

BOOK REVIEW

Diatoms of the United States 1. Taxonomy, Ultrastructure and Descriptions of New Species and Other Rarely Reported Taxa from Lake Sediments in the Western U.S.A.

J. P. Kociolek, B. Laslandes, D. Bennett, E. Thomas, M. Brady & C. Graeff (eds). *Bibliotheca Diatomologica*, vol. 61. Stuttgart: J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung. 2014. 188 pp, 1 table, 80 plates. ISBN 978 3 443 57052 1, ISSN 1436 7270. 79 € (paperback).

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Diatoms of the United States 1 is the latest volume but one in the *Bibliotheca Diatomologica* series, which began in 1983. In its format and design, and in the quality of the photographs (always very important for diatoms), this volume is excellent and more than a match for some of its earliest predecessors, in which the text seemed to have been produced on an electric typewriter. The title implies that further volumes can be expected in due course, especially as “it appears that there are still many new taxa to be found in the flora of the United States” (p. 5), but no prospectus is given; many tens of similar volumes would have to be produced to deal with all the diatoms growing in the USA. It is also unclear what relationship the present volume bears to the excellent online flora of the same name (*Diatoms of the United States*, continuously updated).

Kociolek *et al.* give a short historical introduction to diatom taxonomy in the United States, refer to the methods they used, and list the samples they analysed for the present volume, which were derived from 55 lakes in the western USA that the authors studied as part of the US National Lakes Assessment programme. There is no detail concerning the sites sampled, only their locations and the accession numbers of voucher material, but determined readers will be able to obtain some further information (e.g. about physical and chemical characteristics of the lakes) from the National Lakes Assessment programme report (US Environmental Protection Agency, 2009) and by searching the data available online (begin at <https://www.epa.gov/lakes>). There is also a short section in which Kociolek *et al.* make some general conclusions about the state of knowledge of US diatoms. All this occupies less than 6 pages out of the 64 pages of text (including 10 of references). The greater part of the book is an account of 48 new species (not 50 as stated in the abstract), 2 new combinations, and 10 existing species for which new data are given. These species are illustrated in 80 well-composed plates of light microscope (LM) and scanning electron microscope (SEM) photographs. At the end, there is an index to all the taxa mentioned in the text.

The accounts of new species are arranged in the usual way for diatoms: there is first a formal description of the species, based principally on light microscopy (and usually in an abbreviated style), then a description of valve ultrastructure based on scanning electron microscopy, followed by typification, type locality, geographical distribution (although more than half of the new species are known only from the

type locality), and finally some discussion of the new species. Comparisons are usually made with similar species, but these are rather limited and they are missing in the case of *Aulacoseira acicularis*, *A. pusilloides*, *A. spathulata*, *Cyclotella fourtanierae*, *Neidium limnophilum*, *N. hamiltonii*, *Sellaphora indistincta*, *Halamphora stoermeri*, *H. reimeri* and *H. americana*. The illustrations, which are placed together at the end of the volume, are generally excellent. Minor complaints are that some of the specimens show signs of dissolution. For example, *Pulchella porcata* (pl. 45) has lost the fine internal sieve-like coverings of the marginal chambers that are present in this and similar genera (*Biremis*, *Scoliotropis*: e.g. see Round *et al.* 1990). Although such damage is unlikely to make it more difficult to identify the new species, it does represent a loss of potentially useful information.

Unfortunately, the volume is marred by many typographical and other errors, several of which represent ‘orthographic errors’ in the new species’ names; these have to be corrected to conform with the requirements of the Melbourne Code, specifically article 60 (McNeill *et al.*, 2012). They comprise: *Aulacoseira acicularis* (not *acicularia*: the ending *-ia* is neuter plural but it must be feminine singular), *Aulacoseira singularis* (not *singulara*: no such *-a* ending exists for third declension adjectives); *Thalassiosira khursevichiae* (not *khursevicha*: the *Thalassiosira* is ‘of Khursevich’, so that the genitive *-ae* is to be added because the species is named after the female researcher Galina Khursevich); *Cyclotella fourtanierae* (not *fourtaniera*: the species is named in honour of Elisabeth Fourtanier and so, as in the case of *khursevichiae*, the feminine genitive is required); *Nupela monoraphida* (no adjective *monoraphius* exists or can be derived via the principles of Greek and Latin, so *monoraphia* cannot be correct: *monoraphida* uses the Latin *-idus* ending to form an adjective); *Craticula lowei* (not *lowea*: the species is named in honour of Rex Lowe, so the name should be formed by adding the appropriate masculine genitive ending, *-i*, to ‘Lowe’; an alternative would have been to form the adjectival *loweana* but this cannot now be done because the substantival form has already been adopted and published); *Placoneis potapovae* (not *potapovaea*: the species is named in honour of Marina Potapova and the appropriate feminine genitive form is *potapovae*); *Navicula cerevisiae* (not *cerevisia*: no reason is given for the use of a noun in apposition in the nominative; presumably the species is named as the *Navicula* of, or pertaining to, beer and hence the genitive is appropriate, as in *Saccharomyces cerevisiae*); *Pulchella porcata* (not *porcatus*: *Pulchella* is feminine); *Stauroneis limnetica* (not *limneticus*: *Stauroneis* is feminine); *Stauroneis edgarii* (not *edgaris*: because the species honours Robert Edgar, the appropriate genitive ending is *-i*, and *-i-* is to be added to the stems of personal names except when they end in *-er*); *Muelleria spauldingiae* (not *spauldinga*: the species is named in honour of Sarah Spaulding and the appropriate genitive form is *spaulding-i-ae*); *Sellaphora indistincta* (not *indistinctus*: *Sellaphora* is feminine); and *Surirella ruckiae* (not *ruckia*: the species is named in honour of Elizabeth Ruck, so the appropriate epithet is *ruckiae*; an alternative would have been the adjectival *ruckiana*).

Several of these corrections have already been made by the compilers and editors of *AlgaeBase* (Guiry & Guiry, 2016), which also notes that *Nitzschia americana* D.Bennett

& Kociolek is a later heterotypic synonym of *Nitzschia americana* Hasle 1974, and that it appears that *Muelleria spauldingiae* Kociolek is a later heterotypic homonym of *M. spauldingiae* Bahls (2014: Bahls's paper was published in March 2014, whereas *Bibliotheca Diatomologica* volume 61 was received by the Berlin Botanic Garden in June 2014; Botanischer Garten und Botanisches Museum Berlin–Dahlem, no date). Coincidentally, it seems that the same species may have been given the same name twice by different authors, because Bahls's and Kociolek's descriptions of "*M. spauldingiae*" are almost identical. Bahls's species is known from one lake in Montana, Kociolek's from one lake in Utah.

Latin descriptions are included for all the new species except *Nitzschia destituta*. This was unwise. The requirement for a Latin description ended with publication of the Melbourne Code (McNeill *et al.*, 2012), and the authors should have taken advantage of the opportunity to publish only in English, because the quality of some of their attempts to produce Latin versions of their descriptions is not good. Some examples: "*Ringleiste late praesens*" (p. 9 and see also pp. 10, 11) [*Ringleiste* could have been translated into Latin, but if a German term is used, the singular, agreeing with "*praesens*" is "*Ringleist*"; to agree with *Ringleiste*, the adjective would have to be "*praesentes*"; "*areolis extensis inter ad margini*" (p. 11) [*inter* seems to have lost its noun, while "*ad*" takes the accusative, not the dative]; "*valvis grandibus structuris plus grosse*" (p. 13) [this was meant to mean "larger valves have more coarse structure", which could be rendered as "*valvis grandioribus structuris grossioribus*"; "*stigmata destitute*" (p. 44) [the intended meaning was "stigmata absent"; hence, in agreement with the neuter plural noun "*stigmata*", "*destitute*" should have been rendered as "*destituta*": perhaps this was a typing error]; "*Valvae ovoideae-lanceolatae* heteropolar about the apical axis..." (p. 52) [the authors presumably gave up the struggle].

These examples and the continued decline, at least in the English-speaking world, in the numbers of scientists with any grounding in classical languages, suggest that diatomists should generally avoid writing descriptions of new taxa in Latin, even though this remains permissible according to the Melbourne Code. Further, because of the increased likelihood that species names may have been formed wrongly, anyone referring to recently described species should check the names they use, for example in AlgaeBase (Guiry & Guiry, 2016), even if they have obtained the names directly from the publications in which the species were described.

It is all too easy for a reviewer to pick on inconsistencies in presentation or errors in typography or nomenclature, or to check databases for homonyms. It is much more difficult to assess the taxonomy itself, although this would be more worthwhile. Unfortunately, few people have much taxonomic expertise outside a narrow range of diatom genera, and in many cases the authors of new species know far more about their organisms than anyone else, including reviewers. I know very little about most of the genera in which Kociolek *et al.* describe new species, and so I have no idea whether these are distinct from those already described. What I think I can say with some confidence is that, overall, the species do seem to be allocated correctly to the genera that were recognised in 2014. However, I noticed one species – *Eolimna*

vanlandinghamii – that may be worth further study before the suggested position of the species is accepted. *Eolimna* is a genus of biraphid diatoms, and indeed only raphid valves of *E. vanlandinghamii* are shown in plates 28 and 31 (“*vanlandinghamia*” in the captions). However, it appears from internal views (pl. 31, figs 6, 8) that the internal central raphe endings have the oppositely deflected, noncoaxial form that is typical of *Achnantheidium*, *Cocconeis*, *Planothidium* and related genera, rather than the \pm straight or unilaterally deflected internal endings that have been reported in *Eolimna* or *Sellaphora* (see Wetzel *et al.*, 2015, for discussion of whether *Eolimna* and *Sellaphora* are separate). I think, therefore, that it would be worth checking whether *Eolimna vanlandinghamii* may in fact be related to (or even within?) the monoraphid genus *Achnantheidium* rather than the biraphid *Eolimna* or *Sellaphora*. Is it possible that rapheless valves of *Eolimna vanlandinghamii* also occur and were overlooked? Or could it be that this species is a rare biraphid member of a group otherwise characterised by infilling of the raphe in one valve?

Another problematic species is *Navicula cerevisiae*, which the authors assign to *Navicula* despite recognising that “this species is clearly not a member of *Navicula sensu stricto*” and has a “unique suite of features”, and that additional SEM observations “might show it to be better being placed in *Eolimna*”. If it is definitely not a *Navicula* but might be an *Eolimna*, would it not be more logical to describe it in *Eolimna*?

In one case the species description is certainly wrong. “*Nitzschia americana*” (an illegitimate name: see above) is said (p. 51) to have valves in which the striae are invisible (i.e. unresolved) in the light microscope. However, in all except one of the LM photographs of the type material, striae are clearly visible (pl. 73, figs 1–5, 7) and seem to number c. 30 in 10 μ m. In addition, there is ambiguity concerning whether or not central raphe endings are present. This character has generally been regarded as important for species separation in *Nitzschia* (e.g. Lange-Bertalot, 1980). The English description of “*Nitzschia americana*” indicates in one place that the central nodule “may be present or absent” but elsewhere that it “is appearing to be absent”, whereas the Latin description also states that it is absent (“*destitutus*”). In SEM micrographs of the valve exterior (pl. 74, figs 1, 3, 6), the raphe is continuous across the centre and the LM micrographs (pl. 73, figs 1–7) show neither a central nodule nor a wider separation of the central pair of fibulae. It is therefore unclear why the authors think that some specimens may have an interrupted raphe. The characters of “*Nitzschia americana*” need further evaluation before it is accepted as separate from, for example, *N. fonticola* and, if appropriate, given a new, legitimate name.

Overall, this is a significant, well-illustrated addition to the diatom literature that would have benefited from more careful editing (*Bibliotheca Diatomologica* volumes are stated to be edited but, in this case, the editors’ touch was light indeed) and from further review before publication. The species included in the present volume, like the species published in many other volumes of *Bibliotheca Diatomologica* and *Iconographia Diatomologica* series, are those that were discovered during a particular project or expedition (in the present case a geographically restricted project, a subprogramme of the National Lakes Assessment dealing with the western USA); they

have nothing else in common. Books of this kind are simply a means of documenting species-level biodiversity in particular regions or habitats and publishing *en masse* the descriptions of new, unrelated species. The problem with this approach is the huge difficulty of comparing and remembering all the hundreds of new diatom species being described each year, which is presumably why many researchers do not even try to keep pace with taxonomic novelties, constraining their identifications to the taxa covered in a few ‘standard texts’, such as the *Süßwasserflora von Mitteleuropa* (Krammer & Lange-Bertalot, 1986–1991). Consequently, as Kociolek & Williams (2015) have noted, “there is a pressing need for genus- and family-level revisionary studies”, not only to establish the better taxonomic system that Kociolek & Williams desire (i.e. a more consistently phylogenetic classification), but also to list and evaluate all the species in each genus and to provide a single resource for identification. However, given (1) that the task of cataloguing the world’s remaining undescribed diatom species is enormous (cf. Mann & Vanormelingen, 2013) and (2) the decrease in the number of people able to commit themselves to the kinds of long-term studies needed to make monographic revisions, it is unrealistic to expect that revisionary work will keep pace with species description. Meanwhile, volumes like *Bibliotheca Diatomologica* 61 and papers reporting new species encountered during ecological, palaeoecological or biodiversity surveys could often be greatly improved if editors and reviewers insisted on full comparisons with *all* similar species. As someone who is inexpert in most of the genera represented in the present volume, I would have appreciated more discussion of each species and more help with identification. The same point was made by Rühland & Smol (2015). The ideal version of *Bibliotheca Diatomologica* 61 would have been a definitive, stand-alone guide to the 60 or so species included; as it is, readers will have to refer to many other works alongside the present volume and decide for themselves how (and even whether) to distinguish the new species from those already known.

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