Violet Carpenter Bee *Xylocopa violacea* nesting in Norfolk

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Introduction

In spring and summer 2025, a Violet Carpenter Bee *Xylocopa violacea* (Linnaeus, 1758) of unknown origin nested in our garden in south-west Norwich, Norfolk, UK, and successfully reared at least four adult offspring. This unusual event represents to our knowledge the first definite record of *X. violacea* nesting in Norfolk, and provided us with the opportunity to make detailed observations of the nesting cycle of this scarce but increasing species in its recent British range (Figs. 1, 2).

With its massive size, intensely black body coloration, blackish-brown wings reflecting a shimmering metallic blue, deep buzz in flight, and confiding nature as it visits garden flowers, *X. violacea* is a spectacular and attractive insect. The genus *Xylocopa* (large carpenter bees) occurs worldwide and comprises several hundred species (Gerling *et al.*, 1989), nine of which occur in Europe, where their distribution has a southern bias (Michez *et al.*, 2019). *X. violacea* is a solitary (non-social) species forming a familiar member of the continental bee fauna (e.g. Müller *et al.*, 1997; Bellmann, 2019; Michez *et al.*, 2019). It shares with one other European species, *X. valga*, the traits of very large body size (larger than a queen bumblebee), all-black coloration of the cuticle and fur (in the female) and iridescent violet-blue wings (Michez *et al.*, 2019). Individuals of a third European species, *X. iris*, share this coloration but are much smaller (Falk & Lewington, 2015; Michez *et al.*, 2019). Both *X. valga* and *X. violacea* are described as 'common in all countries on the north side of the Mediterranean', with *X. valga* occurring as far north as the Paris area of France and the south of Germany and *X. violacea* as far north as Belgium and Scandinavia (Michez *et al.*, 2019: 362-363). *X. valga* and *X. violacea* are, in the female, separable mainly by microscopic examination of the hind tibiae (Falk & Lewington, 2015; Else & Edwards, 2018; Michez *et al.*, 2019), in which they differ in the arrangement of tubercles on the outer surface (Amiet *et al.*, 2007; Else & Edwards, 2018; Michez *et al.*, 2019). Fortunately, in the male, the two species can be separated without microscopic examination, because the male's antennae are all-black in *X. valga* but, in *X. violacea*, are black except for the third- and second-last segments (segments 11 and 12), which are orange-brown (Amiet *et al.*, 2007; Falk & Lewington, 2015; Else & Edwards, 2018; Michez *et al.*, 2019), so forming a coloured band lying just short of the antennal tip (e.g. Falk & Lewington, 2015). Conveniently, because female *X. violacea* have all-black antennae, this trait also allows *X. violacea* adults to be sexed from sight of the antennae alone.

Figure 1. **Female *Xylocopa violacea* visiting Broad-leaved Everlasting Pea. 16 June 2025.**

Figure 2. **Female *Xylocopa violacea* visiting Broad-leaved Everlasting Pea. 16 June 2025.**

Both *X. valga* and *X. violacea* are spreading northwards in continental Europe (Nash *et al.*, 2024), for example in Belgium and Poland (Banaszak *et al.*, 2019). In Britain, *X. violacea* occurs sporadically and is regarded as 'a scarce vagrant which has nested or attempted to nest on a few occasions' (Else & Edwards, 2018: 148). In the National Biodiversity Network Atlas, records are widespread in England and Wales but concentrated in the south east (NBN Atlas, 2025). Consistent with the northward spread in continental Europe, records in Britain have increased since the 1990s (Else & Edwards, 2018). In fact, Strudwick (2024: 124) suggests that *X. violacea* 'has been on the brink of colonising southern England for the past decade'. Evidence suggests that individuals arrive both as natural vagrants (i.e. having flown across the English Channel or North Sea) and, given their habit of overwintering and nesting in dead wood, as accidental, human-assisted introductions in timber products (Else & Edwards, 2018). *X. violacea* is the only European *Xylocopa* species positively reported as having occurred in Britain (Baldock, 2008; Roberts & Peat, 2010; Falk & Lewington, 2015; Else & Edwards, 2018; Benton & Owens, 2023). However, as Falk & Lewington (2015) and Else & Edwards (2018) discuss, because of possible confusion (in the female) with *X. valga*, many British records can be assigned to *X. violacea* only provisionally. Equally, males showing the orange-brown antennal segments of *X. violacea* have been observed in Britain, including in association with nesting attempts (Roberts & Peat, 2010), so the British occurrence of the species is not in doubt. Nesting records are reviewed by Else & Edwards (2018) and Benton & Owens (2023), and evidence of nesting within the past 20 years exists from Cambridgeshire, Ceredigion (Cardiganshire), Kent, Leicestershire and Northamptonshire.

In Norfolk, *Xylocopa* has historically been absent (Owens, 2017). Overall, seven pre-2025 occurrences of *X. violacea* have been recorded in the county, five of which were in 2020-2023 inclusive and two of which were in 2006 (Strudwick, 2024; NBN Atlas, 2025). All seven records were in the months June to October inclusive. The recent ones include records at Gooderstone (in 2020), Banham (2021), Geldeston (2023) and Gillingham (2023) (Strudwick, 2024). The Gillingham record involved a male in October 2023 at a site 1.5 km from where the Geldeston female had been recorded in June 2023. Although no nest was observed, this suggests successful breeding may already have occurred in the county (Strudwick, 2024).

Xylocopa violacea: Norwich 2025

Foraging

On 15 June 2025, at our house in Norwich (TG203084), one of us (TC) noticed from indoors a very large black bee flying in our back garden. The time was about 18:00 (BST). We ran outside and were surprised and delighted to see what was unmistakably a large carpenter bee like *X. violacea*, a species familiar from our having seen it (or similar species) several times in southern France. The bee was visiting the large pink flowers of a patch of Broad-leaved Everlasting Pea *Lathyrus latifolius* growing against the back wall of the house. Photographs of this first occurrence, although not high quality, allow a description as follows: body length >2.5 cm (measured relative to a pea flower in one of the images); antennae (with a relatively long and slightly curved scape), eyes, head, mesosoma (main part of thorax), metasoma (main part of abdomen) and legs all entirely black; wings blackish-brown from some angles and shiny metallic blue from others; top of the head and mesosoma uniformly if thinly furred, with, on the metasoma, the fur concentrated into discrete lateral strips, leaving the dorsal surface showing exposed, shiny black cuticle, which appeared smooth and pitted in alternate bands; and legs, especially the hind-legs, broad and densely furred, including on the basitarsus, the distal margin of which on the hind-leg was squared off and far wider than the thin remaining part of the tarsus. From the bee's densely furred hind-legs and its systematic visits to the pea flowers (leading to concentrations of adherent yellow pollen in a 'collar' between the head and mesosoma and on the hind-leg on the proximal part of the basitarsus), it was clearly a female. After several minutes, the bee flew away and we did not see it again that day. The estimated body length matched the published range for female and male *X. violacea* of 2.0-2.8 cm (Bellmann, 2019) (contrasting with that for queen Buff-tailed Bumblebee *Bombus terrestris* of 2.0-2.3 cm; Bellmann, 2019).

We reported this sighting to Tim Strudwick, the county recorder for bumblebees, solitary bees and wasps, on 16 June, later also entering it to iRecord. In fact, a female *Xylocopa* then visited our garden to forage at flowers of Broad-leaved Everlasting Pea, of which there were several patches, for nine additional days in succession (daily from 16 to 24 June inclusive), sometimes several times per day. We did not see visits to any other plant species. During this period, we obtained higher-resolution photos of the foraging bee (Figs. 1-3). Some of these showed it to have appreciable wing-wear, with the rear margins being interrupted by a series of notches (including a relatively large V-shaped and U-shaped notch on the left-hand and right-hand fore-wing, respectively) and with the right-hand fore-wing even being pierced towards its tip (slightly distal to the marginal cell) by a small hole forming a complete window (Fig. 3). This distinctive wing-wear pattern allowed us to recognise the foraging female as an individual (here termed 'Female A') and to determine that, as was anyhow overwhelmingly likely, the same individual was making repeated visits to our garden. Specifically, over the period 15-24 June we observed 22 visits of a female *Xylocopa* to the garden's pea flowers (with never more than one bee at a time showing); in 9/22 visits, the wing-wear pattern was photographed at sufficiently high resolution and in all these nine cases it was Female A's. In short, in every case in which the bee was recognisable as an individual, it was Female A. Later filming of the nesting bee also showed, from its having the identical wing-wear pattern, that it was Female A (see sections on guarding and adult offspring emergence below). Furthermore, since the nest produced males recognisable as *X. violacea* from their orange-brown antennal segments, Female A, as their mother, could be confirmed as *X. violacea*. Therefore, nesting in our garden was by a single female *X. violacea* (so from now onwards we will refer to her and her offspring as this species without further qualification).

Figure 3. **Female *Xylocopa violacea* visiting Broad-leaved Everlasting Pea, showing distinctive wing-wear pattern including notches in rear margins of fore-wings and small hole towards tip of right-hand fore-wing, arrowed in yellow (= Female A). 19 June 2025.**

The Broad-leaved Everlasting Pea plants in our garden had been flowering for several days. Over that time we had observed males of the leaf-cutter bee *Megachile willughbiella* patrolling the flowers and 'bumping' other bees visiting them (i.e. flying in circuits within and between pea patches and rapidly darting at other insect visitors, possibly even striking them). In previous years we have observed targets of this behaviour to include not only female *Megachile* sp. but also bees of other species, e.g. Honey Bee *Apis mellifera* and the bumblebee *Bombus pascuorum*. The aggressive behaviour of male leaf-cutter bees, including *M.*

Figure 4. **Female *Xylocopa violacea* visiting Broad-leaved Everlasting Pea with aggressive male leaf-cutter bee *Megachile willughbiella* (at right, retreating after 'bumping'). 16 June 2025.**

willughbiella, is described by Benton & Owens (2023) and presumably serves both to find mates and to deter competitors. During the *X. violacea* female's visits to our garden's pea flowers, we several times observed her being 'bumped' by a male *M. willughbiella* (Fig. 4). Often the *X. violacea* female seemed to ignore this, but on other occasions she seemed provoked to quit her current flower, which suggested that the leaf-cutter male's behaviour was sometimes effective even on a much larger bee.

Nest construction and provisioning

Up to 21 June, the *X. violacea* female, after visiting the pea flowers, generally left our garden eastwards, so we assumed it had a nest somewhere in that part of our neighbourhood. The garden faces south and is one of a line of mature suburban gardens backed by allotments, so it seemed likely that there would be plenty of potential nest-sites available. On 21 June, at c. 17:45, we observed the bee leave one of the pea patches but, instead of exiting the garden altogether, fly (via a brief stop-off resting in a hedge) into a copper-leaved ornamental plum tree growing on the garden's east side (a Cherry Plum *Prunus cerasifera* var. 'Pissardii'). We assumed the bee had gone to rest further or groom. However, standing under the tree, one of us (TC) then noticed a small hole in one of the branches from which sawdust was falling. We both then observed a *Xylocopa*'s rear-end (abdominal tip) protruding from the hole and pushing out sawdust. This way, we realised that the bee was not only foraging in our garden but also excavating a nest in it, an exciting development that solved the mystery of where nesting might be taking place. We had not observed the bee actually enter the hole (which from most aspects was concealed by foliage), nor did we observe it exit that day (after a short while it withdrew inside). However, as mentioned, later observation and filming showed that it was indeed Female A attending the nest. We assume that previously, when leaving the garden eastwards, the bee had looped back and entered the tree from the side facing our neighbour's garden, accounting for why we had not seen it enter the Cherry Plum on previous days (when presumably the nest, to have become large enough for the bee to fit inside on 21 June, was already under construction).

The Cherry Plum is a medium-sized tree (4-5 m high) of mature age with a pollarded habit. The *X. violacea* nest's entrance hole was 3.2 m above ground level on the lower (west) side of a long, cylindrical branch (diameter c. 14 cm, length c. 170 cm) on the southern side of the tree inclining westwards over the lawn (at an angle of c. 40° to the vertical) (Figs. 5-8). The entrance was c. 75 cm from

Figure 5. **Cherry Plum in which female *Xylocopa violacea* nested, south-west aspect, with area housing nest (hidden by foliage) ringed in yellow. 25 June 2025.**

an old cut forming the branch's top end. Its position made it relatively sheltered, and in particular protected from direct entry by rain. The branch, like others on the tree, was studded with growths of the fungus Cushion Bracket *Phellinus pomaceus* (Fig. 7), which had presumably softened the interior to create a more favourable nesting substrate. The entrance hole was neatly circular with a diameter (measured later) of 1.1 cm (Fig. 8). All subsequent observation suggested that it formed the sole entrance/ exit for the nest tunnel(s) inside. The inner walls of the nest entrance, which was visible to a depth of 1.0-1.5 cm only, showed the creamy-buff wood of the branch's interior. The entrance appeared (from later close-up filming) to form a tunnel slanting slightly downwards and twisting to the right. A short way (c. 1.5 cm) inside, the tunnel appeared to bend completely downwards, so as to run (we assumed) approximately parallel to the branch's long axis to an unknown depth. Filming later hinted at a similar down-shaft to the left.

Van Lith (1955) described and figured the internal structure of a *X. violacea* nest dissected out of a branch of a plum tree ('prune-tree') from The Netherlands. In this, the main shaft took the shape of an inverted hockey-stick, i.e. there was an approximately horizontal entrance tunnel, which, a short distance within, bent sharply downwards to form a longer, approximately vertical shaft. This main shaft reached to c. 15.5 cm below the entrance level, and the lower 10.5 cm of it held four cells stacked vertically one upon another. Two additional shafts branched off at an internal junction at depth 5 cm below the bend to run downwards parallel to the main shaft, creating in total three shafts of depth up to 10.5 cm below their junction, with these two additional shafts holding two and three cells, respectively (making a total of nine cells overall). The overall design of the nest described by Van Lith (1955) seems typical for the species (Else & Edwards, 2018). Although the internal structure of

Figure 6. **Cherry Plum in which female *Xylocopa violacea* nested, south-west aspect, after leaf-fall to show position of branch housing nest, with nest entrance position arrowed in yellow. 9 November 2025.**

Figure 7. **Branch of Cherry Plum housing *Xylocopa violacea* nest, with nest entrance arrowed in yellow and with growths of the fungus Cushion Bracket. 25 June 2025.**

Figure 8. ***Xylocopa violacea* nest entrance in branch of Cherry Plum, close-up. 23 June 2025.**

Figure 9. **Set-up for digital filming of nest entrance (digicam mounted on step-ladder using flexible tripod). 28 August 2025.**

our garden's nest would be verifiable only by destructive investigation, the possible existence of two shafts leading downwards from the rear of a short entrance tunnel matches the internal structure of Van Lith's (1955) nest (but with one shaft less). The choice of a decaying fruit tree as a nesting site also matches previously-reported sites (Else & Edwards, 2018; Benton & Owens, 2023).

On each of the days 22-24 June inclusive we again observed the female *X. violacea,* on leaving a patch of pea plants, fly to the Cherry Plum and enter the nest. On 24 June, to understand the bee's behaviour more fully, we also digitally filmed the nest entrance from 15:01 in a continuous filming bout of 96 min. For this, we fixed a digital camcorder (Sony Handycam HDR-CX240, 9.2 Megapixels, with SanDisk Ultra 64 GB memory card) using a small tripod with flexible legs (Joby tripod) to the top of a 2-m step-ladder, positioning the lens to face upwards to the nest entrance 1.5-1.6 m away (Fig. 9). Depending on the level of zoom selected, this set-up captured at good resolution a field of view centred on the nest entrance and the bark surface extending c. 2-10 cm in all directions around it. The digital filming bout of 24 June was the first of 14 filming bouts of the nest entrance conducted (at most one in a day) between 24 June and 6 September using the same set-up. All bouts took place between 09:30 and 16:45, with 13 lasting an average (mean) of 120 min each (range, 96-139 min) and one lasting 365 min, making up 32.1 h of film in total. We later viewed all film taken to obtain more detailed information regarding events at the nest over its different phases.

The filming bout of 24 June showed that, over the 96-minute bout, the female *X. violacea* made one entry (12.0 min from the start) and three complete excursions from the nest (exit followed by entry) lasting 21.5, 12.0 and 18.0 min, respectively, amounting to 4.4 exits or entries per hour and an overall time absent from the nest of 39.7 min per hour. On each of the four entries the hind-legs were coated with yellow pollen, and on each of the three exits, 7.0-10.0 min later, they were not (Fig. 10), showing that the bee was provisioning the nest with pollen. This was not necessarily pea pollen, as when the bee was visiting the pea flowers its legs never appeared fully pollen-coated (Figs. 1, 2), suggesting it used pea mainly for

Figure 10 Left. **Female *Xylocopa violacea* approaching nest entrance with hind-legs coated with yellow pollen.** Right. **Female *Xylocopa violacea* exiting nest with hind-legs pollen-free. Both images are freeze-frames from the digital filming bout of 24 June 2025.**

nectaring and collected pollen for the nest from other plant species elsewhere.

In the period 25 to 27 June inclusive, the bee was not observed foraging at the pea flowers (although we were not checking for this systematically). On 25 June, we briefly saw it recessed in the nest entrance facing outwards.

Between 28 June and 12 July inclusive we were away from the house and no observations were possible. Later evidence (see following section) suggested that, in this period, the nesting bee finished nest-provisioning but remained to guard the nest.

Guarding

Between 13 July and 19 August inclusive, a female *X. violacea* was still showing in the garden but typically remained in the nest entrance in the Cherry Plum facing outwards (where she could be sexed from her all-black antennae). We observed this from 14 July on eight separate days during this period (Fig. 11), with at other times the nest entrance looking empty. We observed no foraging in our garden over this time, even though Broad-leaved Everlasting Pea continued to flower up to around mid-August. A set of four filming bouts confirmed the female occupying the nest to be Female A (from her wing-wear pattern viewed during a rare excursion) and showed that she spent much time hidden from sight within the nest, with occasional appearances at the entrance, and made very few excursions. Specifically, over 8.1 h of filming, there were 0.4 exits or entries per hour and an overall time absent of 8.9 min per hour; in neither of the two entries did the bee appear to have pollen on her hind-legs. These rates are c. 5-10 times lower than the ones exhibited when the female was pollen-foraging (see section on nest construction and provisioning). On 15 July, filming captured a *Dolichovespula media* wasp worker entering the nest entrance and then being blocked by the female *X. violacea* ascending from inside, causing the wasp to fly away. Therefore, in the current period the female *X. violacea* appears to have refrained from pollen-foraging (with occasional excursions presumably to find nectar) and remained in the nest to guard it. As the nesting female was last observed nest-provisioning on 24 June (but might have continued unobserved up to 12 July), and the last day before adult offspring appeared was 19 August (see following section), the guarding phase lasted an estimated 5.5-8.0 weeks. Guarding the nest following the completion of egg-laying is a well-known behaviour of nesting *Xylocopa* females (Gerling *et al.*, 1989). In the current case, the guarding phase's estimated duration corresponded well with egg-to-adult development times as measured from the species *X. augusti*, which were in the range 6.3-9.4 weeks (Lucia *et al.*, 2020).

Figure 11. **Female *Xylocopa violacea* resting within nest entrance during guarding phase. 5 August 2025.**

Adult offspring emergence

The 20th of August was a landmark day because, at c. 13:50, we observed a *Xylocopa* showing at the nest entrance that, on close viewing, proved to be a male *X. violacea*, with segments 11 and 12 of his antennae orange-brown. The coloured band formed by these segments was surprisingly conspicuous even in shaded conditions, with the junction between the segments showing as a thin dark ring around the band's centre (e.g. Fig. 12). The male's presence showed that the

Figure 12. **Male *Xylocopa violacea* (with orange-brown antennal segments 11 and 12) showing at nest entrance. 5 September 2025.**

Figure 13. **Young female *Xylocopa violacea* showing at nest entrance. 31 August 2025.**

nest had successfully produced at least one adult offspring (and, as mentioned in the section on foraging, confirmed the nesting (mother) female, Female A, as *X. violacea*). When the male was sighted, we had just started another digital filming bout (lasting 119 min), because a few minutes earlier we had seen a female exiting the nest. This filming bout provided further insight into the nest's new phase. From it, Female A was still present and had become more active, as she made one entry (6.0 min after the bout's start) (so was almost certainly the female seen exiting earlier) and three complete excursions from the nest lasting 16.0, 25.0 and 31.0 min, respectively, amounting to 3.5 exits or entries per hour and an overall time absent of 39.3 min per hour. (On the film she was recognisable as Female A from her wing-wear pattern showing during some exits, and because she now also had a distinctive pattern of wear and pollen encrustation on the top of her mesosoma.) However, in all four entries Female A lacked pollen on her hind-legs, so her excursions were not for pollen-foraging. The film also confirmed an adult male's presence. No male exited the nest except for one very brief event in which a male emerged, hovered just outside the nest entrance and then re-entered, all within a minute. Lastly, the film revealed the presence of a second female, as a female showed at the nest entrance during Female A's excursions and, on one of Female A's entries, had to retreat to admit Female A (at which point the two females appear on the film together). So, at this stage, Female A had produced at least two adult offspring (one daughter and one son). Moreover, Female A must have been mated (as in bees, wasps and ants, males can be produced from unfertilised eggs, but with rare exceptions females only from fertilised ones).

The reason for Female A's renewed activity on 20 August was unclear, but possibly stemmed from the excitement and disturbance caused by her adult offspring appearing, and/or from a hunger for nectar after fasting when guarding. Whatever the reason, this was also the final day on which Female A was sighted. Between 21 August and 9 September inclusive there were 18 more days on which we observed or filmed the nest entrance, and every identifiable female then observed (on 9/18 days) was a young female. We conclude that, on or shortly after 20 August, the nesting female (Female A) left the nest permanently or died. The emergence of adult offspring in late summer is a known feature of *X. violacea*'s nesting cycle (e.g. Else & Edwards, 2018), and the absence of prolonged interaction between them and their mother (here apparently no more than a day) is essentially what defines the solitary life cycle of non-social *Xylocopa* species (Gerling *et al.*, 1989).

We conducted six digital filming bouts between 21 and 27 August inclusive (of 115-139 min). On the 22 August film, a female and later a male exited, and in their absence another member of each sex showed in turn at the nest entrance, so proving that at least two females and two males had been in the nest. Moreover, both females were young ones. This could be determined because the second female also exited (very briefly, as in the male of 20 August), and when viewed fully on exit both females had a fresh appearance (lacking encrusted pollen) and showed no wing-wear. The nest had therefore produced at least two female adult offspring and two male ones.

From the films, the young adults spent much time at the nest entrance leaning out (only a single bee could fit there) as if deciding whether to exit (e.g. Figs. 12, 13). They were also observed protruding their rear-ends and defecating from the nest. Sometimes, as mentioned, the bees did exit. They often returned almost instantly (e.g. the young female of 22 August), but the average length of the excursions could not be determined, as with more than one individual present each entry could not be matched to a particular earlier exit. However, across all six bouts the numbers of exits and entries matched (nine of each), suggesting the young adults did not leave permanently at this stage. Likewise, some excursions started with the bee briefly hovering while facing the nest entrance, presumably to learn its position, indicating an intent to return. Other observers also viewed the nest and bees in this period.

Over the period 21-27 August, the young adults were likely to have been visiting sites elsewhere on their excursions, as we did not observe them at large in the garden. However, on 28 August, between c. 13:30 and 13:50, we saw two female *X. violacea* free-flying in the garden at the same time and briefly resting on flowers of Globe Thistle *Echinops* sp. and Sunflower *Helianthus annuus* (Figs. 14, 15). One also briefly landed on the lawn (Fig. 16). As it happened, a longer bout of digital filming (c. 10:00-c.16:00) was ongoing, which showed that both females had exited the nest a few minutes apart shortly beforehand. When outside, these two females could again be recognised and confirmed as young ones from their fresh appearance and complete absence of wing-wear (Figs. 15, 16). One female was observed re-entering the nest (at

Figure 14. **Two young female *Xylocopa violacea* on Sunflower. 28 August 2025.**

Figure 15. **Young female *Xylocopa violacea* on Sunflower, showing fresh appearance and absence of wing-wear. 28 August 2025.**

Figure 16. **Young female *Xylocopa violacea* resting on lawn, showing fresh appearance and absence of wing-wear. 28 August 2025.**

Figure 17. **Male *Xylocopa violacea* visiting Buddleia. 6 September 2025.**

13:50) and we lost sight of the other (and she had not returned to the nest by the end of filming).

On 30 and 31 August, we similarly saw single young females free-flying and resting on flowers (Sunflower and Canadian Goldenrod *Solidago canadensis*) in the garden. Likewise, on 6 September, we saw two males together visiting flowers of Buddleia *Buddleja davidii* in the garden (Fig. 17). As previously, the males could each be sexed from their coloured antennal bands. From some angles, the dense pile on top of the mesosoma also appeared greyish (Fig. 17), a trait mentioned by, for example, Else & Edwards (2018) and Michez *et al.,* (2019). We then set up a final filming bout (108 min) that showed the males did not re-enter the nest before the end of filming (though there can be little doubt that they derived from the garden nest).

The sightings of the young adults free-flying in the garden suggested an increased inclination for them to leave the nest at this time. They also confirmed the production of at least four adult offspring (two females and two males). Neither direct observations nor the films produced evidence of higher numbers. Nonetheless, they are minimum counts because some young adults might never have showed while in the nest and others might have permanently left it at any time. The numbers lie within the productivity range reported for *Xylocopa*, which typically have few offspring, with females in an Italian *X. violacea* population laying an average (range) of 7.4 (3-14) eggs per nest (Vicidomini, 1996).

Final stages of nesting cycle

In the period 1-9 September, both our direct observations and the final filming bout of 6 September showed at least one member of either sex still to be present at the nest (on 6 September, both males seen visiting Buddleia were presumably present, at least initially). We saw no *X. violacea* at all at the nest after 9 September (when a female and a male were observed to be still in residence). None showed between 10 and 15 September, and in the period 16-18 September a medium-sized spider (unidentified species) was occupying the nest entrance and had constructed a diffuse sheet of silk across its lower half, consistent with bee flights in and out of the nest no longer occurring. By September's end the spider had disappeared, and the nest entrance was empty whenever checked in October and November. So it appears that, on or shortly after 9 September, the remaining (young adult) *X. violacea* either concealed themselves within the nest to overwinter, a possibility described by Falk & Lewington (2015), or dispersed elsewhere, presumably to find another overwintering site. Overall, therefore, the nesting cycle lasted from at least 15 June to 9 September, i.e. 12.3 weeks (Table 1).

Discussion

As *Xylocopa* species in Europe are thermophiles favouring warm regions (e.g. Bellmann, 2019), the recent northwards spread of *X. valga* and *X. violacea* (see Introduction) has been attributed to a natural expansion brought about by climate

Table 1**. Nesting cycle of Norwich 2025 *Xylocopa violacea* summarised.**
Week 1 = 15-21 June, week 2 = 22-28 June, etc.

Week	Date	Observation or event	Phase of nesting cycle (inferred)
1	15 June	Female *X. violacea* first recorded, visiting pea flowers in garden	Foraging, possibly nest construction / provisioning
1	16-20 June	Female visits pea flowers in garden daily; when individually recognisable (from wing-wear pattern) is always Female A (see text)	Foraging, possibly nest construction / provisioning
1	21 June	Female continues to visit pea flowers in garden; nest being excavated in Cherry Plum in garden is noticed for first time	Foraging, nest construction / provisioning
2	22-24 June	Female continues to visit pea flowers garden and to attend nest; on 24 June, digital filming showed her regularly taking pollen loads to nest	Foraging, nest construction / provisioning
2	25-27 June	Female not observed to visit pea flowers but is present in nest on 25 June	Possibly nest construction / provisioning and/or guarding
2-4	28 June-12 July	No observations made	End of nest construction / provisioning, start of full guarding
5-10	13 July-19 Aug	Female typically present in nest facing outwards or recessed within; making few excursions, but not for pollen-foraging; blocks entry of *Dolichovespula media* wasp worker into nest; identifiable as Female A	Guarding
10	20 Aug	Adult offspring (at least one female and at least one male) showing at nest for first time; nesting female (Female A) makes several excursions, but not for pollen-foraging; after 20 Aug, Female A not seen again	Adult offspring emergence; departure or death of nesting (mother) female (Female A)
10-11	21-27 Aug	Adult offspring present at nest, making excursions; from 22 Aug, digital filming shows at least two young females and at least two males present at times, i.e. at least four adult offspring in total	Adult offspring residing in nest
11-12	28-31 Aug	One to two young females observed exiting nest and/or visiting garden plants	Adult offspring residing in nest
12	1-5 Sept	At least one female and one male still present at nest	Adult offspring residing in nest
12	6 Sept	One female still present at nest; two males observed visiting garden plants	Adult offspring residing in nest
13	7-9 Sept	One female and one male still present at nest; after 9 Sept, no *X. violacea* seen at nest or in garden	Adult offspring residing in nest
13-14	10-15 Sept	No *X. violacea* seen	Adult offspring overwintering/dispersed

Week	Date	Observation or event	Phase of nesting cycle (inferred)
14	16-18 Sept	Spider occupying nest entrance confirms no exits or entries occurring	Adult offspring overwintering/dispersed
14-25	19 Sept-30 Nov	No *X. violacea* seen	Adult offspring overwintering/dispersed

change (e.g. Banaszak *et al*., 2019). In this, these species might resemble other bee species recently expanding their ranges in Britain (e.g. Jackson, 2019). Because of the likelihood of human-assisted transport in *Xylocopa* (see Introduction), it is also possible that in this group climate change interacts with human agency, with bees accidentally transported north finding climatic conditions more favourable there than previously (Banaszak *et al*., 2019). Against this background, the Norwich 2025 *X. violacea* nesting event described in the current article, although notable, reflects general trends. Moreover, spring and summer of 2025 were unusually warm and dry in Britain as a whole, with the four months May-August having temperatures 1.2-1.9°C above average and rainfall 62-103% of average (Freeman, 2025a, 2025b).

After overwintering in cavities as unmated adults, *X. violacea* born the previous year mate in the spring, with males typically finding females either in flight or at flowers (Else & Edwards, 2018; Vicidomini, 1998). As mentioned, the nesting Norwich female (Female A) must have been mated (to produce daughters). This female conceivably arrived in Norwich via three modes (or a mixture of them): (1) as a member of an existing low-density population in the county or region; (2) as a human-assisted introduction in imported timber; and (3) as a natural arrival from continental Europe. Mode (1) is possible given other recent occurrences of *X. violacea* in the region (see Introduction), though it would have required Female A to have encountered a mate in this population, arguably making it less likely, especially if mating between siblings is avoided. Mode (2) is also possible, though if so the female's arrival was probably not as an overwintering individual, since overwintering occurs before mating, and seems more likely to have been as a mated, pre-nesting female or a mated, nesting female (who then re-nested). Mode (3) would have required a long flight from continental Europe (most likely as a mated female). Coastal records of *X. violacea* in southern England suggest such sea crossings do occur (Else and Edwards, 2018). In addition, large-bodied *Xylocopa* bees are notably strong fliers, foraging up to 6 km from the nest (Pasquet *et al*., 2008). Flying at 7.0 m per second, which is half their estimated maximum speed (Kratschmer *et al*., 2025), it would take a female *X. violacea* 7.7 hours to fly c. 195 km from the closest stretch of continental European North Sea coast to Norwich, or less with favourable winds. In this context, it is relevant that other powerful fliers among southern European insects exhibited influxes to Britain in May-June 2025, including migrant dragonflies and Hummingbird Hawk-moth *Macroglossum stellatarum* (Mearns, 2025; Waring, 2025), presumably facilitated by the exceptional weather noted above. Overall, therefore, all the modes are plausible and none can be ruled out, and Female A's origin and history remain speculative. At the time of writing (late 2025), we await the spring with interest to see if any of her adult offspring will re-emerge from overwintering in the nest.

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