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Mysterious Migration



Migrating birds

Scientists are still trying to unravel the mysteries of bird migration. But increasing encroachment on habitats and man-made structures are making migratory birds lose their track.

THE Arctic Tern covers a distance of over 17,000 km every year and the Pacific Golden Plover crosses open seas with non-stop flights of at least 3200 km! And most species of Penguin cover over 1000 km by swimming regularly! Among the many mysteries that man has been trying to unravel since long, bird migration occupies the pride of place.

Most animals tend to migrate generally in specific periods chiefly due to changes in food availability, habitat and weather. Bird migration too seems to be guided by similar considerations. Lands Borough Thomson describes bird migration as "changes of habitat periodically recurring and alternating in direction, which tend to secure optimal environmental conditions at all times." Alternating, back and forth movement,

is a crucial feature of migration. Irregular and generally unidirectional movements are known as nomadism or invasions.

Although factors like changes in food availability, habitat and weather are responsible for migration, the changing seasons also stimulate the internal and external reflexes in the birds. Sunlight has a significant impact over many physiological processes. Hence, variation in day length is supposed to be one of the primary external stimuli. However, manipulating day length artificially in laboratory has been found to provoke stages of maturity of reproductive organs, suggestive of internal stimuli.

Generally, in summer birds migrate towards the north for breeding and return during winter to the warmer southern regions. The extended day length in

summer in the northern part induces birds to breed more. Since day length has significant effect over clutch size or the number of eggs, the extended daylight hours induce diurnal birds to produce larger clutches as compared to non-migratory species of birds in the same region. In autumn, when day length reduces, the birds return to the warmer regions for food.

Patterns of Migration

Often, the bird has to change its locality due to local conditions only. These conditions may be heat, drought or floods, which generally cause adverse effect on the availability of their food supply. In India, at the base of the foothills of the Himalaya, such seasonal changes are more common as compared to the equatorial regions.

Arctic tern covers 17000 km/year

Grey wagtail



Besides legal efforts like bird sanctuaries, some areas in the country are also protected by people.



V form of migration



Bar headed goose



Critically endangered Siberian Crane

In a bio-diverse country like India, where different seasons provide various types of food for the birds, local migration is common. For example, the flowering season of certain plants lures the nectarivorous birds like Sunbird. Similarly, the ripening of certain fruits and fluctuations in insect population will attract frugivorous birds like Bulbul, Parakeet and insectivorous birds like Egret, Oriole, respectively. The same bird may be found in summers in a particular locality and in winter or rainy season in a different region. This periodical appearance is also known as local migration.

However, not all birds of the same species migrate necessarily. Only a part of the population within a species may be migratory, this is known as partial migration. Surprisingly, sometimes birds at higher latitudes tend to be migratory whereas those at lower latitudes tend to be resident due to suitable wintering habitats. This type of migration is known as leapfrog migration.

Different altitudes also provide variation in food availability forcing birds to migrate. Such altitudinal migration is common in the Himalayan region in India. At a height of 5000 m (16400 ft.) on the Khumbu glacier of Mt. Everest, the skeletons of Pintail and Black-tailed Godwit found give clues about altitude of migration. The Bar-headed geese have also been observed flying over 8000 m (29000 ft.) in the Himalayas. Sea birds migrate at low altitudes over water and high altitudes when crossing the land. Exactly the opposite type of flying altitude is observed in land migratory birds. Most of the birds migrate in the range of 150 m (500 ft.) to 600 m (2000 ft.).

Different patterns of migration are also based on age groups and sex of the bird. In case of Chaffinches in Scandinavia, only females migrate and males stay as resident. Many larger birds fly in flocks. It helps to reduce the energy stress. Most large birds fly in a V-formation.

It is observed that, migratory birds return not only to the same general locality for breeding, but also to the same nesting sites year after year. Even after covering a distance of 2000 km or more, the ringed Grey Wagtail was found to return to the same site in Mumbai on the same day!

The Route Map

How do birds find the route year after year? The phenomenon is exciting and mysterious. Generally, the adult males arrive first at their breeding ground in the spring. Adult females arrive later for breeding. However, in autumn, while returning, the adult birds both male and female follow the path led by young ones. Young ones act as forerunners of the flock. Despite having no idea about the route and destination through any previous experience, the flock still manages to reach desired destination accomplishing journey of thousands of miles.



Hunting of birds—biggest threat



Ring the bird



Bird watching—step towards conservation

According to one hypothesis, the route of migration is an embedded primitive trait, which is inborn and inherited through a number of generations that have followed the migratory route. The ability to navigate and orient themselves during the migration is the same as that of genetically fitted programme in birds along with learning.

The change in day length triggers the hormonal reflex in birds, which can be seen with higher activity or restlessness in cage-raised birds. Also prior to migration period, birds show increased fat deposition in the body, which is suggestive of energy storage for migration. Even in caged birds during migration period, a preferential flight direction is seen, which is roughly the same direction of migration shown by wild birds.

Various natural navigators are supposed to guide the path for migratory birds. Day-flying migrants use the sun as a compass by determining their course based on the angle made between the sun and the earth, at a particular time. On the other hand, in case of nocturnal migrants the constellations of stars act as guides. Along with major visual landmarks and olfactory cues, the ability to detect magnetic field by birds equally contributes towards mapping the path.

In fact, young birds in their first migration fly in the correct direction by using the earth's magnetic field. However, they don't have any idea about stopover points. The innate ability and earned experience helps to find electromagnetic fields to recognize the habitats and helps

them in making mental maps. Studies on migration of raptors like ospreys and honey buzzards, with satellite tracking has shown that the older individuals are better at making correction for wind drift. Recently, researchers found a neural connection between the eye and fore brain, which is active during migrational orientation.

Problems in Migration

The migratory journey is full of risk, barriers and problems. Apart from high stress, the birds are at risk of predation. This predation risk is the same with diurnal and nocturnal migrants both.

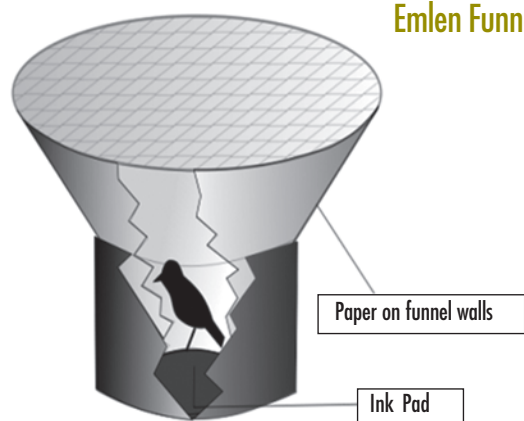
The bird Elenora's falcon feeds its young one with southbound nocturnal passerine migrants. During migration, birds have to stop at some stopover points for

Power lines threatening migratory birds ►

Wind farms could be barriers to migratory birds



Since the thermals only form over land, these birds are unable to maintain their active flight for long distances and have to face great difficulty in crossing the large water bodies.



Emlen Funnel

In a bio-diverse country like India, where different seasons provide various types of food for the birds, local migration is common.

refueling, which also enhances the predation risk. Many smaller insectivorous birds like hummingbirds and flycatchers migrate large distances usually at night to minimize predation and avoid overheating. Again, nocturnal migration is at the cost of loss of sleep, affecting the migrants' journey.

Large broad winged birds like vultures, eagles, buzzards and stork rely on thermal columns of rising hot air to enable them to soar during the daytime. Since the thermals only form over land, these birds are unable to maintain their active flight for long distances and have to face great difficulty in crossing the large water bodies.

Similarly, water birds have difficulty in crossing the large landscapes. Environmental fluctuations provoke food scarcity that may be harmful. Sometimes, differential wind conditions may cause detours. Various parasites and pathogens causing harm to the immune status of birds cannot be neglected at the same time.

Ecological Effects of Migration

Migration of species from one place to the other is not merely a matter of movement; it also favours the movement of ecto-parasites like ticks and lice. Such ecto-parasites are not only harmful to birds but also serve as host for many vectors like microorganisms, threatening human health.

Many times, some viruses (e.g. West-Nile virus) are maintained within bounds without any lethal effects. But migratory birds can act as carriers for various infections, such as the global spread of avian influenza, which is dreadful to domestic as well as pet birds. Migrants also have an important role in dispersion of

plants and plankton. Migration also changes the gene and genotypic frequencies in the population.

Techniques to Study Migration

Ringling is the oldest method used to obtain knowledge about the migration patterns in birds. Some other techniques like colour marking, use of radar, satellite tracking and stable hydrogen isotopes are also used.

Various efforts to study orientation behaviour have been carried out since several years. For instance, an Emlen funnel is a bird cage shaped like an inverted cone, used to study bird behaviour, in particular birds' migratory instincts. An ink pad is placed on the bottom, so that when the bird hops or flutters onto the sloping walls it leaves a track before slipping back down again. The bird's view through the top of the cage can be manipulated, for example, to know how it responds to different apparent "star patterns" (actually generated in a planetarium).

Conservation

Increased human encroachment in the natural habitats of all birds, not just the migratory birds, has led to widespread habitat destruction. Hunting, fragmentation, illegal trades, poisoning, emerging diseases and climatic changes are also threatening various species of birds.

Conversion of forests and grasslands to agriculture, monoculture plantations in natural forests, grazing and woodcutting pressures etc. have led to a decline in quality and quantity of habitat. This is true for both aquatic and semi-aquatic species. Diversion of surface and ground water, drying up of streams and other water bodies, siltation, pollution from

pesticides and chemical effluents have also threatened the survival of migratory birds.

Man-made structures like power lines, wind farms, offshore oil-rigs and hunting along migratory routes have severely affected migrants. Migration of a huge flock of billions of passenger pigeons (*Ectopistes migratorius*), 1.6 km wide and 500 km long, passing in the sky is now becoming history. This bird has gone extinct already.

Various countries have accepted and adopted conservation measures co-operatively, as the migratory birds cross political boundaries, to protect migratory birds, for instance, the Migratory Bird Treaty Act-1918 of the U.S. and the African Eurasian Migratory Water Birds Agreement.

The extremely biodiverse land of India is also a favourite destination of the migratory birds. Almost 13% of the world's bird species are found in India. Even though there are more than 1200 species of birds in India, it is also the largest country containing rare and threatened species. More than 500 protected areas and 35 areas have been especially established for bird protection. Many migratory birds unfortunately are getting added to the threatened list.

Twelve species are facing the threat of extinction as they have already been categorized 'critically endangered', for example, the Siberian crane. The Keoladeo National Park in Rajasthan has been a favoured spot for the Siberian cranes. But they were last seen in 2002 here. It was found that there was severe hunting along the migratory route, particularly in Afghanistan and central Asia.

Besides legal efforts like bird sanctuaries, some areas in the country are also protected by people. These areas have also served as breeding tracts for many migrants. Vedanthangal (Tamilnadu), Nelapattan (Andhra Pradesh), Kokkelabelur (Karnataka), Navegaon bandh (Maharashtra) are a few of them.

Only when more such legal as well as civil movements and measures are put into place will the migratory birds be once again be able to find their way back to healthy habitats.

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