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A Roman Barge from the River Kupa at Kamensko (Croatia): Evidence of a Regional Shipbuilding Tradition of the Danube River Basin in Southeastern Europe

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Slide	Text
1	<p>The riverbed of the Kupa, next to the village of Kamensko in Croatia, holds the remains of a sunken Roman-era river barge, well preserved under the cargo of bricks it was transporting.</p> <p>Discovered in 2009, and briefly excavated from 2011 to 2014, the shipwreck has been systematically researched since 2015 by a team from the Croatian Conservation Institute and the Centre Camille Jullian, making Kamensko the first riverine shipwreck to be systematically investigated in Croatia.</p>
2	<p>Our communication will be organised in four parts:</p> <ul style="list-style-type: none">-first, we will briefly explore the geographical and historical context;-second, the circumstances of the discovery and previous researches will be mentioned;-then the preliminary results on the cargo, the structure and the dating of the barge will be presented;-and, finally, the Kamensko barge will be placed into context with the other regional riverine vessels in order to better delineate the fluvial shipbuilding traditions of the middle section of the Danube hydrographical basin during the antiquity.
3	<p>The site of Kamensko is located on the far southwestern edge of the Pannonian Basin.</p>
4	<p>Located 5 kilometres east from the town of Karlovac, it's separated from the Adriatic and therefore the Mediterranean by a short but mountainous strip of land.</p>
5	<p>Founded <i>ex nihilo</i> in the 16th century, on a spot where the Kupa receives the influxes of Korana, Mrežnica and Dobra Rivers, Karlovac took advantage of this strategic position within an exceptional riverine network and rose to the status of a wealthy river port during the 18th and 19th centuries.</p>
6	<p>60 km east of Karlovac, the Kupa inflows into the Sava River in Siscia, an important roman colony and a fluvial port that today bears the name of Sisak. <i>Siscia</i> was founded around 35 BC after the conquest and destruction of the Celto-Illyrian settlement and</p>

	<p>river port <i>Segestica</i> by the future emperor Octavian, and later flourished due to its exceptional position, subsequently reaching the status of provincial capital</p> <p>It functioned as a home port for a part of the Roman Pannonian fleet, <i>Classis Pannonica</i>, its nautical importance being also attested by numerous archaeological finds hailing from the river. Those include a great number of sporadic artefacts, remains of loading platforms, a number of logboats, as well as the remains of a flat-bottomed river barge.</p>
7	<p>Referred to as <i>Colapis</i> by a number of ancient sources, the Kupa is a tributary of the Sava and belongs to the Danube hydrographical basin. It is just under 300 kilometres long, what makes it the third longest river in Croatia, but the longest one whose both spring and confluence are located within the country. Functioning as an important waterway on a strategic position between Pannonia and the Mediterranean, as well as between the Italian peninsula and the Balkans, this river today represents a very interesting, although little studied, fluvial landscape with great archaeological potential.</p>
8	<p>It was from the riverbed of the Kupa next to the village of Kamensko that numerous fragments of Roman bronze sculptures were for decades being extracted by sand dredgers. These irregular pieces of destroyed, roughly broken, Roman monumental sculptures made up a cargo transported by the river, most likely towards the <i>Siscia</i> foundries, in order to be reused.</p> <p>Extracted from the riverbed as early as 1913 and well towards the end of 20th century, the fragments were generally sold to collectors or in nearby Karlovac for scrap metal, with only eighty-nine pieces remain preserved until today. In an attempt to locate this endangered “bronze shipwreck”, Krunoslav Zubčić from the Department for Underwater Archaeology of the Croatian Conservation Institute launched a systematic prospection campaign in 2007.</p>
9	<p>Although no bronze fragments were ever located, the survey led to a discovery of a tumulus of bricks at the depth of approximately 5 meters. The site was identified as a Roman-era river barge and its importance immediately asserted, followed by several short annual research campaigns under the direction of Zubčić.</p>
10	<p>This initial assessment of the site paved the way for the collaboration between the Croatian Conservation Institute and the Nautical Team of the Centre Camille Jullian lead by Giulia Boetto.</p> <p>After four excavation campaigns, last of which ended just one and half months ago, the scientific results are numerous. An outline of those will be presented in the following minutes.</p>

11	On its last journey, the Kamensko barge was transporting a cargo of several hundred bricks whose standardised units of measurement classify them as <i>lateres sesquipedalis</i> . A total of 297 bricks were displaced from the hull of the barge, so that both the architecture of the vessel and the brick cargo can be studied in detail.
12	A number of both unintentional and deliberate markings were noted impressed in the bricks. We therefore have impressions of human foot, both barefoot and wearing hobnailed <i>caligae</i> , as well as dog paw impressions.
13	Although no epigraphic workshop stamps were found, more than 80% of the bricks bear an alpha-shaped symbol , impressed on the short sides of the bricks before firing. In one instance the alpha is accompanied by a cross-shaped symbol, possibly the number 10, while on another brick a total of three alphas appear. Three bricks bear marks of a semi-circle...
14	...while on one brick an underlined number 212 written in Roman numerals is visible. It seems likely that all the aforementioned markings can be placed in relation with the brick production process , being personal signatures, workshop marks, and ways for tracking the productivity of workers. They also bear witness to the homogeneity of the cargo, probably hailing from a single workshop that relied on the extensive local waterway network in order to distribute its product.
15	This assumption is confirmed by a discovery of the same alpha-shaped symbol, appearing on most of the bricks, inscribed with a burnt point into one side of the barge, placing the cargo and the barge in a mutual relation.
16	During their transport, the bricks were settled on a support made out of branches and smaller tree trunks. This dunnage is not an integral part of the barge's architecture, but a temporary solution in order to facilitate the transport of the bricks and prevent any damage to the hull. On the end of its journey, after unloading the bricks, this wooden cargo might have been sold or used as firewood. Considering the number of bricks displaced and the bricks still in place, we can calculate that the barge transported at least 5 and half tons of bricks, but more precise data will be gathered after the reconstruction of the hull shape.
17	The Kamensko river barge , 2 m wide and preserved in a length of 12 m, is a flat-bottomed vessel of a bottom-based construction, constructed mostly from oak. Its upstream extremity, identified as the prow, is partially preserved, while on the downstream side the barge is broken, most likely destroyed by sand dredgers.
18	Two hull samples have been dated by the AMS technique in two different laboratories, placing the barge in a wide timespan between the 1 st century BC and the 3 rd century AD.

19	The bottom of the barge, flat and keel-less, is made out of three oak strakes . One of them ends as a stealer towards the prow, while the two others seem to run in the full length of the barge.
20	The bottom strakes are inserted between the two bilge strakes , also known as chine girders . These two elements, each carved out from a single large oak trunk, wide as much as one meter in diameter, constituted the sides, bilges, as well as a part of the bottom of the barge.
21	The northern bilge strake can be continuously followed in the length of 10 meters. Due to the northern inclination of the shipwreck this bilge strake was fully covered by the cargo and the sediments and remained preserved almost in its original height, which measures 60 cm. It is possible that the top of this bilge strake also represented the gunwale of the barge, as there are no indications of any side planks being added.
22	The southern bilge strake , due to its greater exposure to the river flow, remained less conserved than its northern counterpart. Carved out from a single oak-trunk as well, it presents two long oblique reparations.
23	The hull of the barge is assembled together by a great number of small metal clamps , driven across the seams in regular intervals both from the inside and the outside of hull. Up to 5 cm long and around 1 cm wide, they have been inserted in already prepared notches.
24	A sample of the hull extracted to the surface, composed of a part of the northern chine-girder and its adjoined strake, allowed us to confirm the presence of the clamps on the external part of the barge as well, where they have need nailed in shorter intervals than in the interior.
25	Apart from holding the hull together, the metal clamps held in place a waterproofing material of vegetal origin, inserted in the form of multiple cords in the seams between the planks, according to the principles of luting.
26	Five frames have been conserved and documented <i>in situ</i> , while the position of other two can be established due to the presence of treenails in the hull. The frames are made out of paired knees settled side by side, the starboard knee always placed towards the prow. They have been carved out from already curved oak branches and attached to the hull by a limited number of treenails, 3 or 4 per each knee. The frames themselves are very widely spaced, the room-and-space amidships being 1,5 m, and somewhat decreasing towards the prow.
27	Last architectural element of the barge to be presented is the mast step , a massive longitudinal timber settled on the bottom planking between two frames. Its extremities

	<p>are worked in order to be settled onto the frames, to which it has been attached by two iron nails driven from the inside of the hull, one on each extremity.</p> <p>On its upper side it contains a large carved recess for housing the mast. It is likely that this mast step housed a towing mast used for hauling the barge upstream, a typical riverine system of propulsion well attested in both Roman iconography and archaeological sources.</p>
28	<p>The position of the mast step allowed us to define the preserved extremity of the barge as the pro. Also, the fact that the brick cargo covered the mast step on the barge's last voyage allows us to conclude that the barge was not being towed upstream, but was sailing downstream, in the direction of <i>Siscia</i>.</p>
29	<p>It is interesting to note that this system of propulsion has been used on the Kupa well into the 20th century.</p>
30	<p>The use of clamps for connecting architectural elements has been very sporadic in Roman fluvial shipbuilding, documented only in few cases of reparations and strengthening the hulls of the Romano-Celtic barges. However, they have never been used as a principal joining element, except on a small group of relatively less-known river barges, all hailing from the Danube hydrographical basin in Slovenia, Croatia and Serbia.</p>
31	<p>Those are the vessels from Sinja Gorica, Sisak, and Kušjak, all three presenting a number of similar architectural elements as the Kamensko barge, although being different in shape and dimensions. All of them are flat-bottomed, bottom-based, with monoxyle chine girders. Their strakes are assembled by numerous, small, metal clamps that also hold the luting material of vegetal origin between the seams. The frames, except in the case of Sinja Gorica, are attached to the hull by wooden dowels, another uncommon element in Roman fluvial shipbuilding.</p>
32	<p>Based on their architectural similarities, and affiliation with a certain time and a certain nautical transport zone, these vessels form a specific assembly belonging to one of the Roman fluvial shipbuilding traditions proper to the Danube hydrographical basin.</p>
33	<p>The second shipbuilding tradition is represented by a large flat-bottomed barge from Lipe, discovered in the 19th century next to the Ljubljanica River in Slovenia and dated between the 1st century BC and the 1st century AD.</p> <p>Its strakes were assembled by the sewing technique, probably a technological transfer from the North Eastern Adriatic where this technique has been attested in shipbuilding from the Bronze age well into the Roman Empire. It is possible that, within the Danube hydrographical basin, this Mediterranean technique evolved into the more cost- and time-effective assembly by metal clamps, documented on the four presented barges.</p>

34	The technological and chronological relations between these two shipbuilding traditions of the Danube hydrographical basin and between the other inland shipbuilding traditions of Continental Europe constitute important questions that we hope to elucidate in the future by continuing pursuing systematic researches in the Kupa River.