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Marine Aggregates and Archaeology: a Golden Harvest?

VIRGINIA DELLINO-MUSGRAVE
Hampshire and Wight Trust for Maritime Archaeology, UK

SANJEEV GUPTA
Department of Earth Science and Engineering, Imperial College London

MARK RUSSELL
British Marine Aggregate Producers Association (BMAPA)

The Aggregates Levy Sustainability Fund (ALSF) was introduced by the United Kingdom Government Department for Environment, Food and Rural Affairs as a two-year pilot scheme in April 2002. It is now expected to end in 2011. Since its inception, the marine part of the ALSF programme has delivered great benefits to the community because it has recognized that the baseline information to promote effective management of marine historic and natural environment resources is relatively poor, and the intrusive nature of marine aggregate extraction can represent a potential impact to heritage assets. This paper discusses the research undertaken under the behest of the ALSF in the UK, specifically in the marine historic environment, and how different marine environment stakeholders have been involved in this process of research, management and outreach to the benefit of all communities.

KEYWORDS Underwater archaeology, Maritime archaeology, Cultural resource management, Aggregates Levy Sustainability Fund, Underwater cultural heritage

A reflection on the Aggregates Levy Sustainability Fund and the historic environment

Virginia Dellino-Musgrave

The Aggregates Levy Sustainability Fund (ALSF) was introduced by the United Kingdom Government Department for Environment, Food and Rural Affairs (Defra) as a two-year pilot scheme in April 2002 (Round 1) in order to address the environmental costs of aggregate extraction in areas affected by primary land-won and marine-dredged

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aggregates resources. Following a mid-term evaluation, the scheme was extended for a further three years and ran until March 2007 (Round 2) (see Defra 2003); in December 2006, following the chancellor's pre-budget report, Defra confirmed that the ALSF would be extended until March 2008. In July 2008, the Government announced that the ALSF would be extended until 2011.

The ALSF programme has delivered great benefits to the community because it has recognized that the baseline information to promote effective management of marine historic and natural environment resources is relatively poor, and that the intrusive nature of marine aggregate extraction can represent a potential impact to heritage assets (Dellino-Musgrave 2007). This paper discusses the research undertaken specifically in the marine historic environment. The term marine refers, in this paper, particularly to the marine (saltwater) environment, the natural and cultural remains within it, and their study and interpretation (for further details see Dellino-Musgrave 2006, 22–23; Flatman & Staniforth 2006, 168–69).

Defra is responsible for the ALSF scheme and has appointed distributing bodies to disburse the funds. The body responsible for commissioning marine historic environment projects is English Heritage (see http://ads.ahds.ac.uk/catalogue/projArch/alsf/projects_new.cfm). Extremely positive work has been produced which can be summarized as follows:

- to gather baseline information for effective management of the marine historic environment, the current evidence for which is relatively poor. For example, *Wrecks on the seabed* aimed to provide industry, regulators and contractors with guidance on the archaeological assessment, evaluation and recording of wreck sites (Wessex Archaeology 2007b). *Seabed prehistory* aimed to inform best practice for the assessment and evaluation of prehistoric deposits on or beneath the seabed in the course of the aggregate dredging licence application process (Wessex Archaeology 2007a)
- to achieve an understanding of the significance of, and severity of, aggregate extraction and the effects of the dredging process on all historic environment assets, in order to promote informed decisions to aid a more efficient licensing process (e.g. *Modelling exclusion zones for marine aggregates dredging*, see Dix et al. 2007)
- to assess value in order to inform the understanding and judging of the 'importance' of all historic environment assets within marine aggregate licensing areas, and surrounding areas, to aid the development of more effective and prioritized mitigation measures (e.g. *On the importance of shipwrecks* (Wessex Archaeology 2006b; 2006c; 2006d))
- to promote the understanding of the scale and character of all historic environment assets in marine aggregate licensed areas and surrounding areas. This has provided the baseline information necessary for effective future management of the resource, development of techniques of prediction, evaluation and mitigation strategies, assessment of best value, and promotion of best practice (e.g. *England's Historic Seascapes Programme* (Hooley 2004; Dellino-Musgrave & Oxley 2007); *3D seismics as a source for mitigation mapping of the Late Pleistocene and Holocene depositional systems of the southern North Sea* (Gaffney et al. 2007))

- to encourage integrative methodologies as well as continue developing and refining methodologies to improve decision-making of historic environment advisers and to generate predictive tools to further develop capacity, which will enable an effective management of aggregate extraction in the future (e.g. *Mapping navigational hazards as areas of maritime archaeological potential* (Merrit et al. 2007))
- to develop outreach and dissemination programmes to ensure the contributions from aggregate extraction towards a better understanding of the historic environment are available to a wide range of stakeholders (e.g. *Solent aggregates to outreach* (HWTMA 2007, 2008) and *Derek the dredger* (Causer & Hamer 2008))
- to develop initiatives that address the archiving of marine historic environment digital data and to provide wide and easy access to this data to deliver to public and professional audiences the full benefits of knowledge gained through work in advance of aggregates extraction (e.g. *ALSF online* http://ads.ahds.ac.uk/catalogue/projArch/alsf/projects_new.cfm).

Several projects have enhanced our understanding regarding the human use of past landscapes that are now submerged. For example, *Seabed prehistory* aimed to inform best practice for the assessment and evaluation of prehistoric deposits on or beneath the seabed in the course of the aggregate dredging licence application process (Wessex Archaeology 2006e; 2006f). This project has enabled a better environmental assessment of prehistoric archaeological heritage of marine aggregate deposits to be undertaken using geophysical and geotechnical surveys to determine the character and the nature of marine prehistoric deposits. The interpretation of the geophysical survey data was used to inform the sampling strategy for the geotechnical surveys. Geotechnical surveys involved the retrieval of vibrocores, and for some study areas, benthic grab samples. The project therefore addressed the difficulties faced by archaeologists gathering data on the potential impact of aggregate dredging on submerged prehistoric material. This involved assessing these different survey specifications to identify palaeogeographic features and/or sediment types of archaeological interest as well as the recovery of artefactual material within aggregate dredging areas. The project *3D Seismics as a source for mitigation mapping of the Late Pleistocene and Holocene depositional systems of the southern North Sea* demonstrated that the use of legacy 3-D seismic data provides an efficient way of generating a regional model for the Late Quaternary and Holocene, contributing to reduce regional uncertainty (Gaffney et al. 2007). The introduction of regional, large-scale studies allows development to be viewed in context. Hence, key areas of attention should be initiatives designed to improve our overall understanding of marine site environments and to enhance our ability to assess and predict site change, and thus to improve decision-making. The utility of such initiatives is enhanced significantly by being integrated with natural environment and environmental protection interests.

Several ALSF projects have explored and used Geographical Information Systems (GIS)-based methodologies. For example, *Mapping navigational hazards as areas of maritime archaeological potential* assessed the suitability of historical and scientific data relating to specific aspects of the marine historic environment surrounding navigational hazards for use in the Environmental Impact Assessment (EIA) of marine

aggregate dredging proposals (Merritt *et al* 2007). *England's shipping* collated documentary information about shipping patterns in a readily accessible format (GIS) to facilitate the assessment of maritime archaeological potential in the course of preparing environmental statements to accompany marine aggregate licence applications (http://www.wessexarch.co.uk/projects/marine/alsf/englands_shipping/index.html). It is now time to reflect on the results produced by these GIS-based projects and assess coordination of methodologies to enable standardization and consistency throughout. Furthermore, these projects should be archived, curated and maintained within one place to enable public access as well as further archaeological interpretations.

One of the most important roles of the ALSF scheme is to fund projects that raise awareness of conservation issues across the historic environment sector, aggregate extraction industry, and the wider community. For example, the project *Solent aggregates to outreach* assessed and developed integrated presentation and teaching packs based around aggregates and the marine historic environment as an information resource for schools, home educators, local archaeology groups, and community groups. This aim contributed to raising awareness and understanding of the marine cultural heritage, heritage conservation issues, and marine aggregate dredging and effects on the historic environment (HWTMA 2007; 2008). The *BMAPA/EH Protocol for reporting finds of archaeological interest* sought to reduce any adverse effects of marine aggregate dredging on the historic environment by enabling people working in the industry to report their finds made as a result of their work, in a manner that is both convenient and effective (BMAPA and EH 2005). In addition, the *BMAPA/EH Protocol for reporting finds of archaeological interest awareness programme* aimed to raise awareness of the protocol amongst aggregate industry staff and to encourage its use. Public awareness has been raised through workshops, visits to wharves and vessels, multimedia packages, and newsletters. Wharf and vessel staff have responded enthusiastically to the protocol. As a result, more artefacts have been reported than originally anticipated (Wessex Archaeology 2006a). This project has proved to be an extremely significant joint initiative in raising awareness in a wider audience and, more importantly, in enabling the marine aggregates industry to develop working practices that take account of the historic environment. Furthermore, the finds reported through this project generated mass media interest and, as a result, a *Time Team* special programme was broadcast in 2007.

Consequently, it can be argued that these marine ALSF projects have mainly focused on addressing the following issues:

- the characteristics of the historic environment resource
- the conditions in which the historic environment is preserved
- the extent of the historic environment resource
- how the historic environment is preserved.

Most of the ALSF projects have focused on data collection to enable a greater understanding of the significance of, and severity of, aggregate extraction and the effects of the dredging process on all historic environment assets, in order to promote informed decisions to aid a more efficient licensing process. This data enables further interpretations to understand why the historic environment has certain characteristics and extent, and why the historic environment is preserved (or not) in the way that it

is. Consequently, making a long-term sustainable, publicly available digital archive of the data gathered (not only reports) is crucial. This enables further understanding of past human activities beyond the ALSF objectives and its contributions, making the significance of the ALSF worldwide for the archaeological discipline as a whole.

There is an urgent need for greater understanding and, in particular, for accurate overviews of the marine environment's historic dimension (Dellino-Musgrave 2007). Developmental pressures on the sea are growing rapidly from, for example, aggregate, oil and gas extraction; wind farm construction; port development, and dredging for shipping channels. Knowledge to inform responses to such developments is unevenly spread, and of inconsistent coverage and quality. Records map the few known historic wreck sites yet research in some areas has confirmed extensive survivals of submerged prehistoric landscape with archaeological remains and palaeoenvironmental preservation. These records provide only a tantalizing glimpse of the wider extent and context of the rich historic heritage in the marine environments: evidence is often situated well away from the areas affected by imminent development. English Heritage ALSF commissioned projects have contributed towards a greater understanding of the marine historic environment and they have demonstrated that there is great archaeological potential yet to be discovered. In other words, the ALSF has shown the beginning of a long and exciting journey.

Marine aggregates and archaeology: a golden harvest?

Sanjeev Gupta

We live in strange times. Isolated from mainland Europe by narrow and shallow seaways, our British view of landscape and environment is moulded by our island status (Preece 1995). And yet it has not always been so. Indeed, our current geographic situation is a mere snapshot (and a recent one at that) in our history. For much of the past one million years, a time of repeated migrations of early humans to Britain, not only has Britain been a mere arm of Europe, but the shallow seas that surround us have been missing, replaced by subaerial landscapes that extended out to the (absent) shores of our neighbours. Geologically our recent history has been one of a remarkably fickle, fidgety palaeogeography. As the climate has stumbled into glacial times, shorelines have retreated hundreds of kilometres, beaches marching out toward the edge of the continental shelf with our familiar rivers, and some not so familiar, in tow extending and eroding into newly minted landscape (Gibbard 1988). Then as the climate abruptly warmed in time with our planetary orbital oscillations, and sea levels dramatically rose, beaches and river courses were abandoned, and continental shelves drowned in rapid marine transgressions. Landscapes of such dynamism are a peculiar feature of the past one million years (and in particular the past half a million years); indeed, in deeper geological time geographies have been rather more conservative.

We have, of course, known for some time that the seas of the English Channel and the North Sea were once dry land. Early palaeogeographers replete with fishermen's encounters with dredged mammoth tusks and submerged forests were remarkably prescient in their reconstructions despite an absence of any real knowledge of what lay beneath the sea. Yet it is only in the past thirty years with the advent of sonar

and seismic technologies that a realistic picture of the submerged landscape has begun to emerge (Gupta et al. 2004; Gupta et al. 2007). Initially the courses of buried river valleys and drowned shorelines were mapped — a one-dimensional snapshot that integrates numerous cycles of sea level change and landscape evolution (Bellamy 1995). These studies brought with them the economic realization that like their onshore equivalents the submerged valleys held valuable reserves of river gravels and sand. Yet to assess these accurately requires detailed and financially exhaustive surveys. Not the widely spaced seismic lines of early reconnaissance surveys that could make out just the rough outline of a buried river valley, but high-resolution closely spaced seismic profiling that suddenly brings out the very details of the valley courses, their individual twists and turns, and a picture of the 'gold' that lies between their bedrock banks (Gupta et al. 2004). This sediment is the 'golden harvest' of the aggregates industry; the fortunes of companies are closely entwined with the type of gravel they encounter, and their resource maps are naturally closely guarded from commercial competitors.

Yet this 'golden harvest' is the very same golden harvest that archaeologists should yearn for. I write 'should' with reason. Traditionally, the archaeological treasure trove comprises artefacts, such as hand axes and other stone implements, and perhaps (in a young archaeologist's dream) ancient human bones. We seek direct visuals of ourselves and our handiwork in order to believe that we once might have existed 'down there'. But 'down there' is no gravel pit where curious nineteenth-century savants could hunt down ice age mammal skeletons and flint implements of early *Homo*. 'Down there' is still tens of metres below the often-harsh sea surface of the Channel. And there is no clean, exposed section through tens of metres of valley-fill river gravels. All we have are grainy remotely sensed seismic images that almost certainly only excite the geologist, and the huge gravel mounds built from giant pouring funnels at quaysides where aggregate dredgers dock.

It is no wonder that some archaeologists have been dismayed by the reality of the offshore prospect; it is somehow too remote and too unreal. It is intractable — the idea of recovering the archaeology that we are familiar with seems impossible. Yes we have possible stone tools in grab samples, we might even be immensely lucky, as one or two researchers have been, in encountering an implement in a core. But these, apart from confirming the visual, are often of limited value because they lack the context a quarry wall can render. And this has led, in some archaeological camps, to a notion that somehow it is different down there. 'It's life, Jim, but not as we know it', and perhaps it is not even worth bothering with: 'It has all been reworked', as if onshore river terrace deposits are somehow in perfect preserved condition.

When I wrote 'this [. . .] is [. . .] the same golden harvest that archaeologists should yearn for' I meant that the focus on the archaeological 'artefact' and 'find spot' should be (at least initially) abandoned in the case of offshore archaeology. Onshore archaeological investigations have been able to proceed because discovery was not always linked to understanding the context. The situation is remarkably different when we are faced with archaeology under the sea. We cannot expect to find 'archaeological resources' when we don't even know where the rivers were, for example. It is my contention that the 'golden harvest' marine archaeologists should now focus on is the discovery of the ancient submerged landscapes, and the detailed

delineation of their environmental evolution. Yes, to a certain extent, this is the preserve of other specialists, but the overarching aim is so central to British archaeology that it is the archaeological community that should become one of the key drivers of this grand reconstruction.

And just as nineteenth-century exploration of the antiquity of early man was linked closely to the growth of the quarrying industry, so it is likely that only through partnership with the marine aggregates industry can we move forward our reconstruction of the past beneath the sea. Exploration of the marine realm is outrageously expensive and difficult, and it is unlikely that significant resources will ever be committed by government for the sake of archaeological curiosity. Thus significant progress can only partly be met by interrogating the detailed datasets collected now and in the future by the marine aggregates industry. Notwithstanding issues of commercial sensitivity, there is perhaps a need for the development of a centralized catalogue of all such data collected, as exists for the petroleum industry in the UK. In the latter case, data becomes available for public access after a suitable time period, but more importantly part of the data collected has to be lodged with the government. This has created a huge research database that has significantly helped the UK economy as the industry has sought to discover new petroleum resources in UK waters. For example, the marine aggregate industry routinely collects numerous vibracores in their evaluation of gravel resources, and yet lacks the manpower and time to assess these in anything but a cursory fashion. Here is an outstanding treasure trove with the possibility of analysing the sediments to reconstruct palaeoenvironments, and the potential to date them to obtain that crucial temporal dimension.

The question we need to address is how we can exploit these marine datasets efficiently and to the mutual benefit of the aggregate industry and the archaeological community. I have no doubt that in the future remarkable discoveries will prevail, and that our map of the landscapes that once existed under the sea will gain exquisite clarity. But there remains a long way to go. For example, our only map of the retreat of the coastline during Holocene sea level rise comes from a numerical model (Lambeck 1995). There barely exist any pinning points to demarcate accurately the spatial pattern of sea level rise in the offshore. The 'golden harvest' will only fully prevail when we focus on defining the outstanding scientific and archaeological problems of this marine realm, and stimulate its exploration.

Marine aggregates and archaeology: a golden harvest?

Mark Russell

The British marine aggregate industry is arguably one of the most advanced in the world, both in the way it is regulated and managed but also in terms of the proactive approach adopted by the operators themselves (Highley et al. 2007). While on the one hand marine aggregate extraction could be viewed as a potential threat to archaeology, in actual fact the sector has made a significant contribution to our understanding of the marine historic environment — both directly and indirectly.

The industry is responsible for managing over 1300 km^2 of production licence, and in a typical year around 135 km^2 will be dredged producing over 20 million tonnes of

sand and gravel for use as construction aggregate and to support coast protection works through beach replenishment (BMAPA and the Crown Estate 2008). A further 1900 km² are at various stages of the development cycle as either prospecting or application areas. To place the scale of this activity in perspective, the Isle of Wight covers an area of some 400 km², so the industry is responsible for managing a significant tract of the 867,000 km² that comprise the total UK seabed area (Figure 1).

The extent of the industry's interests is naturally constrained by the geological distribution of relict sand and gravel deposits, the majority of which are found within submerged palaeochannel systems as infill or terrace deposits. While these palaeochannel systems are spatially extensive, commercially viable deposits of clean sand and gravel tend to be highly localized (Highley et al. 2007). This means that considerable survey effort has been invested by the industry in refining the understanding of the extent and composition of these relatively large-scale features.

In the North Sea and English Channel alone, it is estimated that some 16,000 km² of seabed area has been investigated by the industry over the last twenty years or so. Indeed, in many respects the principal driver for refining the broad-scale understanding of many aspects of the marine environment has been the offshore development activity funded by industries such as the aggregates, oil and gas and renewable energy. Given the move towards an integrated approach to marine planning, management and protection under the umbrella of the UK Government's Marine Bill

FIGURE 1 A typical modern marine aggregate dredger at work, the 8500t capacity *Sand Falcon*, operated by CEMEX UK Marine Ltd.
Image © BMAPA

legislation, the data acquired and held by industry is likely to become increasingly important — particularly in the absence of a nationally sponsored marine mapping programme.

The geological data and understanding necessary for marine aggregate development is comparable to that required for primary research into the marine historic environment. High-resolution single- and multi-beam bathymetry, side scan sonar and shallow seismic data used to develop an understanding of the distribution of marine aggregate deposits can also be used to refine our understanding of submerged palaeolandscapes and to identify wrecks and other seabed anomalies, while the grab and vibrocore samples used to ground truth the sand and gravel deposits being investigated may also provide invaluable data for dating purposes, particularly where the seabed stratigraphy includes organic deposits.

Many of the most significant prehistoric, terrestrial archaeological discoveries have been associated with the quarrying of sand and gravel on land, for example the Condover mammoths (see Coope & Lister 1987), the Alrewas woolly rhino (see Mishra et al. 2007) and the Shardlow log boat (see Flatman & Blue 1999, 181). As the deposits that are being investigated by the marine aggregate industry represent the offshore extensions of these ancient palaeochannel systems, they have a similar potential for archaeological finds to be present — whether preserved *in situ* or deposited in a secondary context through fluvial transport or marine transgression processes. The scale of the marine environment, coupled with the resolution of marine data, means that more modern anthropogenic features, such as ship and aircraft wrecks, are also encountered. All of these issues have the potential to prohibit, constrain or delay marine aggregate operations.

The marine aggregate industry takes its environmental responsibilities very seriously, and adopts a proactive approach to resolving potential issues — proactively seeking practical solutions to issues. This attitude has been extended to issues associated with the marine historic environment, which have increased substantially over the last decade. The reason behind this approach is very simple — because the consents regime is based on a developer-led consensus planning approach, it is for the developer or operator not only to identify potential issues but, more importantly, to resolve them. Therefore it is essential that developers, regulators, advisers and wider interested parties understand not only the potential and significance of issues, but also the appropriate mechanisms available to manage them.

Through its representative trade association, the British Marine Aggregate Producers Association (BMAPA), the industry worked in partnership with government advisers English Heritage and consultants Wessex Archaeology to develop a world-class guidance note entitled *Marine aggregate dredging and the historic environment* (BMAPA and EH 2003). By setting out how heritage issues should be taken into account at every stage of the marine aggregate development cycle, this guidance arguably established a standard for how marine heritage issues should be addressed by marine development interests.

The guidance note was followed by the development of a reporting protocol, again in partnership with English Heritage, whereby any artefacts encountered during marine aggregate extraction can be correctly reported so their significance can

be properly assessed (BMAPA and EH 2005). This included various mitigation and management options that allow marine aggregate operators and heritage professionals to develop practical solutions to the discovery of significant finds. The reporting protocol is currently backed by an industry-wide support service, whereby independent archaeological experts provide the first stage of assessment and reporting, as well as training and awareness to the industry staff who may encounter such items. This delivers a consistent approach across the 25+ aggregate dredgers and 60+ wharves that receive marine aggregate from UK licence areas. While the monitoring regime now forms a standard requirement for new dredging permissions, the industry has voluntarily applied the protocol to all marine aggregate operations taking place on the UK shelf. The reporting protocol is entering its fourth year, and to date over 100 reports have been submitted, covering nearly 1000 individual artefacts. Highlights have included one of the most northerly finds of a mammoth tusk (Figure 2), a collection of prehistoric hand axes, and World War II aircraft wreckage (BMAPA and EH 2006, 2007, 2008).

In all of these cases, the finds and the improvements in understanding that resulted would not have occurred without the support of the marine aggregate industry and the robust guidance and reporting protocols that have been developed.

FIGURE 2 A mammoth tusk recovered in February 2006 from a marine aggregate cargo dredged from licence area 408, located in the southern North Sea 100 km east of the Humber Estuary, England. The tusk is one of the most northerly examples of *Mammuthus primigenius* for which good positional data is available.
Image © Wessex Archaeology

While the high-resolution data acquired by the marine aggregate industry and the guidance note and associated reporting protocol represent a very direct contribution to our understanding of marine heritage issues, there is a further, indirect, contribution which is arguably even more valuable.

In 2002 the UK Government introduced an environmental levy on all primary aggregate sales (including marine) in an effort better to reflect the environmental costs of winning these materials and to encourage greater use of secondary and recycled aggregates by consumers. This measure was notionally introduced as an environmental protection measure and therefore while the vast majority of the revenue raised (>£300m/year) has been retained by the Treasury, a proportion of the revenue (>£25m/year) has been used to fund research through the Aggregate Levy Sustainability Fund (ALSF) to reduce the impacts of extraction.

Some of this fund has then been allocated specifically for marine research, including improving the understanding of marine heritage issues. In the five years between 2002 and 2007, over £12m of marine research projects have been completed, and the heritage component of this represents the single largest investment in marine archaeological research to date (Newell and Garner 2007).

While the wider aggregates industry campaigned unsuccessfully against the Levy being introduced as a means to improve the sector's environmental performance, the funds made available through the ALSF programme have allowed research to be undertaken which otherwise would not have been possible — particularly in a marine setting. Disappointingly though, the overall funding available through the ALSF programme has actually been reducing, despite the Aggregate Levy increasing by a third in April 2008. That being said, the proportion of funding that has been allocated to marine projects has actually increased, reflecting the potential for added value from research outputs in supporting the Government's wider policy objectives, specifically the Marine Bill. Consequently, a further three-year research programme was confirmed in July 2008, which will result in an additional £13.5m of marine research projects being commissioned (Newell and Measures 2008).

A range of marine projects have been commissioned since 2002, and while by necessity these have to have a marine aggregate focus, their findings have the potential to deliver significant 'added value' to our understanding of wider marine archaeological issues and in particular how they should be managed. In the absence of other funding streams for marine research, there is a challenge in ensuring projects are able to deliver applied products which can directly support marine policy, assessment and management rather than simply producing academic outputs. The direction of the marine fund is ultimately guided by a multidisciplinary steering group comprising regulators, policymakers, advisers, scientists, and industry. While each party will have different objectives or motives, there are some very clear synergies behind the overall goal of the marine ALSF programme — to deliver practical outcomes which improve understanding and knowledge, and which, in turn, increase certainty and provide greater confidence.

Over the last decade the marine aggregate sector has, both directly and indirectly, helped deliver a series of opportunities that have significantly improved understanding of many aspects of the marine historic environment in British waters and the means to manage and protect these important resources. Therefore far from representing a

threat to the marine historic environment, the marine aggregate industry has actually contributed to a golden harvest of marine archaeological knowledge and understanding which otherwise would not have been realized. However, while the marine aggregate sector has made a significant (and some may say unexpected) contribution to kick-starting UK marine heritage research by providing focus, direction and funding, the real challenge in the medium to longer term will be how applied marine archaeological research can kick on from here, given the increasing profile of marine policy, planning, and management.

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Notes on Contributors

Virginia Dellino-Musgrave is a Maritime Archaeologist — Project Manager with the Hampshire and Wight Trust for Maritime Archaeology.

Correspondence to: Virginia Dellino-Musgrave, HWTMA, Room W1/95, National Oceanography Centre, Empress Dock, Southampton, SO14 3ZH, UK. Email: vdm@hwtma.org.uk

Sanjeev Gupta is a Royal Society Leverhulme Trust Senior Research Fellow and Reader in the Department of Earth Science and Engineering, Imperial College London.

Correspondence to: Sanjeev Gupta, Department of Earth Science and Engineering, Imperial College London, Royal School of Mines, Prince Consort Road, London, SW7 2AZ, UK. Email: s.gupta@imperial.ac.uk

Mark Russell is Director of the British Marine Aggregate Producers Association, the representative body for the British marine aggregate industry.

Correspondence to: Mark Russell, British Marine Aggregate Producers Association, Gillingham House, 38-44 Gillingham Street, London, SW1V 1HU, UK. Email: mark.russell@mineralproducts.org