

***PEMPHREDON FABRICII* (HYMENOPTERA: CRABRONIDAE) NEW TO BRITAIN**

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ABSTRACT

The crabronid wasp *Pemphredon fabricii* (M. Müller) is formally added to the British list on the basis of two females and three males collected at two valley mire sites in the New Forest, Hampshire. The wasp is associated with the cigar galls of the fly *Lipara lucens* Meigen on common reed *Phragmites australis* (Cav.). A new key to British *Pemphredon* species as currently defined by the Bees, Wasps and Ants Recording Society (BWARS) is provided.

INTRODUCTION

The genus *Pemphredon* Latreille has long been a problematic one in Britain due to disagreement over the number of species involved, how one separates these, and how one interprets the substantial variation associated with most of them. Richards (1980) recognised eight species: *P. clypealis* (Thomson), *P. enslini* (Wagner), *P. inornata* Say, *P. lethifer* (Schuckard), *P. lugubris* (F.), *P. mortifer* Valkeila & Leclercq, *P. morio* (Vander Linden) and *P. wesmaeli* (Morawitz, A.). Since then, influenced by taxonomic revisions on the Continent such as Dollfuss (1995) and Smissen (2003), and scrutiny of British material, *P. enslini* (sensu Richards, loc. cit.) has been sunk under *P. lethifer*, *P. mortifer* and *P. wesmaeli* have been sunk under *P. rugifer* (Dahlbom) and *P. clypealis* has been (perhaps questionably) sunk under *P. morio* leaving just five species. This confusion is exacerbated by the fact that Richards uses a slightly different approach to keying out some species to that of Lomholdt (1984) and some specimens can key out differently depending on which key you use. This does not affect *P. lugubris* (subgenus *Pemphredon*) which keys out easily, but it does complicate the separation of the remaining species, which are in the subgenera *Ceratophorus* (*P. morio*) and *Cemonus* (the remainder, including *P. fabricii*).

METHODS

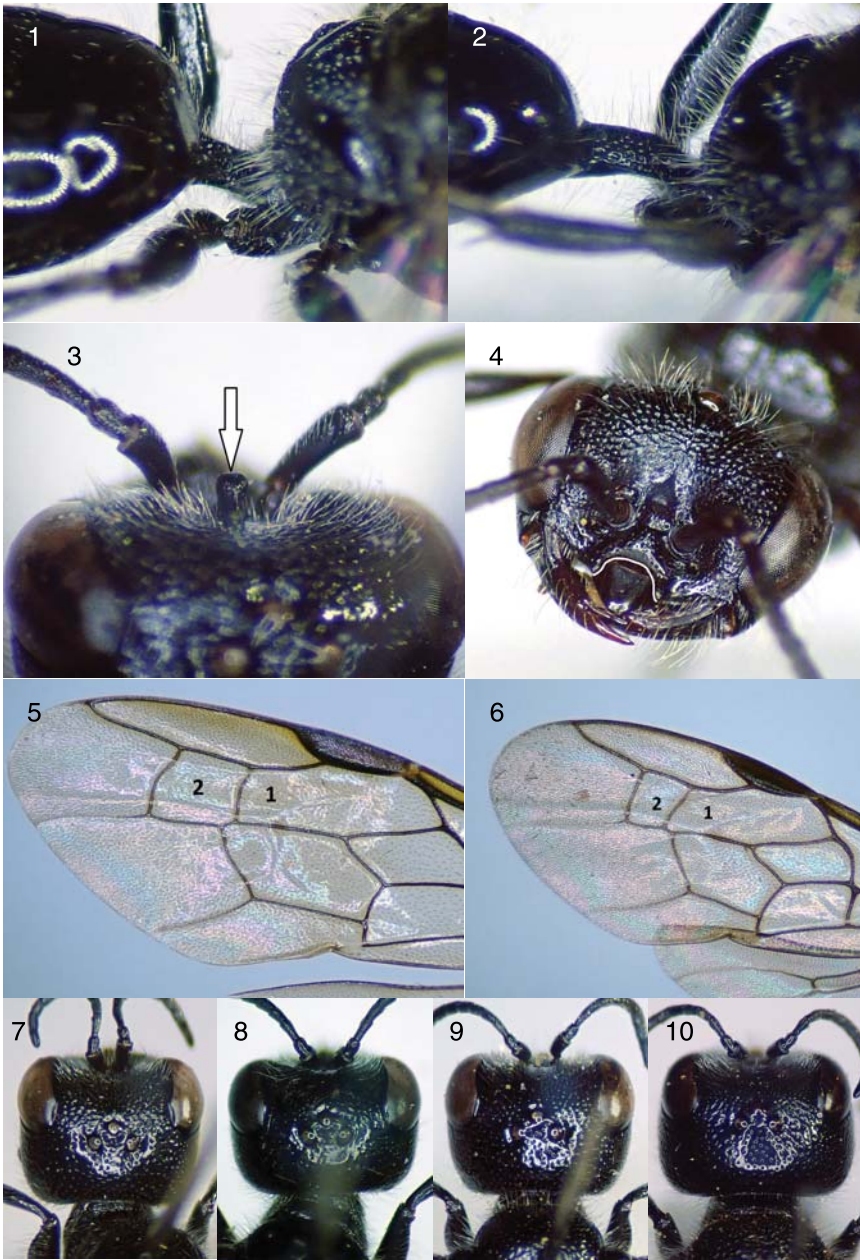
Some years ago, one of us (SJF) encountered *Pemphredon* populations by sweeping insects within reedbeds at two valley mire sites in the New Forest. Some material was pinned and upon inspection under a microscope using the Richards and Lomholdt keys it seemed to key out closest to *P. lethifer* but had features of the propodeum that fell outside the variation found in *P. lethifer*. This held true for both sexes. Eventually SJF was made aware by JE of a *Lipara* gall-associated *Pemphredon* (*P. fabricii*) on the near-Continent, and using information in Jacobs (2007) and Smissen (loc. cit.), plus careful comparison with material of related species, SJF confirmed that the aberrant *lethifer* specimens from the New Forest valley mire reedbeds were *P. fabricii*.

The photographic images used here were taken using an Olympus TG5 camera set on stacking mode (to provide greater depth of field) down a microscope objective. Images were cropped, sharpened and tone/contrast adjusted with Photoshop Elements. Lighting involved a ring light attached to the microscope above the specimen, and in some images, a little lateral lighting was added using an LED spot light on the right hand side.

Identification

The following key covers the five *Pemphredon* species currently recognised by the Bees, Wasps and Ants Recording Society (BWARS) plus *P. fabricii*.

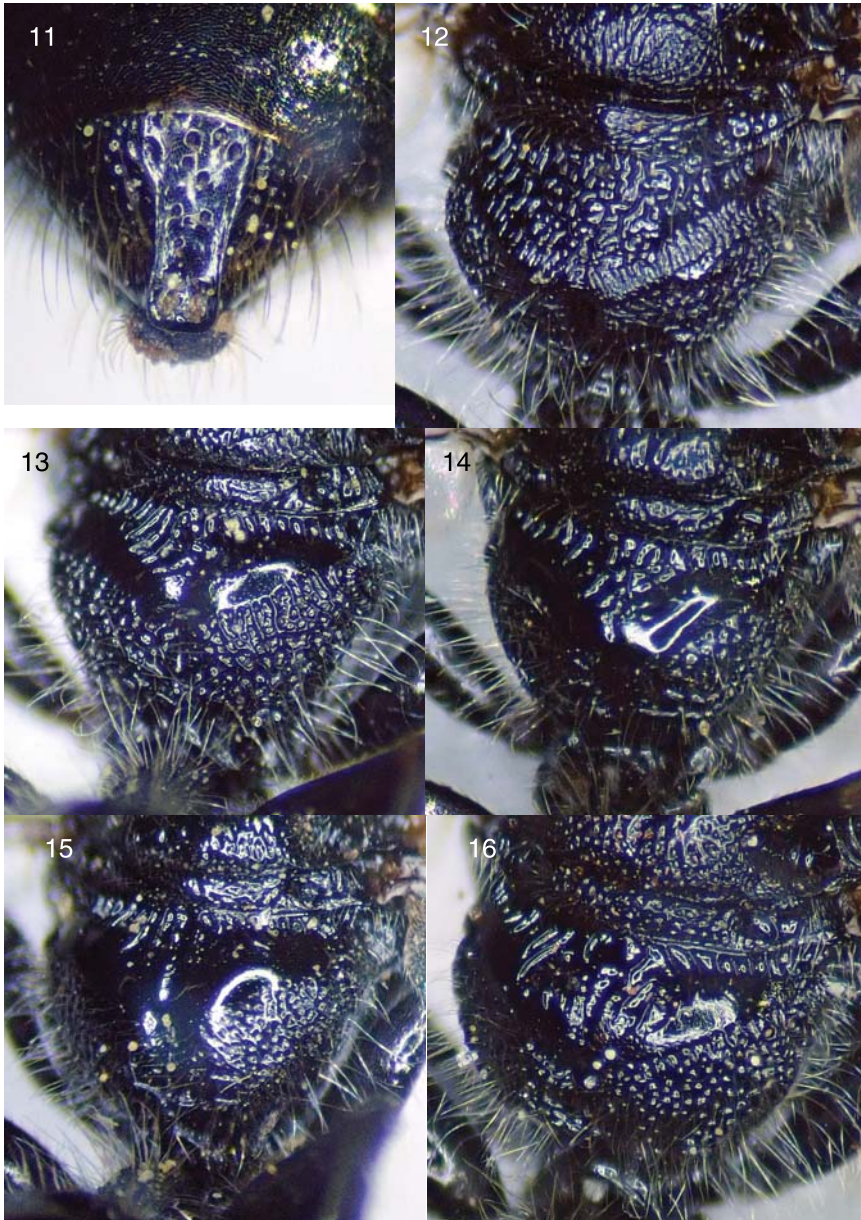
- 1 Face with a strong tubercle on head just above the antennal sockets (Fig. 3). Petiole of gaster short, about 1.5 times as long as wide (Fig. 1). Head in top view relatively transverse, about twice as wide as long and narrowing abruptly behind the eyes i.e. not at all box-shaped. Lower edge of clypeus with a large, deep semi-circular incision through which the labrum projects (Fig 4) **morio**
- Face without a strong tubercle between the antennal sockets. Petiole of gaster longer, about 3–4 times as long as wide (Figs. 2, 29). Head in top view box-shaped, no more than 1.25 times as wide as long (Figs. 7–10). Lower clypeus without a deep incision, at most with a small one (Fig. 22) 2
- 2 Vein 2m-cu enters the second submarginal cell (Fig. 5). Dorsal face of propodeum entirely rugose without strips of smooth shiny or semi-shiny surface (Fig. 12). Typically a large species 10 mm long. **lugubris**
- Vein 2m-cu usually enters the first submarginal cell just before its end – sometimes at its very end (Fig. 6). Dorsal face of propodeum with a complete or divided band of smooth shiny or semi-shiny surface (Figs. 13–16). Most species 7–8 mm long 3
- 3 Tergite 6 with a well-formed pygidium featuring a flat median zone defined by parallel lateral ridges (Fig. 11). Antennae with 10 flagellar segments, those segments simple and without tyloidea (females) 4
- Tergite 6 without an obvious pygidium. Antennae with 11 flagellar segments, those segments often with projecting tyloidea ventrally (Figs. 23, 25) (males) 7
- 4 Clypeus lower margin with a small but obvious semi-circular insertion centrally (Fig. 22 – good lighting and angle of view essential to see this). Dorsal face of the propodeum with the shining areas before the rim broadly interrupted in the middle by longitudinal ridges/rugosity that extend almost to the rim, and with a distinct trough running down the midline (Fig. 16). Pygidium with scattered strong punctures (Fig. 11). Head in dorsal view broadening slightly behind the eyes (Fig. 10). Typically larger (up to 10 mm long) and more robust. Scutum densely and coarsely punctate (Fig. 20) **rugifer**
- Clypeus lower margin flat or pointed, at most with a very weak concavity. Dorsal face of the propodeum with a broad crescent or v-shaped shining zone before the rim that occupies the full width of the propodeum and is not broadly interrupted in the middle, though an inconspicuous trough may be present here (Figs. 13, 14, 15). Pygidium with any punctures weak. Head straight or narrowing behind the eyes (Figs. 7–9). Small species, 7–8 mm long. 5
- 5 Scutum with punctures remote, very shallow/poorly-formed, and set within an uneven surface that has shallow longitudinal ridges and troughs – as if melting under heat (Fig. 18). Clypeus lower margin pointed and produced anteriorly (Fig. 21). Dorsal face of the propodeum with the zone of radiating ridges across



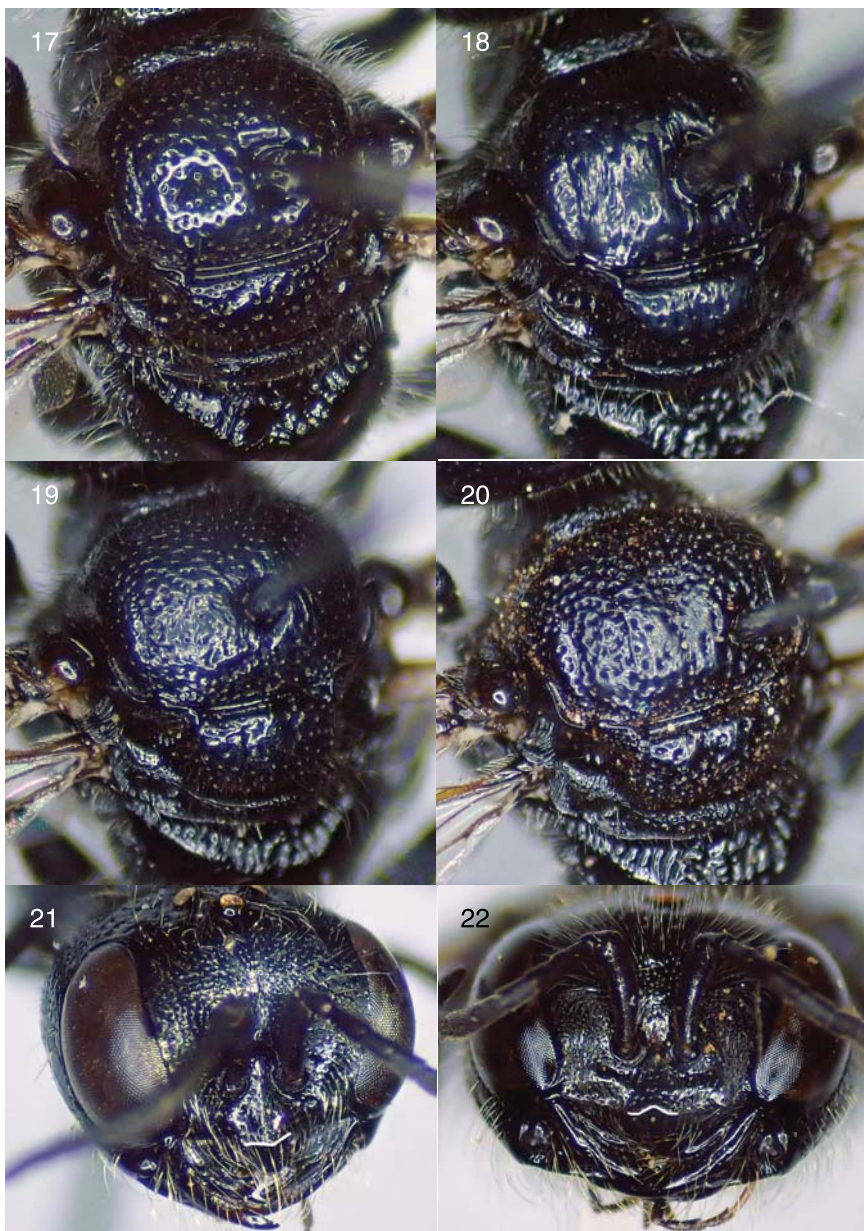
Figs 1–10. Fig. 1. Petiole of *P. morio*; Fig. 2. Petiole of *P. lethifer*; Fig. 3. Head of *P. morio* showing tubercle; Fig. 4. Face of *P. morio* showing clypeal margin (indicated in white); Fig. 5. Forewing of *P. lugubris*; Fig. 6. Forewing of *P. lethifer*; Figs 7–10. Female heads in strict dorsal view of *P. fabricii* (Fig. 7), *P. inornata* (Fig. 8), *P. lethifer* (Fig. 9) and *P. rugifer* (Fig. 10).

- the base narrow at the sides but abruptly produced in the middle to produce a squarish zone of rugosity that protrudes well into the shiny zone beyond (Fig. 14) *inornata*
- Scutum with punctures denser, better defined and not set within shallow longitudinal ridges and troughs (Figs. 17, 19). Clypeus lower margin flat and not protruding. Dorsal face of the propodeum with the zone of radiating ridges across the base gradually broadening towards the middle (Figs. 13, 15) . . . 6
 - 6 Tarsal claws blunt i.e. the apical curved portion barely narrows towards the tip (Fig. 27). Rear and side faces of the propodeum coarsely rugose, this rugosity sharply defined from the shiny zone above it, with no hint of a punctured transitional zone (Fig. 13). Scutum with a smooth shiny surface, the punctures here clearly defined and well separated (Fig. 17). Head in strict top view squarer, and longer behind the eyes; the side margin behind the eyes less convergent posteriorly (Fig. 7). Tergites shinier with less conspicuous punctures. . . . *fabricii*
 - Tarsal claws sharper i.e. the apical curved portion clearly narrows towards the tip (Fig. 28). Rear and side faces of the propodeum less coarsely rugose, this rugosity usually grading into the shiny zone above it, always with lots of punctures adjacent to the shiny zone (Fig. 15). Scutum less shiny with the punctures more closely packed and less well-defined (Fig. 19). Head in strict top view slightly more transverse and shorter behind the eyes; the side margin behind the eyes more convergent posteriorly (Fig. 9). Tergites with more conspicuous punctures and often dulled by a slight microsculpture. . . . *lethifer*
 - 7 Scutum relatively smooth with punctures sparse and barely discernible. Flagellar segments of antennae without tyloidea beneath (Fig. 24). Top of propodeum as per female (body length 5.5–7 mm) *inornata*
 - Scutum with distinct with denser punctures. Tyloidea present below some of the mid-flagellar segments (Figs. 23, 25, 26) 8
 - 8 Dorsal face of the propodeum with a smooth shiny, crescent-shaped zone that is broad throughout its full width and not broken or strongly constricted in the middle. Tyloidea of the mid-flagellar segments somewhat angular when viewed directly from side (Fig. 25) (body length 5.5–7 mm) *lethifer*
 - Dorsal face of the propodeum with the smooth area much narrower and broken or nearly so in the middle by rugosity and ridges that extend from the front. Tyloidea of mid-flagellar segments flat or smoothly rounded in side view but never angular (Figs. 23, 26) 9
 - 9 Tarsal claws blunt, as per female (Fig. 27). Scutum and scutellum with a smooth shiny surface, the punctures here clearly defined but well separated. Tyloidea of mid-flagellar segments bulbous in side view (Fig. 23). Less hairy on the head and thorax, the hairs on side of the head behind the eyes about 1.5–2 times the width of an ocellus. Smaller, body length 6–7 mm *fabricii*
 - Tarsal claws pointed, the apical curved portion clearly narrows towards the tip (resembling Fig. 28). Scutum and scutellum with the puncture dense and coarse. Tyloidea of mid-flagellar segments not bulbous but taking the form of a continuous ridge along the underside of the segment (Fig. 26). More hairy on the head and thorax, the hairs on side of the head behind the eyes about 2–3 times the width of an ocellus. Larger and more robust, body length 9 mm *rugifer*

The ‘get out of jail’ character for both sexes of *P. fabricii* is the very blunt tarsal claws, a feature not found in any other British *Pemphredon* but the general appearance is very close to *P. lethifer*.



Figs 11–16. Fig. 11, Pygidium of female *P. rugifer*; Figs 12–16, Propodeum of female *P. lugubris* (Fig. 12), *P. fabricii* (Fig. 13), *P. inornata* (Fig. 14), *P. lethifer* (Fig. 15) and *P. rugifer* (Fig. 16).



Figs. 17–22. Figs. 17–20. Female thoracic dorsum of *P. fabricii* (Fig. 17), *P. inornata* (Fig. 18), *P. lethifer* (Fig. 19) and *P. rugifer* (Fig. 20). Figs 21–22. Female face showing lower clypeal margin (indicated in white) of *P. inornata* (Fig. 21) and *P. rugifer* (Fig. 22).



Figs. 23–28. Figs. 23–26. Male antennae in perfect side view of *P. fabricii* (Fig. 23), *P. inornata* (Fig. 24), *P. lethifer* (Fig. 25) and *P. rugifer* (Fig. 26). Figs. 27–28. Tarsal claws of *P. fabricii* (Fig. 27) and *P. lethifer* (Fig. 28).

Material Examined

Hampshire: Hincheslea Bog, New Forest SU275004, 16 June 2007 (1f), Wilverley Bog, New Forest SZ246999, 19 July 2008 (1m), 16 June 2009 (1f, 2m).

Compared with 61 specimens of *P. inornata*, 95 specimens of *P. lethifer* and four specimens of *P. rugifer* in the SJF collection.

ECOLOGY

Habitat and lifecycle

Research on the Continent, particularly in the Czech Republic, has shown *P. fabricii* to be strictly associated with reedbeds supporting populations of the chloropid fly *Lipara lucens* (Heneberg, Bogusch & Astapenková, 2014; Bogusch, Belastová & Heneberg, 2017). No galls created by other species of *Lipara* have been found to be used. *Pemphredon fabricii* creates a tiny number of nests in stems of common reed and the remainder in two-year-old cigar galls that the fly induces in the growth tips of that plant – Bogusch, Bilastová & Heneberg (loc. cit) reared forty-six specimens from reed stalk traps and 1,817 specimens from galls.

SJF has surveyed many coastal reedbeds in Hampshire but *P. fabricii* has been encountered to date only at two valley mire sites some miles inland. The reedbeds here (and in most other New Forest mires) grow in low nutrient, acidic peat and are typically sparse and low in height (Fig. 30), unlike reedbeds in more fertile wetlands, and they could be very ancient. These valley mire reedbeds can support exceptionally strong *Lipara lucens* populations, and cigar galls are generally very numerous. That density of *Lipara* galls was not noticed at reedbeds of the nearby coast e.g. at Christchurch Harbour, the slumping cliffs of Highcliffe, or the reedbeds associated with upper saltmarsh at Exbury, Sowley and the west shore of the Solent. These may be too exposed to allow the formation of strong *L. lucens* colonies. As background, P. Heneberg (pers. comm.) comments that galls which develop in reedbeds stressed by drought may be particularly suitable for the wasp, which may indicate that marshes, fens and ponds as well as mires have at least as much potential as coastal sites. Thin reeds seem more suitable than thicker ones (Bogusch, Astapenková & Heneberg, 2015).

Pemphredon lethifer has been recorded at some New Forest valley mire areas and on the coast nearby but can be assumed to be using assorted plants besides common reed, notably bramble *Rubus* agg., because there is no evidence of its ever using *Lipara* galls. The same applies to *P. inornata*, despite suggestions to the contrary. Details given by Schmidt (1916) of *Diphlebus unicolor* (F.) nesting in a *L. lucens* gall clearly relate to *P. fabricii*. The biology of *fabricii* appears to differ from that of its congeners not just in the siting of nests, but because a significant number of records of progressive provisioning have been noted. Prey, as with all species of *Pemphredon*, consists of Aphididae, with records of at least 21 species being taken, chiefly *Hyalopterus pruni* (Geoffroy), which uses common reed as its secondary host (Bogusch *et al.*, 2018). Those authors observe that in about 20% of nests, the nesting female brings fresh aphids to feed the smallest larvae at the apex of the nest, after the larger larvae at the bottom have already reached maturity. This behaviour has not been noted with other species of *Pemphredon*.

For the record, there are indications that on the continental mainland, galls on oaks *Quercus* created by parasitic wasps may be utilised, chiefly by *P. austriaca* (Kohl), which Schremmer (1985) and Blommers (2008) have shown has a tight association with galls of *Andricus kollari* (Hartig). According to Gauss (1982),



Fig. 29. Female *Pemphredon fabricii* taken at Hincheslea Bog, New Forest on 19 June 2007.



Fig. 30. A reedbed in Wilverley Bog, New Forest on 16 June 2007 showing the habitat used by *P. fabricii*.

P. lethifer has used that gall in Germany and Gayubo & Nieves (1982) report the wasp to have nested in galls of *Andricus quercustozae* (Bosc) in Spain. Janvier (1961) described a nest of *P. lugubris* (F.) [as *P. luctuosus*] within a gall on an oak *Quercus*.

Distribution abroad

The relatively recent date of the separation from *P. lethifer* means full knowledge of the distribution of this species remains uncertain. However, P. Heneberg (pers. comm.) notes that from sampling, it is present in Belgium, the Netherlands and France in reed stands growing in dunes along the English Channel and North Sea. Specimens have been identified from much of Germany and from Sweden, Poland, the Czech Republic, Slovakia, Hungary, Italy, Slovenia, Greece, the Russian Federation and Azerbaijan. Given the prevalence of common reed, it is reasonable to assume more countries will be added to the list as time goes by.

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SHORT COMMUNICATION

A new foodplant for *Orthochaetes setiger* (Beck) (Coleoptera: Curculionidae) and comments on its biology. – The larvae of the weevil, *Orthochaetes setiger* have been recorded as polyphagous on a wide range of Asteraceous herbs and occasionally other families of dicotyledonous plants (Morris, 2002; Duff, 2016). In 1996 Mike Nelson and KPB reared a specimen from a leafmine in wild garlic, *Allium ursinum*, a monocotyledon (Bland & Nelson, 1997). As we only saw the single mine in an extensive area of wild garlic it was presumed this was a unique adventitious individual only worthy of note because of the unusual host-plant. Larval mines of *O. setiger* have now been found in another species of the Liliaceae, namely *Hyacinthoides non-scripta*, the wild hyacinth or bluebell. This time the larval workings were not restricted to a single plant but were abundant.

On the 17.vi.2020 in the northern part of Methven Wood, near Dalcrue, Perthshire (O.S. Grid NO0427; VC 88) dead flower-heads of bluebells were found with larvae mining the fleshy developing seed-capsules. Two or three seed-capsules on each



Fig. 1. Larval mines of *Orthochaetes setiger* in the seed-capsules of *Hyacinthoides non-scripta* from Perthshire.