BIOBLITZ Report

Inventories of selected groups of organisms in the 2025 season

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The research was carried out by the Polish Society for the Protection of Birds (OTOP) and commissioned by the Royal Łazienki Museum in Warsaw.

Warsaw, 30.06.2025

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1. Introduction

Bioblitz is a form of rapid nature inventory that combines science with active public participation. This idea was initiated by Susan Rudy from the US National Park Service, who, in cooperation with volunteers, organized the first event of this kind at Kenilworth Park & Aquatic Gardens in Washington in 1996. Since then, the Bioblitz formula has gained worldwide popularity, becoming a valued tool not only for collecting biodiversity data, but also for ecological education and engaging local communities in nature conservation activities.

In 2025, the Royal Łazienki Museum in Warsaw organized its own series of "Bioblitz" events for the first time, spread in time from April to June. Each meeting was aimed at learning about a selected group of organisms inhabiting the historical garden, as well as popularising knowledge about nature among residents and visitors. The events were conducted by specialists in various fields of biology and ecology, accompanied by participants – both nature enthusiasts and people with no previous experience – who had the opportunity to observe, ask questions and actively participate in the research process.

The project was carried out in cooperation with the Polish Society for the Protection of Birds.

2. Purpose of the research

The main purpose of the "Bioblitz" series of events was to conduct a comprehensive inventory of selected groups of organisms inhabiting the park area of the Royal Łazienki Museum, located in the city centre of Warsaw. The collected data is an important supplement to the existing knowledge about local biodiversity and will be used for both scientific and practical purposes – supporting activities in the field of nature protection, urban greenery management and planning exhibitions or educational events.

An equally important aspect of the project was its participatory and educational dimension. Thanks to a direct contact with experts and the opportunity to participate in real field research, the residents of Warsaw and park guests had the opportunity to deepen their natural knowledge, develop the ability to observe the natural environment and feel part of a community that cares for local nature.

The project is also part of the preparations for a temporary exhibition planned for November 2025 under the working title "The Marvels of Łazienki", which will present the natural wealth of the Museum's gardens and showcase various forms of educational and research activities conducted with the public's participation.

As part of this year's "Bioblitz" events, the following groups of organisms were researched:

- birds,
- lichens and bryophytes,
- fungi,
- aquatic invertebrates and fish,
- moths,
- spiders and harvestmen.

3. Location characteristics

The Royal Łazienki Museum in Warsaw is a unique place where history, art and nature coexist harmoniously. This approach can trace its roots back to the 17th century, when Stanisław Herakliusz Lubomirski commissioned the construction of a baroque bathing pavilion – from which the Museum derives its Polish name – at the site of the former hamlet of Ujazdów. In the 18th century, the area became the property of King Stanisław August Poniatowski, who transformed it into one of the most beautiful classicist residences in Europe. The famous Palace on the Isle and the geometric and landscape concept of the garden, modelled on English and French gardens, among others, come from this period.

The park covers an area of about 74 hectares and includes diverse natural habitats – from old-growth deciduous forests, through park glades, to channels, streams and ponds. In total, about 7,300 trees grow here, representing over 300 species and varieties of trees and shrubs. The oldest tree in Łazienki – a 240-260 year old ash, is a living witness to the historical transformations of this place.

The garden is located on the Warsaw Escarpment of the Vistula River, which affects its unique landscape and habitat values. The Vistula river is in close proximity, and the park itself has served for years as a natural boundary between the heavily urbanized centre of Warsaw and the more spread-out suburban areas. Thanks to this, Łazienki have retained their function as an ecological corridor connecting different parts of the city and as a refuge for nature amid an urbanized landscape.

The vicinity of other green areas – such as the Botanical Garden of the University of Warsaw, the Warsaw Escarpment or the Czerniakowski Port – contributes to the Łazienki's key role in the city's local ecological network. It is also a place with a unique educational and social potential, enabling contact with nature in a historical and cultural context.

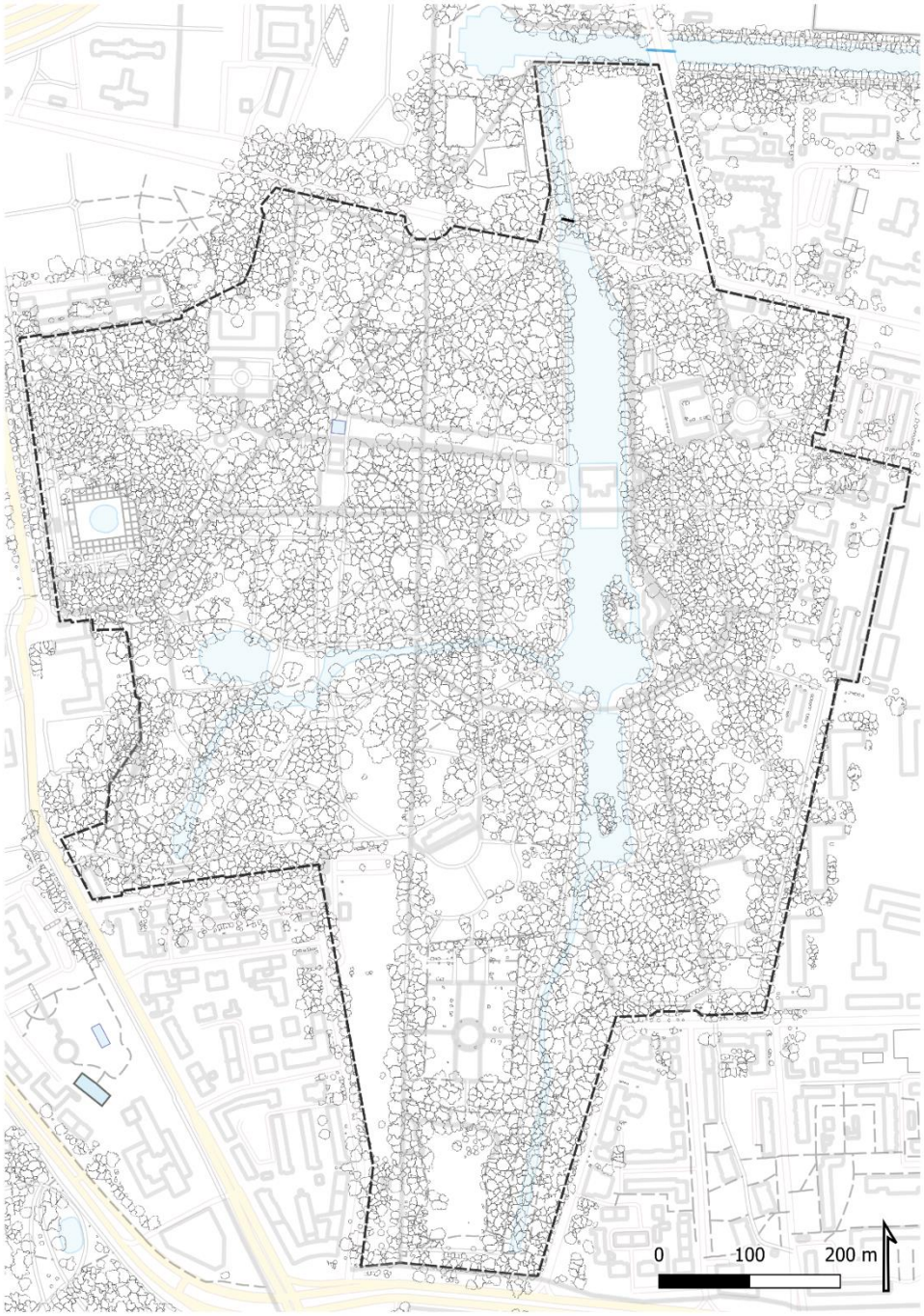

Figure 1. The area of the research (boundaries are marked with a black dashed line. Source: BDOT10k, tree canopy map – modified)

4. Fieldwork methods

Each of the research groups conducted observations and analyses taking into account the specific characteristics of the selected organisms, combining proven scientific methods with educational elements. Thanks to this, the participants not only supported the research process, but also had the opportunity to learn about the tools and techniques of fieldwork.

In the case of bird surveys, visual and acoustic methods were used: observations were conducted using binoculars and bird voice monitoring was carried out in the morning and at dawn, when bird activity was highest.

Aquatic invertebrates and fish were caught using hand nets and other fish nets, and then identified in field. To ensure animal welfare, all individuals were released immediately after being identified.

Moths were lured by UV light, using specialized lamps and canvas sheets hung near the light source. In addition, butterfly nets were used to catch insects in flight, especially at dusk.

Fungi, lichens and bryophytes were documented in field and analysed using stereoscopic microscopes and microscope lenses, which allowed for precise determination of the species. Some of the samples were also analysed on site, at educational points.

In the case of arachnids, both manual harvesting methods (from leaves, grasses and any nooks) and observation techniques were used. Field magnifiers and magnifying glasses were also helpful.

All of the observations were systematically photographically documented, and some of the data was entered into publicly available nature databases or used at exhibitions or educational events.

A detailed description of the methodology used for each group of organisms can be found further in the report, in the sections dealing with results for the given taxonomic group.

Results

5.1. Fungi

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Introduction

The Royal Łazienki Park, which is an old growth garden, is a place that encourages the development of fungal tree parasites. At the same time, trees brought down by storms are meticulously removed from the area, which results in a very serious depletion of the mycobiota. Although fungi are present in the Park all year round, two clear peaks of occurrence can be noticed – the first in April and early May – when, in favourable weather, morels and other sac fungi can be expected, and the second typical peak – from mid-August. Some of the fungi can be tracked down even during periods that are unfavourable for fruiting. This applies, to a large extent, to micromycetes – that is, those species that live on leaves and in the litter as tiny mycelia, and, as spores, wait for moments of increased humidity. At that point, they immediately begin to develop and reproduce, after which they return to waiting for rain again. Macrofungi, in turn, can be seen in the form of rhizomorphs, rootstocks and sclerotia. Sometimes the presence of fungi is betrayed by characteristic symptoms of plant infestation – e.g. fasciation in juniper shoots or witch's brooms, which consist of unnaturally dense and branching stems, resembling mistletoe from a distance. Yet another piece of evidence for the presence of fungi is brown rot or white rot, which can be seen on decomposing wood. Mycologists usually embark on their searches in the autumn, after heavy rains. In June, and sometimes up until July, we can expect to find mycorrhizal fungi. In the spring, during the drought, the mycologists' task is a difficult one. They need to identify small spots on leaves, analyse minute bark

irregularities or closely observe any discolourations on tree bark. Walking around trees, especially the oldest oaks, beeches, and chestnut trees, as well as looking into tree hollows are all part of the repertoire of practices used by mycologists conducting field observations. Rubbing the material in one's fingers and smelling it can also help in identification. Polypores, or conks, which can be observed all year round, may form annual or perennial fruiting bodies, which can grow by a few millimetres every year (*Fomens fomentarius*), or disintegrate with the winter's coming (*Laetiporus sulphureus*).

This study includes fungi inventoried as part of BioBlitz 2025, as well as ones found earlier in Łazienki, photographed and presented during field work by the Park's employees.

Methodology of the study

For the fungi inventory, a route survey method was used. The inventoried area was surveyed twice: 3 April and 12 April 2025, in the morning hours (9:00-13:00). On 3 April, preliminary materials for microscopic analysis were collected alongside the Bioblitz participants. They were plant remains from the northern, sloping part of the park, i.e. from the area adjacent to the Botanical Garden of the University of Warsaw, soil collected from the compost bin at the Old Orangery, as well as plant remains from the drainage ditch below the Old Orangery. The collected materials were left in damp chambers, i.e. on dishes lined with damp paper, at room temperature, until 12 April. When provided with optimal growing conditions, the features of colonies and fruiting bodies of many fungi may already be observed 3 days after being laid out.

On 12 April, after surveying the route, the collected fungi were analysed from 13:00 to 14:40, using stereo microscopes and microscope lenses. The survey route led south from the New Palm House, turning at the Belwedere restaurant. Just behind the Palm House, the Bioblitz participants stopped for a while around the only heap of wood and branches in the back of the New Palm House. During the inventory, the Locus Map Free app for Android was used to document the route and to indicate the objects' points of occurrence. The Locus Map app displays geo-references in decimal degrees (DD). The same notation is used in **Table 1**. The objects found were recorded and some of them photographed. **Figure 2** shows the combined route of the two inventory surveys. Whenever possible, fungal pathogens of plants were identified, as long as they produced symptoms characteristic of an infection.

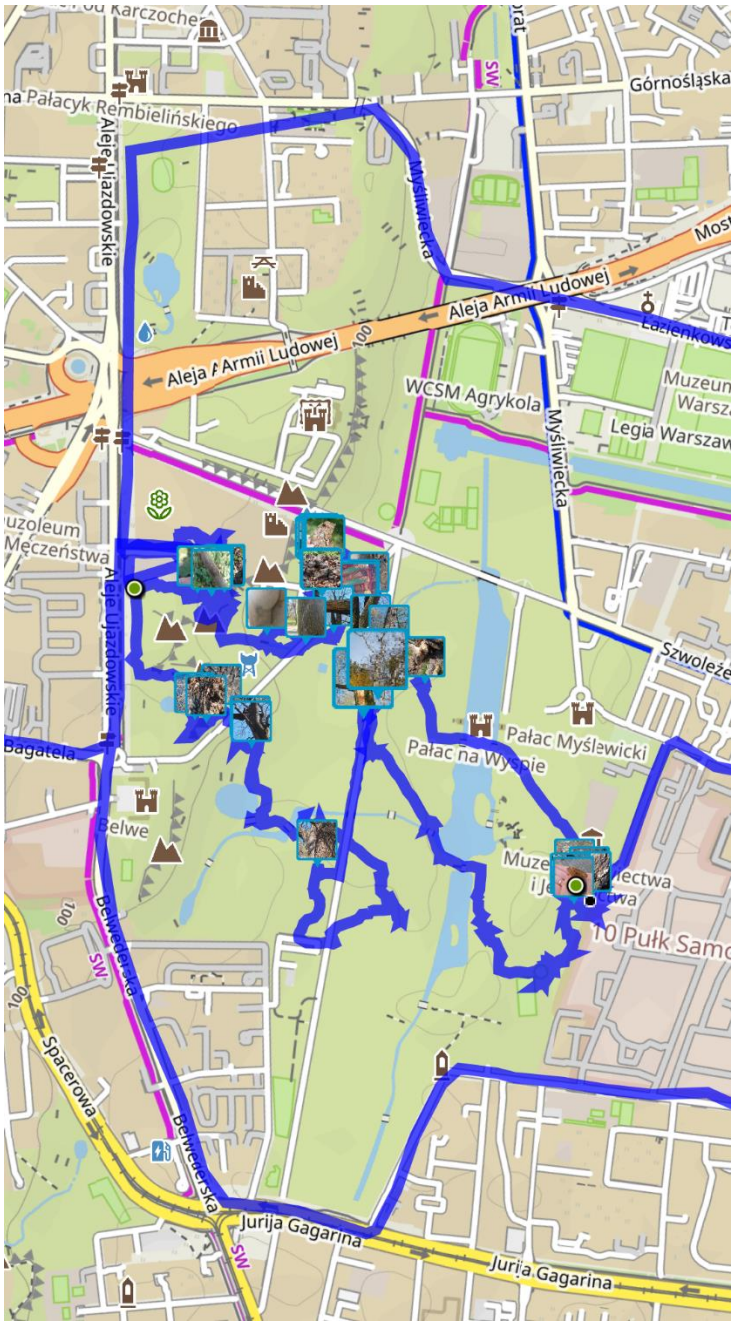

Figure 2. The route of the Łazienkowski Park survey, on 03.04.2025 and 13.04.2025

The materials collected on 03.04.2025, composed of of soil samples, leaves, herbaceous plant fragments, small branches and bark were documented with photographs, using both digital cameras and microscope lenses. The photographic documentation, taken using a NIKON microscope lens, was prepared using equipment purchased for the MYKOTEKA project, co-financed by the Ministry of Education and Science, under the science for the public programme.

Table 1 contains a list of the taxa found, with the point of occurrence marked.

Results and conclusions

During the route survey, 52 species of fungi were identified, of which 25 were basidiomycetes Basidiomycota, whereas 19 of the species found were sac fungi, Ascomycota. Furthermore, soil

studies of the given area have revealed the presence of about 15 taxa of microscopic fungi belonging to different taxonomic groups. **Table 1** presents the identified species of macrofungi and the coordinates of their occurrence, according to GPS indications, as well as information on the habitat. English names were given only if they exist in mycological literature. For the English translation, the common names suggested by the British Mycological Society (2025) were used.

Table 1. List of identified fungi taxa. Fungi belonging to the division of *Basidiomycota* are marked with orange, fungi belonging to sac fungi *Ascomycota* with blue, *Zoopagomycota* with purple, and *Mucoromycota* - green.

Species, scientific name	English name	Coordinates	Photo no., additional data
1.Stereum hirsutum	Hairy Curtain Crust	N52.21292 E021.03900	In citrus plant pots in the palm house
2. Xylaria polymorpha	Dead Man's Fingers	N52.21292 E021.03900	In citrus plant pots in the palm house
3.Coprinellus micaceus	Glistening Inkcap	Unknown, brought for identification.	This fungus certainly grows under a chestnut tree on the slope above the Orangery, on the premises of the UW Botanical Garden (photo), and at the Ujazdowski Palace
4. Melanoleuca cognata	Spring cavalier	N52.21277 E021.03878	On a flowerbed in front of the New Palm House
5. Peniphora cinerea	none	N52.21268 E021.03918	On wood stored in the back of the Palm House
6.Aethelia arachnoidea	none	N52.21590 E021.03108	On maple bark
7.Armillaria sp.	Honey Fungus	N52.21556 E021.03424	At the root of a fallen tree by a lawn in the central part of the park
8.Schizophyllum commune	Common Porecrust	N52.21262 E021.03924	On wood stored in the back of the Palm House
9.Phellinus pomaceus	Cushion Bracket	N52.21268 E021.03918	On wood stored in the back of the Palm House
10. Calvatia gigantea	Giant Puffball	N52.21723 E021.03110	On a lawn in the northern part of the park, next to the Chinese Pavilion
11.Fomes fomentarius	hoof fungus	N52.21597 E021.03322 N52.21609 E021.03271	On numerous park trees
12. Meripilus giganteus	Giant Polypore	N52.21668 E021.03130	At the root of a beech, below the Orangery
13.Phellinus igniarius	Willow Bracket	N52.21722 E021.03124	On a willow in the northern part of the park, below the Orangery
14. Fusarium	none	N52.21488 E021.03280	On sap seeping from the trunk of a supported hornbeam
15.Fusicolla merismoides	none	N52.21488 E021.03280	On sap seeping from the trunk of a supported hornbeam
16.Gymnosporangium sabinae	none	N52.21338 E021.03487	On juniper shoots, at the pond in the central part of the park
17.Nectria muscivora	none	N52.21488 E021.03280	On sap seeping from the trunk of a supported hornbeam
18.Nectria cinnabarina	Coral Spot		On numerous small twigs
19.Ganoderma adspersum	none	N52.21644 E021.03621	Only a detached fruiting body, near a chestnut espalier located

Species, scientific name	English name	Coordinates	Photo no., additional data
			in the vicinity of the northern pond
20.Ganoderma applanatum	Artist's Bracket	N52.21713 E021.03111	On a willow
21.Trametes hirsuta	Hairy Bracket	N52.21277 E021.03878	On wood stored at the New Palm House
22.Auricularia auricula-judae	Jelly Ear	N52.21648 E021.02854	On a fallen black elder branch in the northern part of the park, on a slope
23.Mucor hiemalis	none	N52.21618 E021.03052	In soil in front of the Oragnery
24.Rhizopus nigricans	Black Bread Mold	N52.21618 E021.03052	In soil in front of the Oragnery
25.Absidia glauca	none	N52.21618 E021.03052	On a leaf fragment from the soil in front of the Orangery
26. Piptocephalis freseniana	none	N52.21618 E021.03052	In soil in front of the Oragnery
27.Syncephalis nodosa	none	N52.21618 E021.03052	In soil in front of the Oragnery
28.Molisia cinerea	none	N52.21717 E021.03102	On a maple twig from the central part of the park
29.Septoria sp.	none	N52.21717 E021.03102	On dry shoots of Canada Goldenrod *Solidago canadensis*
30.Alternaria alternata	none	N52.21648; E21.02854	On dried leaves from the upper, northern part of the park
31.Alternaria tenuissima	none	N52.21581 E021.03071	Leaf material taken from a drainage ditch
32. Actinomucor elegans	none	N52.21581 E021.03071	Leaf material taken from a drainage ditch
33. Mortierella alpina	none	N52.21581 E021.03071	Leaf material taken from a drainage ditch
34.Trichoderma harzianum	none	N52.21648; E21.02854	On dried leaves from the upper, northern part of the park
35. Cladosporium sp.	none	N52.21648; E21.02854	On dried leaves from the upper, northern part of the park
36. Penicillium sp.	none	N52.21648; E21.02854	On dried leaves from the upper, northern part of the park
37.Fomitopsis betulina	none	N52.21338 E021.03487	On the trunk of a standing birch in the central part of Łazienki, near the pond
38.Fomitoporia robusta	none	N52.21268 E021.03918	On numerous oaks in the park, on stored wood
39.Inonotus hispidus	Shaggy Bracket	N52.21268 E021.03918	on stored wood
40.Fibroporia vailantii	none	N52.21660 E021.03229	On wood of the Chinese Pavilion
41.Colletotrichum gloeosporioides	none	N52.21644 E021,02815	On leaves of the common ivy *Hedera helix*
42.Crepidotus lundellii (syn. Crepidotus caspari)	none	N52.21653 E021.02884	On deciduous tree branches, on the slope in the northern part of the Park
43.Diatrype decorticata	none	N52.21645 E02102849	On deciduous tree branches, on the slope in the northern part of

Species, scientific name	English name	Coordinates	Photo no., additional data
			the Park
44 Camarops sp.	none	N52.21645 E02102849	On a deciduous tree branch, on the slope in the northern part of the Park
45. Kretzschmaria deusta	Brittle Cinder	N52.21446 E021.02886	On a tree stump
46.Laetiporus sulfureus	Chicken of the Woods	N52.21424 E021.03005	On an oak, between the branches
47.Ceriporus squamosus	none	Identified from a photo taken by employees of Łazienki	On a deciduous tree
48.Mortierella bisporalis	none	N52.21581 E021.03071	Leaf material taken from a drainage ditch
49. Morchella esculenta	Morel	Identified from a photo taken by employees of Łazienki	On soil near the Podchorążówka building
50. Bjerkandera addusta	Smoky Bracket	N52.21268 E021.03918	On a tree stump, with stored wood, in the back of the New Palm House
51. Leptosphaeria doliolum	none	N52.21717 E021.03102	On shoots of Canada goldenrod *Solidago canadensis*
52. Doratomyces stemonitis	none	N52.21717 E021.03102	On shoots of Canada goldenrod *Solidago canadensis*

After an approximately 8-hour inventory survey through the Łazienki, about 60 species of fungi were identified or collected for identification after incubation. The genus or species of 52 taxa has been identified.

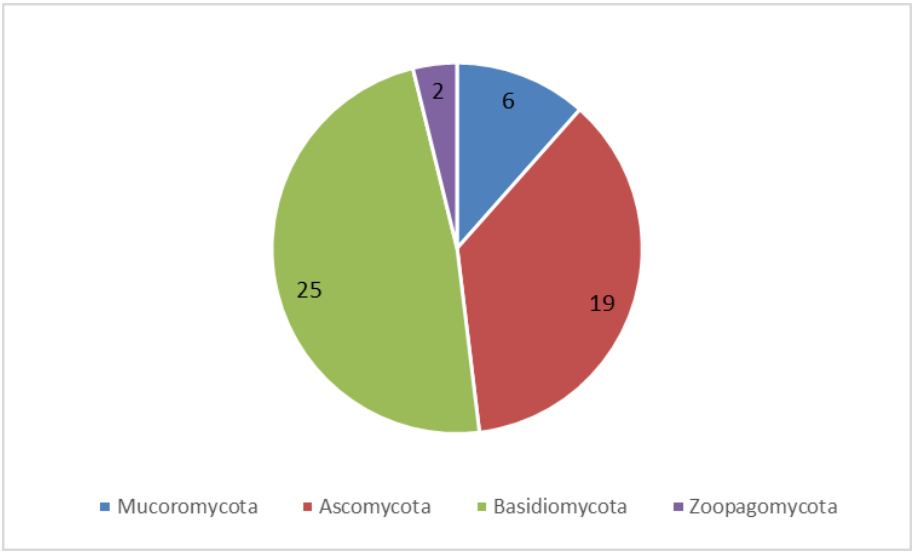

Figure 3. Share of species of fungi by division

Approximately 50% of the inventoried fungi are basidiomycetes. These are mostly tree pathogens or saprotrophs feeding on decaying wood. Most of the saprotrophs were found on wood

stored within the park's internal infrastructure. Leaving dead large-sized pieces of wood in the Park could certainly increase the share of saprotrophs and significantly enrich the list of fungi. The insignificant number of mushrooms, which can certainly be found in the Park during the autumn and with significant humidity, is striking. 19 of the identified species are sac fungi. Most of them are very small forms found on twigs or leaves taken from the park. Collecting the material a week before the Bioblitz event was a deliberate measure, which markedly increased the chances of identifying fungi. Sac fungi collected during a dry period are usually found in a state that makes it difficult to identify them. When conducting inventories, the proper ratio of ascomycetes to basidiomycetes should equal at least 2:1; consequently, at least 50 species of sac fungi are to be confidently expected. It is worth noting that the small forms of ascomycetes, which formed the perythecium present on some twigs and plant remains in the tested material, remained unidentified.

Mucoromycota and Zoopagales represent a small percentage of the fungi, but their number is inflated in reference to the species representing the Dikraya subkingdom (ascomycetes and basidiomycetes). This means that the relatively short incubation of the materials collected in the Park took place in conditions optimal for their growth.

To sum up, the Park management should be strongly encouraged to repeat the inventory of the Park in autumn. A much larger number of mushrooms and gasteroid fungi are expected in autumn – fungi inventoried in the Botanical Garden of the University of Warsaw are particularly likely to be found, as the Garden is adjacent to the Łazienki and the two locations certainly share a common mycocenosis. Common fungi in the BG UW include: Fairy Ring Champignon *Marasmius oreades*, Scaly Earthball *Scleroderma verrucosum,* Wine Cap Stropharia *Stropharia rugosoannulata*, Giant Funnel *Leucopaxillus giganteus*, Deer Shield *Pluteus cervinus*, Silky Rosegill *Volvariella bombycina* and *Xerocomus* boletes. Lurid Boletes *Suillellus luridius*, which can be found among the lindens in the neighbouring Aleje Ujazdowskie, are also expected to be widespread in the Park, especially under the oaks on the slope.

Photos

Photo 1. *Athelia arachnoidea* on maple bark. A sac fungus belonging to the ecological group of lichenicolous fungi (photo: Marta Wrzosek)

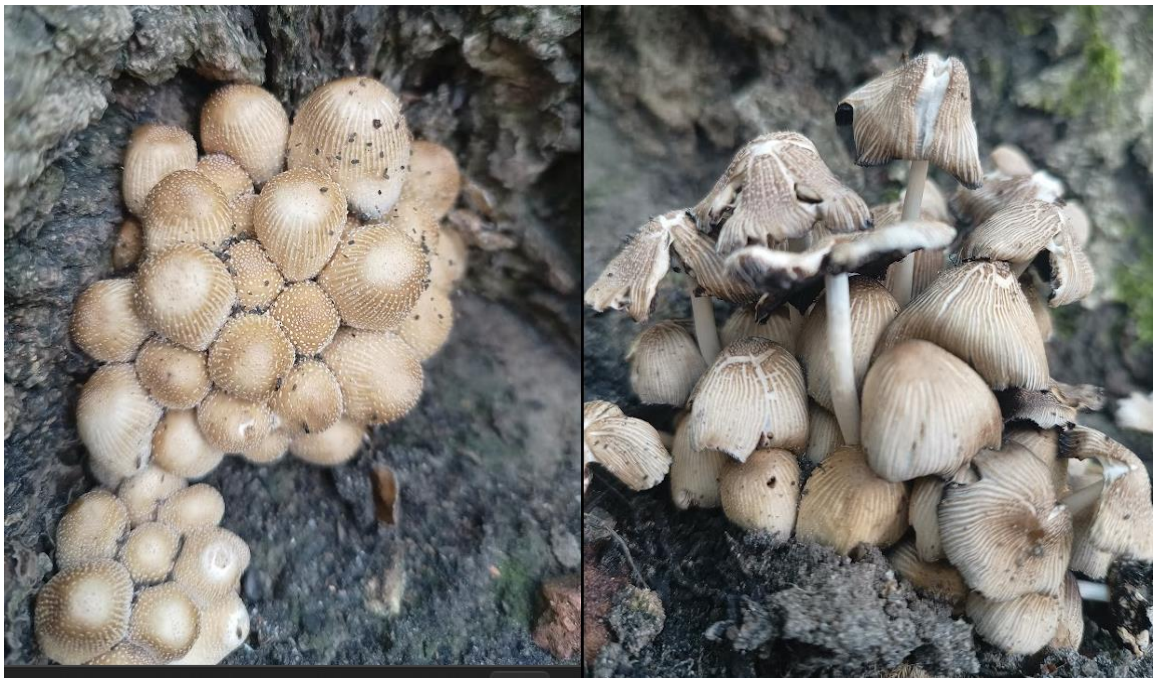

Photo 2. *Coprinellus micaceus* from under a chestnut tree on the slope, above the Orangery (photo: Marta Wrzosek)

Photo 3. *Auricularia auricula judae* found on a fallen elder branch in the bushes at the top of the slope in the northern part of the park, behind the cafe (photo: Marta Wrzosek)

Photo 4. Hoof Fungus (*Fomes fomentarius*) – one of the most common fungi of the Łazienki (photo: Marta Wrzosek)

Photo 5. Artist's Bracket (*Ganoderma applanatum*), found at the base of a live deciduous tree (photo: Marta Wrzosek)

Photo 6. Giant Polypore (*Meripilus giganteus*) growing on beech roots, below the Orangery (photo: Marta Wrzosek)

Photo 7. A hornbeam with sap seepage, containing *Fusarium*, *Fusicolla* and *Nectria* ascomycetes (photo: Marta Wrzosek)

Photo 8. Willow Bracket (*Phellinus igniarius*), on willow wood (photo: Marta Wrzosek)

Photo 9. Chicken of the Woods (*Laetiporus sulfureus*) between oak branches (photo: Marta Wrzosek)

Photo 10. Honey Fungus (*Armillaria* sp.) rhizomorphs and a tree fallen as a result of fungal development in the roots (photo: Marta Wrzosek)

Photo 11. *Fibroporia vaillantii* on the rafters of the Chinese Pavilion (photo: Marta Wrzosek)

Photo 12. *Camarops* sp. on a twig lying in the park floor litter (photo: Marta Wrzosek)

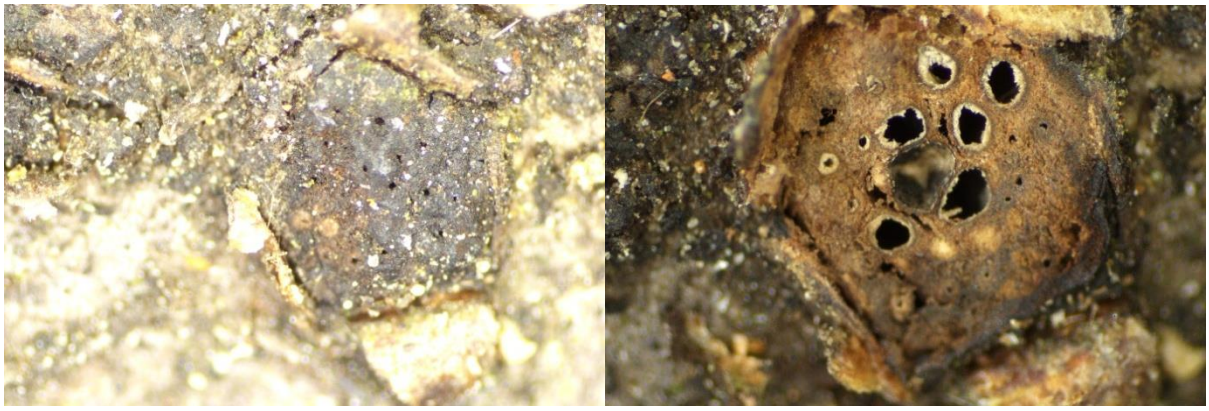

Photo 13. Stroma cross-section of a *Diatrype* sp. fungus (photo: Marta Wrzosek)

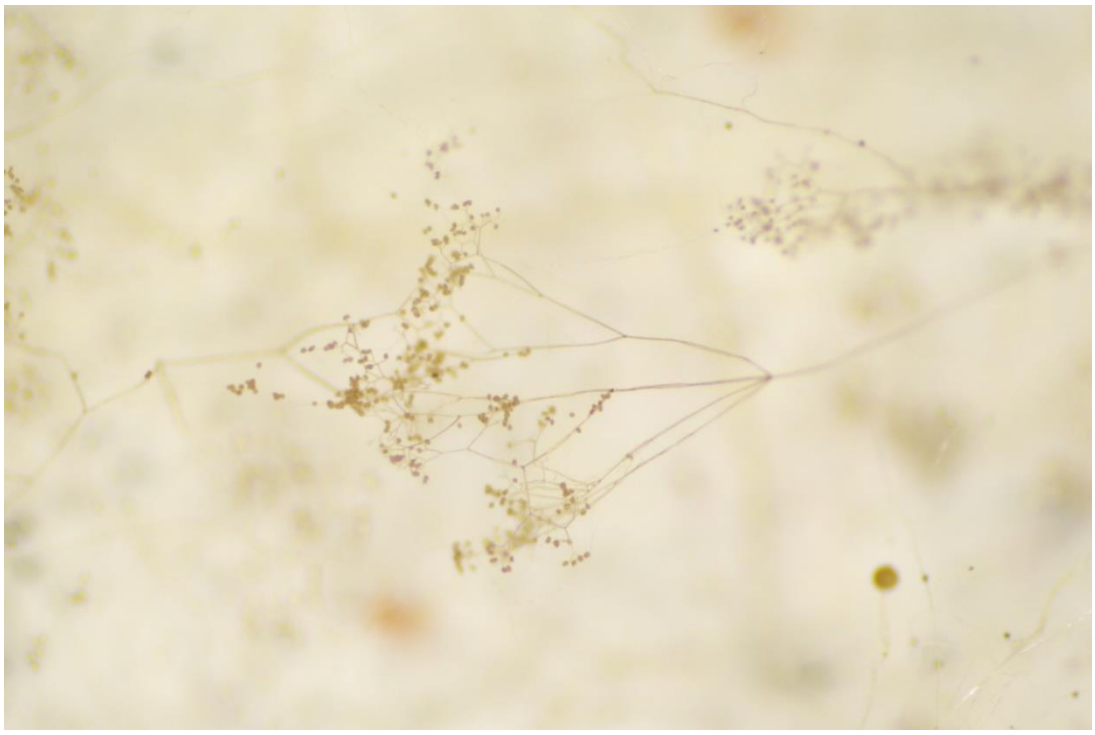

Photo 14. *Piptocephalis freseniana* (photo: Marta Wrzosek)

Photo 15. *Mollisia cinerea* (photo: Marta Wrzosek)

Photo 16. *Nectria cinnabarina* – asexual stage on a twig (photo: Marta Wrzosek)

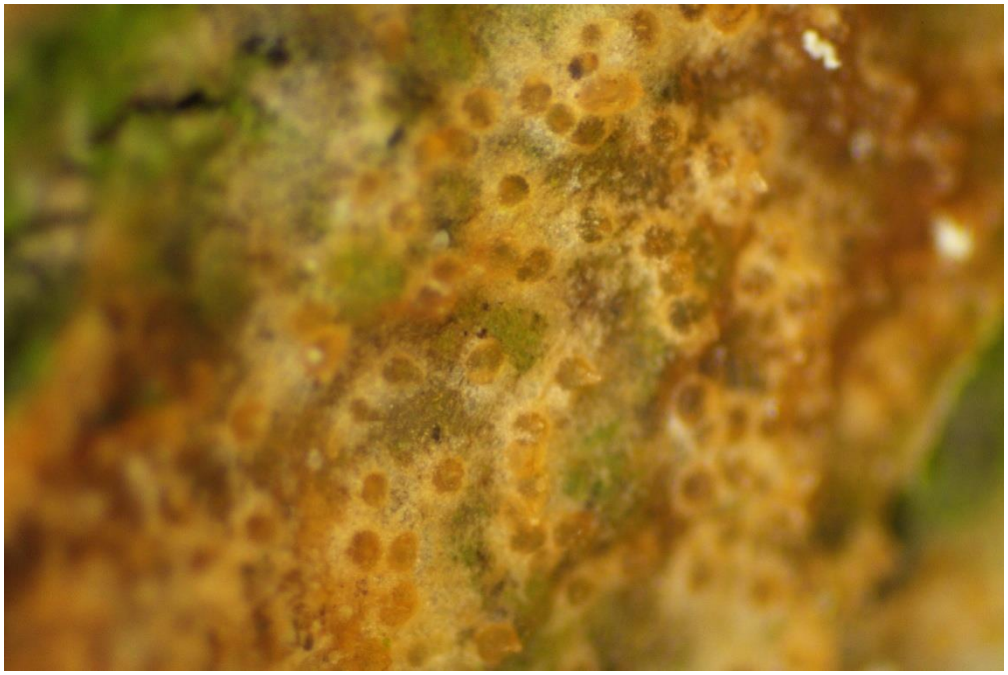

Photo 17. *Nectria muscivora* – sexual stage, on sap seeping from a maple (photo: Marta Wrzosek)

Photo 18. *Absidia glauca,* on a leaf fragment taken from the soil (photo: Marta Wrzosek)

Photo 19. Smoky Bracket *Bjerkandera adusta*, cap edge (photo: Marta Wrzosek)

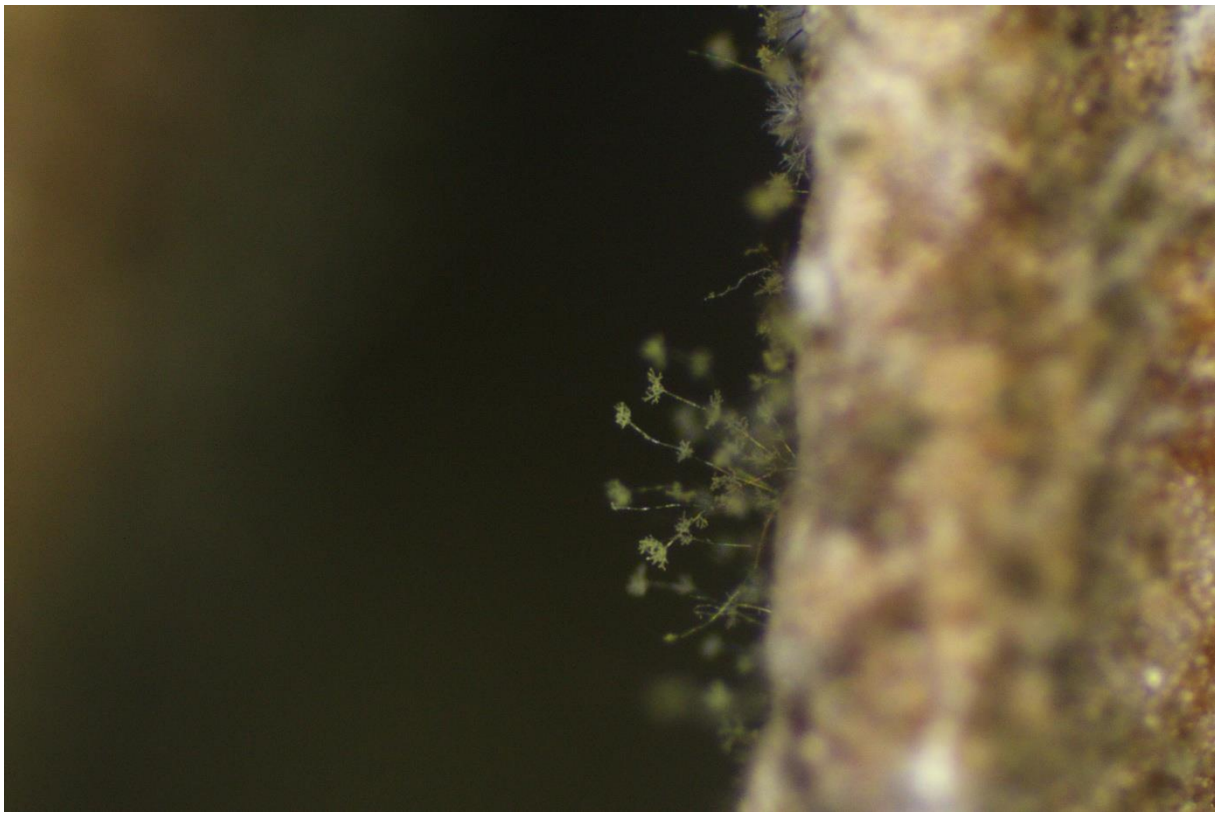

Photo 20. *Cladosporium* sp., on leaves in the litter (photo: Marta Wrzosek)

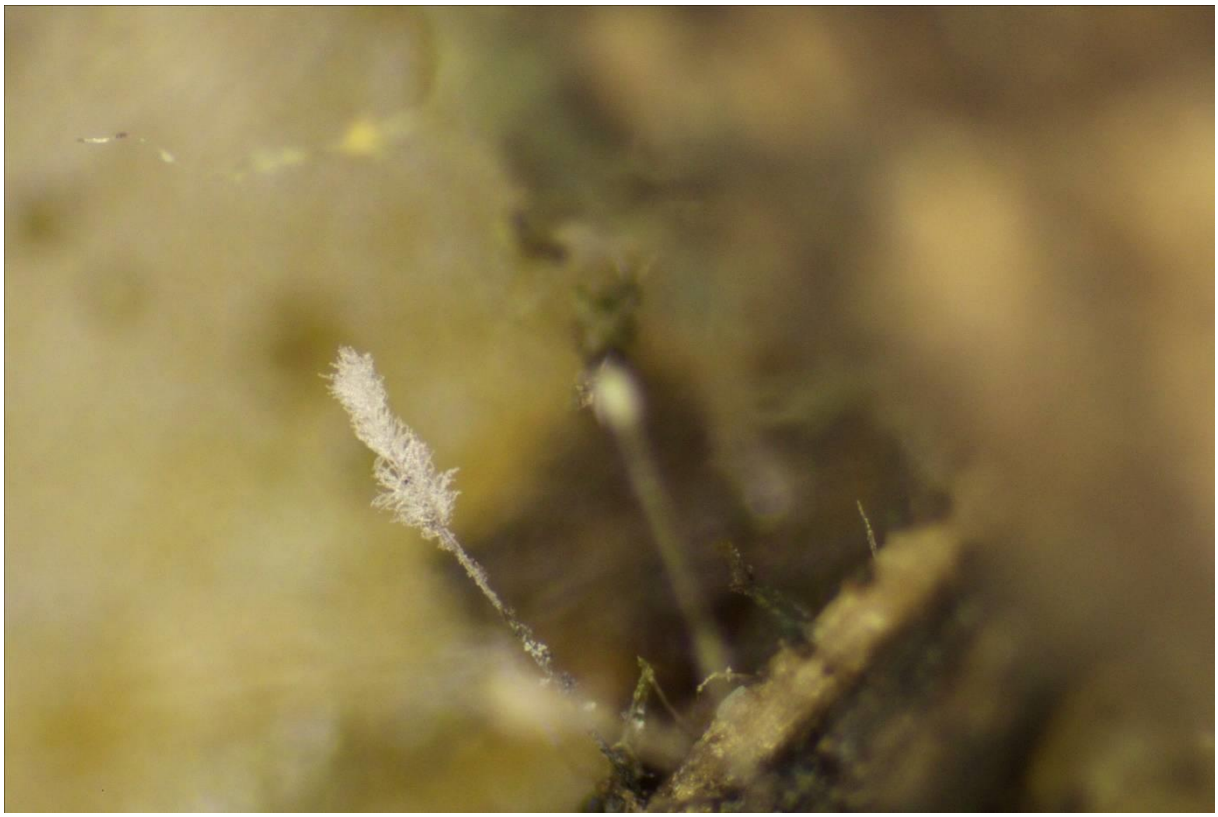

Photo 21. *Doratomyces stemonitis* on plant remains (photo: Marta Wrzosek)

Photo 22. *Inonotus hispidus* found on wood stored within the Park's internal infrastructure (photo: Marta Wrzosek)

Photo 23. *Xylaria polymorpha* in a citrus plant pot in the new palm house (photo: Marta Wrzosek)

5.2. Lichens and bryophytes

dr Piotr Zaniewski

Introduction

During botanical research, we naturally first pay attention to large objects, such as trees, shrubs, as well as groundcover plants. If one were to, however, take a closer look at the object in question, it soon becomes obvious that the bark of trees, boulders, walls, wood and ground among the grasses also host smaller organisms, ones which do not produce flowers or fruits. In order to reproduce, they have instead developed various types of spores, gemmas, soredia and isidia. For this reason, they are commonly referred to as cryptogams (meaning "hidden reproduction" in Greek) or cryptophytes ("hidden flower"). These groups include lichens and bryophytes, which in turn are divided into mosses and liverworts. These organisms, despite their small size, are important for maintaining biodiversity. They are the place where many invertebrates live and feed, and can be used as nest building material by birds. In addition, some of them are also used by humans, e.g. in medicine (see e.g. Zaniewski 2014, Janowska 2020). Despite their preference for habitats that have not been strongly transformed by humans, lichens and bryophytes can also commonly be found in rural areas, and even in cities, where they thrive particularly in parks (see e.g. Fudali 2003, Zarabska-Bożejewicz 2016).

Lichens and bryophytes do not die in winter, as is usually the case with the shoots of many flowering plants. Therefore, we can generally search for them throughout the whole year. This, however, requires perceptiveness and knowledge of their potential places of occurrence. Any given species can usually be found in its specific habitat and substrate. It can be, for example, tree bark, dead wood, rocks, concrete or soil. But even within them, they do not grow evenly. Many species from this group are strongly attached to specific places, called microhabitats. These may be the interiors of deep cracks in the bark of old oaks, sandy slopes or abandoned molehills. In addition, open, park and forest areas can vary significantly in terms of species composition, depending on the preferences of individual taxa from these groups (see e.g. Zaniewski and Czarnota 2018).

Identifying lichens and bryophytes requires knowledge of their anatomy and reproductive methods. For lichens, the basic features are the size, form and colour of the thallus, as well as the shape and location of the rhizoids, fruiting bodies, isidia, or soredia. For bryophytes, on the other hand, the most important characteristics are the size and shape of individual parts (rhizoids, seta and leaves) of gametophytes (sexual generation), the presence and location of gemmas, as well as the features of individual parts of non-green sporophytes growing out of them (asexual generation). The identification of many species nevertheless requires additional microscopic and sometimes even chemical analyses. In spite of this, many lichen and bryophyte species can be identified in field, using an ordinary magnifying glass with a 10x or 20x magnification.

Methodology of the study

The Royal Łazienki is an extensive and varied palace and park complex encompassing an area of about 74 ha. They include the area of the Warsaw Escarpment, its slopes and areas below it, all of which are part of the Vistula valley. Despite the presence of many large trees, as a well-kept and frequently visited area, it is characterized by the presence of cultivated lawns and insignificant amounts of dead wood. The field survey was carried out on 12 April 2025. Its starting point was

located at the New Palm House, where, together with the Bioblitz participants, freshly fallen branches collected from the area of Łazienki were searched for the presence of lichens. Further study was conducted using the route survey method, which aimed to encompass the largest area of the surveyed object possible. During the survey, species were searched for primarily on tree trunks and freshly fallen tree branches, as well as on lawns, boulders and walls. At the same time, participants were introduced to the anatomical features of lichens and bryophytes, which are the diagnostic characteristics of species found on site. Having returned indoors, species identification was continued, and the preliminary, independent identifications made by the participants were verified. A list of lichen and bryophyte species found during the Bioblitz workshop was prepared based on the collected data. In the English translation, names suggested by the British Bryological Society (fifth edition, 2020) and the British Lichen Society (2014) were used for bryophytes and for lichens respectively. The status of their protection was given in accordance with the relevant regulations of the Minister of the Environment (2014a, 2014b), and their conservation status was based on Cieśliński et al. (2006).

Results and conclusions

A total of 49 species were recorded during the Bioblitz inventory in the Royal Łazienki, including 34 lichens and 15 bryophytes, of which 14 species of moss and one species of liverwort. Of the identified species, one is subject to strict protection and four to partial protection. Two of the identified species appear in the red list of lichens with the NT category – Near Threatened, and one with the DD category – Data Deficient (**Table 2**).

Table 2. List of lichens, liverworts and mosses found during Bioblitz workshops in the Royal Łazienki (protection status based on Regulations (2014a, b), conservation status based on the Red List (Cieśliński et al. 2006)

English name	Scientific name	Protection/conservation status in Poland	Group (L – lichens, Lw – liverworts, M – mosses)
none	Lecidella elaeochroma (Ach.) M. Choisy	-	L
none	*Athallia pyracea* (Ach.) Arup, Frödén & Søchting	-	L
none	Punctelia jeckeri (Roum.) Kalb	strict protection / DD	L
none	Verrucaria nigrescens Pers.	-	L
Summer Screwmoss	Tortula muralis Hedw.	-	M
Tiny Button Lichen	*Amandinea punctata* (Hoffm.) Coppins & Scheid.	-	L
Springy Turf-moss	Rhytidiadelphus squarrosus (Hedw.) Warnst.	partial protection	M
Rough-stalked Feathermoss	Brachythecium rutabulum (Hedw.) Schimp.	-	M
Smooth-stalk Feathermoss	*Brachythecium salebrosum* (Hoffm. ex F.Weber & D.Mohr) Schimp.	-	M
none	Lepraria cf. incana (L.) Ach.	-	L
powdery goldfleck lichen	Candelariella efflorescens R.C. Harris & W.R. Buck	-	L
none	Candelariella xanthostigma (Pers. ex Ach.) Lettau	-	L
Hidden Goldspeck Lichen	Candelariella aurella (Hoffm.) Zahlbr.	-	L

English name	Scientific name	Protection/conservation status in Poland	Group (L – lichens, Lw – liverworts, M – mosses)
Common Goldspeck Lichen	Candelariella vitellina (Hoffm.) Müll.Arg.	-	L
Oakmoss	Evernia prunastri (L.) Ach.	NT – Near Threatened	L
none	Lecanora expallens Ach. agg.	-	L
Pointed Spearmoss	Calliergonella cuspidata (Hedw.) Loeske	partial protection	M
none	*Flavoplaca flavocitrina* (Nyl.) Arup, Frödén & Søchting	-	L
none	*Myriolecis hagenii* (Ach.) Śliwa, Zhao Xin & Lumbsch	-	L
none	*Myriolecis dispersa* (Pers.) Śliwa, Zhao Xin & Lumbsch	-	L
Star Rosette Lichen	Physcia stellaris (L.) Nyl. subsp. stellaris	-	L
Little Ciliated Lichen	Physcia tenella (Scop.) DC.	-	L
Hooded Rosette Lichen	Physcia adscendens (Fr.) H. Olivier	-	L
Mealy Shadow Lichen	Phaeophyscia orbicularis (Neck.) Moberg	-	L
Common Clam Lichen	Hypocenomyce scalaris (Ach.) M. Choisy	-	L
Hart's-tongue Thyme-moss	Plagiomnium undulatum (Hedw.) T.J.Kop.	-	L
Woodsy Thyme-moss	Plagiomnium cuspidatum (Hedw.) T.J.Kop.	-	M
Many-fruited Thyme-moss	*Plagiomnium affine* (Blandow ex Funck) T.J.Kop.	-	L
Bifid Crestwort	Lophocolea bidentata	-	Lw
Silver-moss	Bryum argenteum Hedw.	-	M
none	*Porina aenea* (Wallr.) Zahlbr.	-	L
Lustrous Camouflage Lichen	*Melanohalea exasperatula* (Nyl.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch	-	L
Abraded Camouflage Lichen	Melanelixia subaurifera (Nyl.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch	partial protection	L
Monk's Hood Lichen	Hypogymnia physodes (L.) Nyl.	-	L
Cypress-leaved Plaitmoss	Hypnum cupressiforme Hedw.	-	M
none	Protoparmeliopsis muralis (Schreb.) M. Choisy	-	L
none	Phlyctis argena (Ach.) Flot.	-	L
Little Goldilocks	Funaria hygrometrica Hedw.	-	M
none	Physconia grisea (Lam.) Poelt	-	L
Grey-cushioned Grimmia	Dryptodon pulvinatus (Hedw.) Brid.	-	M
Board Lichen	*Trapeliopsis flexuosa* (Fr.) Coppins & P. James	-	L
White-tipped Bristlemoss	Orthotrichum diaphanum Schrad. ex Brid.	-	M
Verdigrise Calicium	Chaenotheca trichialis (Ach.) Th.Fr.	NT	L
Purple Forkmoss	Ceratodon purpureus (Hedw.) Brid.	-	M

English name	Scientific name	Protection/conservation status in Poland	Group (L – lichens, Lw – liverworts, M – mosses)
Yellow Candle Lichen	*Polycauliona candelaria* (L.) Frödén, Arup & Søchting	-	L
Pin-cushion Starburst Lichen	*Polycauliona polycarpa* (Hoffm.) Frödén, Arup & Søchting	-	L
Yellow Wall Lichen	Xanthoria parietina (L.) Th.Fr.	-	L
Lesser Bird's-claw Beard-moss	Barbula convoluta Hedw.	-	M
Catherine's Moss	Atrichum undulatum (Hedw.) P.Beauv.	partial protection	M

The species composition of lichens and bryophytes of the Royal Łazienki is typical of urban park areas. Most of the lichen species found were also reported, among others, from the Skaryszewski Park (Zaniewski and Koziarska 2021). On the other hand, their smaller number is a related to the nature of the Royal Łazienki Bioblitz inventory, which lasted only one day. In spite of this, some interesting species have been recorded here. Especially noteworthy among them is the observation of *Punctelia jeckeri* (photo 24), which, despite being reported from new localities in Poland (see e.g. Szymczyk et al. 2015, Zarabska-Bożejewicz 2020) is still considered a rare species and is subject to protection. It is also believed to be a species that may currently be expanding into Central and Northern Europe, partly due to climate change. A small specimen of Oakmoss, which is a fruticose lichen, was also found. This, together with a markedly growing number of large foliose lichens (photos 25 and 26), most likely indicates an improvement in Warsaw's air pollution. A significant number of lichen species have recently also been recorded in the southern district of Wilanów (Sikorski et al. 2022). This indicates the expansion of lichens towards the centre of the capital. Additionally, towards the end of the Bioblitz workshop, the presence of Verdigrise Calicium, which is a forest species, was noted in the bark crevices of an old oak growing in the eastern part of the Łazienki (Cieśliński 2003). In addition, common photophilous and nitrophilous species were recorded in the Royal Łazienki (photos 27-30) as well as some saxicolous (rock-growing) species (photo 31).

The Royal Łazienki is one of the richest parks in Warsaw when it comes to the number of bryophytes. At the beginning of the 21st century, a total of 42 species from this group were reported from its area (Fudali 2003). Such a significant number is influenced both by the large area of the park, as well as by the presence of many old trees, thanks to which a large share of the species recorded are typical forest species. Most species found during the Bioblitz inventory were ones typical for the urban environment, characteristic for other parks in Warsaw, such as the Skaryszewski Park (Kłosowski 2021). These species grow on trees, soil (photos 32-33) and on concrete walls (photo 34). Additionally, despite the short inventory time and the consequently relatively small number of bryophytes reported, a Grey-cushioned Grimmia growing on a concrete wall was found (photo 35), as well as a liverwort – Bifid Crestwort – growing on the soil by a stream. These species were not previously reported from the Łazienki.

Summary and recommendations

Łazienki Królewskie is another locality in Warsaw that surprises us by not hosting only the commonest lichens and bryophytes, but also being home to some species that are rarely reported from highly urbanized areas. For this reason, it is an important local refuge for these groups of organisms. In order to maintain the diversity of lichens and bryophytes in the Royal Łazienki, it is first

of all important to continue the area's current mode of operation, i.e. to maintain the presence of old trees and mow lawns. In addition, leaving large logs and tree branches in areas inaccessible to visitors could be considered, as they are a potential habitat for epixilic (tree-growing) species of bryophytes and lichens, as well as not cleaning certain fragments of walls, which may in the future become inhabited by more saxicolous (rock-growing) species.

Photos

Photo 24. *Punctelia jeckeri* on tree bark in the Royal Łazienki (photo: Piotr Zaniewski)

Photo 25. Hammered Shield Lichen *Parmelia sulcata* on tree bark in the Royal Łazienki (photo: Piotr Zaniewski)

Photo 26. Abraded Camouflage Lichen *Melanelixia subaurifera* on a fallen tree branch in the Royal Łazienki (photo: Piotr Zaniewski)

Photo 27. Yellow Wall Lichen *Xanthoria parietina* on tree bark in the Royal Łazienki, young thalli of Little Ciliated Lichen *Physcia tenella* and Hooded Rosette Lichen *Physcia adscendens* are visible to the sides (photo: Piotr Zaniewski)

Photo 28. *Physconia grisea* on tree bark in the Royal Łazienki (photo: Piotr Zaniewski)

Photo 29. Mealy Shadow Lichen *Phaeophyscia orbicularis* on tree bark in the Royal Łazienki (photo: Piotr Zaniewski)

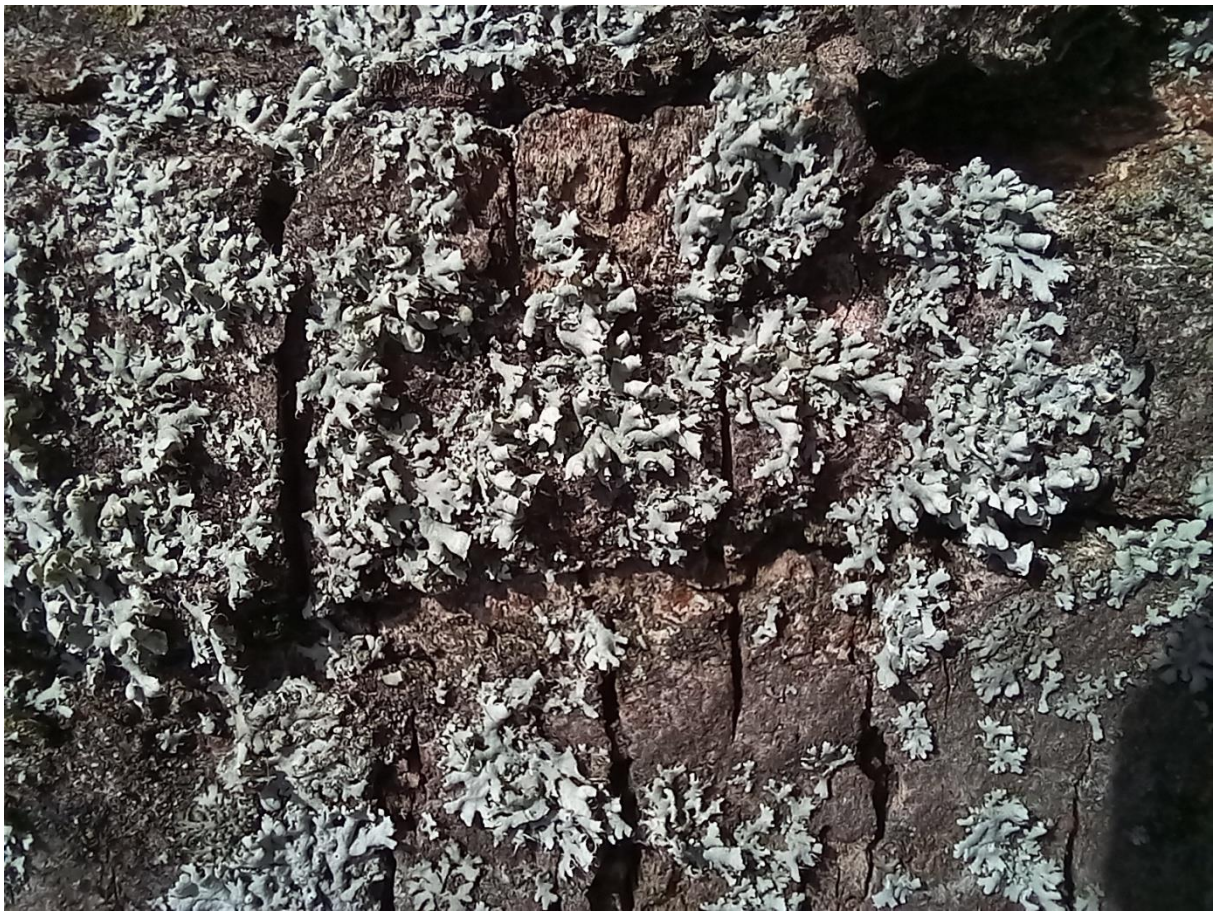

Photo 30. Hooded Rosette Lichen *Physcia adscendens* on tree bark in the Royal Łazienki (photo: Piotr Zaniewski)

Photo 31. *Protoparmeliopsis muralis on* a concrete wall in the Royal Łazienki (photo: Piotr Zaniewski)

Photo 32. Springy Turf-moss *Rhytidiadelphus squarrosus* on a lawn in the Royal Łazienki (photo: Piotr Zaniewski)

Photo 33. Catherine's Moss *Atrichum undulatum* on a slope by the water in the Royal Łazienki (photo: Piotr Zaniewski)

Photo 34. Summer Screwmoss *Tortula muralis* on a wall in the Royal Łazienki (photo: Piotr Zaniewski)

Photo 35. Grey-cushioned Grimmia *Dryptodon pulvinatus* on a wall in the Royal Łazienki (photo: Piotr Zaniewski)

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5.3. Moths

Maciej Sosnowski

Introduction

Imagines of moths (Heterocera) are active throughout the majority of the year. It should, however, be noted that various species have strictly defined periods of occurrence, which are subject only to minor fluctuations, resulting primarily from weather conditions and the consequent rate of vegetation growth in spring, which in turn is directly reflected in both moths and butterflies. For this reason, it is impossible to carry out any meaningful inventory in a short period time, as this would require surveys and specimen collection carried out regularly for at least one full growing season. The second half of May is an optimal period for the activity of many members of the geometer moth (Geometridae) family and numerous families collectively referred to as smaller moths (Microlepidoptera), although the peak period of butterfly and moth occurrence is the second half of June and first half of July. In 2025, after a very warm April, virtually all of May was cold and rainy, which significantly reduced the activity of moths and directly affected the results of the inventory conducted in the Royal Łazienki. In the spring, it is also possible to conduct searches for pre-imaginal stages of many members of the Lepidoptera order, although such activities require much more time than just one day. The following report takes into account the species recorded during the Bioblitz project on 24.05.2025 and the species photographed during light trapping on 08.07.2023 at the Park.

Methodology of the study

In order to inventory moths in the Royal Łazienki, an entomological screen, comprised of a white sheet with the dimensions of 2×3 was used; it was illuminated by a 250W mercury-combustion lamp, powered by an electric generator. Additionally, three autonomous moth traps were deployed, utilizing UV LEDs powered by 12W VRLA batteries. When possible, the moths on the screen were identified in real time by their external features. The material caught in traps was identified after the luring period has ended.

Results

On 24.05.2025, after approximately 3.5 hours of moth light trapping, only 14 species of moths, representing 6 families, were recorded. After adding the material collected in 2023 to this result, the total equals 31 species, representing 9 families. This result certainly represents only a small percentage of the total moth biodiversity in the study area, and is a result of unfavourable weather conditions and heavy light pollution (the effectiveness of light traps can be drastically reduced even by a faint glow of city lights). Below (**Table 3**) is a complete list of moth species recorded in the Royal Łazienki.

Table 3. Moth species recorded in the Royal Łazienki

Species (scientific name)	Family
Cameraria ohridella	Gracillariidae
Acleris forsskaleana	Tortricidae
Cydia inquinatana	Tortricidae
Ptycholoma lecheana	Tortricidae
Rhyacionia pinivorana	Tortricidae
Cnaemidophorus rhododactyla	Pterophoridae
Anania hortulata	Crambidae
Chrysoteuchia culmella	Crambidae
Crambus lathoniellus	Crambidae
Macrothylacia rubi	Lasiocampidae
Thyatira batis	Drepanidae
Bupalus piniaria	Geometridae
Campaea margaritata	Geometridae
Chlorissa viridata	Geometridae
Hypomecis punctinalis	Geometridae
Macaria alternata	Geometridae
Perconia strigillaria	Geometridae
Calliteara pudibunda	Erebidae
Agrotis exclamationis	Noctuidae
Agrotis segetum	Noctuidae
Autographa gamma	Noctuidae
Colocasia coryli	Noctuidae
Diachrysia stenochrysis	Noctuidae
Egira conspicillaris	Noctuidae
Lacanobia contigua	Noctuidae
Melanchra persicariae	Noctuidae

Species (scientific name)	Family
Moma alpium	Noctuidae
Mythimna albipuncta	Noctuidae
Noctua janthina	Noctuidae
Ochropleura plecta	Noctuidae
Xestia c-nigrum	Noctuidae

All of the recorded species are common and widely dispersed throughout most of the country. These species often have broad food preferences or are connected to plants commonly planted in parks and gardens.

Conclusions

This list is certainly incomplete and it can be assumed with near certainty that it showcases as little as 10% of the total diversity of moth species in the Royal Łazienki, considering that the area hosts a relatively large diversity of potential ecological niches. Due to the small amount of data collected, any attempt to assess the general condition of the Park's moth population would be unjustified. For the same reason, more detailed research would be suggested, as it could certainly contribute to new knowledge about the entomofauna of Warsaw.

Photos

Photo 36. *Anania hortulata* (photo: Maciej Sosnowski)

Photo 37. *Bupalus piniaria* (photo: Maciej Sosnowski)

Photo 38. *Cabera pusaria* (photo: Maciej Sosnowski)

Photo 39. *Chlorissa viridata* (photo: Maciej Sosnowski)

Photo 40. *Autographa gamma* (photo: Maciej Sosnowski)

Photo 41. *Chrysoteuchia culmella* (photo: Maciej Sosnowski)

Photo 42. *Cnaemidophorus rhododactyla* (photo: Maciej Sosnowski)

Photo 43. *Diachrysia stenochrysis* (photo: Maciej Sosnowski)

Photo 44. *Egira conspicillaris* (photo: Maciej Sosnowski)

Photo 45. *Colocasia coryli* (photo: Maciej Sosnowski)

Photo 46. *Hyppa rectilinea* (photo: Maciej Sosnowski)

Photo 47. *Macaria notata* (photo: Maciej Sosnowski)

Photo 48. *Macrothylacia rubi* (photo: Maciej Sosnowski)

Photo 49. *Moma alpium* (photo: Maciej Sosnowski)

Photo 50. *Perconia strigillaria* (photo: Maciej Sosnowski)

Photo 51. *Stathmopoda pedella* (photo: Maciej Sosnowski)

Photo 52. *Thyatira batis* (photo: Maciej Sosnowski)

Photo 53. *Trisateles emortualis* (photo: Maciej Sosnowski)

5.4. Spiders and harvestmen

dr Łukasz Nicewicz

Introduction

Spiders (Araneae) occur on all continents except Antarctica and inhabit virtually all available terrestrial habitats – from tropical forests, through deserts, to synanthropic environments. So far, more than 50,000 species classified in 136 families have been described worldwide. Due to their large numbers, predatory lifestyle and diverse hunting strategies, spiders play an important role in regulating the population of other invertebrates, including crop pests (Foelix 2011).

So far, 852 species of spiders have been found in Poland (Nentwig, 2025), belonging to 325 genera from 37 families. The knowledge of the national araneofauna is relatively well established, and the number of documented species continues to grow. As an example, Staręga (1983) reported 728 species, while Rozwałka and Stańska (2008) mention 809. The presence of 330 species has already been noted in the Warsaw area (Krzyżanowska 1981; 1982; Staręga, 1974; Taczanowski, 1866; 1867; Wawer, 2016).

Harvestmen (Opiliones), like spiders, belong to the order of predatory arachnids. They are characterized by an elliptical body, in which the prosoma is closely fused with the opisthosoma, and long, thin legs. They lead a secretive lifestyle – they usually occur in forest litter, on tree trunks, building walls or rocks.

Approximately 6,600 harvestmen species have been described in the world so far. 44 species were reported in Poland, of which 15 occur in Warsaw and its surroundings (Staręga, 1963).

Methodology

Spiders and harvestmen were collected in the Royal Łazienki on 14 June 2025. Specimens from lower parts of the vegetation were obtained using an entomological net. Tree branches were shaken using a beating net, and additional visual observations were conducted alongside building walls, architectural elements, tree trunks and among the vegetation, prioritizing areas close to the nets. Most of the specimens were identified in field and released at the place of capture; the rest were conserved in 75% ethanol and identified under magnification in laboratory conditions. Taxonomic nomenclature was adopted per the World Spider Catalog (Nentwig, 2025).

Results

During the inventory, the presence of 38 species of spiders belonging to 12 families was recorded (Table 4) and 2 species of harvestmen from the *Phalangiidae* family (**Table 5**).

Table 4. Spider species recorded during the inventory of the Royal Łazienki, 14 June 2025.

I.	Agelenidae – Funnel Weavers
1.	*Agelena labyrinthica*
2.	*Eratigena atrica* – Giant House Spider
3.	*Tegenaria ferruginea* – Charcoal Spider
II.	Anyphaenidae – Ghost Spiders

4.	*Anyphaena accentuata*
III.	*Araneidae* – Orbweaver Spiders
5.	*Araneus diadematus* – Cross Orbweaver
6.	*Araniella cucurbitina*
7.	*Cercidia prominens*
8.	*Mangora acalypha – Cricket-bat Orbweaver*
9.	*Nuctenea umbratica* – Walnut Orbweaver
IV.	*Clubionidae* – Sac Spiders
10.	*Clubiona corticalis – Bark Sac Spider*
11.	*Clubiona saxatilis*
V.	*Dictynidae*
12.	*Dictyna arundinacea*
VI.	Hahniidae – Dwarf Sheet Spiders
13.	*Hahnia pusilla*
VII.	*Lycosidae* – Wolf Spiders
14.	*Pardosa monticola – Pin-stripe Wolf Spider*
VIII.	*Philodromidae* – Running Crab Spiders
15.	*Philodromus aureolus* – Wandering Crab Spider
16.	*Philodromus collinus*
17.	*Philodromus fuscomarginatus*
18.	*Philodromus margaritatus*
IX.	*Pholcidae* – Cellar Spiders
19.	*Pholcus phalangioides* – Long-bodied Cellar Spider
X.	*Salticidae* – Jumping Spiders
20.	*Evarcha falcata*
21.	*Heliophanus flavipes*
22.	*Heliophanus* sp.
23.	*Salticus cingulatus*
24.	*Salticus* sp.
25.	*Attulus pubescens*
XI.	*Tetragnathidae* – Long-jawed Orbweavers
26.	*Pachygnatha degerri*
27.	*Tetragnatha extensa*
28.	*Tetragnatha montana* – Silver Stretch Spider
XII.	*Theridiidae* – Comb-footed spiders
29.	*Enoplognatha ovata* – Common Candy-striped Spider

30.	*Parasteatoda lunata*
31.	*Parasteatoda tepidariorum* – *Common House Spider*
32.	*Theridion mystaceum*
33.	*Theridion varians*
XII.	Thomisiidae – Crab Spiders
34.	*Diaea dorsata*
35.	*Misumena vatia*
36.	*Ozyptila* sp.
37.	*Spiracme striatipes*
38.	*Xysticus cristatus* – Common Crab Spider

Table 5. Harvestmen species recorded during the inventory of the Royal Łazienki, 14 June 2025.

I.	Phalangiidae
1.	*Lacinius dentiger*
2.	*Phalangium opilio* – European Harvestman

It should be emphasized that the methods used, combined with the fact that the inventory was carried out at only one date do not allow for a precise assessment of the total biological diversity of arachnid species occurring in the Royal Łazienki. A small number of Wolf Spider (*Lycosidae*) and no Money Spider (*Linyphiidae*) species reported can be attributed mainly to the limitations of the methodology. Typically epigeic species are rarely caught by entomological nets, which is why it would be reasonable to extend the collection methods to include Barber pitfall traps and entomological sieves. These techniques would also allow for more effective surveying of harvestmen, as these species most often live covertly in the litter.

In general, the arachnofauna recorded does not appear to be particularly rich, although almost twice as many species were recorded as during the inventory in the Dolinka Służewiecka Park in 2019 (Bioblitz Report, 2019). Most of the taxa recorded are common and eurytopic species. Typically arboreal species, such as *Tegenaria ferruginea* and *Philodromidae* species, are particularly abundant. Species associated with dense herbaceous vegetation and shrubs were also frequently observed, such as *Agelena labyrinthica*.

Due to the considerable size of the study area (approx. 76 ha), its microhabitat diversity and the limitations of the methods used, it can be assumed that the actual biological diversity of spiders and harvestmen in the Royal Łazienki is significantly higher and requires more detailed research.

Photos

Photo 54. *Tegenaria ferruginea* on tree trunk (photo: Łukasz Nicewicz)

Photo 55. *Araniella cucurbitina* (photo: Łukasz Nicewicz).

Photo 56. *Anyphaena accentuata* (photo: Łukasz Nicewicz)

Photo 57. *Mangora acalypha* (photo: Paulina Organiściak-Kwiatkowska)

Photo 58. *Spiracme striatipes* (photo: Paulina Organiściak-Kwiatkowska)

Photo 59. *Misumena vatia* (photo: Paulina Organiściak-Kwiatkowska)

Photo 60. *Enoplognatha ovata* (photo: Paulina Organiściak-Kwiatkowska)

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5.5. Aquatic invertebrates and fish

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Archival Data

According to Skowroński and Sosin (2022), in the context of research on the fauna of the Royal Łazienki, the correspondence of Polish king Stanisław August with Marcel Bacciarelli is a valuable source of information regarding the stocking of palace ponds at that time. In August 1793, the king expressed a specific wish regarding the species of fish that were to inhabit the Łazienki waters. The monarch mentioned the zander, pike *Esox lucius*, carp, crucian carp and perch, paying particular attention to the former two species. He also mentioned a small fish, known under the Polish name "jaskarek", which may suggest the ruffe ("jazgarz"). According to the suggestions of those involved in the supply of fish, the date of their introduction to the ponds was postponed until autumn, as high temperatures gave rise to concerns for the animals' well-being. The topic of restocking returned in October, when the king repeated his request to Bacciarelli. This time, however, Stanisław August ordered that the introduction of pikes be postponed, to give time for the smaller fish to grow before any predators appeared in the pond. Bacciarelli, relying on the advice of fish traders, responded that he would have the release of both pikes and zanders delayed, as both species required water from the Vistula River to live. The king, invoking his own experience, argued that he had repeatedly caught pike in the Łazienki, which would undermine the claim of their exclusive occurrence in the Vistula. He nonetheless agreed to a temporary postponement of pike introduction, so that other species would have the time to settle in and reproduce. In regards to zander, the king admitted that this species had not been present in the Łazienki ponds so far, but expressed his willingness to release them to see how well they would adapt to the new environment. The motif of fishing is also evident in the works of Zygmund Vogel, which show barges and people wielding fishing rods, suggesting that the Łazienki ponds were popular with contemporary anglers. According to Skibniewska and Zakrzewski (2008), the first official records of fish farming date back to the 12th-13th century. The development of pond fish production is likely associated with the establishment of Christianity in Poland. In Poland and Western Europe, there persists a widespread (and correct) belief that the beginnings of pond carp breeding were the work of monastic orders. For this reason, the first fish farms were established mainly at monasteries. One of the first written mentions of the carp in Poland comes from 1466, from the famous chronicler Jan Długosz (1415–1480), who, mentioning the names of knights participating in the Battle of Grunwald, describes their heraldic crests, some of which feature a carp. Consequently, the carp must have been widely distributed in Poland's rivers and lakes as early as the fourteenth century. As for other small aquatic animals, the Royal Łazienki were inhabited by Common Newts (*Lissotriton vulgaris*), as well as Common Toads. It can be assumed that in the pre-war period, as well as during Stanisław August's reign, the Łazienki ponds were inhabited by amphibian and invertebrate species

typical for natural or semi-natural water reservoirs located in the vicinity of Warsaw and of the given period (Poliński 1913). In the context of fauna research of the Royal Łazienki, the correspondence of Stanisław August and Bacciarelli sheds light on historical attempts to shape the ponds' ichthyofauna. Contemporary research should take this historical information into account when analysing the current carp population, which is species with a long tradition in this ecosystem. At the same time, it is important to monitor and combat possible invasive species that could disturb the delicate biological balance of the Łazienki.

Methodology

The inventory was carried out at the Royal Łazienki ponds. Umbrella traps (Photo 61 A) were chosen as the trapping method, and deployed in less-frequented areas of the Park. Basic physicochemical parameters of water at research sites were taken (temperature, pH, conductivity), (Photo 61 B). Additionally, specimens were collected using a hand net with a mesh size of 1 cm. Six traps were set up on the evening of 25 April 2025 (fig. 4), and their consequent control and specimen collection using hand net carried out on 26 April 2025 (photo 62). The sites were selected basing on previous inventories' results. Frozen sea fish (herring) was used as bait for the traps.

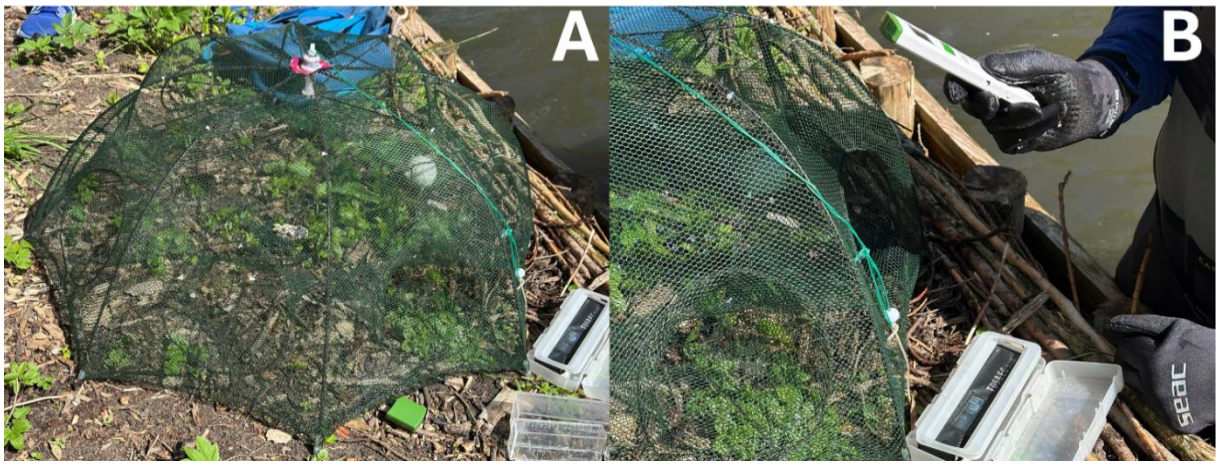

Photo 61. (A) Umbrella trap used for collection, (B) Measuring tools (water pH meter and EC meter), (photo: Paulina Organiściak-Kwiatkowska)

Photo 62. Controlling the traps in the South Canal (photo: Paulina Organiściak-Kwiatkowska)

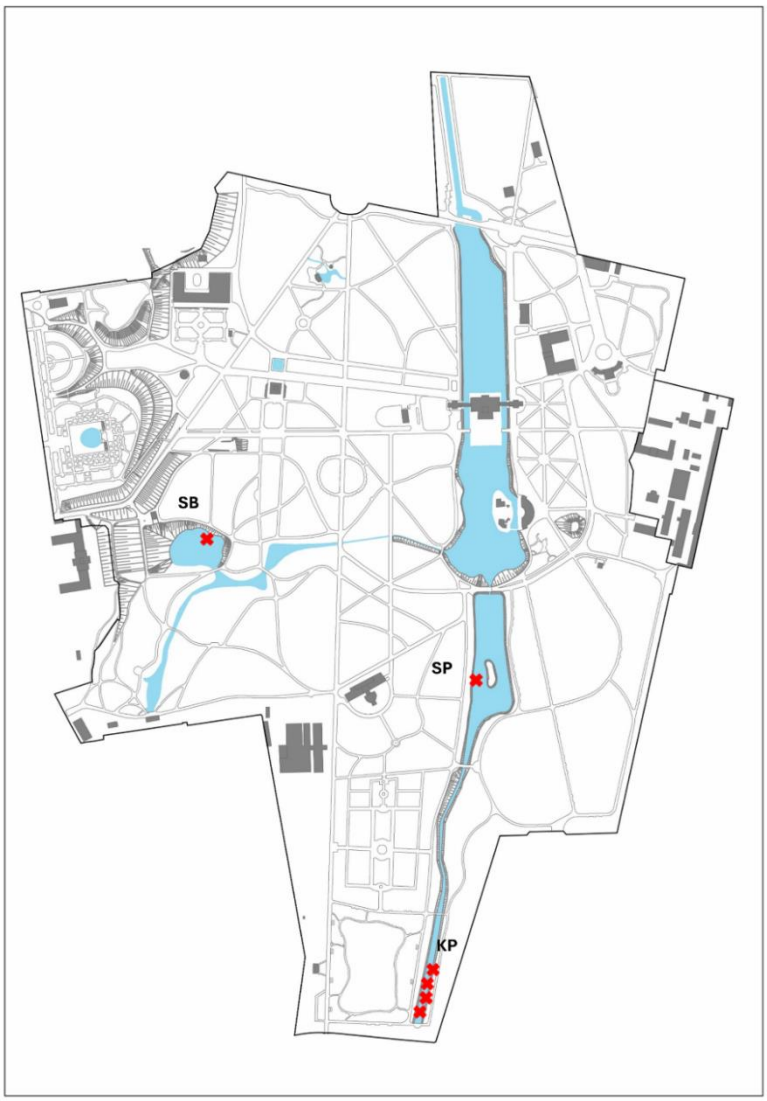

Figure 4. Location of traps (red X) in the Royal Łazienki with marked inventory locations (**SB** – Belwederski Pond, **SP** – South Pond, **KP** – South Canal)

Fish were taken from traps using neoprene gloves, and all the animals identified down to the species level (Brylińska et al. 1991, Thorp et al. 2014), after which the animals were photographed in special aquariums and released at the place of their capture – unless they were invasive alien species. No mortality was recorded among the caught specimens.

Results

During the collection, four species of fish (Photo 63) and one species of amphibian in tadpole stage were observed (Table 6). Additionally captured were: one dragonfly larva, three Zebra Mussels *Dreissena polymorpha*, one horse-leech *Haemopis sanguisuga*, five Water Hoglice *Asellus aquaticus*, three Water Striders *Gerris* sp., a Non-biting Midge larva *Chironomidae* sp., Great Diving Beetle *Dysticus marginalis*. At a depth that did not allow for collection, a shell likely belonging to the Thick Shelled River Mussle *Unio crassus*, a species subject to strict protection, was noticed. The fish sizes were, respectively, Ruffe *Gymnocephalus cernua* (12 cm, 11 cm, 9 cm, 8 cm and 8 cm), Monkey Goby *Neogobius fluviatilis* (13 cm and 6 cm), Western Tubenose Goby *Proterorhinus semilunaris* (6 cm) and Brown Bullhead *Ameiurus nebulosus* (11 cm).

Table 6. Fish and amphibian species recorded in the Royal Łazienki

Reservoir	Species	Number of individuals	Scientific name	Category IUCN*	Category in Poland	Form of protection
South Channel	Monkey Gobby	2	*Neogobius fluviatilis*	-	Invasive Alien Species	No protection
South Channel	Ruffe	1	*Gymnocephalus cernua*	LC	Native Species	No protection
South Channel	Brown Bullhead	1	*Ameiurus nebulosus*	-	Invasive Alien Species	No protection
Belwederski Pond	Western Tubenose Goby	1	*Proterorhinus semilunaris*	LC	Potential Alien Invasive Species	No protection
Belwederski Pond	Common Toad (tadpoles)	Impossible to estimate number	*Bufo bufo*	LC	Native Species	Partial Protection
South Pond	Ruffe	4	*Gymnocephalus cernua*	LC	Native Species	No protection

* IUCN categories: NT – Near Threatened, LC – Least Concern, species classification according to (Witkowski et al., 2009)

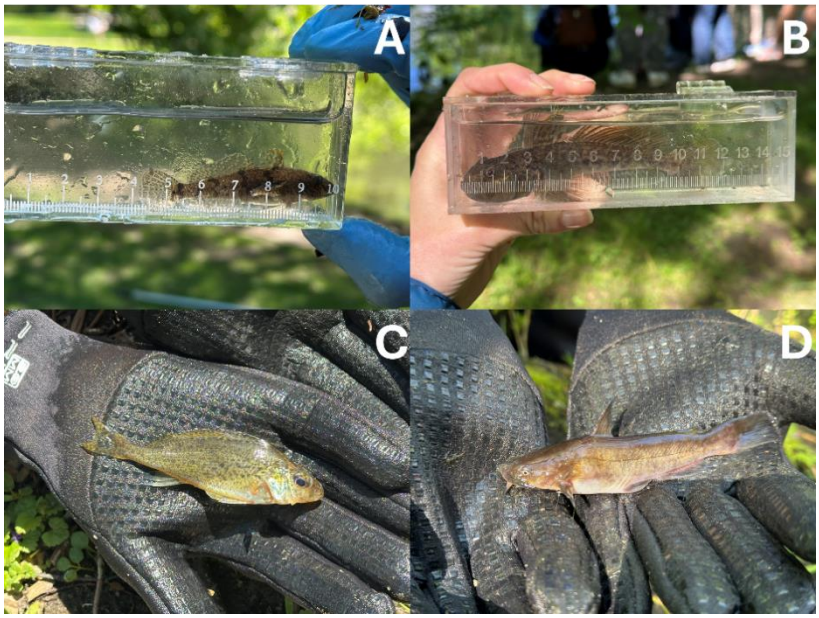

Photo 63. (A) Western Tubenose Goby, (B) Monkey Goby, (C) Ruffe and (D) Brown Bullhead collected during research (photo: Paulina Organiściak-Kwiatkowska)

Photo 64. Dragonfly larva (photo: Paulina Organiściak-Kwiatkowska).

The water parameters taken at research reservoirs are presented in **Table 7**.

Table 7. Physicochemical parameters of water at research reservoirs

Reservoir	Temperature [ºC]	Conductivity [ppm]	pH
South Channel	14.7	0.440	8.80
Belwederski Pond	16.7	0.506	8.83
South Pond	15.3	0.476	8.90

Recommendations

The body shape of the examined fish allows us to determine their overall condition as good. This applies to both native and alien species. No signs of disease were recorded. The number of fish caught does not allow for an estimation of their population size in the ponds. The size differences between Monkey Goby specimens caught may suggest that this fish breeds in the Royal Łazienki; the same can be said for the Ruffe. All of the fish caught are predators (**photo 63**). The presence of

invasive alien species is worrying. The Brown Bullhead competes with native fish species by limiting food and habitat availability. By feeding on roe and fry, it contributes to the reduction of the number and even the complete disappearance of weaker fish species (Kalinowska et al. 2023). In addition, pursuant to the Alien Species Act of 11 August 2021, the Brown Bullhead is on the list of invasive alien species posing a threat to Poland. In years 2012-2021, it was subject to the provisions of the Nature Protection Act of 16 April 2004. The following prohibitions apply to the Brown Bullhead: importing into Poland/EU and exporting from Poland/EU, transporting, keeping, rearing or breeding, introducing into the market, using and exchanging. The presence of Common Toad tadpoles, on the other hand, is a good sign, as it might suggest that other amphibian species may also be present in the ponds, as well as being proof that this area may be chosen by amphibians for reproduction.

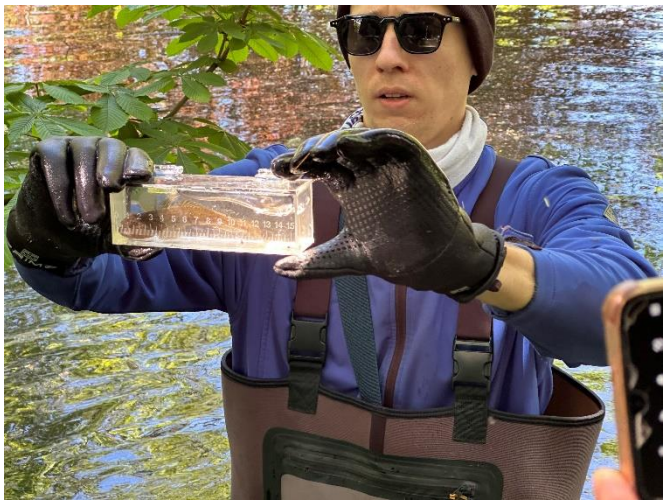

Photo 65. Morphometric measurements of the Monkey Goby (photo: Paulina Organiściak-Kwiatkowska)

Photo 66. Brown Bullhead collected during the research (photo: Paulina Organiściak- Kwiatkowska)

No suspensions were noticed in the water of the Southern Pond and the Southern Channel. This may be indicative of a good water flow, resulting from the underground river that flows from the beginning of the Southern Channel (Galera and Wójcikowska 2010). Both points were characterized by water transparency of up to 50 cm. A large amount of suspension was present in the Belwederski Pond, where the water transparency was equal to about 10 cm. The reservoirs' water parameters did not differ from those typical for urban reservoirs in a similar period (Wróblewski et al. 2024). A slightly higher water temperature of the Belwederski Pond may be a result of its relative isolation from other

channels and reservoirs. It can be assumed that this reservoir will heat up faster. Based on a previous inventory, the Royal Łazienki may be home to a Carp *Cyprinus carpio* population, with unique, archaic features, derived from old stocking. Should this be confirmed, actions should be taken to improve the living conditions of the Carp. These could include reducing the population size of invasive alien fish species (particularily the Brown Bullhead), as well as regular testing of fish condition and water. During previous research conducted at the Royal Łazienki, the following species were also recorded: Roach *Rutilus rutilus*, Bream *Abramis brama*, Zander *Sander lucioperca*, Perch *Perca fluviatilis*, Monkey Goby, Brown Bullhead, Wels Catfish *Silurus glani*, Crucian Carp *Carassius carassius*, and Prussian Carp *Carassius gibelio*.

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5.6. Birds

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Introduction and goal of the study

City parks are an indispensable element of the ecological and social structure of a city. They serve a number of important roles: they regulate the microclimate, affect water retention, protect the soil and provide a living habitat for many species of organisms. Through absorbing air and noise pollution, they have a positive impact on the residents' quality of life. They also serve as a place of leisure and recreational activities, enabling direct contact with nature. These types of areas, although located in the heart of an urbanized space, are often characterized by a relatively high level of biodiversity. The Royal Łazienki Park in Warsaw is a valuable refuge of nature in the city centre, thanks to its large area, habitat diversity and limited urbanization pressure.

One of the important elements of urban biodiversity is its avifauna. Birds readily inhabit the urban environment, utilizing its specific features: the availability of breeding sites (both natural and artificial), easier access to food and fewer predators. Regular observation and monitoring of avifauna provides valuable information about the state of the urban environment and its transformations. Public interest in the subject of birds is also growing, which gives rise to educational initiatives and inventory projects utilizing citizen participation, such as Bioblitz.

The aim of this study is to present the results of ornithological surveys carried out during the Bioblitz event in the Royal Łazienki in Warsaw in 2025. The inventory was aimed at determining the species composition of breeding avifauna, as well as identifying the most important bird habitats in the park.

Archival Data

The first records of bird species occurring in the Royal Łazienki can be found in the works of Władysław Taczanowski ("Ptaki Krajowe" [Domestic Birds] from 1882 and "Spis ptaków Królestwa Polskiego obserwowanych w ciągu ostatnich lat pięćdziesięciu" [List of birds observed in the Kingdom of Poland in the last fifty years] from 1888). They mention the presence of Jackdaws and Rooks in the park.

The first and only scientific study concerning the entire breeding and non-breeding avifauna of the Royal Łazienki is a publication by Maciej Luniak, Piotr Jabłoński and Piotr Marczak: "Ptaki parku Łazienki Królewskie (Warszawa) w latach 1954-1984" [Birds of the Royal Łazienki park (Warsaw) in the years 1954-84] (Acta Ornithologica vol. 22, no 1, 1986).

The first available study, included in the above publication, is an article by Zygmunt Pielowski "Ptaki w parku Łazienkowskim w Warszawie" [Birds in the Łazienki Park in Warsaw], published in Volume 13 (1957) of the journal Chrońmy Przyrodę Ojczystą. The study was conducted between 16 October 1954 and 15 May 1956. It was not scientific in nature, but the overview of species presented therein lets us understand what species of birds inhabited the Łazienki Park nearly 70 years ago.

Selected observations from the Park, concerning mainly rare birds, can be found in "Ptaki Warszawy" [Birds of Warsaw] from 1964 (Maciej Luniak, Wacław Kalbarczyk and Wiktor Pawłowski) and from 2001 (Maciej Luniak, Paweł Kozłowski, Wiesław Nowicki and Joanna Plit).

There exist several publications on the Park's waterbird avifauna. The occurrence and abundance of the Mallard in the park is summarized in a publication from 1987, "Metody oceny liczebności populacji lęgowej krzyżówki *Anas platyrhynchos* w warunkach miejskich" [Methods of assessing the size of the breeding population of the Mallard *Anas platyrhynchos* in urban settings] by Marek Keller, Jacek Engel, Jerzy Zawadzki and Jan Leszkowicz (Notatki Ornitologiczne 28). In addition, information about the only breeding species – the Mallard, can be found in "Lęgowe i zimujące ptaki wodno-błotne Warszawy" [Breeding and wintering waterbirds of Warsaw] (Danuta Jędraszko-Dąbrowska and Jakub Cygan, 1995). The exact characteristics of the Park's Mallard population were also presented by Łukasz Wardecki in his master's thesis from 2019, titled "Występowanie, liczebność I wybrane aspekty biologii krzyżówki w Parku Łazienki Królewskie w Warszawie" [Occurrence, abundance and selected aspects of the biology of the Mallard in the Royal Łazienki Park in Warsaw]. The research for this work was carried out in the years 2015-2019, and the information on the size of the breeding population relates to the 2016 and 2017 breeding seasons.

In recent years, particular attention was paid to the Mandarin Duck, which bred for the first time in the Royal Łazienki in 2001 (Mazgajski T., Mazgajska J. 2004). Information on the population size of the Mandarin Duck was presented by Marek Elas in his bachelor thesis titled "Biologia i zachowanie mandarynki *Aix galericulata* w Parku Łazienkowskim w Warszawie" [Biology and behaviour of the Mandarin Duck Aix galericulata in the Łazienki Park in Warsaw] (2008, observations from June 2006 to October 2007), and then by Łukasz Wardecki ("Występowanie, liczebność oraz wybrane aspekty biologii mandarynki *Aix galericulata* w Warszawie" [Occurrence, abundance and selected aspects of the biology of the Mandarin Duck*Aix galericulata* in Warsaw], 2017. Research conducted in 2015-2017). After 2017, Mandarin Duck research has been continuously carried out up to this text's publication (2025). The collected data, such as occurrence, abundance and many aspects of the species' biology and ecology allow us to trace the development of the Warsaw population and its spread beyond the Park. As part of the research, over 400 individuals were ringed in the Łazienki. Throughout every year, the Park has remained the species' biggest and most important place of occurrence, both in Warsaw and in Poland.

Abundant information is available on the nesting habits of the Common Merganser. Unpublished, but available information, provided by volunteers helping the families move through the city to reach the Vistula River has helped in the creation of the report "Występowanie i liczebność nurogęsi *Mergus merganser* w Warszawie" [Occurence and abundance of the Common Merganser *Mergus merganser* in Warsaw] (Ł. Wardecki et al., 2023). Warsaw's ornithologists and employees of the Royal Łazienki Museum can also access data summarizing the 2024 and 2025 breeding seasons (Paulina Organiściak-Kwiatkowska, unpublished information).

Some of the published scientific works also focus on the Hooded Crow, whose censuses were carried out in the Royal Łazienki in the years: 2008-2009 (Andrzej Węgrzynowicz – research confined to a selected, 10-hectare part of the Park) and in the years 2019-2020 (Julia Moszumańska, bachelor's thesis titled „Liczebność wrony siwej (*Corvus cornix*) i gawrona (*Corvus frugilegus*) na terenie Łazienek Królewskich w Warszawie w latach 2019-2020" [Population size of the Hooded Crow (*Corvus cornix*) and Rook (*Corvus frugilegus*) in the Royal Łazienki in Warsaw in 2019-2020]. In the case of the second paper – the results were presented in a way that makes it impossible to verify the methods and results.

Research on woodpeckers and nuthatches was also published, as in 2014 their population size was estimated by Paulina Organiściak-Kwiatkowska, who used a mapping method in her master's thesis.

The Royal Łazienki are included in the Wintering Waterbird Monitoring programme, and information on them was collected during a single count, carried out in mid-January. The resources available cover the years 2007-2025.

Available sources indicate the presence of 53 breeding bird species (11 of which occasionally) in 1954-1984. In addition to them, in the years 1985-2025, the following species were recorded as breeding or probably breeding: Mandarin Duck (from 2001), Common Merganser (from 1998), Sparrowhawk (from 2023), Coot (from 2016), Syrian Woodpecker (from 2016) and Jay. Furthermore, the breeding of the Moorhen, Black Woodpecker and Goldcrest is considered possible.

In total, in the years 1954-2025, 65 species were recorded as breeding, probably breeding or possibly breeding.

The following species, included in the 1986 research (Luniak et al.), certainly no longer breed in the park: Ring-necked Pheasant, Collared Dove, Turtle Dove, Cuckoo, Little Owl, Barn Owl, Swift, Wryneck, Barn Swallow (present until the closure of the Park's stables), House Martin, Red-backed Shrike, Oriole, Magpie, Garden Warbler, Wood Warbler, European Pied Flycatcher, Marsh Tit, Willow Tit, Common Treecreeper, Penduline Tit, Sparrow, Serin, Goldfinch, Common Linnet.

In the recent years, the following species have either permanently withdrawn from the Park, there is no certainty as to the permanence of their withdrawal, or there is no data about their breeding in the Park: Rook (after 2023), Wren, Lesser Whitethroat, Willow Warbler, Spotted Flycatcher, Nightingale, White Wagtail and Hawfinch.

Materials and methods

The research area covered the entire historic park complex of the Royal Łazienki, with Agrykola and Myśliwiecka streets forming its northern border, Aleje Ujazdowskie the western, Gagarina street the southern, and Czerniakowska street and Trasa Łazienkowska the eastern. The analysed area includes numerous reservoirs, channels and streams, extensive areas of old-growth forests, park woodlands featuring exotic tree species, ornamental shrubs, open lawns, and intensively used recreational areas and historic architectural objects. The surface area of the surveyed site was approx. 76 ha.

In spite of the premise of Bioblitz (quick inventories, usually limited to max. several days, aimed at a specific element of flora or fauna and with public participation), the analysed data comes from more than one survey. Two events were officially organized with the participation of volunteers:

1. 05.04.2025 – waterbirds inventory, Hooded Crow census
2. 31.05.2025 – waterbirds inventory, inventory of breeding birds

Considering the enormous area of the study area, to get a better overview additional surveys were made; their purpose and the person carrying them out can be seen in Table 8.

Table 8. Survey dates, ornithologists responsible for observations and the main research objective for the Bioblitz study

date of survey	main observer	main purpose of the survey
06.03.2025	Łukasz Wardecki	waterbird monitoring
14.06.2025	Łukasz Wardecki	waterbird monitoring

date of survey	main observer	main purpose of the survey
26.03.2025	Łukasz Wardecki	waterbird monitoring
29.03.2025	Fatima Hayatli	songbird and woodpecker census
30.03.2025	Fatima Hayatli	songbird and woodpecker census
05.04.2025	**Łukasz Wardecki**	**BIOBLITZ - Survey 1**
10.04.2025	Łukasz Wardecki	observation of a female Merganser with 18 pulli
12.04.2025	Łukasz Wardecki	songbird census
16.04.2025	Łukasz Wardecki	waterbird monitoring, additional data on songbirds
24.04.2025	Łukasz Wardecki	waterbird monitoring
30.04.2025	Fatima Hayatli	waterbird monitoring
04.05.2025	Łukasz Wardecki	waterbird monitoring
06.05.2025	Łukasz Wardecki	additional data on songbirds
15.05.2025	Łukasz Wardecki	additional data on songbirds
18.05.2025	Łukasz Wardecki, Joanna Dzyr	waterbird monitoring, songbird census
24.05.2025	Mikołaj Żmudziński	waterbird monitoring
31.05.2025	**Fatima Hayatli**	**BIOBLITZ - Survey 2**
14.06.2025	Fatima Hayatli	waterbird monitoring

Most of the controls, including at Bioblitz events with participants, were conducted in the morning and early afternoon. Some of the supplementary surveys were carried out in the evening, but they did not cover the entire garden area at once.

Despite many surveys being carried out, only the waterbird census data allows for a methodical assessment of the breeding population size of the Mandarin Duck and Mallard, and results obtained for birds not belonging to this group do not have the same accuracy and extent in all parts of the Park. The area east of the ponds and canals was surveyed most thoroughly (due to the fact that inventories began and ended at the New Palm House), whereas the modernist garden around the statue of Chopin, Hermitage and the area around the Old Orangery were the least well penetrated.

The survey time varied widely, usually up to 2 hours. The duck monitoring surveys were carried out in a similar time. The corvid census was carried out with the public's participation, with four groups (with an ornithologist guide leading each) completing it in around 2.5 hours.

The songbird inventory was carried out according to the combined avian mapping method, aimed at locating breeding birds (Tomiałojć 1980), which makes it possible to estimate a relatively accurate number of birds occurring in a given area. The surveys were carried out under appropriate weather conditions. During the observations, field notes were taken and data was plotted onto maps, marking all sightings indicating potential nesting (song, presence of nests, feeding young etc.).

A methodological deviation in the case of this study was the limited number of surveys. In order to obtain more complete and representative data using the mapping method, it is recommended that at least 10-12 inspections be carried out during the entire breeding season (from the beginning of March to the end of June).

People who accompanied and assisted in the research had an opportunity to learn about the Łazienki's natural environment, as well as to practice recognizing birds' silhouettes and voices. They also could learn the methods of monitoring and inventorying various bird groups (ecologically, systemically or by methodological differences: waterbirds, corvids, songbirds).

Results and discussion

During the research carried out in the Royal Łazienki in the spring of 2025, 37 bird species, including 33 breeding species, were recorded (**Table 9**). The average number of breeding pairs in the park was 309.5 (range from 284 to 335 pairs). The average density of the nesting bird was equal to 40.7 pairs/10 ha (range from 37.4 to 44 pairs/10 ha). The breeding of 22 species was confirmed (breeding category C: confirmed breeding). 5 species were put in the B category (probable breeding), including the Tawny Owl, which, as of the writing of this report, had no breeding success in 2025. 6 species were put in the A category (possible breeding).

Table 9. Bird species reported during Bioblitz and supplementary surveys, minimum breeding category and estimated number of breeding pairs based on the collected data. Species are ranked alphabetically by their Polish name

No.	English name	Scientific name	breeding category	no. of pairs	comments
1	Great Tit	*Parus major*	C	min. 34	underestimated
2	Syrian Woodpecker	*Dendrocopos syriacus*	C	2	high accuracy
3	Black Woodpecker	*Dryocopus martius*	A	0-1	high accuracy
4	Great Spotted Woodpecker	*Dendrocopos major*	C	7	high accuracy
5	Middle Spotted Woodpecker	*Dendrocoptes medius*	C	12	high accuracy
6	Green Woodpecker	*Picus viridis*	C	4	high accuracy
7	Lesser Spotted Woodpecker	*Dryobates minor*	C	2	high accuracy
8	Feral Pigeon	*Columba livia forma urbana*	C	min. 5	research needed
9	Wood Pigeon	*Columba palumbus*	C	min. 31	close to the actual number
10	Blackcap	*Sylvia atricapilla*	B	min. 13	underestimated
11	Moorhen	*Gallinula chloropus*	A	0-1	high accuracy
12	Blackbird	*Turdus merula*	C	min. 22-25	underestimated
13	Nuthatch	*Sitta europaea*	C	17	high accuracy
14	Sparrowhawk	*Accipiter nisus*	C	1-2	high accuracy
15	Raven	*Corvus corax*	C	1	high accuracy
16	Mallard	*Anas platyrhynchos*	C	7-11	high accuracy
17	Fieldfare	*Turdus pilaris*	C	3-5	close to the actual number
18	Coot	*Fulica atra*	C	1	high accuracy
19	Mandarin Duck	*Aix galericulata*	C	20	high accuracy
20	Blue Tit	*Cyanistes caeruleus*	C	min. 33-40	underestimated
21	Goldcrest	*Regulus regulus*	B	1-2	high accuracy
22	Common Merganser	*Mergus merganser*	C	7	high accuracy
23	Short-toed Treecreeper	*Certhia brachydactyla*	C	min. 11	close to the actual number
24	Chiffchaff	*Phylloscopus collybita*	A	min. 2	research needed
25	Common Redstart	*Phoenicurus phoenicurus*	A	min. 1	research needed
26	Tawny Owl	*Strix aluco*	B	2	high accuracy
27	Robin	*Erithacus rubecula*	C	min. 16-18	underestimated
28	Jay	*Garrulus glandarius*	A	min. 1	research needed

No.	English name	Scientific name	breeding category	no. of pairs	comments
29	Starling	*Sturnus vulgaris*	C	5-10	research needed
30	Song Thrush	*Turdus philomelos*	A	0-1	research needed
31	Hooded Crow	*Corvus cornix*	C	9-30	research needed
32	Icterine Warbler	*Hippolais icterina*	B	min. 1	research needed
33	Chaffinch	*Fringilla coelebs*	B	min. 13-15	research needed
Non-breeding species					
34	Caspian Gull	*Larus cachinnans*	Non-breeding		
35	Wren	*Troglodytes troglodytes*	Non-breeding		
36	Wood Warbler	*Phylloscopus sibilatrix*	Non-breeding		
37	Firecrest	*Regulus ignicapilla*	Non-breeding		

The fieldwork carried out indicates, with a high degree of accuracy, the species diversity of the breeding avifauna in 2025, but it does not allow us to obtain any accurate quantitative data. In order to accurately indicate the abundance of individual species, especially the most numerous ones, research should be carried out in accordance with the guidelines of the mapping method, encompassing the whole Park and with an appropriate number of surveys. It should be clearly noted that the obtained data represents the minimum number of breeding pairs/territories in the garden.

The density of 42.3 pairs/10 ha is much lower than the average for Warsaw's parks (91.7 pairs/10 ha, Wardecki et al. 2025), even for a garden without nesting boxes and with a very low share of cavity nesters, which are often dominant in Warsaw – Starlings, Tits or Tree Sparrows. The number of species recorded is also average (33). Although above the average for Warsaw's parks (25.2 species, Wardecki et al. 2025), it is far from widespread green areas such as the Dolinka Służewska Park (47 species, Rowiński 2022) and the Czerniakowski Port (40 species, Wardecki 2022), similar to the Fosa Park and the Stoki Cytadeli (32 species, Chodkiewicz 2024), and higher than the Marszałek E. Rydz-Śmigły Park, which is similarily forested (29 species, Chylarecki et al. 2024), or Praski Park (28 species, Chodkiewicz and Smyk, 2022). The average number of breeding species may be attributed to the low diversity of habitats and distance from buildings – species associated with buildings and open areas are missing, and ecotone species are represented only sparsely (which is also a result of obvious decreases of abundance, as is the case with the Icterine Warbler). Therefore, most species present are ones typical for woodlands, including 6 species of woodpecker (out of 7 commonly found in this part of Poland).

An attempt to estimate the number of breeding pairs of the Hooded Crow, by conducting a census of their nests in the park, was made during the first Bioblitz survey, before the appearance of leaves on trees (05.04.2025) Unfortunately, due to the second event being postponed from its original date of 17 May until 31 May and despite additional attempts by the authors, the key parts of the garden were surveyed after many young crows already left their nests (own study from Warsaw).

On 5 April 2025, the Bioblitz participants recorded 9 occupied Hooded Crow nests, with another 70 marked for further surveying. Based on the authors' experience and observations from the breeding season, it can be assumed that the breeding population of the Hooded Crow oscillated between 20 and 30 pairs.

The survey of woodpeckers and nuthatches was carried out by Paulina Organiściak-Kwiatkowska (Royal Łazienki), and the number of Mergansers was accurately determined (7 females with young, a total of 69 chicks, 63 of which safely reached the Vistula River) by volunteers patrolling

the garden area with the participation of employees of the Royal Łazienki Museum and the Greenery Office of the Capital City of Warsaw.

Depending on the method, a wide range of abundance values was proposed for the Mandarin Duck (12-61 pairs). By 30 June 2025, 12 broods had been detected (female with at least 1 chick), 51 pairs stayed in the Łazienki in the March-May period (estimation based on ringing – in over 90% of pairs at least one individual was ringed), and an additional 10 pairs were probably also present in the Łazienki (birds unringed or ringed during the breeding season). All Mandarin Ducks were in pairs, which indicates their probable readiness to breed. However, due to the possibility of the ducks adopting several breeding strategies (laying and incubating eggs, laying eggs in other females' nests and not incubating, laying eggs in both other females' and own nest and incubating, or not breeding at all), it is likely that a small proportion of pairs did not breed. A method of estimating population size based on the number of males (20.7 pairs) and females (20 pairs) was used, treating the result of 20 pairs as the most accurate (Keller et al. 1987).

The same methods (Keller et al. 1987) were used to calculate the breeding population size of the Mallard. The applied methods I and II, exactly the same in all previous years of research, indicate a strong decline in the population (Table 10).

Table 10. Comparison of estimated breeding population size of the Mallard (number of pairs) based on available materials

Year	Source	Method 1	Method 2
1979	Keller et al. 1987	51	64
1980		66	66
1981		77	77
1982		63	62
Average for 1979-1982		**64**	**67**
2016	Wardecki Ł. 2019	26	30
2025	BIOBLITZ 2025	10	11

The results obtained during the research should be seen only as showcasing the richness of the garden's avifauna, with far-reaching caution being exercised when it comes to any quantitative data produced. The research was focused solely on investigating the presence of species, and only the following populations were investigated fully and according to proper methodology: extremely rare species, woodpeckers and Nuthatch (Paulina Organiściak-Kwiatkowska) and waterbirds (Łukasz Wardecki, Fatima Hayatli, Mikołaj Żmudziński and Joanna Dzyr). The general species composition of the garden's avifauna is not complete, as migratory species might have appeared in the Park between the surveys, and then left the area. It is possible that species other than those reported occur in poorly penetrated areas. The species migrating over the garden have not been recorded or researched.

The absence of breeding of the Spotted and European Pied Flycatchers, as well as a low number of the Common Redstart and Icterine Warbler are a result of permanent changes taking place in the urban environment (former two species), or a result of a bad year (poor breeding season for the Icterine Warbler and Common Redstart).

Photos

Photo 67. Male Mandarin Duck *Aix galericulata* (photo: Łukasz Wardecki)

Photo 68. Female Mandarin Duck *Aix galericulata* with young (photo: Wiktor Świniarski)

Photo 69. Male Blackbird *Turdus merula* (photo: Wiktor Świniarski)

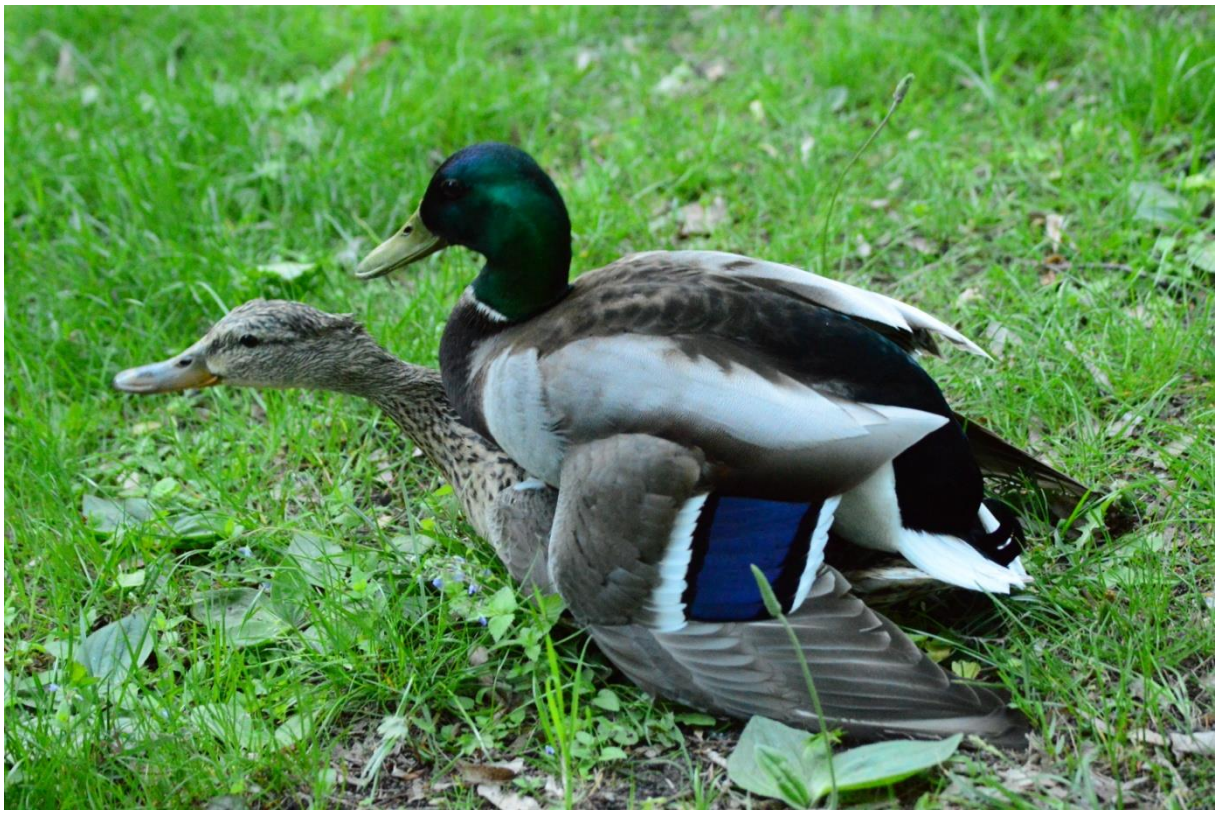

Photo 70. Mallards *Anas platyrhynchos* (photo: Wiktor Świniarski)

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