Nomenclature and biogeography of the genus *Qinia* (*Cymbellaceae, Bacillariophyceae*)

Mark B. Edlund[1], Somayyeh Kheiri[2], Jamileh Panahy Mirzahazanlou[3]

[1] *St Croix Watershed Research Station, Science Museum of Minnesota, Marine on St Croix, MN 55047, USA. (correspondence: medlund@smm.org)*
[2] *Research Institute of Forests and Rangelands, Agricultural Research, Education and Extension Organization (AREEO), Tehran, Iran.*
[3] *Gonbad Kavous University, Faculty of Basic Sciences, Department of Biology, Gonbad Kavous, Iran.*

Many new species and genera continue to be recognised within the *Cymbellales* especially as new Asian habitats and collections are being studied. This includes the recent recognition and description of the genera *Oricymba* Jüttner, Krammer, E.J.Cox, Van de Vijver & Tuji (2010: 408), *Celebesia* Kapustin, Kulikovskiy & Kociolek (2017: 153), *Karthickia* Kociolek, Glushchenko & Kulikovskiy (Glushchenko & al. 2019: 606), *Ochigma* Kulikovskiy, Lange-Bertalot & Metzeltin (Kulikovskiy & al. 2012: 214), *Khursevichia* Kulikovskiy, Lange-Bertalot & Metzeltin (Kulikovskiy et al. 2012: 157), *Vladinikolaevia* Kulikovskiy, Glushchenko, Y.Liu & Kociolek, (Kulikovskiy & al. 2022: 206), and *Qinia* Y.Liu, Kociolek & Kulikovskiy (Liu & al. 2023: 1967). Primarily characterised by morphological features, the new genera vary in their areola structure, apical pore fields (APFs), stigmata, and raphe structure. Many of the new genera are also biogeographically constrained; for example, the three species of the genus *Qinia* appear to be limited in distribution to lakes in the Yunnan Province (China), and the genus *Celebesia* is to date only found in Indonesia (Kapustin & al. 2017).

A new species, *Cymbella golestanica* J.Panahy (in Panahy Mirzahasanlou & al. 2024: 99), was recently described from the Agh Su Waterfall in Golestan National Park in northeastern Iran. The species presents a dorsiventral asymmetry, identical apical pore fields at each end, and internally thickened virgae, all characters placing it in the broader circumscription of the *Cymbellales*. However, closer examination of the morphological characters of *C. golestanica* include the absence of stigmata, slit-like external areolae occluded internally by tectula, a dorsal deflection of the external terminal raphe fissures to split the apical pore fields, a raphe positioned mid-valve, and a lanceolate valve outline. For comparison, the genus *Qinia* is characterised among the *Cymbellales* by its lanceolate-shaped valves that are asymmetrical about their apical axis, a raphe located in the middle of the valve, distal raphe ends bent toward the dorsal margin and bisecting the APFs, stigmata absent, areolae with apically oriented slit-like external openings, and tectula (Cox 2004: 45) internally occluding the areolae (Liu & al. 2023). All morphological characters suggest that *C. golestanica* would be better placed in the genus *Qinia* (Liu & al. 2023) and therefore a formal transfer is proposed:

Qinia golestanica (J.Panahy) J.Panahy, Kheiri & Edlund, *comb. nov.*
Basionym: *Cymbella golestanica* J.Panahy, in Panahy Mirzahasanlou & al., *Phytotaxa*, 637(1): 99, figs 2–7. 2024.
Type locality: Agh Su waterfall (37°27'89"N, 55°99'88"E), Golestan National Park, Golestan Province, Iran.
Registration: http://phycobank.org/104532
Comments: Analysis of light and scanning electron micrographs of *Q. golestanica* (Panahy Mirzahasanlou & al. 2024) shows that it possesses all the defining characters of *Qinia*, justifying this transfer. *Qinia golestanica* differs from the three other *Qinia* taxa in valve shape, central and axial area shape, and size. Compared to *Q. lashiensis* Y.Liu & Kociolek (2023: 1968), *Q.*

aequalis Y.Liu & Kociolek (2023: 1969), and *Q. daliensis* Y.Liu & Kociolek (2023: 1970), *Q. golestanica* has slightly protracted valve ends, less dorsiventrality, a slightly expanded lanceolate axial and central area, and is generally larger than *Q. aequalis* and smaller than *Q. lashiensis* and *Q. daliensis* (Liu & al. 2023; Panahy Mirzahasanlou & al. 2024). Finally, the other three *Qinia* taxa were described from and are limited in distribution to lakes in the Yunnan Province, China (Liu & al. 2023). *Qinia golestanica*, from northeastern Iran, is the first *Qinia* taxon that has been found outside of southern China and represents a considerable expansion of the biogeographical range of *Qinia* (Fig. 1).

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Cox, E.J. (2004). Pore occlusions in raphid diatoms – a reassessment of their structure and terminology, with particular reference to members of the Cymbellales. *Diatom* 20: 33–46.

Glushchenko, A., Kuznetsova, I., Kociolek, J.P. & Kulikovskiy, M. (2019). *Karthickia verestigmata* gen. et sp. nov. – an interesting diatom with frustular morphology similar to several different cymbelloid diatom genera. *Phycologia* 58(6): 605–613.

Jüttner, I., Krammer, K., Van de Vijver, B., Tuji, A., Simkhada, B., Gurung, S., Sharma, S., Sharma, C. & Cox, E.J. (2010). *Oricymba* (Cymbellales, Bacillariophyceae), a new cymbelloid genus and three new species from the Nepalese Himalaya. *Phycologia* 49(5): 407–423.

Kapustin, D.A., Kulikovskiy, M. & Kociolek, J.P. (2017). *Celebesia* gen. nov., a new cymbelloid diatom genus from the ancient lake Matano (Sulawesi Island, Indonesia). *Nova Hedwigia Beihefte* 146: 147–155.

Kulikovskiy, M., Kociolek, J.P., Liu, Y., Kuznetsova, I. & Glushchenko, A. (2022). *Vladinikolaevia*, gen. nov. – a new enigmatic freshwater diatom genus (Cymbellaceae, Bacillariophyceae) from Mongolia. *Fottea* 22(2): 204–210.

Kulikovskiy, M.S., Lange-Bertalot, H., Metzeltin, D. & Witkowski, A. (2012). Lake Baikal: Hotspot of endemic diatoms I. *Iconographia Diatomologica* 23: 1–607.

Liu, Y., Kociolek, J.P., Kulikovskiy, M., Glushchenko, A., Yu, P., Wang, Q.X., Lu, X.X. & Fan, Y.W. (2023). *Qinia* gen. nov. (Bacillariophyceae: Cymbellales) from Yunnan Province, China. *Journal of Oceanology and Limnology* 41: 1965–1977.

Panahy Mirzahasanlou, J., Qarebesloum, T., Farasati, M. & Arsalan B. (2024). *Cymbella golestanica sp. nov.* a new diatom species from Agh Su Waterfall, Golestan National Park, northeastern Iran. *Phytotaxa* 637(1): 97–105.

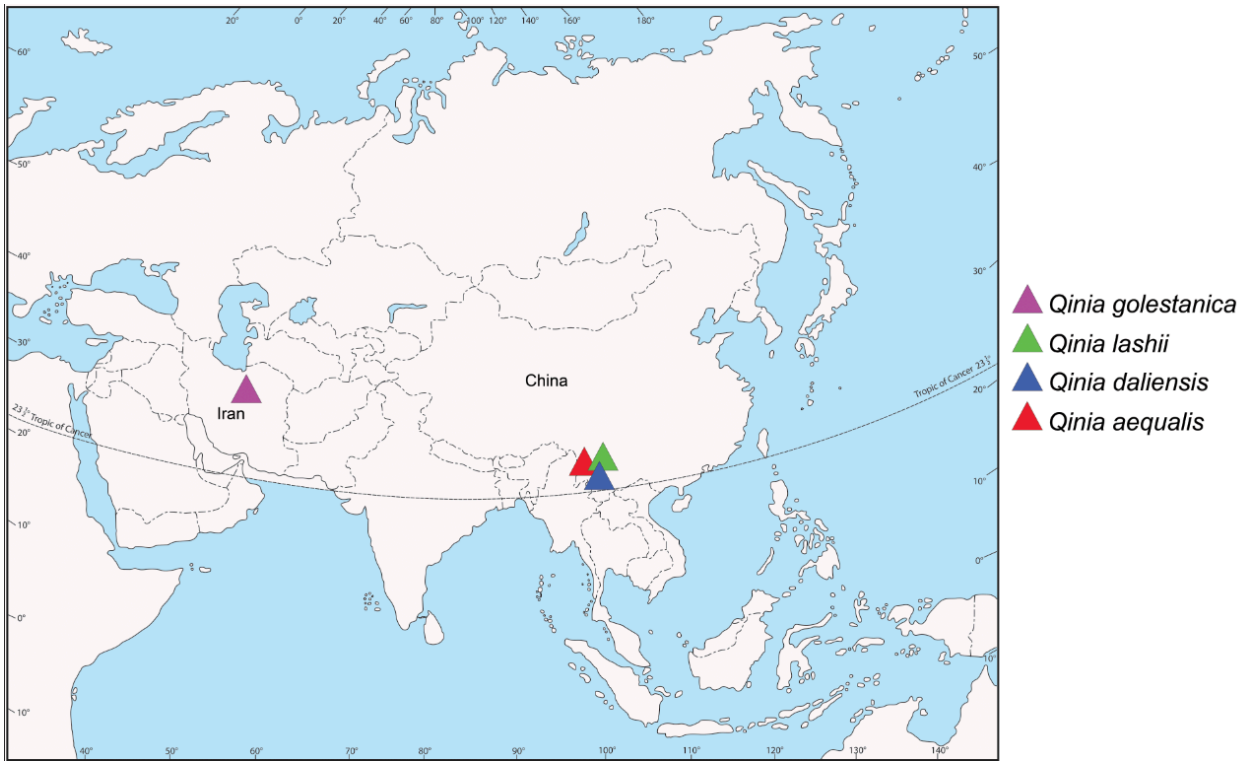

Fig. 1. Distribution map of the four known species of *Qinia* in China and Iran.