

# Letter to the Editors

## Whither *Drosophila*?

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THE recent decision by the International Commission of Zoological Nomenclature (ICZN) to retain *Drosophila funebris* as the type of the genus *Drosophila* (INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE 2010) has many *Drosophila* biologists worried that the name of their favorite model organism will soon be changing to “*Sophophora melanogaster*.” This is not what this decision means. This letter summarizes the ICZN opinion and discusses why the name *Drosophila melanogaster* is not in imminent danger of disappearing.

### THE ICZN

The ICZN is a group that exists to ensure that each and every animal species has a unique name. Since 1895 they have advised the taxonomic community on the correct usage of names and arbitrated nomenclatural disputes in the literature. They are also responsible for producing the set of universally recognized nomenclatural rules—the International Code of Zoological Nomenclature, or simply the Code. The ICZN also publishes Cases, Comments, and Opinions on nomenclatural issues in the *Bulletin of Zoological Nomenclature*. If there is a dispute in the literature, a case is submitted. Such submissions are subject to editorial, not peer, review. Comments from the community are then solicited and, after a suitable amount of time, the commission votes to render an opinion to support or reject the original case on the basis of the established rules of nomenclature. The motto of the ICZN and the goal of the commission's work is to provide “standards, sense, and stability for animal names in science.”

### THE ORIGINAL CASE AND COMMENTS

A proposal was submitted to switch the type of the genus *Drosophila* from *D. funebris* to *D. melanogaster* in December 2007 (VAN DER LINDE *et al.* 2007). The

rationale for this move was that the genus *Drosophila* was not monophyletic and that “modern systematic practice” dictates that taxonomic structure must conform to phylogeny. Given those points and the fact that the type of the genus, *D. funebris*, resided in a separate group from the genetic model system *D. melanogaster*, VAN DER LINDE *et al.* (2007) requested an exemption to the rules of nomenclature. They asked that the type of the genus *Drosophila* be switched from *D. funebris* to *D. melanogaster* to preserve the name *D. melanogaster* and to avoid the obvious problems that would result from *Sophophora melanogaster*.

Several comments were published, both in support and in opposition, to this case. Supporters were broadly in favor of this move in order to maintain nomenclatural stability (POLASZEK 2008; ROISIN 2008) and to free future researchers who wanted to “dismember” the genus *Drosophila* (SILFVERBERG 2008). Those writing in opposition were concerned that changing the type would (1) set a precedent for taxonomic changes throughout Animalia that would have a destabilizing effect outside of Drosophilidae (SIDORENKO 2008); (2) endorse one taxonomy over another (STYS 2008; THOMPSON *et al.* 2008), (3) require additional nomenclatural changes throughout the family Drosophilidae, a situation that is particularly difficult because the relationships, monophyly, and statistical support for these taxa are not well understood and would lead to further instability (GAIMARI 2008; O'GRADY *et al.* 2008a; PRIGENT 2008; YASSIN 2008); and (4) that this change was being proposed without solid research to assess taxonomic limits throughout the genus *Drosophila* and was largely based on unpublished data (MCEVEY *et al.* 2008; O'GRADY *et al.* 2008a).

### THE DECISION

The commissioners voted to maintain the type of the genus *Drosophila* as *D. funebris* (INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE 2010) and cited many of the opposing arguments in their opinion. The final vote was 23 opposed and 4 in favor of the VAN

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DER LINDE *et al.* (2007) case. The extensive comments of the commission can be broadly divided into three main objections: exceptions to the rules of nomenclature set precedents that can destabilize names across animal taxa, the case proposed was basically seeking an endorsement of one taxonomic structure over alternatives, and this drastic move is premature and should wait until additional taxonomic and phylogenetic data are generated.

**Precedent:** Commissioners on both sides of this issue agreed that *Drosophila melanogaster* was one of the most important species in modern biology (second only to *Homo sapiens*) and that the name should be maintained. Those voting against the case proposed by VAN DER LINDE *et al.* (2007), however, pointed out that this was not a justification to grant an exception to the rules of nomenclature. Such a move could be a dangerous precedent that may serve to destabilize names in other animal groups containing model systems.

**Endorsement of taxonomic hierarchies:** The commissioners were clear about the fact that their own rules were specifically against favoring any one taxonomic proposal over another and their decisions should only deal with names and naming rules. In essence, because the proposal by VAN DER LINDE *et al.* (2007) is a debate dealing with systematics and taxonomy, not nomenclature, the commission has little to say about it. In fact, several far less drastic options to "*Sophophora melanogaster*" exist and have been discussed in the literature (REMSEN and O'GRADY 2002; O'GRADY *et al.* 2008b; O'GRADY and MARKOW 2009). Furthermore, these alternatives require no nomenclatural changes and are as well, if not better, supported than the proposal to subdivide the genus *Drosophila*.

**Prematurity:** The majority of the commissioners also felt that a move as drastic as changing the type of this genus was premature at this point in time. This is not to say that the evidence is not strongly in favor of a polyphyletic *Drosophila* (reviewed in THROCKMORTON 1975; POWELL 1997; MARKOW and O'GRADY 2006) or that parts of *Sophophora* are strongly supported as monophyletic (HU and TODA 2001), but that relationships within and between many lineages within the genus *Drosophila*, as it is currently defined, are poorly understood. Moving the type from *D. funebris* to *D. melanogaster* would necessitate defining a new type for one or more lineages in *Drosophila*. However, many of these putative genera within *Drosophila* are lacking phylogenetic support, taxonomic revisions, morphological synapomorphies, or all three. This would create additional problems downstream that the commission did not believe VAN DER LINDE *et al.* (2007) had considered.

Another point made by several commissioners was that much of the supporting data remain unpublished, even over 2 years of deliberation by the ICZN. The work that has been published (VAN DER LINDE and HOULE 2008) has been criticized on analytical grounds as being

incomplete and potentially biased (O'GRADY *et al.* 2008b). The continuing debate concerning phylogenetic relationships within the genus *Drosophila* means that, as additional data are generated, our understanding of the relationships within this group will continue to evolve and may require additional changes before they are stable. The commissioners pointed out that basing new names and taxonomic hierarchies on phylogenetic trees was not advisable when those phylogenies are poorly resolved, actively being debated, or "hypothetical" in the sense that they are unpublished.

#### THE FUTURE OF *DROSOPHILA MELANOGASTER*

Many are worried that, now that the ICZN has voted, the name *D. melanogaster* automatically must change to *S. melanogaster*. This is simply not true and, in fact, this is only the beginning of a process that may or may not result in an accepted name change. First, a revision must be published in the scientific literature proposing *S. melanogaster* as a valid name. If a revision fails to meet the standards of publication, then *D. melanogaster* is still a valid name. Even if a revision is published, there will likely be a debate in the literature concerning this issue for many years to come. Many *Drosophila* taxonomists (MCEVEY *et al.* 2008; O'GRADY *et al.* 2008a) have argued for a more measured, conservative approach based on a combination of statistically supported phylogenetic analyses and complete taxonomic revisions before any reorganization of the genus is undertaken. A nuanced approach should be taken to preserve the long literature history on this group. The current proposal to change the name of part of the currently defined genus *Drosophila* is effectively a "slash-and-burn" approach that serves only to destabilize the remainder of the group.

The second component of this process is community support. When a revision proposes a major name change, it is up to the members of the community to decide whether or not to use that name. If the paper is accepted, the community (*i.e.*, *Drosophila* biologists) may or may not accept that change. If the community does not adopt the recommendations of that revision, the name *D. melanogaster* is still used in the literature and *S. melanogaster* will exist only on a few taxonomic lists. If, on the other hand, the community embraces the change, then *D. melanogaster* passes into history and *S. melanogaster* becomes the name of the major model system in modern biology.

An excellent parallel example exists in the Aedine mosquitoes. Two revisions in the past decade have split this large group into a number of genera, moving many disease vectors previously placed in the genus *Aedes* to either *Ochlerotatus* or *Stegomyia* (REINERT 2000; REINERT *et al.* 2004). Since these revisions, several authors have either opposed (SAVAGE and STRICKMAN 2004) or defended (BLACK 2004) the changes. The

literature debate has led several journals, including the Journal of Medical Entomology and other disease vector journals, ([http://www.entsoc.org/pubs/Periodicals/JME/mosquito\\_name\\_policy.htm](http://www.entsoc.org/pubs/Periodicals/JME/mosquito_name_policy.htm)), to suggest that authors utilize traditional names until additional research resolves this issue. The stance of these journals is based on the fact that the current phylogeny of Aedini is fluid and subject to further change, especially with the addition of molecular data, and it is preferable to wait until phylogenetic relationships are better resolved before completely upending the taxonomy and divorcing new work from the historical literature. If authors have a taxonomic reason for adopting the new changes, then they must mention both the old and new names in the text of the article so that both names return results when articles are searched. The result of these policies is that very little confusion exists about which biological entity is being referred to when an author mentions, for example, *Aedes aegypti* or *Stegomyia aegypti*.

I advocate a conservative approach to the splitting of the genus *Drosophila* and any subsequent renaming of *Drosophila melanogaster*. Partial attempts to revise *Drosophila* or approaches that seek to generate consensus via thinly veiled scare tactics are unlikely to gain credence and will probably not be adopted. Until a comprehensive proposal for revision is made, the name *Drosophila melanogaster* remains valid, as does the taxonomy that has helped make *Drosophila* the best model system for comparative studies in biology, bar none. Any revision of the genus *Drosophila* should be composed of (1) highly resolved, statistically supported phylogenetic trees based on extensive taxon sampling and primary analyses of morphological characters and multiple gene sequences, (2) thorough revisionary systematics that not only deal with nomenclatural and typological issues for the resultant genera, but also propose morphological synapomorphies that diagnose each new genus, and (3) the consensus of the *Drosophila* community, with representation of workers studying all aspects of the biology (*e.g.*, ecology, evolutionary biology, genetics, development) of this genus. If a revision ever appears, *Drosophila* workers must assess the quality of data being brought to bear on any proposed taxonomic change and judge for themselves whether it is valid on the basis of the merits of the analyses.

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