

COMMENTARY

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# Response to rebuttal by Grima et al. elaborating on misleading conclusion in paper on “Pollution Monitoring for Sea Salt Aerosols at Hagar Qim-A Pilot Study” concerning salt decay after sheltering an archaeological site in Malta

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The purpose of our review article [1] was to give a balanced and comprehensive overview of the research conducted to date by various contributors, regarding the shelters installed over three of the Megalithic Temples of Malta, their performance, and lessons learnt, which may be useful in other contexts where comparable challenges are being considered. We will shortly be marking the first decade since the installation of the first two shelters. We therefore consider it useful and timely to examine how far research on the evaluation of the effects of the shelters has come, what preliminary indications have been drawn, whether these stand up to scrutiny, and what gaps in the research remain to be addressed.

The paper by Galea et al. [2], which is the subject of the foregoing rebuttal [3], was one of several contributions that were reviewed. One of the key conclusions of that paper was that:

*‘..the risk of salt decay will probably become more prevalent than when the [sites] had been totally exposed to direct rain washout and through the protection of a biological patina.’*

This conclusion is simply not borne out by the evidence published in the same paper by Galea et al. [2], nor is it suggested by the results of any of the other contributions reviewed in our article [1]. Our review paper paid particular attention to the Galea et al. study in order to evaluate whether such an important and far-reaching conclusion was supported by the evidence, and came to the conclusion that it was not. The statement is unwarranted, misinformed, and misinformative to the readers of the international journal where it appeared, on a point of crucial importance.

Three of the authors of the Galea et al. study [2] have now made a number of clarifications in the foregoing rebuttal [3]. This has been a useful discussion, which certainly highlights the need for further research and discussion, which was one of the main aims of our paper, and which has led to a number of points which we are in agreement on. We stand corrected on an important point, while also noting that in their rebuttal [3], our colleagues are concurring with a number of other key points made in our review article, as summarised below.

First, we stand corrected on the erroneous statement made in our article [1], that ‘...the actual type of filter is not given’ (pg. 13, col.2). This statement was factually incorrect, and is withdrawn, with our unreserved apologies to the authors of the Galea et al. paper [2].

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We also note that the foregoing rebuttal [3] by three of the authors concurred with and confirmed a number of key points made in our review paper, as follows:

- The authors of the rebuttal [3] appear to be concurring that the observed increase in phosphate deposition in December 2009 is very probably influenced by the use of glyphosate (Roundup®) on the site at the time, rather than indicating an increase in salt deposition since the installation of the protective shelters.
- In their rebuttal [3], the authors emphasise that they concur that prudence is required when making statements about the effects of the shelter. As already noted, the principal concern of the present authors, which was at the basis of the criticism made of the Galea et al. paper [2], was the far-reaching statement in the conclusion of that paper, that the risk of salt decay will probably become more prevalent following sheltering. The lengthy rebuttal [3] has made no attempt to defend or reaffirm this conclusion, and it appears that we now have a consensus that this statement was unwarranted, and is not borne out by the evidence of the Galea et al. study [2], and was even beyond its scope. Furthermore, it appears there is agreement that, apart from the phosphate readings discussed above, Galea et al. [2] actually documented a *decrease* in salt deposition, primarily chloride, in the results obtained after sheltering, when compared to the two campaigns conducted prior to sheltering, as reported in the summary of maximum and minimum mean concentrations in Table 1 of the Galea et al. study [2]. In fact Galea et al. themselves state “In the first result of the sampling campaign of this pilot study, post-sheltering, decreasing amounts of sea salt aerosol concentrations were found, notwithstanding that the outside prevailing wind speeds were higher.”
- Most importantly, the authors of the rebuttal [3] and the present authors are fully concurring on the

need for further study to continue to understand and address the complex and multivariate relationship between environment and deterioration, and how these have been altered by the installation of protective shelters.

We thank our colleagues for engaging in this debate, as well as all the other researchers whose work was discussed in our review paper, and look forward to further research and collaboration directed at some of the lacunae that have been identified.

#### Authors' contributions

All authors contributed to the drafting of the manuscript. All authors read and approved the final manuscript.

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#### Competing interests

The authors declare that they have no competing interests.

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#### References

1. Cassar J, Cefai S, Grima R, Stroud K. Sheltering archaeological sites in Malta: lessons learnt. *Herit Sci*. 2018;6(36):1–18. <https://doi.org/10.1186/s40494-018-0201-6>.
2. Galea M, DeBattista R, Grima M, Maccarelli L, Borg R, Zerafa C. Pollution monitoring for sea salt aerosols and other anionic species at Hagar Qim Temples Malta: a pilot study. *Conserv Manag Archaeol Sites*. 2015;17(4):315–26. <https://doi.org/10.1080/13505033.2016.1191890>.
3. Grima M, Galea M, DeBattista R. A rebuttal in defence of misinterpretation of the Galea et al. 2016 paper entitled “Pollution monitoring for sea salt aerosols and other anionic species at Hagar Qim Temples, Malta: a pilot study”. *Herit Sci*. 2018. <https://doi.org/10.1186/s40494-018-0236-8>.

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