



Fifty years of mapping the Balkan flora for *Atlas Florae Europaeae*

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ABSTRACT: *Atlas Florae Europaeae* (AFE), a programme for mapping the distribution of vascular plants in Europe, was launched in 1965 as a collaborative effort between European botanists. A historical review of the mapping for AFE in the Balkan countries, cited in the last volume (16) from 2013 as Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Former Yugoslav Republic (F. Y. R.) of Macedonia, Greece, Kosovo, Montenegro, Serbia, Slovenia, and Turkey (European part), is presented and achievements and problems discussed. The special challenges facing mapping of the Balkan area during the past 50 years include the extremely rich flora, diverse and mountainous relief, political and economic difficulties, inaccessibility of available data, and scarcity of botanists contributing and collecting data for mapping.

KEYWORDS: *Atlas Florae Europaeae*, plant distribution, uneven botanical knowledge, Balkan countries

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INTRODUCTION

Atlas Florae Europaeae (AFE), a running, long-term programme for mapping the distribution of vascular plants in Europe, was launched soon after publication of the first volume of *Flora Europaea* (TUTIN *et al.* 1964). Sixteen Atlas volumes, published between 1972 and 2013, cover the first volume of *Flora Europaea* and the family Rosaceae of the second volume, excepting *Sorbus* s. lat., whose treatment is planned for publication in autumn of 2017 (Table 1). A total of 4878 maps and 3089 pages are included in the published volumes of AFE; several maps incorporate more than one taxon, so the number of mapped taxa is over 5000. More than 600 persons from all European countries have contributed to the Atlas volumes, mostly as regional and assistant collaborators, several as advisers, taxonomic advisers, and data providers; more than 160 persons were involved in preparation of the latest volume.

The *Atlas Florae Europaeae Database* has been developed since the 1990s, in the early stage by scanning all

published maps of AFE and converting them to a database. Since the beginning of the 2000s, all mapping data are first transferred to the database and maps then produced from there. At the publication of Vol. 16, the *AFE Database* contained about one million distribution records. Besides being a technical aid in the production of Atlas volumes, the database has been used quite extensively, for instance in studies on plant geography and modelling of the predicted effect of climate change. During preparation of the text for the taxa to be mapped, much taxonomic and nomenclatural work was also carried out. Some results of this research were published in *Atlas Florae Europaeae Notes*, a series of background publications for taxonomic and nomenclatural corrections. Thirty-one numbers of these *Notes* have now been published.

In this paper, a short review of the challenging mapping work in the Balkans is presented in the context of the mapping programme *Atlas Florae Europaeae*. Romania is excluded because phytogeographically only the southeastern corner of it (Dobrogea) belongs to the Balkans.

Table 1. *Atlas Florae Europaeae*, Vols. 1–16. Editors, number of published maps and pages, publication dates and last additions to the maps before printing.

Volume	Editors	Number of published maps	Number of pages	Publication date	Date of last additions to the maps before printing
Vol 1 Pteridophyta	JALAS & SUOMINEN	150	121	22.05.1972	Jan. 1972
Vol 2 Gymnospermae	JALAS & SUOMINEN	50	40	10.4.1973	Dec. 1972
Vol 3 Salicaceae – Balanophoraceae	JALAS & SUOMINEN	183	128	10.6.1976	Nov. 1975
Vol 4 Polygonaceae	JALAS & SUOMINEN	95	71	20.12.1979	April 1979
Vol 5 Chenopodiaceae	JALAS & SUOMINEN	172	119	15.9.1980	Febr. 1980
Vol 6 Caryophyllaceae (<i>Alsinoideae</i> and <i>Paronychioideae</i>)	JALAS & SUOMINEN	343	176	8.8.1983	March 1983
Vol 7 Caryophyllaceae (<i>Silenoideae</i>)	JALAS & SUOMINEN	497	229	4.9.1986	March 1986
Vol 8 Nymphaeaceae – Ranunculaceae	JALAS & SUOMINEN	444	261	5.9.1989	March 1989
Vol 9 Paeoniaceae – Capparaceae	JALAS & SUOMINEN	156	110	2.12.1991	Sept. 1991
Vol 10 Cruciferae (<i>Sisymbrium</i> to <i>Aubrieta</i>)	JALAS & SUOMINEN	324	224	16.9.1994	April 1994
Vol 11 Cruciferae (<i>Ricotia</i> to <i>Raphanus</i>)	JALAS, SUOMINEN & LAMPINEN	494	310	1.11.1996	March 1996
Vol 12 Resedaceae – Platanaceae	JALAS, SUOMINEN, LAMPINEN & KURTTO	343	250	20.5.1999	Jan. 1999
Vol 13 Rosaceae (<i>Spiraea</i> to <i>Fragaria</i> , excl. <i>Rubus</i>)	KURTTO, LAMPINEN & JUNIKKA	286	320	18.8.2004	March 2004
Vol 14 Rosaceae (<i>Alchemilla</i> & <i>Aphanes</i>)	KURTTO, FRÖHNER & LAMPINEN	355	200	28.11.2007	12.10.2007
Vol 15 Rosaceae (<i>Rubus</i>)	KURTTO, WEBER, LAMPINEN & SENNIKOV	785	362	26.8.2010	12.4.2010
Vol 16 Rosaceae (<i>Cydonia</i> to <i>Prunus</i> , excl. <i>Sorbus</i>)	KURTTO, SENNIKOV & LAMPINEN	169	168	18.12.2013	2.5.2013

MATERIAL AND METHODS

The published volumes 1–16 of *Atlas Florae Europaeae*, and to some extent the unpublished text of Vol. 17, have been consulted, as well as other publications relevant to *AFE*. Information has also been taken from the rich correspondence between the Secretariat and collaborators and from draft maps submitted by the collaborators during the first phase of the programme, all kept in the Archives of the Botanical Museum, Finnish Museum of Natural History, University of Helsinki (H). Additional sources were the *AFE Database*, other archive material of the project, discussions with the Secretariat, and personal knowledge of the programme.

HISTORY AND DEVELOPMENT OF THE PROGRAMME

During the Tenth International Botanical Congress in Edinburgh in 1964, a special meeting was arranged for mapping the flora of Europe. The original idea was to supplement the published *Flora Europaea* volumes with more precise distribution information. At this meeting, it was proposed that a European mapping project could be started on a grid basis and that a small mapping experiment with a few species could be accomplished before the next meeting.

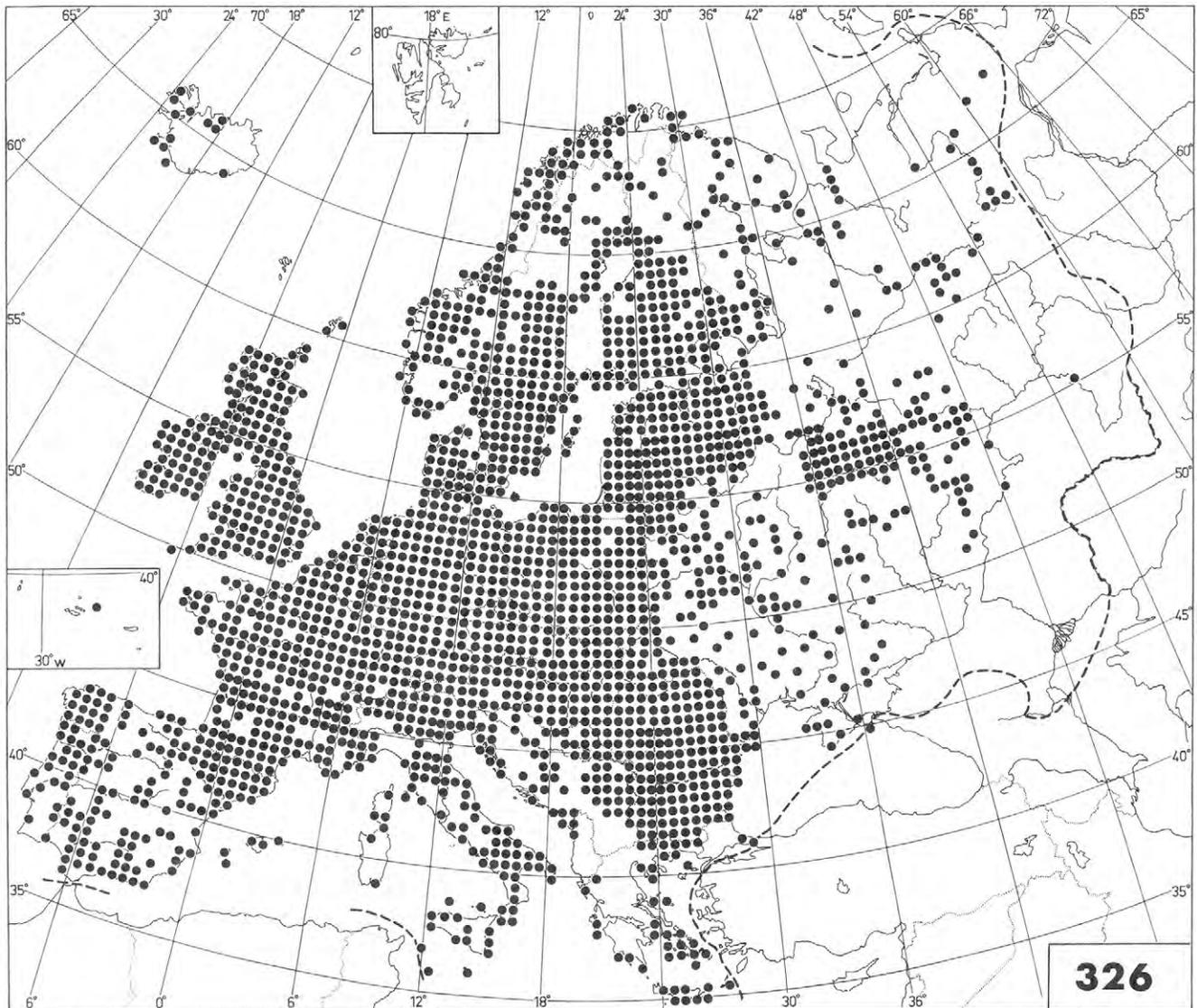


Fig. 1. Map 326 of *Urtica urens* L. in *Atlas Florae Europaeae*, Vol 3 (JALAS & SUOMINEN 1976). Note the gaps in the Mediterranean area, including Yugoslavia, Albania, Greece, and Turkey-in-Europe.

First phase. The project for mapping the European flora was officially launched at a special meeting in Aarhus (Denmark) in 1965 (PERRING 1966). At that meeting, important principles for the mapping were outlined and a permanent Secretariat was proposed to be established in Helsinki, with Professor Jaakko Jalas (1920–1999; UOTILA 2000) as Chairman and Dr. Juha Suominen as Secretary. A committee was selected to include representatives from the *Flora Europaea Organisation* and major mapping projects in Europe. Thus, the *Committee for Mapping the Flora of Europe (CMFE)* was set up. After several months, Jalas announced that the Finnish Government had agreed to finance the Secretariat in Helsinki, where it was located at the Botanical Museum [currently the Botany Unit of the Finnish Museum of Natural History], University of Helsinki.

The first task was to find collaborators for each territory. The *Flora Europaea Organisation* provided help for the search, and most of the collaborators were quickly located. Mapping principles and practical details of the mapping work were agreed on, difficulties discussed, and timetables proposed in a series of *CMFE* meetings: in Poland (Cracow, 1966) (JALAS & SUOMINEN 1967), the GDR (Halle, 1968), Bulgaria (Varna, 1973), the U.S.S.R. (Leningrad, 1975), Italy (Florence, 1977), and Finland (Helsinki, 1983) (JALAS & SUOMINEN 1984). The need to advance and hasten the mapping work was underlined at all meetings – although it was relatively easy to obtain promises of participation, the actual work proved quite difficult for several collaborators. This was also the main message projected by Jalas in his presentations of the project at *Flora Europaea* meetings (e.g., JALAS

1969, 1971). Unfortunately, Balkan representatives at the meetings were either absent or few, just as with the earlier meetings in Edinburgh and Aarhus, the exception being the Varna meeting, which had six participants from the Balkan countries.

The first volume of *AFE* was published in 1972 and the second one quickly followed it the year after (JALAS & SUOMINEN 1972, 1973). The publisher was and still is *Societas Biologica Fennica Vanamo*. As funding of the Secretariat was from state organisations, this ruled out commercial publishers. Volume 12, the last Atlas volume covering the first volume of *Flora Europaea*, was published 27 years later (JALAS *et al.* 1999). UOTILA *et al.* (2005) and UOTILA (2013) provide a detailed history of the project together with the published volumes.

The Secretariat of *CMFE*, mapping work, and published volumes underwent quite a few changes during preparation of the first 12 volumes of *AFE*. Jalas was Chairman of the Committee and Suominen its Secretary for that whole period; Raino Lampinen joined the Secretariat for Vol. 11 and Arto Kurtto at Vol. 12. *AFE* strictly followed the sequence of *Flora Europaea*, mapping critical and uncritical, common, and rare taxa. Collaborators sent mapping data on sheets of paper and data from the sheets were transferred manually onto maps for print originals. The printed maps were later scanned and converted into a digital database (LAHTI & LAMPINEN 1999). The increasing time since the publication of *Flora Europaea* saw a corresponding increase in the number of newly discovered taxa and new taxonomic results. Consequently, differences between *AFE* and *Flora Europaea* soon became apparent, and there was also a noticeable increase in the amount of text for the *AFE* volumes (SUOMINEN 1999). Maps, especially for Eastern Europe and the Mediterranean area, were often quite incomplete (Fig. 1). This 25-year-long period of Jalas and Suominen can be termed the first phase of *AFE*.

Second phase. Profound changes were envisioned for *AFE* after Vol. 12 was completed. After a long interval, a special *AFE* meeting was arranged in Helsinki in 1997 to present and discuss these changes and to start mapping of the second volume of *Flora Europaea* (UOTILA 1999). A significant innovation designed by Raino Lampinen was the adoption of a new grid system for *AFE* (LAMPINEN 2001). The collection and management of data were also modified. Tapani Lahti (Helsinki) prepared a computer program (*AFE Data Editor*) for submitting data in digital format to the Secretariat. Even the editorial and secretarial duties needed reorganisation because both Jalas and Suominen decided to retire. Political boundaries in Europe changed and the Secretariat, wishing to include the new mapping territories from the Balkans and Eastern Europe in the *CMFE*, invited their representatives to the Helsinki meeting with the support of *Societas Biologica Fennica Vanamo*.

After publication of Vol. 12 in 1999, the *CMFE* Secretariat reorganised and changed: Pertti Uotila started to act as Chairman of the Committee, Kurtto as Editor-in-Chief, and Leo Junikka (2000–2006) and Alexander N. Sennikov (since early 2006) as Secretary. The new editorial system for *AFE* was adopted in the preparation of Vol. 13, and it was presented, for example, at the tenth OPTIMA Meeting in Palermo in 2001 (UOTILA *et al.* 2003). Implementation of the new system caused some delay in the publication of Vol. 13 (KURTTO *et al.* 2004). The textual contents of the new *AFE* greatly expanded from the volumes of the first phase. Even the layout changed (Fig. 2). Texts contained information on chorology, taxonomy and nomenclature, cytology, and bibliography, as well as various corrections and adjustments complementing *Flora Europaea*. Statistical information by countries was added. Mapping of the critical apomictic genera *Cotoneaster*, *Alchemilla*, *Rubus*, and *Sorbus* required taxonomic and nomenclatural corrections; these were published in a series of *AFE Notes*. The *AFE Data Editor* was updated in 2010.

SPECIAL PROBLEMS OF MAPPING FOR *AFE* IN THE BALKANS

The mapping grid. The original coordinate scheme of *AFE*, although based on public UTM coordinates, had a number of ad hoc deviations, which were drawn on printed base maps sent to the collaborators. The deviations were not properly documented until the 2000s (LAMPINEN 2001; UOTILA & LAMPINEN 2005), which made it practically impossible to determine the accurate locations of the *AFE* quadrats solely from published maps. Two longitudinal zones of tapered grid cells crossed the Balkan Peninsula, one across Bosnia and Herzegovina and the other across western Bulgaria and the westernmost part of the Greek archipelago. In addition, a tailored grid was prepared for the Greek archipelago to avoid splitting of important islands. It was used only after *AFE* Vol. 3 (JALAS & SUOMINEN 1976), so for the first two volumes, the area was mapped using a slightly different grid system.

The new mapping grid, based on the UTM and Military Grid Reference System (LAMPINEN 2001; KURTTO *et al.* 2004), is regular without tailored deviations. In the Balkan countries, it added significantly more grid cells along the coastline and in the Greek archipelago. Converting the old maps to the new grid resulted in some inaccuracies, and on the Greek islands there were slightly more than usual. The new *AFE* grid has been utilised in several local Balkan projects to present floristic information on rare and endemic species, e.g., by STEVANOVIĆ *et al.* (2003, 2007) and LUBARDA *et al.* (2014).

Mapping territories. The borders of Europe and the territorial division and abbreviations in *AFE* originally

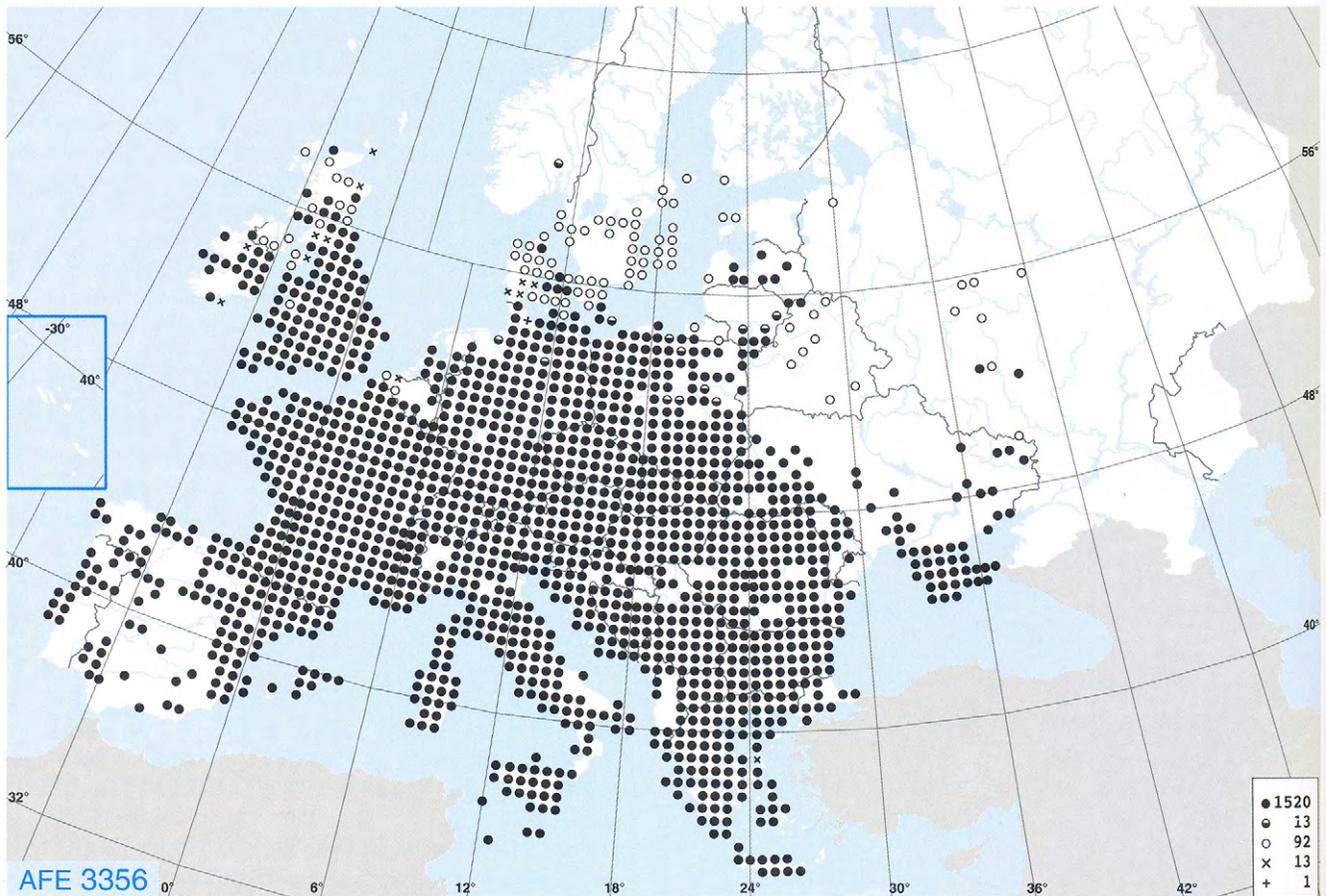


Fig. 2. Map 3356 of *Sanguisorba minor* L. in *Atlas Florae Europaeae*, Vol 13 (KURTTO *et al.* 2004). The Balkan area is well-covered, with the exception of Albania, from where no information was received.

followed those defined in *Flora Europaea*. In the 1960s and 1970s, the political geography of Europe remained stable but towards the end of the 1980s it altered. Significant changes took place especially with regard to former Yugoslavia (Ju). This country split into several independent states which were accepted as separate mapping territories in subsequent volumes of *AFE*. The updated territorial division and the acronyms of territories in *AFE* follow *Euro+Med PlantBase* with some lag. The number of mapping territories in Europe had increased from 41 in Vol. 1 to 54 in Vol. 16, and the Balkan countries from six to 12 (Table 2). Of the original 28 countries represented in *CMFE*, 24 have remained completely unchanged, including Albania (Al), Greece (Gr and Cr), Turkey-in-Europe (Tu), and Bulgaria (Bu).

These changes appear in the boundaries on the base map of *AFE*, as well as in many textual comments, but they have no effect on the grid. Due to lack of documentation, some dots on old *AFE* maps that are now affected by the new boundaries cannot be assigned with certainty to any present territory. Owing to these modifications and changes in the acronyms of some mapping territories in former Yugoslavia, care should be exercised in their use.

Responsibility for data collecting. The mapping was agreed to be a national responsibility already at the Edinburgh meeting, so that each country is responsible for data collecting in its own area. However, in the 1960s, botanical institutes in several Balkan countries were undeveloped, national floristic research inactive, and number of capable personnel low, which made it difficult to find national players for the project. The same is also apparent for the *Flora Europaea Organisation*, where foreign botanists represented Albania, Greece, and Turkey (TUTIN *et al.* 1964). Franklyn H. Perring and David A. Webb corresponded with local institutes and botanists to find collaborators from the Balkans for *AFE*.

On the other hand, researchers and botanical institutes from European countries such as Austria, Germany, Sweden, and the United Kingdom maintained traditionally strong floristic and taxonomic activities in the Balkan area, and they lent their support to *Flora Europaea*. Thus, several of the collaborators were foreigners in the early phase of *AFE* mapping for Balkan countries, and much of the data was received from foreign herbaria and other sources. For instance, the Secretariat sent Arto Kurtto from Helsinki twice to Vienna and

Table 2. Number of mapping territories in Europe, collaborators and assistant collaborators (including “Additional material provided by” and “Material provided by”), and persons / territory in different volumes of *Atlas Florae Europaeae*; the corresponding numbers for the Balkan countries are in parentheses.

Volume, year	Territories	Collaborators	Assistants	Total persons	Persons/territory
1 (1972)	27 (5)	42 (5)	54 (3)	96 (8)	3.6 (1.6)
2 (1973)	27 (5)	33 (5)	34 (4)	67 (9)	2.5 (1.8)
3 (1976)	27 (5)	43 (8)	56 (4)	99 (12)	3.7 (2.4)
4 (1979)	27 (5)	46 (8)	59 (7)	105 (15)	3.9 (3.0)
5 (1980)	27 (5)	46 (7)	64 (6)	110 (13)	4.1 (2.6)
6 (1983)	27 (5)	40 (8)	90 (2)	130 (10)	4.8 (2.0)
7 (1986)	27 (5)	45 (8)	96 (3)	141 (11)	5.2 (2.2)
8 (1989)	27 (5)	47 (8)	80 (2)	127 (10)	4.7 (2.0)
9 (1991)	31 (5)	52 (9)	84 (3)	136 (12)	4.4 (2.4)
10 (1994)	34 (7)	51 (9)	88 (6)	139 (15)	4.1 (2.1)
11 (1996)	34 (7)	53 (9)	92 (10)	145 (19)	4.3 (2.7)
12 (1999)	46 (8)	55 (8)	95 (10)	150 (18)	3.3 (2.3)
13 (2004)	50 (10)	67 (8)	102 (12)	169 (20)	2.6 (2.0)
14 (2007)	52 (10)	74 (10)	54 (13)	128 (23)	2.5 (2.3)
15 (2010)	52 (11)	94 (9)	71 (9)	165 (18)	3.2 (1.5)
16 (2013)	54 (12)	93 (13)	66 (9)	159 (22)	2.9 (1.8)
17 (2017)	54 (12)	97 (15)	65 (6)	162 (21)	3.0 (1.8)

Budapest to extract information from herbarium specimens collected in Romania and Yugoslavia.

During *AFE* meetings and in letters to the Secretariat, national collaborators from the Balkans voiced their difficulties in carrying out the mapping. They were evident, for example, in the absence of factual data or lack of available data — many of the herbarium specimens collected from their area were kept in foreign herbaria and thus were not accessible; moreover, the relevant old literature was not always at hand. Furthermore, recent and authoritative Floras did not exist, and it was hard to obtain *Flora Europaea*, the source of the new taxonomy standard adopted for *AFE*. In addition, the taxonomic concepts used in their own Balkan countries were different, and it was not so easy for local botanists to adapt to the system of *Flora Europaea*. Even the economic basis for the work by national collaborators was often problematical, and the Secretariat was unable to offer funding for their efforts — the annual funding received in batches from the Ministry of Education, Academy of Finland, and University of Helsinki was just sufficient to cover the operating costs of the Secretariat. All these problems caused some delay in the delivery of data and sometimes resulted in incomplete maps. However, I wish to point out that the Balkan collaborators were only exceptionally the latest ones in Europe to deliver their data.

The situation changed somewhat during the past 50 years, and the mapping in most Balkan countries nowadays is controlled by national collaborators. The coverage of national floristic mapping has markedly improved. However, for Greece, Albania, and former Yugoslavia, the contributions of foreign botanists are still very significant in providing s new floristic data.

Documentation. The importance of documentation of the mapped records was noted already at the first meetings where the mapping principles were discussed. However, it was only possible at the meetings to decide that documentation remains the responsibility of the collaborators, not of the Secretariat in Helsinki. The quality of documentation varies in different territories and among different data providers, and the Secretariat is not always aware of the standard of documentation from some of the collaborators. Regional collaborators are informed of the origin of data received from other sources and added by the Secretariat, but this did not function well, especially if there were more than one regional collaborator. The situation improved when computer-based editorial work was initiated at the beginning of the 2000s.

In the early phase, many collaborators added some documentation of important dots to the original information on the map pieces or grid cell lists sent

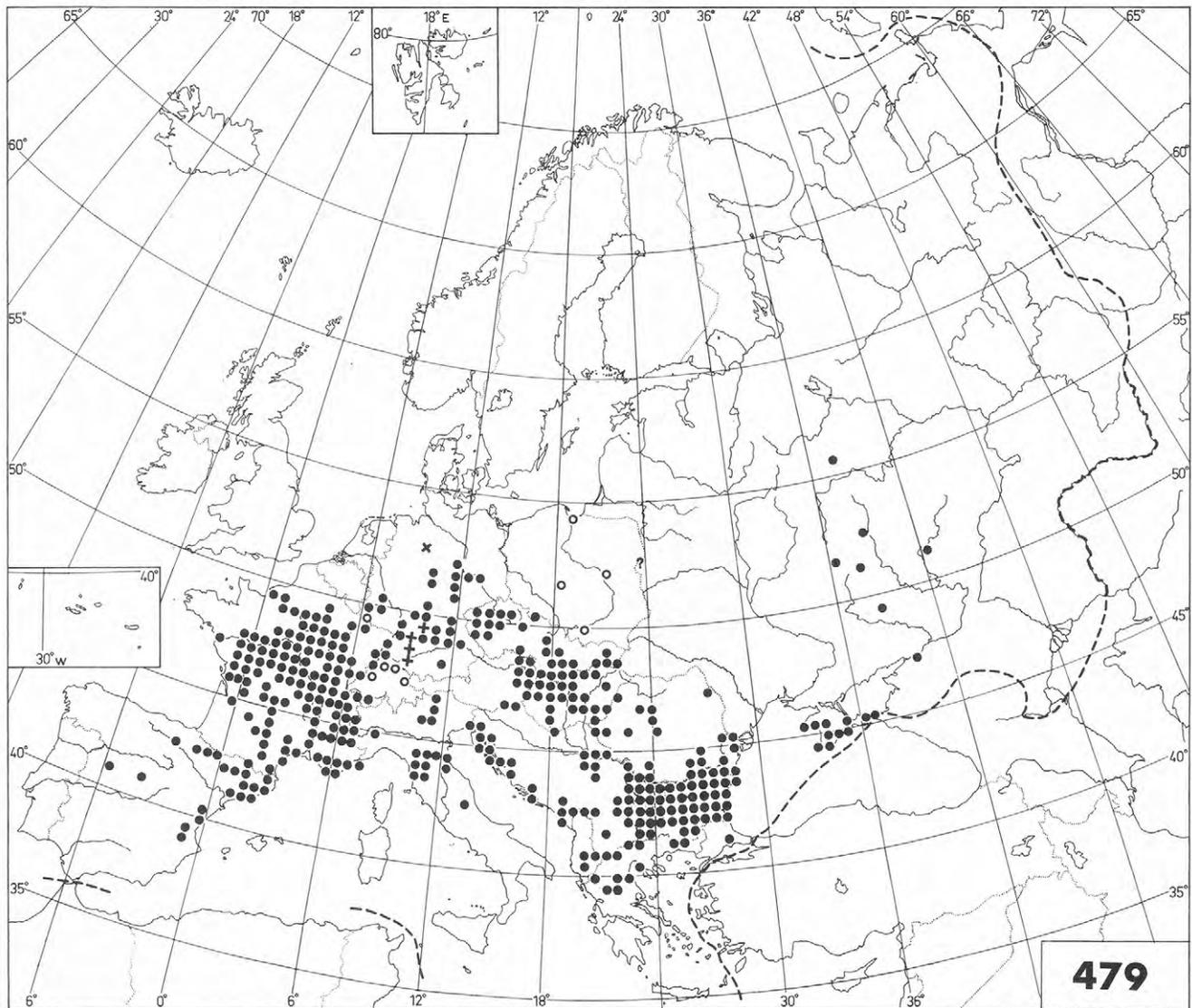


Fig. 3. Map 479 of *Polycnemum majus* A.Br. in *Atlas Florae Europaeae*, Vol 5 (JALAS & SUOMINEN 1980). Bulgaria is well-covered compared with the surrounding countries.

to the Secretariat. This information may be present nowhere else, and it can be used to clarify the origin or exact location of some records behind the dots. A few such cases have occurred for the Balkan data. From Vol. 13 on, the use of *AFE Editor* has resulted in more documentation from the data providers and from the Secretariat. The documentation is available from the *AFE* database on request.

Organising the work. The organising of mapping work has taken place in various ways in different territories. A leading principle from the beginning and still in force is that each territory should organise the work in a way both practical and effective. This is apparent also in the published volumes of *AFE* in the lists of collaborators for each country; the persons, their roles, and their sequence on the lists follow proposals by regional

collaborators. Sometimes only a single person does the work as his/her own research effort, but in most countries mapping is the responsibility of some local institute or botanical community.

The wish of the Secretariat has been from the beginning that the main responsibility of each territory would preferably be on one regional collaborator, who may have assistant collaborators for the mapping work (indicated as 'Assisted by' in *AFE* volumes). Each regional collaborator would collect all the data from his/her territory and send it to the Secretariat. In the Balkan territories, the number of collaborators has been low as compared to the situation in the rest of Europe (Table 2). In the Balkans, most of the collaborators have acted as regional collaborators and only a few as assistant collaborators. Generation transfers have usually taken place smoothly, often from

an assistant to a regional collaborator, especially when the collaboration remained within the same institute. However, sometimes it has not been possible to find an effective and efficient regional collaborator, even though much lobbying and advertising of *AFE* occurred at various botanical meetings in the Balkans and the Mediterranean area. During such temporary periods when regional collaborators were absent, the mapping was done by the Secretariat with the help of other data providers and advisers.

Sometimes the role of assistant collaborators has been exceptionally great in collecting information from a certain part of the territory (e.g., Hans Runemark for the Aegean area of Greece) or on a taxonomic group (e.g., woody plants by Jerzy Zieliński). From Vol. 13 on, a new way to demonstrate collaboration acknowledgement is use of the words "Additional material by". This concerns, in particular, information provided by the Editor-in-Chief and sporadic information from foreign botanists and taxonomic experts, especially Sigurd E. Fröhner (*Alchemilla*) and Heinrich E. Weber (*Rubus*) for many territories. The number of persons providing additional data for a territory has been larger in the Balkan area than in the rest of Europe, which indicates a division of research activity and data holding.

MAPPING IN THE INDIVIDUAL BALKAN COUNTRIES

Yugoslavia. Ju; the former Yugoslavia (Jugoslavija) in *Flora Europaea* and *AFE* Vols. 1–9, subsequently split into BH, Cg, Ct, Ko, Mk, Se, and Sl; Jug, the former Yugoslavia (Jugoslavija), excluding Croatia and Slovenia in *AFE* Vols. 10–12, subsequently split into BH, Cg, Ko, Mk, and Se.

Ernest Mayer (1920–2009) from the University of Ljubljana represented Yugoslavia, the largest of the original Balkan territories, as an Adviser in *Flora Europaea Organisation*. He was the only person from the Balkan countries who participated in the founding meeting of *CMFE* in Aarhus in 1965, and later he took part in the Halle (1968) and Florence (1977) meetings of *CMFE*. He was the Regional Collaborator of Yugoslavia in *CMFE* in *AFE* Vols. 1–9, and he alone provided information from this vast country for the two first volumes of *AFE*. **Darinka Trpin** from the University of Ljubljana assisted him for Vols. 3–5 and acted as a collaborator for Vols. 6–9. **Pavle Fukarek** (1913–1983) from Sarajevo, who was familiar with the flora of Bosnia and Herzegovina, was another collaborator for Vols. 4 and 5. However, a lack of information and mapping capacity is obvious from the incomplete maps (Fig. 1).

Early in the 1990s Mayer foresaw the political development of Yugoslavia and the resulting need for rearrangement of the *AFE* collaboration. He proposed

to the Secretariat new names to take care of mapping in the newly emergent countries: Trpin for Slovenia, **Ivo Trinajstić** (Zagreb) for Croatia, and **Vladimir Stevanović** (Belgrade) for the rest of Yugoslavia. However, he believed that Macedonia would sooner or later become independent and recommended **Vlado Matevski** (Skopje) as a potential collaborator. He could not propose anyone for Bosnia and Herzegovina, as he had lost contact with the botanists of that country and was rather worried about them. Since Vol. 10, Mayer had been appointed Adviser in *CMFE*.

Croatia and Slovenia were mapped separately from Yugoslavia since Vol. 10. In Vols. 11–12, Stevanović was the collaborator for the rest of the former Yugoslavia (Jug). In Vols. 10 and 11, he was assisted by **Dmitar Lakušić** and **Marjan Niketić** (both from Belgrade), and Trinajstić provided complementary material for Bosnia and Herzegovina; in addition, **Snežana Vukojičić** (Belgrade) participated for Vols. 11 and 12, and **Vladimir Randjelović** (Niš) assisted for Vol. 12.

The Former Yugoslav Republic (F.Y.R.) of Macedonia and Bosnia and Herzegovina were treated as independent territories from Vol. 13 on, but in Vols. 13–15 they were mapped together with Serbia and Montenegro (SM), which also included Kosovo. Stevanović continued as collaborator, and he was assisted by **Pal Boža** from Novi Sad (Vol. 13), Niketić (Vols. 13–15), Randjelović (Vol. 13), Lakušić (Vol. 14), **Gordana Tomović** from Belgrade (Vols. 14–15), and Vukojičić (Vols. 13–15). **Sigurd E. Fröhner** (Nossen) and **Heinrich E. Weber** (Vechta) provided additional material for Vols. 14 and 15, respectively. In Vol. 15 Stevanović divided the collaborator's duty with **Danka Petrović** (Podgorica), who was responsible for Montenegro.

Vladimir Stevanović's role in rearrangement of the Balkan flora mapping for *AFE* during the last 25 difficult years was very essential. In the course of the political development of Yugoslavia into seven independent states, he gradually transferred the mapping responsibility to new national collaborators and helped them to begin the task. Coverage in the area greatly improved (Fig. 2). Stevanović's vast knowledge of the Balkan flora is much appreciated, and he was nominated as Adviser to *CMFE* in 2010.

Croatia

Ct; 59 *AFE* grid cells.

Croatia was part of Ju in *Flora Europaea* and *AFE* vols. 1–9. It has been treated as a separate territory since Vol. 10, first as Hrv in Vols. 10–12 and subsequently as Ct. Trinajstić was the collaborator for Croatia in Vols. 10–13. After his retirement, **Antun Alegro** (Zagreb) continued for Vols. 14 and 15 and **Sinisa Ozimek** (Osijek) from then on.

Slovenia

Sl; 20 AFE grid cells.

Slovenia was part of Ju in *Flora Europaea* and AFE vols. 1–9. It has been treated as a separate territory since Vol. 10, first as Sle in Vols. 10–12 and subsequently as Sl. Mayer nominated Darinka Trpin as the collaborator for Slovenia; she already had much experience as assistant collaborator and a collaborator for Ju. Trpin was the collaborator for Vols. 10–14, **Branko Vreš** (Ljubljana) assisted her in Vols. 10–12 and shared the duty with her in Vols. 13 and 14, together with **Valerija Babij** and **Nejc Jogan** (both from Ljubljana). Babij and Vreš continued as collaborators for Vol. 15, after which Babij retired but Vreš stayed on. In the special volumes 14 and 15, additional information was provided by Fröhner and **Willibald Maurer** (Graz; 1926–2016) (*Alchemilla*) and Weber (*Rubus*). Slovenia is a small country, but its flora is rich and well-mapped in the context of AFE and the Central European floristic mapping system (BABIJ *et al.* 1999). At present, the information for AFE is extracted from a National Database.

Bosnia and Herzegovina

BH; 38 AFE grid cells.

Bosnia and Herzegovina was part of Ju in *Flora Europaea* and AFE vols. 1–9 and part of Jug in AFE Vols. 10–12. It has been treated as a separate territory (BH) since Vol. 13, but it was only from Vol. 16 on that it had its own regional collaborators: **Jugoslav Brujić**, **Đorđije Milanović** and **Vladimir Stupar**, all from Banja Luka. Trinajstić provided complementary material for Vols. 10–12.

Former Yugoslav Republic (F.Y.R.) of Macedonia

Mk; 18 AFE grid cells.

The Former Yugoslav Republic (F.Y.R.) of Macedonia, called FYROM in AFE, was part of Ju in *Flora Europaea* and AFE Vols. 1–9 and part of Jug in AFE Vols. 10–12. It has been treated as a separate territory (Mk) since Vol. 13 and has had its own regional collaborator, Vlado Matevski (Skopje), since Vol. 16. **Mitko Kostanidovski** (Skopje) assisted Matevski.

Montenegro

Cg; 15 AFE grid cells.

Montenegro was part of Ju in *Flora Europaea* and AFE Vols. 1–9, part of Jug in AFE Vols. 10–12, and part of SM (Serbia and Montenegro) in AFE Vols. 13–15. Since Vol. 16 it has been treated separately, **Danka Caković** (née Petrović) from Podgorica being the regional collaborator for Montenegro. Stevanović assisted with data from Belgrade.

Kosovo

Ko; 10 AFE grid cells.

Kosovo was part of Ju in *Flora Europaea* and AFE Vols. 1–9, part of Jug in AFE Vols. 10–12, and part of SM (Serbia and Montenegro) in AFE Vols. 13–15. Since Vol. 16 it has been treated separately, **Elez Krasniqi** from Priština being the regional collaborator. Stevanović has assisted with data from Belgrade.

Serbia

Se; 51 AFE grid cells.

Serbia was part of Ju in *Flora Europaea* and AFE Vols. 1–9, part of Jug in AFE Vols. 10–12, and part of SM (Serbia and Montenegro) in AFE Vols. 13–15. Since Vol. 16 it has been treated separately, Stevanović being the regional collaborator, assisted by Niketić, Tomović, and Vukojić, as during the previous SM period.

Albania

Al; 23 AFE grid cells.

Peter W. Ball from the *Flora Europaea Organisation* collated information for Albania for the early maps and could have continued the work, but he hoped that some Albanian botanist in Tirana could be persuaded to do it. Ball proposed **Ilia Mitrushi**, Botanical Department of the Academy of Science of Albania, who acted as the Regional Adviser for Albania in the *Flora Europaea Organisation*. Mitrushi agreed and worked as AFE collaborator for Albania in Vols. 1–6. After his retirement, **Xhafer Qosja** from the same institute was nominated as collaborator for Vols. 7–9, and when he retired in 1989 **Jani Vangjeli** (also from the same institute) continued for Vols. 9–12 with **Babi Ruci** (Tirana) assisting for Vol. 11. After this period, the link to Albania was temporarily broken. For Vol. 13 the material for Albania was provided by **Matthias Baltisberger** (Zürich), **Arto Kurtto** (Helsinki), and Stevanović, and for Vol. 14 by Fröhner and Kurtto. The unfortunate absence of a national collaborator became apparent in these volumes as the maps showed noticeable gaps for Albania (Fig. 2). The situation normalised from Vol. 15 on, when **Lulëzim Shuka** from the Department of Biology, University of Tirana, started as the regional collaborator for Albania. Kurtto continued providing additional information from literature.

Bulgaria

Bu; 63 AFE grid cells.

As a result of correspondence and discussions in 1966 with Franklyn Perring and David Webb, **Stefan Kožuharov** (1933–1997) from the Botanical Institute,

Bulgarian Academy of Sciences (Sofia), promised to work for the European mapping project. His active career as the collaborator for Bulgaria continued for 30 years, up to Vol. 12. He arranged the fourth meeting of the *CMFE*, “Problems of mapping the flora of the Balkan Peninsula”, which took place in Varna in 1974, and participated in the *AFE* meetings in Halle, Leningrad, and Helsinki (1983). The next collaborator, **Ana Petrova** from the same institute, has also worked many years for *AFE*: she began as assistant collaborator from Vol. 3 and since Vol. 5 continued as full collaborator up to her retirement after Vol. 15 was published. **Vladimir Vladimirov** from the same institute follows as her replacement. For the Rosaceae volumes, **Jerzy Zielinski** (Poznań) assisted with woody taxa (Vols. 13, 16, and 17) and Fröhner provided additional material for *Alchemilla* (Vol. 14).

It is noteworthy that Bulgarian territory on *AFE* maps always appeared to be exceptionally well covered from the very beginning (Fig. 3), and it often presented an image distinctly different from that of the neighbouring territories. The Secretariat noted this and queried whether the mapping principles had been appropriately applied. Kožuharov reassured the Secretariat that the excellent mapping coverage was due to good knowledge of the Bulgarian flora. In recent volumes, the level of information for neighbouring territories increased and thus the disparity with Bulgaria considerably lessened.

Greece

Gr [Greece excluding the islands assigned to Cr (Crete) and those which are outside Europe (East Aegean Islands) as defined in *Flora Europaea*]; 137 *AFE* grid cells.

Cr (Crete); 16 *AFE* grid cells.

Concerning Greece, arrangements for providing data have been rather complicated and result from national and various international efforts. **Patroclus Critopoulos** (?1908–1996) from Athens was the regional collaborator for the country from the beginning to 1977. He also took part in the *AFE* meetings in Varna and Leningrad. **Giorgios Lavrentiades** from Thessaloniki and **Werner Greuter** from Geneva assisted him for the first two volumes; likewise **Spyros Dafis** († 2014) from Thessaloniki, for Vol. 2. In Vols. 3 and 4 (up to 1977) he shared the work with Greuter. Critopoulos retired in 1977 and since then Greuter continued with **Dimitrios Phitos** from Patras as collaborator for Vols. 4 and 5. Phitos continued up to Vol. 12, and **Theophanis Constantinidis** (Athens) replaced him as the Greek collaborator. Greuter continued to provide complementary material for Greece for Vols. 7–10. He participated in five *AFE* meetings (Halle, Varna, Leningrad, Florence, and Helsinki 1997) and worked actively for development of the tailored *AFE* grid for

the Greek archipelago. In early volumes of *AFE*, Greuter had a considerable role in trying to provide from Greek and foreign researchers as good maps as possible for the country. Since Vol. 7, he has belonged to the Board of Advisers of *AFE*.

Much of the floristic research in Greece, especially in the archipelago and mountains, was in the hands of foreign botanists. Most notably, **Hans Runemark** (1927–2014) from Lund systematically studied the flora of the Aegean Islands, Greuter that of Crete, **Walter Gutermann** from Vienna that of the Ionian Islands, and **Arne Strid** from Copenhagen that of the mountains. Runemark assisted in Vols. 1–3, 6, 7, and 10; Strid in Vols. 7–10; and **Mats Gustafsson** and **Lars-Åke Gustavsson** from Lund, **Björn Aldén** and **Jimmy Persson** from Gothenburg, and **Karl Heinz Rechinger** (1906–1998) from Vienna in Vols. 4 and 5.

Floristic data from Greece, especially information from herbarium specimens, have been registered in the *Flora Hellenica Database* since 1988 (STRID 2000), which currently comprises almost one million records (STRID & KIT TAN 2017). The database has offered in this millennium better and better possibilities to produce good *AFE* maps for Greece. It is an excellent example of materialisation of the goal to produce *AFE* directly from national databases, and similar development is proceeding in several European countries. For *AFE* Vols. 11–16, Strid provided data for Greek maps from the *Flora Hellenica Database*. Additional Greek data were also received from Gutermann, Runemark, and, for Crete, **Nicholas Turland** (London) in Vol. 11; and from Gutermann and **Ralf Jahn** (Regensburg) in Vol. 12. In Vol. 13 Constantinidis was assisted by Gutermann, Jahn, and Strid, while in Vol. 14 Constantinidis was assisted by Gutermann, Fröhner, and Strid; after that all information for Greek *AFE* maps has been extracted directly from the *Flora Hellenica Database*.

At present, Greece belongs to one of the well-mapped countries, not only in the case of *AFE*, but also within the framework of more detailed projects, such as the *Flora Hellenica* (STRID & KIT TAN 1997, 2002) and *Atlas of the Aegean Flora* (STRID 2016). More than 900 distribution maps have also been presented in publications on endemic and rare taxa, e.g., PHITOS *et al.* (1995, 2009a, b).

Turkey

Tu (Turkey, European part, including Imroz); 26 *AFE* grid cells.

David A. Webb (1912–1994) was a key person in the *Flora Europaea Organisation* (Member of the Editorial Committee and one of the editors of the *Flora*) and in the *Committee for Mapping the Flora of Europe* (Adviser in *AFE* Vols. 1–11). He had already compiled a flora of European Turkey (WEBB 1966), and it was a simple decision to select him as collaborator for Turkey-in-

Europe in the two first volumes of *AFE*. In 1973 Webb proposed that the responsibility be transferred to a Turkish botanist. From Vol. 3 on, **Hüsni Demiriz** (1920–1999) from the Faculty of Biology, Istanbul University, accepted the task of providing data for Turkey-in-Europe. He was collaborator for Turkey up to Vol. 12, which was published in 1999. Webb provided data to the Secretariat at least up to Polygonaceae (Vol. 4) and Chenopodiaceae (Vol. 5). From Vol. 6 on, Demiriz shared the responsibility with **Asuman Baytop** (1920–2015) from the Faculty of Pharmacy, Istanbul University. Baytop continued the work for Vols. 13 and 14 until her retirement, doing so together with her assistant **Neriman Özhatay** from the same institute. Özhatay has continued as collaborator for Turkey.

Although European botanists frequently visit Turkey and local botanical activity has now increased, the European part of the country was until the end of the 1900s still much neglected botanically. This resulted in several incomplete maps for the first volumes of *AFE* (Fig. 1). However, European Turkey is a fairly small area and its flora is rather well-known, so the coverage and accuracy of mapping has gradually increased, as noted in the contributions compiled by Feruzan Dane for *Phytologia Balcanica*.

During the last 20 years, numerous publications containing more than 4500 maps of the distribution of threatened and rare vascular plants from Balkan countries (excluding Greece) have appeared; they have mainly been based on the UTM grid system. These publications are from Serbia including Kosovo (SARIĆ 1992; STEVANOVIĆ 1999, 2012; MILLAKU 2013), Bulgaria (PEEV *et al.* 2015), Albania (MARKU 2007), Croatia (NIKOLIĆ & TOPIĆ 2005; NIKOLIĆ *et al.* 2015), and Slovenia (JOGAN 2001), as well as from Romania (DIHORU & NEGREAN 2009). In addition, an important source of data on the distribution of vascular plants in the Balkans is available in the series “New floristic records in the Balkans” as published in the journal *Phytologia Balcanica* (compiled by VLADIMIROV *et al.* from 2006–2017). All these contributions should be tapped for continuous future mapping of the Balkan flora for *AFE*.

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Botanica SERBICA



REZIME

Pedeset godina kartiranja flore Balkanskog poluostrva za *Atlas Flore Evrope*

Pertti UOTILA

Atlas Flore Evrope (AFE), program za kartiranje distribucije vaskularne flore Evrope, pokrenut je 1965. godine, kao rezultat zajedničkih napora evropskih botaničara. Ovde je dat istorijski pregled distribucije za Atlas Flore Evrope u 11 današnjih balkanskih država, navedenih u poslednjem (16.) volumenu *Atlasa Flore Evrope* kao Albanija, Bosna i Hercegovina, Bugarska, Hrvatska, Makedonija, Grčka, Kosovo, Crna Gora, Srbija, Slovenija i Turska (evropski deo) i diskutovani su problemi i dostignuća. Posebni izazovi sa kojima se suočavalo kartiranje prostora Balkana tokom 50 godina, uključivali su ekstremno bogatu floru, raznovrstan i planinski reljef, političke i ekonomske teškoće, nedostupnost raspoloživih podataka i mali broj botaničara koji doprinose i sakupljaju podatke za kartiranje.

KLJUČNE REČI: *Atlas Flore Evrope*, distribucija biljaka, nejednako botaničko znanje, Balkanske države

