

# Don't leave your socks lying around: if the Jay sees them, you're dead meat!

## On the Purseweb spider (*Atypus affinis* Eichwald, 1830) as prey of the Eurasian jay

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### Abstract

The present paper describes peculiar observations made by the author on Purseweb spiders (*Atypus affinis* Eichwald, 1830), inhabiting his home's plot in Bousval (Belgium), and which occasionally succumb to predation by Eurasian jays (*Garrulus glandarius* Linnaeus, 1758).

### Samenvatting

In dit artikel beschrijft de auteur opvallende observaties van predatie van Gewone mijns핀 (*Atypus affinis* Eichwald, 1830) door Gaaien (*Garrulus glandarius* Linnaeus, 1758) in de tuin van zijn huis in Bousval (België).

### Résumé

Le présent article décrit des observations inédites faites par l'auteur sur des mygales à chaussettes (*Atypus affinis* Eichwald, 1830), vivant dans le terrain autour de sa maison à Bousval (Belgique), et qui succombent parfois à la prédation des geais des chênes (*Garrulus glandarius* Linnaeus, 1758).

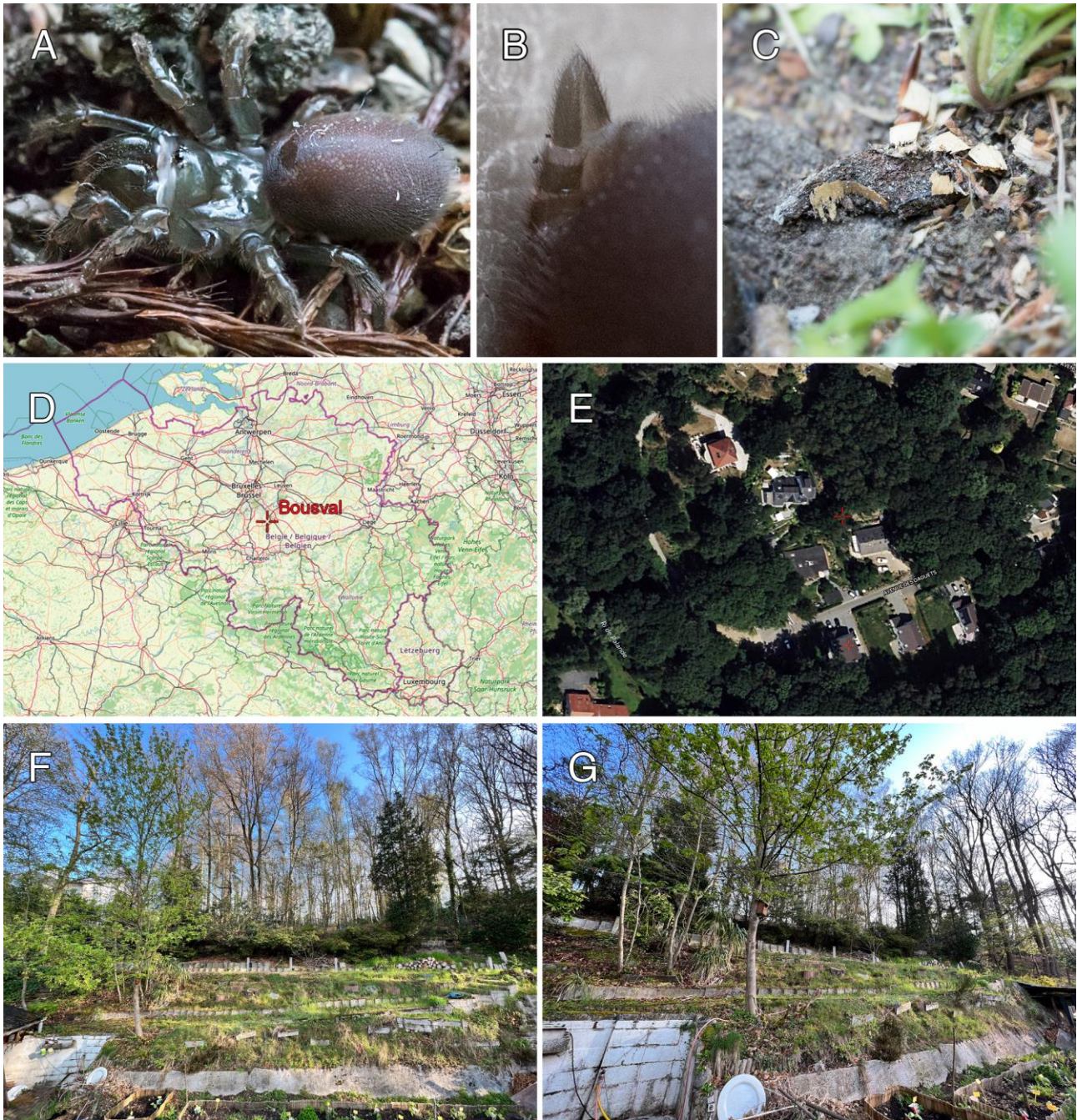
### Introduction

The Purseweb spider genus *Atypus* Latreille, 1804 includes two mygalomorph species that occur in Belgium. *Atypus piceus* (Sulzer, 1776) is restricted to areas related to exposed, sunny environments such as dry meadows and slopes with scarce vegetation (HENDRICKX et al. 2002; IORIO 2006; HENRARD 2010; KEKENBOSCH 2021, 2023). *Atypus affinis* Eichwald, 1830 (Fig. 1A) also likes thermophilic areas with scanty ground cover. However, it seems to accommodate a wider variety of habitats in Europe: mainly in dry, sparse forests, limestone grasslands, and heathlands, but also in dunes and rocky areas such as cliffs scree, or quarries (KRAUS & BAUR 1974; PEDERSEN & LOESCHKE 2001; ŘEZÁČ et al. 2007; ŘEZÁČ & HENEBERG 2014; BRITISH SPIDERS 2023a). The latter species is quite common in Belgium (BARA 1991; HIDVÉGI 1999; KEKENBOSCH 2010, 2011; KEKENBOSCH & SEGERS 2013) and is often found aggregated in dense colonies (ENOCK 1885, 1892; BROEN 1965; KRAUS & BAUR 1974; HIEBSCH & KRAUSE 1976; CANARD 1986; KEKENBOSCH 2011). However, its hidden, underground lifestyle makes it a rarely seen species. Purseweb spiders are known for constructing a peculiar silk-lined burrow as a retreat, which looks like a sock-shaped tube (see detailed views in LEQUET 2015, 2021). The principal part of the silk tube is hidden underground, and the outside sock-shaped portion is covered with vegetation debris, making it well camouflaged on the surface. The spider patiently waits in ambush for a prey crawling onto the tube, and then bites the prey item through the silk. When the prey is subdued, the spider tears its web to pull the stunned insect inside. The spider returns a few moments later to discreetly suture the torn sock behind it. I personally recorded very similar observations to those illustrated by BRISTOWE (1958) and described by ENOCK (1885), and these data are accessible on the ARABEL YouTube channel (<https://youtu.be/FDrahMKbgVA>). The females usually do not leave their sock-shaped retreat, living inside their tube in the soil for almost a decade (BRISTOWE 1933, 1958; CANARD 1986). Only males leave their tube-



shaped retreat, following maturity, searching for a female for mating. Males and females can be found together in her tube, mostly throughout autumn and winter (BRISTOWE 1933; CLARK 1969; KEKENBOSCH 2010, 2011).

Spiders are known to be a key component of ecosystems, being predators of insects mainly, and also being prey for many other animals. However, with such a life buried and barricaded into the ground, what could be a predator of the Purseweb spider? This short note relates to the observations of Purseweb spider *Atypus affinis* as prey of the Eurasian jay, *Garrulus glandarius* (Linnaeus, 1758).



**Figure 1A-G.** *Atypus affinis* Eichwald 1830 found in Bousval (Belgium) with details on its habitats. **A.** Female specimen found in the slope. **B.** Spinnerets of the spider, dorso-lateral view. **C.** Visible, upper part of the cryptic sock-shaped ambush tube of *A. affinis* found in the slope. **D.** Location of Bousval in Belgium. **E.** Aerial view of the locality, showing a wooded rural area. **F-G.** Part of the plot with the habitats consisting of a slope in the foreground and the small woodland above, at the background (photos taken in mid-April 2023). Photos A-C, F-G: © Arnaud Hennard; Maps D-E were obtained with <https://satellites.pro/> © OpenStreetMap contributors.).



## Material and methods

The observations of Eurasian jay predation behavior on *Atypus affinis* were mostly punctual (Table 1) and were sometimes recorded (photos and videos) using smartphones (Samsung Galaxy A12 (default setting) and Apple iPhone 13 Pro (in HD (1920x1080) or 4k (3840x2160))). All the observations were made within the author's property at Bousval, in Belgium (50°38'51.2"N 4°31'38.4"E) (Figs 1 D-G). To differentiate *A. affinis* from *A. piceus*, one of the main distinguishing characters is found in the conformation of the posterior spinnerets. The posterior spinnerets are clearly tri-segmented in dorsal view in *A. affinis* (Fig. 1B) whereas appearing quadri-segmented in dorsal view in *A. piceus* (see HENDRICKX et al. 2002; HENRARD 2010; NENTWIG et al. 2023). Two female specimens of *A. affinis* were excavated from the ground, and their identifications were confirmed (while still alive) using a Zeiss Stemi 2000 stereomicroscope and with photographs taken with a Canon reflex 5D mark III, Canon Macro 100mm IS USM F/2.8L lens and Canon Speedlite 550EX Flash with a homemade diffuser (Figs 1A-B). Both specimens were then released in the author's garden.

## Results

A relatively abundant population of *Atypus affinis* occurs in Bousval, within the property of the author's home (Fig. 1). The plot can be divided into three parts: a garden, an exposed slope with short vegetation, and a wooded part at the top. The small woodland is mainly composed of birch, beech, and oak that grow on a sandy soil. The Purseweb spiders are distributed on the slopes and in the small woodland. The first observations of entire or pieces of *Atypus* sock-shaped tubes, found lying on the ground, were made in mid-April 2020. These empty socks were found on the floor or in elevated supports such as on logs, or path borders (Figs 2A-K). Most of the observations were made in April-June 2020-2023, with a punctual observation on February 19, 2023 (see Table 1).

The first-ever evidence was filmed by my wife, Oksana Kuznetsova, on April 16, 2021, with her Samsung smartphone (See Online Appendix) while citing: "The Jay seems to eat a giant earthworm!". I immediately knew that it was not: we had finally found the culprit of the unearthed *Atypus* socks! A year later, during the same period (May 28, 2022), a not-so-shy jay could be approached and filmed for a longer time, showing more clearly how it detects and catches its prey (Figs 3A-C, and Online Appendix).

**Table 1:** List of records of sock-shaped tubes seen out of the ground and Eurasian jay predating on *Atypus*.

Dates	Records - Observations
10/06/2020	photos of unearthed sock-shaped tube laying on the floor (Figs 2A-D)
20/06/2020	photos of unearthed sock-shaped tube abandoned on a log (Fig. 2E)
04/04/2021	photos of unearthed sock-shaped tube laying on the floor (Figs 2F-G)
16/04/2021	first recorded videos of a Jay predating on <i>Atypus</i> spiders (Online appendix)
07/05/2021	punctual observation of a Jay predating <i>Atypus</i> spiders and taking the tube up a tree
28/05/2022	recorded videos of a Jay predating on <i>Atypus</i> spiders (Online appendix)
28/05/2022	photos of unearthed sock-shaped tube laying on the floor and on stair's border (Figs 2H-I)
19/02/2023	punctual observation of a Jay predating <i>Atypus</i> spiders and taking the tube up a tree
10/04/2023	photos of unearthed sock-shaped tube laying on the floor (Figs 2J-K)

## Discussion

The Eurasian jay is known to eat acorns, which are its staple diet for much of the year, and it thereby plays an important role in the dispersal of tree species such as *Quercus* (BOSSEMA 1979; HERRERA 1989; GOSLER 1993; CLAYTON et al. 1996; PEREA et al. 2011; KUREK et al. 2018; MITRUS & SZABO 2020). However, the Jay is omnivorous and consumes other food resources: a wide range of arthropods and, less often, bird eggs, nestlings, and



small rodents (HOLYOAK 1968; CRAMP 1994; MÄCK 2006). It is known that the use of animals as a food source in seed-feeding birds occurs particularly during the breeding season (DÍAZ 1996; MORRIS et al. 2005; HART et al. 2006; DOUGLAS et al. 2012; MCHUGH et al. 2017). My observations of Jays catching the Purseweb spiders in my garden seem to perfectly correspond with the breeding season of the bird, in late spring.



**Figure 2:** Records of *Atypus*' sock-shaped tubes found unearthed, laying on the floor, or on elevated support. **A-D.** Observations of June 10, 2020. **E.** Idem, June 20, 2020. **F-G.** Idem April 04, 2021. **H-I.** Idem, May 28, 2022. **J-K.** Idem, April 10, 2023. **L.** Similar observations made by André Lequet on August 15, 2015, at Treillières, France (see in the text for more details). Photos: A-K © Arnaud Henrard; L © André Lequet.

Both parents feed and care for the chicks, which can be 5 to 7 in number on average (once a year), during 19 to 23 days in the nest and again six to eight weeks after having fledged out of the nest (CRAMP 1994). The food for feeding nestlings consists mainly of arthropods, especially insects and their larvae (such as defoliating caterpillars), mostly taken from the canopy layer of woodland trees (OWEN 1956, BOSSEMA 1979). Spiders appear to be an important source of food too for birds during the breeding season (GAJDOŠ & KRISTÍN 1997; NAEF-DAENZER ET AL. 2000; PAGANI-NÚÑEZ et al. 2017; NYFFELER et al. 2018) and they also seem to be among the abundant prey captured by adult Jays to feed their young chicks (HOLYOAK 1968, EJGELIS 1965,



MÄCK 2006). However, no detailed information on the identity of the preys of these "spider-eating Jays" could be found. Similarly, the difficulty in finding precise identities of predators in the literature also applies to *A. affinis*. Although Purseweb spiders are redoubtable predators, they are also sometimes cited as being the prey of other arthropods and small vertebrates, including mammals or birds (NEWTON 2008, BANDAR 2012).



**Figure 3:** Screenshots of the Online Appendix video showing an Eurasian jay catching a Purseweb spider (black arrow), the 4<sup>th</sup> of June 2022 in Bousval (Brabant-Wallonigs, Belgium). **A.** Jay's target in sight, *Atypus* retreat being somewhere between the tree base and the garden stair's border (red arrow). **B.** Digging up the sock-shaped tube of the *A. affinis* individual. **C.** Entire sock-shaped tube unearthed. **D.** The silk tube unstitched and the spider collected (black arrow). © Arnaud Henrard.

Among insect predators, the pompilid wasps of the genus *Aporus* Spinola, 1808 are known to hunt *Atypus* species (ELSE 1975; OEHLKE & WOLF 1987; EDWARDS 1997; WIŚNIEWSKI 2009; GERTH et al. 2012). *Aporus unicolor* Spinola, 1808 is especially known to hunt *A. affinis* (ELSE 1975; OEHLKE & WOLF 1987; EDWARDS 1997; GERTH et al. 2012). However, the wasp does not unearth the socked tube. Instead, the wasp possesses specialized, strongly developed forelegs for breaking into the tube silk. The pompilid stings and paralyzes the mygalomorph spider, which is then used as a food host for the larva. The socked tube retreat remains intact, or almost.

Concerning larger animals, however, I've struggled to find specific information on the identity of any bird species that would prey on Purseweb spiders. My records seemed almost unprecedented. However, interestingly, some very similar observations were done by David Trunecka in Hampshire (England) and published in the Spider Recording Scheme News N°75 (TRUNECKA 2013) and also reported in the N°76 (HARVEY 2013). Having also the spider *Atypus affinis* in his garden, Trunecka discovered, in mid-May 2013, several collapsed webs dispersed across his garden. He has never properly seen the spiders being predated, the facts probably occurring very early in the morning. However, he strongly suspected Blackbirds (*Turdus merula* Linnaeus, 1758) pecking at the tube webs. Indeed, some years ago, in springtime, he describes having seen flying away a blackbird carrying off a collapsed tube in its beak, hypothesizing it was for nest building.

Another comparable case was observed by André Lequet on August 15, 2015, at Treillières, located slightly north of Nantes (Loire-Atlantique, France). LEQUET (2015) describes a colony of *Atypus* installed in a very narrow flower bed of perennials adorning the west gable of his garage. That day, he discovered some *Atypus*

retreats on the ground and counted, in a time-lapse of 48 hours, no less than 22 unearthed "socks" (Fig. 2L). Having never observed Eurasian jays around his home, he also suspected the Blackbird of being the culprit of this predatory event. The bird probably took advantage of particularly abundant rains in this period, and the waterlogged ground facilitated the extraction of the silk tubes containing the spiders. To his knowledge, such an event had never happened before and did not happen again (André Lequet, pers. comm., 2023).

In addition to these testimonials, Richard C. Gallon reported an interesting case, which comprises peculiar observations from the prominent limestone headland of Great Orme on the north coast of Wales, located in the seaside town of Llandudno, in 1998 on the 1st of June (GALLON 2001, see also the note in BRITISH SPIDERS 2023b). He described having come "across 13 detached, earth-encrusted, silk tubes which were scattered on the surface of a 70° slope at the side of a south-westerly facing footpath". Due to the presence, in the surroundings, of small soil mounds hiding underlying silk-lined tubes, he suggested it was the result of a behavior of "concerted burrow excavation and enlargement, perhaps prior to molting". It may be now more probable that his observation was the result of bird pickings and the small soil mounds represented the luckily escaped spiders reconstructing their damaged retreats, which were torn and not wholly unearthed by the bird(s).

Eventually, some nice catches were documented by the nature photographer Thomas Hinsche, in the Mittelbe Biosphere Reserve, a protected region located in the state of Saxony-Anhalt in Germany. He photographed the Eurasian hoopoe (*Upupa epops* Linnaeus, 1758) capturing and feeding chicks with Purseweb spiders. His splendid photographs can be seen on his website NATURFOTOGRAFIE (<http://www.naturfotografie-hinsche.de/>).

In Bousval, Eurasian jays could be observed on several occasions, each time in late spring, pecking and pulling up the tube webs from the ground. The remaining web, entire or in scraps, was often abandoned near the original hole. Sometimes, the Jays utilized a raised support, such as a log (Fig. 2E) or a border (Fig. 2H), to extract the spider from the tube. On some occasions, the bird was seen flying away in a tree with the freshly unearthed sock and, sitting on a branch, he decorticated the web to reach the spider. It is absolutely remarkable to note how easily the Jays in Bousval can trace such cryptic retreats of *Atypus* and dig them up from the soil, knowing how extremely delicate the silk tube can be (ENOCK 1885), even if, in this case, the sandy substrate helps. Indeed, that would probably be much more difficult to extract the tube from the soil in south-exposed dry meadows on rocky slopes.

The intensity of the observed predation activities of the Eurasian jay on the Purseweb spiders typically corresponds to the breeding and parental care period, occurring during mid- to late spring. Here, in the relatively small plot, all conditions seem to be met to make such improbable observations possible. Indeed, both species seem linked to similar habitat: *Atypus affinis* often inhabits sparse dwarf dry forests, usually those dominated by oaks (ŘEZÁČ & HENEBERG 2014), whereas the main food of the Jay throughout the year is the oak acorns and other achenes. Although the Jay is known for its rather timid nature, when feeding the chicks, the adults seem very preoccupied in the search for food. Therefore, the probability of observing this predation behavior, i.e. on the Purseweb spider, which may be unique to Jays of the region, was undoubtedly made easier.

## Conclusion

Although most of my observations and records were occasional and not related to a rigorous study, they were all made during spring except for an outlying observation in mid-February 2023. Despite its underground hiding place, it appears that different species of birds have learned very well how to flush out the Purseweb spiders. However, such acts seem to be rarely observed, and it is unclear whether this behavior is regular among these birds, particularly the Jay as discussed here. The global decline of insect populations (HALLMANN et al. 2017; VOGEL 2017; SÁNCHEZ-BAYO & WYCKHUYS 2019; MØLLER 2019, 2020), combined with the large amount of food needed for the growth of Jay juveniles (EJGELIS 1965) may be a hypothesis to explain the apparition of new abilities for the parents to find peculiar sources of food. Undoubtedly, more dedicated studies are needed to answer these questions and determine if this predation behavior is common or, on the contrary, unique and restricted to a small part of Jays' population in Belgium.

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The **Online Appendix** can be consulted here: <https://youtu.be/YaWeryGRMbs>

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