African Carnivores

Kalahari Hyaenas. Comparative Behavioural Ecology of Two Species. M. G. L. MILLS. Unwin Hyman, London, 1994 (U.S. distributor, Chapman and Hall, New York). xvi, 304 pp., illus. $112.95 or £48.

The Kalahari is a nearly two-million-square-kilometer, sand-filled basin (sandveld) in Botswana, Namibia, and South Africa, subjected to irregular rainfall and large daily and seasonal temperature fluctuations (−10° to 40°C). The southern Kalahari, the setting for this study, is a semidesert where free-standing water is found only temporarily on pans (old lake beds) and along river beds after exceptionally heavy rains. Between 1972 and 1984, M. G. L. (Gus) Mills, a wildlife biologist from the National Parks Board of South Africa, studied the comparative biology of the brown (*Hyaena brunnea*) and spotted (*Crocuta crocuta*) hyenas in the Kalahari Gemsbok National Park (South Africa) and the Gemsbok National Park (Botswana), a 36,190-square-kilometer "pristine" wilderness. Mills has been diligent in keeping carnivore biologists "in the picture" by publishing progress reports and papers covering aspects of his work as it has progressed. In this book, he brings the whole enterprise together and provides a framework for judging hyena conservation needs and predicting the impact management actions can be expected to have upon them.

In the Carnivora family Hyaenidae, the *Crocuta* and *Hyaena* lines have been separated since the late Miocene. Today, *Crocuta* is found in Africa south of the Sahara, except for the Congo Basin. The brown hyena has a more southern Africa distribution. The male brown hyena (40 kg) is slightly larger than the female (38 kg), and both are considerably smaller than the sexually dimorphic spotted hyena (males 59 kg, females 71 kg). By following hyena tracks for 4700 kilometers and (with radio-collars aiding in their location) by directly observing the animals for a total of 4000 hours, Mills has produced a remarkable contrasting portrait for these two group-living hyenas. He begins his comparative analysis by detailing differences in feeding ecology and continues with chapters on comparative foraging and feeding behavior, social structure and spatial organization, communication patterns and social interactions, comparative denning behavior and development of cubs, the role of the individual in hyena society, and relations between species and management considerations. He has included appendixes on the trends in the number of ungulates living in the study area, criteria for determining the ages of ungulates, methods used to measure territory sizes, and degree of relatedness between clan members in both species. Each chapter is summarized, usually by means of a comparative table, and statistical tests are grouped at the end of each chapter.

A 14-month-old brown hyena cub emerging from its den. [From the dust jacket of *Kalahari Hyaenas*]

"Six spotted hyena cubs and two adult females at a den in the Nossob river bed." [From *Kalahari Hyaenas*]

Hyenas live at very low density in the Kalahari: 1.8 brown hyenas per 100 square kilometers and half that for the spotted hyena. Brown hyenas live in female-bonded groups or clans (up to 10 adults and subadults) on territories that average about 300 square kilometers. Males born in the clan always leave at some point in their life, and some females also emigrate. An occasional immigrant male will join a clan, but mating with clan females is primarily by nomadic males. Spotted hyenas also live in female-bonded clans (up to 16 adults and subadults) on territories that average about 1100 square kilometers. Males born in the clan emigrated and females were integrated. Mating was by immigrant males living in the group. Spotted hyenas den communally, hunt in groups (averaging three), and specialize in killing large and medium-size mammals. Brown hyenas use solitary dens and primarily forage alone. They are opportunistic foragers, with poorly developed hunting behavior. Both species forage nocturnally, traveling about 30 kilometers a night. The large group territories of both were determined by mean travel distance between meals, averaging about 9 kilometers between meals for brown hyenas and 33 for spotted hyenas. Both species mark their territories with "latrines" (fecal piles) and with secretions from their anal glands deposited on grass blades and clumps or "pasting," but the brown hyena marks about 20 times more frequently than the spotted.

Even in the vast reaches of the Kalahari, rabies is an important mortality factor, especially for spotted hyenas, and spotted hyenas traveling to agricultural areas at the edge of the parks returned with traps on their legs. Spotted hyenas dominate brown hyenas, but because of their low numbers their effect on brown hyenas was small. The population of brown hyenas was more secure than the spotted hyena population because of the nomadic nature of the spotted hyenas' primary prey species, large ungulates. However, the provision of more permanent water sources could alter this relationship. Mills believes it is possible to accommodate brown hyenas in some agricultural areas, but spotted hyenas, because of their stock-killing capabilities, are not tolerated in agricultural areas and require large conservation areas for long-term survival. He stresses the importance of managing the southern Kalahari as a single ecological unit. With the care and effort Mills has invested in this study, this book should serve as a model text for similar studies. It is, however, a book for specialists and not a quick read for general audiences.

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Stellar Fields

Cosmical Magnetism. D. LYNDEN-BELL, Ed. Kluwer, Norwell, MA, 1994. xii, 215 pp., illus. $89 or £63 or Dfl. 160. NATO Advanced Science Institutes Series C, vol. 422. From a workshop, Cambridge, U.K., July 1993.

Upon learning that a colleague is working on an astrophysical application of magnetohydrodynamics (MHD), most astronomers' first thought is along the lines of the motto of the United Negro College Fund, "A mind is a terrible thing to waste." For