ANIMAL BEHAVIOR AND WILDLIFE MANAGEMENT

* 1. **Introduction**

Ethology is the study of animal behavior. It is an integrated since of biology and psychology. Konrad Lorenz is known as a father of Ethology. Niko Timbergen and Karl Von Frisch are also known ethologists. Animal behavior is one of the essential components of wildlife management. For example, dispersal of young animals, habitat selection, territorial behavior, migration and daily and seasonal activities and individual behavioral differences have strong implication for wildlife management.

Any behavior has both innate (instinctive) and learned components, even though the proportion varies. Habitat selection is an innate behavior; the behavior is evolved since it has adaptive significance for the survival and reproduction of species. In this sub unit, we will consider

* how ecological constraints shape the behavior of individual organisms and, conversely,
* the effect of individual behavior on the dynamics of populations and communities
* habitat selection and
* territorial behavior

This is part of the field known as behavioral ecology.

*The role of animal behavior in wildlife management*

The study of the importance of individual differences in wildlife conservation is a the task of behavioral ecologists. Behavioralists can provide an important approach to wildlife conservation because of their tendency to examine individual differences, to emphasize the role of variability, and to think in terms of trade-offs between different behavioral strategies, e.g. elephant Such emphasis on the behavior of individuals and the strategies they adopt to maximize fitness plays an important role when a species’ natural behavior can lead to conservation problems in habitats altered by humans. In extreme and rare cases, the best management strategy may be to interfere with a species’ natural behavior.

The study of animal behavior is most usefully applied to the conservation and management of populations because it both identifies and provides ways to deal with a key characteristic of animals: *i.e.,* they are not all alike, they vary in age, sex, size, aggressiveness, learning ability, past experience, heterozygosity, and a myriad of other variables. Such individual differences can affect how an animal reacts to a given situation and may determine the success or failure of a management strategy or a conservation initiative. Conservation of animal populations thus often depends on meeting the challenge of how to incorporate individual differences in wildlife management. The study of the importance of individual differences in wildlife conservation is a the task of behavioral ecologists.

There is a hierarchy of levels of individual heterogeneity, and all are important to wildlife management and conservation. One may start by considering behavioral differences between similar species.

Similar species in the same area

For example, two North American canids, the wolf (*Canis lupus*) and the coyote (*C. latrans*) react in opposite ways to urbanization and intensive agriculture:

* wolves disappear,
* coyotes prosper

One may argue that the coyote’s greater behavioral adaptability is the key to its success because it allows coexistence with humans, whereas the wolf ’s behavior leads to its demise. Wolves ranges over a wide area, hunt in packs, and are intolerant of humans.

Same species in different areas

Within the same species there are often behavioral differences between broad geographical areas:

For example, wolves in southern Europe and in North America. They are the same species but their behaviors are very different

* wolves in southern Europe coexist with human population densities that are much greater than densities that wolves tolerate in North America
* Southern European wolves resemble North American coyotes in their ability to survive alongside dense human populations.

Same species in the same areas

At a smaller geographical scale variables such as prey type and level of human exploitation can affect

* pack size
* turnover rates, and
* social structure

These variables in turn can determine the level of genetic diversity by varying the opportunities for dispersers to recruit into packs. For example it has been suggested that high levels of shooting and trapping in eastern Canada may artificially increase the rate of hybridization of wolves with coyotes

Finally, the sex/age composition of each pack, individual preferences, and previous experience may affect variables such as prey selection or space-use patterns, which may in turn affect vulnerability to human harvest or the probability of conflict with humans because of livestock depredation.

Specialist predators that appear to form a “search image” for a particular type of prey are a very good example of how animal behavior can affect wildlife management on a local scale.

Bighorn sheep (*Ovis canadensis*) in the Sheep River population and cougars (*Puma concolor*) were studied in the same area since 1981. The study shows that from 1982 to 1993, the cougars have killed only zero to two sheep a year. However, from 1993 to 1995, predation by cougars was responsible for a 20% decline in the bighorn sheep population. This was due to one adult female cougar. This individual adult female cougar suddenly switched from hunting deer (*Odocoileus* spp.) and wapiti (*Cervus elaphus canadensis*) to preying upon bighorn sheep, and almost singlehandedly responsible for this predation.

A similar phenomenon occurred in another study area, in Ram Mountain, from 1997 to 1999: again, following a sudden increase in cougar predation, mortality of adult females doubled, mortality of adult males tripled, and bighorn population declined by almost 50%. Although factors other than cougar predation were likely also involved, in both cases, the increase in predation was apparently due to an individual cougar’s specialist behavior.

For this to happen, a cougar must change hunting technique to prey on bighorn sheep. Hunting bighorn sheep requires specialized, learned skills. Not all cougars have this learned skills. Indeed, one male cougar attempted to kill a lamb and was itself killed when he and his victim fell off a cliff. However through time, bighorn sheep hunting skill can be learned by other members of species and may bring about huge bighorn sheep predation. From a management viewpoint, the experience both at Sheep River and at Ram Mountain suggests that a generalized predator control program would have had little effect without removal of the sheep killing individual.

* 1. **Habitat selection**

There are good reasons for wildlife species to choose habitats carefully,

* to enhance the opportunities for feeding, while reducing the risk of being eaten
* obtaining shelter from inclement weather
* gaining access to water,
* Locating suitable breeding sites, such as cavities in dead trees or burrows.

Quantification of specific habitat needs is known as habitat assessment, and this is an important area of wildlife ecology. Much of this interest derives from practical benefits:

* knowing precisely which wildlife habitats are essential allows appropriate management
* to make decisions regarding alternative forms of land use
* to improve the odds of success when wildlife species are reintroduced to areas from which they were extirpated

There are many ways to quantify wildlife habitat use. One the recent approaches is, *the resource selection function.* Resource selection functions offer a flexible means of quantifying the degree of habitat preference.

The logical basis of virtually all measures of selective use is *comparison between the frequency of use of a particular resource (habitat) and its availability in the environment*. It can be surmised that a resource (habitat) is preferred when its use by animals exceeds its availability and conversely that a resource (habitat) is avoided when its use is less than that expected from its availability in the environment.

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In general habitat/resource selection

* can help in the assessment of land use priorities for wildlife conservation in a planning context
* can be used to evaluate the potential success for reintroduction programs
  + Researchers have used this approach to predict the potential for successful reintroduction of gray wolves to different parts of the USA. How? Data for existing wolf populations were first used to determine the suite of critical habitat variables for wolves and to relate local wolf densities to habitat features.
* Can be also a powerful means of linking habitat characteristics with spatially realistic models of population viability and
* Can be a valuable method to evaluate the conservation needs of threatened populations
  + For example, Akçakaya and Atwood (1997) used logistic regression to develop a habitat suitability model for the threatened California gnatcatcher (*Polioptila c*. *californica*) in the highly urbanized environment of Orange County, California. Gnatcatcher distribution data were mapped onto a GIS map. Numerous geographical habitat features were then evaluated, and a resource selection probability function developed on the basis of the strongest suite of variables. Suitable habitat fragments were mapped onto the Orange County landscape and this spatial configuration was then modeled as a metapopulation to evaluate the long-term viability of gnatcatchers

This is a valuable way to evaluate the conservation needs of threatened populations. It is particularly appropriate for species utilizing fragmented landscapes, because it gives useful insights into the ecological implications of alternative land use policies and planning scenarios.

On the other hand studies show us that the factors affecting habitat preference by a wildlife population may not always be clear to wildlife managers. Most favorable habitats may not always are preferred. A good example is that of white tailed deer in. White-tailed deer congregate in one part of their range that offers shelter from deep snow, high winds and cold temperature during winter. However, in this shelter area food supply is scarce and deer often starve to death in this area during winter. Managers consequently tried to attract deer in to other areas where food is plentiful. But deer stubbornly remain in the shelter area apparently responding to an innate preference to shelter despite the shortage of food. This shows that there are other factors such as density of foragers, disease transmission, or elevated risk of predation.

The management implication of this behavior is that wildlife managers cannot judge the adequacy of a habitat only by human standards as in the example. Habitats considered suitable in the eyes of human may be deficient in the perception of animals.

Therefore:

* Managers should not force animals to inhabit a habitat that is different from their natural preference for the reason only due to availability of food, water, etc.
* Management plans must match instinctive behavioral patterns (habitat preference)

In the case of white tailed deer, management activity should be forest activities that should supply food at border shelter area during winter.

* 1. **Territorial Behavior**

Territory is a part of a home range that is defended by the residents of the territory. Home range is an area in which an animal carries out its normal daily activities such as foraging, resting and watering.

Home range may be shared with other individuals but territories are exclusive, are not shared. In most cases, territories are smaller than home ranges; however, sometimes home range itself used as a territory and is defended. In such case, a territory may have equal size as home range.

Many wildlife species are territorial, meaning that they defend an area of (more or less) exclusive access from usage by other members of the population. Males, females, or both sexes may be territorial, depending on the ecological circumstances that apply. Territories may be defended solely during the breeding season, as in many birds, or throughout the year, as in many vertebrate carnivores; and they may be defended by individuals, such as in tigers, or by a pack of individuals, such as in gray wolves.

For most species, territories represent a wealth of resources where an animal can reproduce and rear a family in a relative prosperity. i.e., territory provides enough breeding area, acquisition of opposite sex and enough food. Consequently, territories set a limit on the population size of breeding population. Breeding population do not tolerate overcrowding. On the other hand, non territorial individuals do not reproduce unless they acquire one. Such individuals rather suffer high mortality rates than the territory holders.

For some species, territorial behavior represents a type of biological symbolism in which males express their social dominance over the others. Such behavior increases survival or reproductively of the dominant individual. For example, the population number of pin-tailed duck limited not directly by food availability or nest site, but by territorial behavior of the birds. In such cases, a single fens post may serve as a territory.

Territories are proclaimed with a combination of visual display (e.g. Dancing), sound (song), sent marks (using urine and feces) and battling (fight). For example, birds use song or dance to defend their territory, urine and faces are used by dogs including aggressive behaviors such as bluffing and fight. Territories proclaimed usually by male individuals. Such behaviors transmit warning information to other males. As the same time such behavior may serve to advertize itself to opposite sex to mate.

Territorial boundaries do not always touch one another, as the result is gaps. The gaps among defended territories therefore occupied by non-breeding or non-territorial individuals. However, for example, if one territory holder is killed, the territory usually claimed by non-territorial individuals from the floating population.

The larger the territory, the greater is the abundance of food. However, there are diminishing returns, in terms of actual feeding rate, as prey abundance increases. As a consequence, food benefits decelerate with increasing territory size. Similarly, the time and energy needed to patrol the perimeter also rise with territory size. Moreover, the larger the territory, the greater the risk that other individuals will intrude. As a result, costs continue to rise steadily while benefits show diminishing returns with increasing territory size. The profit margin is clearly greatest for individuals which hold territories of intermediate size. Provided that females are attracted to males which hold territories with sufficient resources successfully to rear offspring, the same sort of logic would predict that they favor intermediate-sized territories. In short, territory formation can be viewed as an economic decision, like many of the other behavioral processes.

The size of territories occupied by an individual animal becomes smaller when resources are plenty in the habitat. Reduced territory size mean, increased the number of territories that can be formed in the habitat and consequently high density of population. Wildlife managers can attain this by intermingling resources to enrich the habitat.

Management implication

* Territorial animals do not reproduce in a crowded habitat, zoos or in captivity
* Controlling the size of territory of an individual animals help to manipulate population size of territorial animals