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Chytrid does Birth-rate Dynamics and Transcontinental Movements

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Abstract

Migration is an adaptive behaviour in many species, although it is also regarded to inflict major costs on people. Various studies on migratory birds, animals, and fish show that mortality might be greater during migration than during stationary portions of the yearly cycle. Furthermore, research on birds and insects shows that migratory organisms frequently experience considerable metabolic and behavioural changes to meet the high energy needs of migration. The amount of time and energy expended during migration can also influence later breeding success, highlighting the considerable costs that individuals incur when moving.

Keywords: Migration • Grey-cheeked • Metal nanowire • Metabolic

Introduction

Migratory species are anticipated to optimise their fitness by limiting the time spent, energy used, or hazards faced during migratory voyages since migration is expensive. The largest cost of migration, in terms of time, is typically assumed to be incurred during stopovers rather than during times of flight, and birds rely on the time spent at stopover locations to rest and recharge for the next leg of their travels. Using data on fuelling rate, stopover length, fuel loads, and prospective flight ranges, optimal migration theory provides a framework for studying stopover behaviour and its effects. Individuals aiming to reduce total migration time are expected to maximise the quantity of fuel they can get at each stopover in the lowest period of time feasible. This method has the important side effect of increasing the distance that can be flown between stopovers. As a result, a time-fuel minimizer's loads (amount of fat carried) should be strongly related to local circumstances at stopover locations as well as the conditions projected ahead, because these conditions impact fueling rates [1].

Furthermore, stopover lengths in time-minimizers are likely to be moulded by or immediately respond to encountered fueling circumstances. Larger departure fuel loads should allow for longer flights and a faster overall rate of migration because individuals acquiring sufficient fuel in the shortest amount of time will need to make fewer stopovers and be able to take more direct routes to their destination, including the ability to fly over physical barriers or large areas of unsuitable habitat such as deserts or oceans rather than circumnavigating these areas. There are two sorts of energy-minimizers: those that aim to minimise the overall energy used on migration and those that attempt to decrease the expense of transferring big fuel loads per unit distance [2]. The first type of transportation energy-minimizers eliminate the costs of carrying extra luggage by storing only the quantity of gasoline needed to reach the next nearest stopping location.

Overall energy-minimizers of the second kind reduce the total energy cost of migration by reducing energy expenditure during stopovers as well as flying expenses between breeding and non-breeding locations. When feasible, both types of energy-minimizers avoid crossing vast expanses of unsuitable habitat, which would necessitate carrying enormous fuel loads, and their routes are predicted to be more roundabout than those of time-minimizers. As a result, transportation energy-minimizers should exhibit no association between fueling rate and fuel loads, and their migratory route should comprise several brief breaks along the way [3]. As a result, unlike time-minimizers, the rate of migration in transport energy-minimizers is unaffected by fuel loads or refuelling rate.

Total energy-minimizers are intended to be impacted by fueling rates in the same way as time-minimizers are, but they should achieve lower fuel loads and fly shorter distances than time-minimizers. As a result, the slope of the connection between fueling rate and fuel load should be less prominent in energy-saving vehicles. Furthermore, at high fueling rates, this relationship should stabilise in total energy minimizers rather than time minimizers. Long-distance migrating songbirds are either time-minimizers or total-energy-minimizers, according to evidence from refuelling rates at stopover locations. Six species of Nearctic-Neotropical migrants and four species of Afro-Palearctic migrants, for example, demonstrated favourable associations between fuel loads and fuel deposition rates obtained at stopover locations.

Furthermore, there are evident advantages to arriving early at both breeding and immobile non-breeding sites, implying that many songbirds are under substantial selective pressure to travel swiftly. As a result, the capacity to successfully refuel at stopover sites is likely to be a critical determinant of individual performance throughout migration and perhaps later phases of the yearly cycle. Despite the predicted necessity of refuelling at stopover locations for later migration, there is little direct evidence that fuel loads obtained during specific stopovers alter the overall velocity of migration [4]. This is largely owing to the difficulties of quantifying individual behaviour at stopover locations, such as mass gain and departure, and then tracking their continued migration, which can take thousands of kilometres.

However, the development of automated radio-telemetry devices has improved the scale at which detections of animal movements are achievable, without relying on individuals being recaptured to obtain movement data over broad distances. We use an intercontinental array of automated telemetry stations to test predictions of optimal migration theory and quantify the effects of departure fuel loads acquired at a spring stopover site in northern Colombia on the subsequent pace of migration of a long-distance migratory songbird, the Grey-cheeked Thrush Catharus minimus.

The Grey-cheeked Thrush travels around 10,000 kilometres every year between breeding sites in Canada's boreal area and Alaska and wintering habitats in the northern Amazon Basin. During the spring migration, numerous

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Grey-cheeked Thrush halt in northern Colombia before crossing the Caribbean to their North American nesting sites. Individuals departing from this stopover location are assumed to be capable of long-distance flights without needing to refuel, implying that this species optimises its stopover behaviour to decrease overall migratory duration [5].

It is uncertain whether Grey-cheeked Thrush truly does these long over-water flights following their spring layover in Colombia. We test the predictions that fuel loads are steeply and positively correlated with fuel deposition rates, stopover duration is adjusted in response to local fuelling rates, birds take direct routes across a large water barrier, and the pace of intercontinental migration is positively influenced by refuelling rates at the stopover site. More broadly, we want to know if the fuel loads gained at a single spring stopover location impact the rate of intercontinental migration in this songbird.

Conflict of Interest

None.

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