Short communication

Interactions between the Golden Jackal *Canis aureus* (Carnivora: Canidae) and the Wild Boar *Sus scrofa* (Artiodactyla: Suidae) in northeastern Italy

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Abstract - Interspecific interactions among expanding species offer insight into ecological dynamics and resource competition. This study reports the first recorded interactions between golden jackal *Canis aureus* and wild boar *Sus scrofa* in northeastern Italy. Using thermal imaging and camera traps, we documented wild boars preventing jackals from approaching piglets and jackals being chased away from baiting sites. These encounters may suggest predation, kleptoparasitism, and competition for trophic resources, as reported for other canids. Growing spatial overlap between these two species, possibly facilitated by the availability of anthropogenic food resources, highlights the need for further research into the ecological and behavioral impacts of their interactions.

Key words: anthropogenic food resources, Canidae, jackal-wild boar interactions, kleptoparasitism, predation.

Riassunto - Interazioni tra lo sciacallo dorato *Canis aureus* (Carnivora: Canidae) e il cinghiale *Sus scrofa* (Artiodactyla: Suidae) nel nord-est dell'Italia.

Le interazioni interspecifiche tra specie in espansione forniscono informazioni sulle dinamiche ecologiche e sulla competizione per le risorse. Questo studio riporta le prime interazioni registrate tra sciacalli dorati *Canis aureus* e cinghiali *Sus scrofa* nel nord-est dell'Italia. Utilizzando immagini termiche e fototrappole, abbiamo documentato casi in cui i cinghiali hanno impedito agli sciacalli di avvicinarsi ai piccoli e casi in cui gli sciacalli sono stati allontanati dai siti di foraggiamento. Questi incontri potrebbero suggerire predazione, cleptoparassitismo e competizione per le risorse trofiche, come riportato per altri canidi. La crescente sovrapposizione spaziale tra queste due specie, forse favorita dalla disponibilità di risorse trofiche antropogeniche, evidenzia la necessità di ulteriori ricerche sugli impatti ecologici e comportamentali delle loro interazioni.

Parole chiave: alimentazione sinantropica, Canidae, cleptoparassitismo, interazioni sciacallo-cinghiale, predazione.

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Defensive aggression is a crucial survival strategy observed in several mammalian species (Maestripieri, 1992; Blanchard *et al*., 2003). While many prey rely on passive defence mechanisms such as camouflage and fleeing, some engage in active aggression to deter or injure their predators (Grovenburg *et al*., 2009). This phenomenon, often termed "defensive aggression", serves as an important survival adaptation in the face of predation (Maestripieri, 1992). Among mammals, large herbivores such as the African buffalo *Syncerus caffer* and the American moose *Alces alces* – as well as many other ungulates – are known for their defensive aggression, as these animals can charge at predators, using their horns or antlers to inflict serious damage (Geist, 1963; Furstenburg, 2015). Also, smaller mammals such as rodents may display aggressive defensive responses when threatened (Lazzeri *et al*., 2020). The evolutionary significance of defensive aggression in mammals suggests that, in some ecological contexts, active confrontation can be more effective than passive avoidance (Georgiev *et al*., 2013). Besides predation and defensive aggression, another form of interaction between omnivorous prey and predator species is kleptoparasitism, defined as the theft of food from other animals (Focardi *et al*., 2017).

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Wild boars *Sus scrofa* are opportunistic omnivores with a highly adaptable diet, allowing them to exploit a variety of food sources (Herrero & De Luco, 2003; Ballari & Barrios-García, 2014). While the wild boar is often seen as prey for large carnivores such as the grey wolf *Canis lupus* (Mori *et al*., 2017), it is also known to exhibit kleptoparasitic behaviour, particularly by scavenging from kills made by these predators (Materassi *et al*., 2017). Wild boars have been observed stealing carrion from wolves and other carnivores, often arriving at kill sites and using physical strength and group numbers to force predators to abandon their meals (Materassi *et al*., 2017; D'ula & Krofel, 2020). In some cases, wild boars may also aggressively outcompete small-sized predators to claim a carcass (Herrero & De Luco, 2003).

Among medium-sized canids, the golden jackal *Canis aureus* is a generalist species whose range has been rapidly expanding throughout Eurasia, including regions where it has never been present in historical times (Cunze & Klimpel, 2022). Despite its wide distribution, biological interactions between this canid and other mammals have been scarcely studied (e.g., Krofel *et al*., 2022; Böcker *et al*., 2024). The distributions of wild boar and golden jackal overlap extensively (Barrios-García & Ballari, 2012; Cunze & Klimpel, 2022; Kemenszky *et al*., 2022). In some parts of their range, golden jackals and wild boars are among the most common mammal species (see Negi, 2014; Massei *et al*., 2015; Fanelli *et al*., 2021) and yet behavioural interactions between these two mammals are only occasionally reported in the scientific literature.

Wild boar is often found as part of the diet of the golden jackal in Europe (Lanszki & Heltai, 2002; Radović & Kovačić, 2010; Lanszki *et al*., 2015), mostly through scavenging on remains left behind by hunters and large-sized carnivores (Lange *et al*., 2021). In a few studies, wild boar piglets were found in the spring diet of the golden jackal, suggesting possible predation on newborn piglets (Lanszki *et al*., 2006; Bošković *et al*., 2013). A case of kleptoparasitism by a wild boar, involving a golden jackal's predation on a roe deer *Capreolus capreolus*, has been also reported in northeastern Italy (Frangini *et al*., 2022).

In this work, we present four cases of interspecific antagonistic interactions between golden jackal and wild boar recorded in northeastern Italy. We also review the current knowledge on interactions between wild boar and golden jackal and provide a foundation for future research on these interactions, which are likely to become more frequent, considering the ongoing range expansion of both species. We further speculate that wild boar may constitute an increasingly important component of the golden jackal diet.

In the first case, using a thermal imaging camera, we observed five adult golden jackals approaching a group of wild boars with piglets, before being driven away by an adult female (August 2022; floodplain of Isonzo River).

In the second case, a camera trap recorded two golden jackals and a group of adult wild boars feeding together on maize *Zea mays* placed by hunters to attract wild boars (01.01.2025; floodplain of Judrio River; Fig. 1). During this event, one of the jackals was chased away by an adult male wild boar, after which it later returned to the baiting site.

The third case (06.04.2025; Goritian Karst) consists of a camera trap video showing a group of wild boars – an adult female and four subadults – feeding on maize when a golden jackal approached the site (Fig. 2). The jackal attempted to access the feeding area, but was repeatedly driven off by both a subadult and the adult female.



Fig. 1 - A golden jackal and a wild boar feeding simultaneously on *Zea mays* at a foraging site in the floodplain of the Judrio River. / Uno sciacallo dorato e un cinghiale che si alimentano simultaneamente su *Zea mays* in un sito di foraggiamento situato nella piana alluvionale del fiume Judrio.

In the fourth case, we recorded two interactions between wild boars and jackals at the same baiting site, located in the upper plain of the Pordenone Province. These interactions took place in 25.04.2026 and 29.04.2026 and involved golden jackals approaching female wild boars with piglets, and being driven off (Fig. 3).

Interspecific resource-dependent competitive interactions involving aggressive behaviour between golden jackals and other mammals have been documented in Europe, including encounters with the red fox *Vulpes vulpes* (SP, personal observations), the European badger *Meles meles* (Potočnik *et al*., 2019; MGF, personal observations), and the Raccoon Dog *Nyctereutes procyonoides* (https://www.youtube.com/watch?v=fXzpi-SBeX4; accessed on 30.01.2025). In contrast, non-antagonistic interactions (commensalism) have only been reported with the European badger (Kostantinov *et al*., 2022). To the best of our knowledge,



Fig. 2 - Wild boars preventing a golden jackal from approaching a foraging site in the Goritian Karst. / Cinghiali che impediscono a uno sciacallo dorato di avvicinarsi a un sito di foraggiamento nel Carso Goriziano.



Fig. 3 - Female wild boars preventing two golden jackals from approaching piglets (upper Pordenone plain). / Femmine di cinghiale che impediscono a due sciacalli di avvicinarsi ai piccoli (pedemontana pordenonese).

this type of biological interaction has never been observed between the golden jackal and the wild boar. However, the two species sometimes feed on the same trophic resources (e.g., maize, carrion, fruits) at different moments, suggesting some degree of resource partitioning (SP, personal observations), as occurs with the red fox (Pecorella, 2021). Based on current knowledge, the interactions between the two mammal species are complex and can be summarized as follows:

a) predation – by the golden jackal on wild boar piglets;

b) kleptoparasitism – by adult wild boars on golden jackal kills;

c) interspecific competition or resource partitioning – when the two species feed on the same trophic resource.

The increasing number of observations of golden jackals visiting wild boar baiting sites in northeastern Italy may be associated with the recent increase in the local abundance of this ungulate and the related hunting practices, as the remarkable range expansion of this canid across Europe has also been related to additional food resources derived from human activities (Spassov & Acosta-Pankov, 2019). Not only may *C. aureus* forage upon food provided by humans to wild boars, but also the hunting remains (e.g., skins, viscera and organs) represent an additional food source for this scavenger, particularly during periods of low resource availability (Lange *et al*., 2021; Lanski *et al*., 2022), similarly to what has been observed with waste from domestic animal slaughter (Bošković *et al*., 2013; Ćirović *et al*., 2014; Penezić & Ćirović, 2015). Golden jackals may eavesdrop upon rifle shots to exploit hunting remains by associating these sounds with available food (Lapini *et al*., 2021; MA, personal observations). In one instance, three jackals were observed feeding on a wild boar minutes after it was killed, before the hunter was able to retrieve the carcass (06.06.2024, Savogna d'Isonzo, Gorizia; Antonio Pilosio, personal communication).

We consulted data of wild boar harvesting in the Autonomous Region of Friuli Venezia Giulia (northeastern Italy, bordering Austria and Slovenia), which hosts the highest number of jackal groups in Italy (Lapini *et al.*, 2021). In the whole region, the number of harvested animals went from 2,300 in the 2010/2011 hunting season to 7,100 in the 2024/2025 hunting season, showing a steady increase (https://www.regione.fvg.it/rafvg/cms/RAFVG/ambiente-territorio/tutela-ambiente-gestione-risorse-naturali/gestione-venatoria/FOGLIA9/; accessed on 21.05.2026; Fig. 4).

Given that the Karst area seems to host the core population of golden jackal in Italy (Lapini *et al.*, 2021; Pecorella *et al.*, 2024), we also consulted data from the local Hunting District, which had the highest number of harvested wild boars in the region. Here, the number of harvested animals went from 420 in the 2010/2011 hunting season to 1,420 in the 2024/2025 hunting season (Fig. 4).

It should be noted that, since 2015, Friuli Venezia Giulia regional administration has also established a removal zone for wild boar, encompassing the territory extending in the upper and lower plain. Due to the high density of agricultural production, the high risk of collisions with vehicles, and the health and social concerns related to wild boar proximity to residential areas, harvesting plans in the

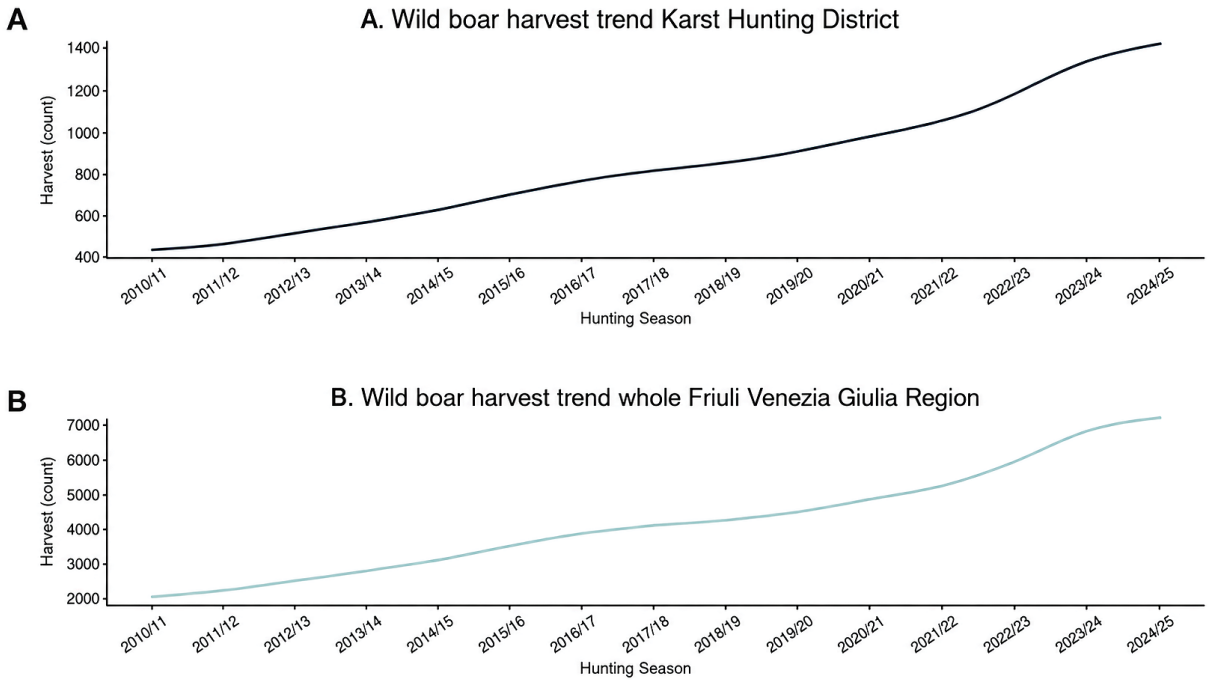


Fig. 4 - Wild boar harvest trend in the Hunting District "Karst" and in the whole Friuli Venezia Giulia Region (data from Friuli Venezia Giulia Autonomous Region). / Andamento del prelievo venatorio del cinghiale nel Distretto Venatorio "Carso" e nell'intera Regione Friuli Venezia Giulia (dati della Regione Autonoma Friuli Venezia Giulia).

removal zone are not subject to numerical or demographic limits (Regione Autonoma Friuli Venezia Giulia, 2015). This may have increased the availability of anthropogenic food resources in newly colonised areas (e.g. upper Pordenone plain, central Friuli, Isonzo river catchment, all colonised by *C. aureus* after 2015; Lapini *et al.*, 2021), potentially facilitating the expansion of golden jackal, although this hypothesis remains to be tested.

Our observations contribute to the growing understanding of the interspecific interactions between golden jackals and medium- to large-sized mammalian species in Europe. The documented cases of potential predatory behaviour, kleptoparasitism, and resource competition suggest a highly dynamic relationship between these two expanding species. As the golden jackal continues to colonise new areas, interactions with wild boars may become more frequent, possibly also influenced by anthropogenic food resources such as hunting remains, carrion, and baiting sites. Therefore, further research is necessary to assess the ecological implications of these interactions, and to clarify the current importance of wild boar in the diet of the golden jackal in Europe, particularly in relation to trophic dynamics, behavioural adaptations, and the potential role of human activities in shaping species coexistence.

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