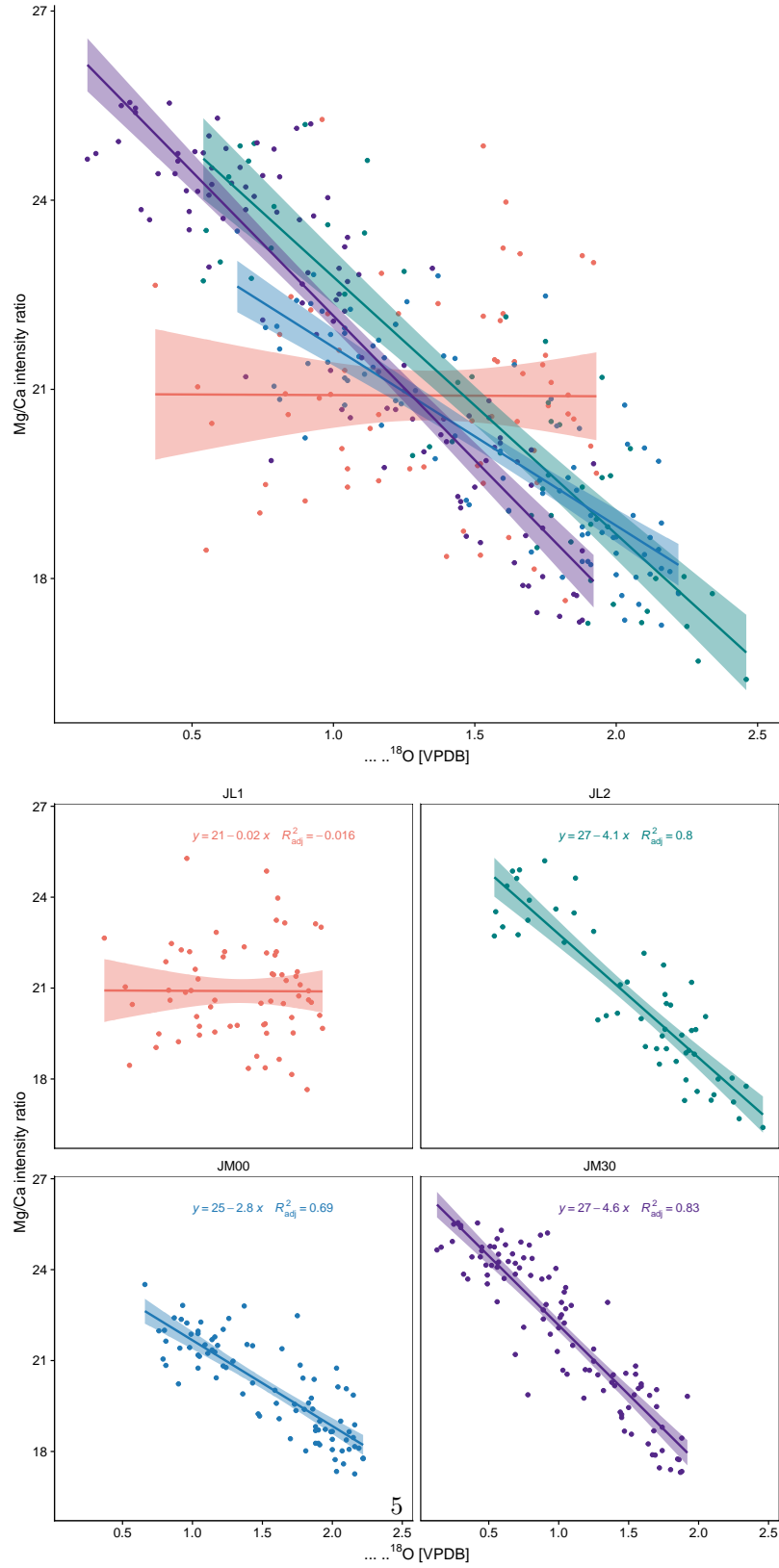


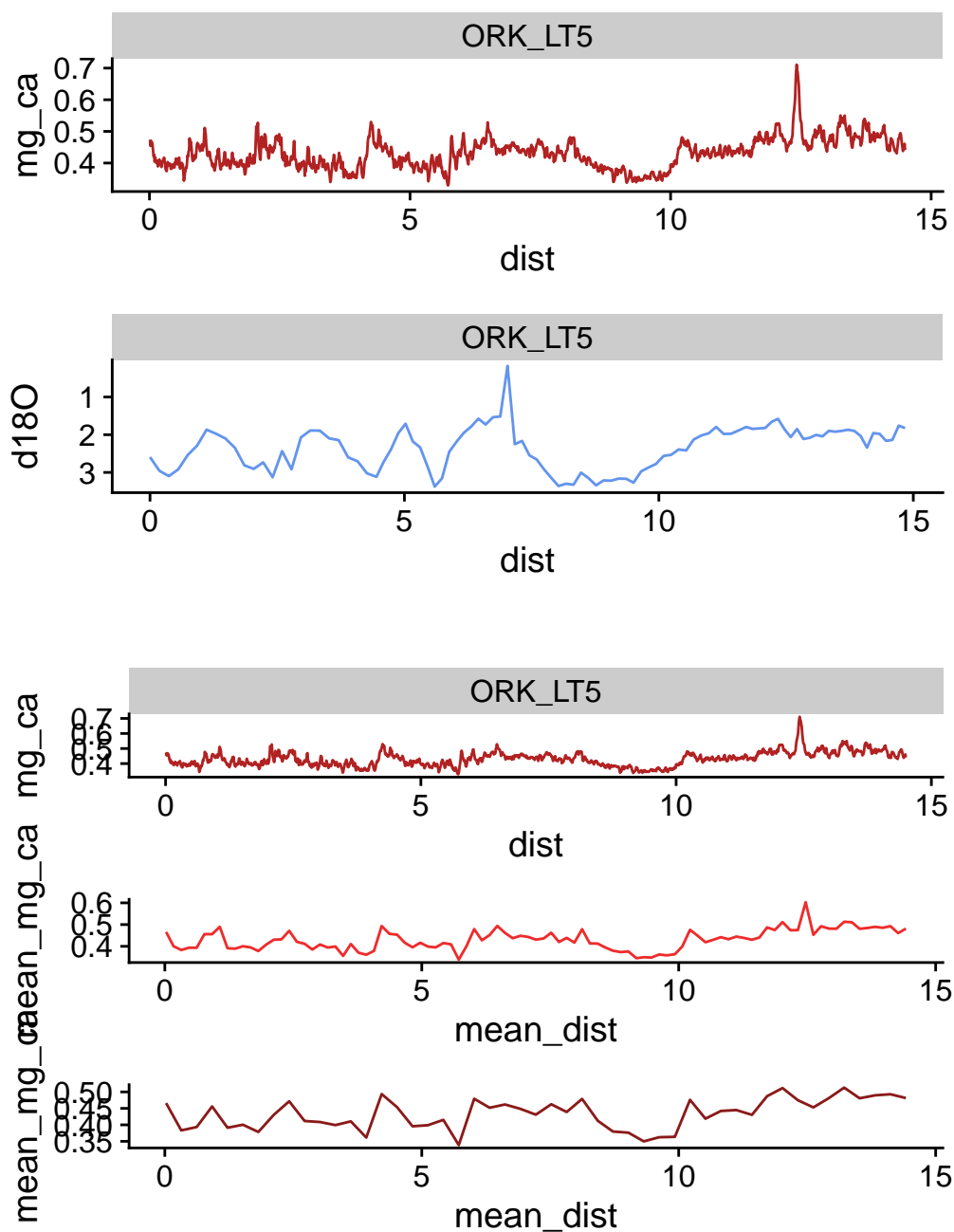
Figure 2: Correlation graphs for Ferguson et al. specimens

Table 1: Overview of comparative correlations {#tab:correlations}

Species	Locality	Specimen	Correlation R ²	Study
<i>Patella depressa</i>	Northern Spain	LAN541	0.87	10.3390/app11072959
		LAN545	0.86	
		LAN554	0.78	
		LAN559	0.82	
<i>Patella caerulea</i>	Croatia	ISTPC1	0.9	10.1038/s41598-019-39959-9
		ISTPC2	0.84	
	Crete	AF1911A	0.91 ¹	
		AF3003A	0.92 ²	
	Israel	AKKPC2	0.96	
		AKKPC3	0.89	
		FRMPC1	0.84	
		FRMPC2	0.96	
	Libya	MO31A	0.83	
		MP64A	0.33	
		MP67A	0.96	
		MP68A	0.81	
	Malta	MA10	0.82	
	Tunisia	TUNPC1	0.81	
		TUNPC2	0.78	
	Turkey	ANTPC1	0.95	
		ANTPC2	0.93	
		KIZPC1	0.94	
		KIZPC2	0.86	
<i>Patella rustica</i>	Gibraltar	JL1	0.02	doi.org/10.1016/j.epsl.2011.05.054
		JL2	0.8 (0.79)	
<i>Patella caerulea</i>	Gibraltar	JM00	0.69 (0.79)	
		JM30	0.83 (0.79)	
<i>Patella vulgata</i>	Orkney	ORK-LT5	not reported, here 0.88	doi.org/10.1016/j.palaeo.2016.10.021 and this study

¹SST only, no other geochemical data available²SST only, no geochemical data available

5.2. Comparison of ORK-LT5



References

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