

**Comments on the proposed conservation of usage of *Drosophila* Fallén, 1823
(Insecta, Diptera)**

(Case 3407; see BZN 64: 238–242)

(1) Stéphane R. Prigent

*Department of Zoology, Faculty of Biology, University of Natural Sciences, 227
Nguyen Van Cu, District 5, Ho Chi Minh City, Vietnam (e-mail: srpfly@gmail.com)*

The proposition of Van der Linde et al. (BZN 64: 238–242) to maintain the name of *Drosophila melanogaster* has two consequences. The first is the loss of the name ‘*Sophophora*’ through synonymy with *Drosophila*. The second is the loss of identity of the current genus *Drosophila* (s.s.). To justify their proposition Van der Linde et al. (BZN 64: 238–242) emphasized the role of *D. melanogaster* in science and weakened the taxonomical significance of *Drosophila* (s.l.) and *Drosophila* (s.s.) that they proposed to split. In my opinion their arguments are oversimplified or not justified. The species of *Drosophila* (s.s.) have also played a major role in science and the classification is not as messy as it is suggested. I think the proposed nomenclatural change would be more detrimental for science than the simple elevation of *Sophophora* to the genus rank.

What is the colloquial meaning of *Drosophila*?

As indicated in the application, the genus *Drosophila* was established by Fallén (1823) to include twelve species. But the scientific renown of *Drosophila* was acquired later, at the beginning of the 20th century, when several species became study material for biological research and particularly for genetics. It is worth noting that the *Drosophila* model has never been restricted to only one species and more than 200 species of *Drosophila* have been cultured for laboratory research. Today most of the species under study are provided by stock centres, the Tucson and the Ehime centres being the two most important. Despite the name ‘*Drosophila* stock centres’ both provide species of other genera. The Tucson *Drosophila* Species Stock Center (<http://stockcenter.arl.arizona.edu/>) provides subcultures of approximately 240 different *Drosophila* species. These include species of *Chymomyza*, *Hirtodrosophila*, *Samoaia*, *Scaptodrosophila*, *Scaptomyza*, *Zaprionus* as well as the Hawaiian ‘*Drosophila*’. The Ehime *Drosophila* stock centre (<http://kyotofly.kit.jp/cgi-bin/ehime/index.cgi>) maintains 400 strains of 50 species and distributes these genetic resources to *Drosophila* researchers worldwide. These too include *Colocasiomyia*, *Chymomyza*, *Hirtodrosophila*, *Scaptodrosophila* and *Zaprionus*. Thus it is clear that, for geneticists, the name ‘*Drosophila*’ does not mean specifically *D. melanogaster* but the family DROSOPHILIDAE (and so includes *D. melanogaster*). Fly geneticists used to refer to the model species as ‘*melanogaster*’ instead of ‘*Drosophila*’ because the research community is aware that many species are used as study material. Research is also carried out on *albomicans*, *ananassae*, *immigrans*, *indianus*, *kikkawai*, *mojavensis*, *virilis* and, whichever genus individual species belong to, all are considered to be ‘*Drosophila*’. This usage suggests that, even under the name of *Sophophora melanogaster*, the species will still be considered as a ‘*Drosophila*’ and the term can be used in the titles and keywords of future publications. We should also note

that 'drosophila' (without initial upper case and not italicized) would be more appropriate.

The extent of paraphyly in *Drosophila*

The paraphyly of the voluminous genus *Drosophila* has been recognized for decades, and by numerous authors, for example Throckmorton (1975) in his phylogenetic analysis. Nonetheless, the only work to really address the question was the cladistic study by Grimaldi (1990). This contribution was so important that the classification it established for drosophilid species has remained fundamentally unchanged ever since. However, he admitted that a definitive, comprehensive study of relationships between subgenera and species groups in *Drosophila* remained to be done.

Van der Linde et al. (BZN 64: 238–242) mentioned Hawaiian '*Drosophila*' as a clade within *Drosophila* (s.s.), however this situation has not been fully accepted. Grimaldi (1990) grouped those species in the genus *Idiomyia* Grimshaw, 1901 and he suggested that calling *Idiomyia* (s.l.) '*Drosophila*', despite the morphological evidence to the contrary, would be 'diluting the diagnosis of the genus *Drosophila*, as a monophyletic group, of biological meaning.' Moreover the Hawaiian '*Drosophila*' are generally recognized to be the sister group of the genus *Scaptomyza*. Therefore it would be illogical to downgrade the Hawaiian '*Drosophila*' but not *Scaptomyza* under the genus *Drosophila*. Despite some unfounded contestation the Hawaiian '*Drosophila*' were considered to belong to *Idiomyia* by Grimaldi (1990) and are still classified in this way in Bachli's database (<http://taxodros.unizh.ch/>). Therefore, the monophyletic genus *Drosophila*, as defined by Grimaldi (1990), consists of only three major clades: *Sophophora* and the *immigrans-tripunctata* and *virilis-repleta* radiations of the subgenus *Drosophila*.

Today there are good arguments to upgrade *Sophophora* to generic status, particularly thanks to the meticulous work of M.J. Toda and his team (e.g. Hu & Toda, 2001). Moreover, the results of their morphological analyses are also supported by molecular data. Nevertheless, this does not justify disruption of the subgenus *Drosophila* as there is no morphological analysis indicating its paraphyly and most molecular analyses fail to resolve the branch order in this part of the phylogeny.

Van der Linde et al. (BZN 64, pp. 238–242) argue that various genera are positioned within *Drosophila* (s.l.). In fact these genera are positioned between *Sophophora* and *Drosophila* (s.s.), or between the Hawaiian '*Drosophila*' and the radiations of *Drosophila* (s.s.), but there is no strong evidence that any such genera intercalate between the *immigrans-tripunctata* and *virilis-repleta* radiations. If molecular analysis eventually suggests the paraphyly of *Drosophila* (s.s.) it would be necessary to study the morphology more deeply. As far as is known, however, the genus *Drosophila* is monophyletic once the subgenus *Sophophora* is removed (Grimaldi, 1990; Hu & Toda, 2001).

What would be the impact of the nomenclatural change on the classification?

As mentioned above, paraphyly in *Drosophila* arises mostly from the inclusion of the subgenus *Sophophora*. This problem in systematics is easily resolved by upgrading *Sophophora* to generic rank. This change would affect the names of only the 332 species currently classified within *Sophophora*, including *Drosophila* (*S.*) *melanogaster*

which would then be called *Sophophora melanogaster*. Stability would be maintained for the remaining *Drosophila* species, which are considered to be monophyletic. Van der Linde et al. (BZN 64: 238–242) propose retaining the binomen *Drosophila melanogaster* on the grounds of convenience. In that situation the subgenus *Sophophora* will become synonymous with *Drosophila* and the names of all 332 species in *Sophophora* will consequently become *Drosophila*. However, the names of all 817 species currently in the subgenus *Drosophila* will also have to change, as they do not belong to the same clade as *Sophophora*. Moreover, 78 species that had no subgeneric affiliation in the former *Drosophila* genus will stay in the new genus. Therefore, the *Sophophora* subgenus, previously defined as a monophyletic group, will now be mixed together with numerous species with which it probably has no affinity.

What would be the impact on scientific research?

The first research purpose for *Drosophila* was as a model in evolutionary biology, and this led naturally to the study of numerous species. As the majority of *Drosophila* species cultured were from the subgenera *Sophophora* and *Drosophila*, the literature of the 20th century involves the continuous comparison of the two lineages. This comparison disappears if *Sophophora* is synonymised with *Drosophila* (s.s.). Most new students of *Drosophila* systematics have to learn from the literature and the major changes proposed will render their task particularly difficult. The proposed nomenclatural change would also be more detrimental than its alternative for retrieving information from databases. It is worth noting that 642 taxa are represented under the genus *Drosophila* in sequence database according to the NCBI Entrez Taxonomy Homepage. With one click in the database, *Sophophora* could be moved to the genus level beside *Drosophila* but the proposed changes require *Sophophora* to be eliminated and reindexing of every one of the 456 taxa included in *Drosophila* (s.s.). Again reclassifying stocks at the different stock centres will be more difficult under the proposed nomenclatural change than the simple elevation of *Sophophora* to genus rank.

Changing *Drosophila melanogaster* to *Sophophora melanogaster* would have no impact as the model is routinely used and accepted in the scientific community and will never be abandoned. A change to *Sophophora melanogaster* would not be the end of the world for *melanogaster* geneticists but the proposed alternative might be so for others. For the stability of numerous branches of science (including systematics) the elevation of *Sophophora* to generic rank is preferable to the nomenclatural change proposed. A change in the status of *Sophophora* is likely to be relayed instantaneously through Flybase (<http://flybase.bio.indiana.edu/>) and major scientific journals. In consequence it would be promptly learnt by all researchers, whereas the alternative would have less media-penetration and the period of misuse and confusion would be consequently longer. It is worth noting that the Blast function of Flybase indicates *D. melanogaster* as being in the subgenus *Sophophora* and that most *melanogaster* geneticists must therefore be aware of its present classification. Geneticists should recognize that science is never static and thus, as an integral part of science, neither is systematics. Furthermore, if *D. melanogaster* is considered so sacred by geneticists, they should be less reticent to accept *S. melanogaster* in honour of the outstanding pioneer of genetics, A.H. Sturtevant, who established *Sophophora*.

Additional references

- Grimaldi, D.A.** 1990. A phylogenetic, revised classification of the genera in the Drosophilidae (Diptera). *Bulletin of the American Museum of Natural History*, **197**: 1–139.
- Hu, Y.G. & Toda, M.J.**, 2001. Polyphyly of *Lordiphosa* and its relationships in Drosophilinae (Diptera: Drosophilidae). *Systematic Entomology*, **26**(1): 15–31.
- Throckmorton, L.H.** 1975. The phylogeny, ecology and geography of *Drosophila*. Pp. 421–469 in King, R.C. (Ed.), *Handbook of genetics*. Plenum Press, New York.

(2) F. Christian Thompson

Systematic Entomology Laboratory, ARS, USDA. c/o Smithsonian Institution, Washington, D. C., 20560 U.S.A. (e-mail: chris.thompson@ars.usda.gov)

Neal L. Evenhuis

Department of Natural Sciences, B. P. Bishop Museum, 1525 Bernice Street, Honolulu, Hawaii, 96817 U.S.A. (e-mail: neale@bishopmuseum.org)

Thomas Pape

Natural History Museum of Denmark, Zoological Museum, Universitetsparken 15, DK – 2100 Copenhagen, Denmark (e-mail: TPape@snm.ku.dk)

Adrian C. Pont

Oxford University Museum of Natural History, Parks Road, Oxford OX1 3PW, U.K. (e-mail: pont.muscidae@btinternet.com)

We oppose the application to conserve the usage of *Drosophila* in the sense of *melanogaster* Meigen. This proposal seeks the endorsement by the Commission of a particular classification and classification paradigm, whereas the preamble of the Code asserts the freedom of taxonomic thought or action.

While the stated purpose is the conservation of usage, the proposal in fact seeks to establish by that a new and as yet undefined concept of *Drosophila*. Today *Drosophila* is accepted as a large genus of flies, containing a number of species of importance to genetics. The most widely known species is *Drosophila melanogaster* Meigen. The proposal declares that the current concept of *Drosophila* is ‘paraphyletic’ and thus ‘violates modern systematic practice’. That practice is cladistics or Hennigian systematics. For followers of ‘evolutionary’ systematics, (Mayr, 1942; Simpson, 1944) or phenetics (Sneath & Sokal, 1973), paraphyletic taxa are acceptable. Then there are issues of the utility of large and small taxa (i.e. lumping vs splitting). We feel strongly that the Commission should not be endorsing one classification paradigm over another.

In an identical situation, some workers (Reinert et al., 2004) have split the large genus *Aedes*. According to their classification, the widely used name *Aedes aegypti* (Linnaeus) for the yellow fever mosquito has become *Stegomyia aegypti*. This change has not caused major nomenclatural instability, in fact the changed combination has ensured that people can distinguish between their modern classification and the old obsolete classification. Nomenclature will inevitably change to reflect progress and improvements in classification. If we wanted true nomenclatural stability in the sense

of unchanging names, then rather than calling the genus *Drosophila*, we would call it 'Conops' as Aristotle did more than 2,000 years ago. We feel that nomenclature should remain independent of taxonomy and that *Sophophora melanogaster* would be a fully acceptable name for the well-known vinegar fly of genetics under a new split cladistic classification.

Finally, this application assumes that the public cannot learn new words and definitions. About a decade ago, Google was a little-known noun to a very large number of people. Today everyone knows it, and also as a verb for searching online. Google will have no trouble in finding information about both *Drosophila* and *Sophophora*. We feel that the public can also learn the meaning of *Sophophora melanogaster* as well.

So we, the editorial team of the BioSystematic Database of World Diptera, urge our colleagues to take no action on this case. Let nomenclature remain independent from taxonomy. Let users decide what classification best serves their needs. The rest is taken care of by the existing International Code of Zoological Nomenclature.

Additional references

- Mayr, E.** 1942. *Systematics and the origin of species*. xiv, 334 pp. Columbia University Press, New York.
- Reinert, J.F., Harbach, R.E. & Kitching, I.J.** 2004. Phylogeny and classification of Aedini (Diptera: Culicidae), based on morphological characters of all life stages. *Zoological Journal of the Linnean Society*, **142**: 289–368.
- Simpson, G.G.** 1944. *Tempo and mode in evolution*. 237 pp. Columbia University Press, New York.
- Sneath, P.H.A. & Sokal, R.R.** 1973. *Numerical taxonomy — the principles and practice of numerical classification*. xv, 573 pp. W.H. Freeman, San Francisco.

(3) Patrick M. O'Grady

University of California Berkeley, Department of Environmental Science, Policy and Management, 137 Mulford Hall, Berkeley, CA, 94720, U.S.A.
(e-mail: ogrady@nature.berkeley.edu)

Michael Ashburner

University of Cambridge, Department of Genetics, Downing Street, Cambridge, CB2 3EH, England

Sergio Castrezana

University of Arizona, Department of Ecology and Evolutionary Biology, 310 Biological Sciences West, Tucson, AZ, 85721, U.S.A.

Rob DeSalle

American Museum of Natural History, Division of Invertebrate Zoology, Central Park West at 79th Street, New York, NY, 10025, U.S.A.

Kenneth Y. Kaneshiro

University of Hawai'i, Center for Conservation Research and Training, 3050 Maile Way, Gilmore 409, Honolulu, HI 96822, U.S.A.

Richard T. Lapoint

University of California Berkeley, Department of Environmental Science, Policy and Management, 137 Mulford Hall, Berkeley, CA, 94720, U.S.A.

Karl N. Magnacca

Trinity College, Department of Zoology, Dublin 2, Ireland

Therese A. Markow

University of Arizona, Department of Ecology and Evolutionary Biology, 310 Biological Sciences West, Tucson, AZ, 85721, U.S.A.

Bryant F. McAllister

University of Iowa, Department of Biology, 143 Biology Building, Iowa City, IA, 55242-1324, U.S.A.

Alfredo Ruíz

Universitat Autònoma de Barcelona, Department de Genètica i Microbiologia, Grup Genètica, Bioinformàtica i Evolució de la UAB, Bellaterra (Barcelona), 08193, Spain

Carlos R. Vilela

Universidade de São Paulo, Instituto de Biociências, Departamento de Genética e Biologia Evolutiva, Caixa Postal 11461, São Paulo, SP, 05422-970, Brazil

Francisca C. do Val

Universidade de São Paulo, Instituto de Biociências, Departamento de Genética e Biologia Evolutiva, Caixa Postal 11461, São Paulo, SP, 05422-970, Brazil

We are writing in opposition to the van der Linde et al. proposal to set aside *Drosophila funebris* (Fabricius, 1787) as the type of the genus *Drosophila* Fallén, 1823 and replace it with *Drosophila melanogaster* Meigen, 1830. Van der Linde and colleagues' case makes the argument that the paraphyletic nature of the genus *Drosophila* necessitates a nomenclatural change. This confuses classification, in this case phylogenetic classification, with nomenclature. It essentially asks the commission to rule in support of an unpublished classification without nomenclatural necessity. We disagree with this case on the grounds that: (1) this is not a nomenclatural issue and even if it were, there isn't a nomenclatural or taxonomic need to make this change at this time, and (2) the phylogenetic argument that van der Linde and colleagues make is based on unpublished methods and, when examined in detail, the supporting literature does not statistically support their case.

1. Nomenclature

While phylogenetic systematics is an important tool for taxonomists interested in delimiting species boundaries (e.g. Savolainen et al., 2005) and testing monophyly of higher-level taxonomic groups (APG II 2003), this field of science is quite distinct

from nomenclature. Cases submitted to the commission requesting an exception to the rules of priority generally follow a formal taxonomic revision in which species are moved from one genus to another, creating a nomenclatural problem. Case 3407 is quite different in that there has been no published study prompting such a revision, nor would a nomenclatural problem arise were such a revision to occur.

2. Methodology

When using phylogenetic trees to justify taxonomic or nomenclatural changes, care must be taken to ensure that those phylogenies are generated by established and reproducible methods and are, in fact, strongly supporting the taxonomic assertions being made. The van der Linde et al. case fails to meet either of these criteria. While we agree that evidence is mounting that the genus *Drosophila* is not monophyletic, and we strongly agree that the name *D. melanogaster* should be preserved in the literature, we also believe that the designation of a new type species for the genus *Drosophila* is premature because of issues with the methodology that van der Linde and colleagues are using to justify their case.

They make their argument on the basis of phylogenetic analyses that, while outside the scope of a nomenclatural comment, should be addressed briefly here. First, the phylogenetic methods used by van der Linde et al. to justify their case are unpublished, meaning that there is no opportunity to assess whether the analytical criteria are biased or even repeatable. Second, while several studies have been published suggesting that the genus *Drosophila* is not monophyletic, methodological rigour has not been applied evenly across studies. The works cited in the van der Linde et al.'s proposal are based upon heterogeneous data and may individually suffer from issues of non-independence, insufficient taxon sampling, inadequate character sampling, or lack of statistical support. Although we are unable to go into detail in the current comment, we feel that these issues should be considered when weighing the merits of the van der Linde et al. proposal.

Conclusions

Taxonomic hypotheses, like those proposed in other scientific disciplines, must be based upon well-supported, repeatable analyses of primary data using philosophically rigorous and published methods. Taxonomic progress, in the sense of creating stable, natural groupings of monophyletic taxa, is not served by revisions of existing nomenclature based on poorly executed or incomplete studies, particularly when these do not add any new data relevant to the problem. Given the status of the current data, there is no question that a comprehensive taxonomic revision of the genus *Drosophila* will be necessary in the future if the taxonomy is to reflect phylogenetic relationships. However such a major reorganization based on an unpublished phylogeny is premature, at best. Such a step will only lead to confusion and instability within the *Drosophila* literature, which is extensive with nearly 3,000 primary publications a year. Hundreds of ecological and evolutionary studies conducted on the *repleta*, *virilis*, and *immigrans* species groups, as well as the work focusing on the Hawaiian *Drosophila*, the premiere example of adaptive radiation in nature, would be dissociated were the genus names of over 1500 species to change repeatedly as monophyletic groups are proposed and overturned as new evidence from research accumulates. A taxonomic change with such wide effect should be well

supported and robust to subsequent revision as evolutionary relationships of individual species and groups are reassigned. The current proposal is neither good taxonomy, good nomenclature, nor good phylogenetic analysis. Instead, it attempts to replace thorough nomenclatural, taxonomic, and phylogenetic study by proposing a classification that is not resolved sufficiently to warrant consideration of the Commission.

Additional references

- A.P.G. (Angiosperm Phylogeny Group) II.** 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Botanical Journal of the Linnean Society*, **141**: 399–436.
- Savolainen, V., Cowan, R.S., Vogler, A.P., Roderick, G. K. & Lane, R.** 2005. Towards writing the encyclopaedia of life: an introduction to DNA barcoding. *Philosophical Transactions of the Royal Society, B: Biological Sciences*, **360**(1462): 1805–1811.

(4) Pavel Štys

Department of Zoology, Charles University, Vinicna 7, Praha 2, CZ-128 44 Czech Republic (e-mail: pavelstys@gmail.com)

The Commission is asked by van der Linde et al. (BZN **64**: 238–242) to preserve the binomen *Drosophila melanogaster* Meigen, 1830. Some obvious points of the application should be stressed and some weak points reviewed.

1. Nomenclatural rules (the Code) regulate nomenclature, i.e. the rules govern how names are used to label recognized taxa formally at family, genus and species level in the Linnean and other systems.

2. The Code is concerned with formation, usage, availability and validity of names, criteria of publication, determination of authorships and dates of publication, and provides the means for maintaining the universality and continuity of usage and meaning of the names, and how to solve potential conflicts.

3. The Code deals largely with the nominal taxa (= nomenclatural taxa), i.e. taxa having their minimum contents linked to their name-bearing taxa of lower rank, or, in case of species-group taxa, to mandatory type individuals. The nominal taxa, in contrast to taxonomic taxa, do not have limits.

4. Taxonomists have freedom of action, i.e. they may, within the framework of voluntarily maintained provisions of the Code, split, unite, interpret, include, exclude, change the ranks of (upgrade or downgrade) existing taxonomic taxa and establish new ones in accordance with progress in knowledge, accepted theory of classification, or even their own ideas. Nobody is obliged to follow these researchers' decisions.

5. If asked, the International Commission of Zoological Nomenclature, is obliged by voting or usage of its Plenary Powers to solve any resulting or threatening nomenclatural problem, which is not or cannot be covered by the Code, even if this means deviating from its provisions.

6. In theory, nomenclature should be completely divorced from taxonomy. In practice (see 4 and 5 above) there is an overlap, because nomenclatural decisions by individual zoologists, as well as those of the Commission, involve mostly the names

of the taxonomic taxa. However, the principle of taxonomic freedom (see 4 above) is always maintained.

The present problem is how to preserve continuing usage of the well known binomen *Drosophila melanogaster* which is threatened by the intended split of the paraphyletic genus *Drosophila* into several smaller monophyletic genera (realized mainly by upgrading several of its subgenera) as suggested by a group of molecular phylogeneticists (van der Linde et al., BZN 64: 238–242). This is basically a taxonomic problem with nomenclatural consequences. *Drosophila melanogaster*, along with several other con-subgeneric model species, would then be classified within the genus *Sophophora* (presently a subgenus of *Drosophila*), unless the Commission changed the fixation of the validly designated type species of *Drosophila*. I should like to provide the following comments.

(1) The preservation of the binomen *Drosophila melanogaster* is desirable since it has been used in numerous publications and is well known to biologists as well as many outsiders and laymen. The arguments, however, focused as they are on *Drosophila melanogaster* and its allies alone, are short-sighted. The consequences for the nomenclature of the whole family DROSOPHILIDAE should be taken into account. The argument that in many general scientific papers the names ‘*Drosophila*’, ‘drosophila’ and ‘fly’ stand for *Drosophila melanogaster* can hardly be taken seriously; moreover ‘fly’ may often stand for *Musca domestica* or *Calliphora erythrocephala*.

(2) To approve the application would be to provide institutionalised support for one of several possible and coexisting hypotheses on the phylogeny of drosophilids. But hypotheses, by their very nature, may come and go and, after rigorous testing, may be replaced by better ones or at least by a set of alternatives. The Commission cannot discriminate between ‘superior’ and ‘inferior’ hypotheses, phylogenies and classifications – its role is to provide a formal framework of rules.

(3) The authors of the application are wrong in considering that their method of classification is the only correct one and must be accepted by the Commission. Freedom of taxonomic thought and action should override all other considerations.

(4) Amelioration of a classification found to be formed by sets of small monophyletic taxa, which are actually ingroups of one or more paraphyletic larger taxa, may be achieved basically by two procedures: (a) an analytic one – by splitting the paraphyletic taxon/(taxa) into two or more monophyletic taxa accompanied by inclusion of their ingroups, formerly classified as coordinate taxa (this is the taxonomic procedure suggested by the authors of the application); or (b) a synthetic one – to combine all the taxa in a comprehensive monophyletic taxon, in this case *Drosophila*, and to build up its structure to include only monophyletic subordinate taxa. This is the course I would recommend; a tacit agreement of all the researchers involved would be a prerequisite to such a solution. The argument that *Drosophila* (s.l.) would then be too large is of no scientific (and definitely of no nomenclatural) importance – how many well known and large genera (e.g. *Papilio*, *Carabus*) do we all know and use?

(5) *Drosophila melanogaster* is an important binomen. However, more important, in a long-term view, is the independence of nomenclature from current taxonomic/phylogenetic hypothesis and paradigm. Therefore, I recommend rejection of the application.

(5) Stephen D. Gaimari

California State Collection of Arthropods, Plant Pest Diagnostics Center, California Department of Food & Agriculture, 3294 Meadowview Road, Sacramento, California 95832, U.S.A. (e-mail: sgaimari@cdfa.ca.gov)

The application to set aside all previous type fixations for the genus *Drosophila* Fallén, 1823 and to instead fix *Drosophila melanogaster* (Meigen, 1830) as the type species should be rejected for several reasons:

1. The authors incorrectly state that the application falls under Article 70.2 of the Code, which specifically refers to situations of overlooked type fixation (i.e., if an earlier type fixation had been overlooked, it would still be the valid type fixation with all subsequent type fixations invalid; but if this would cause instability or confusion, the case would need to be referred to the Commission). Nothing in the current application falls under the provisions of this Article, as there has been no overlooked type fixation. For *Drosophila*, type fixation and details of that fixation have been published numerous times in catalogues (Wheeler, 1965, 1970; Okada, 1977; Tsacas, 1980; Bächli & Rocha Pité, 1984; Evenhuis & Okada, 1989), major revisions (Sturtevant, 1942; Patterson, 1943; Hardy, 1965; Wheeler, 1981; Grimaldi, 1990), and other works (e.g. Sabrosky, 1999) since *Musca funebris* Fabricius, 1787 was fixed as the type species by Macquart (1835). There were many incorrect attributions of this same type fixation to Zetterstedt (1847), but it is evident in Zetterstedt (1847, see p. 2563) that he was following Macquart's (1835) type species designation. The details of the erroneous type fixation of *Musca cellaris* Linnaeus, 1758 are clear, as the species was not eligible (see Sabrosky, 1999, p. 118). In a nomenclatural sense, there is nothing confusing or unstable about the type fixation for either *Drosophila* or *Sophophora* Sturtevant, 1939.

2. Even if the valid and non-controversial type fixation by Macquart (1835) was to be set aside, for whatever reason, Article 67.2 expressly states that the only species eligible for this fixation are the originally included nominal species in Fallén (1823), which are listed in the application. *Drosophila melanogaster* is not eligible, as it was not originally included, and was not even described until seven years later.

3. Stability is not achieved through the proposed application. In fact, quite the opposite, as there will be tremendous instability created in the rest of *Drosophila*. The authors state that *Drosophila* (with the type being *Musca funebris*) and *Sophophora* (with the type being *Drosophila melanogaster*) will be in different genera as a result of their phylogenetic studies. So, setting aside *Musca funebris* in deference to *Drosophila melanogaster* will result in many hundreds of species being displaced from *Drosophila*. This will be a far greater source of instability than that achieved by conserving the combination of a single species.

4. This seems to be a perfect example of an attempt to change nomenclature to fit current taxonomic and phylogenetic thought, when in fact this is not a nomenclatural issue at all. The defining principles of nomenclature are entirely independent of scientific opinions of relationships among taxa.

The underlying principles of nomenclature (see the Code's *Principles* on pp. XIX–XX) should not be disregarded for the convenience of maintaining the taxonomic combination of a single species. The effect of a change in the type species of *Drosophila* for the sake of this single species would potentially cause confusion and

severe instability with regards to all previous works that had used *Drosophila* in the context of its validly designated and recognized type species, *Musca funebris* (also a very common, well known, near cosmopolitan species). The resulting objective synonymy of *Sophophora* under *Drosophila* would leave the taxonomic definition of *Drosophila* (in the sense of *Drosophila funebris*) unstable, with hundreds of species left in limbo. There can be no justification for changing a type species simply to support the results of the most recent phylogenetic study, as this is an entirely different matter from nomenclature. The singular popularity of a species, or the most current phylogenetic hypothesis of its relationships, cannot be deemed reason to force nomenclature to follow it. As science progresses, and more species become critical model organisms, or become better known in a phylogenetic sense, the Code cannot be expected to jump with each new phylogenetic hypothesis. Stability is measured in centuries, not in what is currently in fashion.

Additional references

- Bächli, G. & Rocha Pité, M.T.** 1984. Family Drosophilidae. Pp. 186–220 in Papp, L. & Soós, Á. (Eds.), *Catalogue of Palaearctic Diptera. Volume 10. Clusiidae – Chloropidae*. 402 pp. Akadémiai Kiadó, Budapest.
- Evenhuis, N.L. & Okada, T.** 1989. 98. Family Drosophilidae. Pp. 609–638 in Evenhuis, N.L. (Ed.), *Catalog of the Diptera of the Australasian and Oceanian Regions*. Bishop Museum Special Publication no. 86. 1155 pp. E.J. Brill & Bishop Museum Press, Honolulu.
- Grimaldi, D.A.** 1990. A phylogenetic, revised classification of genera in the Drosophilidae (Diptera). *Bulletin of the American Museum of Natural History*, **197**: 1–139.
- Hardy, D.E.** 1965. Diptera: Cyclorrhapha II, Series Schizophora, Section Acalypterae I, Family Drosophilidae. *Insects of Hawaii*, **12**: 1–814.
- Okada, T.** 1977. Family Drosophilidae. Pp. 342–387 in Delfinado, M.D. & Hardy, D.E. (Eds.), *A catalog of the Diptera of the Oriental Region. Vol. III. Suborder Cyclorrhapha (excluding Division Aschiza)*. 854 pp. The University Press of Hawaii, Honolulu.
- Patterson, J.T.** 1943. Studies in the genetics of *Drosophila*. III. The Drosophilidae of the Southwest. *University of Texas Publication*, **4313**: 1–327.
- Sabrosky, C.W.** 1999. Family-group names in Diptera. An annotated catalog. *Myia*, **10**: 576 pp. Backhuys, Leiden.
- Tsacas, L.** 1980. 74. Family Drosophilidae. Pp. 673–685 in Crosskey, R.W. (ed.), *Catalogue of the Diptera of the Afrotropical Region*. 1437 pp. British Museum (Natural History): London.
- Wheeler, M.R.** 1965. Family Drosophilidae. Pp. 760–772 in Stone, A., Sabrosky, C.W., Wirth, W.W., Foote, R.H. & Coulson, J.R. (Eds.), *A catalog of the Diptera of America north of Mexico*. 1696 pp. United States Department of Agriculture, Agriculture Handbook no. 276.
- Wheeler, M.R.** 1970. 79. Family Drosophilidae. *A Catalogue of the Diptera of the Americas south of the United States*, **79**: 1–65.
- Wheeler, M.R.** 1981. The Drosophilidae: A taxonomic overview. Pp. 1–97 in Ashburner, M., Carson, H.L., & Thompson, J.N., Jr. (Eds.), *The genetics and biology of Drosophila*. Vol. 3a. lxx, 429 pp. Academic Press, London.

(6) Shane F. McEvey

Australian Museum, 6 College Street, Sydney New South Wales 2010, Australia

Michele Schiffer, Jean-Luc Da Lage, Jean R. David, Françoise Lemeunier,
Dominique Joly, Pierre Capy & Marie-Louise Cariou

Laboratoire Evolution, Génome et Spéciation, UPR9034, CNRS, 91198 Gif-sur-Yvette Cedex, France

Case 3407 (van der Linde et al., 2007) is a proposal to conserve the binomen *Drosophila melanogaster*. The combination is threatened by revision of the genus *Drosophila*. We agree that the binomen should be preserved and we agree that the genus is large and paraphyletic but we disagree with some of the qualifying arguments. We would prefer that the taxonomy of DROSOPHILIDAE be guided, not driven, by molecular biological data.

We have the view that the Commission should accept this application to conserve the binomen *Drosophila melanogaster* but we strongly believe that the splitting up of the genus, once redefined, should only occur after comprehensive taxonomic investigation, not driven by the latest molecular phylogenetic data. We acknowledge that there is a range of views about how to deal with the various groups of species in *Drosophila* but we feel that there is still much work to be done before the numerous species can be correctly reassigned. We feel that this can proceed more freely, with less constraint, if *melanogaster* is the type of *Drosophila*. We see no reason why *Drosophila* should automatically be subdivided into different genera if the nominal species becomes *melanogaster*.

The genus *Drosophila* is the largest in the family DROSOPHILIDAE. It is divided into a number of subgenera and it also holds many species incertae sedis. *Musca funebris* is the type species of the genus *Drosophila*, and *Drosophila melanogaster* is the type species of the subgenus *Sophophora*. There is widespread agreement that the species currently accommodated in *Sophophora* represent a natural group that could well be removed from *Drosophila* and treated as a genus. Controversy surrounds this action and its consequences because the binomen *Drosophila melanogaster* is by far the most frequently used in all of biological science, and few people want to change it. An alternative is to make *Sophophora* an objective junior synonym of *Drosophila* (by replacing *funebris* with *melanogaster* as type species), thus preserving the binomen *Drosophila melanogaster*. The underlying concept of *Drosophila*, and the family DROSOPHILIDAE, would shift as a result of changing the nominal species of the nominal genus – put simply, the concept of the typical *Drosophila* (and therefore typical drosophilid) would change from *D. funebris* to *D. melanogaster*.

An application (Case 3407) is currently before the Commission to use its plenary powers to set aside all previous type fixations for *Drosophila* Fallén, 1823 and designate *Drosophila melanogaster* Meigen, 1830, as the type species of *Drosophila* Fallén, 1823; etc.

Six qualifications underpin the application; our comments on each are as follows:

1. 'Phylogenetic and molecular studies show that *Drosophila* is paraphyletic and that an assortment of drosophilids lie within it.' We agree that *Drosophila* is paraphyletic and we are confident that with further taxonomic work the genus will decrease in size and become a more natural group. This will require detailed and, unfortunately, prolonged taxonomic work. See, for example, the taxonomic work that led to the widely accepted proposals to remove the subgenera *Scaptodrosophila* Duda, 1923, *Hirtodrosophila* Duda, 1923, *Lordiphosa* Basden, 1961 and *Dichaetophora* Duda, 1940 (Grimaldi, 1990; Hu & Toda, 2002).

2. 'The genus consists of four major clades.' Taxonomically we see a single genus with a wide range of species, we see some clustering of species and we predict that those clusters will eventually be assigned to genera. There are 78 species incertae sedis and there are many species represented only by poorly preserved specimens. The task

is not as simple as dividing the genus in four and elevating the remaining subgenera to the rank of genus.

3. 'The paraphyletic nature of the genus *Drosophila* is unacceptable as it violates modern systematic practice.' The statement may be true for systematics but paraphyly is permitted within our traditional nomenclature. That is not to say that it is desirable. Paraphyly is not a violation of taxonomic practice, it is regarded as suboptimal but it is tolerated until evidence allows better classification.

4. 'The binomen *Sophophora melanogaster* would cause instability and confusion.' We agree, but our discussion on this point led us to appreciate that many of our colleagues do not foresee a problem, which surprised us. If the binomen *S. melanogaster* was introduced, we think that in evolutionary biology and molecular phylogenetics – perhaps yes, there would be instability. In zoological taxonomy – no. In the normal course of taxonomic work, name-changes (new combinations) are commonplace, they are seen for what they are: a response to new and more compelling data.

The binomen *Sophophora melanogaster* would continue to convey a precise meaning, and in this sense there would be no confusion. With respect to nomenclatural instability, there may be considerable reluctance to adopt the unfamiliar binomen *Sophophora melanogaster* and many would, no doubt, continue using *Drosophila melanogaster*, *Drosophila* or just *melanogaster*. And this would be confusing. Information retrieval would be hampered.

Van der Linde et al. argue that many use *Drosophila* as a shorthand or vernacular name for *Drosophila melanogaster* and instability and confusion would result if *melanogaster* was combined with *Sophophora*. The use of a generic name for a species is already an undesirable situation that is not likely to improve or change whatever decision the Commission makes. *Drosophila*, not in italics, is also used as a common name for *Drosophila melanogaster* and other species, but when written in this way – in normal font – it has the same diminished significance as 'fruit fly', 'vinegar fly', 'ferment fly', or 'pumice fly'. Application of these names is unrestricted, haphazard and entirely outside the Code. In the French language, researchers are accustomed to using "les Drosophiles" as a vernacular and this is (and could still be) used for flies in any drosophilid genus.

The question asked above could be reframed 'would changing the type of *Drosophila* cause instability and confusion?' To which we would answer: no. It is a layer of complexity for taxonomists but not for the rest of the scientific community who work with these flies.

For the drosophilid taxonomist the concept of *Drosophila* is based on the original type species *D. funebris* (Fabricius, 1787). Over the last 115 years new species have been placed in *Drosophila* either because they conform to its underlying generic concept based on *D. funebris*, or because no other genus in the DROSOPHILIDAE was available and the cautious or conservative taxonomist chose not to describe a new one. Lamb (1914), for example, when working on a collection from the Seychelles described 20 new drosophilid species placing 18 of them in the genus *Drosophila*; those 18 are now in seven different genera. Unfortunately and inevitably many large families have such 'trash can' genera, so-called because of the untidy assemblage of species they accommodate. *Drosophila* currently accommodates the flotsam and jetsam of the DROSOPHILIDAE and it will take a very long time for each species to be

examined and correctly re-assigned. It is not simply a matter of examining a type specimen and assigning it to a genus.

The removal from *Drosophila* of the large subgenera *Scaptodrosophila*, *Hirtodrosophila* and *Lordiphosa* and the treatment of them as genera (Grimaldi, 1990) was widely accepted. However, his treatment of the Hawaiian drosophilids (many of which were originally placed in *Drosophila*) has met with disagreement and alternative classifications have subsequently been proposed (O'Grady, 2002). We see the process of offering alternate hypotheses and classification schemes as entirely appropriate and we have a strong sense that gradually we are moving towards a more natural classification scheme overall.

In summary, we agree that it is useful to replace *D. funebris* as the type of *Drosophila* in order to preserve the binomen *Drosophila melanogaster*. But we do not think it is appropriate, at this stage, to automatically and without additional comprehensive taxonomic work, remove all major groups of the newly defined genus.

Additional references

- Grimaldi, D.A.** 1990. A phylogenetic, revised classification of genera in the Drosophilidae. (Diptera). *Bulletin of the American Museum of Natural History*, **197**: 1–139.
- Hu, Y.-G. & Toda, M.J.** 2002. Cladistic analysis of the genus *Dichaetophora* Duda (Diptera: Drosophilidae) and a revised classification. *Insect Systematics & Evolution*, **33**: 91–102.
- Lamb, C.G.** 1914. The Percy Sladen Trust Expedition to the Indian Ocean in 1905 etc. *Transactions of the Linnean Society of London, Series 2, Zoology*, **16**: 307–372.
- O'Grady, P.** 2002. Notes on the nomenclature of the endemic Hawaiian Drosophilidae. *Bishop Museum Occasional Papers*, **69**: 36–40.

Comments on the proposed suppression of *Gobius lagocephalus* Pallas, 1770 (Osteichthyes, Teleostei, GOBIIDAE)

(Case 3383; see BZN **64**: 103–107, BZN **65**: 57–60)

(1) Tan Heok Hui

*Raffles Museum of Biodiversity Research, Department of Biological Sciences,
National University of Singapore, Block S6, #03–01, Science Drive 2, Singapore
117600 (e-mail: heokhui@nus.edu.sg)*

As I am working on Indo-Pacific fishes, I disagree with the proposed suppression of the name *Gobius lagocephalus* and I agree with Kottelat, Larson, Watson & Keith's proposal to retain the present usage.

(2) Rohan Pethiyagoda

*Wildlife Heritage Trust, 24 Katukurunduwatte Road, Ratmalana, Sri Lanka
(e-mail: rohanp@slt.lk)*

I work on the taxonomy of Indo-Pacific fishes. I disagree with the proposal to suppress this name and support retention of existing usage. The name *lagocephalus* Pallas, 1770, as published in the binomen *Gobius lagocephalus*, should be placed on the Official List of Available Names in Zoology.