TWO EXAMPLES OF ANTERIOR/POSTERIOR GYNANDROMORPHISM IN ICHNEUMONIDAE (HYMENOPTERA)

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ABSTRACT

Two specimens of Ichneumonidae exhibiting anterior/posterior gynandromorphism are described. In both the specimens, of *Ephialtes manifestator* (L.) (Ichneumonidae: Pimplinae) and *Cylloceria sylvestris* (Gravenhorst) (Ichneumonidae: Cylloceriinae), the head is female (as is the mesosoma of *E. manifestator*) and the metasoma is male. A potential mechanism for generation of transverse (anterior/posterior) gynandromorphs is briefly discussed, based on experiments (by others) on *Nasonia vitripennis* (Walker) (Hymenoptera: Pteromalidae).

INTRODUCTION

Whilst bilateral gynandromorphs are fairly familiar to many, through illustrations at least, and are more likely to be noticed by entomologists, there are various types of gynandromorphism exhibited by insects. Gynandromorphism refers to a specimen being a chimera of female and male tissues. Anterior/posterior gynandromorphs are probably unlikely to be noticed unless there is pronounced sexual dimorphism in the species. Here we illustrate two specimens that we have noticed, in the collections of the Natural History Museum (BMNH) and National Museums of Scotland (NMS). Both of these specimens would present difficulties if they were run through identification keys.

MATERIAL AND METHODS

Specimens are deposited in BMNH (*Ephialtes manifestator* (L.) specimen number NHMUK010574627 and NMS (*Cylloceria sylvestris* (Gravenhorst)). Images were taken with a Canon SLR EOS 5DSR with 65 mm macro lens mounted on a copy stand with an automated Z-stepper; images were aligned using Helicon Focus software version 6.6.1.

RESULTS AND DISCUSSION

A specimen of *Ephialtes manifestator* (L.) (Fig. 1) amongst several reared from *Megachile leachella* Curtis (Hymenoptera: Megachilidae) cocoons at the BMNH is distinctive in that the metasoma has male genitalia but the mesosoma is obviously female, most conspicuously in that the fore wing lacks elongate, curved setae on the anterior edge, which is a distinctive character of *Ephialtes* males (Fig. 2), and the tarsal claws have basal lobes, which are typically female (Fig. 3). Other minor features of the mesosoma and head also accord with female morphology, such as the black underside of the antennal scape and pedicel. This specimen, with a fore wing length of 12 mm, is larger than any males in the BMNH collection (fore wing from 3.0–7.5 mm) but within the usual range for females.

MRS found a peculiar specimen of *Cylloceria* in NMS (Fig. 4), collected in Scotland, Angus, Caenlochan Craig, 6.viii.2005 (K. P. Bland). GRB identified it as a gynandromorph of *Cylloceria sylvestris* (Gravenhorst), although the taxonomy of

Fig. 1. Anterior/posterior gynandromorph of *Ephialtes manifestator* (L.), lateral habitus.

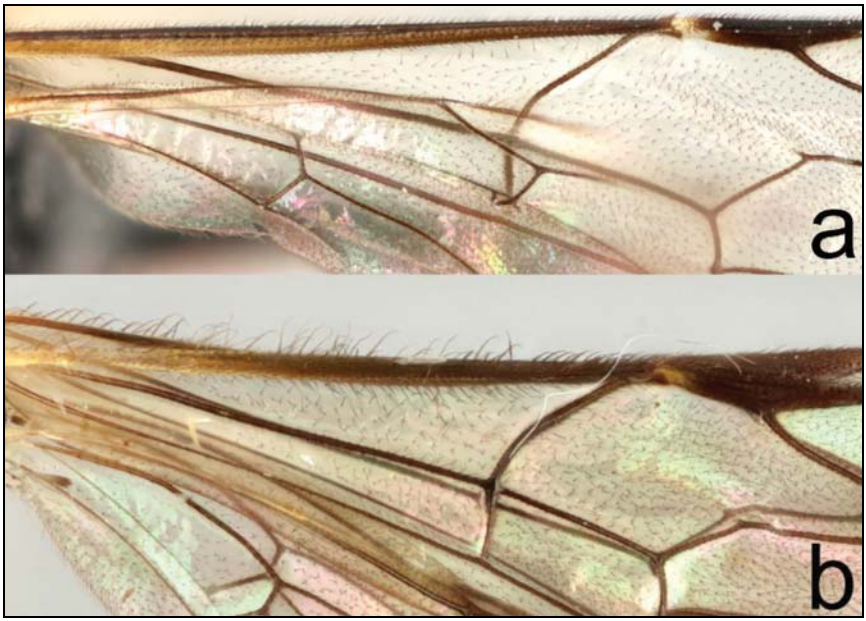

Fig. 2. Comparison of *E. manifestator* fore wing anterior setae on (a) gynandromorph specimen, (b) typical male specimen.

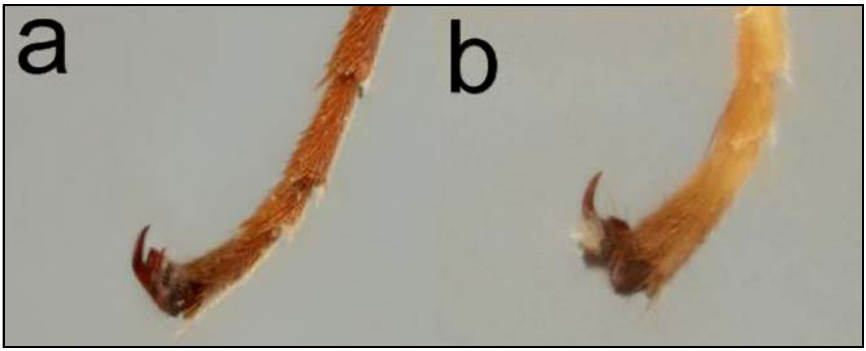

Fig. 3. Comparison of *E. manifestator* fore tarsal claw of (a) gynandromorph specimen and (b) typical male.

Cylloceria species needs work and this species identification should be regarded as provisional. Again, anteriorly there are clearly female features, with the antennal flagellum being typically female, lacking the very distinctive deeply excavate tyloids on flagellum segments 3 and 4 found in male *Cylloceria* (Fig. 5), whereas the metasoma has male genitalia (otherwise there is little sexual dimorphism in the mesosoma that could easily be detected).

Both of these specimens would present difficulties in identification due to their gynandromorphism. The *E. manifestator* would probably key to *Ephialtes* using

Fig. 4. Anterior/posterior gynandromorph of *Cylloceria sylvestris* (Gravenhorst), lateral habitus.

Fig. 5. Comparison of *C. sylvestris* antennal flagellum of (a) gynandromorph specimen and (b) typical male.

Fitton, Shaw & Gauld (1988) as the clypeus is wide and pale brown, but the lack of elongate setae along the anterior edge of the wing contradicts the other key character. The *C. sylvestris* would be confusing if attempting to identify the specimen to subfamily or genus as the key character (as used by Broad, Shaw & Fitton, in press, for example) for recognising *Cylloceria* males is the deeply excavate tyloids on antennal flagellum segments 3 and 4. This specimen is clearly *Cylloceria*, with a rather distinctive clypeus, propodeum and metasomal sculpture, but it would probably not be correctly identified as such by anybody unfamiliar with the genus.

There are various causes of gynandromorphism, such as loss of an X chromosome during the first cleavage division of a female egg. Kamping *et al.* (2007) show that anterior-posterior gyandromorphism can be induced in the pteromalid parasitoid

wasp *Nasonia vitripennis* (Walker) by exposing unfertilised eggs to high temperatures when eggs are nearly mature in the adult female reproductive tract or in the earliest stages of embryogenesis. In their experiments, they found that female tissues predominated anteriorly, male posteriorly, with levels of gynandromorphism varying, although all of the tissues were haploid (normally females are diploid in Hymenoptera, males haploid). The strains of *N. vitripennis* used in Kamping *et al.*'s (2007) experiments were wild-collected and the levels of gynadromorphism (which is at least partly genetically inherited) in the wild were rather high, suggesting that if the same is true for ichneumonids, we could find rather more of them in collections.

Acknowledgements

We are grateful to the donor of parasitoids reared from *Megachile leachella*; it is particularly frustrating that GRB has lost any trace of this person's name! We are also indebted to Keith Bland for giving unsorted Ichneumonoidea to MRS (for NMS).

References

Broad, G. R., Shaw, M. R. & Fitton, M. G. (in press). The ichneumonid wasps of Britain and Ireland (Hymenoptera: Ichneumonidae). *Handbooks for the Identification of British Insects*.

Fitton, M. G., Shaw, M. R. & Gauld, I. D. 1988. Pimpline Ichneumon-flies. Hymenoptera, Ichneumonidae (Pimplinae). *Handbooks for the Identification of British Insects* **7**: 1–110.

Kamping, A., Katju, V., Beukeboom, L. W. & Werren, J. H. 2007. Inheritance of gynandromorphism in the parasitic wasp *Nasonia vitripennis*. *Genetics* **175**: 1321–1333.

SHORT COMMUNICATIONS

Large numbers of *Eutanyacra picta* (Schrank) (Hymenoptera: Ichneumonidae, Ichneumoninae) in coastal Suffolk. – *Eutanyacra picta* identified using Perkins (1960) is a species of ichneumonid wasp that has been a regular autumn catch for me (Fig. 1). It has averaged around a total of five individuals per year over the past five years in the two Robinson-style MV moth traps operating in my garden at Hollesley, East Suffolk. On 10th October 2018 I counted 11 individuals in the front garden trap and two in the rear garden trap. I did not trap on the 11th. On 12th there were three in the front and one in the rear trap. On the 13th I counted 31 in the front trap and none in the rear garden trap. There were five on the 14th when the temperature dropped, wind direction changed and there was a little rain.

These 53 individuals appeared at a time when the country was in the flow of strong southerly winds originating from as far south as north Africa. During this spell of exceptional weather East Anglia remained generally dry and the Suffolk coastal areas were in the line of landfall of the southerly winds. The administrator of the Migrant Lepidoptera Facebook page, Steve Nash (pers. comm.) reported very high migrant moth activity during this period. This was also the case for my traps with migrant moth species peaking on 13th October. *Eutanyacra picta* is resident in the UK and locally. It is interesting to speculate on whether the large numbers of this ichneumonid, coinciding with migrant moth species, were supplemented by migration activity. Broad, Shaw & Fitton (2018) discuss the biology of British Ichneumonidae in great detail and mention, for example, the rapid build-up of related diplazontine ichneumonids following immigration of their host hoverflies from mainland Europe. In some cases diplazontines attack the eggs or early instar larvae of the hoverflies, so if they are appearing in numbers as the hosts appear in numbers, this would be evidence for long distance dispersal (Gavin Broad, pers. comm.).