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# Glasilo Future

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## New data on the distribution of *Adiantum capillus-veneris* L. in Bosnia and Herzegovina

Semir Maslo<sup>1\*</sup>, Šemso Šarić, Đorđije Milanović<sup>2</sup>

*prethodno priopćenje (preliminary communication)*

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### Abstract

This paper is a survey of distribution of *Adiantum capillus-veneris* L. in Bosnia and Herzegovina based on a revision of herbarium material from SARA and ZA collections, literature data and field observations. In addition, a brief morphological description, distribution map and photographs of the species are presented. The aim of the paper is to describe the current distribution of the species in the territory of Bosnia and Herzegovina based on new field research conducted in the last 20 years. It was established that the species is present in nineteen UTM quadrants in Bosnia and Herzegovina, three of which are reported for the first time for the area. On the other hand, the presence of the species was confirmed at the locality of Vranduk in central Bosnia, where it was previously stated that it had disappeared. In the territory of Bosnia and Herzegovina this species is relatively common in the Mediterranean part of the country, especially in the Neretva valley, while in the continental part of the country it is recorded only in four localities, mostly near thermal springs.

**Key words:** *Adiantum*, Bosnia and Herzegovina, distribution, morphology, rare taxa.

### Introduction

The genus *Adiantum* L. includes 225 species distributed mostly in tropical and subtropical regions of the world (Kessler et al., 2017) of which only *Adiantum capillus-veneris* L. is native to Europe. It is a cosmopolitan species that occurs on all continents except Antarctica. Native distribution areas of the species in Europe include the Mediterranean countries as well as the British Isles, including Ireland (Christenhusz and Raab-Straube, 2013). *A. capillus-veneris* is a hygrophilous fern of tropical and subtropical areas. In Bosnia and Herzegovina it is a characteristic species of vegetation of the half-caves with dripping water of the class *Adiantetea capilli-veneris* Braun-Blanquet in Braun-Blanquet, Roussine et Nègre (1952), where tufa is frequently formed (Lasić and Jasprica, 2016).

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<sup>3</sup> Maslo, S., Šarić, Š.o., Milanović, Đ. (2024). New data on the distribution of *Adiantum capillus-veneris* L. in Bosnia and Herzegovina. *Glasilo Future*, 7(2-3), 36–46.

The species has a limited distribution in Bosnia and Herzegovina; its habitats are mainly in the Mediterranean part of the country, in fragmented populations along the banks of the Neretva River and its tributaries south of Konjic. On the other hand, the species has been recorded in four localities in the continental part of the country, where it usually grows around hot springs. This fern occurs on shaded, moist rocky sites on porous, calcareous rock, including tufa, masonry, and other soft limy rocks.

*Adiantum capillus-veneris* is semi-evergreen fern, often pendulous and hanging from vertical surfaces. Fronds are 10-40 cm, 2-pinnate. The petioles and rachis are shiny, slender, and deeply brown to almost black. Ultimate segments are thin, pale green, cuneate, with 2-8 broad lobes in the upper part. Sori on recurved marginal lobes, several on each lobe. Detailed description of the species can be found in Mayer and Horvatić (1967). It is a protected species in Bosnia and Herzegovina (Brežančić, 1962; Šilić, 1992–1995) and classified as vulnerable in the Red List (Đug et al., 2013).

## Material and methods

The study was carried through field studies in Bosnia and Herzegovina conducted between 2003 and 2023, analysis of herbarium material deposited at SARA and ZA (Thiers, 2023), as well as literature data. The specimens were collected and stored in the Herbarium SARA and in the private collection of the authors. Digital photographs were taken in the field (Fig. 1; Fig. 2.) The nomenclature follows the Euro-Med checklist (EURO+MED 2006). The distribution of the species in Bosnia and Herzegovina is shown on the map using standard UTM grid 10x10 km (Fig. 3). A list of all localities representing the distribution of *A. capillus-veneris* in Bosnia and Herzegovina is given in the Table 1. with WGS1984 coordinates.

## Results and discussion

The oldest record for Bosnia and Herzegovina is that of Pantocsek (1874) for Skočigrm near Trebinje (Eastern Herzegovina), which was thereafter reported by Beck-Mannagetta (1916) and Ritter-Studnička (1959), and subsequently confirmed by Abadžić on 13.06.1982 (SARA 53852). Subsequently, the species was recorded in several localities, mostly in the valley of the Neretva River and its tributaries (Struschka, 1880; Fiala, 1891; Murbeck, 1891; Pichler, 1898/9; Sagorski, 1901; Malý, 1927; Kosorić, 1977; Nedović, 1981; Šilić, 2002, 2009, Maslo, 2014; Maslo and Abadžić, 2015). This species was first recorded for the continental part of the country by Hofmann (1878) who noted it at the locality of Gornji Šeher near Banja Luka, which was published in *Österreichische Botanische Zeitschrift* (Hofmann, 1879; 1982). Beck-Mannagetta strongly doubts the credibility of this find, considering that a find of this species is almost impossible in the continental part of the country, especially in December (Beck-Mannagetta, 1916). The presence of this species at the mentioned site was confirmed with certainty for the first time by the Croatian botanist Vale Vouk, who visited this site in 1937 as part of his work on the biology of thermal springs (Vouk, 1940). This finding was later confirmed by other botanists: Ritter-



Studnička (1957), Slavnić and Bjelčić (1963), Nedović (1981, 1984), Brujić et al. (2011) and Stupar et al. (2011). After almost 100 years since the first find from Gornji Šeher, this species is mentioned for another locality in continental Bosnia, namely near Višegradska Banja in eastern Bosnia. As in the location near Gornji Šeher, the species grows here only near thermal springs (Ritter-Studnička, 1969). The third finding of the species in the continental part of Bosnia refers to the locality Vranduk in the valley of the river Bosna, where it grows in the moist area of a cold spring (Ritter-Studnička, 1973). The presence of this species at Vranduk is interesting as it was found for the first time inland around a cold spring where this plant was able to successfully survive continental winters. The presence of this species at the mentioned locality was recently indicated as questionable, and the species is listed as vanished from the current locality (Trakić et al., 2021). During the field research conducted in 2015, it was possible to establish that the species is still present at the mentioned locality near Vranduk, where several hundred individuals were recorded. Upon a re-visit of the site between 2016 and 2023, we observed that the number of individuals was almost unchanged.

Only recently, the species was also recorded in central Bosnia at the Sedraspring, on the left bank of Stavnjariver, near the town of Breza (Trakić et al., 2021), which is also only the fourth finding of the species in continental Bosnia and Herzegovina.

In the Herbarium of the National Museum of Bosnia and Herzegovina (SARA), 21 specimens of *A. capillus-veneris* are stored. Ten of these specimens were collected in three localities in the continental part of the country (Gornji Šeher, 5 specimens; Višegradska Banja, 3 and Vranduk 2 specimens). On the other hand, eleven specimens were collected in the Mediterranean part of the country, from Konjic in the north to Trebinje in the south (Tab. 1). However, the largest number of specimens of this fern was collected by the Croatian botanist Vouk in the area of Gornji Šeher near Banja Luka in 1937 and 1939. In total, there are 22 specimens that are stored in the ZA herbarium collection.

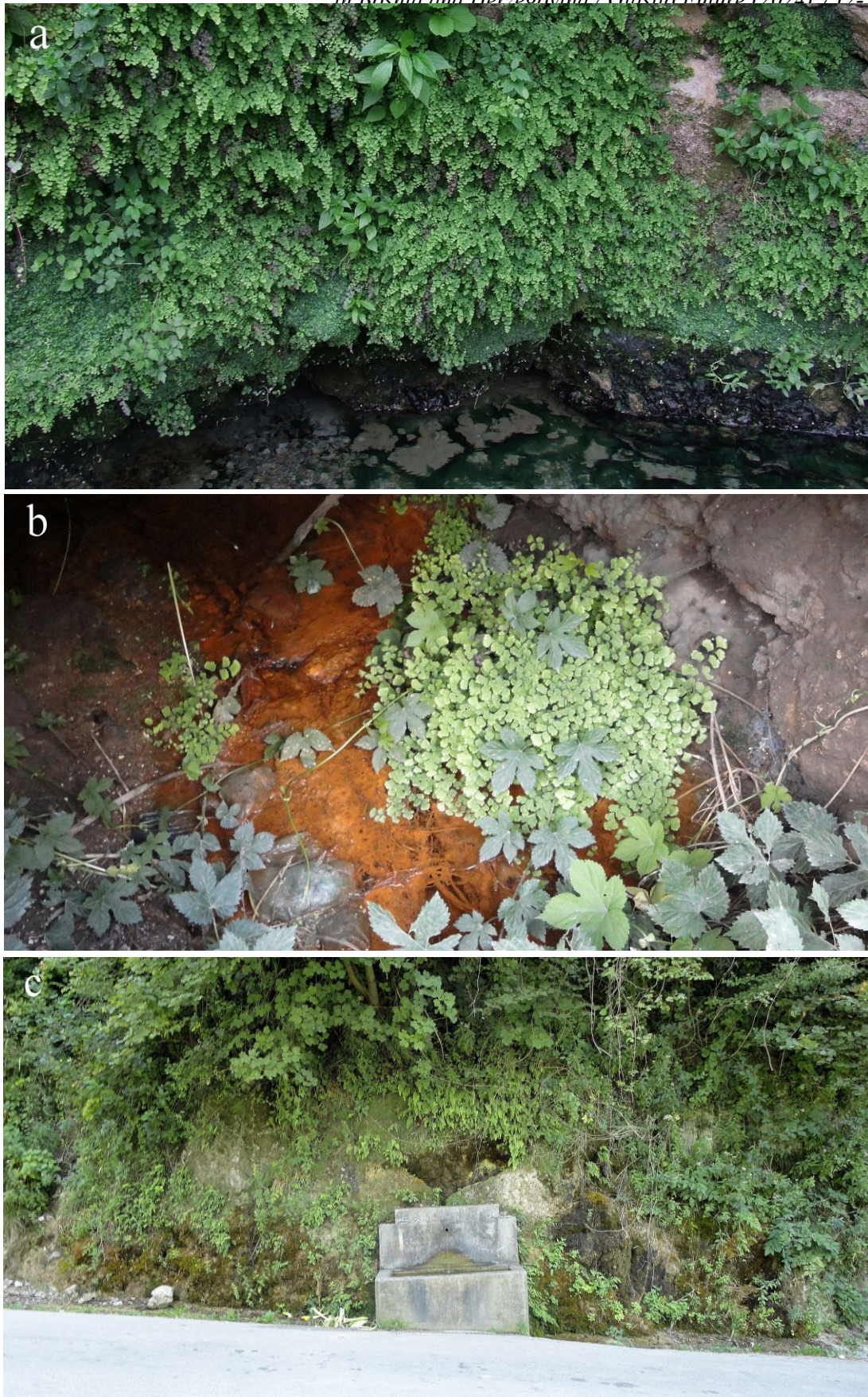
On the territory of Bosnia and Herzegovina *A. capillus-veneris* was thus recorded in nineteen UTM squares 10×10 km from Banja Luka in the north to Trebinje in the south (Fig 3). During floristic research between 2003 and 2023 the presence of this fern could be confirmed in 16 UTM squares. The species was recorded in new localities (Veljaci, Čeveljuša and Jazina) located within three UTM squares (Fig. 3).

#### *New localities:*

*Locality 1:* Vitina, Veljaci, Koćuša waterfall (43.249444, 17.452222), MGRS XH99. *Material:* SARA 53966, 15.07. 2017, 94 m, leg./det. S. Maslo. *Population:* several hundred individuals.

*Locality 2:* Ljubuški, Čeveljuša (43.168333, 17.555278), MGRS YH08. *Material:* SARA 53965, 15.07. 2017, 60 m, leg./det. S. Maslo. *Population:* several hundred individuals.

*Locality 3:* Jazina, around springs in the restaurant of Jazina (42.705305, 18.504848), MGRS BN93. *Material:* observation by Đ. Milanović, 17. 07. 2020, 310 m. *Population:* several hundred individuals.



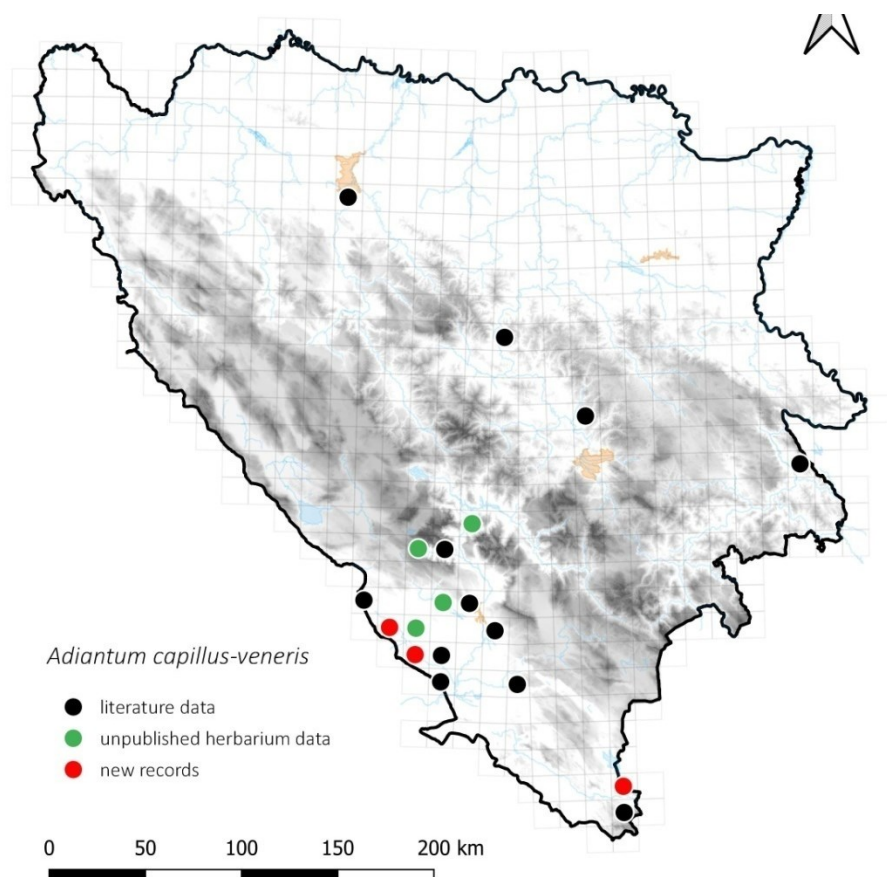
**Figure 1.** *Adiantum capillus-veneris* in some localities from Bosnia a. Gornji Šeher (Photo: Đ. Milanović) b. Sedra spring (Photo: Š. Šarić) c. Vranduk (Photo: Š. Šarić).





**Figure 2.** *Adiantum capillus-veneris* in some localities from Herzegovina  
d. Mostar, under the Old bridge, e. Ljubuški, Kravica waterfall  
f. Ljubuški, Čeveljuša g. Veljaci, Koćuša waterfall (Photos S. Maslo).





**Figure 3.** The distribution of *Adiantum capillus-veneris* in Bosnia and Herzegovina (distribution map by Đ. Milanović).

**Table 1.** Georeferenced data on the distribution of *Adiantum capillus-veneris* in Bosnia and Herzegovina.

Number and name of the locality, observers (collectors) and dates for the observations (Herbarium/collection number)	WGS coordinates	Altitude	UTM quadrant
<b>1 Lit.</b> Banja Luka, Gornji Šeher, on the right bank of the river Vrbas, Hofmann 1879, 1982; Vouk 1940; Ritter-Studnička 1957; Nedović 1981, 1984; Brujić et al. 2011. <b>Herb:</b> Gornji Šeher, leg. ? 03.09.1937 (SARA 00567), Stari Šeher, leg. Ritter-Studnička 23.08.1947 (SARA 00565), Gornji Šeher, leg. Ritter-Studnička 07.10.1955 (SARA 00564), Gornji Šeher, leg. Ritter-Studnička 07.10.1955 (SARA 00566), Gornji Šeher, leg. Bjelčić 09.1960 (SARA 00560), Gornji Šeher, leg. Vouk 27. 08. 1939 (ZA 56423; ZA 56422; ZA 56421; ZA 56420; ZA 56419; ZA 56412; ZA 56411) Gornji Šeher leg. Vouk 03. 11. 1937 (ZA 56430; ZA 56429; ZA 56426; ZA 56424; ZA 56417; ZA 56415; ZA 56414; ZA 56413; ZA 56408; ZA 56407; ZA 56406; ZA 56405; ZA 56404; ZA 56403; ZA 56402); Gornji Šeher, leg. Đ. Milanović, 01.04.2003, DjM 10/01-01/001.	44°44'56"N 17°09'32"E 44.748837, 17.158542	165 m	XK75

<b>2 Lit.</b> Vranduk, in the Bosna river Valley, Ritter-Studnička 1973 <b>Herb:</b> Iznad izvora (česme) kod Vranduka, leg Ritter-Studnička 17.08.1971 (SARA 48503), leg. Šarić 10.07.2019 (SARA 52384)	44°17'33"N 17°54'36"E 44.292500, 17.910000	305 m	YK30
<b>3 Lit.</b> Breza, Sedra spring, Trakić et al. 2021.	44°02'21"N 18°16'48"E 44.039167, 18.280000	524 m	BP87
<b>4 Lit.</b> Višegrad, Višegradaska banja, Ritter-Studnička 1969. <b>Herb:</b> Višegradaska Banja, leg. Bjelčić 09.06.1967 (SARA 00561), leg Ritter-Studnička 20.09.1959. (SARA 48502), leg Ritter-Studnička 09.08.1966 (SARA 48504).	43°49'16"N 19°18'35"E 43.819820, 19.306946	414 m	CP65
<b>5 Lit.</b> Jablanica, Doljanka river canyon, april 29, 1914, leg Maly (according to a written statement), at the limestone caves, the northernmost site in Herzegovina (Vouk1940), Nedović 1981.	43°39'30"N 17°44'41"E 43.658333, 17.744722	220 m	YJ23
<b>6 Herb:</b> Prenj Mt., Jablanička Bijela, dolina Crne reke iznad sela Tretište, leg. Abadžić, 14.04.1981 (SARA 53640).	43°37'29"N 17°48'31"E 43.624722, 17.808611	320 m	YJ23
<b>7 Herb:</b> Čabulja Mt., Vrelo Drežanke leg Šilić 11.08.1970 (SARA 00558).	43°32'54"N 17°33'12"E 43.548333, 17.553333	430 m	YJ02
<b>8 Lit.</b> Čabulja Mt., Donja Drežnica, Tramošnik stream near Golubić, Šilić 2002.	43°30'23"N 17°42'33"E 43.506389, 17.709167	400 m	YJ12
<b>9 Lit.</b> Donja Drežnica, Drežanka river canyon, Nedović 1981, <b>Herb:</b> leg. Maslo 28.07. 2008 (SARA 53964).	43°31'41"N 17°42'11"E 43.528278, 17.703194	144 m	YJ12
<b>10 Herb:</b> Čabulja Mt., Borak Vrelo Lištice ca 400 m.n.v. leg Šilić 15.08.1969 (SARA 00557).	43°24'09"N 17°36'06"E 43.402500, 17.601667	400 m	YJ10
<b>11 Lit.</b> Skakala, in cave connections on the Neretva near Mostar, Murbeck 1891, Pichler 1898/9, Sagorski 1901, Kosorić 1977, Šilić 2009, Maslo 2014 <b>Herb:</b> leg. Maslo 30.07. 2012 (SARA 53957).	43°21'44"N 17°48'22"E 43.362222, 17.806111	55 m	YJ20
<b>12 Lit.</b> Mostar, at the mouth of the Radobolja into the Neretva under the Old bridge, Nedović 1981, Maslo 2014 <b>Herb:</b> leg. Maslo 30.07. 2012 (SARA 53962).	43°20'14"N 17°48'53"E 43.337222, 17.814722	50 m	YJ20
<b>13 Lit.</b> Mostar, the canals of Radobolja river below the Tabacića mosque, Maslo 2014, <b>Herb:</b> leg. Maslo 30.07. 2012 (SARA 53963).	43°20'14"N 17°48'50"E 43.337222, 17.813889	52 m	YJ20
<b>14 Lit.</b> The source of the Buna river, Struschka 1880, Kosorić 1977, Šilić 2009, Maslo and Abadžić 2015, <b>Herb:</b> leg. Maslo 25.07. 2012 (SARA 53955).	43°15'24"N 17°54'13" E 43.256667, 17.903611	90 m	YH39
<b>15 Lit:</b> Bunski kanali, in dams at the mouth of the Buna into the Neretva, Murbeck 1891, Kosorić 1977. <b>Herb:</b> leg. Maslo 20.07. 2023 (SARA 53956).	43°14'25"N 17°50'02" E 43.240278, 17.833889	30 m	YH39



<b>16 Lit.</b> Peć Mlini, Tihaljina River, Fiala 1891. <b>Herb:</b> leg. Bjelčić 13.07.78 (SARA 00559), leg. Maslo 20.07. 2023 (SARA 53959); leg. Đ. Milanović, 09.06.2020, DjM 10/01-01/002.	43°20'10"N 17°19'25"E 43.336111, 17.323611	225 m	XJ80
<b>17</b> Tihaljina, Modro Oko, obs. Boškailo 15.07.2008.	43°18'15"N 17°23'34"E 43.304417, 17.392917	120 m	XH99
<b>18</b> Vitina, Veljaci, Koćuša waterfall, <b>Herb:</b> leg. Maslo 15.07. 2017 (SARA 53966).	43°14'58"N 17°27'08"E 43.249444, 17.452222	94 m	XH99
<b>19</b> Vitina, the source of the river Vrioštica, <b>Herb:</b> leg. Fabijanić 1973 (SARA 00569).	43°14'15" N 17°29'10" E 43.237500, 17.486111	94 m	YH09
<b>20 Lit.</b> Ljubuški, Humac, Fiala 1891. <b>Herb:</b> leg. Fiala juni 1890 (SARA 00568), leg. Brandis 18.07. 1889 (SARA 00782).	43°11'56"N 17°31'28"E 43.198889, 17.524444	75 m	YH08
<b>21</b> Ljubuški, Čeveljuša, <b>Herb:</b> leg. Maslo 15.07. 2017 (SARA 53965).	43°10'06"N 17°33'19"E 43.168333, 17.555278	60 m	YH08
<b>22 Lit.</b> Ljubuški, Studenci, Fiala 1891. <b>Herb:</b> leg. Fiala juni 1890 (SARA 00562).	43°10'47"N 17°36'27"E 43.179722, 17.607500	41 m	YH18
<b>23 Lit.</b> Ljubuški, Kravica waterfall, Fiala 1891, Kosorić 1977, Nedović 1981., <b>Herb:</b> Kravice, leg Maly 03.05.1908 (SARA 00563), leg. Stanković 14.08.2018 (SARA 51888), leg. Maslo 20.07. 2010 (SARA 53958).	43°09'22"N 17°36'29"E 43.156111, 17.608056	50 m	YH18
<b>24 Lit.</b> Struge, at the mouth of the Trebižat into the Neretva, Malý 1927.	43°05'24"N 17°42'03"E 43.092569, 17.697212	1 m	YH17
<b>25</b> Stolac, Provalije Waterfall, <b>Herb:</b> leg. Maslo 03.05. 2019 (SARA 53960); leg. Đ. Milanović, 19.03.2023., DjM 10/01-01/003.	43°05'24"N 17°57'47"E 43.089701, 17.962208	71m	YH47
<b>26 Lit.</b> Stolac, the banks of the Bregava under the bridges in Stolac, Kosorić 1977, <b>Herb:</b> leg. Maslo 03.05. 2019 (SARA 53961).	43°05'03"N 17°57'32"E 43.084167, 17.958889	59 m	YH47
<b>27 Lit.</b> At Koritna greda, near the small springs on the slopes below Skočigrm towards the Jazine valley, Pantocsek 1874, Ritter-Studnička 1959. <b>Herb:</b> leg. Abadžić, Lastva near Trebinje, selo Vučija, 13.06.1982 (SARA 53852).	42°41'03"N 18°31'07"E 42.670937, 18.536053	400 m	BN92
<b>28</b> Jazina, aournd springs in the restaurant of Jazina. Obs. Đ. Milanović, 17.07.2020.	42°42'19.1"N18°30'17.5"E 42.705305, 18.504848	310 m	BN93

## Conclusion

On the territory of Bosnia and Herzegovina, *A. capillus-veneris* has a limited distribution. According to literature data and herbarium material stored in SARA and ZA collections, as our own field study, we could conclude that *A. capillus-veneris* is a quite common species in the valley of the Trebižat River, where it has been recorded in numerous localities from the source in Peć Mlini to the mouth of the Trebižat in the Neretva near the locality of Struge. The most numerous populations with several thousand individuals were recorded at the source of the Trebižat River, along the Kravica watershed, as

well as in the localities of Veljaci and Čeveljuša. Fairly large populations were recorded along the mouth of the Radobolja River in Mostar as well as along the banks of the Bregava River in Stolac. The species is also present in northern Herzegovina, south of Konjic, where individual specimens were recorded along the banks of the Doljanka and Drežanka Rivers. On the other hand, this species has a scattered distribution in the continental part of the country, where it was recorded in only four localities, from Banja Luka in the Northwest to Višegrad in the Southeast of the country. In these continental localities, the species is exposed to various human influences that can lead to the disappearance of habitats suitable for the survival of the species.

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