Taking a Vacation from Predation

Why are all the really large and spectacular herds migratory? The answer may lie in a season's escape

THE WORLD'S GRASSLANDS were once dominated by vast herds of migrants: by buffalo on the Great Plains of North America, by saiga on the Russian steppes, and by the springbok of southern Africa. On the treeless plain of the Serengeti-Mara region of East Africa, great herds of migratory wildebeest and zebra still cover the landscape. What John Fryxell and his colleagues want to know is why migratory herds reach such enormous size, particularly when compared to groups of the very same animals that do not share the wanderlust.

"In a community with both migrants and residents, the migratory animals absolutely dominate the residents," says Fryxell of the University of Guelph in Ontario.

In the Serengeti, migrants outnumber resident ungulates by more than an order of magnitude. For example, the population of migratory wildebeest approaches some 1.4 million members, outnumbering the cape buffalo—the most abundant sedentary species of ungulate in the Serengeti—by a ratio of more than 10 to 1. The migrating wildebeest also greatly outnumber subpopulations of wildebeest that do not, for their own mysterious reasons, join the seasonal marches of the Serengeti.

Fryxell and his associates A. R. E. Sinclair of the University of British Columbia and John Greever of Harvey Mudd College in Claremont, California, examined three possible explanations for the great disparity in the abundance of migrants and residents. Are the migrants more successful simply because they cover a larger piece of real estate? Or are the migrants so much more abundant because they make more efficient use of their resources—like sheep driven from pasture to pasture, are the migratory wildebeest able to keep exploiting regenerated growth? Or finally, perhaps the migrants do so well because they spend part of the year away from the lions and hyenas that would eat them, thereby taking a vacation of sorts from predation.

On the Serengeti, migratory wildebeest exploit two distinct habitats: the open plains and the wooded grasslands. Their movement between the two systems is inexorably tied to the rains. During the wet season, the migrants move down on to the treeless plain to graze upon the new grass and to exploit the temporary watering holes. During the dry season, the holes evaporate and the animals must return to the wooded grasslands, where more permanent sources of water exist. Unlike the migrants, the resident ungulates—the kongoni, topi, impala, and buffalo—never leave the wooded grasslands.

Fryxell and his colleagues designed a simulation model to test the dynamics of the various hypotheses. They found that the migrant's access to greater food resources on the Serengeti plain during the wet season cannot explain the pronounced disparity between the migrants and residents. Even though the migrants enjoy a season of greater food abundance, they are still limited by the period of greatest food scarcity, when both resident and migrant must compete for the same grass. Likewise, the pattern of rotational grazing employed by the migrants may explain as much as a twofold difference in abundance between migrants and residents, but it cannot justify populations that differ in size by more than an order of magnitude. This is partly true because the tropical grasses of Africa decline rapidly as they mature. Rotational grazing may do the migrants some good, but not enough to explain the disparity.

What Fryxell and his co-workers conclude is that predation regulates the resident populations and keeps them at low population densities. This is true, says Fryxell, because the predators are also residents in a sense. Because the lions and hyenas must den their young for a long time, they are married to the wooded grasslands. Though a few predators wander down to the plain, most cannot follow the long migration of the wildebeest.

"The migrants are given a refuge in time from predation, and that refuge is enough to tip the balance in their favor," says Fryxell. In ranges that overlap, then, the migrants should always outcompete the residents.

■ WILLIAM BOOTH

Two rivers meet. *Herds of migratory wildebeest flow through the Serengeti region like a river, from the treeless plain to the wooded grasslands as rainy and dry seasons alternate.*

ADDITIONAL READING

J. M. Fryxell, J. Greever, A. R. E. Sinclair, "Why are migratory ungulates so abundant?" *Am. Nat.* **131**, 6 (1988).