Conserving animals on the move

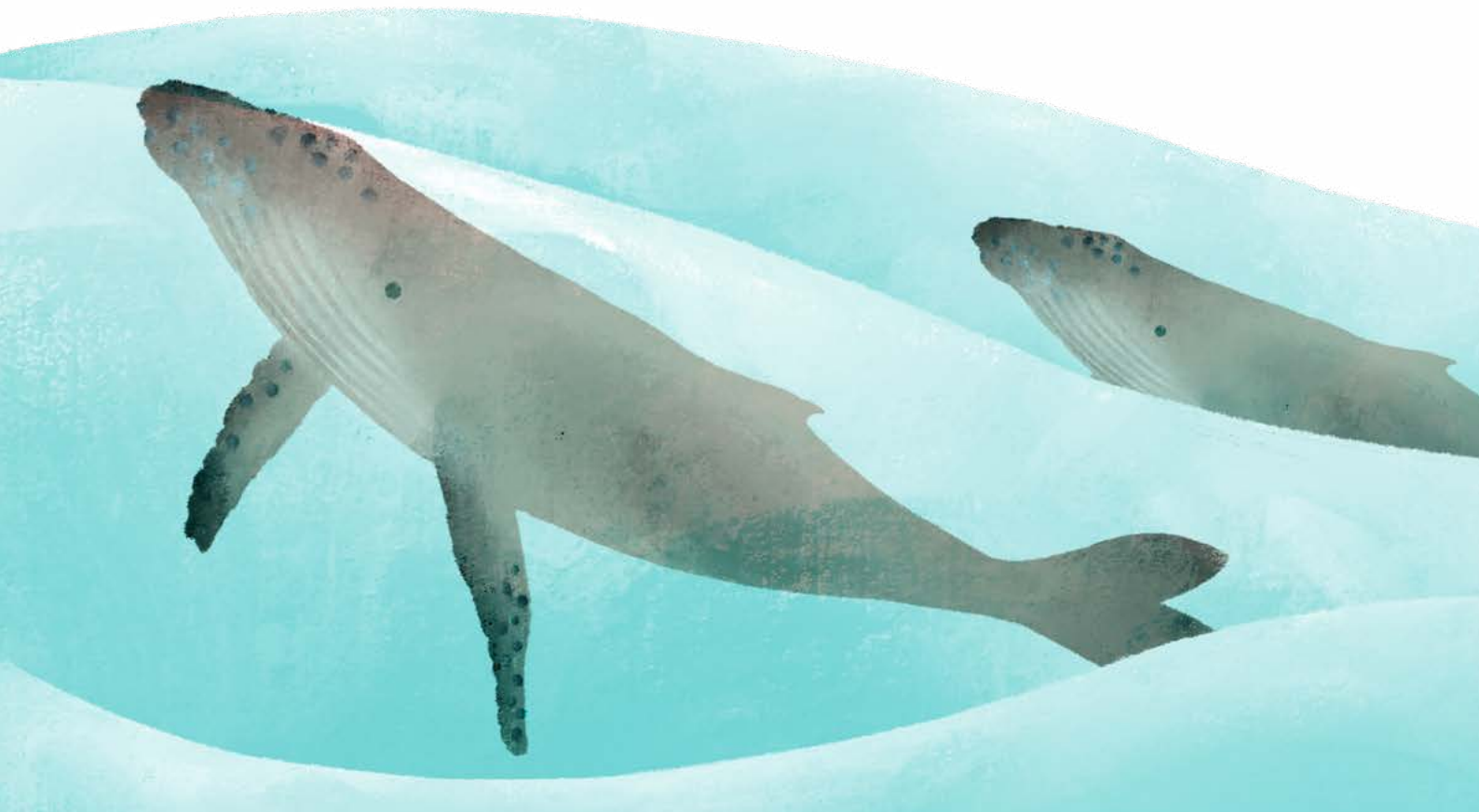
Author **Eduardo Gallo-Cajiao, Kartik Shanker** | *Illustrator* **Malvika Dwivedi**

From frantic wildebeests crossing the Mara River in East Africa, to the lofty flight of bar-headed geese over the Himalayas and the frenetic upstream run of sockeye salmon in the Cascade Range of North America, migration defines the life of many animals around the world in the air, oceans, rivers, mountains, as well as plains. This life strategy entails cyclical, predictable, and seasonal patterns of movement through which individual animals complete their life cycle at separate places that can range from short to extremely long distances. For instance, while the Christmas Island red crab migrates just over 4 km between terrestrial and marine environments in the Indian Ocean, the Arctic tern completely shifts hemispheres by flying from the Arctic to Antarctica and back in a 17,000 km journey each way.

Migration has evolved independently across a wide range of animals, including crustaceans (e.g., lobsters), insects (e.g., butterflies), fish (e.g., tunas), reptiles (e.g., sea turtles), birds (e.g., raptors), and mammals (e.g., whales). This suggests that migration is advantageous—animals are able to maximise their survival by exploiting ephemeral yet superabundant resources, as well as avoid unfavorable environmental conditions, including harsh weather and predation, at critical stages of their life cycle, such as breeding. This seasonal tracking of favourable conditions thus usually leads to movement in large aggregations, creating one of nature's greatest spectacles.

Migratory species have been important to humans across multiple dimensions—tangible and intangible. Many migratory species are exploited as food, as in the case of commercially harvested tuna species, and caribou, which are harvested for subsistence purposes. On the other hand, a well-known case of non-consumptive use of migratory species is ecotourism. For example, the migration of humpback whales along the coasts of virtually all continents creates many job opportunities through whale watching tourism. Additionally, migratory species provide important ecosystem services through transport of nutrients and interactions with other species across different environments. For example, Pacific salmon, which spend most of their lives in the ocean, are important fertilizers of carbon-rich and climate-regulating temperate rainforests, as their mass migrations to spawn in inland waterways results in tons of nutrient-rich carcasses that are shuffled on the forest floor by hungry animals, such as bears. Some of the close connections between humans and migratory species have unsurprisingly become embedded in cultural expressions, such as festivals. For instance, Colombia's upstream migration festival or 'Festival de la Subienda', is held in a small city on the shores of the Magdalena river to celebrate the bounty brought by the migration of multiple fish species of commercial and subsistence importance.

Despite their apparent abundance in many cases, migratory species cannot be taken for granted. North American skies that were once darkened by large roving flocks of passenger pigeons are now just part of a cautionary tale. This species used to migrate between nesting areas in the Northeastern United States, moving as far south as Florida during winter. However, overhunting and habitat loss drove them to extinction by the early 1900s. The story of the passenger pigeon looms over us once again, with many migratory species currently at risk of extinction. Examples include the saiga antelope, the orange-bellied parrot, and the American eel, amongst others. Similar mechanisms seem to be at play in the decline of these species. Depending upon their migratory patterns, habitat loss can have disproportionate effects on populations as they congregate in large numbers at specific sites during their life cycle. Likewise, managing harvest can be very challenging as individual animals often straddle multiple political jurisdictions with different regulatory contexts, potentially leading to overuse.



Recognising these impacts, efforts have been underway to conserve and restore populations of migratory species. These strategies require cooperation and coordination between people, organisations, and governments along their migratory routes. Within this context, multiple international agreements have been developed with a focus on various groups of migratory animals. Examples include the Convention on the Conservation of Migratory Species (CMS), the Inter-American Convention for the Protection and Conservation of Sea Turtles, the Polar Bear Agreement, the Agreement on the Conservation of Populations of European Bats, and the China-Russia Migratory Bird Agreement. Some of these mechanisms have been supplemented by local governments and non-governmental organisations, such as the Network of Urban Nature Reserves of Patagonia, which works on migratory shorebird conservation to support hemispheric conservation efforts in the Americas. Arrangements of cooperation and coordination have enabled the deployment of specific on-ground actions for conserving migratory species, such as the construction of overpasses across highways to allow the safe passage of pronghorn during migration south of Yellowstone National Park in western North America. Additionally, trans-frontier systems of protected areas have been established to secure the habitat of migratory wildebeest and zebra in East and Southern Africa.

Conserving migratory species remains a challenge; however, there are reasons for hope. As researchers continue to unveil long-unknown migrations through the use of ever improving tracking technology, policy makers are better informed to decide where conservation efforts are best rolled out. Likewise, this very information is being adopted by environmental educators and advocates to build narratives that mobilise public and political support based on the amazing journeys of these animals. In line with these ideas, Current Conservation decided to throw the spotlight on migratory species with this special issue, as they are incredibly important, are in peril, and require specific conservation approaches.

This special issue includes a wide breadth of contributions from various perspectives, regions of the world, ecosystems, and groups of animals. We open with an article by Sahas Barve on the ecology and physiology of birds that migrate between places at extremely different elevations, demonstrating their marvelous adaptations. We are then transported to Mexico, where Kirsten Lear explains how migratory bats play a key role in culturally and economically important landscapes. Beyond their biology and roles in ecosystems, migratory species also bear important cultural significance in their own right, as shown with cranes in South Asia in a captivating piece by David Hecht. The role of technology in studying animal migration is absolutely critical, and its development and use is reviewed by Jared Stabach. Along these lines, Rob Harcourt takes us on a personal tour of exciting field work to study the movements of seals in Antarctica. Finally, we end with some delightful storytelling by Kate Mansfield and Liliana Colman, who help us experience migration through the eyes of a sea turtle. We hope this collection of articles sparks further interest in, and support for, these marvelous travelers.

Eduardo Gallo-Cajiao *is a David H. Smith Conservation Fellow studying migratory shorebird conservation governance at the University of Washington. He is also the vice-president for education and outreach of the Society for Conservation Biology and is an associate editor of Current Conservation.*

Kartik Shanker *is Faculty at the Centre for Ecological Sciences, Indian Institute of Science, Bangalore and Founding Trustee of Dakshin Foundation, Bangalore.*

Malvika Dwivedi *is a Visual Designer. Her work spans illustration, animation and graphic design while being rooted in design research. She's currently working as a motion designer at Animal.*