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# The status of *Melanostoma dubium* (Diptera, Syrphidae)

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The validity of the putative species *dubium* Zetterstedt has been a difficult problem for some time. Verrall (1901) first introduced this taxon to the British list but states,'*Melanostoma dubium* is still a very dubious species'. He based this introduction on two females, one from approximately 915m on top of Grey Fell in Perthshire and the other from Rannoch. Both specimens were taken by Colonel J.W. Yerbury in 1898. Verrall (1901) described these females and described the male from an Austrian specimen, but as Speight (1978) points out, this probably refers to a male *Platycheirus*. Verrall (1901) found it disconcerting that a male specimen also taken by Col. Yerbury on Grey Fell on the same day as the *dubium* female, was, in his opinion, only an obscurely marked, very dark-legged *Melanostoma mellinum* (L.).

In his major work on the British Syrphidae, Coe (1953) regarded *dubium* as a variety of *M. mellinum*. In his view, specimens referable to *dubium* were no more than a dark, more dusted form found in northern England and Scotland.

Speight (1978) re-examined the status of *dubium* in the British Isles with reference to the work of Andersson (1970) and Kanervo (1938). Comparing Verrall's (1901) descriptions to those of these authors and to material which he had collected himself, Speight (1978) considered *dubium* a valid species and re-introduced it to the British list on the basis of 9 specimens. Speight (1978) also provided a revised key to the British *Melanostoma* species.

Stubbs and Falk (1983) followed Speight (1978) in recognising *mellinum* and *dubium* as distinct species. They did, however, state that, 'there remain considerable problems since some specimens are neither ideal *M. dubium* nor *M. mellinum*'. In response to this predicament they defined a provisional new taxon, Form A, which covered the range of variation present between *dubium* and *mellinum*. This form is close to *dubium* but its inclusion in that taxon would extend its definition to a point where key characters break down. They hoped that the definition of *Melanostoma* Form A would be a step towards solving some of the taxonomic problems but recognised that the scarcity of material was a major drawback.

## Morphological basis of *dubium*

Andersson (1970) examined Zetterstedt's (1838) type material. The nominate form, *var.* a, was described from 3 females collected in northern Sweden. A second form, *var.* b, was also described from northern Sweden and Norway. Andersson designated a female of *var.* a as the lectotype. This specimen has all the femora darkened, narrow dark bands on all the tibiae and abdomen is black with hardly any dusting (Andersson, 1970). The other two *var.* a females were *Platycheirus* species. Andersson states that the male genitalia of *dubium* are of the *Melanostoma* type but gives no details on differences with other *Melanostoma* species. With regard to the separation of female *dubium* from the not infrequent melanic form of *mellinum*, Andersson gives the character of a divided tergite 8 in the former whilst in *mellinum* this tergite is in one piece. This was considered to represent a definite character to distinguish the two taxa.

The genitalia of putative *dubium* and *mellinum* are very similar and are of no assistance in distinguishing these taxa (Speight 1978). These taxa, including Form A, are separated on a combination of characters involving body colouration and dusting, colour of pubescence and length of antennal segments (Table 1).

**Table 1. Differences between *M. mellinum*, *M. dubium* and Form A according to Andersson (1970), Speight (1978) and Stubbs and Falk (1983).**

| character | *M. mellinum* | *M. dubium* | Form A |
|---|---|---|---|
| **Males** | | | |
| arista | long & narrow | short & thick | short and thick |
| antennal- | long & | short & | short & |
| segment 3 | yellow below | black | black |
| face | narrow | narrow | wide |
| frons angle | < 90 | > 100 | intermediate? |
| thoracic- | | | |
| dorsum | black | black | greenish black |
| abdomen | widening | parallel | parallel |
| tergite- | | | |
| pubescence | black | pale | intermediate |
| tergite- | pairs yellow | dark | markings |
| colour | spots T2-T4 | | reduced |
| sternites | usually pale | usually dark | usually dark |
| **Females** | | | |
| face | narrow | v. wide | wide |
| frontal | | | |
| dust spots | small | extensive | extensive |
| antennal- | long & | short & | short & |
| segment 3 | yellow below | black | black |
| thorax | black | black | greenish black |
| abdomen | long & narrow | short & wide | intermediate? |
| tergite- | | | |
| pubescence | dark | pale | intermediate |
| tergite- | pairs yellow | dark | reduced |
| colour | spots T2-T5 | | spots |
| tergite 8 | complete | divided | not scored |

## New material from Scotland

As Stubbs and Falk (1983) point out, one of the difficulties in assessing the status of *dubium* has been lack of material. As part of an investigation into the montane Diptera of Scotland, extensive pitfall trapping and hand collecting resulted in approximately 130 *Melanostoma* specimens from various altitudes being available for study (Horsfield and MacGowan, 1997). These specimens plus others from lower levels throughout Scotland (28 males and 30 females, Table 2) were used for a detailed analysis of the morphological basis for recognising *dubium*.

On trying to identify these specimens, some from higher altitudes, at over or about 700m in males and 500m in females, fitted the description of *dubium*. Intermediate forms





referrable to Form A occurred at lower altitudes followed by *mellinum* specimens only below 150m. The altitudinal difference between the males and females of specimens identified as *dubium* was a particular feature (Fig. 1).

The *dubium* records given by Speight (1978) would seem to agree with the altitudinal separation of the *dubium* sexes suggested by Fig. 1. Speight (1978) records two males and two females at 760m on Beinn a'Chuallaich, but only females at lower altitudes, two at 460m on Schiehallion and one near Camghouran, Rannoch (estimated altitude 250m).

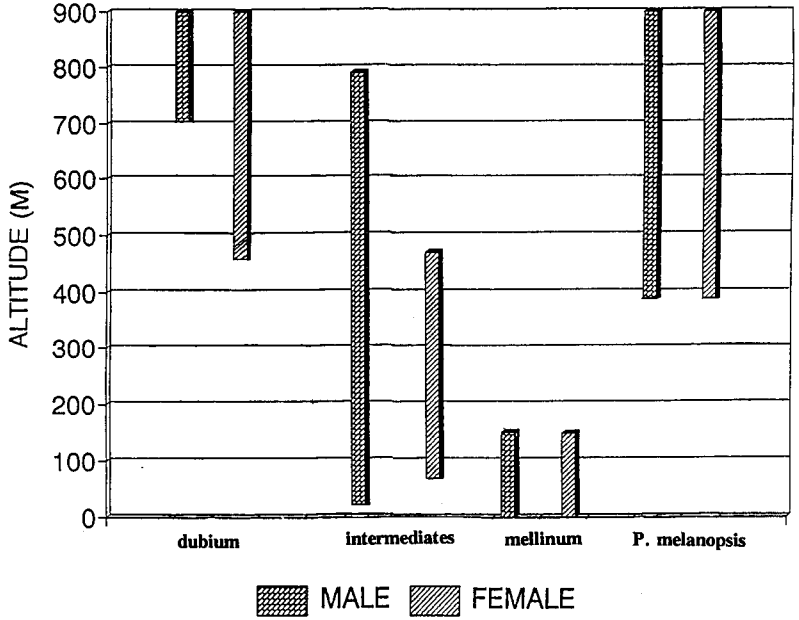


**Fig. 1. Distribution in relation to altitude on Scottish mountains of sexes of *Melanostoma dubium*, *M. mellinum* and morphological intermediates (Form A) and *Platycheirus melanopsis***

## Critical examination of key characters

The existence of intermediate Form A specimens in our material confirms the problem identified by Stubbs and Falk (1983): that morphological variation is greater than can be accounted for in the *dubium* concept. To investigate this variation, a detailed examination of the key characters used to distinguish *dubium*, Form A and *mellinium* was undertaken.

### (a) Colour of abdominal hairs

Speight (1978) uses the presence of white hairs over all the abdominal tergites apart from a few on the tip of t4 as one of his key points in distinguishing male *dubium*. Stubbs

and Falk (1983) also use this character for male *dubium*, but state that this condition can occur in Form A where the abdominal hairs can be all white or transitional to the black haired state of *mellinum*. In specimens we examined, the white haired tergites are not restricted to the high altitude *dubium* form, but also occur occasionally in specimens from intermediate altitudes. For example, on Beinn Eighe one male from 250m, two males from 350m and one male from 650m had white and black hairs on the abdomen (Table 2).

**(b) Antennal length**

Speight (1978) states that in both sexes of *dubium* the depth of antennal segment 3 (A3) is 75% or more of length. Stubbs and Falk (1983) also state that in males of *dubium* and Form A this segment is shorter than long. Our specimens seem to show continuous variation with altitude in this character with no grouping of data points (Fig. 3a,b).

**(c) Aristal length**

Stubbs and Falk (1983) state that in males of *dubium* and Form A the arista is short and thickened at the base. Measurements of the arista on our specimens suggest that the variation in this character not is consistent with altitude or taxon (Fig. 3c).

**(d) Face width**

Speight (1978) states that for *dubium* males 'the face is wider than the maximum width of the eye'. Stubbs and Falk (1983) use as their key character the angle of the eyes where they meet at the top of the frons. Where this angle is less than 90° the specimen is *mellinum*, when more than 90° the specimen is either Form A or *dubium*. Measurements of our males and females suggest continuous variation between face width and altitude with little sign of groups of data points (Fig. 3d,e).

**(e) Antennal colour**

Speight (1978) states that in both sexes of *dubium* antennal segment 3 is nearly always black. Stubbs and Falk (1983) state that both sexes have entirely black antennae, or at most, some yellow on the base of the female third segment. They also state that Form A has the antennae black in both sexes. Examination of our material shows that antennal darkening gradually increases with altitude (Table 2).

**(f) Colouration of the thorax**

Stubbs and Falk (1983) use as the feature to separate Form A the fact that the colouration of the thoracic dorsum differs from that of the tergites. In Form A the thorax has brassy reflections which contrast with the black reflections from the tergites. We would certainly agree that in specimens from intermediate altitudes there are often strong brassy or iridescent reflections on the thoracic dorsum and more especially on the pleurae. This feature does, however, vary in intensity between individuals throughout the Highlands irrespective of altitude and is not a consistent character.





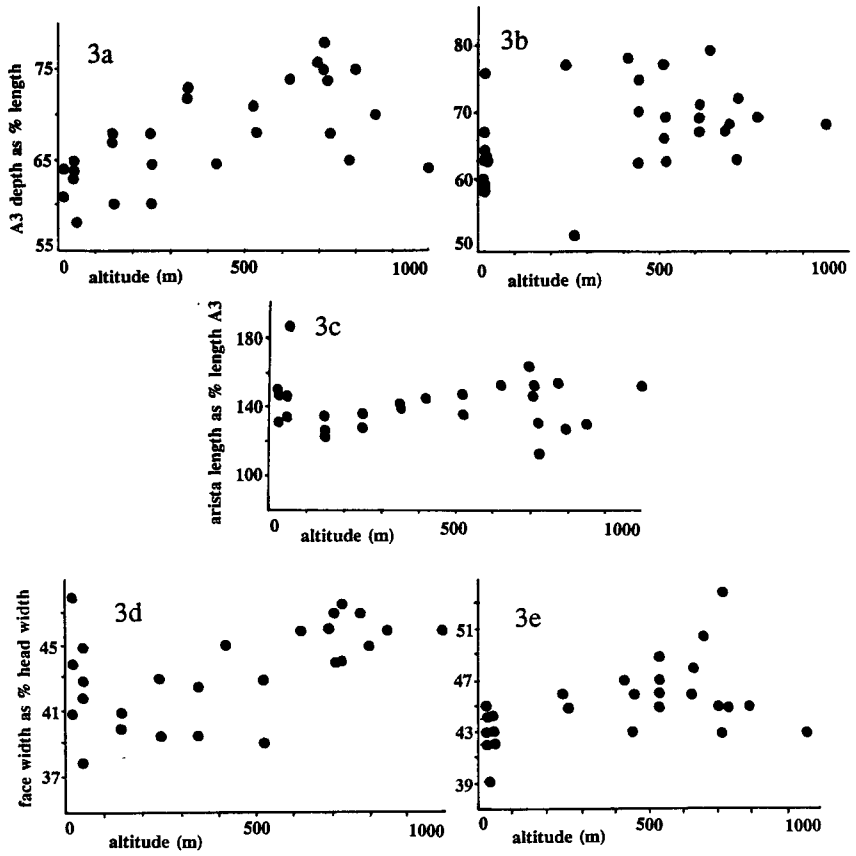


**Fig. 3. Altitudinal variation in characters of *Melanostoma*, depth of antennal segment 3 (A3) as % of its length in (a) males, (b) females; (c) length of arista as % of the length of A3 in males; width of face as % of width of head in (d) males, (e) females.**

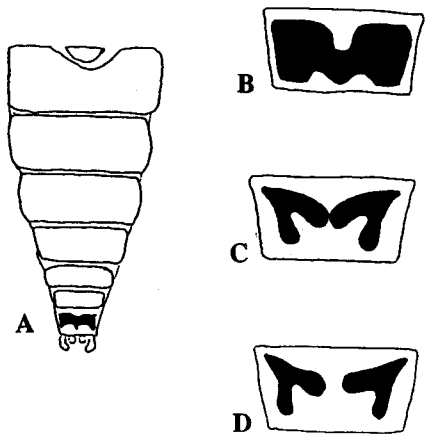


**Fig. 2. Abdominal tergite 8 in female *Melanostoma* A, ventral view abdomen, shaded area = tergite 8; B, *M. mellinum* Tillicoultry, 31.vii.1980, altitude 15m; C, *M. dubium* Beinn Eighe, 12.vi.1990, altitude 250m; D, *M. dubium* Beinn Eighe, 12.vi.1990, altitude 625m.**

morphological cline along an altitudinal axis. We therefore find no grounds within the characters examined, to support *dubium* as a valid species.

Some of the problems experienced by previous authors are undoubtedly due to lack of material. To anyone familiar with the forms of *M. mellinum* found in lowland Britain, high altitude specimens are strikingly different and raise the question of whether they truly belong to the same taxon. However, with the advantage of material from various altitudes the nature of this variation, with its extremes, can be better understood.

Vockeroth (1990) considers *Melanostoma* to be an Old World genus with one very variable New World species. If *Melanostoma* is as variable in the Old World as it seems to be in the New World, then clinal variation of the kind we have encountered on Scottish mountains is to be expected.

If *dubium* is a valid concept then differences appear to exist in the altitudinal distribution of males and females (Fig. 1). However, it is always difficult to accurately assign specimens to a known altitude in the mountains. High winds which are common even in summer can quickly transport an individual from one location to another several hundred metres higher or lower. In general altitudinal zoning of forms is evident, especially in early summer soon after the emergence of the adults. Nonetheless, the distribution on Creag Meagaidh of the montane syrphid *Platycheirus melanopsis* Loew show that both sexes are





evenly distributed throughout the altitudinal range of the species (Fig. 1). The difference in altitude between males and females of *dubium* raises all sorts of problems in understanding the ecology and dispersal behaviour of this taxon, but they disappear if a morphological cline of a single species is involved.

Temperature on Scottish mountains is negatively correlated to altitude and falls by around one degree centigrade for every 150m rise. Windspeed, rainfall and cloud cover all increase so that mountains are cold, wet and windy (Rotheray and Horsfield, 1995). The adult colours of some hoverflies become darker with decreasing temperatures experienced during pupal development (Dušek and Láska, 1974). This could be the physiological mechanism underlying the morphological cline of *M. mellinum*.

Our data show that females exhibit signs of melanism at lower altitudes than males (Table 2). At low altitude temperatures, bright colours may not be precluded, but a mechanism to become dark might be advantageous. Females need to spend more time feeding and maturing eggs. Dark females may be able to remain active for longer than bright coloured individuals. Males, however, are not faced with the same demands and possibly require bright colours to maintain a territory or attract a mate and do not possess such a mechanism.

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