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Geochemical Data of Scaglia Bianca Chert from Central Italy for Provenance Studies

DATA PAPER

ELENA CARLETTI
GIACOMO ERAMO
IGNAZIO ALLEGRETTA
LUCA FORTI
ROBERTO TERZANO
CECILIA CONATI BARBARO
*Author affiliations can be found in the back matter of this article

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ABSTRACT

This work presents the first geochemical characterization data of Scaglia Bianca Fm chert from Central Italy. The dataset is part of the chert reference collection (SiliROck) of Sapienza, University of Rome, and includes 110 chert samples collected from Abruzzo, Latium and Umbria regions. The samples have been previously examined using solely non-destructive techniques: petrographic analysis using a stereomicroscope, and geochemical analysis through portable X-ray fluorescence spectroscopy (pXRF).

In this study, we report a comprehensive dataset of geochemical data of chert samples originated in the Scaglia Bianca Fm, open and reusable to researchers to gain a detailed overview of Scaglia Bianca chert for provenance analysis.

CORRESPONDING AUTHOR:
Elena Carletti
Dipartimento di Scienze dell'Antichità, Sapienza, Università di Roma, Piazzale Aldo Moro 5, 00185, Rome, Italy
elena.carletti@uniroma1.it

KEYWORDS:
Chert; Characterization; pXRF; Provenance analysis; Central Italy

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(1) OVERVIEW

CONTEXT

Provenance studies are a valuable tool to deepen our understanding of human mobility in the past. Mobility is an abstract phenomenon, rarely leaving direct evidence among the archaeological record [1]. Thus, indirect indicators are necessary for assessing territorial behaviour during Prehistory.

Chert represents an excellent proxy to detect prehistoric mobility, due to the abundance and diffusion of chipped stone artefacts. Assessing the origin of chert exploited to produce stone tools can materialize human movements across the landscape to the source, shedding light on technology, procurement strategies, social organization and exchange networks [2, 3].

Notwithstanding the importance of chert as a raw material throughout Prehistory in the region, little is known about chert distribution and availability in Central Italy. Overall, we still lack a comprehensive knowledge of chert sourcing in the area, despite chert geological richness [4].

Moreover, geochemical characterization data and chert reference collections (lithotheques) are generally scarce and, when available, they are not open-access or easily accessible.

In this work, we address the issue by sharing the first geochemical data of Scaglia Bianca Fm chert in Central Italy. The dataset presented here is part of the lithotheque SiliROck, stored at the Department of Antiquities of Sapienza, University of Rome. It represents the direct prosecution of the work by Carletti et al. [5] on chert provenance on the lithic assemblage from Grotta Battifratta site (Sabina, Latium region) (Neolithic period). The dataset is accompanied by a photographic archive. Chert surfaces have been cleaned and immersed in water and microphotographs have been acquired at different magnifications (10x, 20x) using a Leica EZ4W stereomicroscope with built-in LED illumination and CMOS camera.

The present work is the first attempt to make the characterization data open, accessible and reusable by researchers interested in provenance investigation, regardless of context and chronology.

SPATIAL COVERAGE

The dataset shows part of the chert collection SiliROck, and the characterization data acquired. It includes 110 chert samples from five different sources, both primary and secondary, belonging to Scaglia Bianca Fm, located in Central Italy: in Abruzzo (1), Latium (3) and Umbria (1). Sampling locations are shown in Figure 1.

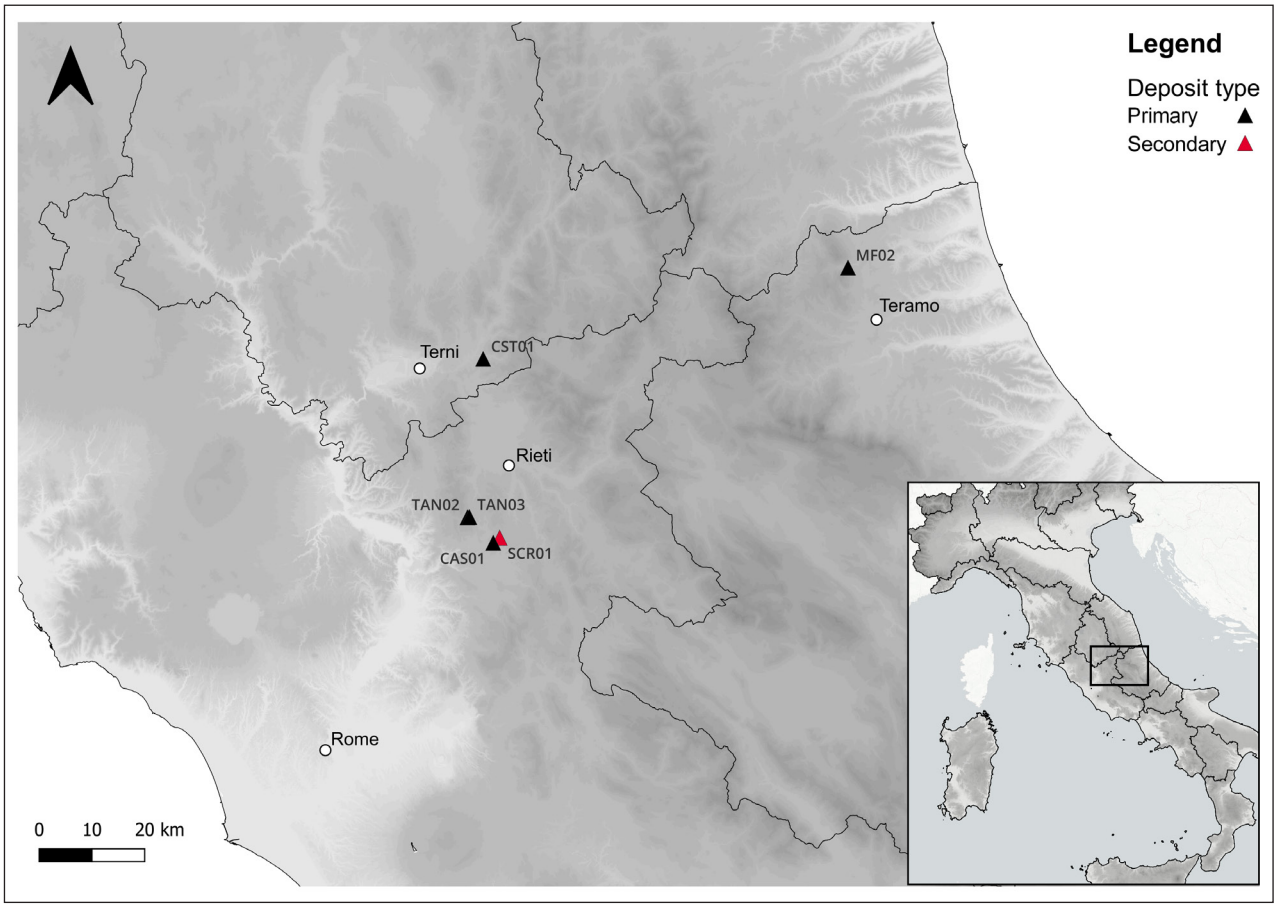

Figure 1 Location of the six sampling locations (Central Italy). CST01 is located in the Umbria region; MF02 in the Abruzzi region and CAS01, SCR01, TAN02 and TAN03 in the Latium region.

Description: Central Italy (mainland). Location names are displayed in Figure 1.

Northwestern boundary: 29.6624; 47.18557
Northeastern boundary: 39.0636; 47.45176
Southwestern boundary: 31.0983; 46.76157
Southeastern boundary: 40.6350; 47.27024

TEMPORAL COVERAGE

The dataset has no temporal coverage and can be used regardless of chronology.

(2) METHODS

STEPS

Geochemical data have been acquired on fresh fractures with a NITON XL3t 900 ED-XRF spectrometer (Thermo Scientific) equipped with an Ag target (2 W). The spot size was approximately 3 mm in diameter, and the resolution of the detector was lower than 160 eV. At least three measures on the matrix of each sample were acquired and the mean values were reported in the table. To quantify both light and heavy elements, a total of 120 s of realtime acquisition was used. Each measurement was performed using three different spectrometer setting in order to enhance the fluorescence in the low, medium and high energy range: 60 s at 40 kV and 50 μA (main range, from 0 to 40 keV); 30 s at 20 kV and 100 μA (low range, from 0 to 10 keV); 30 s at 50 kV and 40 μA with a Mo filter (high range, from 10 to 40 keV). The analysis detected the presence of 11 geochemical elements: Sr, Rb, As, Zn, Ni, Fe, Ti, Ca, K, Mn and Ba. The recovery ranges between 87 and 117%, depending on the element, and the relative standard deviation is lower than 2% for all the elements with the exception of Ni (25%). The limits of detection (LODs) were determined as three times the standard deviation of the replicated blank signal (3σ method), and they are 1 mg/kg for As, Rb and Sr, 8 mg/kg for Fe, 10 mg/kg for Mn and Ni, 50 mg/kg for K and 68 mg/kg for Ba.

The XRF spectrometer was calibrated using a set of geological Service of Analyzes des Roches et des Minéraux (SARM, CRPG-CNRS, Vandoeuvre-les-Nancy, France) standards, including those in particular silicate rocks.

SAMPLING STRATEGY

The sampled primary outcrops and secondary deposits are located in the central sector of the Apenninic chain (Figure 2). The Scaglia Bianca Fm is part of the Umbria-Marche basin, characterized by shelf to deep-water pelagic domains [6, 7]. It exhibits white micritic limestones interbedded with dark chert, occurring in lists and nodules.

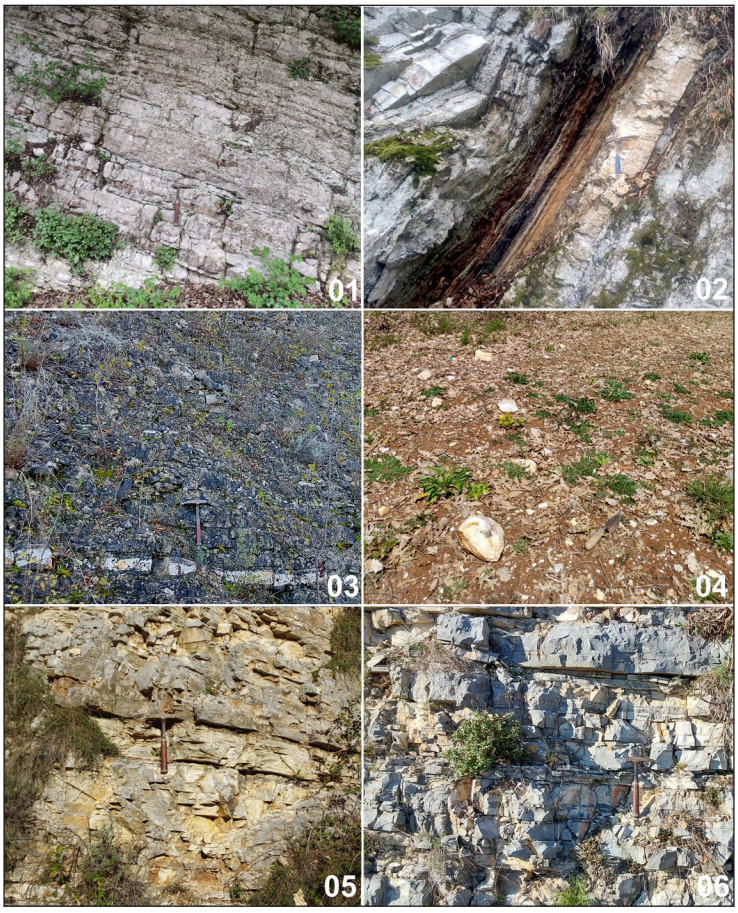

Figure 2 Sources where the sampling activity was performed: 1) CST01, primary outcrop (Umbria); 2) MF02, primary outcrop (Abruzzi); 3) CAS01, primary outcrop (Latium); 4) SCR01, colluvial deposit (Latium); 5) TAN02, primary outcrop (Latium); 6) TAN03, primary outcrop (Latium).

GPS POINT	SOURCE	TYPE	COORDINATES x, y	N° OF SAMPLES
SCR01	Secondary	Colluvial	32.1272, 46.82312	16
CAS01	Primary	Outcrop	32.0116, 46.81342	24
TAN02	Primary	Outcrop	31.5155, 46.86228	20
TAN03	Primary	Outcrop	31.5491, 46.86228	15
CST01	Primary	Outcrop	31.8176, 47.16140	20
MF02	Primary	Outcrop	38.7251, 47.33446	15

Table 1 Output of the sampling activity carried out to collect chert samples in Abruzzo, Latium and Umbria regions, Central Italy. Coordinates are expressed in WGS84.

Sampling involved four primary and one secondary sources. In the first case, samples have been collected systematically at fixed and regular distances of about 1 m, both vertically and horizontally, to gain a representative overview of chert variability within each outcrop. The secondary deposit, once checked its dispersion, was sampled selecting chert clasts from 4 squared areas (1 m × 1 m), with corners spaced at fixed distance of 2 × 2 metres. From each squared area the clasts intercepted by the grid nodes (20 cm × 20 cm) were selected. A total of 15 to 24 samples per outcrop were collected. The calculated relative standard error (RSE) based on the concentrations of K ranges between 10.1% (TAN03) and 46.4% (MF02). The output of the sampling activity is shown in Table 1.

a. SCR01. Secondary deposit located in the Central Sabini Mountains (Mts), within the municipality of Montenero (Rieti prov.). It is a colluvial deposit (Holocene) characterized by pebble to cobble sized chert clasts scattered across a wide Pleistocene terrace [8]. The deposit is located at the top of Scaglia Bianca Fm.
b. CAS01. Primary outcrop. The outcrop is located near SCR01 deposit, within the municipality of Montenero (Rieti prov.). It is characterized by marly-to-micritic limestones strata layered with layers and nodules of greyish chert. The formation originated during the Cenomanian-Turonian [8]. Chert nodules in subprimary position have been sampled.
c. TAN02, TAN03. The primary outcrop is located on the Tancia Mt (Central Sabini Mts), at 800 m asl, along the route connecting Osteria Tancia to Monte San Giovanni in Sabina. The outcrop measures about 100 m in length, hence the need for performing the sampling activity at two different locations: TAN02 and TAN03. The age of the formation is Cenomanian-Turonian [8]. Chert nodules in subprimary position were also collected.
d. CST01. The outcrop is located in the province of Terni (Umbria), near the border with Latium. The geological unit shows an alternation of well-bedded white or pale limestones with grey/brown/black chert layers few centimetres thick. The age of the formation corresponds with the Cenomanian -Turonian.
e. MF02. The primary deposit is located in Abruzzo, on the foothills of the Montagna dei Fiori (Teramo prov.). Chert was sampled at the top of the formation and from the Bonarelli level (MF02-01, MF02-02), despite its bad knapping properties. The Bonarelli level is an organic matter-rich level made of black shales and chert and formed during an oceanic anoxic event [9]. The unit formed during the Upper Albian- Lower Turonian [10, 11].

QUALITY CONTROL
The dataset has been checked by all authors.

(3) DATASET DESCRIPTION

OBJECT NAME
SIlirock_Scaglia_Bianca_Chert_Dataset.csv: the dataset containing chert information and geochemical data.

Silirock_Scaglia_Bianca_Chert_Archive.zip: photo archive as a compressed file containing .tiff images. Images have been acquired using a Leica EZ4W stereomicroscope with built-in LED illumination and CMOS camera. Chert fresh surfaces have been cleaned and immersed in water.

DATA TYPE
Processed and primary data. Physical chert samples are stored at the Department of Antiquities of Sapienza, University of Rome, and are accessible via request.

FORMAT NAMES AND VERSIONS
.csv, .zip, .tif

CREATION DATES
27/01/2025–19/02/2025

DATASET CREATORS
Elena Carletti (ORCID: 0000-0003-4653-9231)
Ignazio Allegretta
Giacomo Eramo
Conati Barbaro Cecilia

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LICENSE
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(4) REUSE POTENTIAL

The characterization data and the geochemical composition published in this work represent an important advancement in provenance investigation in Central Italy. Lithotheques are, indeed, fundamental to assess the origin of the raw material exploited within the archaeological site, giving clues into past human behaviour.

The collection is a pivotal tool, offering a solid base for provenance analysis by providing fresh data, which are open, freely accessible, reliable and reusable for researchers. Visual comparison can be performed using the picture archive, containing a selection of micro-acquisitions at different magnifications for each deposit. Geochemical data can be used for both archaeometrical and geological studies via comparison with other datasets.

The main potential reuse includes the employment of the online lithotheque for scientific purposes as already proposed, for instance, by Prieto et al. [12]. Given the versatile geological nature of the reference collection, it can be used as reference regardless of context and chronology. Archaeological comparisons with lithic assemblages are particularly welcome, in order to deepen our understanding of chert provenance in Central Italy.

The ultimate goal is to shed light on mobility and territorial, economic and social behaviour during Prehistory, improving the archaeological interpretation and encouraging the creation of a more sharing archaeological community.

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COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR AFFILIATIONS

Elena Carletti
Dipartimento di Scienze dell'Antichità, Sapienza, Università di Roma, Piazzale Aldo Moro 5, 00185, Rome, Italy

Giacomo Eramo orcid.org/0000-0001-9621-908X
Dipartimento di Scienze della Terra e Geoambientali, Università degli Studi di Bari Aldo Moro, Via Orabona 4, 70125, Bari, Italy

Ignazio Allegretta orcid.org/0000-0002-6182-9563
Dipartimento di Scienze e Tecnologie Biologiche ed Ambientali, Università del Salento, Via Monterioni 165, 73100, Lecce, Italy

Luca Forti orcid.org/0000-0002-2965-9955
Dipartimento di Scienze della Terra "A. Desio", Università degli Studi di Milano, Via L. Mangiagalli 34, 20133, Milan, Italy

Roberto Terzano orcid.org/0000-0001-6232-6151
Dipartimento di Scienze del Suolo, della Pianta e degli Alimenti, Università degli Studi di Bari, Via G. Amendola 165/A, 70126, Bari, Italy

Cecilia Conati Barbaro orcid.org/0000-0001-9911-163X
Dipartimento di Scienze dell'Antichità, Sapienza, Università di Roma, Piazzale Aldo Moro 5, 00185, Rome, Italy

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