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Rare Records of Tropical Spiders Preying on Vertebrates in Southwest China

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ABSTRACT

We report four rare instances of spider–vertebrate predation documented at the Xishuangbanna Tropical Botanical Garden in Southwest China. The predatory events involved four spider species: *Nephila pilipes* (Nephilidae), an unidentified *Bowie* sp. (Ctenidae), *Heteropoda venatoria*, and *H. tetrica* (Sparassidae). The prey taxa included representatives from avian, reptilian (snake and gecko), and mammalian (shrew) classes. These unusual predation occurrences highlight previously underreported trophic interactions in Asia and underscore the potential impact of large spiders on vertebrate prey dynamics in tropical ecosystems. Notably, repeated avian predation by *Nephila pilipes* over a 3-day period provided valuable insights into spider feeding behavior. These findings expand current knowledge of spider predation on vertebrates and trophic roles, highlighting the ecological and conservation significance of large-bodied spiders in Asian tropical biodiversity hotspots.

1 | Introduction

Spiders predominantly prey on invertebrates, yet occasional predation on small vertebrates—such as birds, reptiles, amphibians, and mammals—has been documented in various parts of the world (Nyffeler and Vetter 2018; Wilder and Simpson 2022). Although such events are relatively rare, they provide valuable ecological insights into trophic interactions and predator–prey dynamics. A recent global review compiled more than 1300 instances of arthropod predation on vertebrates, with spiders accounting for over half of all recorded events (Valdez 2020). Yet, reports from tropical Asia, and particularly China, remain limited (Walther 2016). Walther (2016) noted the surprising paucity of Asian records in earlier literature (only three cases) and subsequently compiled 56 instances of birds caught in spider webs across Asia, suggesting that these interactions may be more common regionally than previously recognized.

The Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences (XTBG) (N 21°55.77′, E 101°15.12′), is located in Yunnan Province, Southwest China, at the confluence of the Indo-Burma and South China biodiversity hotspots. Spanning 1125 hectares, XTBG hosts an exceptionally diverse arachnid fauna, with over 920 spider species from 70 families (Mi et al. 2024). In 2024 alone, six new genera and twenty new species of Araneidae were described from XTBG, underscoring its taxonomic and ecological significance. Given this high spider diversity, rare predation events may be more readily observed

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Summary

Spiders are usually known for feeding on insects, but some large species are also capable of hunting small vertebrates. In this study, we recorded four rare cases of spiders preying on vertebrates at the Xishuangbanna Tropical Botanical Garden in Southwest China. These events involved three spider families and included a blind snake, a tiny shrew, a gecko, and a small bird. One particularly striking case showed a giant golden orb-weaver feeding on a bird for three consecutive days, revealing how spiders maximize energy from large prey. These observations expand our knowledge of spider diets and demonstrate that large spiders can occasionally influence populations of birds, reptiles, and mammals. While uncommon, such events highlight the broader roles of spiders in tropical food webs and the ecological importance of conserving their habitats in these highly biodiverse regions.

with systematic monitoring. In this study, we report four uncommon cases of spider–vertebrate predation recorded at XTBG between 2022 and 2023. These records provide novel insights into the trophic interactions and ecological roles of large-bodied spiders in tropical Asian ecosystems.

2 | Observations

We detail four cases chronologically below, including the spider and prey species involved and notable predation behaviors (photographic evidence in Figures 1 and 2).

2.1 | Case 1: *Bowie sp*. Preying on a Brahminy Blind Snake

On August 5, 2022, at approximately 21:50, a large wandering spider was observed in the riparian rainforest of XTBG dragging a writhing snake across a leaf. The predator was identified as a female *Bowie sp*. (family Ctenidae), with an estimated body length of approximately 3 cm. The prey was a Brahminy blind snake (*Indotyphlops braminus*), about 10 cm long, nonvenomous, and characterized by glossy, dark brown to black coloration (Figure 1a). Unlike web-building spiders, the ctenid did not use a web but actively attacked, biting the snake's head and immobilizing it with its fangs. After a brief struggle, the snake was subdued and dragged toward cover. This observation represents the first documented record of a ground-hunting ctenid spider preying on a snake in Asia, filling a notable geographic gap in the global literature, where such interactions have primarily been reported in the Americas and Australia (Nyffeler and Gibbons 2021).

2.2 | Case 2: *Heteropoda tetrica* Preying on an Etruscan Shrew

On August 19, 2023, at approximately 00:30, a large huntsman spider was observed attacking a small mammal at the base of a leaf stem in a ravine forest. The predator was a female *Heteropoda tetrica* (family Sparassidae), with a leg span of about

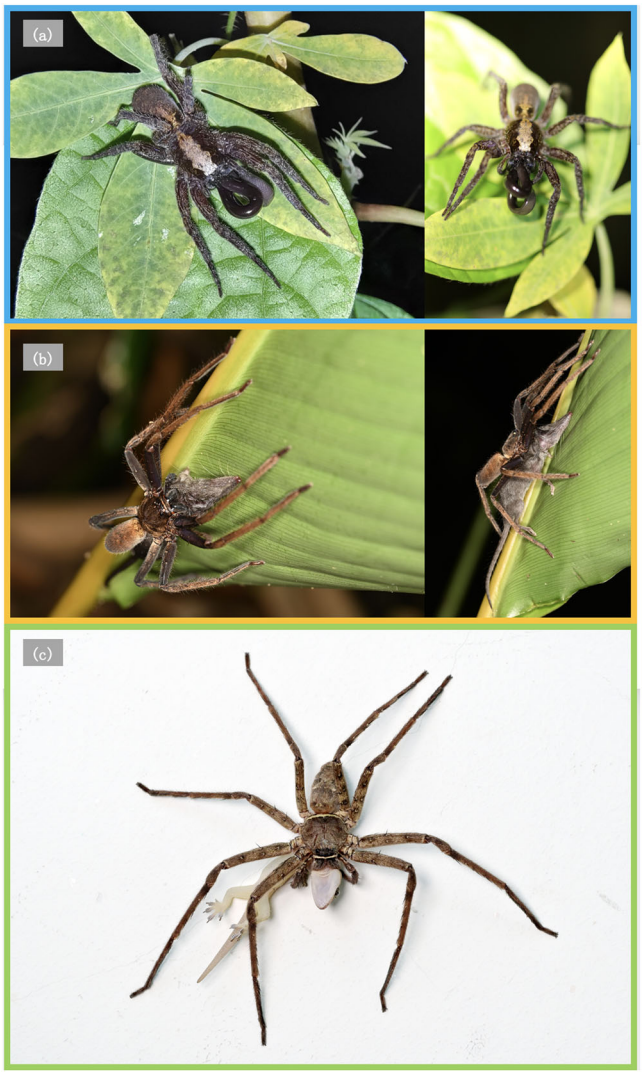

FIGURE 1 | Photographic documentation of three instances of spider–vertebrate predation in XTBG. (a) *Bowie* sp. biting a Brahminy blind snake (*Indotyphlops braminus*); (b) *Heteropoda tetrica* seizing an Etruscan shrew (*Suncus etruscus*); (c) *Heteropoda venatoria* gripping a Bowring's gecko (*Hemidactylus bowringii*).

11 cm. The prey was identified as an Etruscan shrew (*Suncus etruscus*, family Soricidae), approximately 6 cm in body length (excluding tail)—one of the world's smallest mammals. The spider's fangs were embedded in the shrew's neck, and the prey remained motionless for over 10 min (Figure 1b), suggesting envenomation and the injection of digestive enzymes. This observation expands the known prey spectrum of Chinese huntsman spiders to include small mammals, providing a rare record of sparassid predation on vertebrates in tropical Asia.

2.3 | Case 3: *Heteropoda venatoria* Preying on a Bowring's Gecko

On September 16, 2023, a female *Heteropoda venatoria* (Sparassidae) was observed on a hotel wall near the XTBG suspension bridge, clutching a gecko in its chelicerae (Figure 1c). The spider measured about 3 cm in body length and displayed the species' characteristic white facial stripe. The prey

FIGURE 2 | Predation sequence of a white-rumped munia (*Lonchura striata*) by a giant golden orb-weaver (*Nephila pilipes*) at XTBG. (a) Day 1: Spider wrapping the bird's wing and biting its thigh; (b) Day 1: Bird fallen from the web, showing visible leg wounds; (c) Day 2: Spider continuing to wrap the carcass and feeding on the head; (d) Day 3 (morning): Spider still feeding on the prey; (e) Day 3 (afternoon): Bird carcass fallen to the ground with evident wounds to the head and thoracic region.

was a Bowring's gecko (*Hemidactylus bowringii*, family Gekkonidae), approximately 5 cm long (excluding tail). At around 23:00, the gecko was seen hanging limp from the spider's grasp, indicating successful envenomation. The spider remained stationary while feeding, consuming the soft abdominal tissues for at least 15 min. By the following morning, skeletal remains confirmed complete consumption of the prey.

2.4 | Case 4: *Nephila pilipes* Preying on a White-Rumped Munia (Small Bird)

On November 29, 2023, at approximately 11:18 AM, a rare instance of avian predation by a spider was observed at the edge of a limestone forest patch within XTBG. In a sunlit, open area, a female *Nephila pilipes* (giant golden orb-weaver; body length: ~5 cm) was found at the center of her large vertical orb web, actively entangling a small bird that had become ensnared in the silk. The prey was identified as a white-rumped munia (*Lonchura striata*), a small passerine species approximately 7 cm in length. The bird appeared to have flown inadvertently into the web and was unable to free itself from the high-tensile-strength silk. Upon initial observation, the spider had already partially wrapped the bird's body in silk and was attempting to bite its thigh (Figure 2a). Shortly afterward, the bird fell out of the web to the ground below. Field inspection revealed the carcass was already stiff and bore visible leg wounds (Figure 2b). The carcass was placed back onto the web to see if the spider would continue feeding. On the following day (November 30), at around 16:00, the spider was observed reinforcing the silk around the bird and feeding on its head region (Figure 2c). This feeding behavior continued into a third day: on December 1 at 11:00, the spider was again seen biting the prey's head (Figure 2d). By 13:11 that day, the bird carcass had fallen to the ground, with extensive injuries to the head and thorax (Figure 2e). A subsequent inspection on December 2 found the spider no longer present, with only remnants of the partially damaged web remaining.

3 | Discussion

The predatory interactions between spiders and vertebrates documented in this study provide valuable insights into the ecological roles of large-bodied spiders within tropical Asian ecosystems. The three spider families documented—Ctenidae, Sparassidae, and Nephilidae—are all recognized for their capacity to engage in vertebrate predation under favorable conditions (Nyffeler and Gibbons 2022; Valdez 2020). Collectively, the four cases presented here illustrate distinct modes of predation and broaden our understanding of predator–prey associations involving spiders and their vertebrate prey in Asia.

Case 1 documents a nocturnal, ground-hunting ctenid spider (*Bowie sp.*) capturing a Brahminy blind snake. Records of spider–snake predation have previously been concentrated in

the Americas and Australia (Nyffeler and Gibbons 2021), making this the first confirmed instance from Asia involving a ctenid. This fills a notable geographic gap in the global literature and contributes novel information to the natural history of both predator and prey.

Case 2 involved *Heteropoda tetrica* preying on an Etruscan shrew, representing a striking example of spider predation of a warm-blooded mammal. Such occurrences remain exceedingly rare and underscore the potency of spider venom against endothermic prey (Nyffeler and Gibbons 2022). As generalist predators, huntsman spiders in the genus *Heteropoda* have been recorded feeding on a wide range of taxa, and our finding expands their known dietary breadth in China (Nyffeler and Gibbons 2022; Valdez 2020).

Case 3 describes *Heteropoda venatoria* consuming a Bowring's gecko, providing additional evidence of Sparassidae targeting small reptiles. While spider–lizard predation has been well-documented in the Neotropics and Andes—often involving ctenids and theraphosids (Reyes-Olivares et al. 2020)—comparable cases in tropical Asia remain scarce. This record demonstrates that similar interactions also occur in Asian systems, albeit involving different predator (Sparassidae) and prey (Gekkonidae) families. Notably, some sparassids, such as *Damastes* in Madagascar, have been reported to build leafy retreats that act as traps for frogs seeking shelter (Fulgence et al. 2021), suggesting that vertebrate predation by spiders can extend beyond opportunistic behavior and include more specialized strategies.

Case 4 describes prolonged avian predation by *Nephila pilipes* on a white-rumped munia. This finding aligns with previous reports of large orb-weavers occasionally ensnaring birds (e.g., Brooks 2012; Walther 2016), but the multi-day feeding behavior we documented here offers particularly rare insights into how these spiders maximize the nutritional value of exceptionally large prey. The size of the munia falls within the known vulnerability range of birds captured in orb webs (avianres. biomedcentral. com), and the extended feeding period reflects the energetic benefits associated with such rare events (Nyffeler and Gibbons 2021).

Comparing our findings with global patterns reveals notable consistencies and contrasts. Amphibians, particularly frogs, represent the most frequent vertebrate prey of spiders worldwide, accounting for approximately 40% of reported cases (Valdez 2020). In contrast, our observations included avian, reptilian, and mammalian prey. The absence of amphibians in our records is likely indicative of local prey availability or the low likelihood of witnessing such rare events, rather than a fundamental difference in spider dietary habits. Nevertheless, by documenting spider predation across three vertebrate classes that are less frequently reported, our study contributes valuable records to the global data set.

The spiders involved in our observations (Ctenidae, Nephilidae, and Sparassidae) are recognized as habitual or capable vertebrate predators (Nyffeler and Gibbons 2022). Their foraging strategies align with global patterns: orb-weaving spiders, such as *Nephila*, opportunistically ensnare aerial prey, while cursorial hunters, like sparassids and ctenids, ambush surface-dwelling vertebrates (Valdez 2020). Similar interactions have been systematically documented in the Neotropics. For example, von May et al. (2019) recorded 15 instances of large arthropods preying on vertebrates in lowland Amazonian Peru—including frogs, lizards, snakes, and a mammal— highlighting the important ecological role of invertebrate predators in shaping tropical food webs in the New Tropics.

Whether interactions between spiders and vertebrates, particularly rare predation events, significantly influence the structure and functioning of ecosystems in tropical Asian forests warrants further investigation. Empirical studies from Neotropical forests have shown that predatory spiders can exert considerable top-down pressure on vertebrate populations, at times surpassing bottom-up effects such as food availability (Folt and Guyer 2021). This suggests that if similar dynamics operate in tropical Asian ecosystems such as Xishuangbanna, reductions in habitat complexity or leaf litter, through seasonal changes or anthropogenic disturbance, could heighten encounters between spiders and vertebrates. Although spiders are primarily regarded as regulators of insect populations, growing evidence suggests that they may also occasionally impact vertebrate populations and contribute to energy transfer across trophic levels. In specific microhabitats, large spiders can significantly affect vertebrate mortality; for instance, *Latrodectus* colonies have been documented capturing dozens of snake hatchlings at a single site (Nyffeler and Gibbons 2021). Our observation of *Bowie* sp. preying on a blind snake fits this pattern, demonstrating that spiders can indeed be predators of small snakes. More broadly, the ability to exploit vertebrate prey—though rare—may confer nutritional and evolutionary advantages, as large prey items offer high energetic returns that support spider survival in resource-limited environments (Nyffeler and Gibbons 2021). In Case 4, the prolonged feeding of *Nephila pilipes* on a munia over three consecutive days illustrates this point, suggesting that a single large prey item may sustain an orb-weaving spider over multiple days.

Our observations also illustrate how invertebrate–vertebrate predation transcends traditional taxonomic boundaries, adding further complexity to tropical food webs. Spiders, despite their small size, may functionally overlap with snakes, birds, or small mammals as occasional vertebrate predators. This trophic plasticity implies potential evolutionary feedback: spiders benefit from potent venom, strong silk, and large body size, while prey species may evolve avoidance behaviors or greater maneuverability (Blackledge 2012; Nyffeler and Gibbons 2022). Thus, energy and nutrient flow in tropical ecosystems may operate not only in the familiar top-down direction from vertebrates but also in the opposite direction, from invertebrates upward, reinforcing the intricate nature of ecological interactions.

From a conservation perspective, recognizing spiders as occasional vertebrate predators broadens our understanding of their ecological significance. Arthropod predators—including spiders, scorpions, mantids, and centipedes—are often overlooked in conservation frameworks, yet they may influence vertebrate community dynamics, especially among juvenile or small-bodied populations (Valdez 2020). Our observations support this notion, suggesting that even rare events may carry ecological weight in a hyper-diverse system like Xishuangbanna. Therefore, preserving the habitats of large spiders contributes to

arthropod biodiversity and also to ecosystem processes that maintain trophic balance. As Greenstone (1999) proposed, integrating field observations with prey-remains analysis and molecular gut-content methods can yield more comprehensive insights into spider diets. Future research efforts—including continuous video monitoring and eDNA analyses—could enhance our understanding of spider–vertebrate interactions in biodiversity hotspots. Additionally, engaging naturalists and citizen scientists can help build broader datasets of rare predation events, refining our comprehension of the ecological roles spiders play in tropical ecosystems.

Author Contributions

Wanlu Liu: conceptualization, methodology, data curation, validation, investigation, writing – original draft, visualization, writing – review and editing. **Jin Chen:** writing – review and editing. **Cheng Chen:** writing – review and editing, investigation, data curation. **Ming Tang:** investigation. **Jiabin Li:** validation. **Minghui Yuan:** investigation. **Yan Xu:** investigation.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

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