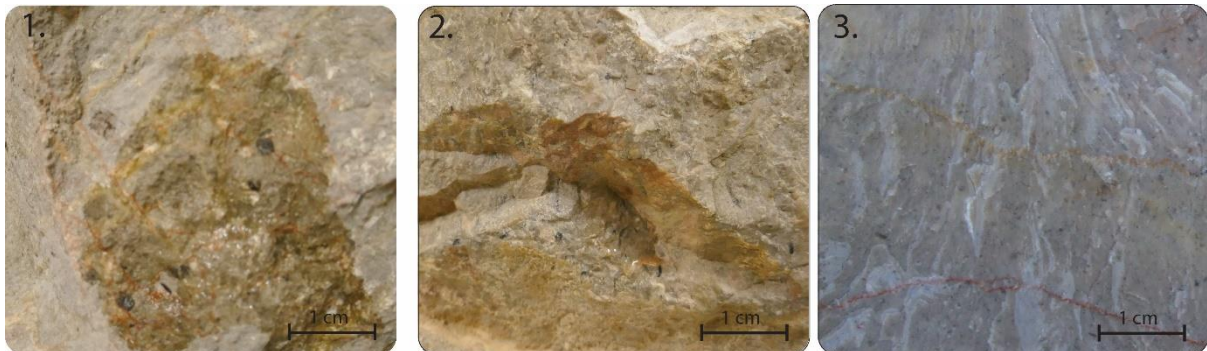


Supplementary Material to “Mid-Cretaceous calcarenite in stone products from the Roman colony of Emona, Regio X (modern Ljubljana, Slovenia)”, by R. Brajkovič et al.

S1 – Macroscopic determination of provenance of mid-Cretaceous calcarenites

Three different facies have been microscopically described in the stone products from Emona. They are late Aptian to early Cenomanian (mid-Cretaceous) in age. The facies consist of (i) sedimentary limestone breccia, (ii) coarse-grained calcarenite, (iii) fine-grained calcarenite. Their petrographic and microfacies compositions, as well as the foraminifer assemblage, are presented in the manuscript sections "Geological characterisation" and "Characterization of possible source formations in the local and regional radii of Emona" and the figures therein.

Now defined microfacies of stone products also allow macroscopic recognition, as described in the "Geological characterisation" section of the present manuscript. The additional macroscopic pictures presented below are intended as examples of each facies to facilitate further macroscopic identification of these products, thereby reducing the need for further sampling of stone products from mid- Cretaceous calcarenites found at Emona.



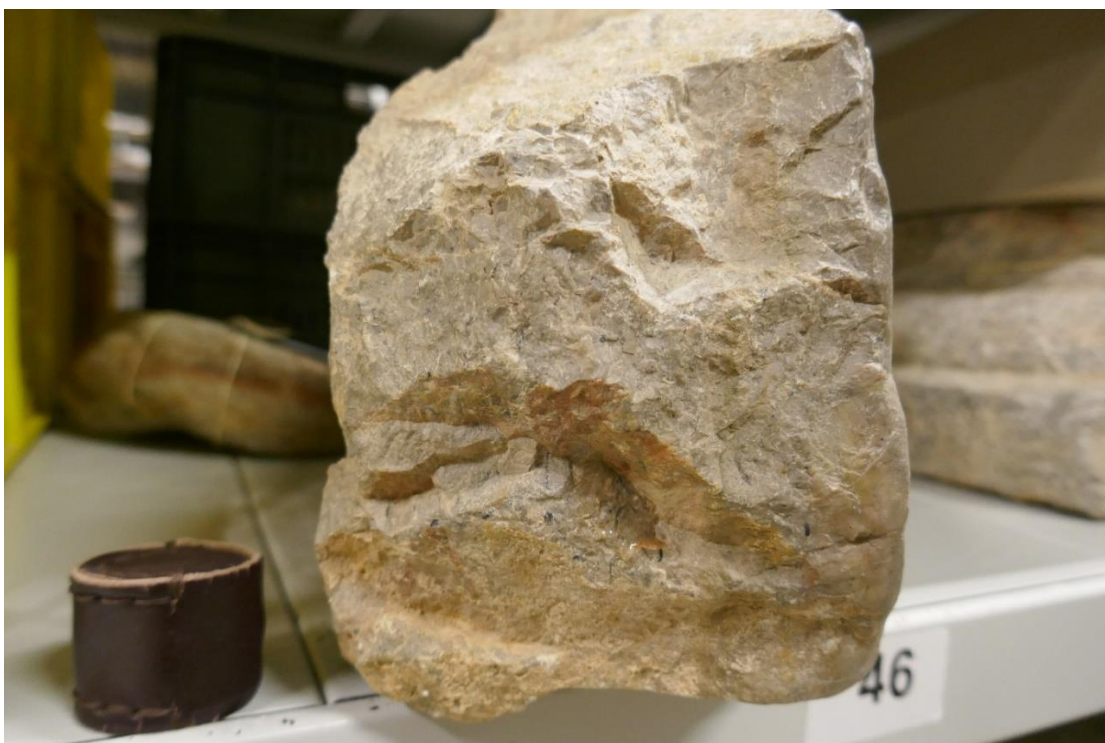
Picture 1: Macroscopic view of each determined facies in stone products. 1. – sedimentary limestone breccia (inv. no. MGML 0057726); 2 – coarse-grained calcarenite (MGML 0061375); 3 – fine-grained calcarenite (inv. no. MGML PN 9102/1). Foto: R.B.



Picture 1.1: Sedimentary limestone breccia – note the angular clasts on the left of the stone product MGML 0057726. Foto: R.B.



Picture 1.2: Sedimentary limestone breccia – close-up of the example of angular clasts in the stone products MGML 0057726. Foto: R.B.



Picture 1.3: Coarse grained calcarenite – note the relatively large (up to 3 mm) black clasts of rudist debris in stone product MGML 0061375. Foto: R.B.



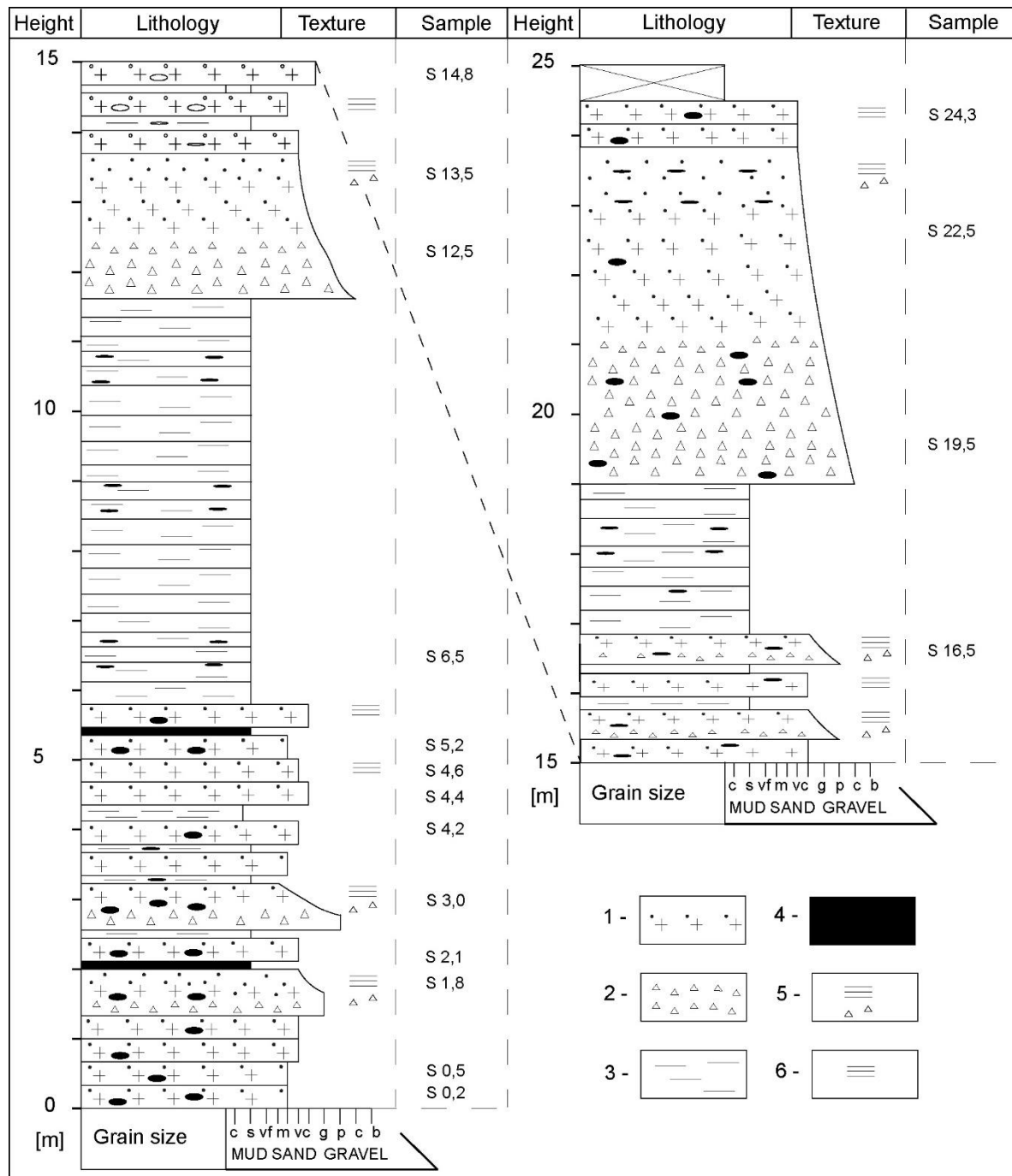
Picture 1.4: Fine-grained calcarenite – note the fine black clasts (rudist debris) in stone product PN 9102/1. Foto: We thank to Igor Rižnar for the field photos of the studied stone product PN 9102/1.



Picture 1.5: Fine-grained calcarenite – note the fine black clasts (rudist debris) in stone product MGML PN 9102/1. Foto: We thank to Igor Rižnar for the field photos of the studied stone product PN 9102/1.

S2 – logged sedimentological section

For position of the logged section see Figure 1c in the manuscript.



Picture 2: Sedimentological section of the Lower Flyschoid Formation logged on the Smednik hill. Lithologies: 1 - calcarenite, 2 - breccia, 3 - marlstone, 4 – chert. Sedimentary textures: 5 - gradation, 6 - lamination.

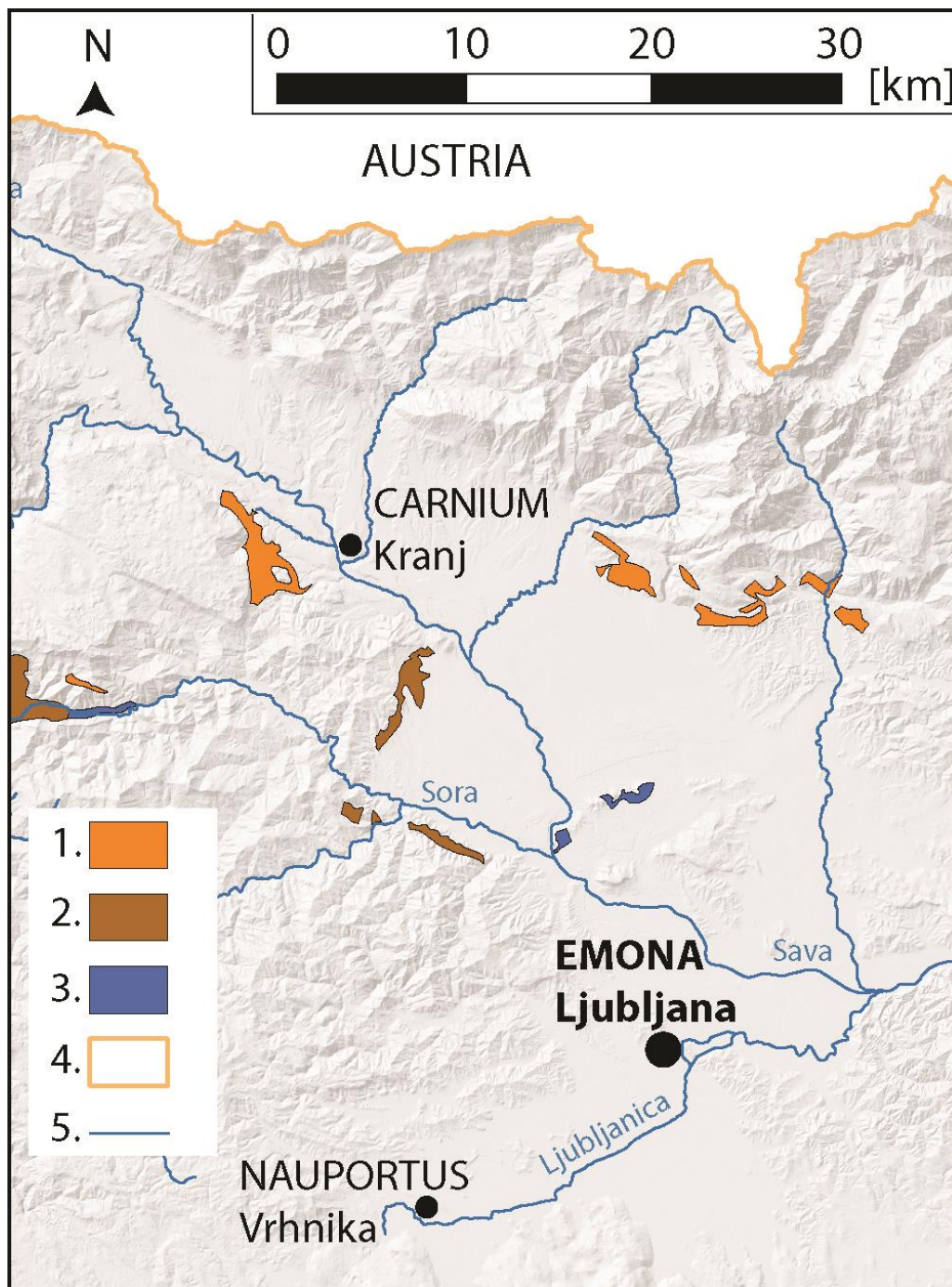
S3 - Locations of the Lower Flyschoid Formation in north-western central Slovenia

The locations of Lower Flyschoid Formation (after Buser, 2010) within the local and regional radii of two Roman settlements: (i) Emona (mod. Ljubljana) and (ii) Carnium (mod. Kranj) was checked on the field to determine if mid-Cretaceous calcarenite could be imported from the vicinity of the nearby Roman settlement of Carnium. Based on fieldwork observations, the individual polygons where the Lower Flyschoid Formation outcrops were categorised according to the presence of carbonate resediments (calcarenites and limestone breccia) as follows:

(i) very little to no carbonate resediments; resediments occur only sporadically as thin-bedded, fine-grained calcarenite within a succession composed predominantly of marlstone and mudstone.

(ii) - carbonate resediments are subordinate. Resediments occur only as individual thin-bedded, fine-grained calcarenites within the marlstone and mudstone succession. Since no coarse-grained calcarenites or sedimentary limestone breccias were found, these sites do not correspond to the studied stone products.

(iii) - carbonate resediments predominate. Thin-bedded calcarenites (fine- and coarse-grained facies) and sedimentary limestone breccia predominate at the sites marked in blue in the picture below. The facies at these sites correspond in facies and age to the studied stone products.



Picture 3: Locations of the Lower Flyschoid Formation in local and regional radii of Emona (mod. Ljubljana) and Carnium (mod. Kranj), modified after Buser (2010), and classified by the ratio of resediments (calcarenites and limestone breccias); (1 - very little to no carbonate resediments; 2 – carbonate resediments are subordinate; 3 – carbonate resediments predominate; 4 - state boundaries; 5 - major rivers).

The two locations north of Ljubljana marked in blue colour are studied in detail in the present manuscript (see Fig. 1c of the manuscript).

Literature:

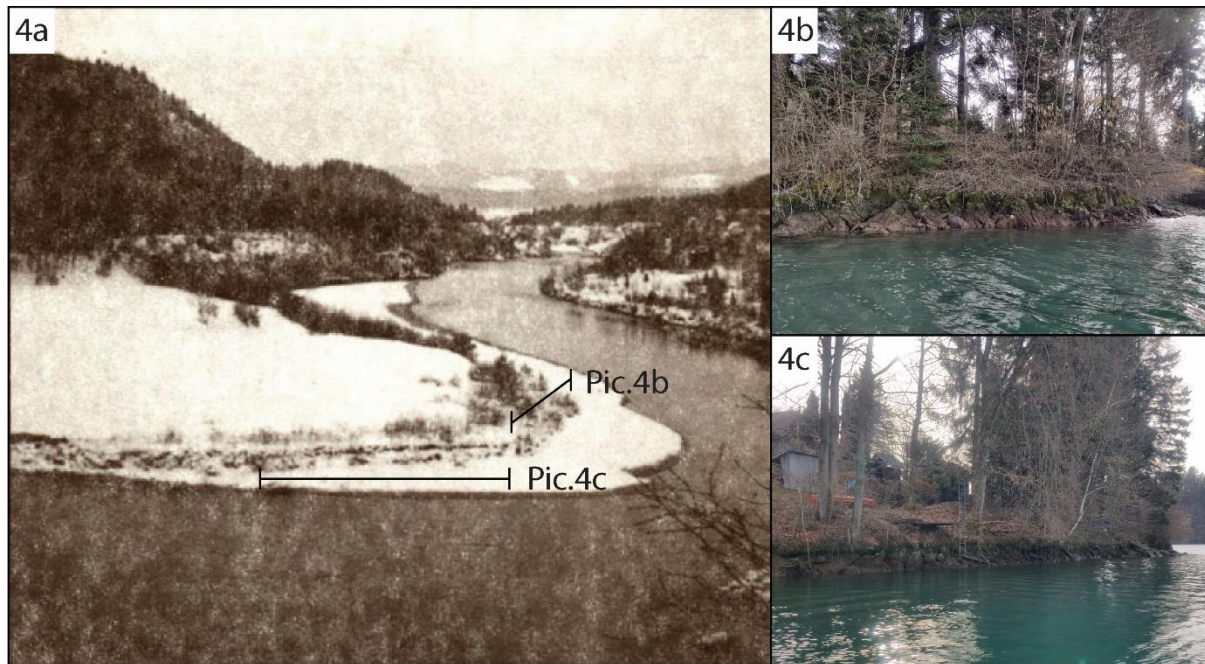
Buser, S., 2010. *Geološka karta Slovenije 1:250.000*. Ljubljana: Geološki zavod Slovenije.

S4 - Locations of the Lower Flyschoid Formation near the Sava River in the local radii of Emona

The geographic location of the sampling sites near Lake Zbilje and the towns of Verje and Medvode can be found in Figure 1c in the manuscript.

Location 1 (L1 in Figure 1c):

Thin-bedded, fine- and coarse-grained calcarenites and thin- to thick-bedded limestone breccia are present on the sampling location 1.



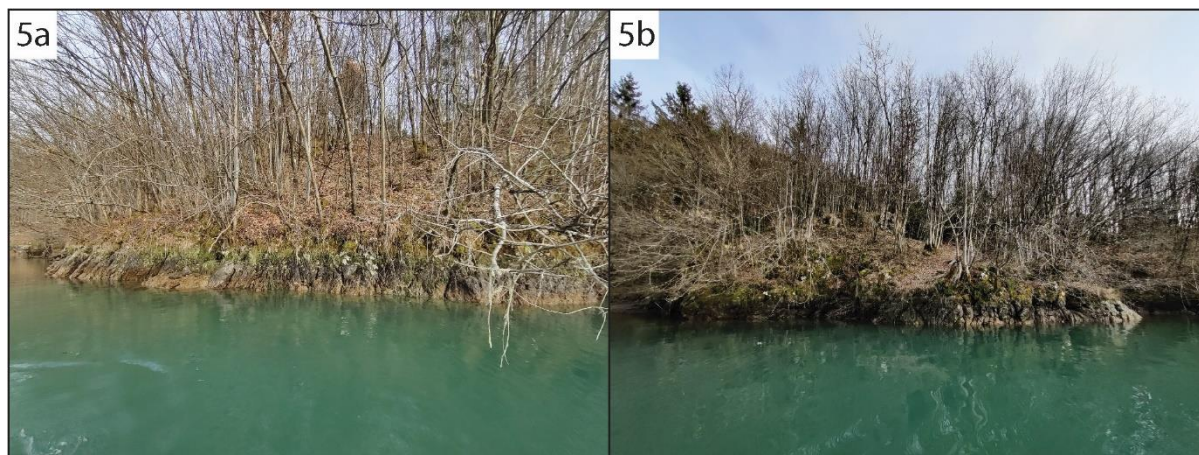
Picture 4: The sampling location 1, prior to building of the Hydroelectrical power plant Medvode and during the field sampling. Note the thin- to thick-bedded layers in picture 4b and 4c. Foto: 4a – HE Medvode archive; 4b and 4c – R.B.



Picture 4.1: Sampled beds in location 1.

Location 2 and 3:

Thin-bedded, fine- and coarse-grained calcarenites and thin- to thick-bedded limestone breccia are present on the sampling locations 2 and 3. Note the thin- to thick-bedded layers in picture 5a and 5b.



Picture 4.2: Sampling locations 2 and 3. 5a – location 2; 5b – location 3.

Locations 4 and 5:

For detail geographical locations of sampling sites L4, L5, L6 see the Figure 1c of the manuscript.

Between locations L3 and L4 (see Fig. 1c) an incised part of the Sava River was present before the building of HE Medvode. The largest altitude drop was localised on natural rapids (also a historical passage) studied by Gaspari (2012). The locations upstream thus had limited direct access through Sava River to Emona. However, the walking distance to the navigable part of the Sava River (Umek, 1986) for locations L1, L2 and L3 is less than 2 km.

Fine- and coarse-grained calcarenites and limestone breccia are present on the sampling locations 4, 5, and 6, however the outcrops are present only as individual outcrops seen and sampled between larger boulders that reinforce the current anthropogenic riverbed.

See Gaspari (2012) for further historical and archaeological data of the area in question.

Literature:

Gaspari, A., 2012. Kulni kompleks bronastodobnega orožja iz lesene konstrukcije v Savski tesni pri Medvodah = Cult complex of Bronze Age weapons and wooden structure at the Sava narrows near Medvode. In A. Gaspari and M. Erič, eds. 2012. *Potopljena preteklost : arheologija vodnih okolij in raziskovanje podvodne kulturne dediščine v Sloveniji : zbornik ob 128-letnici Dežmanovih raziskav Ljubljani na Vrhniki (1884-2012)*. pp. 319–324. Radovljica: Didakta.

Umek, E., 1986. Plovba po Savi v 18. stoletju. *Zgodovinski Časopis = Historical Review = Istoričeskij Žurnal: Glasilo Zveze Zgodovinskih Društev Slovenije*, 40(3), pp. 233–268.