

Geology

Mythical “Gold Sands” of Svaneti (Greater Caucasus, Georgia): Geological Reality and Gold Mining Artefacts

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(Presented by Academy Member David Shengelia)

ABSTRACT. According to Greek mythology and the historical sources in Svaneti there existed “Gold sands”, the natives mined gold from the rivers, using special wooden vessels and sheepskins. The geological reality of this mythological and historical “gold sands” is investigated in the paper and a schematic geological map of its distribution is given. At the same time, the artefacts of gold extraction and processing in the region have been discovered and have been compared to historical and geological data. As a result of geological research, it is shown in the article that gold-fields and river placers of different types and scale characteristic of collision orogens on the territory of Svaneti really existed. Proceeding from the foregoing the authors come to the conclusion that “gold sands” aforesaid, referred to Greek mythology and historical sources, was a geological reality, and sources of gold were ore mineralization in Svaneti. After comparing the geological research data, artefacts, myths and historical data, the authors share the viewpoint of the Roman historian Appian (90-170 A.D.) and suppose that the myth about the voyage of the Argonauts for the “Golden Fleece” to the Kingdom of Colchis was a real event, and the notion of “Golden Fleece” was associated with the sheepskin technique of gold mining in rivers. © 2010 Bull. Georg. Natl. Acad. Sci.

Key words: *Svaneti, Greater Caucasus, gold sands, Golden Fleece, sheepskin.*

Introduction

Data on Svaneti natural resources are considered in the works of the ancient Greek and Roman scientists. The Greek historian Strabo (44 B.C.-23 A.D.) in his Book IX of Geography wrote about Svaneti and its natives: “In the mountain rivers of this country there is a lot of gold mined by these barbarians using perforated vessels and sheepskin”. It is interesting to note that the ancient Roman historian Appian in his book XII “The Argonauts Voyage to the Kingdom of Colchis” that considers the main aim of the expedition was to obtain the method of gold mining. In his opinion, the “Golden Fleece” implies the sheepskin technique of gold mining.

Recent geological studies of Svaneti also show that high content of gold is present here in the main rocks as

well as in river alluvium. At the same time, the natives in Svaneti still mine gold from rivers using special wooden vessels and sheepskin.

The main purpose of the paper is to justify geologically that Svaneti is a region where the fact of probable gold mining using sheepskin and wooden vessels was realistic and the notion of “Golden Fleece” was associated with the sheepskin technique of gold mining from rivers.

Factual Material and Methods

Field work was carried out during 2002-2008 and based on classical geological principles. In more than 800 samples, ore elements were determined using the ICP method in the ALX Chemex laboratory (Vancouver,

Canada). Besides geological material, we have collected wooden pan-like vessels and sheepskin still used by the natives for gold-washing were gathered.

Brief Geological Description of Svaneti

Svaneti is situated on the southern slope of the Greater Caucasus and covers the catchment area (~8000 km²) of the Enguri River. It represents a part of the Greater Caucasus orogen, within its limits two major formations are distinguished: the Pre-Alpine crystalline basement complex [1] and Alpine volcanic-sedimentary cover [2]. The Main Range zone is the best exposed part of the crystalline basement of the Greater Caucasus. Unlike the other zones, the Variscan granitoid magmatism is intensively expressed in this unit [3].

The southern slope zone is represented by the Upper Paleozoic-Triassic, the so-called Dizi series, which

in the Jurassic sedimentary cover forms two lens-shaped “windows” of general Caucasian direction. It is made of volcano-sedimentary thick deposits, which is intensive dislocation. During the Middle Jurassic tectonic-magmatic activation within the limits of Svaneti numerous intrusive bodies of various size and composition were formed.

Brief Metallogenic Description of Svaneti

Although the area occupied by Svaneti region is small, numerous ore mineralizations of various genetic types occur here (Fig.1). They are connected with magmatic formations as well as with sedimentary ones. During the Soviet times, in 1934, near the village of Jvari, alluvium mining of gold sands was started in the Enguri River (main water collector of the region), lasting until 1957. After 30 years gold mining was renewed in

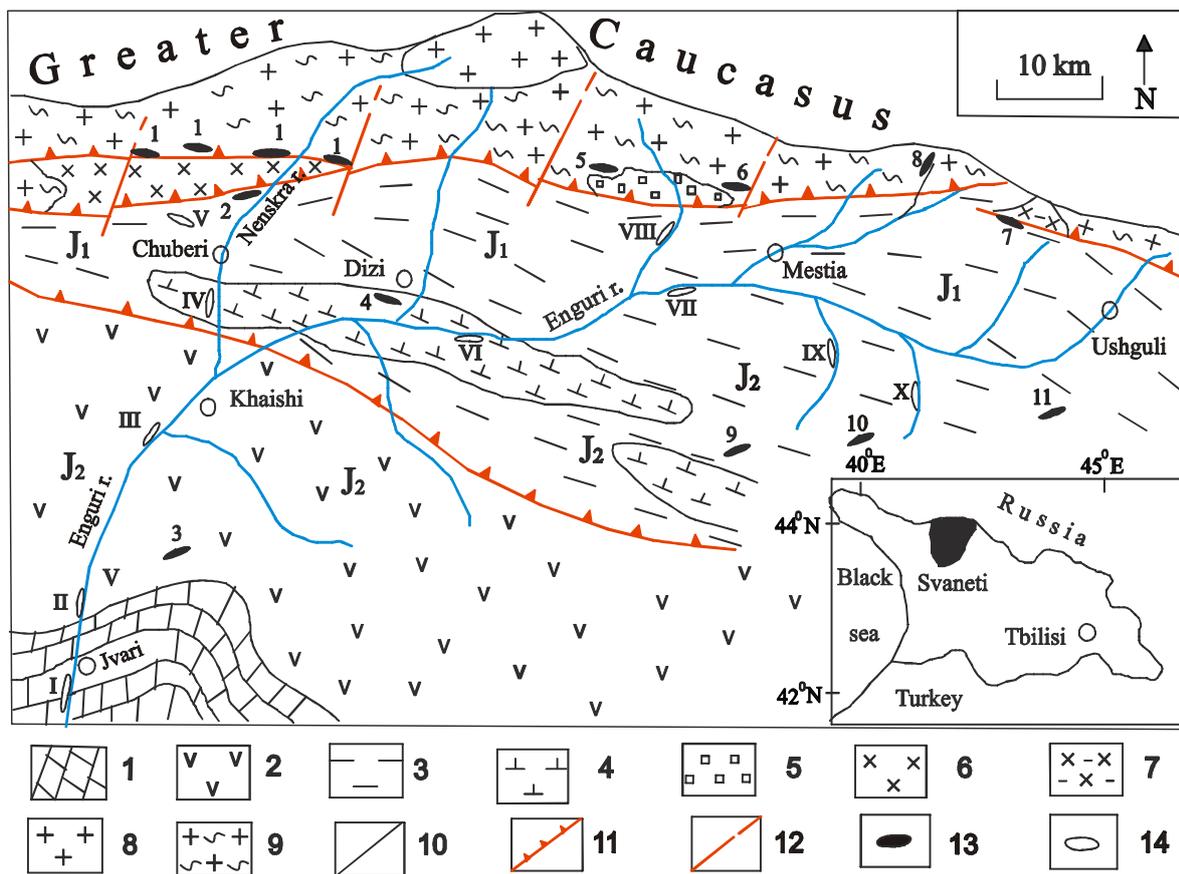


Fig. 1. Schematic geological map of Svaneti with gold ore manifestation and gold sands.

Legend: 1- Middle-Upper Cretaceous sediments; 2-Middle Jurassic porphyrite suite; 3-Lower Jurassic schists; 4- Upper Paleozoic-Triassic volcanogenic-sedimentary and sedimentary rocks (Dizi series); 5-Middle Jurassic diorites and granodiorites; 6-Upper Paleozoic quartz-diorites and granodiorites; 7- Upper Paleozoic plagiogneises and plagiogranites; 8- Upper Paleozoic two mica granitoids; 9-Paleozoic granite-migmatite complex; 10-Geological borders; 11-Thrusts; 12- Tectonic faults; 13-Gold ore mineralization; 14-Gold sands.

Gold ore mineralization: 1- Sakeni ore fields; 2-Tetnashera; 3-Shkenari; 4-Lukhra; 5-Guli; 6- Kvishi; 7- Sgimazuki; 8-Tviberi; 9- Khalde; 10- Arshira; 11- Lasili.

Gold sands: I- Jvari; II- Khudoni; III-Khaishi; IV- Chuberi; V-Kharami; VI- Lakhmula; VII- Latali; VIII- Becho; IX-Arshira; X- Lasili.

the mentioned area and it turned out that in geologically such an insignificant time interval there took place replenishment of this gold field to the industrial mark [4]. It was natural that after that discovery of gold-bearing main structures and bedrocks in Svaneti became actual.

In the 1960s-1970s in Svaneti gold prospecting began in the rocks of sedimentary cover but the results were insignificant. Several ore manifestations were found, but they could not give a quantity of gold sufficient for replenishment of a gold field in such a small interval of time. In the 1990s gold prospecting in the crystalline basement of the Variscan consolidations was started, yielding substantial results [5-9]. Below is given a short description of gold ore-mineralization of Svaneti.

Qvishi polymetallic ore-mineralization – is exposed on the right banks of the river Dolra, within 15 km of the Becho village. This ore field is connected to the zone that was silicified and oxidized in the Lower Jurassic clay shales. In the zone a 1m thick quartz vein is traced over 80m. Gold content in the vein is 2.25 g/t, silver – 125 g/t, copper – 0.06 %, lead- 7.5 %, zinc – 14.8 % [7].

Khalde gold-antimony ore-mineralization – is exposed south-eastwards of the Khalde village, on the southern slopes of mount Tsrnari. Ore manifestation is connected to the contact zone of the Lower Jurassic clay shales and diabase dykes. In the shales, parallel to schistosity, a 6 m thick system of quartz veins is developed; it is traced over the distance of 40 m. In the vein Sb content varies from 2.88 % to 37.8 %, gold- 0.4 g/t-5.3 g/t, and silver 13-362 g/t [7].

Tviberi ore-mineralization - is situated 15km northward of the village of Zhabeshi, at the end of the Mt. Tetnaldi western glacier. The ore field was outcropped in the spring of 1991, when the eastern part of the tectonic wedge of the Lower Jurassic clay shales between the Paleozoic granites broke up into huge quartz-porphyry blocks. The remains of the mountain are of the same composition and intersected by the vein system of young quartz. Here, gold content reaches 1.2-1.7 g/t [3]. For its scale (its thickness is 120 m; extends over 750 m) and the intensity of mineralization, this ore mineralization attracted considerable interest, but because of complex geographic conditions, it is too early to think of its mining yet.

Lasili-Arshira gold field is situated in the Enguri River valley, 12 km northwards of the village Eli and located in the Lower Jurassic clay shales. Gold-bearing quartz veins genetically belong to the sulfide-gold-quartz formation that occurred at medium depth. Gold content in quartz veins is highly variable – from a few grams to tens of grams per ton [7]. On the territory adjacent to the

ore field gold sand accumulations are widespread. Nowadays as well as in historic times, tools of primitive mining were found.

The Sakeni ore field. In the crystalline basement of the Greater Caucasus, in the contact zone between the Upper Hercynian Sakeni intrusive of dioritic-granodioritic composition of the mantle-crust generation and the Pre-Alpine anatectic granite-migmatitic complex, the Sakeni ore field was discovered [9]. Here, four isolated ore-manifestations of gold-quartz low sulfide hydrothermal genetic type have been established, formed at a medium depth (2-3km), entirely controlled by the Alibek regional overthrust and a system of young cross faults. Recent erosion strips mainly form the frontal part of low temperature quartz-gold-antimonite mineralization. Due to it more important stockwork type mineralization is expected in the deeper horizons.

Thus, for its vast scale, mineralization type and concentration of gold, the Sakeni ore field is a very prospective mineralization. By a tentative estimation this ore field should contain 65-70 tons of gold. Proceeding from the propagation area and extent, we think that the Sakeni ore field should be one of the main suppliers of alluvial gold of Svaneti.

Alluvial gold fields. It is fairly obvious from the second figure that gold-bearing alluvial sands in Svaneti are widespread and they have mainly elongated forms; the scale of their spread varies from few meters to hundreds of meters. In Svaneti among the gold-bearing alluvial sands we should distinguish the Jvari gold sands for their considerable industrial scale. Lasili and Arshira gold fields are also remarkable, where gold mining goes far back to the historic past. The Latali gold fields are distinguished for their large scale. At present the village of Latali is located on it. In Svaneti besides alluvial gold sands gold accumulations are found in the so-called “bear’s kettles” – river cut depressions, where specific weight-induced accumulation of gold takes place.

At present the Svans mine gold from the mountain rivers as they did in ancient history – using sheepskins, and special wooden vessels (Fig.2). It is rather interesting that this wooden vessel is unlike those used for gold-mining in any other region of the world, showing that it underwent independent evolution. In general it is 50 cm long and in the center 30 cm wide, in the peripheries – 10 cm wide – oval and deep form and is made of massive ash-tree. Due to its perfect forms and functional efficiency, it is quite clear that its handicraft manufacturing has a long history.

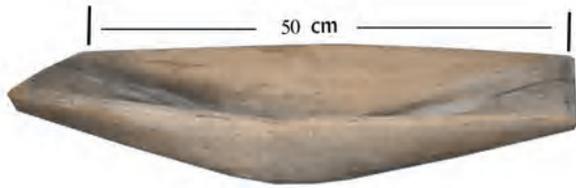


Fig. 2. Wooden vessel of ash-tree from Svaneti (Sgurishi village).

Discussion and conclusions

The analysis of our researches and the existing data has shown that Svaneti is fairly rich in auriferous mineralizations characteristic of orogens. They were formed in the crystalline basement as well as in the rocks of sedimentary rocks. Gold fields that are connected with sedimentary rocks are not distinguished for large scale. They are represented by gold-quartz-sulfide associations of vein facies. Unlike the sedimentary cover, in the “basement” a gold formation is produced, the so-called Sakeni ore field belonging to gold-quartz-low sulfide genetic type characteristic of collision orogens [10]. Such deposits are known in numerous regions of the world and make up 30% of the Earth’s Crust gold reserves [11].

Investigations of Svaneti ore fields revealed that their majority was exposed even in the historic past. At the same time, the intensive erosion caused due to abundant precipitation, water-abundant hydrological network and rapid uplift of the Caucasus segment of Svaneti (2mm per

year) in the past and at present promoted fast renewal of river placers. It is a geological argument for the probability of gold mining in the historical past as well. Thus, geological data of Svaneti give ground believe that there was enough reason for creating legends and describing the region as the country rich in gold.

As a result of geological researches, it is shown in the article that on the territory of Svaneti numerous gold-fields and river placers of different type and scale characteristic of collision orogens exist. Among the main deposits, we have discovered the Sakeni ore field of quartz-gold-low sulfide genetic type that deserves special attention. Preliminary estimations show that the Sakeni ore field must contain 65-70 tons of gold. It should be considered as one of the main suppliers of alluvial gold in Svaneti.

Thus, proceeding from the research data we can come to the conclusion that the “gold sands” mentioned in Greek mythology and in historical sources was a geological reality, and sources of gold were ore mineralization existing in Svaneti. After comparing the geological research data, artefacts, myths and historical data, we share the viewpoint of the Roman historian Appian (90-170 A.D.) and suppose that the myth about the expedition of the Argonauts in quest of the “Golden Fleece” to the Colchian Kingdom, was a real event, and the notion of “Golden Fleece” was associated with the sheepskin technique of gold mining in rivers.

გეოლოგია

სვანეთის მითიური “ოქროს ქვიშრობები” (კავკასიონი, საქართველო): გეოლოგიური რეალობა და ოქროს მოპოვების არტეფაქტები

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(წარმოდგენილია აკადემიის წევრის დ. შენგელიას მიერ)

ბერძნული მითებისა და ისტორიული წყაროების მიხედვით სვანეთში არსებობდა “ოქროს შემცველი ქვიშრობები”, საიდანაც ადგილობრივი მცხოვრებლები ოქროს ცხვრის ტყავებისა და სპეციალური ხის

გობების მეშვეობით მოაპოვებდნენ. შრომაში გამოკვლეულია ამ მითიური და ისტორიული “ოქროს ქვიშრობების” გეოლოგიური რეალობა და მოცემულია მათი გავრცელების სქემატური გეოლოგიური რუკა. ამასთან ერთად, რეგიონში მოძიებულია ოქროს მოპოვების და დამუშავების არტეფაქტები, რომლებიც შეჯერებულია ისტორიულ და გეოლოგიურ მონაცემებთან.

სტატიაში ნაჩვენებია, რომ სვანეთის ტერიტორიაზე რეალურად არსებობს ოროგენებისთვის დამახასიათებელი განსხვავებული ტიპის და მასშტაბების ოქროს შემცველი გამადნებები და მდინარეული ქვიშრობები. აღნიშნულიდან გამომდინარე, ავტორები მიიჩნევენ, რომ ძველ ბერძნულ მითოლოგიაში და ისტორიულ წყაროებში მოხსენიებული “ოქროს ქვიშრობები” გეოლოგიურ რეალობას წარმოადგენდა, რომელთა ოქროს წყაროები სვანეთშივე არსებული გამადნებები იყო. ავტორები იზიარებენ რომაელი ისტორიკოსის აპიანე ალექსანდრიელის (90-170 წწ.) მოსაზრებას და უშვებენ, რომ მითი არგონავტების მოგზაურობის შესახებ კოლხეთის სამეფოში შესაძლებელია რეალური მოვლენა იყო, ხოლო ცნება “ოქროს საწმისი” ცხვრის ტყავებით მდინარეებიდან ოქროს მოპოვების ტექნოლოგიასთან ასოცირდებოდა.

REFERENCES

1. *I.P.Gamkrelidze, D.M.Shengelia* (2005), Dokembriisko-Paleozoiskii Regionalnyi Metamorfizm, Granitoidnyi Magmatizm i Geodinamika Kavkaza, M., 458s (in Russian).
2. *M.A. Beridze* (1970), Litologiya Nizhne i Sredneyurskikh Otlozhenii Bolshogo Kavkaza, Tbilisi, 108s. (in Russian).
3. *A.V. Okrostsvaridze* (2007), Gertsinskii Granitoidnyi Magmatizm Bolshogo Kavkaza, Tbilisi, 223s. (in Russian).
4. *V.B.Geleshvili* (1988), Doctoral Thesis, Tbilisi, 50 (in Russian).
5. *A.V. Okrostsvaridze* (1992), Bull. Georg. Acad. Sci., **145**, 1: 120-124.
6. *D.M. Shengelia, M.G. Gagnidze, A.M. Kvitsiani* (1997), Bull. Georg. Acad. Sci., **155**, 3: 379-382.
7. *A.M. Kvitsiani, A.G. Gagnidze A.L. Gomelauri, et al.* (1998), Sakartvelos Geologiuri Departamentis Angarishi [Report of the Georgian Geological Department], Tbilisi, 118p. (in Georgian).
8. *A.V. Okrostsvaridze, D.I. Bluashvili* (2000), In: Felsic Magmatites and Associated Ore Mineralization, Helsinki, 50-53.
9. *A.V. Okrostsvaridze, D.I. Bluashvili* (2009), Bull.Georg. Natl. Acad. Sci., **3**, 1: 84-86.
10. *R.J. Goldfarb, T. Baker, B.Dube et al.* (2005), Economic Geology 100th Anniversary Volume, 407-450.
11. *D.I. Groves, R.J. Goldfarb, M. Gembre-Mariam* (1998), Ore Geology Reviews, **13**: 7-27.

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