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SHORT NOTE

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Snakes on the menu of free-range chickens: Incidents in smallholder traditional poultry farming systems in Greek rural areas

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INTRODUCTION

Snakes, as a taxonomically diverse group of reptiles, face predation risks from a wide range of vertebrate and invertebrate species (Schalk & Cove, 2018). Concurrently, the anthropogenic impact on snake populations, despite deviating from natural predation processes, is conspicuously widespread, evident through both direct killing, whether intentional (Larson et al., 2024) or unintentional (Zevgolis et al., 2023).

Beyond these threats, domesticated vertebrates with access to a wide range of food sources in their natural environment, such as the domestic cat, can also contribute to snake mortality (Dickman & Newsome, 2015). Another noteworthy domesticated vertebrate is the chicken *Gallus domesticus* L., 1758. Originating from the jungle fowl lineage (Lawal & Hanotte, 2021) this avian species has undergone significant dietary transformations since its ancestral days. In contemporary settings, domestic chickens' dietary habits are influenced by their living conditions and housing system. Compared to the predominantly plant-based diet of cereal grains, animal-based protein sources, soy and vegetable residues consumed by chickens in barns or industrial farming systems (Coletta et al., 2012; Bryden et al., 2021), free-range chickens exhibit a significantly more diverse diet (Singh & Cowieson, 2013), which can include seeds, fresh leaves and small stems from a wide variety of flora (Dal Bosco et al., 2014), as well as organic household waste. Additionally, free-range chickens adapt their diets to include a broad spectrum of fauna, including a substantial intake of invertebrates such as arthropods and earthworms (Clark & Gage, 1996) and vertebrates such as snakes.

Despite anecdotal reports suggesting such interactions, a lack of formal documentation of snake consumption by domestic chickens, particularly within free-range systems, has limited our understanding of this potential dietary behaviour. In this study, we provide six documented cases within the confines of smallholder traditional poultry farming systems.

MATERIALS & METHODS

Our study formed a component of the Amaltheia Network research programme to assess the losses and conservation opportunities of the indigenous productive and working animals in Greece. From 2012 to 2022 we investigated multiple smallholder traditional poultry farming systems across diverse regions in both the mainland and islands. Using a combination of photographic and observational methods, we documented predation events involving domestic chickens and snakes. Direct field observations were made during routine visits to poultry farms, where each predation event was recorded by documenting the date, location, species involved (both chicken and snake) and the observed behaviour of the chicken during the event. All field observations adhered to ethical guidelines for animal research and welfare, ensuring minimal disturbance to the natural behaviour of the animals under study.

RESULTS

Natrix natrix

On 26 August 2012, in a smallholder local bantam farm in the village of Lianokladi (Fthiotida), mainland Greece, we recorded a direct observation of predatory behaviour by a domestic chicken. The individual, a young female bantam, was observed preying upon a juvenile grass snake *Natrix natrix* in a grassy area using its beak (Fig. 1A–C). Upon approaching the scene, we observed the bantam seize the snake in its beak and retreat a short distance before stopping. The bantam then proceeded to subdue and kill the snake with several forceful pecks before initiating consumption. The breeding of poultry followed a traditional free-range, semi-enclosed farming method, with the birds belonging to the native Greek population of Aegina Bantam.

On 23 May 2014, in Proastio (Karditsa), mainland Greece, a hen was observed having killed and consumed a juvenile grass snake *N. natrix*, which it quickly swallowed when approached further. The poultry farming followed a

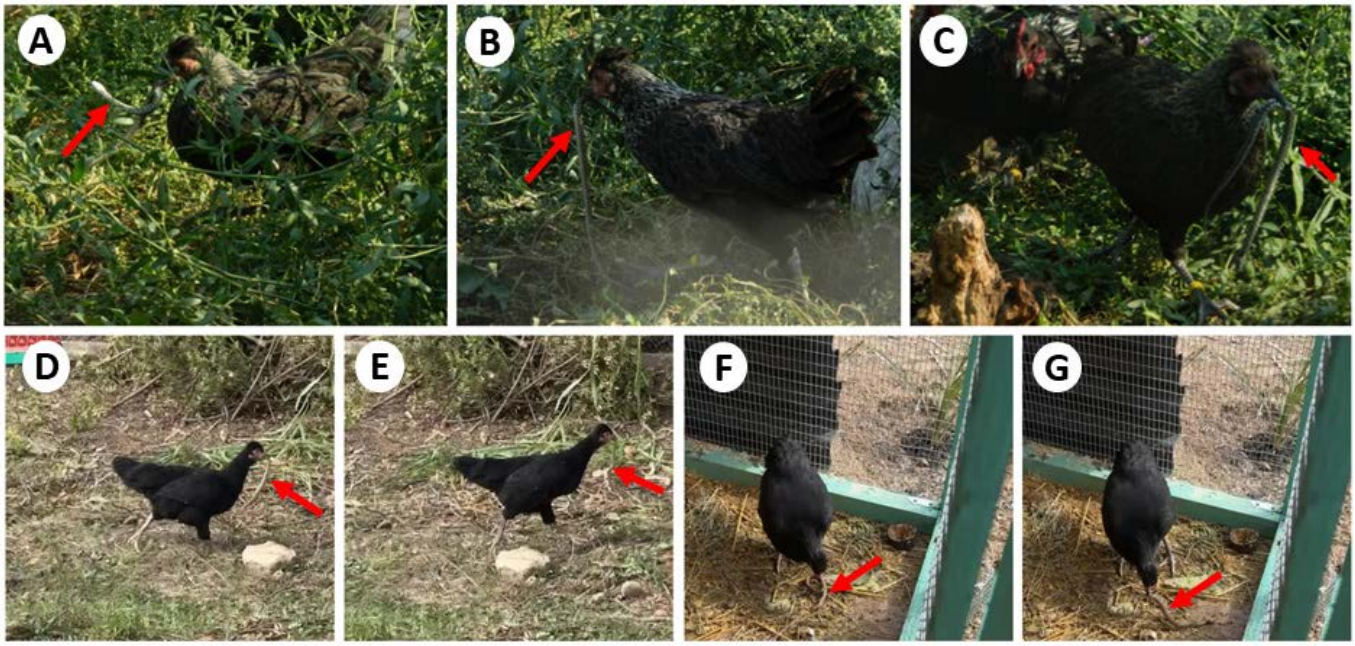

Figure 1. Sequential photographs of predatory behaviour by domestic chickens capturing- **A.–C.** A juvenile grass snake *Natrix natrix* in Lianokladi (Fthiotida), and **D.–G.** A juvenile nose-horned viper *Vipera ammodytes* in Rafina, Attica, mainland Greece. Red arrows indicate the positions of the snakes.

traditional free-range method within a large enclosed area with dense grassy vegetation, located within the settlement. The birds belonged to the local indigenous population of Thessaly Plain Chicken, which is bred in many rural villages, primarily in western Thessaly.

Malpolon insignitus

On 22 April 2013, in Megalo Evydrio (Larissa), mainland Greece, a hen was observed consuming a juvenile eastern Montpellier snake *Malpolon insignitus*, which likely had been killed moments before, as the snake still exhibited nervous reactions. Poultry farming followed a traditional free-range method, situated in an unfenced area near agropastoral facilities close to the settlement. The birds on the farm were hybrids of commercial poultry breeds as well as individuals belonging to the local native population known as the Thessaly Plain Chicken.

Dolichophis caspius

On 5 May 2013, in Sykia (Elassona, Larissa), mainland Greece, a hen was observed running with a small snake in its beak. The snake was alive and attempting to escape. When the hen stopped, it dropped the snake to the ground and attempted to kill it by striking it with its beak. An attempt to approach the hen revealed that the snake was a juvenile Caspian whipsnake *Dolichophis caspius*. The hen retrieved its prey and disappeared into a cluster of brambles *Rubus fruticosus*. The poultry farming followed a traditional free-range method, situated in an unfenced area on the outskirts of the settlement. The birds belonged to the local indigenous population of Potamia Chicken, which is bred in the area of Potamia, Elassona.

Xerotyphlops vermicularis

On 7 March 2019, in the broader area of Antissa, Lesvos, insular Greece, within a setting with free-ranging local chickens, a hen was observed executing a similar predatory behaviour. In this instance, the prey was a European blind snake *Xerotyphlops vermicularis*, and the hen employed the same procedure of killing and subsequent consumption.

Vipera ammodytes

On 27 February 2024, in the area of Rafina, Attica, mainland Greece, another instance of similar behaviour was observed at a farm raising local line chickens. A hen was observed killing and consuming a juvenile nose-horned viper *Vipera ammodytes* (Fig. 1D–G). Notably, the method employed by the hen in this case mirrored the behaviour observed in the other five incidents.

DISCUSSION

These documented instances of domestic chickens actively preying upon and consuming five different snake species (*N. natrix, M. insignitus, D. caspius, X. vermicularis* and *V. ammodytes*), present a noteworthy addition to our knowledge of predation dynamics within small-scale traditional farms, highlighting the diverse diet of free-range poultry. Moreover, the observed resilience of domestic chickens to the defensive strategies employed by the consumed snakes prompts intriguing questions about the coevolutionary dynamics between prey and predator within these ecosystems. For instance, while some snakes utilise foul odour and feigned death (e.g. *N. natrix*) (Hagman et al., 2015) or rely on bite-and-release tactics to escape, stand up, hiss and even pursue their attackers (e.g. *Malpolon* spp.) (Martín-Sierra et al.,

2018; Ballouard et al., 2022) to evade predation, chickens clearly have adaptive mechanisms to overcome these defences. Similarly, the jumping at the attacker, hissing, biting and tail waving of snakes such as *D. caspius* (Bjelica et al., 2024), or the venomous defence of *V. ammodytes* (Paolino et al., 2020), is likely not successful against the predatory prowess of chickens, at least in the instances we observed. It is noteworthy that, in most cases, the chickens involved were local populations from old traditional lines specific to each respective region, especially in Thessaly area.

The observed predation events contribute to our broader understanding of the intricate predator-prey dynamics that shape local ecosystems and the intricate relationships between domesticated animals and their environments. Further research, employing methods such as questionnaires, hold promise in revealing the frequency with which snakes or other reptiles are consumed by domestic chickens, to give a more nuanced understanding of their dietary patterns and ecological impact. Future research should strive to unravel the broader ecological implications of these findings, delving into the multifaceted interactions within rural landscapes and exploring potential parallels with issues related to super-predators, such as the domestic cat.

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