**Supplementary Text**

1. Characters applied in phylogenetic analyses
2. Characters applied in morphologic analysis
3. **Characters applied in phylogenetic analysis**

(Non-applicable characters were coded as “-” and uncertain or unknown character states as “?”.)

1. Hingeline denticulation. Absent (0); present (1).
2. Hingeline denticulation. Hingeline partly denticulated (0); hingeline completely denticulated (1).
3. Valve outline. Slightly elongate or nearly equilateral (shell width/shell length < 1.2) (0); wide (1.2 ≤ shell width/shell length < 2.5) (1); very wide (shell width/shell length ≥ 2.5) (2).
4. Ventral valve convexity. Gently convex (0); moderately convex (1); strongly convex (2).
5. Dorsal valve convexity. Concave or slightly convex (0); moderately convex (1); strongly convex (2).
6. Hingeline width. Much less than maximum width of shell (maximum width of dorsal valve near midlength) (0); slightly less than maximum width of shell (maximum width of dorsal valve slightly anterior to hingeline) (1); equal to maximum width of shell (2).
7. Cardinal extremities. Rounded (0); angular (1); alate and acute (2).
8. Ventral sulcus. Absent (0); shallow (1); deep (2).
9. Radial ornament. Absent (0); present (1).
10. Coarseness of radial ornament. Very coarse (number of ribs < 12) (0); fine (12 ≤ number of ribs < 24) (1); very fine (number of ribs ≥ 24) (2).
11. Radial ornament in sulcus. Absent (0); present (1).
12. Microornament. Absent (0); spines or pustules (1).
13. Ventral interarea attitude. Orthocline or strongly apsacline (0); moderately apsacline (1); slightly apsacline to catacline (2).
14. Ventral interarea height. Very low (0); low (1); high (width > height) (2); very high (width < height) (3).
15. Ventral interarea curved or flattened. Curved (0); flattened (1).
16. Bear ridges. Subangular (0); rounded (1).
17. Delthyrial cover plate. Absent (0); present (1).
18. Dental adminicula. Absent (0); present (1).
19. Dental adminicula length. Short (0); long (1).
20. Dental adminicula orientation. Ventrally divergent (0); parallel (1); ventrally convergent (2).
21. Spondylium formed by the fusion of dental adminicula. Absent (0); present (1)
22. Dental flanges. Not fused or fused by callus (0); fused directly (1).
23. Dental flanges width. Narrow (0); wide (1).
24. Dental flanges pierced or not. Not pierced (0); pierced (1).
25. Ventral median septum height. Low (0); high (1).
26. Cardinal process. Ctenophoridium (0); Lacking ctenophoridium (1).
27. Hinge plates. Not fused (0); fused (1).
28. Dorsal adminicula. Absent (0); present (1).
29. Dorsal median septum. Absent (0); present (1).
30. Dorsal median septum height. Low (0); high (1).
31. Jugum. Absent (0); present (1).
32. Jugal net. Absent (0); present (1).
33. **Characters applied in morphologic analysis**

(O, ordered characters; U, unordered characters. Uncertain or unknown character states were coded as “?”.)

1. Valve outline [O]. Elongate (shell width/shell length < 1.0) (0); equilateral (1.0 ≤ shell width/shell length < 1.2) (1); wide (1.2 ≤ shell width/shell length < 2.5) (2); very wide (shell width/shell length ≥ 2.5) (3).
2. Ventral valve convexity [O]. Gently convex (0); moderately convex (1); strongly convex (2); subconical (3).
3. Dorsal valve convexity [O]. Concave (0); gently convex (1); moderately convex (2); strongly convex (3).
4. Hingeline width [O]. Much less than maximum width of shell (0); slightly less than maximum width of shell (1); equal to maximum width of shell (2).
5. Cardinal extremities [O]. Rounded (0); angular (1); alate and acute (2).
6. Ventral sulcus [O]. Absent (0); shallow (1); deep (2).
7. Development of plicae [O]. Absent (0); slightly developed (1); strongly developed (2).
8. Development of fine costae/costellae [O]. Absent (0); slightly developed (1); strongly developed (2).
9. Ventral interarea attitude [O]. Orthocline or strongly apsacline (0); moderately apsacline (1); slightly apsacline or catacline (2).
10. Ventral interarea height [O]. Very low (0); low (1); high (width > height) (2); very high (width < height) (3).
11. Ventral interarea curved or flattened [U]. Curved (0); flattened (1).
12. Delthyrial cover plate [U]. Open (0); fused deltidium (1); stegidial plates (2); deltidium with spines (e.g. *Thecocyrtellioidea*) (3); complex imbricate plates (e.g. *Neocyrtina*) (4); delthyrial plate (= connector plate) (5).
13. Size [O]. Small, 0–20 mm (0); Moderate, 20–40 mm (1); large, 40–60 mm (2); very large, 60–80 mm (3); exceptionally large, > 80 mm (4).
14. Secondary thickening or callus [U]. Absent or weakly developed (0); strongly developed (1).