

Discovery of the larva of *Gynnidomorpha permixtana* ([Denis & Schiffermüller], 1775) (Lepidoptera: Tortricidae) in the British Isles and a consideration of the species' distribution there

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Synopsis

An account is given of the discovery of the larva of *Gynnidomorpha permixtana* ([Denis & Schiffermüller], 1775) in the British Isles feeding in seed-capsules of *Odontites vernus* (Bellardi) Dumort and *Rhinanthus minor* L., together with a review of literature records of the foodplants and a consideration of the species' status and distribution in the British Isles.

Key words: Lepidoptera, Tortricidae, *Gynnidomorpha permixtana*, larva, *Odontites vernus*, *Rhinanthus minor*, larval foodplants, British distribution.

Introduction

Gynnidomorpha permixtana is a local and scarce species in the British Isles, having apparently been recorded only from the following 13 vice-counties: England, North Devon (V.C. 4) one locality, East Sussex (V.C. 14) one locality, East Kent (V.C. 15) four localities; Wales, Carmarthenshire (V.C. 44) possibly only one locality, Pembrokeshire (V.C. 45) possibly only one locality; Scotland, Main Argyll (V.C. 98) three localities, Coll, Mid Ebudes (V.C. 103) one locality; Ireland, West Cork (H. 3), Limerick (H. 8), Clare (H. 9), West Galway (H. 16), West Mayo (H. 27) and Sligo (H. 28), possibly from only one locality in each. On the basis of these vice-counties, except for East Sussex and East Kent, *G. permixtana* has a markedly western distribution, and many of the localities are coastal.

We cannot trace any record from Wales since 1884. The most recent record from England before 2007 appears to have been in 1983. Until the species was found on Coll in 2009 the most recent record from Scotland was in 1985. The most recent record from Ireland was in 2007. As far as we are aware, the larva was unknown in the British Isles before 2008, with published information about the foodplants and larval and pupal period derived from mainland European sources.

In 2007 SDB took two adults at light at Braunton Burrows, North Devon (V.C. 4), which is the first confirmed record from V.C. 4 and possibly from Devon. Investigations in 2008, 2009 and 2010 resulted in finding larvae there in seed-capsules of *Odontites vernus* and *Rhinanthus minor* and moths were reared.

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Odontites vernus is not given as a foodplant in the British literature. A full account is given later in this paper together with a review of published foodplants as well as a consideration of the species' British status.

The following names, often without citation of author and year of publication, have been given in the literature and referred to later in this paper in respect of the species now known as *Gynnidomorpha permixtana*: *Argyrolepis mussehliana*, *Cochilis mussehliana*, *Conchylis mussehliana*, *Eupoecilia mussehliana*, *Phalonia mussehliana*, *Phalonia permixtana* and *Phalonia permixtana*. We have not cited those names except where clarity is required or if they are part of a quotation.

Records from the British Isles

The first published record of the species in the British Isles appears to have been by Doubleday (1850: 27). As this was simply a list of British Lepidoptera, excluding the Tineidae, he did not include dates when species were first recorded, or localities. Doubleday died on 29 June 1875 and his collection is now in the Natural History Museum (BMNH), London, and remains in the original cabinets. None of the specimens bears a data label. There are two specimens standing under the name *A. mussehliana* in drawer 97 and both appear to be this species; however, they are not set in the same style as most of the other material, nor are they in such good condition.

Stainton (1855: 59) states, 'first enumerated as British in Doubleday's Catalogue, at page 27; a specimen has been taken by Mr Weaver, in the west of England.' Four years later, however, he records (1859: 269) that the species was found 'many years ago in Devonshire.' In the same year Wilkinson (1859: 289) comments that it is 'Exceedingly rare; one or two specimens were captured many years ago in Devonshire by the late Richard Weaver and are in the cabinet of Mr. Henry Doubleday.'

We have not been able to trace either when or where Weaver collected the specimen(s) mentioned by Stainton and Wilkinson nor why they believed that Weaver took them in Devon. Although Wilkinson recorded that Weaver's specimens were in Doubleday's cabinet, it is not clear that they were Weaver's. Indeed, Doubleday rather implies that they were not when he comments (1868: 31) that 'The late Richard Weaver took a few specimens of a Tortrix which were certainly identical with those which were given to me by the late M. Becker under this name [*Argyrolepis Mussehliana*] ...' This statement suggests that although Doubleday had seen Weaver's specimens he had not been given any because his came from M. Becker. We have not been able to trace anything about M. Becker and do not recognise this as the name of a British lepidopterist.

In a series of notes on the British Tortricidae, Barrett (1874: 133) records that he has 'an old specimen which was sent to me many years ago under one of these names, and three more exist in Mr. Douglas's Collection, but their localities cannot now be traced. Besides Mr. Doubleday's two specimens taken by Weaver in Devonshire, these are the only British examples that have come under my notice.'

Barrett (1878: 39) records that on 27 May 1878 he captured four specimens 'near Pembroke' (V.C. 45) in a field covered with *Inula dysenterica* (now *Pulicaria dysenterica* (L.) Bernh.) and some *Genista tinctoria* L. He states that he knows of no British record since 'Weaver took his few specimens in Devonshire many years

ago. Some of these were placed in Mr. Doubleday's Collection, and I expect Mr. Allis had, and partially distributed, the rest.' T. H. Allis was a lepidopterist who lived in York, where his collection is still preserved.

Vaughan (1878: 253) states that Barrett identified some specimens that he found at Deal, Kent (V.C. 15) in the summer of 1878 as this species. He comments that it is strange that a long lost species should have occurred in two such widely separate localities as Kent and Pembrokeshire and that the only locality given in Stainton's *Manual* (1859: 269) is Devon.

Barrett (1881: 70) observed the species at the beginning of June 1881, again 'near Pembroke', exact locality and habitat not given. He states that the foodplant was still unknown and that a rumour that it had been bred from *Pedicularis palustris* L. did not seem to be confirmed. *Pedicularis palustris* was subsequently shown by Richardson (1891: 239–240; 1892: 173–176) to be the larval foodplant of the very similar *Gynnidomorpha minimana* (Caradja, 1916).

Richardson (1882: 115) caught two specimens, determined by Barrett, in 1882 in Carmarthenshire (V.C. 44), habitat, locality and date not stated.

In early August 1884 Barrett (1884: 138) took 12 specimens in Pembrokeshire, but again no indication is given of the habitat or locality.

A report of a meeting of the Natural History Society of Glasgow on 28 April 1885 (King, 1887: xlix) records that 'Mr. James J. F. X. King exhibited specimens of *Eupoecilia Mussehliana*, Tr., a moth which is new to the Scottish Fauna, and is very rare in England, having only occurred in the counties of Pembroke and Devon;'

The King collection is in the Hunterian Museum, Glasgow. This has six specimens standing under that name taken by King. Five bear the collecting code '191', which denotes his field trip during June to July 1884 to the Dalmally/Loch Awe area, Main Argyll (V.C. 98). A sixth specimen bears the collecting code '244', which denotes his field trip on 16 July 1886 and which his manuscript notebook lists as 'Cushinshean Laoghs', in West Mayo (H. 27) but whose current spelling is Cushinshean Loughs. The existence of this specimen was brought to our attention by Mr K. G. M. Bond; it has no abdomen and so the genitalia cannot be checked. We have not examined any of the specimens but based on very good photographs of them taken by Mr E. G. Hancock they all appear to be this species.

Fenn (1891: 203) records the species from Deal, Kent, on 9 July 1891. The BMNH has specimens from there collected by W. Purdey in 1890 and 1910, and also some caught at Sandwich, Kent, by both Fenn and Purdey in 1892 and by Purdey in 1912. The BMNH also has a specimen taken near Folkestone, Kent, in 1912, without a captor's name, and material from Walmer but without any other data. All these localities are in V.C. 15.

Barrett (1905: 295–297) states that after his discovery in Pembroke it was found in Kent, in Carmarthenshire by N. M. Richardson and that Russ of Sligo, Ireland, captured five specimens in a moist field near his home.

The next British record that we can trace is an un-dissected specimen standing under this species in the BMNH taken by R. Adkin on 3 August 1933 at Eastbourne, East Sussex (V.C. 14). It is clear from papers that he published in *The Entomologist* that he regularly ran a light-trap in his garden at Eastbourne, which is very close to the coast. Therefore, it is likely that the specimen was from there. Although rather worn it appears to be this species. If so then this may be

the only Sussex record, because Mr C. R. Pratt tells us (*in litt.*) that he knows of no other record from the county.

In his account of the Lepidoptera of the Ilfracombe district of north Devon that includes the Braunton area, Palmer (1946: 107) provides a list of Microlepidoptera compiled from data provided by 'Dr F. R. Elliston Wright (Braunton)' and 'Dr G. B. Longstaff (Mortehoe)'. Against the name *Phalonia mussehliana* are the initials 'F. R. E. W.' who presumably recorded it in the Braunton area, possibly at Braunton Burrows (V.C. 4). There are records attributed to him of at least two species which must have been misidentified: *Coleophora conspicuella* Zeller, 1849 and *Eudonia murana* (Curtis, 1827), the former being restricted to the south-east of England and the latter not having been reliably recorded in southern England. Thus, although his record of *Phalonia mussehliana* might be correct, especially as SDB found undoubted specimens of this species at Braunton Burrows in 2007, it might not.

In his list of the Microlepidoptera of Ireland, the only record that Beirne (1941: 77) cites is, 'Sligo [H. 28]: (Russ) Kane 1901. The specimens are correctly identified, and the record is probably reliable.' The reference to Kane is to *A Catalogue of the Lepidoptera of Ireland* by W. F. de V. Kane published in 1901. Mr K. G. M. Bond tells us (*in litt.*) that there are four specimens with the label 'Russ, Sligo' in The National Museum of Ireland, Dublin.

In the first half of June 1952 Bradley (1953: 17) found the species in the grounds of Ballylickey House Hotel, near Bantry, Co. Cork (H. 3). There is a specimen in the BMNH with a data label reading 'IRELAND/Bantry, Co. Cork, 4-15.vi.1952/J. D. Bradley. B. M. 1952-297'. It is a female and Bradley made a genitalia preparation (slide number 2882).

Huggins (1953: 177) observes that the capture of what he describes as 'this obscure Tortrix' by Bradley is the first record he could recall since he found one at Deal in 1922 and that Bradley's record confirmed the western distribution of the species. He comments that the Deal locality had since been destroyed and that it was the only eastern one. We cannot trace whether Huggins had previously published his Deal record. He adds that there was no reliable account of its life history, but because it was double-brooded, so that larvae would not have to be carried over hibernation, he hoped that an energetic collector might fill the gap.

In 1953, 1954, 1955 and 1962 E. C. Pelham-Clinton collected one in each year at Port Appin, Main Argyll. These are erroneously cited under *Phalonidia minimana* by Bradley, Tremewan & Smith (1973: 37-38), as pointed out by Pelham-Clinton (1982: 121).

The Hope Department of Entomology, Oxford University, has a specimen taken by D. W. H. Ffennell on 28 July 1962, also at Port Appin, no doubt in the company of Pelham-Clinton because they had entomological excursions together.

In a list of Somerset Lepidoptera, Turner (1955: 127) states that it is generally common and widespread on cowslips (*Primula veris*, L.) and provides four localities. Barnett *et al.* (2008: 505) comment that this entry is an error for *Falseuncaria ruficiliana* (Haworth, 1811), and this must be correct because not only is *Primula veris* a larval foodplant of that species but Turner does not include it in his list.

Bradley, Tremewan & Smith (1973: 38-39) state that it is a local species whose distribution is little known, noting that it has been recorded in England from Kent (Deal, Walmer, Sandwich, Folkestone), Sussex (Eastbourne), Somerset and

Devon, with no indication of localities in the last-mentioned two counties, and that in Wales it is known from Pembrokeshire and Carmarthenshire, with no indication of localities. They add that there is one record from Scotland, citing King (1887: xlix) but with the comment that no locality data are given and that the record needs confirmation. The present paper confirms that King took specimens of what appears to be this species in Scotland, and identifies the locality. As regards Ireland they state that Beirne (1941: 77) cites Kane's record from Co. Sligo and that Bradley (1953: 17) records it from the Bantry-Glengarriff area in Co. Cork.

Dr P. H. Sterling tells us (*in litt.*) that he had a specimen, confirmed by dissection, at light on 16 July 1983 at Boulderwall Farm Nature Reserve, Dungeness, Kent (V.C. 15). This record has not been previously published.

P. W. Brown found the species at Connel, Main Argyll (V.C. 98), on 6 July 1985 (Agassiz, 1987: 178).

K. G. M. Bond (Agassiz *et al.*, 1995: 216) recorded it on 6 July 1993 at Tory Hill, Co. Limerick (H. 8). He tells us (*in litt.*) that he also caught a specimen at Ballyconneely, West Galway (H. 16), on 4 August 1994.

On 9 August 2007 a female (confirmed by dissection) was taken at Skehanagh, near Ennis, Co. Clare (H. 9) (K. G. M. Bond, *in litt.*).

As stated in the Introduction, SDB had two specimens at light on 25 July 2007 (confirmed by dissection) at Braunton Burrows, North Devon.

On 29 June 2009 RJH collected a male in a damp slack amongst sand dunes near Tràigh Hogh and a female (confirmed by dissection) in an area of machair at Machair Mhór, both on Coll, Mid Ebudes (V.C. 103).

We have not traced any other record from the British Isles. It may be significant that several of the localities are coastal, such as Braunton Burrows (V.C. 4), Eastbourne (V.C. 14), Deal, Sandwich, Folkestone, Walmer and Dungeness (V.C. 15), Port Appin (V.C. 98), Tràigh Hogh and Machair Mhór (V.C. 103) and near Bantry (H. 3).

Larval foodplants given in the British literature

Stainton (1861: 126) was the first to provide information on the biology, from mainland Europe, in the British literature. In what he describes as "Extracts from Kaltenbach's 'vegetable-feeding insects'" he records that Kaltenbach states that, "The larva of *C. [Cochylis] Mussehliana* feeds on the pith of the stem of *Alisma Plantago* ..."

Gynnidomorpha alismana (Ragonot, 1883) is the only Cochylid species in the British Isles whose larva is known to feed in the stem of *Alisma plantago-aquatica* L., but at the time of Kaltenbach's publication it had not been described. We have little doubt that this is the species that resulted from those larvae. This plant continues to be listed as a larval foodplant of *Gynnidomorpha permixtana*.

Barrett (1905: 295–297) states that the history of the larva was 'involved in obscurity' and critically reviews certain foodplants cited in mainland European literature. He records that Kaltenbach stated that he had reared it from *Sagittaria sagittifolia* L. and that Stange had reared it from *Butomus umbellatus* L. We have been unable to trace where Kaltenbach states that he had reared the species from *Sagittaria sagittifolia*. He published a series of papers in *Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande und Westphalens* entitled 'Die

deutschen Phytophagen aus der Klasse der Insekten' on plant-feeding insects, arranged alphabetically by plant genera. Kaltenbach's *Die Pflanzenfeinde aus der Klasse der Insekten* was published in 1874. He includes 'Sagittaria' in both works but does not mention the species feeding on *Sagittaria*. Barrett goes on to observe that it is reasonable to conclude that the same species might feed on the closely allied plants, *Sagittaria sagittifolia* and *Butomus umbellatus*, but that he had no idea what that species might be. He comments that neither plant occurred where he had found the moth in south Wales, nor was the moth known to have occurred in any place suitable for these water-plants.

Barrett notes that Zeller suggested *Linum catharticum* L. as a foodplant but comments that although this was common enough where he, Barrett, had found the moth, abundant and frequent examination of the plant, including the seed-capsules, produced no result. He does not indicate whether Zeller's suggestion was made in correspondence or in a publication. Further, he comments that the statement that it had been reared from *Alisma plantago-aquatica* 'probably refers to *E. alismana* (this has been proved by examination of specimens); and that which refers to *Pedicularis palustris* surely belongs to the closely allied *E. geyeriana* [= *Gynnidomorpha minimana*].'

He also records that the species occurs in rough poor pastures on moderate slopes of hillsides, where the herbage is short and thin with very poor grass, often among scattered fleabane (*Pulicaria dysenterica*) and small sedges (*Carex* spp.).

Initially Meyrick (1895: 550) gave the larval foodplant as 'seed-vessels of *Butomus*'. This may have been based on a review of *Verzeichniss der Schmetterlinge der Umgegend von Halle an der Saale* by A. Stange published in 1869, where the reviewer (Anonymous, 1870: 144) states that "The rare *Mussehliana* may soon be an inmate of all our cabinets, if we bear in mind that it was "once bred abundantly from the seeds of *Butomus umbellatus*."'. Later Meyrick comments ([1928]: 489–490) that 'Larvae on *Butomus* or other plants hitherto attributed to this species were based on wrong identifications.'

Bradley, Tremewan & Smith (1973: 38–39) refer to Meyrick's comments mentioned above and state that the immature stages and life history do not appear to be known in the British Isles. They accept the larval foodplants given by Swatschek (1958: 237) as the flowerheads, seeds and stems of '*Butomus umbellatus*, *Pedicularis*, *Alisma plantago-aquatica*, *Gentiana lutea*, *Euphrasia* and *Rhinanthus*.'

Emmet (1988: 148) gives, '*Butomus*, *Pedicularis*, *Alisma plantago-aquatica*, *Euphrasia* or *Rhinanthus*'; these names are preceded by an asterisk denoting that the information has been taken from mainland European authors. Later this list is reduced to simply: '*Butomus*, *Pedicularis* etc.; flower-heads, seeds and stem' (Emmet, 1991: 140–141).

Bradley (2000: 31), probably understandably, states that the foodplants are uncertain.

Accordingly, we are not aware of the larva being found in the British Isles prior to 2008.

Mainland European literature records of the larval foodplant

The following, which does not claim to be exhaustive but may be representative, sets out foodplants cited in mainland European literature.

Kaltenbach (1856: 191–192; 1874: 712) gives 'Alisma' and this is followed by Rössler (1867: 194).

A. Stange (1869: 73) gives the seeds of 'Butomus umbellatus' and this is followed by Hartmann (1880: 40) who includes the flowers of that plant and adds the flowers and seeds of 'Gentiana lutea'.

G. Stange (1900: 25) states that the larva feeds on the seeds of 'Pedicularis' and 'Euphrasia od.' *Euphrasia odontites* is now known as *Odontites vernus*. This entry, like several others, is preceded by an asterisk meaning that it is corroborated by Messing or Sponholz.

Kennel (1913: 281–282) records that the larva occurs in the flowers, seeds and stems of 'Rhinanthus', 'Butomus umbellatus', 'Pedicularis', 'Euphrasia', 'Gentiana lutea' and 'Alisma plantago'.

Schütze (1931: 173), in translation, states in two generations in the seeds of 'Pedicularis', preferring to bore into a stem for pupation, then in a spun tube amongst flowers and seeds of 'Euphr. odontites' and 'Rhinanth.' mining, according to Stange. This is rather difficult to understand, because if the larva lives in a tube amongst the flowers and seeds then why does it mine, unless Schütze means that it lives amongst the flowers and seeds of 'Euphr. odontites' but mines 'Rhinanth.'. As will be seen, mining does not accord with our observations. Schütze comments that neither of these plants grow in his locality and that the larva probably lives on 'Euphr. officinalis' which is common there.

Lhomme (1935: 206–207) cites *Rhinanthus*, *Butomus umbellatus* and *Gentiana lutea* L., adding that Chrétien indicates *Melampyrum pratense* L., *Linum usitatissimum* L. and *Linum catharticum* but comments that it is encountered more frequently on *Rhinanthus major* Ehrh. and *Odontites*, in the flowers, seeds and stems.

Swatschek (1958: 237) states that the larvae are in the flowers, seeds or stems of *Butomus umbellatus*, *Pedicularis*, *Alisma plantago*, *Gentiana lutea*, *Euphrasia* and 'Rhinanthus' (*sic*) and gives a larval description based on larvae found in the flowers of 'Rhinanthus'.

Razowski (1970: 227–228) gives *Pedicularis*, *Euphrasia*, *Rhinanthus*, *Butomus umbellatus*, *Alisma plantago* and *Gentiana lutea* and later (2002: 50) records that the larva feeds in the flowers, seeds and stems of *Alectrolophus* (= *Rhinanthus*), *Pedicularis*, *Gentiana lutea*, *Solidago virgaurea*, *Alisma* and *Butomus umbellatus*.

Svensson (2006: 49) comments that the larva is said to live in the flowers, seed-capsules and stems of *Butomus*, *Pedicularis*, *Alisma*, *Gentiana* and *Euphrasia*.

Finally, Razowski (2009: 56) slightly changes the foodplants he had given in 1970 and 2002, listing the following, '*Alectrolophus*, *Rhinanthus*, *Gentiana lutea*, *Solidago virga-aurea*, *Alisma plantago-aquatica*, *Butomus umbellatus* and *Sedum* etc.; in Japan feeding on *Alisma* sp., *Gentiana* sp., *Euphrasia* and *Pedicularis*'.

Discovery of the larva in the British Isles

On 25 July 2007 SDB attended a British Butterfly Conservation meeting at Braunton Burrows, Devon (V.C. 4), an extensive sand dune system on the north Devon coast, with dune slacks and comparatively flat areas with a compacted sand substrate. This is an area that is comparatively well known entomologically and which both of the present authors have visited on numerous occasions since the mid 1980s. Light-traps were run and two male Cochyliid specimens in good

condition were attracted. Subsequent genitalic dissection of one confirmed the tentative determination that they were *Gynnidomorpha permixtana*.

Only four of the foodplants given in the British literature have been recorded at Braunton Burrows: one or more *Euphrasia* species, *Pedicularis sylvatica* L., *Rhinanthus minor* L. and *Alisma plantago-aquatica*.

On 23 August 2008 we visited the area where the light-traps had been placed which comprises a large number of bushes of *Salix* species in damp grassland with a mix of lower vegetation. *Rhinanthus minor* was common but all the seed-capsules of these were open and most of the seeds had already been shed. What was almost immediately apparent was that there were also scattered plants of *Odontites vernus*. RJH had previously found larvae of *Gynnidomorpha luridana* (Gregson, 1870) in seed-capsules of that species in Dorset (Heckford & Sterling, 1997: 125–126) and wondered if *G. permixtana* might also use this.

We started opening a few green seed-capsules and very soon found larvae about 3–4 mm long, but never more than one larva in any one capsule. At that stage the larva produced slightly damp black frass that was not granular but rather compressed. Each seed-capsule was no longer than 5 mm and at that stage each larva fed entirely within one seed-capsule, but in captivity we noticed that sometimes a larva would spin two seed-capsules together and apparently transfer from one to the other. The seed-capsules with larvae sometimes had some dark discoloration on the outside but otherwise there was no outward visible sign that they were inhabited.

The plants with larvae grew amongst taller vegetation, often near *Filipendula ulmaria* (L.) Maxim. in slightly damp areas, whereas plants growing in drier situations, such as in the middle of tracks, did not have larvae. However, we only searched a comparatively small area and our observations may not be representative of the preference, if any, of ovipositing females.

The larvae fed up very quickly and all except one pupated by early September, either amongst spun seed-capsules, within tissue or in balsa wood. The containers were kept indoors and six moths of both sexes emerged between 23–30 September 2008. The one larva that had not pupated by early September had not done so by 23 September. The date of pupation was not noted but must have been soon afterwards because the moth emerged on 15 October 2008. Genitalia preparations were made of one specimen of each sex to confirm that we had indeed reared *G. permixtana*.

We returned to the same area on 22 August 2009 to examine further seed-capsules. Again we found very small larvae in seed-capsules of *Odontites vernus* and also a few in seed-capsules of *Rhinanthus minor*. We examined *Euphrasia* spp. occurring in the area but it appeared to us that the seed-capsules of these were too small to accommodate larvae and none was found within them. We reared moths in September and October 2009 from *Odontites vernus* and in early 2010 SDB found a dead moth in one container of *Rhinanthus minor* seed-capsules.

We made a further visit to the same area on 18 August 2010. This was to try to find more larvae in seed-capsules of *Rhinanthus minor*. We found several *Gynnidomorpha permixtana* flying in the early evening in areas with *Odontites vernus* and where there was also some *Rhinanthus minor*. We opened a few seed-capsules of the former, but found no larvae and so collected at random a few stems of this with seed-capsules. Unlike in 2008 and 2009 we found a few plants of *Rhinanthus minor* that were flowering or had just finished flowering and

collected a few. We did not try opening any of the seed-capsules of these. In due course we noted that some of both had larvae because full-grown larvae were found wandering about the containers in which we had put these seed-capsules. These duly pupated, usually in balsa wood but sometimes within the seed-capsules, and moths emerged from both foodplants between 14 September and 1 October 2010.

Bradley, Tremewan & Smith (1973: 38–39) and Emmet (1988: 148; 1991: 140–141) give the larval period as June to July and September to April, this information no doubt derived from Kennel (1913: 281–282). In view of our experience, it seems likely that the second generation does not overwinter as larvae, but become pupae in September. We appreciate that we kept the larvae indoors and that is probably why moths emerged from late September to early October, which we doubt would have happened in the wild, but in our experience larvae that overwinter in that stage in the wild usually also do so when kept in captivity.

Description

Larva. The larva is described by Kennel (1913: 281–282) as dirty brownish white, with a light yellow-brown head [schmutzig bräunlichweiß, der Kopf hell gelbbraun] and by Swatschek (1958: 237) as dirty yellowish white, strongly grained with small spicules; head light brown; prothoracic plate yellowish. Swatschek makes clear that his account is based on larvae found by Disqué on 26 June 1893 in the flowers of *Rhinantus* (*sic*) and preserved in the Zoologische Staatssammlung, Munich, Germany. Bradley, Tremewan & Smith (1973: 38–39) repeat part of Swatschek's description but do not mention that it is based on preserved larvae.

The following descriptions are based on our observations.

Early instar (Fig. 1). 4–5 mm long. Head black; prothoracic plate slightly translucent dark grey; body pale yellow; pinacula very small, pale grey; peritremes of spiracles black; anal plate slightly shiny, concolorous with body; thoracic legs translucent yellow; ventral and anal prolegs translucent and colourless, crochets reddish brown. Because it is very difficult to keep detailed observations on seed-feeding larvae we cannot say whether this was the penultimate or a pre-penultimate instar.

Final instar (Fig. 2.). 8–9 mm long. Head yellow-brown, stemmata black; prothoracic plate yellow-brown; body pale to mid grey, sometimes suffused pale yellowish dorso-laterally; pinacula very small, often hardly discernible, dark grey; peritremes of spiracles black; anal plate yellow-brown, darker anteriorly; thoracic legs translucent yellow-brown; ventral and anal prolegs translucent and colourless, crochets reddish brown. Shortly before pupation the posterior dorsal area of the abdomen usually becomes suffused with reddish pink.

Pupa. Not described. Exuviae yellowish brown, considerably extruded on emergence.

Adult. As there appear to be few recent records a male and female are illustrated (Figs 3, 4), as well as the female genitalia (Fig. 5) because Pierce & Metcalfe (1922: 38, pl. 13) describe, and figure, the ductus bursae as very long and narrow but in fact it is comparatively short and wide.

Discussion

The larval foodplants that we have traced in both British and European literature represent seven families within two subclasses and are: 'Sedum' (Crassulaceae), *Linum usitatissimum* and *Linum catharticum* (Linaceae), *Gentiana lutea* (Gentianaceae), *Melampyrum pratense*, *Euphrasia odontites* (now *Odontites vernus*), 'Euphrasia', 'Rhinanthus', *Rhinanthus major* and 'Pedicularis', (all Scrophulariaceae), *Solidago virgaurea* (Asteraceae), all in the subclass Magnoliidae (Dicotyledons), and *Butomus umbellatus* (Butomaceae) and *Alisma*



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Photos: R. J. Heckford
Figs 1, 2. *Gynnidomorpha permixtana* ([Denis & Schiffermüller], 1775). 1, early instar larva on seed-capsule of *Odontites vernus*; 2, final instar larva within seed-capsule of *Odontites vernus*.



Photos: R. J. Heckford
Figs 3, 4. *Gynnidomorpha permixtana* ([Denis & Schiffermüller], 1775). 3, adult ♂; 4, adult ♀.

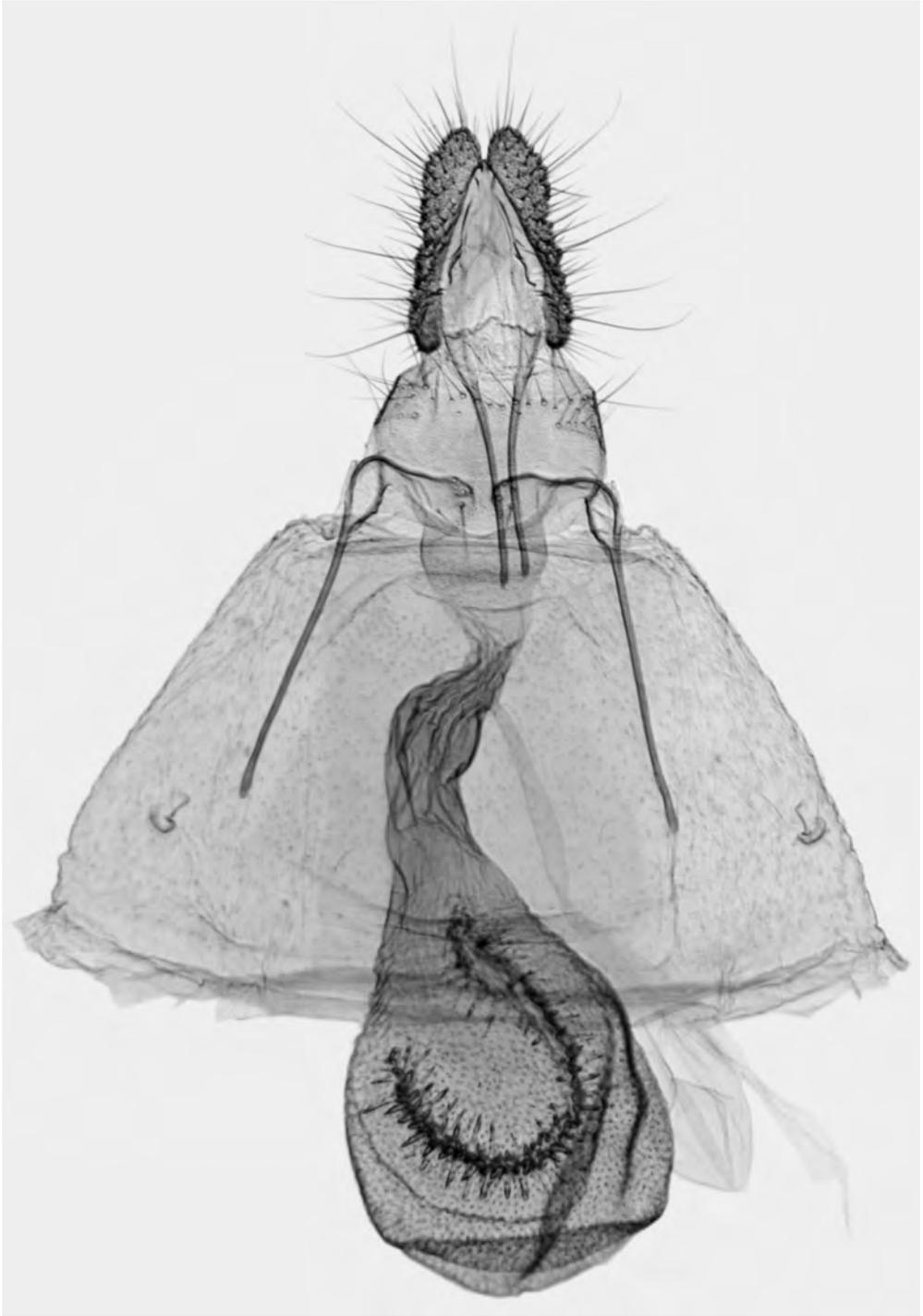


Fig. 5. *Gynnidomorpha permixtana* ([Denis & Schiffermüller], 1775), ♀ genitalia. *Photo:* B. Goodey

plantago-aquatica (Alismataceae) which are both in the subclass Liliidae (Monocotyledons). This is both a surprisingly long and varied list.

From our observations it is clear that in the British Isles *Odontites vernus* and *Rhinanthus minor* are foodplants. Searches where these occur in damp habitats may show the moth to be more widespread than current British records suggest. Whether any of the other foodplants cited in the publications mentioned in this paper are also foodplants in the British Isles or elsewhere is another matter. If one or more are then the species would appear to be one of the more polyphagous members of what used to be the Cochylidae, now in the Tortricinae.

We note that of the mainland European foodplants mentioned in this paper, *Gentiana lutea* does not occur in the British Isles and it seems likely that *Alisma plantago-aquatica*, the foodplant of *Gynnidomorpha alismana*, has mistakenly been given as a foodplant of *G. permixtana*.

Odontites vernus was cited as a foodplant over 100 years ago by Stange (1900: 25), under 'Euphrasia od.' As far as we can trace, this was the first publication of this name. Schütze (1931: 173) enlarges this to *Euphrasia odontites* and Lhomme (1935: 206–207) gives 'Odontites'. *Euphrasia odontites* was an earlier name of what is now *Odontites vernus*.

As far as we can trace, the first publication to give simply 'Euphrasia' was Kennel (1913: 281–282). We suspect that Kennel was aware of Stange's publication and simply contracted 'Euphrasia od.' to 'Euphrasia', and that all subsequent publications with 'Euphrasia' are derived from Kennel.

It appears that *Odontites vernus* has never previously been cited as a foodplant in British literature.

Although in the same family as *Odontites vernus* and often occurring in the same biotopes, it may be that *Euphrasia* species are not foodplants. If so, then Kennel's apparent contraction of Stange's 'Euphrasia od.' to 'Euphrasia' combined with the subsequent change of name from *Euphrasia odontites* to *Odontites vernus* has resulted in a considerable misunderstanding of a foodplant.

In the British Isles the genus *Euphrasia* currently comprises 19 species and a considerable number of hybrids. In general they have white and yellow flowers whereas *Odontites vernus* has purplish red flowers and they are readily distinguishable in the field. This is an illustration of how a change of both the generic and specific name of a species can later give rise to misinterpretation, at least if subsequently only the 'new' generic name is given with no specific name. Had vernacular names additionally been given, then it is possible this confusion would not have arisen because such are often more stable than scientific names.

Acknowledgements

Our thanks are due to Mr J. Breeds and British Butterfly Conservation, because without their light-trapping event and invitation to SDB we would not have known that the species occurred at Braunton Burrows, Mr B. Goodey (Colchester) for his excellent photograph of the female genitalia, Mr K. G. M. Bond (Cork), Mr E. G. Hancock (Hunterian Museum, University of Glasgow), Mr C. R. Pratt (Peacehaven), Professor J. Razowski (Kraków), Miss J. Robinson (Kelvingrove Art Gallery and Museum, Glasgow), Dr K. Sattler (Natural History Museum, London), Dr P. H. Sterling (Weymouth) and Dr W. G. Tremewan (Truro) for their help in various ways.

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