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Amphibians and Reptiles

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1. Amphibians

Amphibians *Amphibia* originally left the water over 370 million years ago and were thus the first vertebrates to conquer the land. A terrestrial existence opened up new life possibilities for them, though the great majority of species have continued to be dependent on water for breeding, and are hence unable to persist in areas lacking aquatic habitats. This is why the term *Amphibia* in Latin denotes “two lives”.

When set against other groups of animals, the amphibians have to be seen as rather poorly represented in Poland. By way of compensation, the small number of species can be said represent quite a wide diversity of form among these small vertebrates. More or less associated with that are a range of habitat requirements, various breeding behaviours and differing life cycles. When it comes to the Białowieża National Park as such, the conditions for the existence of representatives of this group are as favourable – as they are for many other kinds of living thing. This fact is most visible – and audible – in the early-spring breeding season, when literally thousands of frogs and toads emerge, pretty much *en masse*, following the several-month-long sleep of winter, i.e. their hibernation. The Białowieża Forest area in fact supports 13 amphibian species (Buszko-Briggs, Briggs 2001), which is no more or less than in other parts of the Polish Lowland. The overall abundance of these species is most likely even greater than elsewhere, though – as ever – some species can hardly be avoided, sometimes even literally, while others are met with but rarely. Inevitably, a National Park accounting for less than 20% of the Polish Białowieża Forest (let alone its counterpart on the Belarusian side) fails to include all 13 of the species, though 10 are present. These are the crested and smooth newts, *Triturus cristatus* and *T. vulgaris*, the common spa-footed toad *Pelobates fuscus*, the common toad and green toad, *Bufo bufo* and *B. viridis*, the common tree frog *Hyla arborea*, the common frog *Rana temporaria*, the moor frog *R. arvalis*, the edible frog *R. esculenta* and the pool frog *R. lessonae*.

Just a little over a decade ago it was still possible to come cross two further species within the Park, the fire-bellied toad *Bombina bombina* and the natterjack toad *Bufo calamita*. Unfortunately, it has not proved possible to confirm the existence of these species within BNP in recent years, and they have also disappeared from the *Polana Białywieska* (Białowieża Clearing) area. While the few items of literature on the subject that are available suggest that the natterjack was never particularly common here (Mertens 1921, Koźmiński 1923), the situation of the fire-bellied toad was entirely different. The work Koźmiński published in 1923 had it that: “the fire-bellied toad is quite common in the Białowieża Forest. I have met with it in great numbers in the Białowieża Clearing, principally at the Skrzekowe Ponds” [bodies of water now falling within the BNP boundary – author]. However, “within the Forest proper I found just a single site in the northern reserve” [i.e. in what is now the Orlówka Protective District]. Even in the second half of the 20th century, this was still considered quite a common species in the wider Forest area (Borowski, Okołów 1968).

Today, however, it has become almost entirely confined to the margins of the Primeval Forest, leaving any observations in basins further within the forest interior as an exceptional rarity.

Both aquatic and terrestrial habitats are of major importance to the amphibians of our climatic zone, but the presence of the former is obviously essential if a population of amphibians is to persist at all. For it is only in water that mating, the production of spawn and the development of embryos and larvae can take place. Only newly-metamorphosed animals (i.e. miniature versions of those in adult form) are able to live beyond the water. The continued existence of species or populations depends above all on reproductive success (the number of offspring capable of themselves breeding), with the result that research on amphibian ecology (and conservation) attaches the greatest importance to aquatic habitats. However, results are now making it clear just how important the terrestrial habitats may also be. It is after all in these that individuals of some species spend the vast majority of their lives. The most favourable situation is thus one of a mosaic of habitats that guarantees both the enhanced breeding success and abundance of a species. The living habitats for amphibians must first and foremost offer them feeding opportunities, but also places of concealment in which they can both offset potentially dangerous losses of moisture and obtain shelter from predators.
A tree frog Hyla arborea – males of this species have large vocal sacs allowing the croaks of several to be heard over long distances, especially in the evening.

Photo: R. Kosińska and M. Kosiński

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Transect-based counts of amphibians made in 2007 within the Orlówka Protective District make it clear that the common frog is the dominant species here, while moor frogs and common toads together account for less than 7% of individuals (Fig. 1). Since other species were not caught at all – as a reflection of the specific way of life they lead – it is clear that another counting method ought to be applied. Furthermore, it was young animals (in their first year following metamorphosis) that were overwhelmingly caught (Fig. 2). As the count in question was made in the second half of August, virtually all larval forms had undergone metamorphosis and left their breeding ponds and other bodies of water (Krzysiak-Kosińska, unpublished data). The results noted are in line with those of previous studies (Pikulik et al. 2001).

Almost all of the Primaeva Forest’s terrestrial habitats have amphibians in them, though the different species do have their preferences, as was noted previously. All the forest habitat types support them, though they are particularly fond of marshy or swampy areas along river valleys, as well as meadows and pastureland, and even dunes. Research on amphibians in the region done in the years 1995 – 1998 (Pikulik et al. 2001) in all the different types of habitat showed how amphibians were present at highest densities in the forested valley of the Orlówka – a stream flowing through the area of the Forest enjoying Strict Protection. The common frog was again the dominant species (individuals thereof accounting for 91% of all those caught), though moor frogs and common toads were also present (if occurring at higher densities in wet riparian forest and alder carr). Only lower densities were to be observed in the Iwona and Łutowina Valleys, as well as in the alder carr growing along them. There are fewest amphibians of all in the very dry forest communities, notably tall oak-lime-hornbeam forest and mixed/broad-leaved and coniferous forest, as well as in the open valleys of the larger rivers like the Narwawa and Leśna. The similar results of the research done in the years 1992 – 1993 (Jędrejewska et al. 2003) point to population densities being at their highest in alder carr; and only much lower in the drier broadleaved forest habitats, let alone the mixed/coniferous forests from which they may be almost entirely absent. The habitats that amphibians find in some way appropriate also change from one part of the growing season to another. By the end of April, the common frog is already becoming rather abundant in wet forests, but here the numbers are only much lower in summer, before they rise again markedly in early autumn as newly-metamorphosed young augment the population. The common frog enters very dry habitats in May, while greatest population densities coincide with late summer and early autumn. However, around mid October, amphibians bring an almost complete end to the active phase of the life cycle, going into hibernation at this point. As “cold-blooded” animals, amphibians are active to the extent that the temperature in their surroundings allows. Should air temperature fall below a certain critical level needed to maintain metabolism, a series of important changes takes place in the amphibian’s body allowing it to live on in the face of the unfavourable conditions. All the Polish species hibernate for the winter, and most of those inhabiting the lowland parts of Northern Europe do so on land – hidden in the holes dug out by other animals, among tree roots, in beds of moss or thick tufts of grass. They may also sometimes spend the winter at the bottom of ponds, lakes or streams. The green frogs usually choose the beds of flowing waters or bottoms of other large bodies of water. In search of suitable conditions to pass the winter, some amphibians may also find their way into cellars and outbuildings.
As has been noted, the presence of suitable habitats in which to breed is an essential feature if a stable population of an amphibian species is to persist. Aquatic habitats must be present for mating and the subsequent development of embryos and larvae. Conditions of this kind are present throughout the Park and the Białowieża Forest as a whole, *inter alia* in the floodplains of bodies of water, oxbow lakes, natural wetlands and marshy depressions, alder carr, ponds remaining in the wake of human activity (sand and gravel extraction and brickmaking), roadside ditches and larger bodies of water (like the lakes in the Palace Park).

Amphibians take an important place in the food chain, especially if their total biomass in ecosystems is taken into consideration. Their main food is invertebrates, though there are some rare cases of larger specimens (especially of the green frogs) taking small invertebrates and even the young of their own or other amphibian species. Newt larvae are very predatory, actively hunting all mobile organisms in the water, most especially cladocerans and copepod crustaceans. In contrast, the diets of adult newts are mainly dependent on the habitat lived in. In the water it is aquatic organisms, insects and their larvae, amphibian eggs and tadpoles and small fish that are eaten. On land, they mainly take earthworms, snails and insects and their larvae. In turn, the larvae of anurans (frogs and toads) mainly eat algae, which they scrape off the surfaces of water plants, as well as dead plant and animal matter, and oligochaete worms, arthropod larvae and small tadpoles. The diet of the adults in turn features earthworms, snails, spiders, and insect larvae and adults – most especially beetles. Invertebrates are also taken, however – tadpoles and small amphibians, as well as young lizards and snakes. Ants also play a surprisingly major role in the diet.

Amphibians fall prey to the whole gamut of predators. The tadpoles are taken by fish and such invertebrates as water-bugs and dragonfly larvae, while the newly-metamorphosed individuals are mostly consumed with gusto by snakes, birds, mammals and so on. Spadefoot toads actually play quite a significant role in the diet of owls, both being out very largely at night. Research done in the Forest also points to the very frequent presence of amphibians in the diets of otters, American mink, polecats and raccoon-dogs. In the spring-summer period, up to 34% of the biomass consumed by otters was found to be in amphibian form, the figure rising to 58% in autumn and winter. The respective figures for mink are 32 and 51% (Jędrzejewska et al. 2001). The group is yet more important to the survival of polecats, these in fact being specialists in the seeking out of hibernating frogs, toads and newts as a dependable winter food source.
2. Reptiles

Reptiles *Reptilia* are an exceptionally diverse class with more than 8000 species present around the world. Unfortunately, their biology tends to confine them to the warmest parts of the planet, leaving our climatic zone severely impoverished. Poland as a whole has just eight reptile species, and as many as seven of these can be seen within the Bialowieża National Park. The species in question are 3 lizards – the common or viviparous lizard *Lacerta vivipara*, sand lizard *L. agilis* and slow-worm *Anguis fragilis*; plus the grass and smooth snakes *Natrix natrix* and *Coronella austrina*ca and adder *Vipera berus*; and the European pond terrapin *Emys orbicularis*. Thus far, no detailed research to map the precise distributions and assess the populations of this group within the Bialowieża Forest area has been carried out. We are therefore left with more or less sporadic and fragmentary information gained “by the way”, as other studies are being conducted. This state of affairs is far from satisfactory, since the chance observation of reptiles is always hindered by their well-known exceptional wariness and capacity to escape both rapidly and quietly if approached. What we can say is that two of the seven aforementioned species can reasonably be looked upon as “common”, i.e. the grass snake and common lizard. Koźmiński (1923) considered both of these very abundant in the forest interior, along the rivers and among the marshes and peatlands. In contrast, he never even saw a sand lizard during his first (1922) visit, though he was able to report several sites – mainly dry and sunny – when he came back a year later. Yet in later years, the sand lizard even came to be regarded as common (Bozkowski, Okolów 1968). The legless lizard known (unfortunately) as the slow-worm was also viewed as quite common at the beginning of the 20th century, though admittedly, when he was looking, Koźmiński failed to find a single specimen of this notorious skulker within the area today constituting the National Park. These days, representatives of the Park Services quite regularly come cross both slow-worms and adders within the Park area. In contrast, only met with very rarely is the smooth snake – which Koźmiński never reported at all in the course of his two-month sojourn at Bialowieża in 1922. However, the odd specimen was obtained by Dr Nick during the First World War, these being sent to the Museum at Frankfurt-am-Main, if unfortunately with no precise location given (Koźmiński 1923). Koźmiński himself man-
The European pond terrapin *Emys orbicularis* – unfortunately, a sighting of this species in the Białowieża Forest is now rare enough to be a noteworthy event. Photo: R. Kositska and M. Kositski

aged to catch one a year later within what is now Białowieża Forest District (Kozmiński 1929), and Prof. Karpiński (1965) held that the smooth snake was present – if “very rare” – in the Forest. It can likewise be assumed present today, within BNP in its present borders, though confirmatory observations are lacking. Almost as fleeting a presence is that of the European pond terrapin, which information in the literature suggests was to be met with occasionally in the Białowieża Forest area in years gone by. However, Kozmiński (1929) could only come up with one definite report – of a single animal caught here in June 1924. Further observations of the species in subsequent years were apparently very few and far between. However, Berger (1957) notes how, in 1931, Docent Wachaw Oltuszewski brought 12 terrapins from the Białowieża area for release into the wild at Rydzyn near Leszno in the Wielkopolska region. Such information makes it absolutely clear that this was by no means a rarity here at that time at least. Indeed, Białowieża villagers and foresters alike are consistent in claiming that specimens could be encountered regularly, as recently as in the 1980s, in both the Białowieża Clearing and the National Park itself. In that light, particular significance should be attached to the reports from the 1970s concerning young animals in the Narewka area. However, the last several decades have only brought a couple of documented cases of European pond terrapins being caught in the Forest, though happily these have included references to juveniles (Ruprecht 1989). The last verified observation dates back to May 2008, when a Park employee caught a terrapin crossing a forest track within the Hwoźna Protective District. The animal in question was an old male with a much-damaged carapace. Put together, all of this information clearly points to the existence of a native population of European pond terrapins in the Białowieża Forest area, albeit one that is so scattered that its longer-term persistence in the absence of active conservation measures must be in doubt. This sad state of affairs above all reflects the changes affecting terrapin habitat in recent decades. In particular, there has been a marked lowering of the water table, which has combined with the low rainfall totals of recent years to leave in a dried-out state a number of the bodies of water that remained full just a few decades ago. Furthermore, natural succession plus an ongoing process of the abandonment of farmland have been encouraging the overgrowth of formerly open areas, this representing nothing less than habitat deterioration from the point of view of egg-laying terrapins, since any temperature-related postponement of hatching leaves young terrapins with little time to seek out the best conditions under which to pass the winter.