

# International Bear News



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Sloth bear feeding on a honeycomb in Melghat Tiger Reserve, Maharashtra, India. Read about it on page 59.

## Brown Bear Behavior in the Human-Modified Landscapes of Cantabrian Mountains (NW Spain)



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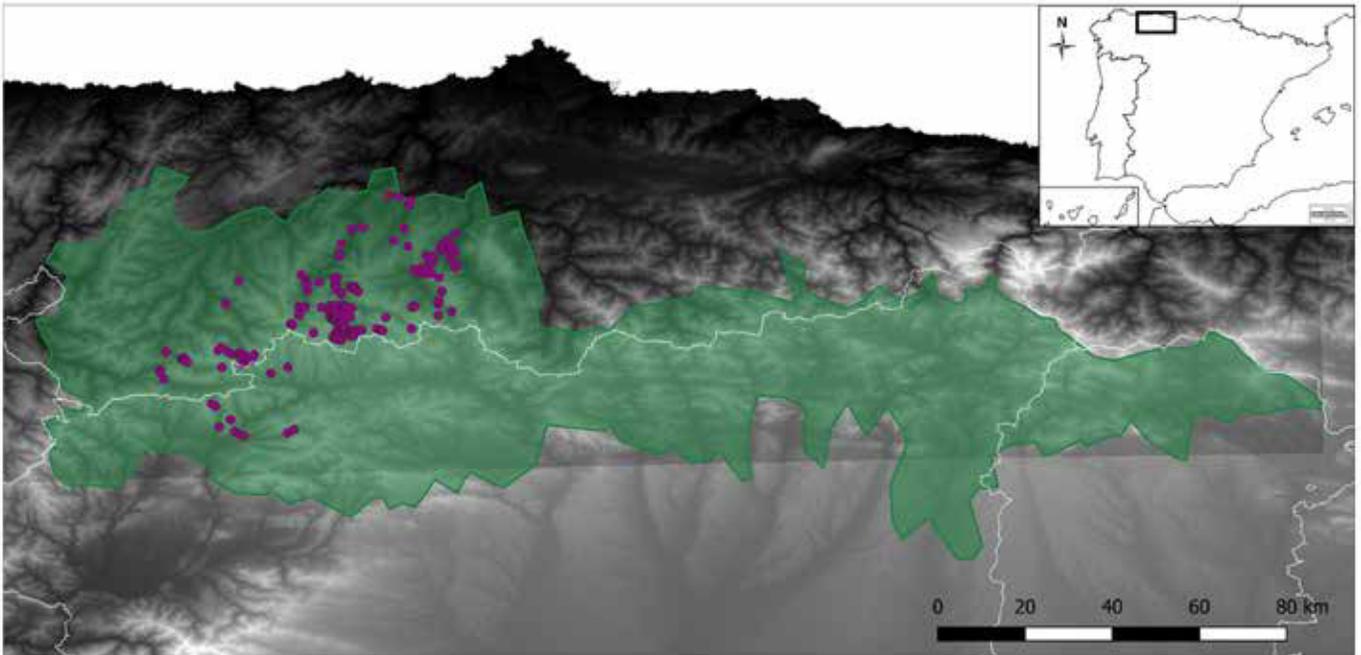
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The current large carnivore recolonization of parts of their historical range in Europe (Chapron et al. 2014) is bringing wild animal populations closer to humans, in areas where habitats are fragmented and encroached on by human settlements, roads and a variety of human activities. This close coexistence of large carnivores and humans has the potential to produce human-driven disturbances that can affect species behavior (Gaynor et al. 2018).

The current expansion of brown bears *Ursus arctos* in human-modified landscapes demands an improvement of our knowledge on how this species manages to coexist with humans, and what potential effects human presence and activities may have on bear behavior. Sharing the landscape with humans may be costly, and thus bear conservation and management strategies should take into account potential behavioral alterations related to living in human-modified landscapes. Brown bears in the Cantabrian Mountains (NW Spain) represent an example of an endangered, small and isolated bear population in human-modified landscapes, where human activities and presence might cause stress to bears and, consequently, alter their behavior. Additionally, brown bear viewing is nowadays a common practice in the Cantabrian Mountains (Ruiz-Villar et al. submitted; Penteriani et al. 2017).

Thanks to the IBA grant RG\_16\_2016, we studied brown bear behavior by analyzing 3132 videos (78.5 hours of observed behaviors recorded by the digiscoping technique; 167 adult bears, 42 subadults and 112 females with cubs) with the free software BORIS (<http://www.boris.unito.it/pages/download.html>) during a 10-year period (2008-2017). We explored potential factors that may cause the appearance of vigilance/alert behaviors, as a proxy of human disturbance, as well as the duration of such behaviors (Zarzo-Arias et al., submitted). We considered that bears were exhibiting vigilance behavior when they were: (1) sniffing the air; (2) exploring their surroundings by intensively looking around; and (3) focusing attention in a given direction. Then, we analyzed the time bears dedicated to different behaviors, namely feeding, resting, mating, and nursing cubs, in relation to the human and natural characteristics of the landscape they inhabit. Specific characteristics of individuals, such as fur marks, color and body morphology, allowed identification of some individuals over the years (Higashide et al. 2012). Beyond the fact that it was not possible to observe bears during the night, we consider that diurnal

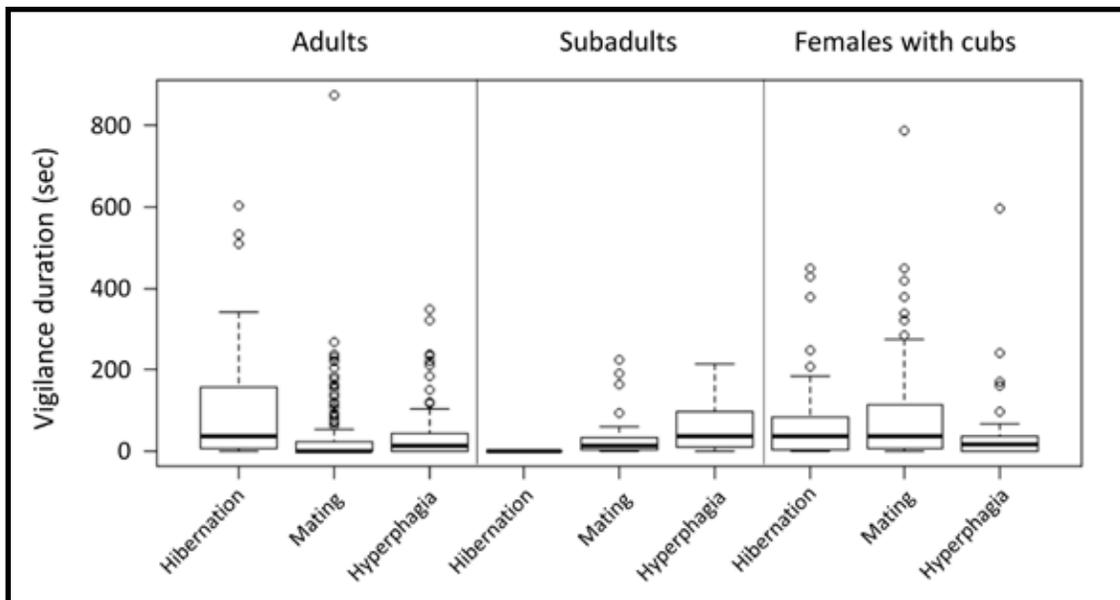
# Human-Bear Conflicts



The locations (purple dots) of the 3132 videos (78.5 hours in total) of different brown bear behaviors (167 adults, 42 subadults and 112 females with cubs), within the population distribution (green shape) in the Cantabrian Mountains (north-western Spain).

observations are best to detect bear reactions to humans because that is the time when humans are active, and there is greater potential for bear and human overlap. Each video was also classified seasonally, on the basis of the main bear cycle in the Cantabrian Mountains, i.e., hibernation (January to mid-April), mating (mid-April to June) and hyperphagia (July to December). In the Cantabrian Mountains, not all bears hibernate every year and hibernation may be relatively short, and thus several observations were also recorded in winter. The location of each video-recorded bear was also used to analyze the characteristics of the human and natural environment surrounding bear behavior.

Generalized linear mixed-effects models were used to explore whether (a) the appearance of the vigilance behavior and (b) the time bears spent alert (vigilance behavior duration) depended on the proximity of different human structures (human settlements, roads, trails and bear tourism viewing points) or habitat types (forest, open habitat and shrubland). Main results showed that: (1) the bear class had a significant effect, with adult bears displaying less vigilance than subadults



Distribution of vigilance behavior duration (in sec) among the different bear classes (adults, subadults, and females with cubs) in each season (hibernation, mating, and hyperphagia).

