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

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.
and females with cubs; (2) the appearance of vigilance behavior was not modulated by any of the human elements and habitat variables we considered in our analyses; and (3) vigilance behaviors lasted slightly less during hyperphagia, when bears focus on feeding prior to hibernation and cubs are no longer at risk of infanticide. Thus, as an end conclusion, neither the appearance nor the duration of vigilance behavior in Cantabrian brown bears seemed to be influenced by the closeness of any of the human structures and activities that we took into account in this study. Additionally, during the mating season, when the need to protect offspring is crucial due to the high risk of infanticide, females with cubs spend somewhat more time on vigilance behaviors compared to other seasons. Then, alert behaviors of females with cubs may reflect the potential risk driven by males rather than by humans and their activities.

In the Cantabrian Mountains, illegal poaching has declined in recent decades, resulting in the positive trends exhibited by this population (Gonzalez et al. 2016). Lower rates of human-induced mortality in recent times might have improved bear-to-human tolerance, as may have happened in other populations where bears are not persecuted (Smith et al. 2005). Brown bears have largely coexisted with humans in Europe, including northern Spain. If the positive trend persists, brown bears would have to expand into even more encroached landscapes in the Cantabrian Mountains (Zarzo-Arias et al., submitted). Human activities and infrastructure do not seem to provoke critical behavioral responses in the brown bears of the Cantabrian Mountains, but physiological reactions of bears to human presence, i.e., stress responses, should also be investigated, because they do not necessarily need to manifest visible behavioral changes and can have a cost on disturbed animals (Støen et al. 2015). Certain levels of tolerance from both humans and large carnivores, which are reflected in behavioral patterns, seem crucial to facilitate persistence and eventual recovery of bears in human-modified landscapes, even where human encroachment is high.

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Literature Cited


