BLOCK 2

WANDERING OUT IN AUTUMN

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With the changing seasons, not only the bird species in the area change, but also their behaviour does. Full of joyful spring singing and twittering gardens, city parks, forests or meadows at some point become quiet and empty. The birds are still there, but they sing less and become hard to be spotted. There are other species of birds that come and stay with us for the winter. This is because in the regions where they spent the summer it is difficult to find enough food at this time of the year. Winter guests include: bohemian waxwing, brambling, twite, redpoll, rough-legged buzzard (which is a bird of prey) and numerous water birds such as common eider, long-tailed duck, black-throated loon or razorbill.

Why those changes occur and what is there to understand for us - bird watchers?

Autumn is the season of intense and mass migration, one of the most spectacular events in the lives of most birds. Many bird species, which are nesting in Poland, undertake they journey at the turn of September and October, and only some species begin their migration earlier, for instance lapwing – which migrates in the second half of June. A careful watcher will surely notice big herds of storks gathering in the meadows, or rows of swallows on the wires of the power grid, gathering energy before the journey. Geese and cranes create characteristic V-shaped keys during their migration flights. On the other hand, starlings migrate creating a cloud of individuals, changing the direction of flight in a synchronized way (murmuration). This is considered one of the ways to confuse the bird predator, because it is difficult to locate a potential victim in such a rapidly changing group of birds. Birds migrate twice a year - in spring and autumn. It is an energy consuming effort for them, and comes with many difficulties: unfavourable weather conditions, dangers due to the presence of technical infrastructure (power lines, large windmills), hunting or lack of food. Migratory birds are hunted in Africa (for meat) and especially intensively in Malta, Cyprus, the Middle East, and Arabia (also for sport).

Autumn migration is an escape from decreasing food supplies, mainly plants and insects, and migration to areas rich in food, which allows the birds to survive the difficult winter season. However, migration does not always mean moving to the so-called „warm spots" or „warm countries", which are distant from the areas where they settle during the breeding season (spring, summer). There are long-distance migrations, which are performed by for example white storks and barn swallows. Some birds change their place of residence only to a small extent - these are short-distance migrations. There are some birds that are nesting in Poland and make short-distance migrations for instance rooks and jackdaws, which spend the winter in Western Europe and to Poland, come only those, which breed in North-Eastern Europe. There are also species that lead sedentary lives and remain within their territories for the winter. Most of owls, magpie, black grouse and capercaillie are the examples of non-migratory species.

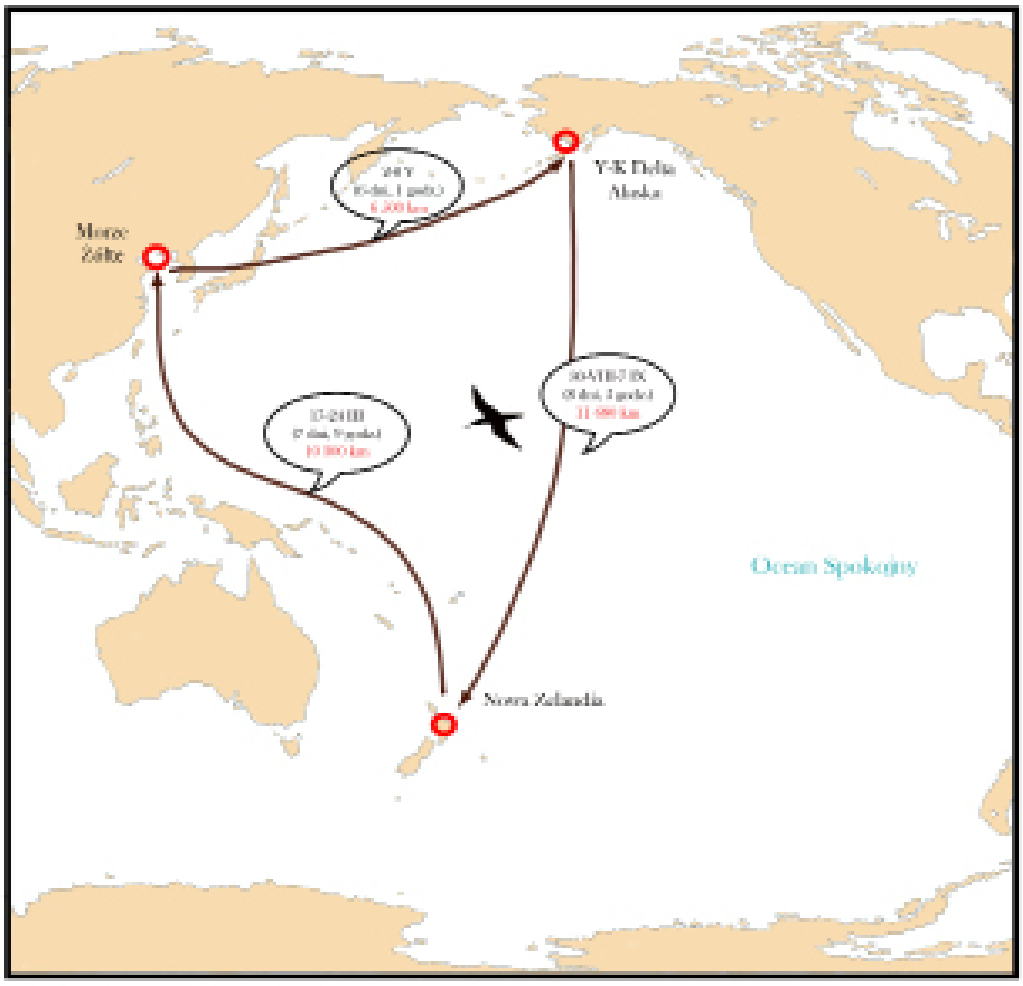
Among the birds, there are also real record-holders who cover huge distances during their journey. The most well-known example is the migration of a sooty shearwater, a bird nesting in

FIGURE 1: BAR-TAILED GODWIT
Author: Juan Varela

New Zealand and Chile. In search of food he can fly across the Pacific - the coasts of Japan, Alaska and California, thus flying for about 64 thousand km. Many birds take short stops during the journeys, so they can stock up food supplies and rest. Some records are beaten here also. Thanks to the use of satellite transmitters mounted to the birds back, it was discovered that the record belongs to the bar-tailed godwit (Charadriiformes), which covered a route of 11680 km within 7 days and 9 hours (figure 1 and 2).

How can birds fly on such long distance? This requires a set of special adaptations from them:

- fat reserves accumulated during the breeding season are the source of energy, and when fat reservoir is gone, the bird begins to burn



Rekordowy lot Szlamnika
FIGURE 2: MIGRATION MAP OF THE BAR-TAILED GODWIT.
Author: Marek Kołodziejczyk

the protein from the muscles and the wall of the digestive tract;

- a large heart size and a greater number of erythrocytes provide constant access to oxygen needed to produce/release energy;
- taking advantage of local storm winds, that can shift birds over long distances;
- flying at high altitudes, making it easier to get rid of excess metabolic heat;
- reusing metabolic water, that is, the one that is by product in digestion of food, which reduces the required intake of water from the external sources, and thus allows to decrease number of breaks taken on long distance journeys.

How do birds know where to migrate and how to get to the destination? This question has aroused interest in us for a long time. Initially, knowledge in this area was not very impressive. It was believed, among other things, that swallows are overwintering buried in lake mussels, which probably resulted from the observation of a group of nocturnal swallows in reeds.

The first verified information of bird migratory routes and places of their overwintering was obtained thanks to the ringing method, which is based on marking birds with special metal rings. The ring is engraved with unique number and name of the Bird Banding Centre of the given country. Rings, depending on the species, are put on bird's leg or neck. The originator and precursor of this method was Dane Hans Mortensen (Danish), who introduced it in 1898. Due to ringing efforts we can get data on flight dates, pace of migration, routes, wintering places and much other information on species biology. Thanks to the individual marking, you can also follow the fate of specific individuals.

Information about the ring read on a alive or dead bird should be sent to the headquarters of the country's Ringing Centre within which borders the observation was made, regardless of the address on the ring. In Poland, the headquarters is the Ornithological Station Museum and Institute of Zoology of the Polish Academy of Sciences in Gdansk.

In 1931, this method was started in Poland, and up to now, the number of ringed birds has exceeded four million individuals. Every year, in Poland, about 150,000 rings are put on new individuals.

The ringing method has several drawbacks, the most important is the need to ring a huge number of individuals to receive any feedback. It is easy to imagine that the chances of finding a ring, or reading it on a live bird, taking into account the bird's lifestyle, diversity of places of residence and high mortality of juveniles is very difficult. When it comes to small, short-lived birds, the number of re-captured ringed birds is only a small fraction of all birds ringed. It is better for large birds, but even here the results are not impressive.

In addition to old methods, new achievements in the field of science and technology came handy. They allow obtaining very accurate data on not only migration, but also other aspects of birds' biology. Currently, the use of miniature devices that register the bird's geographical location in pre-set time frames and record this information in databases, which can then be analysed on the computer, is more and more common and used. However, to recover the data from geolocation device, the bird has to be captured again and this is not always easily obtained or even possible. In this respect, telemetric devices (e.g. GPS transmitters) are much more efficient. They provide continuous information on the bird's location via satellite or radio networks.

Regardless of the improving technical possibilities in the field of bird migration, the main question remains: how do birds know when to fly and what route to take? What helps them in spatio-temporal orientation?

FIGURE 3: METAL BIRD RINGS. Author: Jadwiga Moczarska

The signal to start the journey depends on a number of environmental factors that stimulate the bird's nervous system and elicit bird's reaction. Such factors include the changing number of hours of sunshine per day, seasonally changing ambient temperature and changes in food availability. Such a set of factors causes in birds the so-called „migration anxiety". It means that the bird will embrace certain behaviour indicating the approaching departure moment.

One of the research methods on birds' navigation uses "directional orientation cages". It was used by many scientists including the American ecologist Steven Emlen in the 1950s and the German ornithologist Gustav Kramer in the 1960s. The birds, which were placed in those cages showed the aforementioned „migration anxiety". They were very clearly directed to the area of the cage that was consistent with their predicted migration direction. It still did not explain what causes this behaviour and what factors are responsible for it. The answer to this question has been developing gradually. It was found that orientation points as fixed topographical points (river channel lines and sea shores, mountain ranges) and the position of the Sun during the day are important for a birds which fly during the day, and for those traveling at night, the star system in the sky plays a role of a map. But what happens if the sky is covered with clouds? At the end of the 19th century, a theory appeared regarding the possession by birds of the magnetic sense, or the ability to record the changing intensity of the Earth's magnetic field. In the second half of the twentieth century, the presence of magneto receptors, i.e. microscopic

magnetite crystals containing iron, located around the eye and in the nasal cavity in the upper part of the beak, was recognized and demonstrated in pigeons.

Today, we assume that all of the mentioned ways of orientation and navigation can be used in parallel or interchangeably. For children, bird ability to register the magnetic field can be somewhat abstract. It is better to draw their attention to the topographic orientation - „recognizing the way home based on memorized places" or knowledge passed by parents -learning it from those individuals who have been traveling in previous seasons, or to point that birds can orientate themselves based on the sky map. Birds migrating in spring and autumn move along historically established routes, repeated from year to year:

- some birds fly along the coasts of the Baltic, North Sea and European Atlantic coasts, reaching the Mediterranean Sea and then to Africa across the Gibraltar;
- some fly southeast, reaching the Mediterranean Sea and then to Africa from Greece and Turkey via the Bosporus;
- the last group reaches Africa by crossing the Mediterranean Sea in its narrowest places, near Crete and Sicily.

White stork's migrations are one of the best known migration patterns of birds that inhabit our country. In most cases storks begin their preparations for migration at the end of July. The juveniles leave their nests after when they are about 60-65 days old and together with adult birds they gather in large (sometimes containing even several hundreds of individuals) flocks, so-called councils. While in the flock, birds collect fat reserves before long journey, eating large amounts of rodents, earthworms and insects. They also buff up and warm up their wings by flying for hours on the surrounding areas. Birds choose the extensive and fertile meadows located in the river valleys or in the proximity of swamps. Not only stork families with juveniles, but also those birds that did not bring up offspring in a given season, come together.

The autumn migration of storks begins in August and lasts 2-3 months. Their destination is Africa. Storks from Poland spend the winter mostly in the eastern part of Africa south of the Sahara and even in South Africa. They travel up to 11,000 km during this time. The birds fly along the eastern route along the Carpathians, the Balkans, then the Bosporus and further along the eastern shores of the Mediterranean to the Sinai Peninsula, and then along the Nile to Equatorial Africa. Under favourable weather conditions, they fly at an average speed of over 40km/h, covering about 340km a day. As for storks from Western Europe, they reach Africa via the western route through the Gibraltar.

During the migration, storks usually soar using the ascending air currents. They do not fly actively, like geese, which are waving their wings all the time. They perfectly recognize "air elevators", which lift them very high (the official record is 1550m above sea level), and then slide down to search for the next "elevating" spot and repeat the whole manoeuvre. The condition for using the ascending currents is warm and possibly sunny weather. Storks cannot travel over waters, because there are no ascending air currents there.

Storks return from the wintering grounds in the last days of March or in April. They fixup

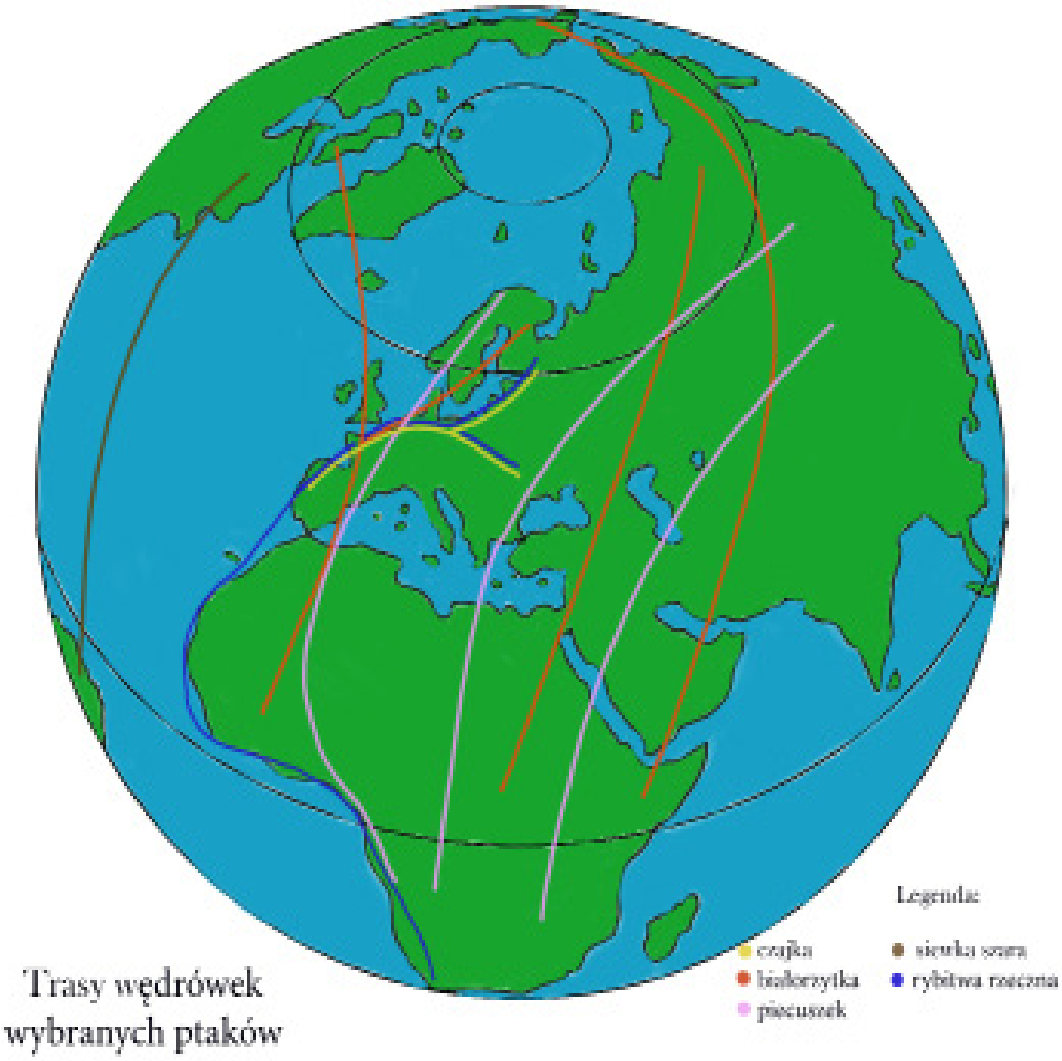


FIGURE 4: ROUTES OF SELECTED BIRD SPECIES.. Author: Marek Kołodziejczyk

their old nests or start building new ones just after their arrival. Storks reach sexual maturity at the age of 3-5 years and then for the first time they start breeding. Some of the juveniles may remain on wintering grounds until they reach maturity. The female usually lay first eggs in the second half of April. There are usually 3 to 6 eggs in a single nest. Both birds, female and male stork, are taking care of the nest. Incubation lasts 33-34 days.

This material was prepared as part of the project „We live in harmony with nature. The educational program for teachers of pre-school and primary education". The project involved selected non-governmental organizations involved in the protection of birds associated as part of the international BirdLife International federation. In addition to the National Society for Bird Protection, which ran the project, the Spanish Ornithological Society (SEO), the Slovak Ornithological Society (SOS), the Macedonian Ecological Society (MES), the Czech Ornithological Society (CSO) and BirdWatch Ireland (BWI) were involved. The University of Gdańsk became the substantive partner of the project responsible for creating materials for teachers.

BirdWatch Ireland is a non-governmental organization with a public benefit status, dealing with the protection of wild birds and the places where they live. The aim of the Society is to preserve the natural heritage for the benefit of present and future generations. BirdWatch Ireland is the Irish partner of the global federation of bird protection societies - BirdLife International.

Publikacja została zrealizowana przy wsparciu finansowym Komisji Europejskiej.
Publikacja odzwierciedla jedynie stanowisko jej autorów i Komisja Europejska oraz Narodowa Agencja Programu Erasmus+ nie ponoszą odpowiedzialności za jej zawartość merytoryczną. PUBLIKACJA BEZPŁATNA