

SEEING, SENSING, AND DE/SCRIBING – NARRATIVES ON WEATHER AND CLIMATE IN PREINDUSTRIAL SERBIA AND BOSNIA-HERZEGOVINA

VIDJETI, OSJETITI I OPISIVATI - NARATIVI O VREMENU I KLIMI U PREDINDUSTRIJSKOJ SRBIJI I BOSNI I HERCEGOVINI

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Summary

Over the past five decades, there has been a steady increase in paleoclimatic and historical climatological research in Europe and beyond, emphasizing the need for mathematical calibration of data, both natural and manmade, in order to produce reliable scales and cycles of climate change patterns. To a lesser extent, attention has been paid to people as living beings, sensory creatures, that is, less rational and predictive than climate scientists would like them to be. This paper is dedicated to the sensual, emotional but also practical and cautious side of human nature, to the people who gather experience through generations, so as to increase resilience of their families and communities when faced with short, medium or long-term weather events and climate change. Data for Serbia and Bosnia-Herzegovina have so far fit the models of 'typical' pre-industrial societies, in which agriculture and animal husbandry provided the livelihood for the vast majority of the population. Christian culture shaped the fears expressed in short marginal notes and Franciscan chronicles, but since the 15th century, urban and rural society included the Muslim culture and worldview as well. With periods of feudal, civil, and Austro-Ottoman wars, the spread of epidemics, a climate of violence emerged, producing dire consequences, such as heightened sensitivity, anxiety, and uncertainty, contributing to existential crises. Beside these tales of fear, oral testimonies provide a treasure of traditional ecological knowledge (TEK), which helped people cope with great uncertainty and explain their own social-cultural realities. This will be re-evaluated through our ethnographic material in various areas of Serbia and Bosnia-Herzegovina.

Keywords: narratives, weather, climate, preindustrial era, traditional ecological knowledge (TEK), Serbia, Bosnia-Herzegovina

Ključne riječi: narativi, vrijeme, klima, predindustrijsko doba, tradicionalno ekološko znanje (TEK), Srbija, Bosna i Hercegovina

INTRODUCTION

We like to think that we are finely evolved creatures, in suit-and-tie or pantyhose-and-chemise, who live many millennia and mental detours away from the cave, but that's not something our bodies are convinced of... To begin to understand the gorgeous fever that is consciousness, we must try to understand the senses — how they evolved, how they can be extended, what their limits are, to which ones we have attached taboos, and what they can teach us about the ravishing world we have the privilege to inhabit.

To understand, we have to “use our heads,” meaning our minds. Most people think of the mind as being located in the head, but the latest findings in physiology suggest that the mind doesn't really dwell in the brain but travels the whole body on caravans of hormone and enzyme, busily making sense of the compound wonders we catalogue as *touch, taste, smell, hearing, vision*.

– Diane Ackerman, *A natural history of the senses*, Vintage Books Edition 1995

This quote from a popular science book aims to help us address several issues in the text that follows.

First, living and perceiving the natural world in the second decade of the 21st century is, and at the same time is not, different in regard to past communal experiences. To begin with, here in Belgrade, not a single snowflake appeared last winter, and night temperatures were well above freezing – this is personal, un-measured, and purely sensual observation, but corroborated by the very low levels of heating required. It is, however, also verified by proper scientific data published by the *Copernicus Climate Change Service* (C3S) and NOAA *National Centers for Environmental Information* – the boreal winter, from December 2019 to February 2020 was ‘by far the warmest on record for Europe’, ever since measurements began, in the 1880s. The winter of 2019/20 was 3.4°C warmer than the average winter in between 1981 and 2010, and almost 1.4°C higher than that of the previous warmest winter, 2015/16. What is more important, the month of February is heating up: the ten warmest Februaries have occurred since 1998 (C3S, NOAA NCEI – March 2020). With all these reports being in the media, it is clear that *a new, more sensitive environmental awareness* is developing among modern citizenry. Namely, in 1988, one scientist ‘expected’ that by the early 21st century *the informed public* should be able to recognize that the frequency of unusually warm seasons has increased (Hansen 1988; id. 2012). However, it turns out that people do not prioritize this kind of risk, or even the detrimental outcomes of the *contemporary process of climate change*, because, in addition to facts and scientific reports, the public's perception is influenced by cognitive, affective, social, and cultural factors, which interact in various ways (van der Linden 2017).

In our Centigrade/Fahrenheit and clock obsessed world, this paper should remind us of the fact that before all technological gadgets, instruments, applications, and media reports, people were human beings, mammals, physiologically made fit for tropical and subtropical zones, so that their comfort zone demands maintaining body temperature of around 37° Celsius. Yet, they reach their biological optimum at much more diverse places on Earth, and have managed to adapt even to extreme climate and environmental conditions. This was done biologically/genetically, but much more through very creative cultural adaptations (Goromosov 1968; Mrgić 2013). The subject of this paper is how people in pre-industrial Serbia and Bosnia-Herzegovina observed the weather and climate, how they perceived those systems and coped with changes, especially given the meager written eye-witness evidence. As a historical geographer/environmental historian and an ethno-anthropologist, we thought that going a bit into the past would raise awareness of both similarities and differences between ‘then and now’, thus narrowing the historical gap between us and these previous times.

Second, scientists from various fields – evolutionary, perceptual, cognitive etc. – have over the past decades been doing theoretical and experimental research aiming to ‘make sense of the senses’. Beside the basic five: touch, sight, smell, hearing and seeing, there are plethora other senses and variations, such as the body's perception of movement, and then there are combinations of senses. Sensations felt through the skin – the largest organ – touch, cold, warm, moistness, etc., are ‘processed’ in the mind.

Humans actually possess *multisensory perception*, so it is necessary to investigate the relation between perception and action, and the connection between touch and bodily awareness (Fulke 2016). There is a growing literature in anthropology of weather, climate, and reading the climate through culture (Janković 2000), which stands to reason, given that human beings are sensory creatures, and sensory experiences shape their memory and their expectations about the climate future. Before modern instruments, people ‘sensed’ the weather with their bodies and minds, observing the behavior of other people, domestic and wild animals, making connections with the wind patterns, humidity, temperature, precipitations. Relations between the climate, weather features, and health were well known to Hippocrates (ca.460–ca.370): “In seasons which are regular, and furnish the productions of the season at the seasonable time, the diseases are regular, and come readily to a crisis; but in inconstant seasons, the diseases are irregular, and come to a crisis with difficulty. In autumn, diseases are most acute, and most mortal, on the whole. The spring is most healthy, and least mortal” (Hippocrates, Aphorisms, III.8, 9; Strauss and Orlove 2003; Hulme et al. 2009).

In human minds, where ‘sensory data’ meets genetic experience, *trans-generational knowledge*, and living practice, our understanding and data interpretation commences. The aforementioned *environmental awareness*, including weather and climate predictive awareness, is not immanent in humans, but the result of experience, of prolonged exposure to ever-changing conditions of the living environment. Furthermore, perception of changes is shaped according to expected and average variations. Both the individual and social memory are important conveyers of past experiences, traditional knowledge, and coping strategies. In distinction to the modern ‘culture of progress’, the agro-ecological production regime of the pre-industrial time that this text deals with, was dominated by a ‘culture of survival’ (Hassan 2000, 121–140; Mrgić 2018). The most important thing to understand is that a pre-industrial, i.e. Ladurie’s *motionless* society, is based on agriculture: the vast majority, which percentage varied across time and place, were engaged in food production. Therefore, the conventional periodization of the Middle Ages, from the 5th to the 15th century, cannot be taken as relevant for environmental history when approached from an agro-ecological and climate perspective (Le Goff 1974; Ladurie 1977).

For the region of Serbia and Bosnia-Herzegovina (**Map 1**), in the late Middle Ages, the proportion of the population producing food was as high as 90–95%. The rest of the population worked in the secondary and tertiary sector (mining, wood, textile and leather manufactures, transport, trade), with a slow increase by the start of the second half of the 19th century. Depopulation of central Serbia due to prolonged Habsburg-Ottoman warfare (1683–99, 1714–18, 1736–38, and 1788–91), combined with climate deterioration during the “Little Ice Age” (further: LIA) ca.1550–1850, epidemics and famine, resulted in the abandonment of agricultural fields and reforestation of the whole region. This history is reflected in the region’s name, appearing in 1790: *Šumadija* (literally ‘Woodland’) (Mrgić 2011).

The mountains above the Neretva river basin separate Herzegovina’s Mediterranean climate and karstic poljes, from Bosnia to the north, with a temperate and continental climate, densely forested and rich in ore deposits exploited since Roman times. Fluctuation of population density followed the described pattern of Central Serbia, but was also impacted by the shifting northern Ottoman border around the river Sava. The transition from agriculture to more extensive cattle rearing took place in both Serbia (*Šumadija*) and Bosnia-Herzegovina due to the cumulative impact of climate change, and political and economic history in this long period (Sugar 1963; Mrgić 2006-2007; ead. 2011; ead. 2013). Intense industrialization of agriculture, food production, living conditions and systems of education and information only began after the Second World War. Even then, it did not spread evenly, meaning that there are still ‘pockets’ in this territory where neither tractor, electricity, radio nor television has reached people. Just to the south of Serbia, for example, we encounter the magnificent life of the beekeeper Hatidže in the village of Bekirlija, Northern Macedonia, as documented in the 2019 movie *Honeyland* (directed by Tamara Kotevska and Ljubomir Stefanov).

Therefore, during this very long pre-industrial period, the most important ‘time and workforce organization’ was the seasonal division of labor during the agricultural year. The essential importance of composing a reliable, ecologically adapted *agricultural calendar* cannot be overemphasized. Miloš

Blagojević has done extensive archival research on medieval Serbian lands prior to Ottoman conquest, which stretched from the river Neretva to the Danube. In “Agriculture in Medieval Serbia” (2004), Blagojević notes the contrast between the beginning and end of the agricultural year in the Mediterranean and more temperate, continental climate. The warmer and drier southern climate meant that work on the vineyards started as early as February (that is, on St. Trifun’s Day, celebrated February 1st in the Julian calendar, which is the 14th in the Gregorian calendar). Inland, however, work began in March. This postponement of at least four weeks was also true for the major labors – spring and autumn plowing, sowing, and harvesting the main crops: wheat, barley, oats, millet and rye. Their schedule followed Christian holidays, i.e. the “Christianized” traditional Slavic agricultural calendar. Upon conquest, the Ottoman government accepted these as dates on which certain taxes were due, thus also preserving the calendar. The agricultural year was basically bookended by the feasts of St. George (*Djurdjevdan*, April 23rd Old Style) and St. Demetrius (*Mitrovdan*, Tur. *Kasum*, October 26th). In regard to animals, March and April were important for sheep rearing, while November was dedicated to culling the herds and flocks for winter and curing meat (Blagojević 2004; Mrgić 2008). Another Mediterranean crop, olives, did not figure prominently in medieval Serbian lands, yet it played a significant role with its appropriate calendar in the Franciscan chronicles during the 18th century in the Adriatic city of Makarska (Mrgić 2018).

The cycle of agriculture and animal rearing, each according to specific crop and animal species, and conditions in the specific natural environment, was observed, determined and memorized through centuries of first-hand experience: gathered by community elders and passed down to younger generations. This corpus of ‘know-how’ is named *traditional ecological knowledge* (TEK). Being a universal trait around the world, it is as old as hunter-gatherer and the earliest farming cultures. First recorded by natural historians and anthropologists, it has only recently been appreciated by modern science, i.e. rational, and measurable disciplines, and adopted by ecologists and environmentalists. As Fikret Berkes has pointed out almost thirty years ago, one should not restrict the terms ‘traditional’ and ‘ecological’ to their narrowest sense, especially since their wider meaning allows multidisciplinary approaches as applicable concepts that have been yielding new results ever since. Berkes says that:

“...traditional usually refers to cultural continuity transmitted in the form of social attitudes, beliefs, principles and conventions of behaviour and practice derived from historical experience. However, societies change through time, constantly adopting new practices and technologies, and making it difficult to define just how much and what kind of change would affect the labeling of a practice as traditional.” (Berkes 1993)

Keeping in mind the labels ascribed to these practices, TEK will hereafter be considered a combination of wisdom, practice, and skill. We see it as the ‘instruction manual’ how to act and react in time to prevent death, hunger, sickness, and famine. Since every tradition relies on repetitive patterns, the most important part was to produce constant, daily, vigilant observations of nature and natural features, and make accurate, ‘informed guesses’ about future ‘behavior’ of the weather, the onset of seasons, their unusual traits and un/timely transitions (Netting 1974; Berkes et al. 2000; Winiwarter 2005; Winiwarter and Knoll 2007; Mrgić 2008; ead. 2013; Lemi 2019).

Extra-ordinary, i.e. ‘out of order’ weather phenomena and events were the cause of unexpected stress, perceived as risk, threat, and danger for food production, human and animal lives. These referred primarily to perturbation of the beginning of seasons, dated by the major Christian holidays during the agricultural year. March to November was the main season for grain production, which included wheat, barley, rye, millet, spelt wheat, maize (starting in the late 17th century). Rice became more common during Ottoman rule and under the favorable conditions of greater precipitation during LIA. Two harvests depended on spring/summer and summer/autumn conditions, but both could be easily jeopardized by late or extended frost, prolonged or excessive rainfall, heavy snow; or indeed the opposite, prolonged drought, lack of rainfall in the germination phase, excessive and lingering heat. As evidenced by the Franciscan chroniclers in Split, Fojnica, Kreševo and Šaregrad, as well as Sarajevo, a multiconfessional imperial center in the 17th and 18th centuries, weather changes and shifts between seasons were sudden, untimely, unexpected – *suis temporibus non correspondentes*. Weather perturbances were also detri-

mental in the sense that particular agricultural work could not be performed at the usual, traditional schedule (Mrgić 2018). Strange sky appearances, ‘tailed stars’ i.e. comets, curious colors in the celestial dome, ‘black’ and ‘red’ snow and rainfall were also recorded with great fear and awe (Mrgić 2001; ead. 2016b). Tumultuous social history of the region and surrounding areas – wars, civil unrest – coupled with epidemics, locust invasions etc. developed into a *culture of uncertainty*. In addition, all these events are reflected in only a small amount of written evidence, due to the high rate of destruction of archives: dynastic and noble chronicles, personal and city business accounts, and the like. Besides relying on previous research of surviving proxy data for this region presented in the first part (Mrgić 2011; ead. 2013; ead. 2016a, 2016b; ead. 2018), in this paper we refer to contemporary times to demonstrate how even today traditional ecological knowledge is treasured, gathered and evaluated for weather and climate research. The combination of various data should provide new insights and open new investigation paths to humanities scientists.

THERE IS A TIME FOR EVERYTHING, AND A SEASON FOR EVERY ACTIVITY UNDER THE HEAVENS (ECCL. 3:1) – DESCRIBING THE WEATHER AND EXPRESSING EMOTIONS

For a large part of the pre-industrial history of Serbia and Bosnia-Herzegovina, written evidence on weather and climate originated in Christian culture, within the Orthodox and Catholic Churches. Though they were usually not the producers, but consumers, these writers lived off the land and were keenly interested in observing the outcome of the agricultural year because it impacted the staples market: cereals, vegetables, red wine for liturgical practice, and fish. With the inclusion of this region into the Ottoman Empire, Serbia in 1459 and Bosnia-Herzegovina in 1463/77, the Muslim population added a third cultural layer to the villages and cities. Their cuisine preferences and religious practice required greater consumption of rice and mutton, and though Jewish communities had been present prior to Ottoman conquest, we have not analyzed their written sources. Each of these cultures influenced the worldviews of chroniclers. In a recent paper, one of the present authors provided an overview of the preserved written sources, as well as their quality (Mrgić 2018). The results are presented in the following table, serving the same purpose as in the original paper.

The shortest and most discontinuous were the marginal notes in Orthodox liturgical manuscripts and later, printed books. Their brevity could be sometimes taken for an expression of haste, rush, heightened anxiety, since they almost exclusively deal with extreme events and natural disasters. Since these occurrences could not have been predicted, the scale of fear was great, and it was interpreted through a Biblical mindset, i.e. punishment for sins. Some notes speak of a ‘seven-year hunger’, ‘forty-day flood’, ‘three-year drought’. The designations might have been the actual duration of the phenomena, especially hunger and drought, as the first was induced by both climatological and man-made factors, while the second took longer time to be noticed. The notes speak of sudden, detrimental events, such as: “1453 (6961 Byzantine Era) – The sultan Mehmed conquered Constantinople on May 24th (sic!), on Tuesday, and before that, on April 6th, frost gripped and killed the land” (Stojanović, SSZiN, vols. 1–6).

The majority of notes from the Franciscan chronicles testify that climate anxiety was caused by ‘*intempestivus*’ seasons. Thus, in Friar Gojak’s writing one reads how the winter of 1758 was too mild, too hot, and without snow. This *unnatural character of the months and season – sua natura non correspondens*, gave way to proverbs he wrote down: “What January and February don’t do, March will double,” “If March is tender, April is tough,” and also “If the frost falls not on Christmas day, it will on Easter.” His testimony in describing the calamities of 1740 was more elaborate and emotional: “If one were to write about sorrows, pains, and troubles of this year, one large book would not be enough, not even for the briefest of notes... This year was so poor and hard in this *vilayet* (Turk. area, land). None living remembers a year of no grains, either in the Turkish or Christian *vilayet*, nor that they could have been acquired by sea or land... Winter was so vicious, beginning with All Saints’ Day (November 1st),

Table 1 – Overview of narrative sources during the LIA in the Western Balkans, 17th–18th c. (Mrgić 2018)

Sources	Continuity and relevance for weather data	Time coverage	Space coverage	Frequency of entries on weather data
Chronicle of Friar Pavo Šilobadović (? –1686)	Continuous Medium relevance	1662–1686	Makarska and the border area of Venetian Dalmatia and Ottoman Herzegovina	Monthly, mostly political events, except for extreme weather events
Chronicle of Friar Nikola Gojak (1680–1772)	Most continuous and consistent Most relevant	1712/21–1772	Makarska, Venetian Dalmatia and hinterland	Weekly, frequent daily and, less frequently, monthly entries, and overview of seasons
Friar Gojak's Continuators – Friar Petar Antulović (1706–1781) Friar Bartul Ribarović (1724–1781) Friar Andrija Ivičević (1740–1799)	Continuous and consistent High relevance	1773–1780 1780–1781 1781–1794	Makarska, Venetian Dalmatia and hinterland	Weekly, monthly, and extreme events with precise dates
Chronicle of Friar Marijan Bogdanović (ca. 1720–1772)	Continuous and consistent High relevance	1765–1771	Kreševo in central Bosnia, with entries on farther away places	Seasonally, monthly, and extreme events with precise dates
Diary (<i>mecmua</i>) of Mulla Basheski (1731/2–1809)	Continuous and consistent High relevance	1746–1806	Sarajevo and news from other parts of the Ottoman Empire	Islamic holidays, seasonally, and extreme events with precise dates
Chronicle of the Franciscan monastery of Šarengrad	Continuous and consistent, depending on the authors (anon.) High relevance	Total coverage: 1683–1907, used here: 1683–1800	Region of Srem/Sirmium and Habsburg Slavonia	Monthly and seasonal entries, and extreme events with precise dates
Chronicle of Friar Nikola Lašvanin (ca. 1703–1750) from the Franciscan monastery of Fojnica	Compendium of various chronicles and writings, discontinuous Medium relevance, except for extreme events	General chronicle – from Creation to 1690 AD Bosnian chronicle – 1682–1750 The Chronicle of Fojnica monastery 1300–1750 etc.	Area of the Franciscan Province of Bosnia (Bosnia and Herzegovina, Slavonia)	Annual, mostly political but with much data regarding extreme weather events
Marginal notes in Orthodox liturgical manuscripts	Discontinuous, mostly anonymous High relevance for specific events	The Middle Ages and Ottoman times 12 th to 19 th c.	Very dispersed, various manuscript copy centers in Orthodox monasteries across South East Europe	Extreme events and natural disasters

staying like that until today (March 30th), with *bora* and snow, so nothing survived – no big or small cattle, no greens (*zelje*), grains and fruits are frozen, bees were killed by the cold, olives and figs have turned to thorns – so little is left that such great hunger is on its way, as no man remembers.” He ended the records with a note on November 1st, saying that “This is punishment from God.” Later we read that Friar Gojak was of the opinion that God’s actions were reciprocal to the people’s actions: reward for good and punishment for bad. His *continuator*, Friar Antulović recorded that the drought in 1777 was so extreme that by October the wells were dry so that people were thirsty, the fields were scorched so

they were hungry, indeed, the situation in the *vilayet* was so dire, people escaped to Ottoman lands not to starve (Makarski ljetopisi 1993; Mrgić 2016a; ead. 2018).

The Italian scientist and writer, Alberto Fortis (1741-1803) travelled and hiked extensively, and wrote two chronicles about the Makarska region, gathering information about nature in Dalmatia. He has a famous quote in *Viaggio in Dalmazia* (1774), referring to the Mountain of Biokovo, sending winds, hail, and rain to the people of *Primorje* (littoral), serving as their proper “meteorological theater.” Over the next several pages, Fortis continues to describe the *local knowledge about winds*, especially the important northern ones (*bora*, *tramontana*), and how the locals always carefully observed the time of the appearance of *clouds* above this mountain, their shape, the fog etc. Most important were the regime of precipitation and the timing of the rainfall necessary for tilling and sowing, but detrimental to harvesting, so the local wisdom was that if the winter or summer were more abundant with snow or rainfall, it was a disturbance; but if the winter was mild, one could expect a stormy summer. A wet summer meant a good olive harvest, but it was bad for grapes and wine, and the worst was if the winter was rainy, and spring and summer dry, the various crops would all suffer (Fortis 1984).

Friar Marijan Bogdanović (ca. 1720–1772) was educated in Naples, where he and his brother caught the fatal illness, *phtysis* (tuberculosis), making him a more sensitive observer of the cycles of nature. He began his chronicle in 1765, describing it as tumultuous and troublesome. He considered it Divine punishment for sins: the winter was like the summer, with no snow, while the previous autumn saw floods the magnitude of which had been unseen in fifty years prior. Friar Marijan even described the infestation of mice in the fields as one of the “plagues of Egypt.” He must have known that mice were not mentioned in the Bible, which means he sought to stress the scale and horror of the devastation. He further recorded for 1769 and 1770 that May was unusually cold, while the cold in April was unheard of (*inauditus*), because nothing could be either ploughed or sowed, *uti communiter solet*. It is quite clear that specific agricultural work could not be performed *ut moris est*, i.e. in the traditional manner, time, and schedule, because of the great weather perturbances! Therefore, neither the outcome of agricultural work nor the amount of food could be predicted. On top of which, the food supply was jeopardized by frequent wars, banditry, and sanitary cordons between Venetian Dalmatia and Ottoman Bosnia-Herzegovina. As far as can be gleaned from the preserved available written records, there were two peaks in climate induced fears and anxieties, and heightened existential crises: one started in the second half of the 16th century, reaching a climax with the advance of the Little Ice Age deterioration; and the second, and more memorable, was during the War of the Holy League (1683–1699), with disturbing reports of cannibalism due to extreme hunger (Mrgić 2016a; ead. 2018). One wishes that more of manorial books and diaries with weather predictions were saved, such as those made by the Bishop of Ljubljana, Tomaž Hren for the period 1597–1630, and later meticulously analyzed by Zwitter. Hren’s vigilant observations provided enough material for Zwitter to conclude that perceived and described temperatures, precipitation patterns, and weather anomalies correspond, up to a certain point, to the results obtained in other parts of Central Europe in the initial phase of the ‘Little Ice Age’ (Zwitter 2013).

In the “waning of the Middle Ages,” (Johan Huizinga) at the end of the Little Ice Age (LIA), Archdeacon Stefan Počuča in the monastery of Ostrovica, Central Serbia, left a rather poetic passage: “The autumn of 1806 was beautiful: no snow fell until the holiday of St. John the Baptist (January 6th, Old Style), but then it fell and kept falling until St. George’s Day (April 23rd, Old Calendar), and the people could sow but little. From St. George’s to the Assumption of Mary Mother of God (August 15th) it rained but once, and everything was eaten by worms, the harvest was scorched, and the famine was so great that men wept with sorrow. Even the birds of the mountain could not rejoice this summer, certainly not the poor hungry and thirsty people. Our fields are barren; our springs are dry.” The fickleness of fortune was noted by an anonymous monk near the city of Pljevlja (Montenegro) who wrote how the year of 1823 seemed to be *blessed* with mildness, warmth, and fertility; but ten years after, he reported: “From 1833 onwards, evil years followed – hate, fury and conflicts among the people, barren years, evil winds, evil winters, and animals fell sick” (Stojanović, SSZiN 3, No. 1599, 1607; 5, No. 8969: transl. Mrgić).

ETHNOGRAPHIC MATERIAL OF TRADITIONAL ECOLOGICAL KNOWLEDGE (TEK) OF WEATHER AND CLIMATE

From the previous section, we can see that written evidence on weather and climate originated in the Christian (Orthodox and Catholic) and Islamic cultural tradition in Serbia and Bosnia-Herzegovina. These and many other cultural influences also shaped people's knowledge about weather and climate. The present section will show some of these materials collected via ethnographic fieldwork that usually aim to describe local communities, cultures, societies and other groups, and the description will be followed by their analysis.

For the purpose of this paper 32 informants were interviewed in Serbia¹ and Bosnia-Herzegovina² (**Map 1**). They reside in the village of Zlakusa (western Serbia), the Romanija region (east-central Bosnia, municipality of Pale-East Sarajevo), Sarajevsko polje (central Bosnia, East Ilidža – the city of East Sarajevo and the city of Sarajevo), Herzegovina (mostly central, western and eastern part), Central Bosnia (the city of Travnik and the town of Bugojno), and Bosanska Krajina (the village of Barači near the town of Mrkonjić Grad). Respondents from the central part of Herzegovina live in the city of Mostar and the village of Raštani, interviewees from western Herzegovina reside in the village of Ljuti Dolac, the town of Grude, and the nearby village of Poorte, while those from the eastern part of this region live in the town of Nevesinje, the village of Zijemlje (municipality of East Mostar) and the village of Grajseljčić near the town of Kalinovik, which is partly in southeastern Bosnia. One informant lives in the village of Klepci near the town of Čapljina in the southern Herzegovina, and one interlocutor lives in the town of Jablanica in the northern Herzegovina. The ethnographic material based on their statements will be presented and analyzed in the next section. The generational structure of our respondents is as follows. Two are members of the younger generation (younger than 30); middle-aged interlocutors, between the ages 30 and 60, represent the majority of our sample – 18; last, 12 members of the older generation (above 60) gave their statements on weather features in their place of living. The oldest respondent was born in 1933, while the youngest one was born in 1994. In between we have informants born in 1941, 1959, 1963, 1978, 1989 etc. All interviews were conducted online via cell phone, e-mail and Facebook

¹ Ethnographic material from Serbia was collected in the village of Zlakusa in the municipality of Užice and the Zlatibor County in western Serbia (Đorđević Bogdanović 2016). Savo J. Orović gathered a volume of ethnographic notes on traditional ecological knowledge all across Serbia, but without stipulating the precise geographical areas from which he gathered it (Orović 1974). Mile Nedeljковиć conducted ethnological research in the central (Šumadija) and eastern part of Serbia (Aleksinačko Pomoravlje), in which he collected ethnographic data on folk weather predictions (Nedeljković 1990).

² Our ethnographic material from Bosnia-Herzegovina was gathered from several regions, where our interlocutors provided oral testimonies of observations and folk proverbs on weather features, patterns, and extreme events. The Romanija region encompasses the mountainous area of the city of East Sarajevo in east-central Bosnia (Dražeta 2019, 146), municipalities of Pale, Sokolac, and Han Pijesak. It is a border area – historically important for communication and transportation (Đerković 1999; Mrgić 2016c) – between Podrinje (the river Drina basin) and Sarajevsko polje (the region around Sarajevo, where the river Bosnia originates). Romanija is connected to the southeastern part of Sarajevsko polje, which holds the administrative part of the City of East Sarajevo, as well as the City of Sarajevo, part of the Sarajevo Canton (Teftedarija 2007). During Ottoman rule, (1463–1878) there was little or no use of instruments for weather and climate observations in Sarajevsko polje and Romanija. The Austro-Hungarian administration (1878-1918) started to measure air temperature, rainfall and air pressure in Sarajevo, and later also in the Romanija region (Đerković 1999). The Mostar basin (Mostarska kotlina) is a region in the central part of Herzegovina, where the city of Mostar is located on the banks of the River Neretva. Beside the urban zone, the basin consists of two open areas: Bijelo polje in the north, and Bišće/Mostarsko polje in the south. There is also a karst field, Mostarsko blato, southwest from the Mostar basin, in western Herzegovina. The mountains that surround Mostar are Prenj, Velež, Čvrstica, and Čabulja. These areas administratively fall into two cantons (Herzegovina-Neretva and West Herzegovina), with the towns of Mostar and Široki Brijeg in the Federation of Bosnia and Herzegovina. East of the basin are two municipalities in the Republika Srpska – Nevesinje, with the town and municipality of the same name, and East Mostar, whose administrative center is in the village of Zijemlja and its surrounding area, Zijemlje (Budim 2015; Kotrošan 2017). Herzegovina is a historic region formed during the Middle Ages, and is today smaller than in the past (Mrgić-Radojčić 2004). But the regions within it maintain historical and cultural ties, and therefore our ethnographic material was presented as a whole. We have also obtained oral testimonies on weather features from Central Bosnia. This region is located in the middle part of present-day Bosnia and Herzegovina, from the River Vrbas on the east, up to the river Bosnia in the west. Beside cities/towns such as Zenica, Jajce, Bugojno, Gornji Vakuf-Uskoplje, Fojnica, and Kiseljak, within Central Bosnia there are also smaller areas. One of them is called Lašvanska dolina (Lašva river valley) with four municipalities (Travnik, Novi Travnik, Vitez and Busovača). The valley is surrounded by five mountains – Komar, Vilenica, Kruščica, Zabrdje and Vlašić (Bugarin 2017). The last region from which we obtained ethnographic data is Bosanska Krajina (western Bosnia), where the village of Barači is located, near the town of Mrkonjić Grad.



Map 1 – Ethnographic field work material collected by Bogdan Dražeta. Background: Apple Maps, cartography: Mladen Stankić.

in the period from January until March 2020. Respondents had to answer whether they knew how the weather has been generally predicted in their living place, then according to the position of clouds, colors of sunsets, observations of the moon, wind direction, folk proverbs, animal behavior, major holidays, and finally, what long-term weather forecasts looked like.

Research has shown that folk beliefs, proverbs and observations regarding the weather influenced local communities (Orović 1974; Detelić 1992). The concept of “chronotope” shows that every local community in history has had its own connection of time and space, a specific temporal and spatial context. The majority of studied communities have been oriented towards the natural environment, which is part of a specific lifestyle and life built on production, consumption, spatial concreteness, unity, and repetition (Bahtin 1989). The present ethnographic material will show such practices through contemporary oral testimonies on weather observations and climate changes among the people in various areas of Serbia and Bosnia-Herzegovina. Furthermore, observations and folk proverbs about weather features, patterns, and extreme events can be used as testimonies of past climates in the pre-instrumental period, that is, part of traditional ecological knowledge. In our research, some of the informants are members of the younger generation and some interviews were conducted in urban settlements or in their vicinity. However, use of local reference points in their statements, such as mountains and hills, speaks to the age of these types of weather observations and predictions. These narratives will be presented in the following pages through three categories – weather predictions based on observation, animal behavior, and major holidays. Our research has shown that narratives perceived as locally present can be actually widespread, but not always well-known to the people who (re)produce them, due to their mobility. Furthermore, the concept of traditional ecological knowledge includes, conditionally and analytically speaking, “positive” as well as “negative” examples (Zwitter 2020, 49-82), as described later.

OBSERVING WEATHER, SKY, MOON, SUN AND LANDSCAPE

The first example, as general weather prediction, was recorded in both the karstic polje and town of Nevesinjsko polje, eastern Herzegovina. R. Kovačević, N. Bovan, and S. Grahovac from that subregion believe each of the twelve days between Catholic (December 25th) and Orthodox Christmas (January

7th) represents a month of the upcoming year and should be observed carefully: the weather conditions of these twelve days will correspond to the months of the upcoming year. This belief is also found in Ž. Antelj from the village of Zijemlja, located in the Zijemaljsko polje neighboring region, as well as S. Krunić in the village of Klepci near the town of Čapljina (southern Herzegovina). The same twelve-day rule about weather conditions between Catholic Christmas and Epiphany (January 6th) was recorded by Thomas Hren, bishop of Ljubljana, in the early 17th century (Zwitter 2013). The twelve days between St. Lucia Day (*Sveta Lucija*, December 13th) and Catholic Christmas (December 25th) were carefully observed because there also was a belief that each day represented one month's weather conditions for the upcoming year. This practice was recorded not just in Herzegovina, as we have mentioned, but also in different regions of Central Bosnia, Livanjsko polje (southwestern Bosnia) and Usora (north-central Bosnia) through various ethnographic research of an ethnologist-anthropologist Velimir Bugarin (2019).

Further examples are clouds covering mountain tops, interpreted in the context of folk weather forecasting. B. Guja and Z. Guja from the town of Pale in Romanija think of red clouds over or to the west of the Romanija mountain, as harbingers of rain that will last several days. B. Pjević in the southeastern part of Sarajevsko polje, where East Sarajevo municipalities of East New Sarajevo and East Ilidža are located, believe bad weather will come "when the towers rise" (*kad se kule dižu*) over the Igman Mountain. Towers are clouds and their density towards the south and the southwest portends rain or storm. There will be no rain if lightning jumps from the Igman to Ivan Mountain. This is also true if hills and mountains are in the shadow of clouds. He added that when clouds go up the hill, it will stop raining. When a cloud descends down the hill or basin, it will be rainy. Northern wind called *sjever*, *sjeverac* can be predicted for the upcoming days if there is a cloud on the Velež Mountain in the morning, claim P. Savić and S. Savić from Raštani near Mostar in Bijelo polje (Herzegovina). T. Kajtaž could predict rain in the old urban zone of Mostar when clouds come from the nearby hill *Planinica*. A cloud or "hat" (*kapa*) on Velež (east) is a sign of bad weather to come, says O. Maslo, except if it comes from the direction of the town of Nevesinje (southeast), in which case there will be no rain. He added that some consider clouds over both the mountain and the town harbingers of bad weather, while others think it only applies to Velež. A cloud towards the south (from the town of Čitluk) or the east (towards Velež) means that the bora (*bura*) will blow for at least three days, claim M. Ćorić and Z. Damjanović from the village of Ljuti Dolac around the area Mostarsko blato in western Herzegovina. In the nearby village of Pocrte next to the town of Grude, Ž. Šimunović states that stormy weather with hail (*krupa*) can be expected if great white clouds billow (*kulaju*) over the Zavelim mountain in the northwest, along with rolling thunder (*mumljavina*) and a consistent bora wind. Ž. Antelj from the village of Zijemlja (eastern Herzegovina) says that if clouds appear in the south (Velež), it will be a rainy winter. S. Krunić from the village of Klepci near the town of Čapljina (southern Herzegovina) indicates that rainy weather is predicted through fog which stays on the mountain Žaba when the weather is clear all around it.

The third example in this chapter deals with colors of sunsets. In the town of Pale (Romanija, east-central Bosnia) B. Guja and Z. Guja claim that if clouds are red or pink at sunset, the weather will be clear and sunny the next day. In Sarajevsko polje people say it will be warm next day if the sky is red in the evening, claims D. Sakić. In the central part of Herzegovina (Mostar), O. Maslo believes good weather comes if the sun is red at sunset. In the village of Zijemlje (eastern Herzegovina), Ž. Antelj claims that if the sky is red in the evening, a northerly wind (*sjever*) will blow the next day. For Grude (western Herzegovina) I. Barić states that a golden or orange sun at sunset denotes a sunny and bright tomorrow. Ž. Šimunović from the nearby village of Pocrte says there is no rain in the summer if the sky above the Mountain Biokovo (in the west) has a red or purple color at sunset. Just as the locals in the past observed the Mountain of Biokovo in Dalmatia as their landmark, as described by the Italian scientist and writer Alberto Fortis (1741-1803), our interlocutors in western Herzegovina look to it today as well, along with the Zavelim mountain mentioned in the previous paragraph. J. Došlov from the village of Barači near Mrkonjić Grad (Bosanska Krajina) tells us that a red sun at sunset can predict rainy weather.

Observations of the moon are the fourth example which can be drawn from our ethnographic material. The wind called *sjever*, *sjeverac* (Northern wind) blows from the north and P. Savić and S. Savić

in Raštani near Mostar in Bijelo polje (Herzegovina) believe it can be predicted if there is a red color around the moon in the evening. Both of them also say the other important wind is the Sirocco (Ser. *jugo*) and “it comes from the Adriatic.” In both the karstic polje and town of Nevesinjsko polje, eastern Herzegovina, R. Kovačević indicates people knew better in the past how to orient themselves by the moon. Our informant says this technique was believed to be able to forecast rain if the second quarter of the moon is oriented towards the south, i.e. the Adriatic Sea, and conversely, a lack of rain if oriented north. There will be no rain but a drought when the moon is thinner than usual, and when it is said to be “sinking” (*uroni*). This belief was recorded in the interview with Z. Damjanović from the village of Ljuti Dolac around the area Mostarsko blato in western Herzegovina. I. Barić from the town of Grude in the karstic polje of Imotsko claims they can expect rain if the moon is oriented to the ground (last quarter). There will be no rain if the moon is oriented towards the sky (third quarter). A drought is coming if a solar eclipse or “the blind sun” (*slijepo sunce*) takes place. If the southern wind, Sirocco (*jugo, jugovina*) blows, there will be a lot of rain, claims Ž. Šimunović from Pocrte. He also states that night rain in the summer never comes with hail; while a moon vaulted over the ground (waxing crescent, *zahvatio, zajtnio*) announces rain, and vice versa, there will be no rain if the moon is oriented towards the sky.

In the village of Grajseljčići near the town of Kalinovik (eastern Herzegovina and southeastern Bosnia), we recorded how one informant knows when the weather will be nice or foul:

Bad weather also comes if “the mountain rumbles” (*huči gora*). When you see fog in the mountain that rises from the valley, it will be fresh and cold; when you see fog descending, the weather will be nice. There is a proverb here: ‘till Christmas in the mountain, from Christmas in the valley’ (*Do Božića u planinu, od Božića u dolinu*). And really, until mid-winter the weather is nice in the mountain and cold in the valley, but from mid-winter it is cloudy and cold in the mountain and sunny in the valley. (V. Lalović Grajseljčići, Kalinovik, age 85)

Long-term weather forecasts were based on people’s experience, claims our informant from Grude in Imotsko polje:

There is always a danger from frost and rime ice until Biokovo and Zavelim are completely cleared of snow. If springs that occasionally have water sprout early, there will be floods and it is necessary to save the harvest in the poljes. People would say: ‘Mud will slide down over at night’ (*Priko noći će se zalit blato*). After prolonged summer droughts, and with the occurrence of the first heavy rains in the fall, there can also be earthquakes. (Ž. Šimunović Pocrte, Grude, age 66)

As we can see, the Mountain of Biokovo was the “meteorological theater” not just in the past and from the Dalmatian hinterland, recorded by Alberto Fortis (1741-1803), but on the Herzegovinian side and today as well. Imotsko polje as the karstic polje belongs both to Herzegovina and Dalmatia, both regions whose weather features were described by Fortis (1984).

In Sarajevo and in Travnik (central Bosnia) A. Pondro and F. Maslić say that “džemre” has struck (*udarilo džemre* – ‘džemre’ being the Turkish word for heatwave), announcing the first spikes of spring warmth, from the end of February until the beginning of March. Three such waves are supposed to strike in a period of few weeks: the first towards the sky, the second towards the water, and the third towards the ground.

REPORTING HUMAN FEELINGS

The next example shows how human feelings and even notions of certain groups of people are allegedly connected to the weather. A person who had any type of bone fracture is believed to be able to predict weather changes through pain at the healed place, say B. Guja from Pale (east-central Bosnia), M. Ćorić from Ljuti Dolac (western Herzegovina), and R. Džino from Jablanica (northern Herzegovina). The informant B. Pjević with medical implants who resides in East Ilidža (central Bosnia) is believed to be able to sense what the weather will be like, even far away from his living place. M. Ćorić in Ljuti Dolac claims to have a ‘sense’ of coming snow, because she constantly feels cold before falling asleep. In the town of Bugojno (Central Bosnia), like elsewhere, those who have rheumatoid arthritis in their

legs can predict rain, claims S. Rustempašić, while F. Maslić from the city of Travnik claims that people knew how to predict weather in the past because they “followed the rhythm of nature, which was relatively moderate.” In Pale we recorded a phrase uttered by B. Guja: “From the east, from Drina, comes neither rain nor people” (*Od istoka, od Drine, nema ni kiše ni ljudi*). In the old urban zone of Mostar T. Kajtaz had similar expression: “Nice weather and good people never come from over there” (*Nikad finog vremena i dobrih ljudi da idu od tamo*).

WATCHING HOW ANIMALS BEHAVE – AND FORECASTING BY “READING” THE ANIMAL PARTS

This section will present ethnographic material on animal behavior, as well as certain remarks from ethnographic literature. The first example is about bird behavior used as folk weather forecast. Ethnographic literature describing various regions in Serbia notes that people in villages considered the cock a good weather forecaster. When it crows at early dawn, the whole day will be bright and clear, but when it does not crow on a rainy morning, it will rain the whole day (Orović 1974). In the Romanija region B. Guja said people are awoken by the “natural alarm” of a cockerel’s first crowing at 4 a.m. Everyone knows the second crowing is at 5 a.m., when everybody has to wake up. People say that: “As the cock jumps higher, the day grows longer” (*Koliko oroz skoči, toliko dan duža, tol’ko je dan poduljo*). In Sarajevsko polje, A. Pondro had similar expression: “As the cock jumps higher from the fence, the day grows longer” (*Kol’ko horoz skoči od plota, tol’ko se dan produljava*). In the southeastern part of Sarajevsko polje the weather will be bad, according to B. Pjević, when chickens “huddle together” (*ako se stiču jedna uz drugu*), or if they chirp a lot so their mother hen gathers them beneath her wings. Our informant also believes that rainy weather can be expected when birds wash in the creek, while bad weather comes if birds, especially pigeons, fly low or seek shelter and huddle under eaves. D. Sakić from Sarajevsko polje says that a storm is coming when crows or pigeons are disturbed. In the village of Ljuti Dolac, R. Petrović and A. Čović claim that it will be rainy if a chicken stands on one leg, while warmer weather is coming when cranes fly to the fields. If a chicken walks frightened in the yard, it will be windy, says I. Barić from Grude. In the nearby village of Pocrte, Ž. Šimunović claims that when a cock stands on one leg, it indicates freezing temperatures outside. He added that sparrows gathering inside the house announce bad weather in general. In the town and area of Nevesinje, R. Kovačević believes that when swallows fly in a circle it will be rainy, while cranes that fly back from the south announces good weather. He added that cuckoos crying in the spring are harbingers of the new agricultural cycle, a signal to people to start planting potatoes. In the village of Grajseljići near the town of Kalinovik V. Lalović believes it will snow if sparrows gather and fly into a house, barn, or under the eaves. In the town of Jablanica on the River Neretva (northern Herzegovina), E. Klepo claims bad weather is coming when birds fly low, while flying high means the weather will be nice.

Ethnographic notes from Serbia show that people in villages think specific behavior of cattle is a possible predictor of good weather, especially when they graze more slowly than usual, indicating a change in weather. A similar thing happens to sheep when they do not graze as usual the day before rain (Orović 1974). In the Romanija region, cattle shake if bad weather is coming, claims B. Guja, while B. Pjević from the southeastern part of Sarajevsko polje who believe that rainy weather can be expected when sheep and cows lie in the field, “grabbing a dry place” (*hvataju suvo mjesto*). Several other examples were collected through interviews with the same interlocutor. For instance, a sunny day is near if sheep seem to be joyous and graze peacefully. When cattle are not yet in the meadows, but they shake off flies or wasps, and their bells ring loud, it will storm. In the village of Grajseljići near the town of Kalinovik, if cattle shake their feet, it will be cold and very wet (*padanje*), says V. Lalović. She added that the weather will be bad and winter will be hard if sheep eat each other’s hay bedding. R. Petrović from Ljuti Dolac said that it will be rainy if flies attack livestock and humans more than usual.

Ethnographic literature from Serbia records that frogs croaking loudly announce warm and nice weather, but if they are silent, there will be rain soon (Orović 1974). This was also noted by R. Kovačević

who lives in the town and area of Nevesinje. He added the croaking also alarms people to prepare for hot temperatures. On the other hand, frogs croaking loudly announce bad weather, believes B. Pjević from the southeastern part of Sarajevsko polje. Z. Damjanović from Ljuti Dolac claims frogs croaking in a tree announce rain. In the village of Pocrte near Grude, Ž. Šimunović believes that animals are always disturbed before a storm or bad weather, in particular horses; but also worms and frogs, since they avoid water, announce possible rain.

Respondents also indicate that the weather in both the karstic polje and town of Nevesinje, eastern Herzegovina can be 'read' through a lamb spleen:

When a lamb is slaughtered, one look at the spleen: is it flat or wavy, how many furrows are there and how big are they? If flat, the winter will be mild without much snow; if wavy, there will be snow. Each wave represents one snowfall, and the size of the furrow indicates the amount of snow – the deeper the furrow, the more snow. (R. Kovačević, Nevesinje, age 31)

READING THE SKYSCAPES ON MAJOR HOLIDAYS

Ethnographic material about skylscapes on major holidays from Serbia was collected by Mile Nedeljković. He noted that people in the villages of Šumadija, the central part of Serbia, believed that summer temperatures will always drop after The Transfiguration of Jesus (*Preobraženje Gospodnje*, August 19th, Gregorian calendar), when "nature [itself] is transfigured," especially mountains, forests and water, i.e. it grows colder. On the Feast of the Presentation of Jesus Christ (*Sretenje Gospodnje*, February 15th, Gregorian calendar) "days begin to lengthen, and nights begin to shorten." This is the belief among the people in the region of Aleksinačko Pomoravlje, in eastern Serbia, along the basin of the Južna Morava (Nedeljković 1990).

A. Pondro states that if there is thunder on St. George's Day (*Jurjevo, Đurđevdan*, May 6th, Gregorian calendar) in Sarajevsko polje, hazelnuts will drop. On the same day in Nevesinjsko polje in eastern Herzegovina, it is believed by N. Bovan, that if enough rain falls to wet the horn of a bull, the year will be good for people engaged in agriculture. He added that if there is thunder on St. Elias' Day (*Ilindan*, August 2nd, Gregorian calendar), hazelnuts will not drop. One research showed that farmers from Lower Austria, among other "holy" days, organized their activities according to St. George's Day (Landsteiner 1993, 57-58). The same can be said for our ethnographic examples from Sarajevsko polje and Nevesinjsko polje, where (a 13 days later) St. George's Day is being observed as a benchmark. K. Šimić and Ž. Šimunović in Imotsko polje in western Herzegovina believe that summer will be arid if there is no rain or storm on that day, while a productive year and a lot of summer rains are expected if it rains on St. Peter's Day (*Petrovdan*, July 12th, Gregorian calendar). The locals also use a proverb to refer to predicting snow after St. Catherine of Alexandria's Day (November 25th): "St. Kata, snow at the door" (*Sveta Kata, snig/snijeg na vrata*). A. Ćović from the area Mostarsko blato in the same subregion claims ice can be expected when frogs croak before the Feast of the Annunciation (*Blagovisti*, March 25th), and stop after it. High productivity is expected in the village of Barači in Bosanska Krajina, according to J. Došlov, if it snows on Orthodox Christmas (January 7th, Gregorian calendar), or if it rains on St. George's Day (May 6th, *Đurđevska*) or Ascension (40 days after Orthodox Easter, *spasovska*), or indeed on the Pentecost (50 days after Easter, *duovska kiša*).

RE-EVALUATION OF SELECTED ORAL NARRATIVES IN ETHNOGRAPHIC MATERIAL

Recent research has discussed the concept of traditional ecological knowledge, pointing out that there is a wide spectrum of oral narratives about weather and climate which are, for the purpose of this research, recognized as well-founded, with some belonging to unfounded beliefs (Zwitter 2020, 49-82). These claims are not value judgments, but an analytical tool for classification of ethnographic material, as Berkes observed a long time ago, and has been included in the earlier part of this article (Berkes

1993). However, in everyday life things usually look different, especially because local communities can combine traditional with popular or scientific knowledge (Hernández-Morcillo et al. 2014, 4). European traditional knowledge differs from knowledge of various tribal, indigenous, and predominantly ex-colonized societies from North, Central and South America to Africa and New Guinea. In Europe, communities do not depend on the local landscape so much, due, in part, to trade. This personal and collective relation towards the environment creates specific forms of “communally stored experiences (...) mostly independent of western science and connected to rituals of social life” (Molnár et al. 2008, 18). In that sense, traditional ecological knowledge can be transmitted not just orally and through written texts, but also “other media containing local as well [as] non-local knowledge” (Hernández-Morcillo et al. 2014, 4). Last, it is clear that these forms of traditional ecological knowledge can be verified through experience, but not all of them can be treated equally regarding their verifiability and reliability. That is why our ethnographic material was divided into “positive” and “negative” examples that represent an analytical tool for classification of our ethnography. Our anthropological contribution to the perception of nature is oriented towards the exploration of cognitive processes and systems of classification which go into the make-up of agrarian society. One research example from Lower Austria shows that farmers organized their activities according to certain “holy” days, such as St. George’s Day (April 23rd), but these practices were not in conflict with meteorological and climatological science, which provided measurements with basic instruments since the 17th century. The Christian calendar was used to match both traditional and modern discourses about the weather, which further muddies such boundaries between these two systems of classification. Generally speaking, people brought the Christian calendar in line with the vegetation cycle of grapevines (Landsteiner 1993, 57-58).

In our ethnographic material, “positive” examples can be seen in the romanticized practices that are believed to predict good weather based on the color of clouds, sky, or even the sun in the Romanija (Pale) and Herzegovina (Grude) regions, as well as Sarajevsko polje. The locals claim if they have red, pink, golden or orange (bright) colors at sunset, the following day will be clear and sunny. Keeping in mind that traditional ecological knowledge is not static, but rather a dynamic concept of “constant qualitative and quantitative changes” (Zwitter 2020, 60-61), the same phenomenon of a red sun at sunset can, in Bosanska Krajina (Baraći), predict rainy weather. Examples of bad weather predictors (of rain, storm, hail etc.) in the southeastern part of Sarajevsko polje and western Herzegovina, such as clouds of specific shape (tower, billowing), represent high-quality intuition. It is actually a “social institution,” which functions as a cornerstone of individual and collective act of giving meaning to their living environment (Landsteiner 1993, 44). The predictions born of this practice were believed to be almost always correct, more often even than the official weather forecast. The locals of the southeastern part of Sarajevsko polje (at around 500 m of altitude) noticed that when clouds go uphill the rain will stop, while moving towards the basin or downhill usually indicated rainy weather. In southeastern Bosnia/eastern Herzegovina (Kalinovik, at 1000 m of altitude) and Bosanska Krajina (Baraći, 750 m of altitude) the situation is the reverse: the fog descending to the valley announces nice weather, while cool, refreshing temperatures can be expected if the fog ascends uphill. While Sarajevsko polje has a continental climate, Kalinovik and Baraći belong to a mountainous climate zone, and it stands to reason that the fog would behave differently in these two contexts. Traditional local knowledge of the southern wind (Sirocco or *jugo*, driving wet air masses from the Adriatic) in Herzegovina shows that people believe this wind is a harbinger of rain.

Speaking without any generalization, “negative” or unfounded examples based on our ethnography are statements that connect certain groups of people with natural phenomena. In Romanija (Pale) and Herzegovina (Mostar) regions, the phrase that connects people with bad weather shows the attitude of the local population towards them. Natural phenomena have no meaning until shaped by people, their technologies, and their way of life (Landsteiner 1993, 51). Communities tend to combine novelties from culture in general with banal occurrences like rainy or windy weather, in order to make their everyday lives make sense. Products of the modern era, such as medical implants, are used as weather predictors, in place of and in addition to natural phenomena (clouds, wind, color in the sky). As the example of tra-

ditional ecological knowledge of 16th and 17th century Alpine pastures and meadows shows, this concept is not simply autochthonous, but a blend of learned and borrowed knowledge. It becomes “part of the broader cultural milieu” (Zwitter 2020, 60). The example from Herzegovina, central Bosnia, as well as its central-northern and southwestern parts regarding a symbolic twelve-day period between Catholic and Orthodox Christmas (or St. Lucia’s Day and Catholic Christmas), was also recorded in Ljubljana in the 17th century, between Catholic Christmas and Epiphany (Zwitter 2013, 314). The same interconnection between the Christian calendar and air temperature, or the extension of the day (agricultural cycle), can be perceived in the examples of The Transformation of Jesus (August 19th) or the Feast of the Presentation of Jesus (February 15th) in the central and eastern part of Serbia.

CONCLUSIONS

With documentary sources from the Middle Ages almost completely destroyed in the turbulent past of Serbia and Bosnia-Herzegovina, and while the Ottoman archival material is only partially available, scientists are left to work with narrative sources, with all their qualities and disadvantages. As Jean Delumeau demonstrated in his *magnum opus* – *La Peur en Occident*, each age in history has its own fears and anxieties, which are shaped, designed and influenced by society at large and institutions of the Church and State (Delumeau 1978). Scientists need to be more sensitive to the people in the past, which we have tried to demonstrate here with interpretation of narrative sources, but they also need to be aware of the same human traits in their own world. Ethnographic work presented here as performed in various areas of modern Serbia and Bosnia-Herzegovina, with data gathered from various interlocutors seems to confirm the bulk of traditional ecological knowledge. Not only the mountain of Biokovo, as Alberto Fortis described in 1774, but almost every mountain mentioned here – Velež, Romanija, Ivan-planina, Žaba etc. – are still used as a ‘mirror’ for weather predictions, and people vigilantly watch the shape and color of the sun, moon, and clouds, the direction of winds with their local character, the color of the sky at dawn and dusk, as well as the behavior of wild and domestic animals, and their own feelings on the skin and ‘in the bones’. Major Christian holidays – Orthodox and Catholic – Christmas, St. George’s, St. Demetrius, St. Elias Days are still used as markers to start with certain agricultural labors and to ‘read’ the omens, good and bad, for the forthcoming year. Considering the longevity of experience living on the land and from the fruits of the land, contemporary scientists should invest more effort in gathering, preserving, and presenting traditional ecological knowledge and agricultural practices around the world. This paper is thus part of that larger endeavor, aiming to stimulate similar research in the wider region of Southeast Europe.

SAŽETAK

S obzirom na to da su dokumentarni izvori za srednjovekovnu Srbiju i Bosnu i Hercegovinu skoro u potpunosti uništeni tokom njihove burne prošlosti, a podaci osmanskih arhiva su tek delimično objavljeni, naučnici su upućeni na narativne izvore, sa svim njihovim kvalitetima i nedostacima. Žan Delimo je u svom magnum opusu – *Strah na Zapadu*, pokazao da svako doba ima svoje strahove i teskobe, koje oblikuju, formiraju i na koje utiču Društvo i institucije. Stoga smatramo da naučnici treba da budu senzitivniji prema ljudima u prošlim vremenima, što smo pokazali ovde u interpretaciji narativnih izvora, ali takođe treba da budu svesni zajedničkih osobina kod ljudi u savremenom svetu. Etnografska istraživanja koja su ovde predstavljena potiču iz različitih oblasti savremene Srbije i Bosne-Hercegovine, i njihovi rezultati potvrđuju najvećim delom postojanje tradicionalnog ekološkog znanja. Ne samo planina Biokovo, kako je Alberto Fortis zabeležio 1774, već i skoro svaka planina u ovim istraživanjima – Velež, Romanija, Ivan-planina, Žaba i dr., i dalje služe kao ‘ogledala’ u kojima se predviđa vreme, i ljudi budno posmatraju oblik i boju sunca, meseca, oblaka, pravac vetrova sa njihovim osobinama, boju neba u zoru i sumrak, kao i ponašanje divljih i pitomih životinja, pritom ‘osećajući vreme’ na koži i u kostima. Glavni hrišćanski praznici, pravoslavni i katolički – Božić, Đurđevdan, Mitrovdan, Ilindan, i danas se koriste

kao oznaka za početak nekih poljoprivrednih radova i za ‘čitanje’ znakova koji upućuju na dobro ili loše vreme u narednoj godini. Uzimajući u obzir takvu dugovečnost iskustva življenja na zemlji i od plodova zemlje, savremeni naučnici bi trebalo da ulože više napora u prikupljanju, očuvanju i predstavljanju tradicionalnog ekološkog znanja i zemljoradničkih praksi u celom svetu. Stoga je ovaj rad deo tog većeg poduhvata, s ciljem da se stimulišu slična istraživanja širom regiona Jugoistočne Evrope.

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