ARPHA Preprints

PENSOFT

PREPRINT

Author-formatted, not peer-reviewed document posted on 15/12/2022

DOI: https://doi.org/10.3897/arphapreprints.e98841

Genus *Aconitum* (Ranunculaceae) in the Ukrainian Carpathians and adjacent territories

Andriy Novikov, **Oleh Prylutskyi**

ARPHA Preprints *Author-formatted, not peer-reviewed document posted on 15/12/2022*. DOI: https://doi.org/10.3897/arphapreprints.e98841

Genus *Aconitum* (Ranunculaceae) in the Ukrainian Carpathians and adjacent territories

Andriy Novikov‡, Oleh Prylutskyi§

‡ State Museum of Natural History of the NAS of Ukraine, Lviv, Ukraine
§ V. N. Karazin Kharkiv National University, Kharkiv, Ukraine

Corresponding author: Andriy Novikov (novikoffav@gmail.com)

Abstract

Background

The dataset represents a comprehensive collection of occurrence records regarding the genus *Aconitum* (Ranunculaceae) in the Ukrainian Carpathians and adjacent territories. It is mostly based on results of critical revision of the main herbarium collections of the Carpathian region (i.e., LW, LWS, LWKS, KRA, KRAM, CHER, KW, UU, and KWHU). Besides this, the dataset contains the data parsed (and taxonomically revised) from the published materials and other available sources (e.g., Karel Domin's Card Index).

New information

In total, 2,280 occurrence records of the genus *Aconitum* representatives distributed in the Ukrainian Carpathians were published.

Keywords

Occurence, herbarium material, phytodiversity, mountain flora

Introduction

The Ukrainian Carpathians are one of the principal centers of floristic diversity and endemism in Ukraine, serving as a house for over 2500 plant species (Chopyk and Fedoronchuk 2015). Among them, many species of vascular plants are rare, endemic, or have very limited distribution (Tasenkevich 2003, Tasenkevich 2014). In particular, the genus *Aconitum* L., one of the problematic taxonomical groups of the vascular plants, has a local center of its distribution and diversity in the Carpathians (Mitka 2003, Mitka et al. 2007, Mitka 2014). Specifically, in the Ukrainian part of the Carpathian Mts., 21 *Aconitum*

species and infraspecific taxa are distributed. From this number, ten *Aconitum* species and infraspecific taxa are threatened (Onyshchenko et al. 2022), and 11 – are endemic or sub-endemic (Novikoff et al. 2016, Kliment et al. 2016). Taking into account such a high level of rarity and endemism, biogeography studies of the genus *Aconitum* can be useful to reveal the hot spots and stress the hypoteses of distribution patterns of other vascular plants in certain regions (Wang et al. 2009, Novikov and Mitka 2020, Wani et al. 2022). Data on distribution also important for threat assesment of rare representatives of the genus *Aconitum* and other groups of vascular plants (Hamor et al. 2009Turis et al. 2014, Agnihotri et al. 2015, Novikoff et al. 2016).

For all these investigations, initial distribution information based on herbarium material and field observations is required. Access to the Ukrainian herbarium collections remained restricted for the last few years due to pandemic limitations (Baldini 2020, Cota-Sánchez 2020Shiyan 2021). In the context of the current situation, Ukrainian collections will remain unavailable for an unexpectedly long period, can be damaged or even lost (Mosyakin and Shiyan 2022). At the same time, most of the available publications are Cyrillic and, hence, difficult to use by foreigners. Therefore, we believe that creating open-access datasets that follow recognized biodiversity information standards, as well as provide a translation of Cyrillic information and georeferencing of reported occurrences is an important step to make biodiversity data from Ukraine accessible and usable for scientists worldwide.

General description

Purpose: The purpose of creating this dataset was to gather and georeference all available data on the distribution of the genus *Aconitum* representatives in the Ukrainian Carpathians and adjacent territories and to make this dataset freely and readily available through the GBIF facilities. Online publication of such datasets ensures the broad application of biodiversity data from Ukraine even in case of limited access to collections, their loss, or damage.

Sampling methods

Description: The dataset contains information on 2,280 occurrences of *Aconitum* species and infraspecific taxa from the Ukrainian Carpathians and adjacent territories (Novikov 2022).

Sampling description: Initially, the working list of 28 species and infraspecific taxa of the genus *Aconitum* that are potentially distributed n the Ukrainian Carpathians has been created following the recent taxonomy (Mitka 2003, Novikoff and Mitka 2011). After that, the working identification key for these taxa has been created. All herbarium specimens of monkshoods from the Ukrainian Carpathians deposited at leading herbaria in Lviv (LW, LWS, and LWKS), Uzhgorod (UU), Chernivtsi (CHER), Kyiv (KW), and Cracow (KRA and KRAM) were then critically revised using the created indentification key. As a result, the dataset containing the raw data extracted from the processed herbarium labels has been

created. Later this dataset has been completed with the data from available published sources and also supported by georeference information with indication of the precission level of coordinates identification. Coordinates of the occurrences were extracted and verified manually, using the OpenStreetMap (OpenStreetMap contributors 2022) and QGIS (QGIS Development Team 2022) services. Finally, the dataset has been completed with the data parsed from the Karel Domin's Card Index, deposited at the Institute of Botany of SAS in Bratislava. Due to the high risk of misidentification of *Aconitum* taxa, doubtful or incomplete (e.g., without information allowing clearly identifying the reported specimen at least to the rank of the species) reports were avoided.

Quality control: The data were cross-checked for the correct identification and known distribution areas to delimit potential errors and outlets. In case of doubt or impossibility of correct identification of the species, specimens were omitted from the analysis. In case of unusual reports from the new areas, such occurrences were critically revised or omitted due high risk of misidentification.

Step description: The following steps were taken before the work with the herbarium material:

1. Creation of the list of *Aconitum* species potentially distributed in the Ukrainian Carpathians and adjacent territories;
2. Clarification of the supraspecific and infraspecific taxonomy and morphology of the listed species to delimit similar and phylogenetically related taxa that potentially can be misidentified or confused;
3. Creation of the identification key with indication of similar taxa;
4. Creation of the working check-list with the nomenclatural synonyms of selected *Aconitum* species.

The following steps were taken during the work with herbarium materials:

1. Photo capture of herbarium vouchers of selected species;
2. Taxonomic revision of specimens following recent taxonomy;
3. Parsing and databasing the information (i.e., locality, collector, date, and other relevant data) from the labels following the DarwinCore standard;
4. Translation of Cyrillic (i.e., Ukrainian and Russian) data from labels into English;
5. Georeferencing and verification of localities;
6. Quality check applying OpenRefine.

The following steps were taken during the work with literature sources:

1. Verification of the authors on their authority;
2. Extraction of reported data to the dataset following the DarwinCore standard;
3. Translation of Cyrillic (i.e., Ukrainian and Russian) data into English;
4. Georeferencing and verification of localities;
5. Quality check applying OpenRefinel.

 Author-formatted, not peer-reviewed document posted on 15/12/2022. DOI: https://doi.org/10.3897/arphapreprints.e98841

Geographic coverage

Description: The occurrences from the Ukrainian Carpathians and adjacent territories were considered (Fig. 1). Most of the databased occurrences are scattered in the region of the Ukrainian Carpathians. However, some analyzed species (i.e., subendemic and non-endemic) have wider distribution and occur also in adjacent lowland territories. The occurrences of such species out of the Ukrainian Carpathians were also taken into consideration to demonstrate their natural distribution patterns.

Coordinates: 47.8 and 51.5 Latitude; 22.7 and 25.9 Longitude.

Taxonomic coverage

Description: All analyzed specimens and occurrence reports were identified to the lower possible rank, usually – species or subspecies. As a result, the dataset generally contains 40 *Aconitum* taxa, including 16 species and 24 infraspecific taxa. From this number, two species (i.e., *A. napellus* and *A. paniculatom*) do not correspond to the recent taxonomy of the genus (Mitka 2003) and cannot be unambiguously reidentified. The specimens identified as belonging to these two species (eight occurences) were left in the dataset 'as is' with the hope of potential further clarifications. The dataset also contains 19 occasional occurences of *A. besserianum, A. lycoctonum,* and *A. pseudanthora* that are not represented in the flora of the Ukrainian Carpathians but occurs in adjacent territories.

Taxa included:

Rank	Scientific Name
species	*Aconitum anthora*
subspecies	*Aconitum anthora* subsp. *anthora*
subspecies	*Aconitum anthora* subsp. *jacquinii*
species	*Aconitum besserianum*
species	*Aconitum bucovinense*
species	*Aconitum cammarum*
species	*Aconitum czarnohorense*
species	*Aconitum degenii*
subspecies	*Aconitum degenii* subsp. *degenii*
variety	*Aconitum degenii* subsp. *degenii* var. *intermedium*
species	*Aconitum firmum*
subspecies	*Aconitum firmum* nothosubsp. *fussianum*

 Author-formatted, not peer-reviewed document posted on 15/12/2022. DOI: https://doi.org/10.3897/arphapreprints.e98841

subspecies	*Aconitum firmum* subsp. *firmum*
subspecies	*Aconitum firmum* subsp. *fissurae*
species	*Aconitum gayeri*
species	*Aconitum lasiocarpum*
subspecies	*Aconitum lasiocarpum* subsp. *kotulae*
subspecies	*Aconitum lasiocarpum* subsp. *lasiocarpum*
species	*Aconitum lycoctonum*
subspecies	*Aconitum lycoctonum* subsp. *lycoctonum*
species	*Aconitum moldavicum*
subspecies	*Aconitum moldavicum* nothosubsp. *confusum*
subspecies	*Aconitum moldavicum* nothosubsp. *porcii*
subspecies	*Aconitum moldavicum* nothosubsp. *simonkaianum*
subspecies	*Aconitum moldavicum* subsp. *confusum*
subspecies	*Aconitum moldavicum* subsp. *hosteanum*
subspecies	*Aconitum moldavicum* subsp. *moldavicum*
species	*Aconitum nanum*
species	*Aconitum napellus*
subspecies	*Aconitum napellus* subsp. *tauricum*
variety	*Aconitum napellus* subsp. *tauricum* var. *nanum*
species	*Aconitum paniculatum*
species	*Aconitum pseudanthora*
species	*Aconitum variegatum*
subspecies	*Aconitum variegatum* subsp. *nasutum*
subspecies	*Aconitum variegatum* subsp. *variegatum*

Temporal coverage

Living time period: 1803-2019.

Usage licence

Data resources

Data package title: Genus Aconitum of the Ukrainian Carpathians and adjacent territories

Resource link: https://doi.org/10.15468/n37j8x

Alternative identifiers: https://www.gbif.org/dataset/91f04313-0699-41a7-87ef-2b0c13180778, https://ukraine.ipt.gbif.no/resource?r=aconitum_carpathians

Number of data sets: 1

Data set name: Genus Aconitum of the Ukrainian Carpathians and adjacent territories

Character set: utf8

Download URL: https://www.gbif.org/dataset/91f04313-0699-41a7-87ef-2b0c13180778

Data format: Darwin Core

Description: The tab-delimited CSV formatted dataset (Novikov 2022) has been created following Darwin Core standards and contains all available data on the distribution of the genus *Aconitum* representatives in the Ukrainian Carpathians and adjacent territories.

Column label	Column description
occurrenceID	An unique identifier for the Occurrence (as opposed to a particular digital record of the occurrence)
basisOfRecord	The specific nature of the data record, e.g. preserved specimen or field observation
collectionCode	Unique code of collection (e.g., herbarium) depositing the certain specimen
institutionCode	Unique code of institution (e.g., museum or herbarium) depositing the certain specimen
catalogNumber	An identifier for the record within collection
scientificName	The full scientific name of taxon including at least the genus and species epithets, and in some cases including the subspecies epithet
taxonRank	The taxonomic rank of the most specific name in the scientificName
recordedBy	A person, group, or organization responsible for recording the original Occurrence
verbatimEventDate	The date of record as it appears in the original publication or specimen's label
EventDate	The date during which an event (e.g., collection of the specimen, photographing of the plant or its registering in the field in any other way), occurred

day	The day when occurrence was recorded
month	The month when occurrence was recorded
year	The year when occurrence was recorded
fieldNumber	An identifier given to the specimen in the field by collector
identifiedBy	A list of names of people, who assigned the Taxon to the subject
dateIdentified	The date on which the subject was determined as representing certain Taxon
identificationRemarks	Comments or notes about the Identification
decimalLatitude	The geographic latitude (in decimal degrees, using the spatial reference system given in geodeticDatum) of the geographic center of a Location
decimalLongitude	The geographic longitude (in decimal degrees, using the spatial reference system given in geodeticDatum) of the geographic center of a Location
coordinateUncertaintyInMeters	The horizontal distance (in meters) from the given decimalLatitude and decimalLongitude describing the smallest circle containing the whole of the Location
geodeticDatum	The ellipsoid, geodetic datum, or spatial reference system (SRS) upon which the geographic coordinates given in decimalLatitude and decimalLongitude as based. In our case, it is always WGS84
verbatimElevation	The original description of the elevation (altitude, usually above sea level) of the Location
countryCode	The standard code (ISO 3166-1-alpha-2) for the country in which the Location occurs
country	The name of the country in which the Location occurs
locality	The specific description of the place where the specimen was registered or collected
verbatimLocality	The original textual description of the place where the specimen was registered or collected
fieldNotes	The original text of notes taken in the field about the specimen by the collector
associatedReferences	A list (concatenated and separated) of identifiers (publication, bibliographic reference, global unique identifier, URI) of literature associated with the Occurrence
kingdom	The full scientific name of the kingdom in which the taxon is classified. In our case it is always Plantae
language	The language of the resource. In our case herbarium labels contained information in different languages, and sometimes different languages were even combined on a single lable. To simplify the work with data we indicated the languages applied for the data

minimumElevationInMeters	The lower limit of the range of elevation (altitude, usually above sea level) in meters
maximumElevationInMeters	The upper limit of the range of elevation (altitude, usually above sea level) in meters
higherGeography	A list of generalised toponyms less specific than the information captured in the locality term (e.g., names of the mountain ridges, biogeographical zones, other natural areas, etc.)

Acknowledgements

We cordially thank Józef Mitka from the Jagiellonian University in Cracow, who, during the years, supported our investigations on the genus Aconitum. We also thank all people who helped during the work in herbaria.

References

- Agnihotri P, Husain D, Husain T (2015) Assessment of diversity, endemism and distribution of the genus *Aconitum* Linnaeus (Ranunculaceae) in India. Pleione 9 (1): 95-102.
- Baldini RM (2020) The impact of Covid-19 crisis on Plant Taxonomy: will we be able to approach to plant taxonomy as in the past? Webbia 75 (1): 3-4. https://doi.org/10.36253/jopt-9205
- Chopyk V, Fedoronchuk M (2015) Flora of the Ukrainian Carpathians. Terno-Graph, Ternopil', 712 pp. [In Ukrainian]. [ISBN 978-966-457-263-4]
- Cota-Sánchez JH (2020) The value of virtual natural history collections for botanical instruction in these times of the COVID-19 pandemic. Brazilian Journal of Botany 43 (4): 683-684. https://doi.org/10.1007/s40415-020-00663-y
- Hamor F, Hamor A, Antosyak T (2009) Regional Red List of vascular plants in Transcarpathia and some practical aspects of their protection. Scientific Proceedings of Uzhgorod University. Series Biology 25: 89-107. [In Ukrainian].
- Kliment J, Turis P, Janišová M (2016) Taxa of vascular plants endemic to the Carpathian Mts. Preslia 88 (1): 19-76. URL: https://www.preslia.cz/article/81
- Mitka J (2003) The genus *Aconitum* in Poland and adjacent countries - A phenetic-geographic study. Institute of Botany, Jagiellonian University, Cracow, 204 pp. [ISBN 83-915161-2-1]
- Mitka J, Sutkowska A, Ilnicki T, Joachimiak A (2007) Reticulate evolution of high-alpine *Aconitum* (Ranunculaceae) in the Eastern Carpathians (Central Europe). Acta Biologica Cracoviensia. Series Botanica 49 (2): 15-26.
- Mitka J (2014) Phenetic and geographic pattern of *Aconitum* sect. *Napellus* (Ranunculaceae) in the Eastern Carpathians - a numerical approach. Acta Societatis Botanicorum Poloniae 71 (1): 35-48. https://doi.org/10.5586/asbp.2002.005

- Mosyakin SL, Shiyan NM (2022) The M.G. Kholodny Institute of Botany and the National Herbarium of Ukraine (KW), Kyiv: Damage due to the missile strikes on 10 October 2022. Ukrainian Journal of Botany 79 (5): 339-34.
- Novikoff A, Mitka J, Kuzyarin A, Orlov O, Ragulina M (2016) Some notes on the genus *Aconitum* in Chornohora Mts. Modern Phytomorphology 9 (Supplement): 35-73.
- Novikoff AV, Mitka J (2011) Taxonomy and ecology of the genus *Aconitum* L. in the Ukrainian Carpathians. Wulfenia 18: 37-61.
- Novikov A, Mitka J (2020) Spatial analysis and distribution modeling of *Aconitum moldavicum* in Ukrainian Carpathians and adjacent territories with special reference to the algorithm used. Plant Introduction 85-86: 50-64. https://doi.org/10.46341/pi2020001
- Novikov A (2022) Genus *Aconitum* of the Ukrainian Carpathians and adjacent territories. 1.2. Ukrainian Nature Conservation Group (NGO). Release date: 2021-8-02. URL: https://doi.org/10.15468/n37j8x
- Onyshchenko VA, Mosyakin SL, Korotchenko IA, Danylyk IM, Burlaka MD, Fedoronchuk MM, Chorney II, Kish RY, Olshanskyi IH, Shiyan NM, Zhygalova SL, Tymchenko IA, Kolomiychuk VP, Novikov AV, Boiko GV, Shevera MV, Protopopova VV (2022) IUCN Red List categories of vascular plant species of the Ukrainian flora. FOP Huliaeva V.M., Kyiv, 198 pp. [ISBN 978-617-7901-63-0]
- OpenStreetMap contributors (2022) OpenStreetMap database. OpenStreetMap Foundation. URL: https://www.openstreetmap.org/
- QGIS Development Team (2022) QGIS Geographic Information System. Open Source Geospatial Foundation Project. URL: http://qgis.osgeo.org
- Shiyan NM (2021) Type collections of plants and fungi in Ukraine: realities and prospects. Novitates Theriologicae 12: 358-370. [In Ukrainian]. https://doi.org/10.53452/nt1255
- Tasenkevich L (2003) Diversity of the flora of vascular plants In Ukrainian Carpathians. Proceedings of the Taras Shevchenko Scientific Society 12: 145-157. [In Ukrainian].
- Tasenkevich L (2014) Endemism of the Carpathians' flora–ecological and chorological peculiarities. Proceedings of the Taras Shevchenko Scientific Society 39: 22-36. [In Ukrainian].
- Turis P, Kliment J, Feráková V, Dítě D, Eliáš P, Hrivnák R, Košťál J, Šuvada R, Mráz P, Bernátová D (2014) Red List of vascular plants of the Carpathian part of Slovakia. Thaiszia 24 (1): 35-87.
- Wang L, Abbott RJ, Zheng W, Chen P, Wang Y, Liu J (2009) History and evolution of alpine plants endemic to the Qinghai-Tibetan Plateau: *Aconitum gymnandrum* (Ranunculaceae). Molecular Ecology 18 (4): 709-721. https://doi.org/10.1111/j.1365-294x.2008.04055.x
- Wani ZA, Ridwan Q, Khan S, Pant S, Siddiqui S, Moustafa M, Ahmad AE, Yassin H (2022) Changing climatic scenarios anticipate dwindling of suitable habitats for endemic species of Himalaya—Predictions of ensemble modelling using *Aconitum heterophyllum* as a Model Plant. Sustainability 14 (14): 8491. https://doi.org/10.3390/su14148491

Author-formatted, not peer-reviewed document posted on 15/12/2022. DOI:
https://doi.org/10.3897/arphapreprints.e98841

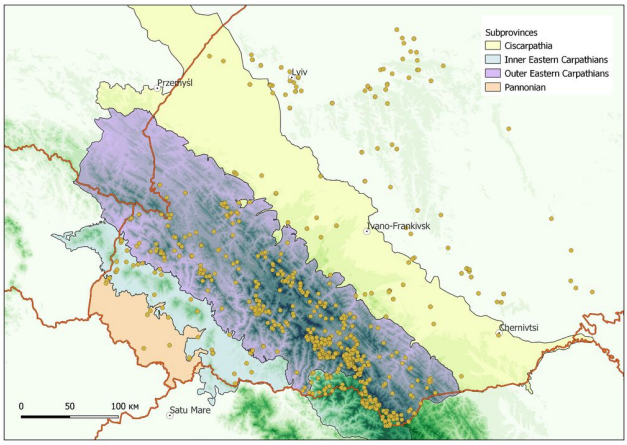

Figure 1.

General distribution of georeferenced occurrences of the genus *Aconitum* in the Ukrainian Carpathians and adjacent territories.