MARITIME TRADE IN GLASS: A CASE HISTORY SHOWING THE VALUE OF SCIENTIFIC INVESTIGATIONS

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ABSTRACT

Glass is frequently recovered during the excavation of shipwrecks of virtually all ages and from everywhere around the world. It can be found as artifacts or as a commodity, that is, as chunks of raw, unshaped material, as cast ingots, or as broken glass intended for recycling. Apparently, the earliest examples of glass excavated under water are the ingots and certain small finds from the Uluburun wreck, while the best-known, perhaps, are the hundreds of thousands of broken vessel fragments from the Serçe Limanı wreck.

There is one underlying concept about glassmaking that can be easily overlooked when interpreting archaeological finds of glass. Glassmaking has always been a two-stage process. First, there is the engineering stage: the hot, often laborious process by which a mixture of earthy materials is transformed into a molten mass that eventually ends up as a bright, transparent material. The second stage is the artisans' contribution, in which the material is formed into artifacts.

Sometimes these two stages were carried out simultaneously with the artifacts being formed directly from the initial glass melts. In other cases, raw, unshaped glass was stored until a time that best suited the artisans who were to resoften it and form it into artifacts. In still other situations, raw glass was transported to distant locations to be fashioned into objects closer to the markets where it was to be sold or ultimately put to use. This also allowed for it to be formed into objects suiting local tastes and needs. That technological duality had a parallel in ancient metallurgy. The copper ingots recovered from Bronze Age shipwrecks were being transported from places where ores had been smelted to places where the metal was to be formed into artifacts. Of course, finished glass artifacts were also widely transported throughout the Ancient World.

Glass factories varied in their scales of production. The earlier operations involved furnaces that could have fit under an ordinary dining room table. Some centuries later they evolved into tank furnaces in which glass was melted by the tons. The character of the earlier furnaces and glassmaking operations are echoed today at factories in Herat and India.

Although glass has sufficient durability to survive relatively well under water — in comparison to many other materials — it is, nevertheless, subject to slow weathering processes. Given enough time, chemistry eventually takes its toll. Hence, glass finds from underwater sites sometimes pose extremely challenging conservation problems. The glass *opus sectile* panels from Kenchreai are prime examples.

Glass finds can offer valuable opportunities to learn more about the ships that carried them and, perhaps, about the crews and the rest of the cargos. Typological glass evidence can be augmented by chemical analysis and by various isotope analyses. We will bring together here both scientific evidence and the concepts expressed above to illustrate how such investigations have shed light on the Uluburun glass finds — and how laboratory analyses can reasonably be expected to do so again in the future.