



## **BIAŁOWIEŻA FOREST BIRD SURVEYS: THE END OF AN ERA**

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*Special issue: A tribute to Ludwik Tomiałojć, Wiesław Walankiewicz and Tomasz Wesołowski*

## Foreword

### BIAŁOWIEŻA FOREST BIRD SURVEYS: THE END OF AN ERA

Among ecologists worldwide, Białowieża Primeval Forest is now one of the best-recognized windows into our evolutionary past. This is not only due to the extensive patch of a primeval forest that – against all odds – remained largely governed by natural processes, but also due to researchers that studied the unique ecosystem and published results of their studies, bringing novel findings to an international audience. In the ornithological bubble, research in Białowieża Forest was always inextricably linked with three names: Ludwik Tomiałojć, Tomasz Wesołowski, and Wiesław Walankiewicz, who studied local birds for almost 50 years since 1975. Sadly, they all passed away recently, within a single year. In recognition of

their unique contribution to ornithological science, we devoted this issue of the *Acta Ornithologica* to the papers linked with forest birds, preceded by three essays about our missed colleagues and their bird studies in Białowieża, written by their friends. We very much hope the legacy of their research will be continued for another 50 years to come at the very least. Truly effective protection of the whole Białowieża Forest (currently just one-third of the Polish part is strictly protected) using their research results would be the best tribute to their lives.

*The Editors*

### HOW THE LONG-TERM BIRD MONITORING IN THE BIAŁOWIEŻA NATIONAL PARK WAS LAUNCHED

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Ludwik Tomiałojć (1939–2020) was the original initiator of research on birds in the Białowieża Forest. For a long time, Ludwik was interested in the adaptation of birds to human transformed environments and conducted research on urban populations of the Wood Pigeon *Columba palumbus*. While gathering information from scattered reports for the first critical summary of information about Polish birds after the Second World War (Tomiałojć 1972), he noticed that the eastern parts of the country were relatively little known, with many poorly explored areas. Eastern Poland has

not undergone such a profound anthropogenic transformation as the remaining part of the country and many only little changed natural areas have been preserved there.

During his stay in England (1973), Ludwik noticed how different the behaviour of birds in forests transformed by man is from their behaviour in better conserved forests in Poland. It was probably then, when he decided that filling the gap in the knowledge on avian communities (i.e. recognition of both composition and densities) in undisturbed forests and studying their

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life-histories there would be of importance. He chose the Białowieża National Park (BNP) as the site of his research. Similarly as in mid 1970's, the Białowieża Forest is the last remaining fragment of primeval lowland mixed forests that once covered our continent. Ludwik invited two younger colleagues who were just starting their scientific careers to participate in this research: Wiesław Walankiewicz (1949–2020) and Tomasz Wesołowski (1950–2021). Following a year of reconnaissance, monitoring of the breeding birds of the Białowieża Forest began in the spring of 1975. With great effort, in difficult field conditions and in unfavorable early spring weather, ten large plots (24–33 ha) were delimited. They were located in various types of forest — coniferous, ash-alder and lime-hornbeam. The names of these plots followed the circumstances of their designation or location. These common names have survived to this day, although of course in scientific publications they were later identified only with their initials. With time, the number of plots was reduced, but they were still large and represented different types of forest. An improved version of the mapping technique for censusing breeding birds has been applied for 48 years now. Tomiałojć modified Enemar's cartographic method to increase the effectiveness of a single visit to the plot. During the breeding season, ten field visits lasting several hours were carried out on each plot, including one visit at dusk. Additionally, bird nests were actively searched for.

The research was originally planned to last for five years. Their results, however, turned out to be so revealing and bringing so much new understanding of the functioning of primeval forest ecosystems that it was decided to continue them. By 2022, 48 years of uninterrupted censuses of birds in the BNP were completed (since 2020, the team continues monitoring with the mapping technique on just four plots, but other methods — i.e. point counts — are applied on all the seven plots). Of course, the composition of the team of ornithologists conducting the research has changed over time. Ludwik Tomiałojć withdrew from participating in the field work at some point (but he collaborated in data analysis until the end). Wiesław Walankiewicz compared the results obtained with the mapping method with the results from transects, a method that requires much less effort and time. Unfortunately, this valuable work has never been published. Although Wiesław no longer contributed to the monitoring, he continued to conduct other

research at BNP. Over time, the team has grown to include Dorota Czeszczewik, Marta Maziarz, Cezary Mitrus, Patryk Rowiński, Grzegorz Hebda and Grzegorz Neubauer. After Ludwik Tomiałojć's withdrawal, Tomasz Wesołowski became the leader of this group and his research on bird assemblages in the BNP continued for 47 years. If it had not been for his enormous commitment and charisma, the monitoring would have ceased but it continued even during the most difficult times. Over the years, countless students and volunteers, several dozen people in total, also participated in the field work. They all left with unforgettable experiences and learned much about both birds and the natural forest. The results of the censuses was published every five years and the article summarizing the 45-years of research appears in this issue. In addition to monitoring, each team member conducted his own research on individual bird species or on biological processes in the forest.

Years of research in the BNP have shown that primeval temperate forests are similar to their tropical counterparts. Both are characterized by an extraordinary species richness (but individual species are found in low densities) and by predation as one of the most important factors influencing these ecosystems. The results of the research in the Białowieża Forest have become famous throughout the world. As a consequence, over the years naturalists, especially ornithologists, from many countries around the world made pilgrimages to this unique forest. Bird monitoring in the BNP is one of the longest continued ornithological research projects in the world, and certainly the only one conducted on such a large scale.

During this period, over 100 articles devoted to the birds of the BNP have been published. Their co-authors were often ornithologists from other countries. A list of these works is included at the end of the Foreword. Ornithologists working in the Białowieża Forest were not only interested in birds. There were also other research topics on ecological relationships among organisms that make up and living in the forest, including phenology of foliage development, fruiting cycles of forest trees, fluctuations in the number of leaf-eating caterpillars, changes in the number of small rodents, bird parasites or the fate of nesting holes occupied by birds. This research has also been published in multiple articles (the most important of which are listed below). Some of these studies take the form of annual monitoring and provide data that is unique on a global scale.

All members of the Białowieża trio, who started their lifelong adventure there nearly half a century ago, also devoted much time and energy to defending the Białowieża Forests against intensive forest management and logging. Ornithologists fought to preserve this most valuable ecosystem in Poland and tried to ensure that the entire forest was under protection in the national park. They were deeply involved in these activities, ignoring the many difficulties that they

encountered as a result. Unfortunately, this unique Forest, included in the UNESCO World Heritage List, is still more widely appreciated in the rest of the world than in Poland. Recently, it was the EU institutions that had to take steps to prevent logging in the Białowieża Forest.

It is hard to believe, that all three initiators of the BNP bird censuses left us within a single year. This volume is devoted to their memory.

All photos from from archives of Wanda Wesołowska, authors unknown.



The team that began monitoring birds in the BNP, 3 April 1977. Left to right: Tomasz Wesołowski, Ludwik Tomiałoć, Wiesław Walankiewicz.



Ludwik Tomiałoć designing the Łęgoles plot, 1975.



Wiesław Walankiewicz next to a large oak tree, 1970s.



Ludwik Tomiałoć while working in the woods. 1970s, Łęgoles plot.



Tomasz Wesołowski on the trunk of an overturned ash, 2012.



Tomasz Wesołowski in front of the root shield of an overturned tree, 2012.



Ian Newton (left) and Tomasz Wesolowski (right) in the BNP, 2013.



Marta Maziarz at the camera trap during the Wood Warbler study, 2015.



Census team on the 40th anniversary of the monitoring, 2015. Left to right: Cezary Mitrus, Marta Cholewa, Grzegorz Hebda, Tomasz Wesolowski (holding the card), Patryk Rowiński, Marta Maziarz and Dorota Czeszczewik (crouching).



Grzegorz Neubauer with the ladder, 2016. Fot. T. Wesolowski.

## BIRDS AND BEYOND — COMMEMORATING PIONEERS OF ORNITHOLOGICAL RESEARCH IN BIAŁOWIEŻA FOREST

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We are usually preoccupied with our own problems, challenges, and visions. For active scientists, these might be research projects, graduate students, securing and managing grants, publishing papers, or pursuit of an academic career. But sometimes, events in life break our self-absorption and cause us to reflect on the past, present, and future with a new eye. Occasionally, such events

come in series like the passing away of the three eminent researchers who studied birds for decades in the Białowieża Forest. All three of them, Prof. Ludwik Tomiałojć, Prof. Wiesław Walankiewicz and Prof. Tomasz Wesolowski have abruptly left us between June 2020 and July 2021, creating painful hole in Polish ornithology and in our hearts.

Ludwik, Wiesław and Tomasz influenced my life-long adventure with forest birds in diverse ways. These three scientists were of utmost importance for initiating and conducting ornithological studies in Europe's most famous forest, and I was lucky to meet all three of them on many occasions mostly through a shared research interest in forest birds and our mutual concern for the Białowieża Forest. However, my perception and knowledge of their deeds as people and scientists is probably not directly comparable since my relationships with them differed. I visited Białowieża Forest for the first time in May 1987, and at this time I already knew Tomasz quite well and even met Ludwik a few times. I believe that I met Wiesław seven years later.

What had linked three of them most? Of course, Białowieża Forest and its birds. When we review their classic (and very long) paper published in 1984 in *Acta Ornithologica* (Tomiałojć et al. 1984), we readily understand that starting systematic ornithological research in this renowned forest must have been a journey of discovery for them. The paper summed up the first results of their excellently designed bird censuses (1975–1979) in the best-preserved part of the forest. Perhaps, the most important finding was that birds in Białowieża Forest have low breeding bird densities that were tentatively explained by heavy predatory pressure. This finding, being in stark contrast to what we knew from some other European forests and woodlands, affected the direction of future studies on birds of this primeval forest. The lives of some of the species also differed in other ways, especially when compared with western Europe — notably the selection of habitat and nest sites by some species. As Tomasz nicely explained to me later, birds of Białowieża Forest were apparently unaware of the contemporary scientific knowledge of how they should “behave”. All three of them continued ecological studies of birds in Białowieża Forest for decades (see the list of their publications included at the end of the Foreword).

Tomasz and Wiesław studied mostly cavity-nesting species (tits, the nuthatch, flycatchers, woodpeckers), whereas Ludwik pursued open-nesting species (hawfinches, thrushes). Their fieldwork required innumerable nest inspections across a large range of heights — a challenge that is particularly striking in the highly diversified and unusually tall (as for the European lowlands) vegetation of Białowieża Forest. And here comes a remarkable feature shared by these three pioneers

that made me admire them a lot — all of them climbed Białowieża trees into their 60s. This dedication to science had its costs — both Tomasz and Wiesław endured injuries, some more serious than others, falling from trees. The accident in 2001 that very seriously injured Tomasz and almost led to his death (he was working alone that day) changed his perception of life. Since then, he said that he appreciated any good day without having long-term plans. Fortunately, Ludwik, who potentially faced the gravest risk due to the height of the nest of hawfinches located on average at 18 m, with some over 30 m above the ground (Tomiałojć 2005), never fell out of a tree.

Only two common peer-reviewed publications were co-authored by all three: Ludwik, Wiesław and Tomasz (Tomiałojć et al. 1977, 1984). Nevertheless, the latter paper, as mentioned above, became a classic with the highest bibliometric achievement for Ludwik and Wiesław, and, until recently, also Tomasz (almost 300 citations in Google Scholar). Ludwik and Tomasz who were employed at Wrocław University, produced some ten additional joint papers, and Tomasz and Wiesław (employed by the university located in Siedlce) co-authored three. Not surprisingly, the majority of their scientific production as senior scientists, were published within their respective research groups or as single authors.

Ludwik, born in 1939, was older than Tomasz and Wiesław and already in the middle of 1970-ties well-known to anyone in Poland interested in ornithology. Personally, I believe that the main reason was his book “Birds of Poland — the checklist and distribution” published in 1972, the first modern account of the Polish avifauna. I remember that after purchasing it as a teenager sometime around 1975, this book boosted my interest in birds enormously and sharpened my “birder’s imagination and dreams.” A most surprising achievement considering the complete lack of any illustrations except of one little map! For years, the phrase “we have to look it up in Tomiałojć” was a typical part of discussions with my fellow birders when it came to the distribution of birds. I never forget my first, very brief, personal meeting with Ludwik one early morning of March 1978 in Gdansk. It was like meeting a deity. His personal charisma, great ability to share his enthusiasm for research, and his work ethic was a mixture rarely spotted in academia. During my PhD-studies at Grimsö in the mid-1990s, he visited me in Sweden for a month or so to work undisturbed on one of his blackbird’s papers. I remember that he was

almost glued to his desk with complete focus on his work.

I really appreciated his interest in macro-ecological questions reaching far beyond Białowieża Forest. He published a major work that looked at the distributional patterns of the European avifauna as shaped by natural and anthropogenic factors (Tomiałojć 2000). He has also published several papers concerning comparisons of birds living urban and non-urban environments and was particularly interested in studies on Wood-pigeons *Columba palumbus*. Ludwik's research, conservation and wider environmental interests have left a deep mark. I am convinced that he, through stimulating the development of birding, also largely contributed to the advance of Polish "citizen science" and the advance in conservation interests in society. It has been demonstrated elsewhere that birdwatchers are much more likely than other people to engage in conservation behaviours (Cooper et al. 2015).

I had the pleasure and honour of working, travelling, and socialising with Wiesław on numerous occasions. As I recall, it started in 1994, when he guided me and a couple of friends through limited access reserves of Białowieża National Park. Kindness, great knowledge of birds and nature, and sincere attention to people are characteristics of him that I will remember the most. He was also continuously full of potential research questions and hypotheses, even if many of them never led to any formal research and publication. One of the limiting factors in his research was the massive amount of teaching duties at his university. He was especially proud of his 2002 *Acta Ornithologica* paper that identified nest predation as a limiting factor for the population size of Collared Flycatcher *Ficedula albicollis* (Walankiewicz 2002). This paper and an earlier companion paper (Walankiewicz 1991) were milestone contributions that identified the important role of predation on some birds in primeval forest conditions.

Wiesław was a very talkative person always having a story for almost anything. In addition to his impressive biological knowledge, he possessed almost encyclopaedic familiarity of history, anthropology, human foods, physical geography and more. He was kind in so many ways. I never forget Wiesław feeding Dorota Czeszczewik and I with fantastic avocados that he found in the jungle on our joint adventure in Colombia in 2017. Moreover, he almost never turned down any call for help in field work or other activities. I really

miss the guy, and I also miss Wiesław and Dorota being an almost inseparable team of workhorses in their research for over 25 years. Finally, I would like to add that he was fierce conservation advocate. On numerous occasions, Wiesław engaged himself in discussions and other actions concerning the future of Białowieża Forest. This included, in more recent years, several publications that he co-authored that go much beyond biological questions (e.g. Czeszczewik et al. 2019 or Niedziałkowski et al. 2019).

I met Tomasz in the late 1970s, when I started to interact frequently with the group of prominent bird researchers at Department of Avian Ecology in Wrocław. Tomasz, with his extreme rigor in "doing science" captivated my attention and respect from the very beginning. As a free-lance ornithologist with ambition of becoming scientist, I benefited from his generosity and help. He provided me with excellent advice in my early studies on Icterine Warbler *Hippolais icterina* and thanks to his support I got an opportunity to start my internships in Sweden in the late 1980s that eventually transformed into PhD-studies on woodpeckers. There is no doubt that Tomasz was highly respected among his colleagues in Wrocław; I remember when prof. Dyrz introduced him once for a largely "internal" audience at one of the departmental seminars as department's scientific "forefront".

Tomasz had such a deeply rooted knowledge of his field that often it was senseless to argue with him. Throughout the friendship that I enjoyed for over 30 years, I always felt the "little guy" when it came to discussing the intricacies of forest bird ecology. Interestingly, his focus on Białowieża Forest, was almost total. I asked him in 2020 why he basically only worked there and not in other interesting forest environments. His answer was simple — after 3 months of intensive fieldwork in Białowieża Forest he had no desire to work somewhere else. Tomasz was upset about the recent trend for ornithologists to publish as many papers as possible in high-ranked journals using advanced technologies and complex statistical methods but frequently based on weak data that rarely posed or answered biologically relevant questions. His advice for young students of forest ornithology was to try to think like the object of your study — a good recipe to finding new and exciting questions and hypotheses. He was particularly proud of his research on biology of species that nest in natural cavities, in contrast to knowledge derived from nest-box studies that

he largely criticized. He and his colleagues delivered several dozen papers unravelling the biology of species in primeval, naturally dynamic conditions observed in Białowieża Forest with virtually all of them based on field-data collected during many years. A few years ago, Tomasz mentioned to me that he still has some 65 papers to write. Unfortunately, 50 of them will never be written. We should also remember Tomasz' involvement in nature conservation, particularly the fight for protection of Białowieża Forest. He told me once that his involvement in conservation did not produce easily measurable outcomes and took a lot of time; if he hadn't gotten involved he probably would have produced twice as many scientific papers. However, all of us familiar with the protection of Białowieża Forest remembers the importance of the quantitative description of old stands suggested by Tomasz (later called "Wesołowski's definition") in saving logging hundreds, if not thousands of hectares of stands valuable for biodiversity.

All three pioneers of ornithological research in Białowieża Forest were initially more interested in birds of non-forest habitats. Tomasz, for example, mentioned to me that his hope was to work on the Biebrza Marches instead, and the fact that he ended up in Białowieża Forest was accidental — the project led by Ludwik simply started earlier. Without exaggeration, we may say that ornithological knowledge of forest birds in Europe would

be much more limited without their contributions. Remarkably, both Tomasz and Wiesław admitted that their interest in birds started with knowledge acquired from Zenon Lewartowski, a living legend of Polish non-professional ornithology. Zenon still roams Białowieża Forest observing birds or guiding people interested in our famous Puszcza, as we call this forest.

Ludwik, Wiesław and Tomasz put a lot of energy in fighting for the protection of Białowieża Forest and other Polish natural areas. While their scientific contributions are well-preserved in their publications, I desperately wish that their conservation engagement and occasional personal sacrifices will not be for nothing. The hope must be that the entire Białowieża Forest will become a national park and the recent decades of no progress in nature conservation in Poland will end with the creation of additional national parks. This is what our three pioneers would wholeheartedly wish for.

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## ALMOST HALF A CENTURY OF ORNITHOLOGY IN BIAŁOWIEŻA FOREST

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While I was a student in Poland during the 1990s, I dreamed of working as a researcher in a forested national park. Moreover, it was a dream not only for me, but probably for the majority of young ornithologists to meet the famous ornithological figures, who were known to us only from the

professional literature. The publications of Tomiałojć (1990) and Tomiałojć et al. (1984) were already classics of Polish ornithology. I was lucky — immediately after graduation I got the opportunity to do research in the Białowieża Forest (BF). In addition, I had the pleasure to work with



Wiesław Walankiewicz, Tomasz Wesołowski and Ludwik Tomiałoć. Tomasz and Wiesław have known each other from their biology studies at the University of Poznań, and Ludwik was their senior colleague. Wiesław was now the head of the Department of Zoology at Siedlce University, where I got a job after graduation, while Tomasz was working at the University of Wrocław and became the supervisor of my doctorate a few years later. However, the official relationships were of minor importance while working together in the field as part of the BF ornithological team — everyone was equal and worked equally hard. I learned a lot from them all, and certainly many more people can say the same.

When I joined the BF ornithological team in 1994, my older colleagues and Cezary Mitrus (the youngest member of the team at this time) were celebrating the 20-year anniversary of ornithological studies in the Białowieża National Park (BNP). Tomasz usually encouraged new ornithologists that were able to recognize birds' calls and songs to join the team, but few people liked to get up long before dawn, day after day, during the long field season each spring. However, I enthusiastically accepted such an invitation as an honour, of course. Then, a few more young ornithologists joined the team: Patryk Rowiński, Marta Maziarz, Grzegorz Hebda and Grzegorz Neubauer joined the mapping team in the following years. More recently, Julia Barczyk and Marta Cholewa (after a 4-year break) joined the team as well. One of the core research activities was the monitoring of breeding birds in BNP, and the results have been presented and discussed in an extensive series of research papers (Tomiałoć et al. 1984, Tomiałoć & Wesołowski 1990, 1994, 1996, Wesołowski et al. 2002, 2006, 2010, 2015, 2022), and the monitoring has continued to the present time.

At the beginning, I learned that each study plot in the BNP had a specific name. In the papers, the names of the study plots were just abbreviations, but the full names that we used in the field were special, and always associated with a particular story. One of them (known as "MS" in papers) is called the 'Dream' plot (*Marzenie* in Polish). It got its name from the fact that in 1975 Ludwik Tomiałoć really wanted to have one plot resembling an old city park, full of large deciduous trees but virtually lacking any spruce *Picea abies* (spruce is quite ubiquitous even in deciduous stands of the BF). When he found his ideal place, he exclaimed that his "dream" had come true. This

plot is still covered with a beautiful old-growth forest with huge oaks *Quercus robur*, limes *Tilia cordata*, maples *Acer platanoides*, hornbeams *Carpinus betulus* and very few old spruces.

The name of another plot, known from papers as "K", is derived from the word *Katorga* in Polish, which broadly means 'slavery'. It was so named because of the hard working conditions there — a riparian forest with a flowing river, numerous fallen trees and inaccessible sections flooded with deep water and millions of annoying mosquitoes in the peak season. In addition, since this study plot is the largest (33 ha), we are forced to divide it into two mornings or between two people for mapping — real "katorga".

The "NW" and "NE" plots are the Western and Eastern Bears (*Niedźwiedzice* in Polish). They took their names from a forest path called the Bear Path, at which there was a site in the 1930s associated with an attempt to reintroduce Brown Bears *Ursus arctos*. The genesis of the names of the other plots is simple: "W" is the Entrance plot (*Wejściowa* in Polish), located just behind the entrance gate to the BNP, "CM" is the Central plot (*Centralna*) due to its location in the middle of the forest. The name of the plot "L" (*Łęgoles* in Polish) reflects the character of the riparian and ash-alder forest covering it.

Over several decades of research, we all spent a lot of time in Białowieża. Monitoring of breeding birds on seven study plots started around April 10 and ended on June 20, which means that during this period at least one person was mapping one of the plots every day. For many of us, being part of the ornithological research team in the BF meant over a 2-month long presence each year. If we roughly add the territory mapping effort together — the 45 years gives more than 17 thousand hours of field work. In the early years there were even more study plots than now, and fewer people.

In April, bird mapping starts relatively late in the morning because the sun rises only after 5:30 a.m. Then, there are relatively few birds, and it is nice to have the first records of newly arrived migrant bird species. However, some mornings during this period can be very cold, and the chill penetrates to the bone. Therefore, the sight of an ornithologist in a winter jacket, cap and gloves was nothing strange in early spring (see the photograph on p. 3). Until about 20 years ago, in the swampy forests during April we walked on ice, sinking into the mud, which, fortunately, was not very deep, because there was frost below. After

that, walking on swampy stands was no longer so easy, and it was rare to return from such a trip with a dry leg. For years now, however, the swampy forests have become drier and drier, and even the mosquitoes are noticeably less numerous than before. Climate change is happening in front of our eyes.

As the season progresses, dawn becomes very early (June 20 around 3:00 a.m.) and one must get up in the dark for mapping, especially if the plot is an hour's bike ride away. Getting up so early has good points, too — probably few people other than ornithologists could see so many magnificent sunrises, or observe bison *Bison bonasus*, elk *Alces alces*, wolves *Canis lupus*, raccoon dogs *Nyctereutes procyonoides*, badgers *Meles meles* or lynxes *Lynx lynx* in their natural environments. In addition, everyone has a variety of memories concerning other natural phenomena, such as the beautiful mists or morning scents.

Until 1989, our older colleagues operated under communistic regime. The life was not easy then as almost everything was missing, even the most basic things like food and clothes. Moreover, services could cling to anything. Wiesław even spent one winter in jail for his opposition activities. Certainly, it was the ornithological passion that helped them to survive. The study plots can only be reached on foot or by bike (up to approx. 8 km). Bicycles that were worn out and often broke down caused problems, e.g. sometimes we had to quickly repair the bike in the middle of the forest or continue on foot. We used to joke that an ornithologists' bike was recognizable by the fact that it had a removable chain guard, which made it easier to put on the chain when it unexpectedly fell off in the forest. But, according to the 'Białowieża philosophy', whatever was in use, no matter how, had to work. Our bikes are a special story in themselves; when I started my research, the most popular were heavy and rather clumsy "Ukraina" fixed-wheel bikes that had no derailleur. In addition to the fact that in the time of communism it was not easy to find other brands, they were actually the most durable in forest conditions. Since the 1990s more modern bicycles began to appear, and the era of old bicycles has passed. Only Tomasz was faithful to his Ukraine-bike until the end.

In addition to not having fully reliable bicycles, rubber boots also caused problems for the team. Until around a dozen years ago, rubber boots (gumboots, or wellingtons) were the most universal outdoor footwear. But as with rubber boots, so it was with bicycle tyres — they often got

punctures, and during the communist era they both were scarce goods (like many other products). That's why one colleague wore two rubber boots of different colours — it was an early sign of pro-environmental behaviour. It also happened, when walking through a swampy area, that the muddy ground often sucked up the rubber boot and the person jumped out with a sock into the mud. These days, this happens only occasionally because the forest is getting drier.

My older colleagues told me that long ago they sometimes spent the night at 'Dziedzinka', an old forester's lodge located deep in the forest, to be ready for dawn thrush mapping in the farthest study areas. This saved time and energy, because reaching the farthest study plots took a long time. On one occasion an old donkey, a resident of Dziedzinka, ate the rubber boot of one of the team, and another time a wild boar cannibalised the remains of their open can of pork luncheon meat. That must have been a painful loss in those times when it was difficult to buy anything.

Everyone remembers at least a few interesting stories from the evening mapping, done once a season in each study plot. One of them, still from the communist period, I know from Wiesław's anecdote, when he and Ludwik were riding their bikes back through Białowieża village in the evening, without lights (which was the norm then). Wiesław rode first, Ludwik a dozen metres away, it was downhill, and suddenly a policeman with a dog on a leash jumped out of the darkness and waved a flashlight, trying to stop them. Wiesław had weak brakes on his bicycle and so he sped away, while Ludwik slowed down and was accused of "not having lights". The policeman chastised him, commenting loudly: "well, a doctor with a university education running away from a policeman with a high school education?" After which, Ludwik was given a double fine — one for him and the other for his colleague who sped away. However, the consequences of this event were much more serious, because a few months later Ludwik was not allowed to go on a foreign internship, just because of this incident. In those days, such things happened, unfortunately.

Evening mapping, especially at the beginning of the season, when we had just arrived from different parts of Poland to Białowieża, were also an opportunity for kind of a social mini-gathering. For example, we always went to the 'L' plot as a small group, and before we dispersed on the study plot we sat on a fallen log talking about plans for the coming season or mentioning various events. After we counted the birds, we again

sat briefly on the log and shared our thoughts and observations. Also unforgettable were expeditions to the farthest study plots (NE, NW and MS) with the whole team. We drove by car to Dziejzinka, and then walked a few kilometres to the plots. While walking back, we sometimes heard wolves howling or other exciting sounds of the wilderness. Sometimes we walked in complete darkness and other times a beautiful moon illuminated our route.

None of our home universities has ever had a field station in the BF, so we always had to find some accommodation before the season. I know from stories that in the early years it used to be a youth hostel or an old museum building. Since the late 1980s, the 'Hunting House', located in the Białowieża Palace Park, served as a base for ornithologists for many years. It was the best location, as the route to the BNP gate took only a few minutes. In 2014, the Hunting House was closed, and the ornithologists dispersed to various locations — the Geobotanical Station of Warsaw University, the Białowieża village Youth Hostel, the 'House under the Stork' guesthouse, and several other accommodations. This was a pity, because living together had many advantages, especially since we spent many weeks away from our homes and were all friends with each other.

Apart birds censuses in BNP, there was a parallel study on the biology of tits *Paridae* led by Tomasz (the 'Wrocław team'), and of the Collared Flycatcher, initiated and led by Wiesław in 1988. For several years Wiesław collected the data by himself, observing birds and climbing trees to check nesting holes. Then Cezary Mitrus joined him in 1992, and I joined two years later. Over the years, many people passed through our team, which we call the 'Siedlce team'. These included our masters and doctorate students, usually working for 1–3 spring seasons. Several years of research that culminated in PhDs were also spent in Siedlce team by Tomasz Stański, Anna Kapusta, Grzegorz Bednarczyk and Mustapha Sahel. For the past three seasons, our Siedlce team has included Oliwia Karpińska, who studies the niche selection of birds in BNP, and by Kasia Kamionka-Kanclerska, who studies with tree-related microhabitats (TreMs).

Working on the flycatchers has consumed a lot of time. Starting around April 20, almost every day one must go around the plot in search of the nest-holes, which then have to be inspected repeatedly. At the beginning Wiesław climbed the trees himself to look into the holes with the help

of a small mirror and a torch. Then we bought the first ladder, which we could use to check many holes (an average height of flycatcher's nesting hole is 8.5 m), but many of the higher holes, located up to 17 m, were still checked by tree-climbing. Wiesław was very efficient in climbing trees, but the best climber in BF was Arek Szymura, who helped us more than once, especially when it came to the most difficult trees. Arek, having worked closely with the ornithologists, still visited us occasionally, and coloured our free time with interesting stories. In the past he has also been involved in other ornithological research with Ludwik, Tomasz and Wiesław.

Then a specialized telescopic device with a camera to check the holes appeared on the market, but its price was prohibitive. Once we managed to raise the funds, it turned out that the device was no longer produced. That's when Wiesław assembled his own device at little cost from a laptop, telescopic rod, a webcam, cables, LEDs, a spruce stick, and adhesive tape. We simply called it a fishing rod and it was used very successfully. The device had plenty of advantages, being cheap, lightweight, safe, with long range and relatively easy to repair, even in the forest. It was possible to check most holes with it. With the help of this device, we also conducted surveys of nest-hole resources in the forests of Nepal (Bhusal et al. 2016, Baral et al. 2018), Sweden and the US.

Wiesław used to say that he did not want to be a researcher who was identified with just one species of bird (although he produced several papers on the Collared Flycatcher, to mention just Walankiewicz 1991, 2002a, 2002b, Walankiewicz et al. 1997, 2007), and that he wanted to get out of the "ornithological ghetto". Therefore, our team expanded its interests to a variety of topics, including woodpeckers (e.g. Czeszczewik 2009, Walankiewicz et al. 2011, Czeszczewik et al. 2013, 2007), tree stand dynamics (e.g. Walankiewicz 2002c, Czeszczewik et al. 2022), tree cavity resources (Walankiewicz et al. 2014), mammals (Czeszczewik et al. 2008, Zub et al. 2014) and natural resource evaluation (Czeszczewik et al. 2019).

Sometimes the ideas for future work arose in quite unusual circumstances. In 2017, Wiesław, Grzegorz Mikusiński and I were returning from the Congress for Conservation Biology in Cartagena, Colombia, and on the plane we came up with the idea for a paper on the threats posed by logging in the BF as part of the fight against the bark beetle (Mikusiński et al. 2018). This was not a strictly ornithological paper, but the protection of

the Forest means protection for bird habitats, too. In contrast, another paper that focused on the relationships between climate, predation, rodents, birds and insect cycles (Czeszczewik et al. 2020) took at least several years to mature from an idea to implementation, but the data series has grown because of it.

Wiesław and Tomasz were very much involved with the BF until the end of their lives and doubtless still had plans to spend many more seasons there. Ludwik withdrew from Białowieża field-research around 2000, but visited the Forest many more times and published several papers based on data he gathered in BNP (e.g. Tomiałojć 2012, Tomiałojć & Wesołowski 2005, Tomiałojć & Neubauer 2017). Ludwik last visited the forest in the summer of 2019, where we celebrated his 80th birthday with a few months delay. This was his farewell meeting with the BF.

All three great ornithologists left us suddenly, in order of seniority, within the space of just 13 months. Wiesław, after his last season in Białowieża, still came back several times in the summer and autumn of 2020, as if he didn't want to be detached from it. And then suddenly he passed away, in that terrible Covid year. And then Tomasz also died completely unexpectedly, soon after a season spent in his beloved Białowieża. Maybe they have already started new research in some undiscovered Primeval Forest of another world. After their passing in 2020–2021, there was an unanticipated exchange of generations.

In total, the intensive Białowieża Forest ornithological research has spanned 48 breeding seasons. I hope to celebrate half a century of Białowieża Forest ornithology two years' time. Unfortunately, this will be without its founding fathers, but their legacy will continue.

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LIST OF MAJOR PUBLICATIONS DEVOTED TO THE BNP BY  
LUDWIK TOMIAŁOJC, WIESŁAW WALANKIEWICZ  
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(in chronological order)

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