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## ESSAY ON THE HISTORY OF STUDY OF FORESTS OF THE CENTRAL CISCAUCASIA

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The article gives a brief overview of the history of study of forest flora and vegetation of the Central Ciscaucasia from the late 18th century till present. The entire history of the study of forests in this region can be divided into five periods. Each period has a particular degree and depth of study of forest flora and vegetation. The majority of the publications relates to individual areas where the vegetation cover was studied either as part of works covering larger regions or during narrowly focused studies. The long history of forest study in a region like the Central Ciscaucasia is of interest in the context of learning the history of scientific thought development in Russian botany.

**Key words:** *Central Ciscaucasia, forest, flora, vegetation, study history, study period*

The Central Ciscaucasia is the central part of North Caucasian plains and foothills. The region includes the Stavropol Upland, the Terek and Sunzha crests. Due to the complex terrain the orography-dependent differences in moisture are observed, and an altitudinal climatic zonality appears in some areas (the western part of the Sunzha crest, the Caucasian Mineral Waters region) (Gvozdetsky, 1957, 1963).

Currently, more than 80% of the forest area of the Central Ciscaucasia lie in the Stavropol Upland and the Terek and Sunzha crest (Shevchenko, Viktorov, 2014). Forests are formed by oak–hornbeam–ash and beech–oak–hornbeam communities with an admixture of the field maple (*Acer campestre* L.), Norway maple (*A. platanoides* L.), field elm (*Ulmus minor* Mill.), white poplar (*Populus alba* L.), cherry (*Cerasus avium* (L.) Moench.), Caucasian linden (*Tilia begoniifolia* Steven), Caucasian pear (*Pyrus caucasica* Fed.), common hawthorn (*Crataegus monogyna* Jacq.), blackthorn (*Prunus spinosa* L.) and others (Belous, Shevchenko, 2010; 2011; Shevchenko 2013; Shevchenko, Viktorov, 2014). In the gullies of the steppe rivers of the Kalas Heights there are gully forests with predominant oak–hornbeam–ash and oak–ash communities. Oak–poplar and oak–elm–ash communities are common in the floodplains of the Kuban, Terek, Sunzha, Baksan and Kuma rivers (Shevchenko, Belous, 2007; Shevchenko, 2013).

The objective of this study is to review the history of flora and vegetation study in the Central Ciscaucasia forests on the basis of literature-based data.

## RESULTS AND DISCUSSION

The long history of studying the flora and vegetation of the Central Ciscaucasia forests is inextricably intertwined with the study of the Caucasus as a whole and dates back about 250 years. The entire period of botanical and geobotanical studies which somehow or other deal with the area of interest can be divided into five main periods.

**The first period** (1771–1809) was marked by early expeditions of the St. Petersburg Academy of Sciences. The early period is associated with the names of famous botanists J.A. Gldenstdt (1787–1791), S.G. Gmelin (1784), P.S. Pallas (1789), and Ch.Ch. Steven (1809). Most routes of these expeditions merely touched the territory of the Central Ciscaucasia; the research was focused on studying the flora of the oldest Russia health resort, i. e. the Caucasian Mineral Waters region. Despite the general descriptive nature of the research, the obtained scientific materials formed the basis of knowledge about the nature of this region.

The small report on the forests of the Caucasian Mineral Waters by J.A. Gldenstdt "About Beshtau mountains or Pyatigorye" published in the collection "The latest geographical and historical information about the Caucasus" (Bronevsky, 1823) is of particular interest. This material is one of the first mentions of the forests of the Pyatigorye region with the enclosed brief listing of the flora of Mount Beshtau forest consisting of 54 plant species. J.A. Gldenstdt gives a brief overview of the forests of Mount Beshtau: "*...making my way to the top of the mountain, the forest was markedly reducing and shrubs were gradually replacing it. Before I reached its naked summit, I noticed Pontic Azalea to be the most common of all plants... Other types of trees and plants are seen across the area of Mount Beshtau... The forest stretches beyond the foothill of Mount Beshtau in different directions, much further to the North, even reaching the plains, but in the East it ends near Mashuk Mountain...*" (Bronevsky, 1823. P. 361).

In 1773, J.P. Falk made an expedition to the Caucasus across the Terek and Sunzha crest. In his reports on the nature of the region he describes the species composition of the forests of the crest: "*...elm, yew, hornbeam, barberry, pear, apple and plum species grow in the mountains near Terek...*" (Falk, 1824. P. 227). Unfortunately, this report gives very little information about the forests of the region, at the same time it is one of the first references to the foothill forests of the Terek and Sunzha crest, and is in our opinion worth noting.

In 1793, an expedition under the leadership of P.S. Pallas was sent to the Caucasus to update and edit the data collected by J.A. Gldenstdt. The route passed through the mountains of Beshtau, Mashuk, the city of Kislovodsk, Georgievsk and the valley of the Baksan River. One of

Pallas's descriptions is an essay on the forests of Mount Beshtau, listing 53 species of plants. In his notes, he writes that "... the forest on Beshtau is not evenly spread along the foothill of the mountain. Towards the East, it goes uninterrupted to Mashuk Mountain; to the North it reaches the foothill of the neighbouring mountains. Zheleznaya and Zmeyka mountains are also heavily forested..." (Pallas, 1789. P. 86).

In the period from 1800 to 1803, Ch.Ch. Steven made an expedition across the North Caucasus. While travelling, he made notes on flora and collected a large herbarium. Ch.Ch. Steven was the first to describe such species as *Colchicum umbrosum* Stev., *Dictamnus gymnostylis* Stev., *Ornithogalum arcuatum* Stev. (*Locus classicus*, Mount Beshtau) in the forests of the Central Ciscaucasia (Steven, 1809).

**The second period** (1810–1895) contributed to the accumulation of knowledge about the flora of the region as well as to the collection of extensive herbarium material and the publication of floristic reports. Most expeditions were mainly observational and focused on the nature and population of the region. This period is associated with the names of F.M. von Bieberstein (1819), C. Koch (1849), A. Becker (1868), P.N. Muromtsev (1872), A.P. Overin (1875), A. Riesenkampf (1881–1882; 1882; 1883; 1904), A.P. Norman, (1881), I.Ya. Akinfiyev (1893; 1894a; 1894b; 1897; 1898), S. Sommer and E. Levier (1900). Currently, the herbarium material collected by them is the oldest documented source of information about the flora of the region and this information is cited in various floristic reports.

One of the important works of this period is the paper on the Crimean-Caucasian flora by F.M. von Bieberstein (Bieberstein, 1819) where the author gives information on nearly 2.300 plant species classified according to the Linnaean system. On the basis of collections made in the forests of the Central Ciscaucasia the author describes four new plant species: *Lilium monadelphum* M. Bieb. (*Locus classicus* Mount Beshtau), *Euonymus nana* M. Bieb. (*Locus classicus* Mount Beshtau), *Hablitzia tamnoides* M. Bieb. and *Physochlaina orientalis* M. Bieb. (Bieberstein, 1819).

In 1875, A.P. Overin published "The List of Pyatigorye Flora" consisting of ca. 800 species including 343 species of forest flora, with the extensive herbarium material (Overin, 1875). The report of A.P. Overin on flora of Pyatigorsk is most likely the first floristic report for the region of the Caucasian Mineral Waters.

In the second half of the 19th century A.P. Norman, an apothecary, collected a herbarium of the flora in the vicinity of the city of Stavropol, the valley of the Kuma River and the deserts of the the Kuma river region. After his death in 1913 M.V. Brzhezitzky and P.I. Nagorny published the "Florula Stavropolensis" collection with a list of 1,016 plant species. The herbarium collected by A.P. Norman is of great value for the study of forest flora in the region because it is the oldest one and includes many plant species of the Stavropol Heights forests, i. e. Archiyereysky,

Tamansky, Chlinsky, Krugly, Temny forests and of Russkaya lesnaya dacha. Unfortunately, herbarium collection made by A.P. Norman was not followed by any further studies of the regional flora and vegetation. The majority of plants he collected were later classified by J.Th. Schmalhausen and partially by V.I. Lipsky. On top of that, the collections of A.P. Norman were random and only included 42 species of forest flora (Norman, 1881).

I.Ya. Akinfiev was exploring the flora of the Central Ciscaucasia from 1881 to 1898. Beside floristic collections, the author made notes on the ecology of forest communities of Mount Beshtau and their association with various forms of terrain: "... *beech, hornbeam and linden are common throughout the shaded slopes, while oak, ash, maple, elm and other Ulmus species grow on the southern slopes*" (Akinfiev, 1894b. P. 201). These reports are interesting in so far as they are the first attempts to explore the ecological patterns of location of forests of Mount Beshtau.

**The third period** (1898–1945) began with the first geobotanical reports on the territory of the Central Ciscaucasia, including those on forest vegetation. The first data on forest vegetation appeared in the works of V.V. Markovich (1898), V.I. Lipsky (1891; 1894; 1899), G. Shiryayev (1904), I.V. Novopokrovsky (1906), G. Stepunin (1914), W. Koch (1925) and others. Despite the fact that in many regions of the Russian Empire and later in the USSR forest typological studies flourished (Morozov, 1917; Pogrebnyak, 1928, etc.), forests of the Central Ciscaucasia were considered mainly as an object of floral studies.

The first geobotanical (Novopokrovsky, 1906; Bush, 1930; 1935; 1937; Kuznetsov, Bush and Fomin, 1901–1916, etc.) and floristic maps (Lipsky, 1899, etc.) of the region appeared, the issues of reforestation (Markovich, 1898; Stepunin, 1914; Rogovsky, 1928, etc.) were largely debated.

The monograph by V.V. Markovich "In the forests of Ichkeria – a forest ranger's memories of the Chechen forest" (1898) is the first paper to give practical recommendations on the protection and regeneration of forests of the Central Ciscaucasia, forest protection legislation and personal memoirs of the author are included. Botanical aspects form a small fraction of the work and include only a list of the main forest-forming tree species and their possible practical applications. This paper is of great value in terms of studying the history of forest management in the region (Markovich, 1898).

The monumental work of the famous researcher of the Caucasian flora V.I. Lipsky, "Flora of the Caucasus" (1899), containing a list of 4,430 plant species with their geography was published in the late 19th century. One more focus of the paper is the history of the study of regional flora with a list of literature and a brief analysis of each paper (Lipsky, 1899).

The article by G.I. Radde "The main features of the plant world in the Caucasus" (1901) gives a review of the patterns of vegetation distribution in the Caucasus region including the Central

Ciscaucasia. It was noted that "...the valley of Baksan and Malka is abundant in willows with black poplars, aspen, crippled oaks in between..." (Radde, 1901. P. 112).

The "Proceedings of the Society of Naturalists of Kazan University" collection, containing a large article on the vegetation of the southern slopes of Mashuk Mountain by G. Shiryaev, titled "Vegetation of Mashuk Mountain" was published in 1904. The paper contains findings of a floristic study of the southern slope of Mashuk Mountain; it is noted that all forests of Mashuk Mountain are secondary (Shiryaev, 1904).

In this period of research it is also necessary to mention the article by G. Stepunin "Forests of the Stavropol Upland" (1914). The final version of the article was never published because of the revolution. This article gives some recommendations on economic use of the woods and on geography of the Stavropol Upland.

In addition to these publications on the flora and vegetation of the region, a number of summary reports was also published in this research period, somehow or other concerning the forest flora of the Central Ciscaucasia. Those are such works as "Flora Caucasica Critica..." (Kuznetsov, Bush and Fomin, 1901–1916); "Vegetation of the Stavropol Krai" (Novopokrovsky, 1906); "List of plants of the North Caucasus and Dagestan" (Flerov, 1938); "A botanical and geographical sketch of the Caucasus" (Bush, 1935); "List of plants collected in the vicinity of stanitsa Naurskaya, Terek region (Razdorsky, 1913); "Vegetation of Kabarda" (Chernetskaya, Vinogradov, 1926), etc.

**The fourth period** (1946–1987) began with the publication of the first forest typological works on the forests of the Central Ciscaucasia and the North Caucasus; floristic, florogenetic and geobotanical studies of the Caucasus were continued. This period is associated with the names of T.B. Vernander (1946), A.A. Klopov (1952; 1960), N.N. Tumadzhyanov (1961), V.N. Kononov (1960; 1964; 1968; 1971; 1976), S.P. Ganzha (1968), B.F. Ostapenko (1974), V.G. Gnilovsky (1971; 1976) and others.

Unlike the works of the previous periods, these ones became comprehensive studies of the forests of the region were carried out. One of the top priorities was the economic and conservation value of forests as well as measures for their regeneration. Most publications somehow related to the forests of the region were made as review articles without detailed descriptions of forest communities. Besides, there was almost no information about the state of forest communities of the Terek-Sunzha crest and floodplain forests of the foothills of the Central Ciscaucasia, apart from some solitary floristic notes.

The article by T.B. Vernander "Vegetation of the urban forest of Mount Beshtau" (1946) became one of the first forest typological papers on Ciscaucasian forests. The paper not only gives floristic descriptions of the forests of Mount Beshtau, but also contains information on the history of exploration of these forests. T.B. Vernander distinguishes 4 types (beech, ash, hornbeam and

oak) and 12 cycles of forest type of the urban forest of Mount Beshtau. One of the limitations of this work is that it is an overview, lacking specific geobotanical descriptions or methodological features of distinguishing between forest types and cycles.

At this period V.N. Kononov published his articles on the study of individual small forest areas of the region, i. e. Russky, Kazenny forests, forests of the heads of the Yegorlyk and Tomuzlovka rivers (1960; 1964; etc.), which are small floristic reports without geobotanical descriptions.

In the context of studying the history of reclamation and restoration of the forests of the Stavropol Upland the article by A.A. Klopov "Forests of the Stavropol Krai" (1952) is of great interest. It provides historical facts about reforestation in the Stavropol Krai from the late 19th to the mid-20th century.

In 1968, the article by S.P. Ganzha "Forest types of the Stavropol Upland" was published. Depending on the dominance of the main forest-forming species for the Stavropol Upland, the author distinguishes five types of forests (beech, oak, maple, hornbeam and ash) (Ganzha, 1968).

The monograph by B.F. Ostapenko "Types of forests of the Stavropol Krai" (1974) deserves special attention. It provides six main types of forest within the boundaries of the modern Stavropol Krai and the Karachay-Cherkessia Republic: oak, beech, dark coniferous, pine, floodplain and forests of the upper boundary of the stand spread (Ostapenko, 1974). Of all the papers dealing with the forests of the region, this monograph is the most interesting one from the forest typological point of view. In addition to describing the types of forest, the paper lists economic groups and logging principles of forests. The monograph lacks comprehensive assessment and comparative description of forest types of the region.

An outstanding work on the history of forest management and forest area dynamics in the Ciscaucasia is the article by V.G. Gnilovsky "Forests of the Stavropol Upland according to historical and geographical data" (1971), "New data on forest maps of the Stavropol Krai in the early 19th century" (1976). The author analyzes old maps of the Caucasus. The findings of his research make it possible to assess the dynamics of the composition of the main forest-forming species, predominantly of the forests in the vicinity of Stavropol. These articles provide a list of inventory numbers of old maps of the region and their storage data, making it much easier to find them for more detailed study.

In addition to the above works, there was a number of publications in this period somehow or other concerning the forests of the Central Ciscaucasia: "Flora of Kabarda" (Kos, Demishev, 1951); "The condition of stands of the forest area of Mount Beshtau" (Bondarenko, 1958); "Development of forest crops on the green slopes in the area of the Caucasian Mineral Waters" (Demyanov, 1964); "The guide to higher plants of North-West Caucasus and Ciscaucasia"

(Kosenko, 1970); "Vegetation of Checheno-Ingushetia" (Galushko, 1975); "Ecology of herbaceous plants of forest-steppe oak forests" (Goryshina, 1975); "To the research of the floristic composition of the Stavropol Upland forests" (Grantseva, 1976); "Flora of the North Caucasus" (Galushko, 1978–1980); "Vegetation of the North Caucasus and its natural forage lands" (Shiffers, 1953); "Forest resources of Kabardino-Balkaria" (Nechaev, 1960); "Catalogue of wild plants of the Stavropol Krai" (Tanfiliev, Kononov, 1987) etc.

**The fifth period** (from 1988 till present) is marked by the transition to an in-depth study of local flora and vegetation, analysis and generalization of materials from previous periods. One of the top focuses is research into the state of threatened and endangered plant species which is associated with the publication of regional Endangered Species Lists (Red Books) (Endangered Species List of the Republic of North Ossetia-Alania, 1999; Endangered Species List of the Kabardino-Balkarian Republic, 2000; Endangered Species List of the Stavropol Krai, 2002; Endangered Species List of the Republic of Ingushetia, 2007, and Endangered Species List of the Chechen Republic, 2008). Most of the works are aimed at taking inventory of the flora. Major reports such as "Brief listing of the flora of the Stavropol Krai" (Ivanov, 1997, 1998); "Brief listing of the flora of the Chechen Republic" (Umarov, Taysumov, 2011); "Brief listing of the vascular plant flora of the Caucasian Mineral Waters and neighbouring areas" (Mikheev, 2009) are published. A number of theses were devoted to the analysis of flora of certain floristic regions (Ivanov, 1998; Utenkova, 2001; Ivanov, 2004; Chimionina, 2004; Mikheev, 2009; Morozova, 2009, etc.) was defended. These papers analyze the flora of certain floristic areas without delineation of the forests; there are no descriptions of forest types or patterns of their distribution. Besides, the publication of a series of articles is continued on the study of flora of individual forest areas, updating of areas and description of the status of populations of threatened and endangered plant species (Gruchushkina-Sukhorukova et al., 1993; Belous, Dronov, 2005; Ivanov, 1990; Shevchenko, Belous, 2005; 2006; 2007a; 2007b; 2008, 2009; Shevchenko, 2007a; 2007b; 2008; 2009a; 2009b; 2011a; 2011b; Shevchenko N. E., Belous V. N., Ulanovsky, 2012; Doronin, Shevchenko, 2008; etc.).

In 2014 the "Brief listing of the flora of the Central Ciscaucasia forests" (Shevchenko, Belous, 2014) was published, which is a result of the successful candidate's thesis "Forests of the Central Ciscaucasia: floristic composition, vegetation and problems of their protection" (Shevchenko, 2013). The "Brief listing..." lists 746 species of vascular plants of forest flora and provides with ecological, chorological and phytosozological description of these species.

Based on the materials of archival records, old forest maps and review of published papers, the article by N.E. Shevchenko "Dynamics of the area and measures of forest conservation of the Stavropol Governorate based on historical and geographical data from the late 17th to the

early 20th century" (Shevchenko, 2015) provides information on the area and measures of forest protection in the Stavropol Governorate (the Stavropol Upland). The role of the Stavropol Governorate Forest Protection Committee and certain provisions of the Forest Department in the conservation of forests in the region is outlined. Three main stages of artificial reforestation are described followed by the examples of individual works being of the greatest importance for the region. It was found that from the late 17th century to 1880 the forest area of the Stavropol Upland decreased by 40% due to active exploitation of the region and uncontrolled felling. From 1880 to 1917, successful reforestation resulted in the increase of the forest area in the governorate by 22%.

In the period from 2012 to 2018, a series of articles on the analysis of the flora of the Central Ciscaucasia forests (Shevchenko, 2018), their forest typological composition (Shevchenko, Viktorov, 2014), spectrum of fertile forms of forest flora (Shevchenko, Godin, 2015) and the history of forest protection in the region (Shevchenko, 2012; 2011b; 2014) was published.

Therefore, the long history of studying the flora and vegetation of the Central Ciscaucasia forests, from the first expeditions of the St. Petersburg Academy of Sciences to the present time, made it possible to scrutiny the floristic composition and vegetation of forests in the region, the history of natural resource management and the dynamics of their area. Reviewing the materials on the history of forest studies in the region provides an opportunity to assess the promising lines of future research. These papers clearly lack deep research of the structural and functional organization of forest ecosystems aimed at increasing productivity and preserving forests' biodiversity in the arid climate of the region.

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