*Journal of Advances and Scholarly Researches in Allied Education*
*Vol. 19, Issue No. 4, July-2022, ISSN 2230-7540*

# Predator-Prey Relationships: An Overview

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***Abstract -*** ***Relationships between predators and prey have been compared to an evolutionary arms race in which the predators improve their capacity to catch and kill their prey while the prey grow harder to catch and consume. The intensity of the interactions between predators and their prey likely determines how powerful these selection pressures are. A common interpretation of the ecological characteristics of the predator-prey interaction in arachnids is that it involves reversible hunting behavior that scientists refer to as a "swapping ball game." In this perilous game of hunting, predators and prey often switch places, changing the trophic dynamics. The primary goal of this study was to clarify how predators and prey interact.***

***Keywords -*** ***Predator–prey, Marine mammals, Invertebrates–***

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## INTRODUCTION

Due to its unique geological past, India is at the crossroads of three of the world's most important faunal realms: the Paleoarctic, the Paleotropical: Ethiopian, and the Paleotropical: Indomalayan. Even within a single nation, there is a wide range of biogeographic features due to differences in elevation, geology, and temperature. Different zones, biotic provinces, and biomes are used in India's biogeographical classifications. The vast species richness and variety of the Indian fauna is the consequence of a combination of natural biogeographic heterogeneity and human alterations throughout millennia.[1]

The variety of carnivorous mammals found in India is unparalleled by any other region. India barely accounts for 2.2% of the world's geographical area, yet it is home to 55 (24%) of the world's 231 known carnivore species. There are eight large predators among these carnivores, which are animals that subsist largely on hunting large prey like ungulates and primates. These include the tiger, lion leopard, snow leopard, cheetah, wolf, and dhole. The country's varied topography has also resulted in the development of a number of diverse mammalian assemblages, each of which is home to its own unique set of huge predators and the food they rely on.

## COMMUNITIES OF PREY AND PREDATORS

Recently, Rodgers and Panwar (1988) devised a categorization scheme for India that divides the country into 10 biogeographic zones, each of which is further subdivided into biotic provinces. Prey species, such as ungulates and primates, and the predators that seek them out are distributed differently among the eight terrestrial biogeographic zones. Recent extinctions caused by humans have wiped off species from several communities. Below is a quick description of the typical predator-prey ecosystems found in each of the eight biomes:

- **Himalayan Zone, trans**

The snow leopard, the wolf, and the dhole are the top predators in the freezing desert and steep alpine environment. Animals such as the tibetan wild ass, wild yak, tibetan antelope, tibetan gazelle, blue sheep (or bharal), urial (or shapu), argali (or nayan), markhor (or wild goat), Ibex (or himalayan tahr), and nayan (or argali) are all fair game depending on where in the zone you.[2]

- **Himalayan Region**

A wide variety of mammals, including the red deer sambar , muntjac, musk deer , blue sheep, himalayan tahr, goral serow , mishimi ta It's also home to a variety of primate species, including as the hanuman langur , rhesus macaque, and Assamese macaque (tacaca assamensia). Their main enemies are dholes, snow leopards, leopards, and tigers.[3]

- **Desert Region**

This flat and arid zone harbors wild ass (E,_ hemionys khur blackbuck (Antelope cervicapra), chinkara (Ctazella gazalia benetti) and nilgai (Boselaphus tragocamelus) as the prey, with the wolf and cheetah (now extinct), as the dominant predators. In the case of the Arid zone, no sites with

intact assemblages of the large mammal fauna typical to the zone have been conservevation.[4]

- **Area with Modest Humidity and Dryness**

As far as ungulates go, you may hunt blackbuck, chinkara, fourhorned antelope , nilgai, chital, sambar, and wild pig here. The final three species are restricted to the zone's moist eastern regions. Rhesus macaques and hanuman langurs are common primate prey. Predators vary by region and may include wolves, dholes, lions, tigers, leopards, and even cheetahs (though they are now extinct)**.[5]**

- **The Western Highlands and Lowlands**

The sambar, chital, muntjac, fourhorned antelope, gaur , nilgiri tahr and wild pig are the most common ungulates in this montane and foothills zone with evergreen and deciduous woods. The hanuman langur, nilgiri langur , bonnet macaque , and lion-tailed macaque are the four species of monkeys that make up this group . Their natural enemies include the tiger, leopard, and dhole**.[6]**

- **The Deccan Peninsula Zone**

Chital, sambar, hard-ground barasingha , muntjac, fourhorned antelope, chinkara, wild buffalo (Ruhaiaa bubalis), and wild pig are the most common ungulates in this vast area characterised by deciduous woods and open scrub. Blackbucks, but not gaurs, buffalo, or muntjacs, are found only in very open, arid environments. Species like the barasingha and buffalo are dwindling down to small, isolated pockets of survivors. Rhesus macaques, bonnet macaques, and hanuman langurs are some examples of primate prey. Tigers, leopards, and dholes are common woodland predators, whereas wolves and cheetahs are more common in open, drier areas.[7]

- **Plain of the Ganges**

Until recent extinctions, the Siwalik foothills forests and the Terai wet grasslands next thereto were home to the greatest diversity of ungulates in the whole Asian subcontinent.oral, muntjac, chital, hog deer sambar, barasingha , fourhorned antelope, nilgai, black buck gaur, wild buffalo, and the Indian rhinoceros are among the ungulate prey species . The rhesus macaque and the Hanuman langur are two of the prey species of primates. The tiger, leopard, and dhole are the predators here.[8]

**PRESERVING INDIAN MAMMAL SPECIES**

To wildlife, ecosystems, and habitat biodiversity, conserving mammals, especially the flagship species, is like saving the world.[9]

There isn't much room in the mammal world for big creatures like elephants and giraffes. This may be seen in a crude classification of animal groups into those with "little" and those with "big" bodied members. The chiroptera (bats) are the most numerous of the "small-bodied" mammal groupings with more over 100 species distributed over 7 families. A majority (over 50%) of India's animal population consists of bats and rats. The remaining Logomorpha Scandentia and Pholidota primates are insect eaters.[10]

There are tiny cats like the leopard cat and the rusty spotted cat among the felids; foxes, jackals, and other canids; and the mouse deer among the Artiodactyla. Carnivora, including felids, canids, and so on, are among the largest of the animal orders. There is just one member of each family in the orders Artiodactyla, Cetaceae, Perissodactyla, Sirenia, and Proboscidae. The proportion of large-bodied animals is estimated to be about 25%. One of the most well-known threats to India's mammal population is the international trafficking in wildlife. Animals like tigers, rhinoceroses, desert foxes, and others come to mind when one thinks about trade. Nonetheless, members of almost all mammalian groups in India may be found in trade. Although trade is likely a major contributor to their reduction, it is not the main explanation. Loss of habitat and interference from humans are two other factors that threaten animal populations.[11]

A plethora of research over the last two decades have shed light on the ecology of bigger mammals in Asia, revealing previously unknown information on population dynamics, life histories, prey-predator relations, and patterns of habitat usage in the examined environments. These experiments have only been conducted in dense, well-lit, deciduous or scrub forest.[12]

The biggest challenge to the preservation of wild cats is the widespread deterioration of habitat caused by the increasing human population. Long-term protection of big cats in troubled and poor places is impossible. The leopard, however, seems to be an exception to this rule, since it may be seen living in or near human settlements, agricultural regions, and even cities. The number and distribution of wild tigers in Maharashtra outside of protected areas have been analysed.[13]

Killing a representative species is the standard practise for studying the diet and parasite prevalence of lower vertebrates; this provides a clear image of the food consumed by the animal as well as the parasites that are harboured by the host. When dealing with endangered or threatened species, this is just not an option. Further, for detection of illnesses the chemical restraint techniques are not uniformly applicable and also are not feasible owing to shortage of professionals in this sector in spite of very excellent efforts done by the Wild Life Institute of India, in the previous decade. Therefore frequent faeces testing is the only safe approach to determine the food habitat and ill status of the wild animals in any Sanctuary and Bioreserve. Due to the regularity with which wild animals defecate—a certain amount

of times per 24 hours, albeit this number varies with season and diet—the density of dung and droppings may be used as an indicator of population and health. There is a significant difference between populations of one species depending upon the kind of habitat in which they dwell and season.[14]

**Parasites In Wildlife Are Spread By A Variety Of Factors**

Parasite transmission may be affected by the host's food, movement, and bowel habits as well as environmental variables that influence parasite survival and activity. Furthermore, the host's (1) health, (2) behaviour, (3) sexual selection, and (4) population regulation may all be affected by the variety and severity of parasite infections. The host-parasite relationship is shaped by both chance and compatibility . This results in four distinct permutations: There are three possible states for the host-parasite association: (1) both filters are closed, meaning that there is no such thing as a parasite-host association; (2) the encounter filter is open, but the compatibility filter is closed, meaning that there is no such thing as a parasite-host association, but that some individuals of the parasite may be able to open the compatibility filter due to selective pressure; and (3) the encounter filter is closed, but the compatibility filtration is open, meaning that there is no.[15]

Because of their widespread diversity, it would be hard to explore the complex relationships between mammals and parasite populations in a single publication. Therefore, I have zeroed down on several European terrestrial animals that particularly pique my curiosity since they have been so understudied. Table 1 provides a summary of the literature chosen to date on the topic of the variables influencing the transmission of parasites in populations of wild European land animals. The parts that follow go into further depth with respect to some of the most important considerations and instances. Though I try to utilise examples involving European terrestrial animals wherever possible, there were times when I had to use examples involving terrestrial mammals from those other continents due to a lack of research depicting a certain topic properly. A network of host-parasite interactions and parameters controlling their cohabitation is provided in Fig. 1 to better convey the intricacy of the examined issue.[16]

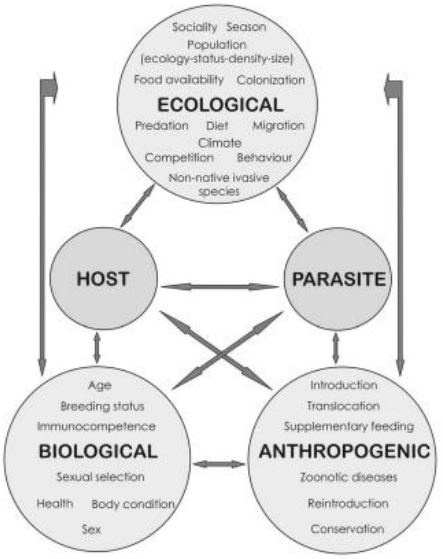


**Figure 1 Links between hosts and parasites, and the environmental factors that shape their mutualism in the wild.**

**ECOLOGICAL FACTORE**

**Conflict and predation**

Through their effects on host and vector population densities, competition and predation may affect parasite infection rates. These characteristics enhance the frequency with which members of the same or different species interact, and therefore the risk of transmission of disease. Sarcoptic mange research conducted in Poland's Biaowiea Primitive Forest (BPF) has uncovered this trend among the region's carnivore populations. Wolves and lynxes have been recorded engaging in intra-guild predation on medium-sized carnivores like red foxes and raccoon dogs, which may be a factor in the spread of sarcoptic mange. Parasites or their hosts may be consumed by predators, who in turn reduce the population size and density of parasites. There may be a trade-off between reduced density-dependent transmission and increased per capita exposure if the density-independent origin of the illness shifts to a lower host density. The Combes' encounter filter, which describes how frequently parasites are encountered, may be modulated by changes in prey behaviour that are induced by predators.[17]

**Access to food and diet**

Predators and scavengers are major vectors of parasites because they ingest their hosts when they feed. When a predator and scavenger is a good host for a certain kind of parasite, that prey might become a vector for illness. In contrast, the parasite that is ingested will not get infected and will die if the predator is not a host. Some parasites of herbivorous animals' gastrointestinal tracts are incapable of reproducing and hence can only spread illness by leaving behind eggs or oocysts in faeces, which then contaminate the surrounding

environment. Human activities, such as supplemental feeding or using the same meadows as cattle, d), produce a greater concentration of animals in a given area, which in turn allows parasites to spread more easily than they would otherwise. Also crucial is the fact that food is available only at certain times of year. There were considerably less Aonchotheca putorii nematodes in the nonbreeding season in one study of American minks compared to the breeding season. This nematode was found in higher numbers in the intestines of mink between the months of February and May. Earthworms serve as intermediate hosts for A. putorii, therefore their availability may have contributed to the rise. In Canada, raccoon A. putorii infection rates were greatest in the spring and lowest in the winter.[18]

**Sociality and behavior**

Parasites or other infectious diseases exert substantial natural selection pressures on wild animals. Consequently, prospective hosts' behaviours change to protect them from becoming parasite hosts. Parasite avoidance behaviour may also have an impact on ecology and evolution; this phenomena, termed as the Blandscape of disgust, is analogous to the Blandscape of fear idea of predator avoidance. Defending oneself from predators may also help ward off their parasites, and vice versa if you're trying to avoid their excrement. Parasite avoidance has powerful impacts on feeding, locomotion, and social relationships, similar to those of predator avoidance. Different mechanisms have developed throughout time to help wild animals combat parasites. Among them include the use of disinfectant sprays in bedrooms and other resting locations, a variety of personal hygiene practises, and the use of therapeutic plant-based chemicals. Species-specific adaptations like these are a direct result of the unique conditions that each species calls home. One illness that is transmitted in part by the way its hosts interact with one another is sarcoptic mange. Epizootic skin disease is caused by a highly infectious mite infestation that affects wild and domestic animal populations worldwide. Due to the large degree of overlap between social and solitary carnivores in terms of space, habitat utilisation, and denning behavior—especially the sharing of den sites—the former are more prone to mange than the latter. In contrast to sociable mammals, mating season is often the only time members of solitary species interact with one another.[19]

**Invasive Species Of Non-Native Mammals**

Understanding whatever happens to parasite fennec foxes when host species get established in a new territory is a central tenet of invasion ecology. For example, which parasites are common in their native ranges but missing in new regions, and vice versa, is a topic of frequent discussion. Is there evidence that certain parasites, when they invade new ecosystems, represent a greater risk to indigenous fauna and human health than others? It is well-documented that raccoon dogs, raccoons, or American mink—all examples of INNS—in Europe serve as significant vectors of several zoonotic pathogens, some of which are very harmful for humans. Meat eaters often serve as terminal hosts, dispersing eggs and adult animals into the wild. As a result of the significant pathological alterations and major health repercussions brought on by the parasites' larval stages once they have established in human organs and tissues, humans play the role of intermediate, paratenic, or Bdead end host for these parasites. One of the most crucial explanations for understanding the introduction and quick spread of INNS is ERH. Numerous studies have revealed that host populations in invaded ranges had lower parasite species richness and prevalence than native range populations, confirming the likelihood of parasite escape. The issue is, though, for how much longer. Recently published research has shown that just 20 years after an invading mammal like the American mink was introduced to an invaded region, the number of parasites in the invasive animal grew dramatically. This provides evidence that INNS have a narrower window of opportunity to avoid parasite pressure. Invasive non-native species (INNS) that manage to leave their native range might gain advantages such as reduced parasite pressure at the outset of the invasion and relaxed selection for costly immune response, both of which encourage reallocation of resources toward growth, reproduction, & survival. Consequently, invasive hosts may have lower infection rates but increased susceptibility to infection as a consequence of compromised immune systems.[20]

**CONCLUSION**

Many tigers, leopards, & wild canines have been seen while doing study on predator-prey interactions. According to tiger observation, sambar is the main source of prey for tigers in terms of quantity & biomass. Based on biomass, sambar was chosen above wild pig, domesticated animals, chital, & four-horned antelope as prey. Nevertheless, the order of predation was sambar > Indian hare > four-horned > antelope > chital. It demonstrates that certain areas still have a good prey density, with tigers depending mostly on wild species like sambar, wild pigs, & hares. Conservationists support the survival of these prey species by maintaining the plants and grasses that serve as their food source.

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