

Drenov grič

Drenov grič limestone

Apnenec Drenovega griča

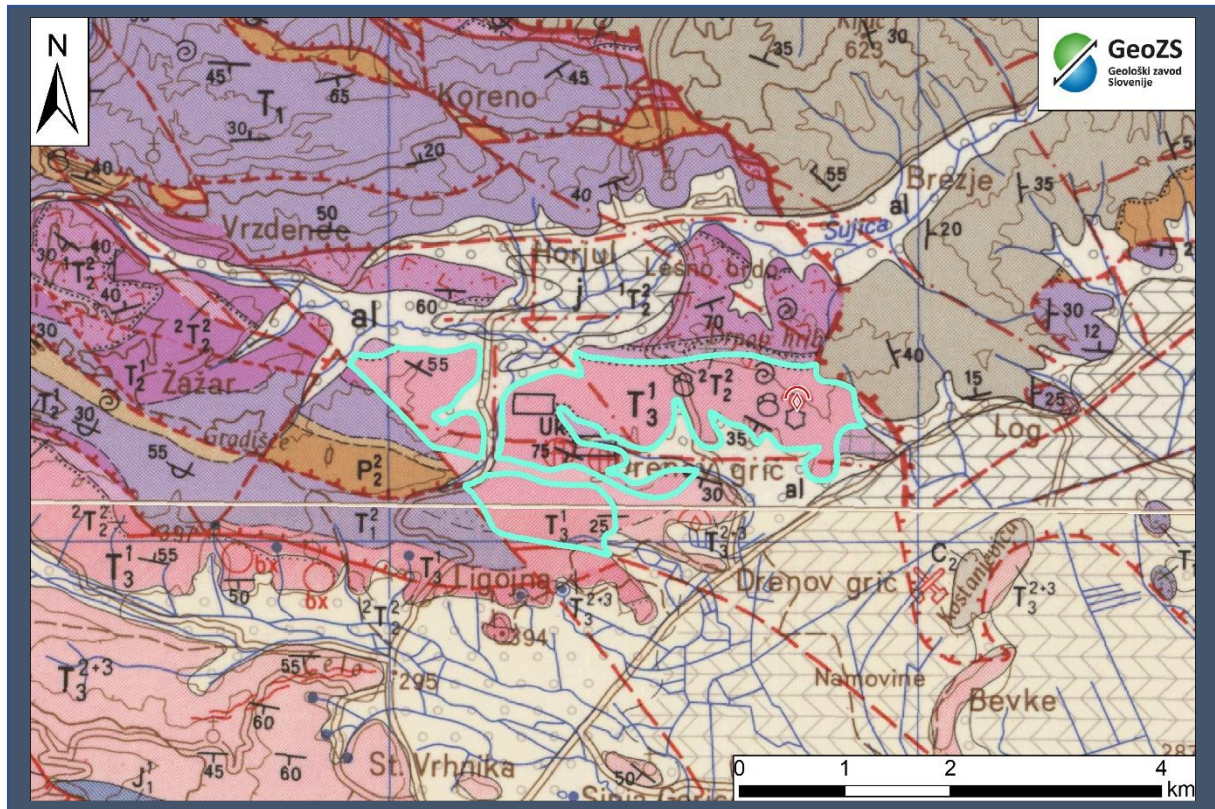


10 cm

Short description: Well-stratified black micritic limestone with numerous white calcite veins and fossil remains of mainly bivalves and marlstone intercalations. The image displays a polished surface.

Commodity (vocabulary)	Lithology (vocabulary)	Typical colour (code list)	Place of origin			
			Country	County / District / Province	Municipality / Community	Place/town / Village
limestone	limestone	black	Slovenia	Notranjska (traditional province)	Vrhnika	Drenov grič

Geological setting



Geology: Bedded to thin-bedded limestone with intercalations of shaley marlstone and claystone. Diverse marine and brackish fauna and with most common bivalve species *Trigonodus carniolicus* and *Myophoria kefersteini*, gastropods, ostracods and foraminifera suggest deposition in a shallow-marine lagoon on the Dinaric carbonate platform. Three layers of coal (anthracite) were also found among the limestone beds.

Production: Kucler quarry near Drenov Grič was the largest extraction site. Together with several smaller ones it is now abandoned. It is designated as natural monument. Drenov grič limestone is no longer quarried.

Geological age: Upper Triassic (Carnian) (225 million years)

Geological unit: Carnian Raibl beds of the Outer Dinarides geotectonic unit.

Application, use and heritage

Description: Due to its uniform black colour, invigorated by white calcite veins and individual remains of shells it has been very appreciated and often used as ornamental stones for portals, columns, slabs, tombstones, and other ornaments. It played a major role in the Slovenian art and architecture, mainly during the Baroque period.

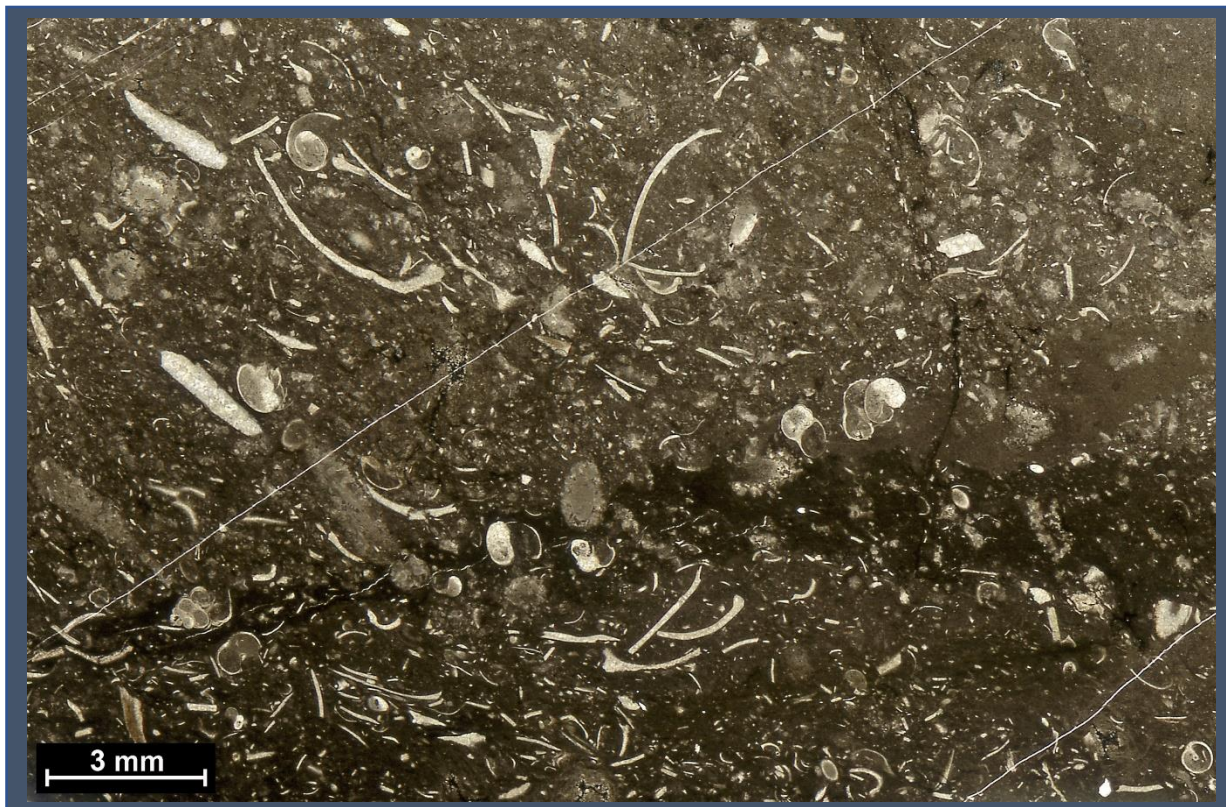


Two stone giants at the portal to the entrance of Ljubljana's Seminary Palace (1714).



Entrance portal of St. Jacob's Church in Ljubljana and Moorish king sculpture in one of the altars from early 18th century (photo of the sculpture: Miran Kambič, photo library of the Department of Art History, Faculty of Arts, University of Ljubljana).

Petrography



Description: Calcite is the main component, with dolomite, quartz, illite/muscovite and pyrite. Pyrite occurs frequently as framboidal pyrite concentrated in veins filled with phyllosilicates and around fossil fragments, although in some areas isometric grains of pyrite also occur. Some fossil fragments of bivalves, gastropods and ostracods are also present. Very rich in carbonaceous and bituminous organic matter.

Source of information: Geological Survey of Slovenia, Mirtič et al., 1999, Ramovš, 2000; Kramar et al., 2011; Kramar et al., 2019

Mineral composition

If no accurate number, use MM=main minerals, SM = Subordinate minerals, AM=accessory minerals

Mineral n (%)	Mineral n (%)	Mineral n (%)	Mineral n (%)	Mineral n (%)	Mineral n (%)	Mineral n (%)
Mineral n (%)						

Source of information:

Physical properties

Apparent density (EN 1936) kg/m ³	Open porosity (EN 1936) % vol	Water absorption at atmospheric pressure (EN 13755) % wt	Uniaxial Compressive strength (EN 1926) MPa	Flexural strength under concentrated load (EN 12372) MPa

Real density (EN 1936) kg/m ³	Total porosity (EN 1936) % vol	Water absorption coefficient by capillary (EN 1925) (g/m ² x s ^{0,5})	Flexural strength under constant moment (EN 13161) MPa

Frost resistance (EN 12371)				
Technological Test (Test A)				Identification Test (Test B): Number of cycles completed prior to stone failure
Flexural strength (EN 12372) after freeze-thaw cycling, MPa	Number of cycles	Uniaxial compressive strength (EN 1926) after freeze-thaw cycling, MPa	Number of cycles	

Resistance to ageing by thermal shock (EN 14066)			
Change in dynamic modulus of elasticity (increase: +; decrease: -) %	Change in open porosity (increase: +; decrease: -) %	Change in ultrasound pulse velocity (increase: +; decrease: -) %	Change in flexural strength under conc. load (increase: +; decrease: -) %

Abrasion resistance (EN 14157)			Resistance to salt crystallisation (EN 12370)	Breaking load at dowel hole (EN 13364)	
Method A - Wide Wheel Abrasion Test, mm	Method B - Böhme Abrasion Test, cm ³ / 50cm ²	Method C - Amsler Abrasion Test, mm	Change in mass (increase: +; decrease: -), %	Breaking load, N	Thickness of the test specimens, mm

Slip resistance by means of the pendulum tester (EN 14231 / CEN/TS 16165)			Rupture energy (EN 14158), Joule	Thermal Conductivity (EN 1745), W/m·K
Tested surface finish	Slip Resistance Value — SRV			
	Dry test condition	Wet test condition		

Methods applied and source of information:

Chemical properties

Main elements

SiO ₂ (%)	Al ₂ O ₃ (%)	Fe ₂ O ₃ (%)	TiO ₂ (%)	MgO (%)	CaO (%)	Na ₂ O (%)	K ₂ O (%)	MnO (%)	P ₂ O ₅ (%)	SO ₃ (%)	LOI (%)

Trace elements

V (ppm)	Cr (ppm)	Mn (ppm)	Co (ppm)	Ni (ppm)	Cu (ppm)	Zn (ppm)	As (ppm)
Sr (ppm)	Cd (ppm)	Ba (ppm)	Pb (ppm)	Be (ppm)	Rb (ppm)	Bi (ppm)	U (ppm)
Sc (ppm)	Y (ppm)	Th (ppm)	Sb (ppm)	Ta (ppm)	Nb (ppm)	Zr (ppm)	Sn (ppm)
Ag (ppm)	B (ppm)	Mo (ppm)	W (ppm)	Ga (ppm)	Ge (ppm)	Se (ppm)	Cs (ppm)
Tl (ppm)							

REE

La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)
Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)		

Methods applied and source of information:

Sources of more information

Type of information	Name of provider	URL
This data sheet		
Non-commercial directory	Geological Survey of Slovenia: Mining Registry Book	https://www.ms.geo-zs.si/en-GB
Non-commercial directory		
Commercial directory		
Scientific publication	JELLEN, B. 1990: The Karnian bivalves (Mollusca) from Lesno Brdo, Slovenia, NW Yugoslavia and their paleobiological significance. <i>Geologija</i>, 31/32, 11-127. http://www.geologija-revija.si/dokument.aspx?id=889 MIRTIČ, B., MLADENVIČ, A., RAMOVŠ, A., SENEGAČNIK, A., VESEL, J., & VIŽINTIN, N. 1999. Slovenski naravni kamen. Ljubljana, Geological Survey of Slovenia, Slovenian National Building and Civil Engineering Institute, University of Ljubljana Geology department. 131 pg. RAMOVŠ, A. 2000. Podpeški in črni ter pisani lesnobrdski apnenec skozi čas. Ljubljana, Mineral. 115 pp. KRAMAR, S., MIRTIČ, B., KNÖLLER, K & ROGAN-ŠMUC, N. 2011. Weathering of the black limestone of historical monuments (Ljubljana, Slovenia): Oxygen and sulfur isotope composition of sulfate salts. <i>Applied Geochemistry</i>, Volume 26, 9–10, 1632–1638. KRAMAR, S., ŽBONA, K. I., BEDJANIČ, M., MLADENVIČ, A. & ROŽIČ, B. 2019: Drenov Grič black limestone : a heritage stone from Slovenia. In: HANNIBAL, J. T., DOLENEC, S., COOPER, B. J. (eds.), <i>Global heritage stone : worldwide examples of heritage stones</i>. 1st ed. London: The Geological Society Special Publications no. 486, 1-14, https://sp.lyellcollection.org/content/early/2019/10/03/SP486-2017-188	
Other publication		

Compiled by:	Geological Survey of Slovenia (GeoZS) www.geo-zs.si	Logo
		 GeoZS Geološki zavod Slovenije