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Shivaji College

Zoology Department

Diversity Of Chordates

Assignment On

Migration In Birds

8/8

Nidhi
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Submitted By

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Submitted to Dr. Nidhi Garg

CERTIFICATE

This is to Certify that 'Sonali' student of B.Sc Zoology (H); sem III; 2nd year has Successfully Completed the 'Diversity of chordates' Assignment on 'Migration in Birds' Under the guidance of 'Dr. Nidhi Garg' Ma'am.

Nidhi

'Teacher Sign'

Assignment On Migration in Birds

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INTRODUCTION

Our world is full of biodiversity, we can see different kinds of Birds, animals & plants all around us, there are different species of animals & plants that use various strategies to survive & keep the cycle of life going. One such strategy that birds use is called migration. Migration is a regular seasonal movement of birds in large groups.

It happens in the case of migratory birds when they have to leave their home place to migrate to some other favourable place and for that, they have to adopt a long journey in which there is no guarantee whether they will be able to return back or not but if they do not migrate, in that case as well, their survival is not possible, thus they used to have migrated in any case, In this—

Q. What is Migration?

The word 'Migration' has come from the latin word migrare which means going from one place to another. Migration is the movement of an animal between distinct habitats or home range; these movements are greater in scale than those that occur as part of the regular daily routines of animals (Dingle & Drake, 2007). Most commonly, migratory movements, including those of birds, take animals between a breeding location and non-breeding location or wintering ground. Although migration is itself an energeti-cally seasonally. For example, Gambel's white crowned sparro-ws (Zonotrichia leucophrys gambelii) breed at high latitudes such as in Alaska & northern Canada, where they

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can feed on insects that become abundant in the spring and summer. Migration is not an easy process, as birds to have cover long distances in order to reach their destinations and during these journeys, they need a lot of energy, food, water, sufficient rest etc. & not all the migration journeys become successful and some of the birds die as well in these journeys.

Q. What are Migratory Birds?

Those birds who migrate from one location to another location in order to breed, feed, & raise their offspring, are known as migratory birds. They usually migrate from unfavourable locations to some favourable places which are having suitable conditions alongwith sufficient food and water resources and are also safe as well. The majority of the birds migrate during the breeding season & others migrate for food resources and because of change in seasons.

FEATURES OF MIGRATORY BIRDS

★ These birds are known to have good morphology as well as physiology because of which they can cover long distances by flying fast and observing various other things.

★ They have the ability to navigate things with good accuracy. They use the sun, the stars, the Earth's magnetism etc.

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Luscinia svecica (Blue throat)

(It is a migratory insectivorous species)

Turdus migratorius (American Robin)

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- They know when to migrate and when to return. For their specific reasons, they do not hesitate to migrate to for present locations.

- They can fly as far as 16000 miles and some of the birds fly at a speed of 30mph to reach their destination with this speed, they can reach in 533 hours where as if they fly on the Basis of 8 hours per day, they can reach the final destination in 66 days.

- They fly at different speeds and at different altitudes. Some fly at low altitudes where we can see them where as some birds fly at high altitudes as well such as Songbirds who travel at 500 to 2000 feet where as if we talk about Geese or vultures, they used to fly at 29,000 to 37,000 feet altitudes.

- Before migration, they prepare themselves for the journey by increasing their body weight or by keeping food reserves.

- Different birds migrate at different timings but most of the birds prefer to fly at night because usually, the night is much safer for them due to fewer predators or having cooler air at night with which they can fly and rest easily.

- They also prepare for their return as well because, after exhaustion of their whole energy in the long-distance journey, they usually feel hungry and require food and water.

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Q Why do Birds Migrate?

There are several reasons, a few of which are mentioned below -

* Food is one of the major reasons for their migration. If they all stay at one place then food will be exhausted & scarce during the breeding time and thus breeding will be less successful. Thus, they migrate to food-abundant areas.

* During the nesting season, the depletion of food will not only affect the adult birds but also attract a lot of predators because they become an easy meal for them.

* Birds usually migrate for their family or we can say for healthy breeding. They always require healthy conditions for raising their offspring. These condition depend upon different species such as sources of food, weather, habitat, adequate shelter, breeding colonies, safety etc.

* Another reason can be a change in the climatic conditions. Any severe change in these conditions can cause their migration because it makes it difficult for them to survive in harsh conditions be it extra warm or extra cold.

* They also can migrate to save themselves and their offspring from predators and diseases. They usually migrate to places that are inaccessible to predators.

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Bird Migrate

Diversity & Beauty in Bird Migration

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- Siberian Cranes & Greater flamingo are migratory birds that are usually seen in India in the winter season.
- Asiatic Sparrow Hawk migrates to India and Myanmar during winters.
- Swallow, which is a small bird, migrates from Southern England to Southern Africa.
- Red wing lives in Eurasia or the Himalayas but flies to Africa in winter.
- Sand Martin that live in Eurasia or North America usually migrate to Southern areas which depend on their zones.
- Whinchat who lives in Europe flies to Africa between October to March.
- Common Rosefinch lives in Europe and flies To Southern parts of Asia in winters.
- Names of other migrating birds are Back-headed gull, Green Sandpiper, Northern Lapwing, Eurasian Hobby, Grey Heron etc.

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Q. How do Birds Migrate ?

* They make different physical adaptations for the travel journey such as building extra fat Supplies to provide extra energy during the journey.

* keeping food and water reserves by increasing their body weight before the migration and this phenomenon of increasing weight is known as hyperphagia and alot of birds experience this phenomenon.

* They also shaved shed their old feathers in order to make their flight easy so that it takes less energy to fly.

* They used to changes the altitude as well. They fly at higher altitudes for a speedy and fast journey.

* They change their behaviour of flying as well. Sometimes those birds who used to fly in the day, during migration fly at night.

* Sometimes they also fly in a V pattern or we can say in a group by following the leader who has much experience and this pattern makes the journey much easier.

* Migratory Birds with Names -

Let's see some of the examples of migratory birds which are mentioned below -

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Phylloscopus superciliosus
Helgoland

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KINDS OF MIGRATION

Migration is broadly divided into following 3 kinds.

1. Return Migration - Migration to a previously known place which has been visited earlier is called return Migrat°.

2. Exploratory migration - Migration to a completely unknown place which has not been visited earlier is called exploratory. Although ability to return to return to the known place is retained but is not exhibited.

3. Removal migration - Migration to a comparable spatial unit which is not followed by a reversal to the Original spatial unit is called removal migration.

Depending upon the plane of movement of the migrants, migration is divided into 3 types -

1. Horizontal Migration - Migration occurring on a path perpendicular to the gravitational force of the earth is called horizontal Migration. Depending upon the directions of path, horizontal migration is further divided into following two kinds -

a. Latitudinal migration -

✓ Horizontal migration occurring from north to south or vice-versa is called latitudinal migration.

✓ Usually it occurs from north to south and it occurs from south to north in few cases only.

✓ Cuckoo breeds in India and spends the summer at South-East Africa.

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- Thus it Covers a distance of about 7250 km.
- Ruff breeds a Siberia and travels to Great Britain, Africa, India and Srilanka Covering a distance of about 9650 km.

b. Longitudinal migration -
- It takes place of East - West direction.
- They starting moves from towards the Atlantic Coast to avoid the Continental winter.
- The pentagonian plover visits the folkland Island and South pentagonia in September and October for breeding.

2. Vertical Migration - Migration occuring in a plane parallel to the gravitational pull of the earth is called Vertical Migration.

3. Altitudinal Migration -
- This involves both horizontal & Vertical Components.
- Birds fly up and down over mountain and hills.
- Generally migration occurs at relatively low altitudes.
- Small passerine birds fly at a height 60 meters.
- Some birds have been found to fly at an altitudes of 4000 meters.
- A no. of birds in India migrate from plains to the slopes of Himalayas ascending thousands of feet above sea level during summer and return to the plane on Commence of winter.
- These movements in birds are included under altitudinal migration.

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Pluvialis dominica (American golden plover)

Fratercula arctica (Atlantic puffin)

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Migration is also divided into two types on the basis of time of flight which occurs during migration -

1. Diurnal Migration -

✓ Many large birds fly in day.

✓ These are Crows, Swallows, robin, hawks, Cranes, pelicans etc.

✓ These may stop to forage in suitable places.

✓ However Swallows and Swifts Capture their insect food in the air during flight.

✓ Diurnal migratory birds usually travel in flock which may be well organized.

2. Nocturnal Migration -

✓ Majority of small sized birds like sparrows, warbl-ers, thrushes etc. prefer to fly at night, under the protection cover of darkness to escape their enemies.

✓ They feed and rest during day.

✓ However some birds like Geese & Ducks fly by day & night while migrating.

On the basis of reasons of migration, migration is categorised into following 3 types -

1. Climatic migration -

✓ It occurs in response to change in the climate of the environment.

✓ North- South migration of many ducks and geese is a good example of climatic migration.

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2. Alimental migration -
- It occurs due to shortage of water food.
- It may occur at any time in a year.

3. Gamatic migration -
- It occurs in a need to certain environment for Succesful completion of the Some parts of the repro-ductive process.
- Majority of the birds perform this type of Migration.

On the basis of seasons during which birds migrate they are categorized into following types -

1. Summer Visitors - These birds arrive in spring from the South to breed & leave for the south in autumn. e.g., Swifts, Swallows, Nightingales, Cuckoos etc.

2. Winter visitors - These birds migrate Southward & South-west in winter & go back to North in spring. e.g., Field Fare, Snow bunting, Red wig etc.

3. Birds of passage - Some birds are seen for a short time twice in a year on their way to colder or warmer Countries in spring & autumn e.g., Sand pipers, spines etc.

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Podiceps auritus (Horned Grebe)

Gallinago delicata (Wilson's snipe)

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Modes Of Flight In Migration

1. Nocturnal & diurnal migration -
- Many large birds like Crow, Swallows, orioles, bluebirds, jays, Cranes, pelicans & geese fly by day whereas warblers, thrushes migrate during night.

2. Segregation during migration -
- Certain birds travel is seperate companies eg. Nighthawks, Swifts.
- other birds travel in mixed companies eg. Swallows, blue birds

3. Range of migration -
- Distance travelled during migration depends on local condition
- e.g. Himalayan Snow partridge descends few hundred feet only whereas Arctic tern travel about 11,000 miles.

4. Altitude of Migration -
- Some birds fly close to earth while most routine migration takes place within 3000 feet from earth.

5. Speed and duration of flight -
- Average flight velocity of small bird is 30 miles per hour whereas greatest speed is by swifts which can travel up to 180 miles per hour.
- Birds usually travel 5 to 6 hours in a day or night and resting in between whereas golden plover

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travel a distance of 2400 miles non stop.

6. Regularity of migration -
- Several species of birds show striking similarity of arrival and departure every year.

7. Routes of migration -
- Migratory birds usually follow definite lines of flight.

TIMING OF MIGRATION & CONNECTION TO REPRODUCTION

In many birds, reproduction and migration are tightly linked in the annual cycle. Preparation for breeding often being begins with migration to the breeding grounds, and the termination of breeding can be closely tied to the migratory departure to the wintering grounds. In order to prepare for breeding, most birds undergo seasonal development of the reproductive system, a process coordinated by activation of the hypothalamic - pituitary - gonadal (HPG) axis. The HPG secrets reproductive hormones leading to the development of a gonad capable of producing gametes. Although some species, typically those that more more only short distances, do not undergo the process of gonadal development until after they arrive on the breeding grounds, many species

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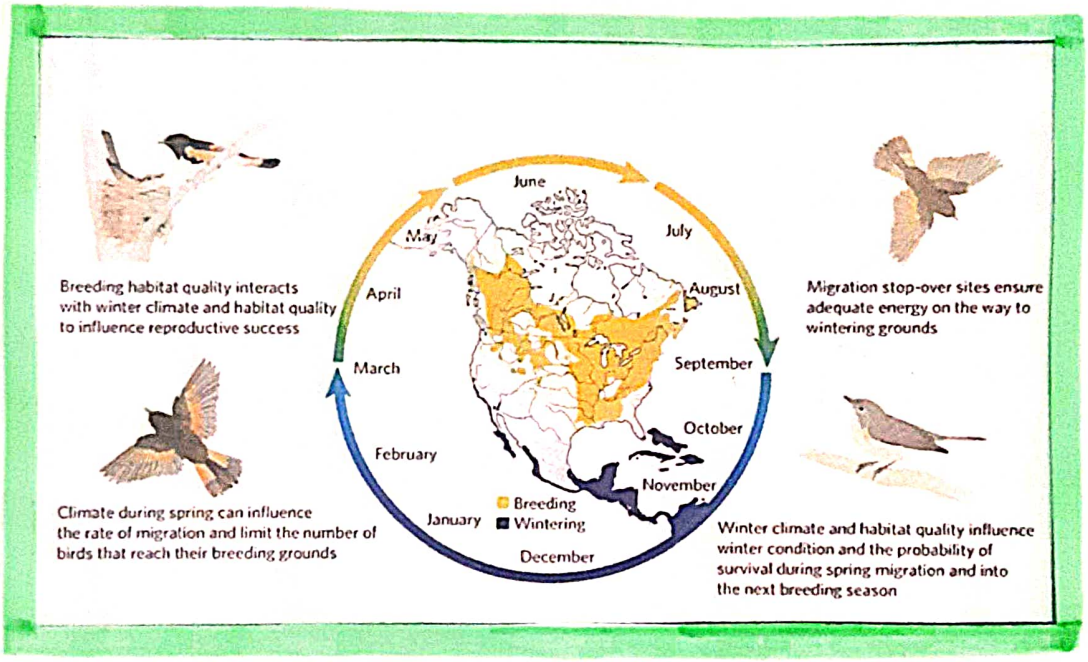

Time of Migration & Connection to Reproduction

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undergo gonadal development during migration and arrive on the breeding grounds in a state of near-readiness to breed. In Gambel's white Crowned sparrows, for example, initial activation of the HPG axis begins on the wintering grounds. By the time birds arrive on the breeding grounds, males are producing mature spermatozoa in the testes and females have enlarged ovarian follicles, though they have not yet begun yolk Synthesis or deposition (Romenofsky and Wingfield, 2006).

Appropriately timing events like migration and reproduction is critical to the Survival and reproductive success of individual birds, and Ultimately to the persistance of bird populations. If birds arrive on the breeding grounds too early, Conditions may still be inhospitable and their Survival may be threatened. On the other hand, birds that arrive too late may not have enough time to Complete breeding, or they may miss peak food availability which could Compromise their reproductive success. The question of how birds time their migration has been best studied in obligate migrants. Therefore, that is the focus here, but for greater discussion of other migratory types see Wats et al. (In press) Among obligate migrants increasing day length (photoperiod) in conjuction with an endogenous Circannual rhythm are important mechanisms initiating spring migration (Gwinner, 1996), while other environmental Conditions, such as temperature, can fine-tune the timing. Increasing photoperiod stimulates activation of the HPG axis, which is also important in preparations for breeding, and leads to increasing levels of Circulating androgens,

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notably testosterone. In both males & females, increasing androgen levels are important in stimulating the behavioral and physiological changes associated with the transition to spring migration (Wingfield et al, 1990). Activation of thyroid hormone signaling pathways in the brain in response to increasing photoperiod is also critical in the spring migratory transition (Perez et al., 2016).

The Mechanism triggering fall migration are not as well studied as those operating in the spring. As for spring migration, photoperiod (experienced in the fall as well as those experienced earlier in the year) and endogenous circannual rhythms likely play important roles. On the other hand, the endocrine mechanisms underlying the transition to a migratory state appear to differ from those in spring migration, though they are currently not well understood. The timing of fall migration tends to be more variable than spring migration, which likely reflects sensitivity to local environmental conditions (e.g., temperature, food availability) & differences among individuals.

MIGRATION & NAVIGATION IN BIRDS

Through breeding and the feather molt usually needed before the migratory flight. for example, when breeding of mountain white-crowned sparrows is delayed due to heavy snow cover, birds subsequently delay the fall migratory departure (Morton & Pereyra, 1994).

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(Grey-rumped Swift) Collocalia marginata

Branta canadensis (Canada goose)

(a brown-backed)

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just as circumstances around breeding events can influence fall migration so too can spring migration influence breeding. In many species, it has been found that birds arriving earlier on the breeding grounds enjoy greater reproductive success than later arriving birds. For examples, in American redstarts (Setophaga ruticilla), which migrate from wintering sites in the Caribbean and Central & South America to breeding sites the United States & Canada, earlier arrival corresponds to greater reproductive success in males. The potential advantages of earlier arrival for redstarts and other species include access to more and/or higher quality territories & mates, as well as the potential to lay more clutches during the breeding season. Interestingly, studies across a variety of species have revealed that it is those birds in the best physical condition that arrive earliest. Among American redstart, males that winter in better quality (in this case, wetter) habitats are in better physical condition at the end of the winter, depart for spring migration earlier, and arrive on the breeding grounds earlier than males that winter in poorer habitats (Marra et al., 1998). Given the correlation between migratory timing & physical condition, it is difficult to disentangle whether the superior reproductive success of early arriving birds is a result of their earlier arrival or their superior condition, or a combination of the two.

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PROBLEMS OF MIGRATION

1. Way finding or navigation -
Various explanations to determine direction during flight

a) Visual landmarks - Sense of direction attributed to various topographical features or landmarks such as great rivers, river valley, coastal lines, chain of oceanic islands, mountain range.

b) Experience - Some naturalist believe that birds learn by experience from their elders.

c) Telluric Currents - Others believe that telluric current play a role

d) Earth's Magnetic field - Some workers like Middendorff and yeagler suggest that birds uses earth magnetic field to find direction

e) Celestial bodies - kramer experiment on staring Suggest that birds use sun as Compass for orientation.
Franz sauer experiments on warblers indicate movement of birds in relation to Constellations of star.

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Labage tricolor (The white-winged tiller)

Diversity of Birds

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2. Origin of migration -
- Basis of origin of migrations still a matter of speciation & most convincing theory is that process of migration is evolutionary one.

3. Stimulus or immediate Cause of migration -
- Immediate Cause may be like scarcity of food, shortening of day light & increasing cold.

4. Purpose or advantage of migration -
- Migration helps birds avoid harsh climate extremes.
- Migrants get more food and better condition for living.

5. Substenance during Migration -
- Pre migratory deposition of fat helps in providing energy during long flight distances.

CAUSES OF MIGRATION

The obvious stimulus of migration in birds is still unknown. Various factors causing migration put forward by different workers include followings-

1. Environmental Stimulus for migration -
✓ It is believed that decline in temperature & food availability might trigger off migration.
✓ With less hours of light during autumn in temp. & Northern hemisphere, the time for food gathering is lessened. It initiates autumnal migration.

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✓ Similarly increasing day lengths causing elevated temp. in Southern hemisphere during Spring acts as initiator of migration.

✓ However, the sensitivity of migratory birds to change in the weather is species specific.

2. Physiological stimulus for migration -

✓ Scientists are busy today to assess the role of endocrine glands such as pituitary, gonad, thyroid, adrenal & pineal in migration.

✓ The pituitary regulates the development of gonads and influences all metabolic processes by way of its action on thyroid gland.

✓ It has been demonstrated in a passerine migrant that thyroid hormones may play an important role in the initiation of migratory deposition.

✓ Gonadal hormones are also responsible for the deposition of fat in many migratory birds.

MIGRATION CONDITIONING

It has been possible to teach a migration route to a flock of birds, for example in re-introduction schemes. After a trial with Canada geese Branta Canadensis, microlight aircraft were used in the U.S. to teach safe migration routes to reintroduced whooping Cranes Grus americana.

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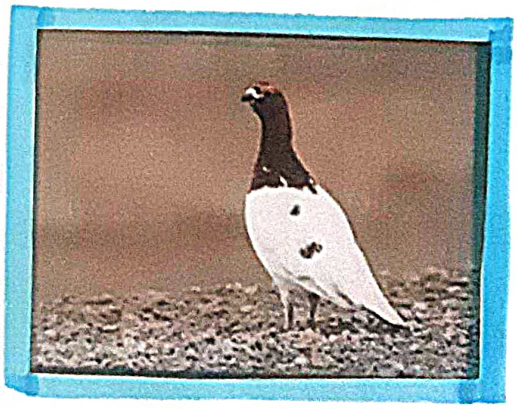
Sterna paradisaea (Arctic tern)

(tern species that makes the longest annual migration of any bird.)



Lagopus lagopus (Lagopus, means hare-footed)

Carpodacus rubicilla (The great rosefinch species)

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ADAPTATION

Birds need to alter their metabolism to meet the demands of migration. The storage of energy through the accumulation of fat and the control of sleep in nocturnal migrants require special physiological adaptations. In addition, the feathers of a bird suffer from wear and tear and require to be moulted. The timing of this moult - usually once a year but sometimes twice - varies with some species moulting prior to moving to their winter grounds and others moulting prior to returning to their breeding grounds. Apart from physiological adaptations, migration sometimes requires behavioral changes such as flying in flocks to reduce the energy used in migration or the risk of predation.

EVOLUTIONARY & ECOLOGICAL FACTORS

Migration in birds is highly labile and is believed to have developed independently in many avian lineages. While it is agreed that the behavioural and physiological adaptations necessary for migration are under genetic control, some authors have argued that no genetic change is necessary for migratory behaviour to develop in a sedentary species because the genetic framework for migratory behaviour exists in nearly all avian lineages. This explains the rapid appearance of migratory behaviour after the most recent glacial Maximum.

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ECOLOGICAL EFFECTS

The migration of birds also aids the movement of other species, including those of ectoparasites such as ticks and lice, which in turn may carry microorganisms including those of concern to human health. Due to the global spread of avian influenza, bird migration has been studied as a possible mechanism of disease transmission, but it has been found not to present a special risk; import of pet & domestic birds is a greater threat. Some viruses that are maintained in birds without lethal effects, such as the west Nile virus may however be spread by migrating birds. Birds may also have a role in the dispersal of propagules of plants and plankton.

THREATS & CONSERVATION OF MIGRATORY BIRDS

When birds migrate from one place to another there can be many threats to them. It took a lot of energy to cover these long-distance journeys. The major threats include exhaustion, starvation, injuries, threats from predators or hunters, diseases, pollution, natural calamities or disasters etc.

For their conservation, we have CMS which means Convention on Migratory Species at the International level which is also famous as the Bonn Convention

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Passer domesticus (House sparrow)

Poecile atricapillus (The black capped chickadee)

which aims to protect migratory species such as territorial, avian, or marine, throughout their ranges and all the countries coordinate with each other for their conservation.

To sum up we can say that avian migration is not an easy task but also important for the birds as well. They require favourable conditions in order to survive and raise their young ones for which they adopt long journeys which are exhausting for them & in these journeys they have to cross the boundaries which can lead to more problems and threats for them and for which every country should adopt conservation measures for them. In this we think about the conservation of these species.

MIGRATORY BIRDS - SURVIVAL OUT OF THEIR HABITAT

The birds who migrate from one unfavourable location to some favourable location in order to breed, feed & raise their children are known as migratory birds. They migrate to some locations which are having abundant food and water resources with good climatic conditions. They make different physical adaptations for the travel journey such as building extra fat supply and keeping food and water reserves by increasing their body weight before the migration.

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Migratory birds shed their old feathers in order to make their flight easy & on the other hand, they used to change their altitudes as well. They fly at higher altitudes for a speedy & fast journey along with the change in their behaviour of flying as well. Sometimes those birds who used to fly in the day, during migration fly at night. Sometimes they also fly in a V pattern or we can say in a group by following which makes the journey much easier. Some of the examples of migratory birds with names are the Black-headed gull, Green sandpiper, Northern Lapwing, Eurasian Hobby, Gray Heron, Siberian Cranes or Greater Flamingo etc.

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Coturnix adamsoni (the common quail of Europe)