

Who wants mice if there's seafood? Crayfish as a novel food resource for a generalist avian predator.

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Abstract

Generalist predators can exploit a wide range of food resources, making them more adaptable to many habitats and situations. Sometimes, the introduction or appearing of new species can lead to the exploitation of this resource, especially when it is abundant. In this sense, American crayfishes, being one of the most dangerous exotic species in the World are an important food resource to some species in their foreign distribution range. Here, we describe a new behaviour and food source for common buzzards (*Buteo buteo*) observed in Western Iberia. American crayfishes seem to be a recurrent food source for buzzards in late summer, showing a riverbank patrolling behaviour through riparian forests, overlapping the consumption of this crustacean with other carnivore species such as foxes (*Vulpes vulpes*), american mink (*Neogale vison*) and Eurasian otters (*Lutra lutra*).

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Abstract

Generalist predators can exploit a wide range of food resources, making them more adaptable to many habitats and situations. Sometimes, the introduction or appearing of new species can lead to the exploitation of this resource, especially when it is abundant. In this sense, American crayfishes, being one of the most dangerous exotic species in the World are an important food resource to some species in their foreign distribution range.

Here, we describe a new behaviour and food source for common buzzards (*Buteo buteo*) observed in Western Iberia. American crayfishes seem to be a recurrent food source for buzzards in late summer, showing a riverbank patrolling behaviour through riparian forests, overlapping the consumption of this crustacean with other carnivore species such as foxes (*Vulpes vulpes*), american mink (*Neogale vison*) and Eurasian otters (*Lutra lutra*).

Introduction

American crayfishes (*Procambarus clarkii* Girard, 1852) are known to be one of the worst invasive species around the World (Vilá et al. 2010), supposing a menace to native biodiversity. This species has expanded considerably its original distribution range in Southern USA and Northern Mexico to other parts in America,

Africa, Asia and Europe (Oficialdegi et al. 2020). In Spain, it was introduced in 1974 in the Guadalquivir marshes, to use it with commercial purposes (Catálogo Español de Especies Invasoras, 2013). From there, it has been introduced to almost every place in Iberia, becoming one of the main conservation threats to the Spanish crayfish (*Austrapotamobius italicus*) (e.g. Gil-Sánchez et al. 2006) and other native fauna such as several species of amphibians (e.g. Cruz et al. 2006). However, since its introduction, it's been demonstrated to have become an important part of the diet of several predators (Tablado et al. 2010), especially semi-aquatic carnivores such as *Lutra lutra* and several species of herons, storks and seagulls that can exploit this resource.

The role of crayfishes (Cambaridae) in raptor (referring here to Accipitriformes, Falconiformes and Strigiformes) diet has not been studied profoundly. In North America, are some records of owls like *Strix varia* (Livezey, 2007) and *Megascops asio* (Courter, 2017) and some species of hawk, especially *Buteo lineatus* (e.g. Fisher, 2020; Johnston, 2000) preying upon crayfish (Cambaridae). Focusing on Europe and the Iberian Peninsula, it has been described that black kites (*Milvus migrans*) have increased the consumption of *Procrambarus clarkii* in the period 1976-2002 in Doñana National Park population, SW Iberia, in the place where American crayfishes were introduced first in Spain (Tablado et al. 2010).

In Europe, common buzzards (*Buteo buteo* L. 1758) are one of the most common raptor species and are recognized as generalist predators known to be capable of prey upon a great variety of species. They usually catch prey from gliding or soaring flight, although sometimes they hover, or walk on the ground when they are actively looking for invertebrates. Although common buzzard diet is wide, normally is mainly composed by mammals, (especially rabbits and rodents) and reptiles (mainly lizards) which usually constitute the main food income during the breeding period (e.g. Valverde, 1967; Mañosa & Cordero, 1992) while invertebrates (mainly Coleoptera and Orthoptera) play a more important role during the winter (Valverde, 1967; Bustamante, 1985). They can consume also carrion from roadkills (Elósegui, 1974), amphibians (Cramp & Simmons, 1980), nocturnal raptors (*Tyto alba*) (Bullock, 2006) and even fish, since Madge, 1992 cited a predation event upon an eel. Although invertebrates can constitute an important part of the diet in certain populations and situations (Orta et al. 2022) the consumption of crustaceans has never been described for this species.

Methods

We used one Apeman H55 camera trap at a 40 cm height programmed to take 4 pictures every time the camera was activated. A period of 1 minute between activations was set. The camera is part of a 10 camera's arrange along the Tormes river (Salamanca, Western Iberia) (Figure 1), designed to obtain carnivore pictures. We recorded buzzard events from 09/08/2021 until the 02/09/2021.

Results

Here, we describe a new foraging behaviour for common buzzards feeding on crayfishes in a riparian forest in Western Iberia. We observed a predation behaviour towards crayfishes several times by common buzzards. The animals were observed in 16 occasions in the riverbank that we were monitoring with a camera trap, showing a walking foraging behaviour in search of invertebrates (9) (Figure 2A), perching (2) or trying to catch prey (5). Despite this could be considered as isolated events, this behaviour was observed a lot of times during the study period, suggesting that these birds visit that place consciously (Table 1). They seem to actively look for this prey, walking next to the riverbank and catching them in the water when the level is low. After that, they usually move to a separate log to eat them. We recorded three events of successful predation and four attempts by at least two individuals (Figure 2B, Figure3). Since it is not easy to distinguish between individuals in this species, we assigned three codes to animals that we considered different basing on marks and colour.

Table 1: Events in which buzzards appear in the camera trap, supposed individuals and behaviours.

| Date | Hour | Individual |
|------------|----------|------------|
| 09/08/2021 | 18:06:41 | Bb_1 |

Table 1: Events in which buzzards appear in the camera trap, supposed individuals and behaviours.

| | | |
|------------|----------|------|
| 19/08/2021 | 14:36:53 | Bb_2 |
| 19/08/2021 | 15:26:00 | Bb_2 |
| 19/08/2021 | 16:50:00 | Bb_2 |
| 20/08/2021 | 15:39:01 | NA |
| 21/08/2021 | 14:19:56 | Bb_2 |
| 21/08/2021 | 15:01:00 | Bb_2 |
| 23/08/2021 | 10:23:33 | Bb_2 |
| 23/08/2021 | 13:25:00 | Bb_2 |
| 23/08/2021 | 13:50:00 | Bb_2 |
| 23/08/2021 | 15:20:00 | Bb_2 |
| 24/08/2021 | 15:27:25 | Bb_2 |
| 29/08/2023 | 13:13:59 | Bb_3 |
| 29/08/2023 | 14:00:43 | Bb_3 |
| 01/09/2021 | 18:33:33 | Bb_3 |
| 02/09/2021 | 17:56:01 | Bb_3 |

Discussion

We hypothesize that buzzards are taking advantage of the mating season of the crayfish when they are more visible, when the water level is a little bit lower, since the cameras were active the whole year and we only recorded this behaviour during this period. Crayfishes may suppose an important energy source during this part of the year, when the young buzzards are flying, since we detected the consumption of this crustacean by Eurasian otters (*Lutra lutra*) and American mink (*Neogale vison*), (that consume them almost year-round) but especially by red fox (*Vulpes vulpes*) that overlapped the consumption period with buzzards (Figure 4).

Conclusion

We describe a new food source and foraging behaviour by a generalist raptor, the common buzzard (*Buteo buteo*), contributing to the knowledge of the prey spectrum this species is capable of prey upon in its distribution range.

Figure captions

Figure 1: Study area in Western Iberia (A), in Salamanca province white line (B) and location of the camera trap in the middle of a riparian forest close to the Tormes river (C).

Figure 2: A) Foraging behaviour observed, with the common buzzard patrolling the riverbank looking for prey, including American crayfishes. B) Successful catch of an American crayfish.

Figure 3: Full predation sequence, where the buzzard captures the crayfish in the water and moves to a log to eat it.

Figure 4: American mink (A) and red fox (B) catching crayfishes during the same period as the buzzards.

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Conflict of Interest statement

The authors declare no conflict of interest.

Data Availability statement.

All data are contained within this manuscript and its associated tables.

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Figures
Figure 1

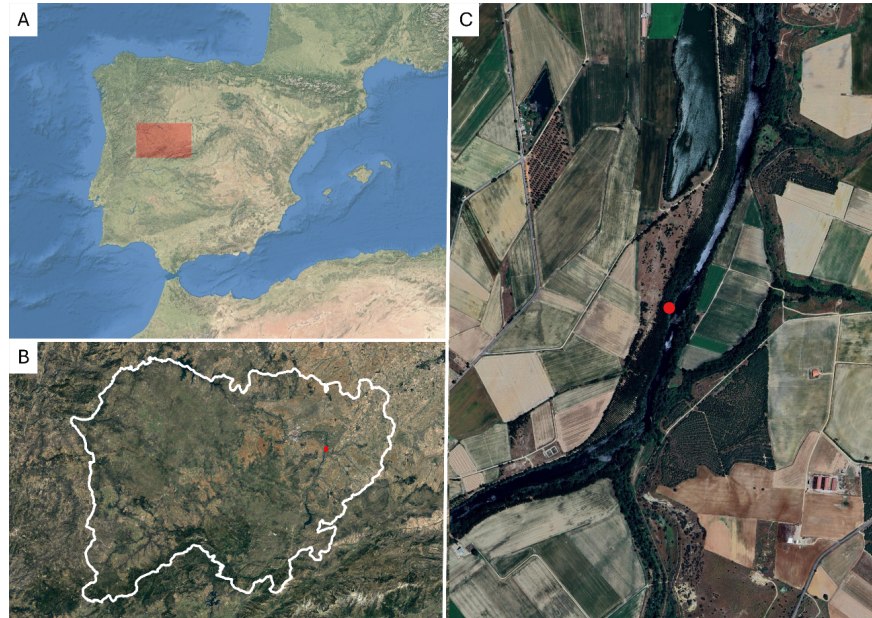


Figure 2

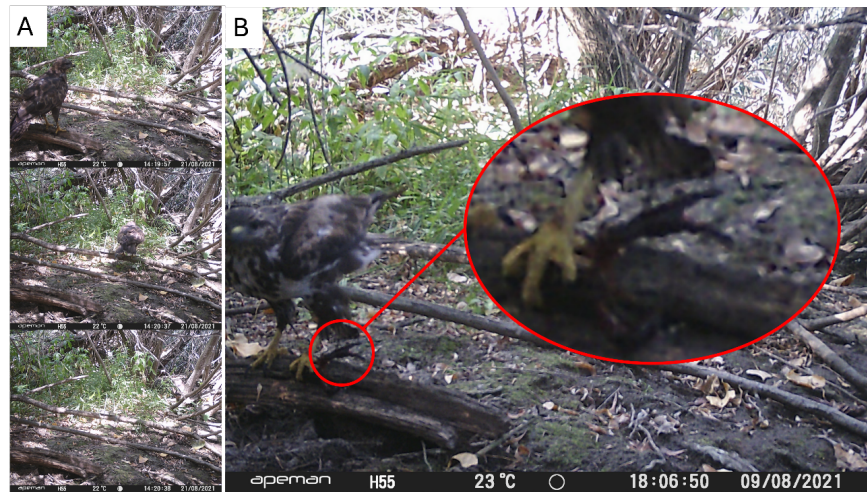


Figure 3



Figure 4



