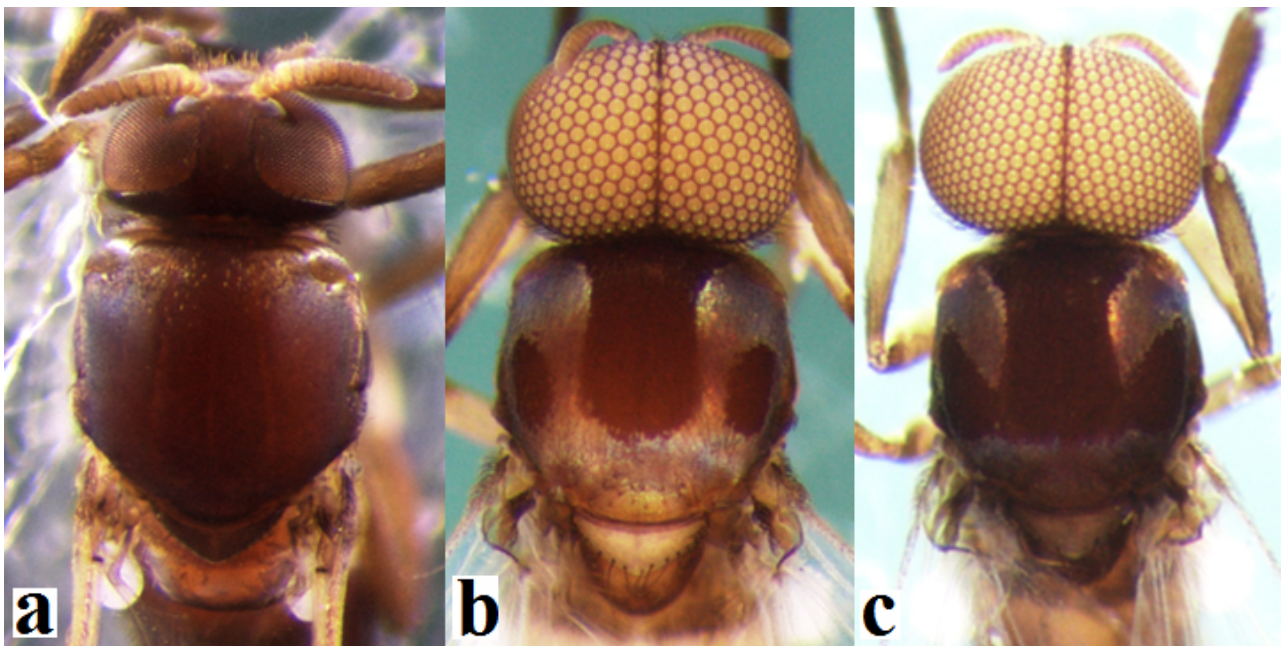


Two male forms vs one female form in a new black fly discovered from Malaysia

A new species of black fly (tiny, two-winged biting fly with its body 2–3 mm long) discovered from Sabah and Sarawak, Malaysia, was given a new name, *Simulium mirum*. *Simulium* is a genus name and *mirum* is a species name. The Latin adjective ‘mirus’ means ‘striking’. As its name shows, this new species is really striking. It is because this species possesses two morphologically different forms of males, which emerged from the pupae with the same appearance: form A with a white dorsal surface of the thorax with a medial and lateral black spots (Fig 1b) linked with a smaller number of upper-eye facets in 12–14 vertical columns and 15 or 16 horizontal rows, and form B with a white dorsal surface of the thorax with an inverted-T-shaped, large, medial, black portion (Fig 1c) linked with a larger number of upper-eye facets in 16 or 17 vertical columns and 17 or 18 horizontal rows. Beside these two different characters, both forms of males have the same morphological characters.



At first, these two male forms were thought to represent two different species because so distinct is the difference between two forms in the thoracic color pattern and number of upper-eye facets, both of which are key characters often used to separate one species from another. However, the pupae of these two forms of males are morphologically indistinguishable from each other, and always live together in the same aquatic habitats (Black flies pass their life in clear running streams or rivers at egg, larval and pupal stages). Coupled with these observations, the fact that there was only one form of the females that emerged from the pupae strongly suggested a single species composed of two male forms and one female form. Finally, it is proved that these two male forms belong to the same species by using a DNA sequence-based analysis.

In most groups of insects including black flies, female and male adults are morphologically differentiated (e.g., head and thorax of the female black fly as in Fig 1a; those of the males as in Fig 1b, c) but two or more forms in one sex are a very rare phenomenon, though it is known to occur in certain species of beetles and social insects such as ants. In the family Simuliidae (2,204 species recorded in a world list), to which this species belongs, the male thoracic color pattern, if any, is monomorphic (one pattern in one species), though rarely polymorphic (two or more patterns in one species). Even in such rare polymorphic cases, no linkage of any one of different thoracic color patterns with the certain number of upper-eye facets or other characters has been reported.

Two male forms of this species are apparently genetically inherited and might have originated before it had spread in Sabah and Sarawak because this phenomenon was observed in at least two locations in Sabah and three locations in Sarawak.

Further studies are needed to determine the frequency of occurrence of each male form in each location and underlying genetic mechanisms of this phenomenon. How the difference in the number of male upper-eye facets and thoracic color patterns affects the male and female mating behavior, and whether the possession of two male forms is advantageous to the survival of this new species remain to be studied.

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[Dimorphic male scutal patterns and upper-eye facets of *Simulium mirum* n. sp. \(Diptera: Simuliidae\) from Malaysia.](#)

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