



Incredible journey of a Migrant

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Since our childhood days how we wished to fly as a bird spreading the wings in the blue sky! Our desire to fly as a bird probably can be related to our love for freedom, and wish to break shackles of inhibitions. Often, we wonder how a little bird like Arctic tern migrates from Arctic Circle to the Antarctic Circle, an annual round-trip journey without any aid like a map or GPS!

From the early times of human civilization, the phenomenon of bird migration has attracted the attention of naturalists often accompanied with the excitement in the thoughtful minds of observers. As a part of survival strategy, millions of birds leave their breeding grounds every autumn to migrate to areas with seasonally more favorable conditions. In a very impressive way some long-distance migrant species cross oceans, deserts, mountains, high plateaus, and other inhospitable areas from where they do not get any scope of replenishment of depleted fat reserves in their bodies built to burn energy fast with a scope for little fat storage. One of such interesting species is Bar-headed goose (*Anser indicus*) which migrates biannually over the lofty Himalayan range. It has been regarded as an amazing migratory species in the avian world.

No one but the Nature has designed them as migrants and their migration is often said to be one of the wonders of the Natural world. During summer, one can see Bar-headed geese anywhere from Mongolia to Tibetan Plateau where they breed and raise young. In the autumn, majority of them takes long flights towards south. They spend winter in the Indian subcontinent and subsequently the return journey starts following the spring. Some early mountaineers and naturalists first sighted Bar-headed geese migrating amidst the Himalayan Mountains. George Lowe, the New Zealand born climber who supported Sir Edmund Hillary and Tenzing Norgay's ascent in 1953, reported that he had seen the geese flying over the top of Mount Everest. Scientists using modern technology and satellite telemetry have tracked migrating geese crossing the Himalayan Mountains. It has been found that most birds reach the altitudes of 5000m-6000m during the migration and occasionally fly over 7000m. The long journey needs them to adopt an itinerant lifestyle and nature has equipped them well to make it possible. Any migratory animal during the course of migration faces a few adverse surroundings and situations which vary from species to species. High altitude environments pose a range of challenges to the migrants. A logical approach to the migration must be there behind every successful model, which is assessed through the process of natural selection. This remains quite evident in the architecture of physiological, anatomical and ethological features of Bar-headed geese. In this connection, some interesting facts may be cited for better understanding about how does this fascinating species cope with adverse conditions during migration. Bar-headed geese are flapping fliers that very rarely glide, even during steep descents. Flapping flight is first of all an energy-intensive activity and especially at high altitudes, it is even more challenging to generate lift in very thin, low density air. Bar-headed geese usually try to minimize the flight

altitude and to utilize favourable wind to reduce flight costs. The researchers have found that they often fly at night when the air is cooler and denser thus reducing the cost of flight compared to the daytime. Wind currents are more stable and less turbulent. Nocturnal flight also protects them from risk of predation and exposure to solar radiation.

As altitude increases, barometric pressure, oxygen availability, temperature, air density and humidity decreases. And hypobaric



Fig 1: Bar-headed geese in Teesta River at Gajoldoba of Jalpaiguri district of West Bengal.

(Photo: Indrani Das)

hypoxia is considered to be one of the major challenges, migrants have to face. But the trans-himalayan migration of bar-headed geese in oxygen-thin air is achieved successfully because of a very unique cardiorespiratory physiology and some astonishing metabolic tricks that likely have evolved during the process of evolutionary adaptation to high altitude. What will happen to us while climbing a steep terrain at high altitude? Above 2000m altitude, humans may begin to suffer from altitude sickness, dizziness, high-altitude pulmonary edema and may even succumb to death in case of extreme change in elevation. Members of the avian world in general are more tolerant than mammals to hypoxia. Higher average heart rates and wing-beat frequencies are required for climbing flight in hypoxic air and in case of Bar-headed geese their ability to sustain the high oxygen demands of flight in air depends on their unique ecophysiological features. At the same time high altitude fliers require additional metabolic energy for thermogenesis if the heat production from exercise



is not sufficient to maintain body temperature. It has been found that Bar-headed geese never stop flapping their wings during flight and it may continue up to 17 hours long. What an amazing skill and innate architecture gifted by Mother Nature! More capillaries, more efficient red blood cells and more mitochondria ensure delivery of more oxygen to the muscles at a faster rate than their relative fowls. This iconic high-altitude migrant species can also breathe in and out very rapidly to get adequate flow of oxygen during flight and that too without any lethal effects or feelings of dizziness. To maintain an adequate supply of fuel to the flight muscles and to prevent dehydration and muscle damage, they need to get regular “stop-overs” to rest and refuel. Recent studies show that geese usually stop three to four sites while travelling from breeding ground to wintering ground. These extraordinary migrant species take some serious preparations some weeks before take off. Such preparations are not done consciously but are endogenously controlled by some body chemicals including hormones which subtly modify the metabolism of birds to accumulate energy reserves chiefly in the form of fat, to build up muscles for a long and metabolically costly flight.

Regarding navigation skills of long-distance migrations several factors including inherent global positioning system seem to play great role in following the flight path or patterns of migration every year. Efficiency of brain and neurons are connected with navigational ability.

A question may appear why do Bar-headed geese choose to fly over a metabolically expensive high-altitude mountain route instead of rather easier route around the Himalayas. Some scientists believe that bar-headed geese follow a difficult but time saving route. Alternate routes would add more days to reach the destination and net energy requirements would be increased accordingly.

Dr. A.P.J. Abdul Kalam used to talk about self-motivation being the key of success. And he often used to cite the example of a bird which according to him is powered by its own life and by its motivation. Like most of other natural migrants, Bar-headed geese migrate as a part of survival strategy. Qualities like self-organization and motivation enable them to overcome all the obstacles of migratory life. Humans are not made in that way and they settle in a favourable area where abundance of food, availability of shelter and other essential requirements indulge them to live in the same place for years. On the basis of fossil data and archaeological evidences it has been hypothesized at least 100,000 years ago our earliest modern ancestors began migrating from Africa and dispersed in nearby continents. Shifts in climate and vegetation in tropical and subtropical regions most likely triggered periodic mass exodus in ancient time. But such migrations were not very frequent and cannot be compared with the bird migrations which occur every year. Human migration has limitations and needs preparations for a journey even in easier routes. Sudden and unplanned movements especially due to compulsions have shown to be disastrous. And this fact reiterates the very truth that natural migrants have advantages over the forced migrants.



Fig 2: Bar-headed goose flying over Himalayan foothill of Dooars, West Bengal in the month of January (*Photo: Indrani Das*)

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Bar-headed goose, a social bird migrates as flocks in traditional inverted 'V' shaped formation to gain aerodynamic benefits which save energy by reducing cost of flight and also to get visual assurance. They communicate with each other visually and vocally. When the lead bird in the front gets tired, it comes at the back and another goose takes the lead. This fact depicts a great lesson for us about how to take responsibilities when situation demands. When a goose gets sick and has to come down to ground, few other geese of the same flock drop out of formation to help and protect the sick bird. They stay until it dies or gets recovered. Can we call such compassionate behaviour as Humanity?



Fig 3: Bar-headed goose at a grazing site near Chilka Lake of Odisha (*Photo: Indrani Das*)

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