

Brown bear multi-scale response to human presence and mobility in the Italian Alps

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In an increasingly human-dominated world, wildlife is constrained by human presence and activity, inducing behavioural adjustments as a consequence. Large mammals are especially sensitive to such changes, questioning the potential of their behavioural flexibility to cope with human disturbance. Using brown bears in the Italian Alps as a study case, we investigated their response to changes in human presence over different temporal scales. Combining human mobility data with bear tracking and activity data spanning from 2006 to 2019, we analysed bears' behaviour and movement as a function of human activities. We observed that over the years bear activity and daily movement length have increased, while diurnality and range size have decreased. While tourism has grown in parallel, this was not identified as the main driver of such responses. Rather, it was mostly due to the increase in bear population, whose space is nonetheless limited by human infrastructure. At a weekly scale, we observed no difference in daily movement lengths between weekdays and weekends. This might perhaps be because of the continuous human disturbance in the area overall. Finally, at the daily scale, we found that individuals roamed in places more intensively exploited by humans at night compared to daytime, especially when ranging in heavily disturbed areas. Our results highlight how humans are indirectly, by hampering connectivity, and directly, through disturbance, shaping brown bear behaviour and movement. In view of a growing volume of outdoor human activity, we analyze the implications of such responses and present challenges for human-wildlife coexistence.