

***Discostella asterocostata* (B.Q.Lin, S.Q.Xie & S.X.Cai) Houk & Klee (*Stephanodiscaceae*, *Bacillariophyceae*) in the Meuse River, a new invasive diatom species spreading in European Rivers?**

David Heudre¹, Etienne Ponton², Christelle Gisset² & Laura Moreau³

¹Office Français de la Biodiversité, Direction Régionale Grand Est – Chemin du Longeau, 57160 Moulins-lès-Metz, France (correspondence: david.heudre@ofb.gouv.fr)

²AQUABIO, 41 rue des Frères Lumière, 63000 Clermont Ferrand, France

³Office Français de la Biodiversité, Direction Régionale Grand Est – Chemin du Longeau, 57160 Moulins-lès-Metz, France

Cyclotella asterocostata B.Q.Lin, S.Q.Xie & S.X.Cai (1985: 473, pl. 1: figs 1–5) was first described as a planktonic diatom species from lakes and reservoirs in China (Beijing, Tangshan in Hebei, Shanyang in Liaoning, Suzhou in Jiangsu, and Guilin in Guangxi). While a single element [JNU HOP 760358 (16)] was designated as type, the English abstract and Latin description do not give a specific locality for it. Subsequently, the same taxon was described from a lake in South Korea as *Cyclotella orientalis* J.H.Lee, J.Chung & Gotoh (1995: 145, figs 1–21), before being recognised as *Cyclotella asterocostata* (Tanaka 2007, Houk & al. 2010). *Cyclotella asterocostata* was also reported from the Xizang Plateau (China) by Zhu & Chen (2000). In 2004, Houk & Klee (2004: 220) transferred *C. asterocostata* to their newly described genus *Discostella*. The species seemed to be only present in Asia as in 2007, Tanaka (2007) identified it from Japan. However, in 2009, Medvedeva & al. (2009) included this taxon, under the name *C. asterocostata*, in a list of centric diatoms from the Primorsky region of Far Eastern Russia, where it had been previously reported by Genkal & al. (1998), a record unknown to Tanaka. Much later, *D. asterocostata* was also reported as an introduced species in the United States of America by Alverson & al. (2021) who commented on its distribution and expansion in America, concluding that its presence already dated back to at least the 1980s. More recently, Tomović & al. (2024) reported *D. asterocostata* in Europe, in samples collected in 2021 from the Sava and Tisa rivers, two large lowland rivers of Serbia.

As part of the monitoring programme of the European Water Framework Directive, routine analyses are made annually on the French part of the Meuse river. In this context, *D. asterocostata* was identified for the first time in France in a phytoplankton sample collected on 5 July 2023 at Givet (Ardennes, France) close to the Belgian border. Over the past two years, the species has seemed to become established in the diatom plankton flora of this locality, as it was reported in significant abundances in all further samples collected subsequently at this location (1 and 28 August 2023; 27 September 2023; 28 May 2024 and 25 June 2024). On 17 August 2023 it was also reported from the benthos of the same locality. The presence of *D. asterocostata* was also confirmed in the downstream part of the river Meuse in benthos samples collected at Hastière (Belgium) on 29 September 2023 and at Namur (Belgium) on 6 October 2023 (Julien Marquié and Maryse Msaaf, pers. comm.). However, the species has not been found at monitoring stations upstream of Givet, especially at a phytoplankton sampling station at Lumes (Ardennes, France).

Specimens of *D. asterocostata* identified in the Meuse River (Figs 1–20) were in all respects consistent with the description given in Houk (1992) and Houk & al. (2010). In some samples it was observed together with *Discostella pseudostelligera* (Hustedt) Houk & Klee, a morphologically similar, but easily distinguishable species given the unique combination of morphological features of *D. asterocostata*: a rough central area delimited by radial striae, marginal striae having all the same



width and the presence of outer tubes of mantle fulcortulae, giving the appearance of spines in light microscopy.

Alverson & al. (2021) highlighted a distinct overlap between the distribution areas of *D. asterocostata* and that of Asian carps, especially the Silver carp [*Hypophthalmichthys molitrix* (Valenciennes, 1844)], an invasive and acclimatised species in several American river basins, mainly in the Mississippi catchment area. They concluded that these fish could be the vector for the introduction and spread of *D. asterocostata* in the United States. In France, Silver carp are also used by pond managers to control algal blooms, suggesting that carp could also be the introduction vector of *D. asterocostata* in the Meuse River. However, carp being the spreading vector after introduction seems unlikely insofar as these fish are not acclimatised in French rivers given the specific conditions necessary for their reproduction (cf. Teletchea & Le Doré 2011). The original source of introduction in the Meuse basin is probably a pond where those fish were introduced, which has not yet been identified, an impossible task given that there are more than 30 private fish ponds in the area between Lumes and Givet, where carp may have been introduced.

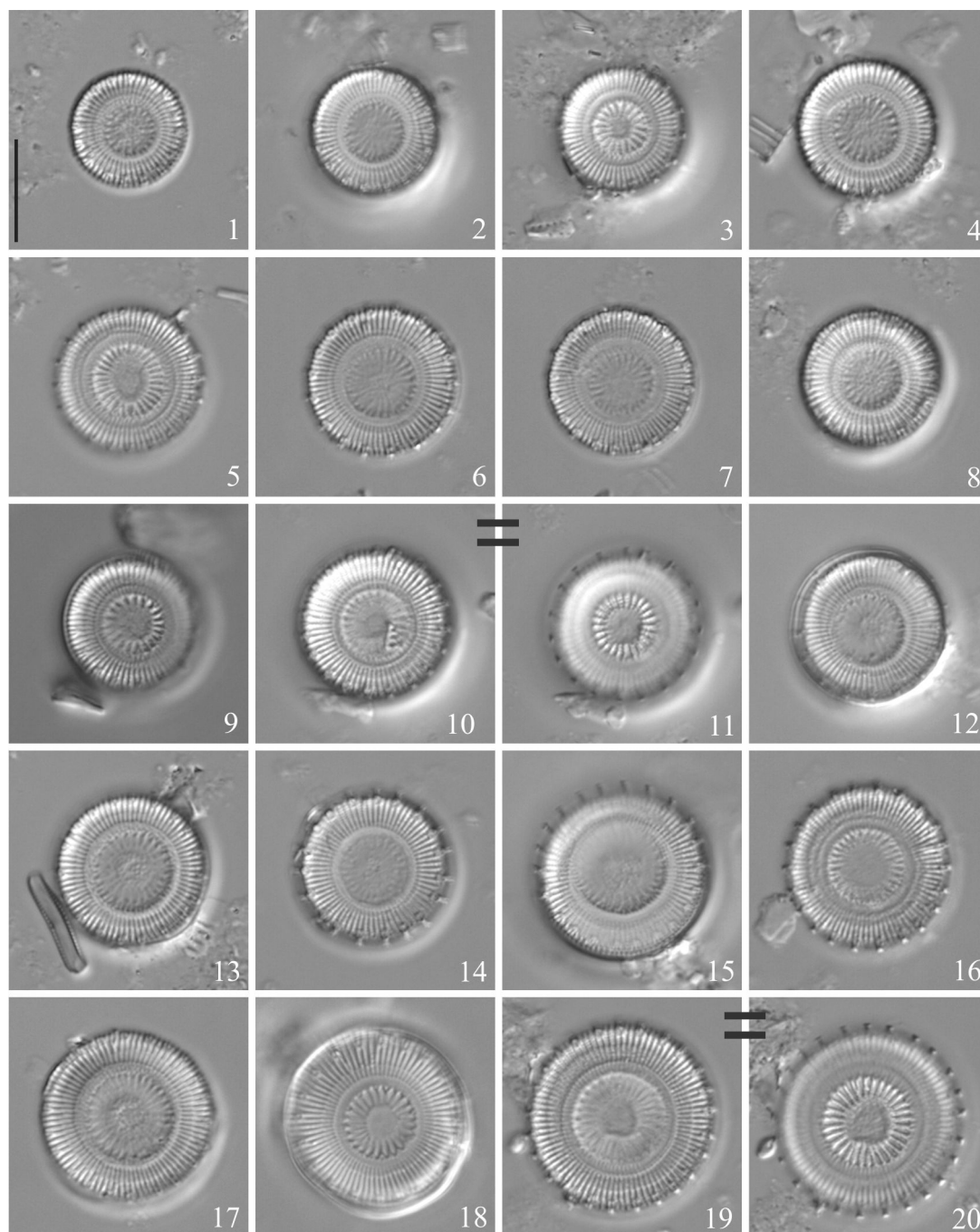
The present note is intended to highlight the existence of a new, possibly invasive species in our native European floras. As this is the second recent report of *D. asterocostata* in Europe, it is likely to spread further in European lakes and rivers. It is unclear for now what effect the introduction of this Asian species will have on the native diatom communities and on aquatic ecosystems in general.

The authors thank Julien Marquié (Sage Environnement) and Maryse Msaaf (Service Public de Wallonie) for the confirmation of the presence of *D. asterocostata* in the Belgian part of the Meuse river. Bart Van de Vijver (Meise Botanic Garden) and Michael D. Guiry (AlgaeBase) are also thanked for their time and constructive comments. The results of this paper have been presented during the 42ème Colloque de l'Association des Diatomistes de Langue Française (ADLaF), 10–12 September 2024 in Limoges, France.

- Alverson, A.J., Chafin, T.K., Jones, K.A., Manoylov, K.M., Johnson, H., Julius, M.L., Nakov, T., Ruck, E.C., Theriot, E.C., Yeager, K.M. & Stone, J.R. (2021). Microbial biogeography through the lens of exotic species: the recent introduction and spread of the freshwater diatom *Discostella asterocostata* in the United States. *Biological Invasions*, 23: 2191–2204.
- Genkal S.I., Makarova I.V., Goncharov A.A. (1998). Centric diatom species (Centrophyceae, Bacillariophyta) new for the waterbodies of Russia. *Botanicheskii Zhurnal*, 83(10): 121–123. [in Russian]
- Houk, V. (1992). *Cyclotella asterocostata* Lin, Xie et Cai (Bacillariophyceae): A little known stelligeroid *Cyclotella* species from China. *Archiv Für Hydrobiologie, Supplement Band 95*: 33–43.
- Houk, V. & Klee, R. (2004). The stelligeroid taxa of the genus *Cyclotella* (Kützinger) Brébisson (Bacillariophyceae) and their transfer into the new genus *Discostella* gen. nov. *Diatom Research* 19(2): 203–228, 137 figs.
- Houk, V., Klee, R. & Tanaka, H. (2010). Atlas of freshwater centric diatoms with a brief key and descriptions. Part III. Stephanodiscaceae A. *Cyclotella*, *Tertiarius*, *Discostella*. Fottea. 10(Supplement): 1–498.
- Lee, J.H., Chung, J. & Gotoh, T. (1995). *Cyclotella orientalis* sp. nov. (Bacillariophyceae) from South Korea. *Phycol. Res.* 43(3): 145–149, 21 figs.
- Medvedeva, L.A., Nikulina, T.V. & Genkal, S.I. (2009). Centric diatoms (Coscinodiscophyceae) of fresh and brackish water bodies of the southern part of the Russian Far East. *Oceanological and Hydrobiological Studies* 38(2): 139–164, 2 tables.



- Tanaka, H. (2007). Taxonomic studies of the genera *Cyclotella* (Kützinger) Brébisson, *Discotella* Houk et Klee and *Puncticulata* Håkansson in the family Sephanodiscaceae Glezer et Makarova (Bacillariophyta) in Japan. *Bibliotheca Diatomologica* 53: 1–203.
- Teletchea, F. & Le Doré, Y. (2011). Study on the breeding of so-called Chinese carp in France and assessment of their possible natural reproduction in French rivers. Nancy Université. Scientific report. 92 pp. [in French]
- Tomović, G., Sabovljević, M.S., Dorđević, V., Krdžić, S., Niketić, M., Šovran, S., ... & Šinžar-Sekulić, J. (2024). New records and noteworthy data of plants, algae and fungi in SE Europe and adjacent regions, 16. *Botanica Serbica*, 48(1): 93–104.
- Xie, S.Q., Lin, B.Q. & Cai, S.X. (1985). Studies by means of LM and EM on a new species, *Cyclotella asterocostata* Lin, Xie et Cai. *Acta Phytotaxonomica Sinica* 23(6): 473–475, 1 pl. [in Chinese]
- Zhu, H.Z. & Chen, J.Y. (2000). *Bacillariophyta of the Xizang Plateau*. pp. [1]–353. Beijing: Science Press. [in Chinese]



Figs 1–20. *Discostella asterocostata* (B.Q.Lin, S.Q.Xie & S.X.Cai) Houk & Klee. LM pictures of material from the Meuse River at Givet collected on the 05/07/2023.

Note: The symbol = denotes different focus levels of the same valve. Scale bar = 10 μ m.