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Letter to the Editor

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No sand shipment for Cleopatra by Antonius: Resedimentary origin for the ooidal sand beach of Sedir Island (Aegean coast of SW Anatolia)

Mehmet Cihat ALÇİÇEK*
Department of Geology, Pamukkale University, Denizli, Turkey

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According to a long-held myth, the Roman General Marcus Antonius once ordered – as a gift for Cleopatra, the Egyptian Queen – a large shipment of white ooidal sand from the Alexandria coast of Egypt to Sedir Island on the Aegean coast of SW Anatolia (Figure a), supposedly frequented by the queen and hence known as Cleopatra Beach. The millennial conundrum in such a shipment has become disputed only in the past decades, by analysing and comparing the overall characteristics of ooidal sand at these two Mediterranean coasts.

The shipment legend was, thus, put in doubt, especially since the millennial preservation of such delicate ooidal sand on a wave-dominated non-native beach can be questioned. This was noted by Üşenmez et al. (1993) who suggested that the hydrodynamic conditions around Sedir Island apparently are not convenient for forming ooids in situ owing to lack of strong open marine water movement related to tidal- and wave motions. El-Sammak and Tucker (2002) favour the shipment hypothesis by claiming that the ooids must have been formed somewhere else and been brought to Sedir Island as reliant on their sedimentological study remarking on differences in the nature of the ooids nuclei at the two coasts. Insomuch that the authors attempted to calculate quantity and volume of the ooidal sand presently on the Cleopatra beach of Sedir Island and came to a conclusion that 15 Roman corn-barges would have been required for carriage. By contrast, Eren et al. (2016) found the notion of an intercoastal sand transportation across Mediterranean unrealistic based on the sedimentological, mineralogical, and geochemical comparison of the ooids from both coasts and distinct textural features such as size, sorting, and nuclei of ooids from both coasts, all suggesting formation in different agitated environments. Based on the amino acid racemization (AAR) ages of 1.3–2.3 ka and 1.8–2.6 ka provided by Altun et al. (2009) for the modern ooids from Alexandria and Sedir respectively, Eren et al. (2016) ascribed at last the late Holocene age for the formation of ooids from both coasts. Since the AAR is a relative dating method based on racemization rate, which is sensitive to temperature, a calibration is essential and must rely on other independent chronological methods. For this reason, derivation of numerical dates from the D/L values in areas for which a calibrated framework has not been built is not advisable (Demarchi and Collins, 2014). Yet, absence of other ooidal sand formations at surrounding is notable.

The present author has recently surveyed the ooidal sand beach of Cleopatra, a north-facing U-shaped narrow marine bay on the Sedir Island (Figure a and b). Therein appears to be a prominent submerged oolitic sandstone bed dipping at 15° to the north and being eroded by the waves directly below the shoreline. This bed has been overlooked by the previous researchers, most likely due to their visit in unfair weather condition when the bed is usually invisible due to algae accumulated by waves in the narrow bay. The ooidal sandstone bed extends laterally into the Neogene shallow marine succession exposed on both sides of the bay (Şenel and Bilgin, 1997), which stands in the same attitude as that of the submerged oolitic sandstone bed as seen in Figure c–e. The spectacular white ooidal sands of the Cleopatra beach (Figure b) have, thus, been derived through erosion of the submerged Neogene substrate by nearshore waves and accumulated on the beach and the backshore zone of the bay (Figure c-g). The oolitic sandstone lies further on the seafloor as much as a few meters in depth extending northward being and eroded by sea-waves for more than a hundred meters as seen in pale white colour seen underwater (Figure a).

This evidence, based on the field observations from the white ooidal sand beach of Cleopatra on Sedir Island, unravels the long-held mystery of a sand gift-shipment from

* Correspondence: alcicek@pau.edu.tr

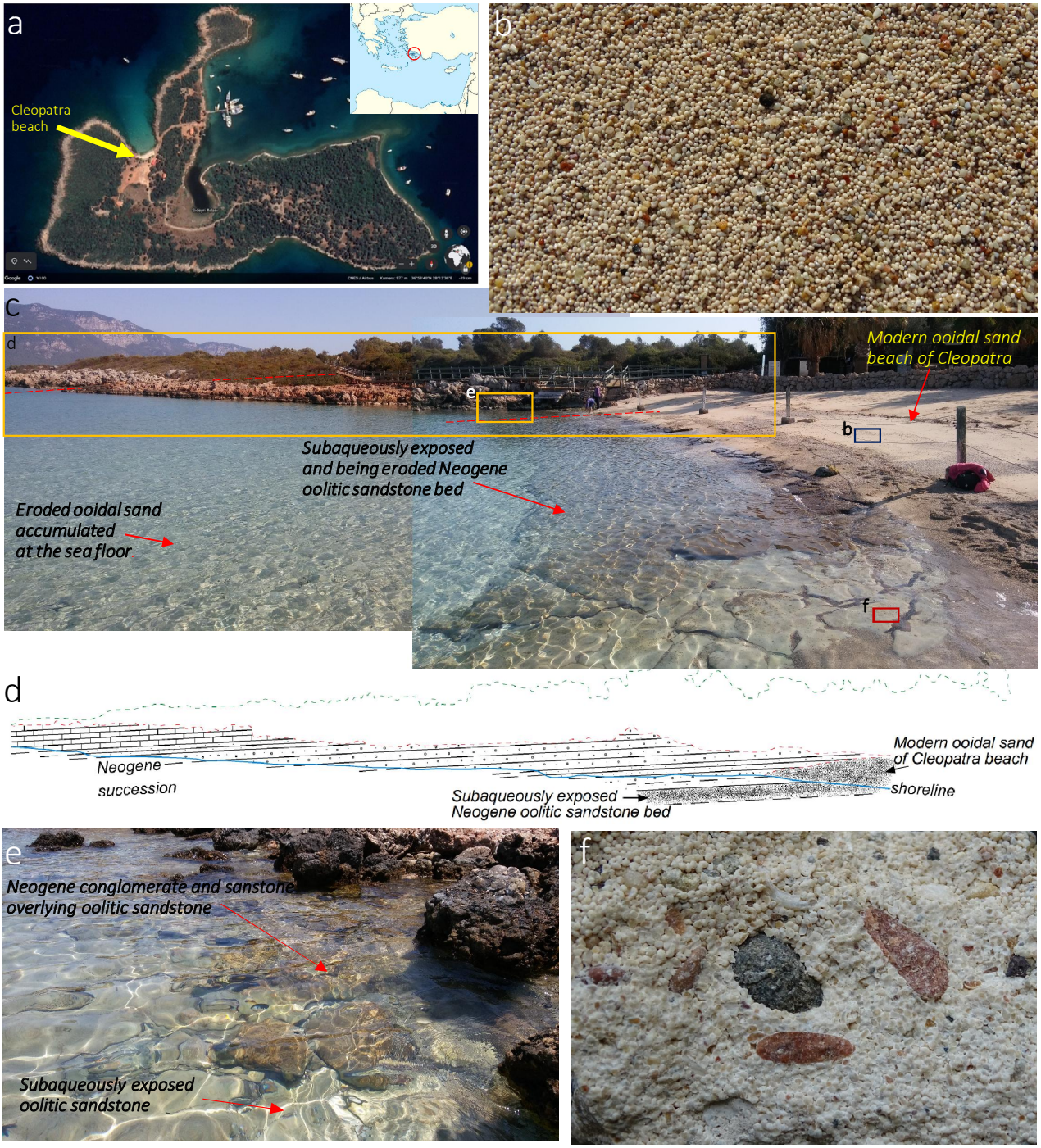

Figure. (a) Google Earth image for the location of Cleopatra beach in the Sedir Island in Aegean coast of SW Anatolia. (b) Subaerially exposed modern ooidal sand of Cleopatra beach (photo courtesy of O. Düşen) derived by erosion of the Neogene oolitic sandstone bed lying below sea. (c) Panoramic view of the Cleopatra beach in Sedir Island, view to the east. The submersed oolitic sandstone substrate dipping to the north lies directly below the shoreline; the bed eroded by waves is the source for the modern ooidal beach sand. (d) Sketch illustrates the stratigraphic position of Neogene oolitic sandstone bed. (e) Close-up view showing the ooidal sandstone bed position within the Neogene succession, where it is overlain by sandstone and conglomerate at this location. (f) Close-up view of a hand specimen of the oolitic sandstone substrate.

Egypt and sub-recent in situ oolite formation. The present author clarifies, instead, that the white ooidal sands of the Cleopatra beach are a continual product of an erosional in-place reworking of the Neogene oolitic sandstone bed lying directly below the shoreline and suggests that the same possibility of recycling should probably be taken into consideration for the origin of the oolitic sands on the Alexandria coast of Egypt, while no historical documentation on such a striking shipment.

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