

***Microgaster alebion* Nixon and its 'var A': description of a new species and biological notes (Hymenoptera: Braconidae, Microgastrinae)**

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Introduction

Nixon (1968), in his revision of the microgastrine braconid genus *Microgaster* Latreille, brought forward a new species, *M. alebion*, which he provisionally regarded as being composed of two generations, a spring form emerging as a solitary parasitoid from (overwintered) larvae of *Platyptilia gonodactyla* ([Denis & Schiffermüller]) (Lepidoptera: Pterophoridae), which feeds on *Tussilago farfara* (Asteraceae), and a summer form that he considered to differ only in having a shorter ovipositor (its sheath two-thirds as long as the hind tibia, as opposed to 'about' three-quarters in the spring form), parasitising various Lepidoptera feeding on *Urtica* (Urticaceae), again as a solitary parasitoid. He selected as holotype a female specimen reared in spring from *P. gonodactyla*, and included many other specimens from this host in various localities as paratypes. Nixon called the supposed summer generation '*Microgaster alebion*, var A' and listed the data of several specimens under that name, but in such a way that they were clearly excluded from the type series of *M. alebion*. Hosts listed by Nixon for his 'var A' are (after nomenclatural updating) *Prochoreutis myllerana* (Fabricius), *Anthophila fabriciana* (Linnaeus) (both Choreutidae), *Pleuroptya ruralis* (Scopoli) (Pylalidae) and *Vanessa atalanta* (Linnaeus) (Nymphalidae). Nixon erroneously regarded the first three of these as Pylalidae, and also implied that all four feed on *Urtica*, whereas in fact both the British *Prochoreutis* species (which were often treated together as '*myllerana*' at the time the relevant specimens of '*M. alebion* var A' were collected) feed on *Scutellaria* (Lamiaceae) in an apparently indistinguishable way (Pelham-Clinton, 1985). Subsequent taxonomic treatments of *Microgaster* have continued to treat 'var A' explicitly as part of *M. alebion* (e.g. Papp, 1976) or to ignore it (e.g. Tobias, 1986).

Early in the course of a long-term study of the parasitoids of Choreutidae I became interested in the status of '*M. alebion*, var A' and about 25 years ago I conducted experiments that demonstrated beyond reasonable doubt that it was a species distinct from *M. alebion*. Additional data on the host relations of the two support that view. In this paper I present the experimental and other biological evidence, and formally describe Nixon's '*Microgaster alebion*, var A' as *Microgaster nixalebion* sp. nov. (p. 221). I also briefly describe and illustrate the external feeding phase of the final instar larva of the new species (typical of the genus).

Methods

For host selection experiments, adults of *M. alebion* were reared from

overwintered *Platyptilia gonodactyla* larvae collected at Woodley, Reading, Berkshire, and those of the new species from *Anthophila fabriciana* at Shiplake, near Reading. The adults were fed *ad libitum* on 1 : 3 honey : water and offered putative hosts after two days (*M. alebion*) and ca 12 days (the new species).

The experimental host, *Anthophila fabriciana*, was cultured on *Urtica dioica* from eggs, but wild-collected leaves were used to feed the resulting larvae. Leaves on which the order of 30 first and second instar larvae of *A. fabriciana* had established themselves beneath silken retreats were placed on top of other *Urtica* leaves in closed clear plastic boxes, ca 13.5 × 7.5 × 6 cm, well-lined with absorbent tissue, and single virgin females (with three conspecific males) in the case of *M. alebion* (four replicates), or two virgin females together in the case of the new species (one treatment only), were introduced to the box. The behaviour of the females was observed in each case for 20 minutes and the boxes were then kept in a well-ventilated and fully shaded outdoor shed (*cf.* Shaw, 1997) and food changes conducted as necessary (further details, including the lengths of exposure of the hosts to the parasitoids, are given in Table 1). Unfortunately, moderate to very high mortality, owing to overlooked predatory *Lestodiplosis* (Diptera: Cecidomyiidae) larvae inadvertently introduced with the foodplant, was suffered by many of the *Anthophila* larvae in three of the treatments.

Table 1. Exposure of *Anthophila fabriciana* larvae to *Microgaster* females (separate treatments).

Origin of ♀	Date introduced	Days of exposure	Oviposition observed	Outcome	
				<i>Microgaster</i> cocoons	<i>Anthophila</i> pupae
(2♀) ex <i>Anthophila fabriciana</i>	9.ix.1979	3 (then removed)	Yes, both	22	5
ex <i>Platyptilia gonodactyla</i>	25.vi.1979	22 (until died)	No	0	36
ex <i>P. gonodactyla</i>	25.vi.1979	19 (until died)	No	0	4*
ex <i>P. gonodactyla</i>	25.vi.1979	20 (until died)	No	0	15*
ex <i>P. gonodactyla</i>	29.vi.1979	10 (until died)	No	0	7*

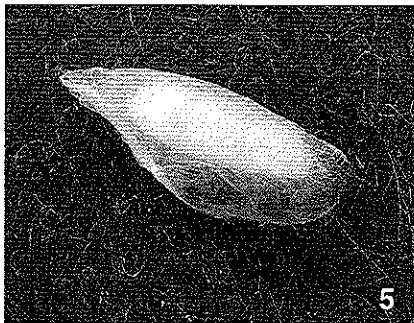
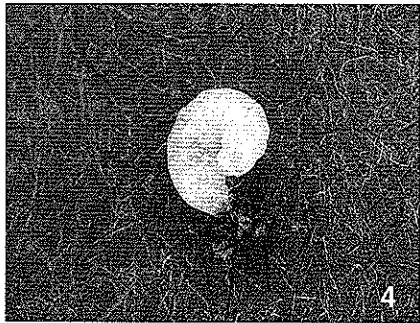
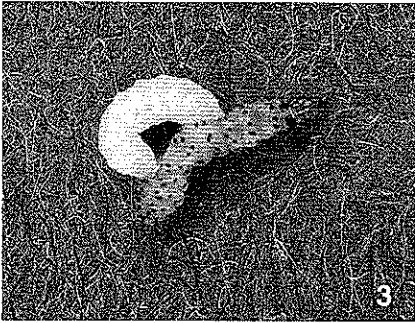
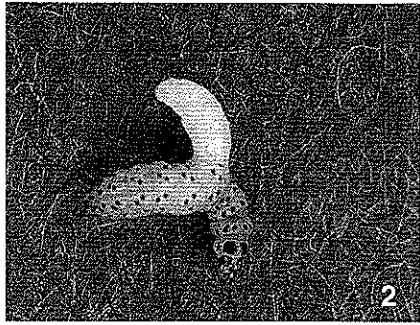
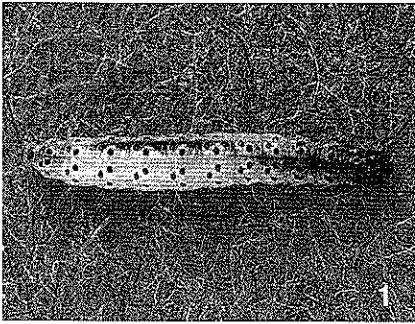
*Heavy predation of the *A. fabriciana* larvae by *Lestodiplosis* larvae.

Concepts of host range are based on my own rearings and on the extensive collection of reared Ichneumonidea that has accumulated at the National Museums of Scotland (NMS) also as a result of donations from many of Britain's leading field entomologists.

Results

Host acceptance

No oviposition behaviour, nor indeed any sign of interest in the hosts or their workings, was seen in any of the four treatments involving exposure of *A. fabriciana* to *M. alebion* s.str. Although only one treatment was unaffected by



Figs 1-5. *Microgaster nixalebion*: larval development as a parasitoid of *Anthophila fabriciana*. 1, final instar larva shortly before eruption; 2, final instar larva erupting from host; 3, final instar larva reinserting its head to resume feeding; 4, final instar larva with host remains at end of external feeding phase (photographed 3h 20m after Fig. 3); 5, cocoon constructed within host cocoon.

mortality caused by *Lestodiplosis* species, altogether 62 hosts pupated (about another 15 killed by *Lestodiplosis* were in sufficiently good condition to be certain that no parasitoids were present on dissection) and no *Microgaster* developed despite the females having been present for the majority of the hosts' larval period. In contrast, both females of the new species immediately started to probe the hosts' silken retreats in a frenzied fashion and apparently oviposited into the most accessible hosts; the females were removed after only three days in order to prevent possible damage to the hosts. From this treatment, 22 *Microgaster* cocoons and only five host pupae resulted. Both this outcome and the observed behavioural difference towards *A. fabriciana* larvae provided strong evidence that *A. fabriciana* is not a host of *M. alebion* s.str. – i.e. that two species are involved.

Development of the new species

Ovipositions into first and second instar *Anthophila fabriciana* larvae took place in the period 9–13.ix.1979. The host larvae were killed in their final (fourth) larval instar, usually within a rudimentary host cocoon, in the period 4–10.x.1979, and the all-male progeny to be expected from virgin females emerged in the period 20–30.x.1979. As it grew large, the developing parasitoid larva was easily visible in the final instar host larva as a whitish swelling, causing the host's gut to be displaced to one side (Fig. 1). By timely intervention on two occasions, the eruption of the *Microgaster* larva from the host was witnessed (Fig. 2), and the ectophagous phase of the final instar larva observed (Figs 3–4). This is typical of the major lineage within the Braconidae to which *Microgaster* belongs (cf. Shaw & Huddleston, 1991), though it has been secondarily lost in some taxa (including many genera of Microgastrinae). The parasitoid larva partially erupted from about the fifth body segment of the host (Fig. 2) and, while its terminal segments were still in the host, curled round and chewed another hole in the integument near the caudal end of the host and reinserted its head to feed (Fig. 3 – both observed cases were identical, but it is not clear whether or not these orientations may vary). The external feeding phase lasted about 3h 15m and 3h 20m in the two cases (the time that separates the photography of Figs 3 and 4). Normally the host is killed as a prepupa within a significantly frailer cocoon than those constructed by unparasitised *A. fabriciana* larvae, within which the *Microgaster* then spins its own cocoon (Fig. 5).

Phenology and additional rearing records

Nixon (1968) was not entirely correct that the data with the specimens he saw suggested that *M. alebion* s.str. was the overwintered generation while '*M. alebion*, var A' occurred only in the summer, because one of the emergence dates he recorded for 'var A' was earlier in the year than at least the majority of those given for *M. alebion* s.str. The fact that all 24 of the specimens he saw from *P. gonodactyla* had been reared from the overwintering generation of that host rather than its late summer generation is likely to be just a consequence of the fact that the overwintered larva of *P. gonodactyla* is extremely easy to find in spring when it feeds in the flower stem, flower and developing seeds of *Tussilago*, causing conspicuous feeding damage and then pupating in situ at a time of year when the plant itself is conspicuous, while the midsummer generation feeds on

the underside of the leaves of *Tussilago* which, by then, are usually hidden away beneath the more vigorous growth of other plants. This makes searching for the summer generation of *P. gonodactyla* larvae so relatively unrewarding, to say the least, that they are very seldom sought. On the basis of reared specimens in NMS (which include 19♀, 13♂ from overwintered *P. gonodactyla* from four localities in England and Scotland), it is clear that at least one other species of *Platyptilia* is regularly a host of *M. alebion*: 1♀, Devon, Glazebrook, ex *Platyptilia isodactylus* (Zeller), *Senecio aquatica*, coll. 14.vi.1985, em. 25.vi.1985 (R. J. Heckford) (two others with similar data failed to emerge); 2♀, Hants, Southampton, ex *P. isodactylus*, *S. aquatica*, coll. 4.vi.1991, em. vi.1991 (J. R. Langmaid); 1♀, 2♂, Hants, Lower Test Marshes NR, ex *P. isodactylus*, *S. aquatica* stems, coll. 7.viii.1984 (P. H. Sterling). The last series came from the summer generation of the host and the female does not differ in ovipositor length. In The Natural History Museum, London (BMNH), are further series of *M. alebion* s.str. reared by R. Hinz from *Platyptilia nemoralis* Zeller from two sites in Germany in the late summers of 1954 (1♀, 2♂) and 1956 (3♀, 2♂). Nixon had added his determination labels to the first series in 1957 but did not mention them in the course of describing *M. alebion* in 1968, presumably having forgotten that these late summer specimens had ovipositors as long as the early summer specimens from *P. gonodactyla* that he had before him.

The reared specimens of the new species in NMS and in BMNH are all part of the type series and their data are given as part of the formal description. Although most of the available reared specimens are from summer generation hosts, there are a few (including females with ovipositor lengths normal for the new species) reared from the overwintered larvae of *Pleuroptya ruralis* and *Anthophila fabriciana*, and it is clear the these two generally widespread and abundant hosts enable the parasitoid to get through the British winter. These fully resident hosts in Britain (also the more local *Prochoreutis* species) thus enable a population of the parasitoid to be on hand to greet the annual immigration of *V. atalanta*, of which (at least in southern Britain) the new species is an abundant parasitoid in most years.

Microgaster nixalebion sp. nov.

Microgaster alebion, var A: Nixon, 1968.

Microgaster alebion var A: Papp, 1976.

Nixon (1968) has adequately characterised this species as '*Microgaster alebion*, var A', and Papp (1976) has recognised the same segregate in his more comprehensive key to European *Microgaster* species. In view of the adequate existing characterisation of the new species in the European *Microgaster* fauna, the following description concentrates on expressing the variation seen in the new species, much of it size-related and perhaps the result of its taxonomically broad host range.

Female. Length of body (excluding ovipositor) 3.4–4.0 mm; length of fore wing 3.7–4.1 mm.

Head: transverse, about 1.7–2.0 times as wide as long in dorsal view, roundly narrowing behind eyes; eye about as long as temple (measurement very dependent

on orientation); distance between posterior ocelli and between ocellus to eye the same, 1.4–2.0 times maximum diameter of ocellus; anterior tangent to posterior ocelli usually clearly cutting anterior ocellus; distance between anterior and a posterior ocellus usually distinctly shorter than diameter of posterior ocellus; ocellar triangle more or less surrounded by striate sculpture; face 1.4–1.5 times as wide as high, rugose, centrally with an indication of large punctures but dominated by transverse sculpture (running upwards to eyes) which becomes coarsely striate towards inner orbit; clypeus also rather coarsely sculptured but slightly more shiny than face; antenna about as long as fore wing, fourth segment 2.5–3.0 and penultimate segment 1.1–1.5 times as long as wide.

Mesosoma: 1.30–1.45 times as long as high; mesoscutum anteriorly rather dull and rugose to rugose-punctate, notaulic courses indicated by broad bands of stronger rugosity which do not coalesce posteriorly, the posterior 0.25–0.35 largely smooth and shiny but often somewhat rugose-punctate at sides; scutellum with scattered shallow punctures but largely smooth and shiny; mesopleuron with superficial puncturation anteriorly and ventrally, centrally smooth and shiny; propodeum coarsely rugose, a median longitudinal carina evident but somewhat irregular; hind coxa laterally mostly smooth and shiny; hind femur rugulose, shiny, 2.9–3.3 times as long as wide; hind tibia 5.0–5.9 times as long as wide, its inner spur about 1.6 times outer spur and 0.65–0.75 times basitarsus; hind claw with 1–2 fine black spines basally.

Metasoma: first and second tergites strongly rugose, third and subsequent tergites essentially smooth (third sometimes weakly sculptured anteriorly) with evenly distributed hairs; second tergite 2.9–3.1 times as wide as long and 1.2–1.3 times as long as third tergite; hypopygium tightly folded along midline but scarcely creased; ovipositor sheath 0.63–0.68 times as long as hind tibia.

Colour: black; palpi at least distally brownish yellow; all legs (except coxa, trochanter and at least basal part of trochantellus) dull orange, the hind femur and to a lesser extent hind tibia smudged brownish apically and the hind tarsus darkening to brown distally; frequently all femora basally and telotarsi to some extent darkened. Wings slightly yellowish infumate.

Male. Like female apart from sexual differences but, like males of most *Microgaster* species, poorly characterised and rather more variable.

Etymology. The first three letters allude to the late G. E. J. Nixon, who had associated this species with *M. alebion*.

Nixon (1968) noted only the shorter length of the ovipositor to separate his var A from *Microgaster alebion* s.str., but *M. nixalebion* is a less slender species (length of mesosoma in females 1.30–1.45 times its height; *M. alebion* 1.50–1.55) with the second abdominal tergite usually less transverse (in females 2.9–3.1 times as wide as long; *M. alebion* 3.0–3.4). In addition, the hairs on the wings of *M. nixalebion* are slightly stronger, giving the wings a slightly darker appearance. The clearest difference, however, remains the length of the hairy part of the ovipositor sheath which (from the start of its substantial widening) is 0.63–0.68 times as long as the hind tibia in *M. nixalebion* (with no seasonal difference) and 0.71–0.81 times as long as the hind tibia in *M. alebion*. Also the hairs towards the apex of the ovipositor sheath are longer, more upstanding and more strongly

curved in most female specimens of *M. nixalebion*, but there is considerable variation.

MATERIAL EXAMINED

Holotype ♀: [England] 'Otmoor NR, Oxon. H: *Anthophila fabriciana*, *Urtica*. HLC: 3.8.[19]78. PLE: <16.8.[19]78. PIE: 25.8.[19]78. *M. R. Shaw*' (in NMS).

Paratypes. England: 2 ♀, same data as holotype except emerged 23.viii.1978 (NMS); 1 ♀, 3 ♂, University of Reading (Whiteknights Campus), ex *Anthophila fabriciana*, *Urtica*, coll. 9.viii.1978, em. 20-29.viii.1978 (*M. R. Shaw*) (NMS); 1 ♀, 2 ♂, Oxford Canal, ex *Anthophila fabriciana*, *Urtica*, coll. 11.viii.1978, em. 13.viii-2.ix.1978 (*M. R. Shaw*) (NMS); 1 ♀, 1 ♂, Shiplake, Oxon, ex *Anthophila fabriciana*, *Urtica*, coll. 5.viii.1979, em. 24-28.viii.1979 (*M. R. Shaw*) (NMS); 1 ♂, Dunsden, Oxon, ex *Anthophila fabriciana*, *Urtica*, coll. 1.viii.1979, em. 20.viii.1979 (*M. R. Shaw*) (NMS); 1 ♀, Pamber Forest, Hants, ex *Anthophila fabriciana*, *Urtica*, coll. 25.vii.1979, em. 13.viii.1979 (*M. R. Shaw*) (NMS); 1 ♀, Catfield, Norfolk, ex *Anthophila fabriciana*, *Urtica*, coll. 16.viii.1980, em. 7.ix.1980 (*M. R. Shaw*) (NMS); 1 ♂, Great Hockham, Norfolk, ex *Anthophila fabriciana*, *Urtica*, coll. 3.viii.1988, em. 23.viii.1988 (*M. R. Shaw*) (NMS); 1 ♀, Leighton Moss, Lancs, ex *Anthophila fabriciana*, *Urtica*, coll. 12.viii.1992, em. 12.ix.1992 (*M. R. Shaw*) (NMS); 1 ♀, 1 ♂, Eastleach, Glos, ex *Anthophila fabriciana*, *Urtica*, coll. 18.vii.1985, em. 3-17.viii.1985 (*M. R. Shaw*) (NMS); 1 ♀, Redhill, Surrey, ex *Anthophila fabriciana* (as *Simaethis*), coll. 22.vii.1937, em. 14.viii.1937 (*R. L. E. Ford*) (BMNH); 1 ♀, Weston Turville Reservoir NR, Bucks, ex *Anthophila fabriciana*, *Urtica*, coll. 12.viii.1978, em. 29.viii.1978 (*M. R. Shaw*) (NMS); 6 ♀, 1 ♂, as preceding but ex *Prochoreutis myllerana* (as *Choreutis*), *Scutellaria gallericulata*, em. 27.viii-8.ix.1978 (NMS); 1 ♀, Oxford University Parks, Oxon, ex *Prochoreutis myllerana* (as *Choreutis*), *Scutellaria gallericulata*, coll. 11.viii.1978, em. 29.viii.1978 (*M. R. Shaw*) (NMS); 1 ♀, Oxford Canal, ex *Prochoreutis myllerana* (as *Choreutis*), *Scutellaria gallericulata*, coll. 11.viii.1978, em. 22.viii.1978 (*M. R. Shaw*) (NMS); 2 ♂, Catfield, Norfolk, ex *Prochoreutis* sp., *Scutellaria gallericulata*, coll. 26.vii.1988, em. 10.viii.1988 (*M. R. Shaw*) (NMS); 9 ♀, 2 ♂, Bexley, Kent, ex *Prochoreutis myllerana* (as *Choreutis*), coll. vi.1943, em. vii.1943 (*R. L. E. Ford*) (BMNH); 1 ♀, Catcliffe, S. Yorks, ex *Pleuroptya ruralis*, *Urtica*, 16.vi.1993 (*T. H. Ford*) (NMS); 1 ♀, Moss Valley, Sheffield, Yorks, ex *Pleuroptya ruralis*, *Urtica*, cocoon coll. 24.v.1993, em. vi.1993 (*T. H. Ford*) (NMS); 1 ♀, Wimbledon Common, Surrey, ex *Pleuroptya ruralis* (as *Botys*), coll. v.1947, em. 20.v.1947 (*J. D. Bradley*) (BMNH); 2 ♀, 1 ♂, Esher, Surrey, ex *Pleuroptya ruralis* (as *Notarcha*), coll. 18.vi.1947, em. 30.vi.1947 (*G. E. J. Nixon*) (BMNH); 1 ♀, Hailsham, Sussex, ex *Pleuroptya ruralis* (as *Notarcha*), coll. 20.vi.1960, em. 9.vii.1960 (*R. L. E. Ford*) (BMNH); 1 ♀, Roding Valley Meadows, Buckhurst Hill, Essex, ex *Pleuroptya ruralis*, coll. 21.v.1992 (*C. Hallett*) (NMS); 1 ♀, as preceding but ex *Vanessa atalanta*, coll. 7.viii.1991, em. 1991 (NMS); 1 ♀, Reading, Berks, ex *Vanessa atalanta*, *Urtica*, coll. vii.1983, em. 19.vii.1983 (*B. T. Parsons*) (NMS); 1 ♀, Portslade, Sussex, ex *Vanessa atalanta*, em. viii.1992 (*A. R. Cronin*) (NMS); 1 ♀, Bentley Wood, Salisbury, Wilts, ex *Vanessa atalanta*, *Urtica*, coll. vii.1983, em. viii.1983 (*P. Waring*) (NMS); 1 ♀, 1 ♂, Bexley, Kent, ex *Vanessa atalanta*, coll. 6.vii.1938, em. 1.viii.1938 (*R. L. E. Ford*) (BMNH); 1 ♂, Stockbridge, Hants, ex *Vanessa atalanta*, em. 20.viii.1954 (*R. L. E. Ford*) (BMNH); 1 ♀, as preceding but coll. 10.vi.1955, em. 1.vii.1955 (BMNH); 1 ♂, Oxford, ex exposed larva of *Aglais urticae*, coll. as externally feeding larva, 1986 (*T. Shepherd*) (NMS). Wales: 1 ♂, Little Haven, Pembro, ex *Anthophila fabriciana*, *Urtica*, coll. 11.viii.1977, em. 1.ix.1977 (*M. R. Shaw*) (NMS); Cyncoed, Cardiff, ex *Anthophila fabriciana*, *Urtica*, coll. 13.iii.1982, em. 3.vi.1982 (*A. Davis*) (NMS); 2 ♀, Michaelstone-le-Pit, Cardiff, ex *Pleuroptya ruralis*, *Urtica*, coll. 10.v.1983, em. 3.vi.1983 (*A. Davis*) (NMS). Belgium: 2 ♂, Stoumont, Liege, ex *Anthophila fabriciana*, *Urtica*, coll. 11.vii.2003 (*M. R. Shaw*) (NMS). France: 1 ♂, Chartres, Eure-et-Loire, ex *Vanessa atalanta*, coll. 24.vii.1990, em. viii.1990 (*M. R. Shaw*) (NMS); 1 ♀, Availles-Limouzine, Vienne, ex *Vanessa atalanta*, *Urtica*, coll. 5.viii.1990, em. 23.viii.1990 (*M. R. Shaw*) (NMS); 1 ♀, Couhé, Vienne, ex *Vanessa atalanta*, coll. 27.vii.1990, em. viii.1990 (*M. R. Shaw*) (NMS); 1 ♀, Limogne, Lot, ex *Vanessa atalanta*, *Urtica*, coll. as cocoon 22.vii.1993, em. 27.vii.1993 (*M. R. Shaw*) (NMS). Greece: 3 ♀, 2 ♂, Ropa Valley, Corfu, ex *Vanessa atalanta*, *Urtica*, coll. as cocoons 17.iv.2004, em. 24.iv.2004 (*P. J. C. Russell*) (NMS).

Host range of *M. nixalebion*

The host range of *M. nixalebion* is interesting. Although it is quite probable that additional hosts may be found, it might best be explained by suggesting an original association with Choreutidae feeding on low plants, from which it has recruited other suitable hosts on the same foodplant as one of them (*Anthophila fabriciana* on *Urtica*). The hosts that are suitable for it on *Urtica* come from a range of families (Choreutidae, Pyralidae, Nymphalidae), but each species used as a host has in common the fact that it feeds or rests in concealment, allowing the final external feeding phase of the parasitoid to take place in relative safety. Related Lepidoptera such as the vanessine nymphalids *Aglais urticae* (Linnaeus), *Inachis io* (Linnaeus) and *Polygonia c-album* (Linnaeus) that feed and rest in more exposed situations on *Urtica* would not be so suitable on these grounds alone, and this has presumably been an important factor in the failure of the parasitoid to recruit such species to its host range. Note that although a single supposed rearing from *A. urticae* is listed, it is clear that (even though this record may be correct) *A. urticae* is best rated as being outside the host range of *M. nixalebion* on the grounds that it is very seldom used even though it must be often encountered (cf. Shaw, 1994). It is of interest that another *Microgaster* species, *M. subcompletus* Nees (the only gregarious species of *Microgaster* known in Europe), similarly uses both *P. ruralis* and *V. atalanta* as hosts, and is in Britain a common parasitoid of both, but shuns other *Urtica*-feeding vanessines: the fact that the resident and ubiquitous *P. ruralis* supports *M. subcompletus* over the winter similarly explains how the immigrant *V. atalanta* is always so heavily parasitised by it in Britain.

Acknowledgements

The experimental part of this work was done while I had the wonderful support of a University Research Fellowship at Reading University, 1977–1980. I am also grateful to all those who have provided reared parasitoids for incorporation in the NMS collection, to Bill Crichton for digitising images and to Sarah Martin for typing the manuscript.

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