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edited by

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The award will be assigned yearly, in the second semester of the year following that of reference (i.e., Best Paper Award for 2013 will be assigned in the second semester of 2014). The Editorial Committee is responsible to assign the award. A written motivation will be made public on the journal website.



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edited by  
Roberta Chirichella and Damiano G. Preatoni

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# **Riassunti: Comunicazioni e Poster**

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## Assessing the impact of bears, wolves and jackals on extensive livestock practices in north-eastern Italy

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Human-carnivore conflict is one of the main causes which have led to the decline of several carnivore species worldwide, and to the abandonment of livestock practices in those areas in which conflicts were more intense. In Friuli Venezia Giulia (hereafter, FVG) the main carnivores which may come into conflict with human activities are the brown bear (*Ursus arctos*) and the grey wolf (*Canis lupus*). As for the brown bear, the re-colonization of the Region occurred due to the natural dispersion of individuals coming from both the central Italian and Dinaric Alps. Within the Region, from one to seven individuals are monitored each year. For what concerns the grey wolf, the re-colonization of the territory occurred because of the natural dispersion of individuals coming from both western and Dinaric Alps. The species re-established in FVG in 2016/2017 and now seven packs are estimated to be present, at the very least. The recent natural arrival of the golden jackal (*Canis aureus*) from both the Dalmatian and Slavonian populations opens new ecological scenarios. To date, the population in FVG is estimated to be composed of about 25–35 packs, at the very least. However, this new presence claims the need for an adequate monitoring program to assess the eventual impact on human activities. Based on these considerations, the main purpose of the present work was thus to quantify the impact of brown bears, grey wolves and golden jackals on livestock activities within the FVG Region. Specifically, we aimed to address the main following research questions: (i) Is there a difference in terms of predatory pressure among predators? (ii) Is there a difference in terms of the overall number of predated individuals, also taking into consideration the affected livestock species and responsible predator? (iii) Is there a difference in terms of number of predatory events among seasons? (iv) Is there a variation in terms of compensations (€) recorded per year and considering each predator? (v) Is there a difference in terms of number of predatory events between farms that use and don't use mitigation measures?

Data on carnivore predations (from 2009 to 2021) were collected by the regional wildlife technicians in collaboration with the researchers of the University of Udine and the members of the Forestry Service. Seasons were classified as follows: autumn (October, November, December), winter (January, February, March), spring (April, May, June), and summer (July, August, September). To answer questions (i), (ii), (iii) and (v), both the chi-square and Fisher's exact test (in the case of contingency tables showing values <5) were used. The eventual difference among more than two categories was subsequently explored through the *pairwise nominal independent function* (*pnif*). To answer the question (iv) we used linear regression models. Statistical analyses were run using the Software R (v. 4.1) and setting the level of significance at 0.05.

Our findings revealed a significant difference ( $\chi^2=61.12$ ,  $p<0.001$ ) in terms of number of predatory events among predators: bears (n=81, 53.29%), wolves (n=54, 35.53%), jackals (n=17, 11.18%) and in terms of number of predated individuals per predator ( $\chi^2=225.08$ ,  $p<0.001$ ). However, in the latter case the only significant differences (*pnif*,  $p<0.001$ ) were recorded comparing bears (n=206, 46.08%) and jackals (n=27, 6.04%), as well as wolves (n=214, 47.88%) and jackals. For what concerns bears, sheep (n=163, 78.74%) were significantly (*pnif*,  $p<0.001$ ) more predated than both goats (n=32; 15.46%) and cattle (n=12, 5.80%); and the same significance was observed for wolves: sheep (n=191, 89.25%), goats (n=22, 10.28%), cattle (n=1, 0.47%). Regarding jackals, only predations at the detriment of sheep were observed (n=27, 100%). A significant difference ( $\chi^2=57.75$ ,  $p<0.001$ ) in terms of number of predations was recorded among seasons: autumn (n=25, 16.45%), winter (n=12, 7.89%), spring (n=53, 34.87%), summer (n=62, 40.79%), with the only exception of spring vs summer (*pnif*,  $p=0.34$ ). A significantly higher ( $\chi^2=16.12$ ,  $p<0.001$ ) number of predations was observed in farms which did not use mitigation measures (n=94, 61.84%) compared to those that used them (n=58, 38.16%). For what concerns bears, no significant variations (LM,  $R^2=0.008$ ,  $p=0.77$ ) in terms of compensations was observed among years. Conversely, a significant high variation (LM,  $R^2=0.45$ ,  $p=0.13$ ) was observed for wolves.

The higher number of individuals predated by wolves underlies the impact that wolves may have on livestock practices, especially in the light of its recent re-appearance in the Region. Sheep confirmed to be easier to predate because of their smaller size and poor anti-predatory strategies. The higher number of predations recorded during the warm seasons match the transhumance period, during which animals are moved at higher elevations to feed in open pastures and, therefore, are more likely subjected to carnivore attacks. The high number of predations recorded in farms that did not use mitigation measures, suggests that the latter may effectively deter predators. Regarding bears, we did not observe significant variations in terms of compensations per year. However, data variability reported by the  $R^2$  did not allow us to elaborate strong inferences. Conversely, for wolves, higher compensations were registered especially in the latest years. As for jackals, compensations were given starting from 2018 when the species was included in the list of 'potentially damaging carnivores' for human activities. To conclude, our findings revealed an existing degree of negative interactions between carnivores and human activities in north-eastern Italy. Therefore, monitoring the carnivore population and adopting adequate mitigation measures assume remarkable importance to enhance the coexistence in the long-term.