

SALT AND THE DEVELOPMENT OF HUMAN SETTLEMENTS WITH BALNEAR AND CLIMATERIC POTENTIAL WITHIN THE ROMANIAN INTRA- CARPATHIAN SPACE

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Abstract. Deposit salt in Romania has extremely important reserves, considered even inexhaustible at the current exploitation level. The biggest salt resources are found in the intra-Carpathian arch, represented by Transylvania and Maramures. Most sources of salt outcrops are disseminated on the edge of the Transylvania Depression, in the diapir folds formed following salt migration. The salt mines – Turda, Praid, Ocna Mures, Ocna Dej, Ocna Sibiu, Cojocna, Ocna Sugatag – represented an important source of incomes, reason for which important human settlements formed around them. All these localities have turned nowadays into balneal and climacteric resorts that fully use the beneficial effect of the atmosphere within galleries (Praid, Turda). The most important incomes from tourism are represented by the galleries of the mines of Turda (one of the 10 wonders of the modern world) and Praid. The balneal and climacteric resorts also developed around the salt lakes installed in the areas of collapsed mines: Sovata, Ocna Sibiu, Ocna Dej, Cojocna. The most well known human settlements and the most important balneal and climacteric resorts, implicitly, are disseminated on the external branch of the Transylvania Depression (Sovata, Praid, Ocna Mures, Baile Figa, Cojocna thermae, Ocna Dej, Ocna Sibiu) and of the Maramures Depression (Ocna Sugata, Costiui, Vad). The oldest mining exploitation is situated at Figa (county of Bistrita-Nasaud) was founded around the year AD 3000. From this point of view, it is one of the oldest mining exploitations on Earth. The existence of the world-important archaeological site can invigorate the development of the surrounding localities, but mostly of the city of Beclean.

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Introduction

Salt has represented an important resource for industry and nutrition (Alexianu et al., 2015; Merutiu, 1912). For this reason, its quality is continuously preserved because competition is extremely strong. It is disseminated across the world (Romanescu, 2015; Romanescu et al., 2015; Sedrati et al., 2017a,b). The Planetary Ocean contains the highest amount of salts, but its extraction from the marine environment is expensive (Romanescu & Stefan, 2012; Romanescu et al., 2012, 2014a,b). The most important resources are cantoned in marine deposits of Europe, North America, South America, Asia, etc. Romania has extremely important resources in the intra-Carpathian arch and in the Subcarpathians (Ciupagea et al., 1970; Romanescu, 2015). The national and international scientific literature related to salt resources (marine and deposit) is extremely rich (Adopo et al., 2014, 2015; Mrazec & Teisseyre, 1902). It mainly focuses on the quality of the salt waters within clastokarst and anthroposaline lakes (Alexe et al., 2006; Alexe & Serban, 2008; Bulgareanu, 1983; Romanescu et al., 2014a, 2017). This study analyzes the exploitation of the salt-water resources within the natural and anthropic lakes of the Romanian intra-Carpathian arch (Transylvania and Maramures). Only the most important lacustrine basins around which important human settlements developed acquired the status of balneal and climacteric resorts (Romanescu & Romanescu, 2008; Romanescu et al., 2009, 2010).

Study area

The intra-Carpathian saline space comprises the Transylvanian depression and the Maramures depression (former maritime areas dredged by the Pannonian basin and subsequently by the Black Sea basin). The salt within these regions has a marine origin, formed following the intense evapotranspiration during the Badenian-Burdigalian (Ciupagea et al., 1970; Pauca, 1967a,b; Romanescu, 2015). The sediments within the Carpathian arch covered the deposits and they determined the emergence of the diapir folds on the external branch of the Transylvanian basin (Alexe et al., 2006; Romanescu, 2015). The salt layers may reach several hundreds meters in height. The exploitation is performed through mines; however, most of them are currently closed. Salt deposits belong to the counties of Cluj, Alba, Sibiu, Brasov, Covasna, Harghita, Mures, Bistrita and Maramures (Fig. 1).

Methodology

The study of the salt resources within the lacustrine basins of the Transylvania Depression and of the Maramures depression is based on the field observations made throughout 20 years and on the integration of scientific literature in the context of the tourist exploitation. The “necklace” of salt lakes within the

depressions of Transylvania and Maramures were analyzed from an economic perspective, mainly for tourist exploitation (Romanescu et al., 2008, 2009, 2010, 2014a,b, 2015, 2017). From this point of view, the physical-chemical characteristics of waters and the efficiency in treating certain diseases were highlighted (Bulgareanu et al., 1984, 1985a,b; Panzaru, 1982; Sandu et al., 2010; Stanila & Barbu, 2016).



Fig. 1 - The geographic positioning of the salt mines and of the balneal and climateric resorts in the intra-Carpathian space

Results and discussions

Deposit salt in Romania is disseminated in the Moldavian Subcarpathians, the Getian Subcarpathians, the Transylvanian depression and the Maramures depression. Salt deposits in the intra-Carpathian arch were formed 13.5 million years ago in an epicontinental sea and a tropical climate that favoured evaporation. The salt layers reach thicknesses of hundred of meters (a maximum of 400 m) (Ciupagea et al., 1970; Pauca, 1967a,b; Romanescu, 2015). The reserves, to the current consumption in Romania, can be considered inexhaustible. On the Romanian territory, there are some of the oldest salt exploitations on Earth, which date to around 5,000-6,000 years ago: Poduri (the county of Neamt) and Figa (the county of Bistrita-Nasaud) (Alexianu & Weller, 2007; Cavruc et al., 2006a,b; Cavruc & Dumitroaia, 2006; Dumitroaia, 1994; Monah, 2008). The Scythians and the Greeks traded the salt extracted by the Thracians and the Dacians (Ciobanu, 2002, 2006).

In the Romanian intra-Carpathian space, represented by the depressions of Transylvania and Maramures, important salt deposits were identified. The largest salt deposit in the extra-Carpathian space is represented by Folesti, which contains 22,000 millions t. Those in the intra-Carpathian space are much bigger: Sarmasel and Vaidei-Ogra with 100,000 millions t., Turda with 66,000 millions t, Ocna Sibiului with 61000 millions t., east Praid with 50,000 millions t, etc). The Transylvanian depression comprises the following depressions: Nires Est, Ocna Dej, Ocna Mures, Ocna Sibiului, Nires Vest, Petresti-Salatiu, Sanmarghita, Nord Gherla, Sic, Gadalın, Sud Gherla, Apahida, Cojocna, Aiton, Valea Florilor, Viisoara, Dumbravei, Turda, Tiur, Pauca, Acnisoara Blaj, Panade, Manarade, Enciu, Feldioara, Ceapa, Zoreni, Micesti, Beudin-Strugureni, Sarmasel, Milas, Milasel, Ulios, Sincai, Madaras, Zau de Campie, Copand, Vaidei-Ogra, Ernei, Sinniclaus, Cetatea de Balta, Pinticu-Uila, Corunca, Tauni, Magherani, Saros, Sangeorgiu de Padure, Simonesti, Daia, Nocrich, Apasu, Sighisoara, Daia-Odorhei, Beia, Bunesti, Granari, Valeni, Rupea, Fiser, Gibert, Dumitra, Mogosani, Iad, Sacalu-Ideciu, Blajeni, Caila, Saratel, Sieu Sfantu, Figa, Albestii-Bistritei, Jabenita, Praid, Sovata, Orsova, Corund, Mercheasa, Est Praid, Odorhei, Bradesti, Comanesti, Martinis, Meresti, Sanpaul, Cata, Lueta. In The Maramures depression, there are salt deposits at Costiui, Vad and Ocna Sugatag (Dragnescu, 2006). The most important salt mines in the Middle Ages were situated at Turda, Dej, Sic, Cojocna, Ocna Sibiului, Costiui and Rona (Simon, 2006).

Salt – besides the fact that it represents an important industrial and food resource – can also be used in the sanitary field. The bath treatment or the treatment using the air in the salt mines has beneficial effects on the following conditions: inflammatory rheumatism in the calm phase (ankylosing spondylitis, psoriatic arthritis, reactive arthritis, gouty arthritis, chondrocalcinosis, rheumatoid arthritis); degenerative rheumatism (arthroses with different localizations, spondylosis, vertebral discopathy, aseptic bone necroses); abarticular rheumatism (myalgias, periartthritis, tendonitis, tenosynovitis, epicondylitis, bursitis, enthesitis, fibromyalgia); posttraumatic sequelae (concussions, sprains, twists, fractures, meniscus and ligaments lesions, muscular sprains, hypotonias and muscular atrophies); vertebral static disorders (kyphosis, scoliosis); rehabilitation after neurosurgical and orthopaedic interventions (for herniated discs, joint prosthetics, etc); dermatological disorders (eczemas, psoriasis, chronic pruritus, incipient ichthyosis, keratotic dermatitis); infectious and allergic chronic respiratory disorders (rhino-sinusitis, pharyngoamygdalitis, chronic bronchitis, bronchial asthma); gynaecological diseases (ovarian insufficiency, chronic cervicitis, chronic metrorrhagia); vascular diseases (incipient varicose veins, erythromelalgia); disorders of the peripheral and central nervous system (sciatica, cervicobrachial, intercostal, trigeminal neuralgias, facial and limb paresis, hemiparesis, post-

strokes, overloading asteo-neurotic syndromes, Parkinson's, sensorimotor polyneuropathy) (<http://terapii100.blogspot.ro/2015/07/lacurile-sarate-oaze-de-regenerare.html>).

The most important human settlements, with a role of balneal and climacteric resorts, developed in the area of the salt exploitations with important reserves. The saline lakes in the intra-Carpathian arch have a clastokarst origin (formed after salt dissolution) or anthropic origin (cantoned in the old superficial salt excavations or in the areas where the galleries collapsed). Natural lakes are small, currently covered by vegetation or highly clogged (because their depths are reduced). The anthropic lakes resisted over time because the depths are significant and the organic clogging is very low. The tourist industry based on the exploitation of the salt resources developed extremely well around the lakes of Sovata (the county of Mures), Ocna Sibiu (the county of Sibiu), Turda (the county of Cluj), Ocna Dej (the county of Cluj), Ocna Mures (the county of Alba), Costiui (the county of Maramures), Ocna Sugatag (the county of Maramures), Cojocna (the county of Cluj), Praid (the county of Harghita) and Sangeorgiu de Mures (the county of Mures). The largest housing capacities are found at Sovata, Ocna Sibiu and Praid (also due to the use of galleries for treating asthma).

Sovata

This city was attested in documents in the year 1602; it is situated on the upper stream of the river of Tarnava Mica, in the depression of Praid-Sovata, at altitudes ranging between 475 and 530 m (mathematical coordinates: 46°35'46"N; 25°04'28"E). It has a population of 10,500 inhabitants. In the area of the locality of Sovata, there are seven salt lakes (Ursu, Alunis, Verde, Negru, Rosu, Mierlei, Serpilor) and two freshwater lakes. These are clastokarst and anthroposaline lakes evolved on the territory of the salt exploitations. The most important salt-water lakes used in balneal treatment are Ursu (Fig. 2) and Negru (Alexe et al., 2006; Alexe & Serban, 2008; Bulgareanu et al., 1985b).

The Ursu Lake has a karstosaline origin (installed on the basin formed after salt dissolution). The salinity of Ursu Lake varies by depth: 0-2 m 100 mg/L; from 2 m to the bottom 220-300 mg/L. It is the only lake in Romania high a significant heliothermal character (higher temperatures at depths of over 1.5 m). At the end of June, water temperature at the depth of 1.5 m can reach 50-60°C, while at the surface it may record 20°C and at the depth of 1 m, 30-40°C. It has a maximum depth of 18.4 m and a surface of 40,235 m³. It is a monument of nature because is the largest karstosaline lake in Europe and the only one with a real phenomenon of heliothermy.

The Negru Lake is anthropic, formed after the collapse of salt exploitation galleries. It is situated at an altitude of 501 m, is has a surface of 3,400², a depth of

7 m and a salinity of 277 mg/L (Alexe et al., 2006; Alexe & Serban, 2008; Bulgareanu et al., 1985b).

The locality of Sovata is mentioned as a treatment resort since 1597. At Sovata, they treat gynaecological conditions (ovarian insufficiency, chronic cervicitis, metro-adnexitis, sterility). In addition, degenerative, inflammatory and abarticular rheumatisms can also be treated (arthroses, spondyloses, tendinoses, polyarthroses), posttraumatic disorders (post-sprain or twist states or post joint surgeries), peripheral neurological disorders (sequelae after poliomyelitis, pareses, polioneuropathies) and endocrine disorders (hypothyroidism).



Fig. 2 - The Lake in 1942 (left) and in the present (right)

Ocna Sibiului

The city of Ocna Sibiului was attested in documents in 1263. It is crossed by the valley of the Visa brook and it has a population of 3,600 inhabitants (mathematical coordinates: 45°52'54"N; 24°03'41"E). The primitive pits of the Dacians were reprised and modernized by the Romans in order to increase salt production. In the area of the locality of Ocna Sibiului, stone axes dating to mid-Palaeolithic (around 100000 - 40000 BC) were discovered. The balneal and climacteric resort of Ocna Sibiului holds a chain of lakes accounting for a surface of 35,700 m² and a volume of 265,700 m³. Salinity increases from water surface towards the bottom of the lake, the maximum level (320 mg/L) being reached at the contact with the salt massif. All the 50 lakes (15 of which natural lakes) have curative qualities but the most important are: The Bottomless Lake, formed on the place of the former salt mine of Francisc Grube, abandoned in the year 1775 (1,665 m², 34 m deep), declared a monument of the nature because it has the phenomenon of heliothermy; Ocna Pustie Lake (or Avram Iancu), formed on the place of the salt mine of Fodina Maior, deserted in the year 1817, the deepest anthroposaline lake in Romania (160 m); the Brancoveanu Lake, formed in the year 1699 on the place of a deserted salt mine, being the saltiest lake in Romania (310 mg/L salinity), along

with the Black Lake and the Red Lake, etc. The waters and the sapropelic mud within the 12 functional lakes are used in treating rheumatic, neuromotor and gynaecological conditions (Bulgareanu, 1983; Panzaru, 1982).



Fig. 3 - Ocna Sibiului at the end of the 19th century (left) and in the present (right)

The core of the saline ensemble of Ocna Sibiului is represented by the Balneal Complex of the lakes Horia, Closca and Crisan (Fig. 3). The city holds a natural leafy park with a surface of 15 ha (<https://romania.directbooking.ro/prezentare-ocna-sibiului-informatii-poze-imagini-32.aspx#photo>).

Turda and the complex of the Durgau lakes

The city of Turda is attested in documents in the year 1202, being known in the Roman period as Potaissa. It has a population of 50,000 inhabitants, and it is situated on the left bank of the Aries river, at altitudes ranging between 310 and 436 m (mathematical coordinates: 46°34'15"N; 23°46'45"E). The Turda salt mine is placed in the Durgau-Valea Sarata area of Turda (the county of Cluj). The salt mine is listed among the historical monument within the county of Cluj. Archaeological evidence demonstrates that salt exploitation in the area of Durgau-Turda have pre-Roman origins (50 BC-106 AD). The Roman camp of Potaissa (present-day Turda) protected the salt exploitations. In the 13th century, the mine of Durgau-Turda is mentioned (on May 1st, 1271 the clergy of the Bishopric of Transylvania was given “the salt mine of Durgau-Turda - Dörgö-Torda). In the period of the Hungarian domination (15th-18th centuries), four mines were inaugurated at Durgau. At the end of the 17th century, the salt mine of Durgau-Turda was submitted to the Austrian administration.

On the Josephine map, edited in the period 1769-1773, Turda is represented with five salt mines: Carolina, Iosif, Terezia, Anton and Cojocneana. Turda, in the year 1780, had five ogival salt mines: “Die obere Grube” (“Ocna de Sus”, “Felső-Akna”); “St. Josephi” (“Iosif”); “Maria Theresia” (“Terezia”); “St. Antoni” (“Anton”); “Koloscher Grube” (“Ocna Cojocneana”). In the year 1896, there were

three other salt mines (active) (<http://www.ilikecluj.ro/lacurile-durgau-attractia-de-langa-turda/>).



Fig. 4 - Complex of the lakes Durgau: a- Carolina; b-Durgau; c-Dulce; d-Ocnei; e-Rotund; f-Sulfuros

The exploitation of salt within the Turda salt mine stopped definitively in the year 1932. The Turda salt mine was opened in the year 1992 only for tourism and for treating specific diseases. The European investments, of six mln Euros,

transformed the Turda salt mine into a work of art, being considered one of the 10 wonders of the modern world. For this reason, the number of tourists increased substantially and the area recorded a significant economic development. The curative and leisure area comprises six lakes (Carolina, Durgau, Dulce, Ocnei, Rotund, Sulfuros) (Fig. 4) (<http://www.ilikecluj.ro/lacurile-durgau-atractia-de-langa-turda/>). The Carolina Lake is clogged (initially, it had a depth of 45 m). The deepest ones are the lakes of Ocna (40 m) and Sulfuros (47 m). The lakes are anthroposaline and they have chlorinated-sodic mineral waters, with mineralization ranging between 19.27 and 225 mg/L (they have sulphated, calcium, magnesium, iodated character) and mineral (sapropelic) mud in the Tarzan Lake. Microclimate is used within the salt mine.

Ocna Dej

Ocna Dejului, a locality within the municipality of Dej, is listed among the historical monuments in the county of Cluj. It was attested in documents in the year 1291 and it has a population of 2,400 inhabitants (mathematical coordinates: 47°06'56"N; 23°51'33"E).

Rock salt deposit emerged in the extremity of saliferous Badenian within the northwest of Transylvania. The horizon is not diapired and the thicknesses range between 10 and 160 m (Ciupagea et al., 1970; Pauca, 1967a,b). On the territory of this locality, there are salt springs, and inhabitants have used brine since time immemorial. The lakes have an anthropic origin (they are anthroposaline): the Toroc-Cabdic Lake; the former Lake no. 1; Lake Iosif; Lake Stefan; Lake Mina Mare (Fig. 5).

The Roman camp of Gherla protected the salt exploitations of Ocna Dej, Cojocna, Pata and Sic. Salt exploitation was seasonal in the Roman period. The Roman mines were superficial (down to a depth of 12-15 m). In the year 1780, the following ogival salt mines existed: "St. Josephi" ("Iosif mine");



Fig. 5 - Ocna Dej (left) and the Balneal Complex (right)

“St. Stephani” (“Stefan mine”). In the year 1896, just one salt mine was open. Currently, only the Transylvania mine is still functional. The old mines within the southern sector caved in and on their place, active collapse cones (Iosif mine, Stefan mine, Ciciri mine, Ferdinand mine) and salt lakes emerged (mina Mare lake).

On the place of the former Roman salt mine, a lake with chlorinated-sodic (NaCl) water emerged. On the slope, there are two lakes with vegetal-mineral mud. The water within the salt lake is chlorinated, weakly sulphated, sodic, highly concentrated. It is indicated for the treatment of locomotor system conditions (arthritis, arthrosis, myositis, tendovaginitis, osteitis, periostitis), of peripheral nervous system conditions (radiculitis, plexitis, neuritis and polyneuritis), of women genitalia issues (cervicitis, metritis, metroadnexitis, uterine hypoplasias, postinflammatory and postoperative sequelae), chronic dermatosis, post-trombophlebitis sequelae, etc.

Ocna Mures

The city of Ocna Mures is attested in documents in the year 1202. It is dredged by the Mures River and it has a population of 13,000 inhabitants (mathematical coordinates: 46°23'24"N; 23°51'36"E). The Ocna Mures salt mine within the county of Alba exploited salt within Ocna Mures and Razboieni-Cetate. The dome of the salt diapir massif outcropping at the surface has an ellipsoid shape: the big axis measures 800 m; the small axis measures 500 m.



Fig. 6 - The anthropic lakes in the area of the locality of Ocna Mures

The salt deposit has been exploited since the Bronze Age; the exploitation has continued without interruptions in the Dacian and the Roman periods (in the Roman period, the locality was called Salinae). The quarries subsequently created the so-called “Roman lakes” (Fig. 6). The Roman camp of Razboieni-Cetate protected the salt exploitations of Ocna

Mures. On the Josephine map of Transylvania, generated in the period 1769-1773, it is marked by “Ruiniert, Saltz Gruben, Okne”. The locality developed towards the end of the 18th century, when organized salt exploitation began, namely, when the Austrian administration took over the control of salt production. In the year 1896, only two salt mines were active.

The anthroposaline lakes within the area of the locality are affected by pollution and they are not currently used for treating any conditions. Some of them also emerged because of the mining disasters of 1912, 1978 and 2010, when the galleries flooded and the ceiling collapsed (Alexe & Serban, 2008).

Costiui

Costiui is a village within the commune of Rona de Sus in the county of Maramures. It was attested in documents in the year 1353 and it has a population of 630 inhabitants (mathematical coordinates: 47°52'45"N; 24°01'49"E). Salt dates to the Miocene and it was exploited between the localities of Costiui and Rona de Sus. Salt exploitation dates to Late Bronze age (the discovery of bronze and horn tools).

The salt thermae of Costiui were opened to the public in the year 1967. Salt exploitation in open quarries is certified by the ancient existence



Fig. 7 - The thermae of Costiui (in the past) and the current salt swamps

of excavations, with diameters ranging between four and 15 m and depth of down to 10 m. Anthropic microdepressions are currently filled with water or clogged and

turned into swamps with halophyte vegetation (Bulgareanu et al., 1984, 1985a) (Fig. 7).

The salt mine, inaugurated in the 14th century, was closed definitively in the year 1933. With the exception of the Apaff salt mine, which functioned in the period 1590-1766, all the old mines are collapsed and filled with water. In the year 1896, only five salt mines were functional. Near the Apaffi mine, there was the anthroposaline Ferencz-Francisc lake formed after the collapse of the mine ceiling. The thermae of Costiui use curatively the salt waters of the lake (today highly clogged).

Ocna Sugatag

The locality of Ocna Sugatag is situated in the Maramures depression. It was attested in documents in the year 1355 (the road leading to the salt mines is featured in documents). It has a population of 1,250 inhabitants (mathematical



Fig. 8 - The anthroposaline and clastokarst lakes in the area of the locality of Ocna Sugatag

coordinates. 47°46'52"N; 23°56'22"E). The etymology of the name of the locality: mine (< the noun *ocna* “mine salt mine” < Sl. okno “window” < Sl. oko “eyes”) + *sugatag* (< Hu. sóvágó “salt cutter”). Salt exploitations are known since Antiquity. At the end of the 14th century, the permanent salt exploitation began within organized mines. In the year 1489, the existence of the Paul Silvestru mine is attested in documents. The salt mines per se emerged in the year 1777 (Bulgareanu et al., 1984, 1985a).

In the year 1896, only three salt mines functioned. Due to the infiltrations of meteoric water, the salt mines were closed in the year 1950. The old excavations were filled with water and turned into anthroposaline lakes. A part of the clastokarst lakes were formed in dissolution pseudodolines. The existence of salt springs and of mine lakes transformed the locality of Ocna Sugatag into a regional balneal and climacteric resort (Fig. 8).

Cojocna

The locality of Cojocna is situated in the Fizes plain in the county of Cluj. It was attested in documents in the year 1199 and it has a population of 4,200 inhabitants (mathematical coordinates: 46°44'54"N; 23°50'0"E). It is located near the salt exploitations of Turda. The first habitation traces date to the 1st century BC. Cojocna, in the Roman period and in the Middle Ages, became an important salt exploitation centre. Romans excavates on the surface and down to a depth of 12-15 m. The deserted excavations became lakes (anthroposaline). The Roman camp of Gherla also protected the salt exploitations of Cojocna (Ciobanu, 2002, 2006).



Fig. 9 - The Cojocna thermae in early 20th century (left) and in the present (right)

The saline deposits of mid-Miocene, which outcrop to the surface due to soil erosion, are accompanied by salt springs, by plateaus with sapropelic mud, salt-rich fields and halophyte vegetation. The salt massif is elongated on a northwest – southeast direction and it is found very close to the surface. The covering layers

have maximum thicknesses of 6-10 m. The salt mines were attested in documents since the 12th century. In the year 1780, there were the mines “Die grosse Grube” (“the Big Salt Mine”) and “the Small Salt Mine” (“Ocna Mica”).

The activity of the Cojocna thermae was suspended temporarily in the year 1852, and it was briefly reopened in 1873. The old mines collapsed and the water that became salty installed in microdepressions, thus acquiring therapeutic properties. The mild climate of the resort and the two salt lakes (Toroc-Durgau Lake and Mare-Bailor Lake) constitute a proper place for treating conditions (rheumatism, gynaecological, endocrinological, etc.). The most important are as follows: Toroc-Durgau (surface of 2,635 m² and 49 m deep), Mare-Bailor (surface of 2,100 m² and 13.5 m deep), Bottomless (surface of 608 m² and 0.80 m deep) and Plop (surface of 161 m² and 0.50 m deep) (Fig. 9).

Praid

The locality of Praid is situated in the Transylvanian depression, the county of Mures, on the valley of the Tarnava Mica River. It has a population of 3,500 inhabitants (mathematical coordinates: 46°33'9"N; 25°7'28"E). In the locality, there was one of the largest salt mines in Romania. Nowadays, it is also destined to tourism and to the treatment of asthmatic conditions.



Fig. 10 - The salt-water pool in Praid

In this locality, the largest pool with salt water was built in Romania (surface of 5,200 m²) (Fig. 10). The pool is an artificial place. The salt pool and the warm baths to the tub are supplied with salt water pumped from the Praid salt mine, from a depth of 150 m. The water supplying the pool stations for several months in the groundwater basin in order to acquire very high salinity.

Sangeorgiu de Mures

The locality of Sangeorgiu de Mures is situated in the Transylvanian depression, the county of Mures, on the left bank of the Mures River. It was

attested in documents in the year 1332 and it has a population of 8,800 inhabitants (mathematical coordinates: 46°34'35"N; 24°36'15"E). The last baths of Sangeorgiu de Mures are located several kilometres away from the centre of the Targu Mures city. Water is extracted from a depth of 900 m. It has been known since 1880, when a basin constructed for salt baths, supplied with water from a superficial source, was used for the first time.

It is famous for salt waters and mineral mud. Waters with a mineralization of 135,586 mg/L and high contents in iodine, calcium, magnesium, potassium and nitres are present. Water has the highest iodine contents in the intra-Carpathian space (11.4 mg/L). The salt waters of Sangeorgiu de Mures are similar to those of the main source of Szobranc and of Untere-Quelle in Switzerland (which comprise a lower amount of sulphured hydrogen and only 50% of the amount of sodium chlorides).

The salt baths are found in the Apollo Wellness Club hotel (Fig. 11). The Apollo pool is made of a large basin with rectangular shape (with salt water) and a complex of smaller oval-shaped basins (with freshwater). The salt-water basin has a length of 10 m, a width of 8 m and deepness ranging between 1.40 and 2.50 m.



Fig. 11 - The salt-water pool within the Apollo Wellness Club hotel

Conclusions

The new social and economic conditions in Romania, but mostly in the intra-Carpathian space, determined the current use of salt resources exploited through mines for the cure of certain illnesses. For this reason, balneal and climacteric resorts with a significant economic boost emerged. The development of specialized tourism is due to the existence of the clastokarst or anthroposaline lakes within the salt mines. Almost all the salt mines have interrupted their traditional activity of salt extraction and they have focused on developing the internal space (of the caves) or the external space, especially of the lakes, in order to attract as many tourists as possible.

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