A new species of *Trigonostoma* (Gastropoda, Cancellariidae) from the Miocene (Upper Langhian to Serravallian) of Dingden, Germany

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A new species of *Trigonostoma* (Gastropoda; Cancellariidae) from the Middle Miocene North Sea Basin is described, *Trigonostoma ariejansseni* nov. sp., and compared to similar congeners.

Key words: Middle Miocene, North Sea Basin, *Trigonostoma*, new species

Introduction

The Oligocene and Miocene molluscs from Germany have been monographed first by Von Koenen (1872-1874). The Middle Miocene was first properly monographed by Kautsky in 1925 based on material from Hemmoor (Kautsky, 1925). The research in the North Sea Basin molluscan assemblage continued strongly in the 20th century by Glibert for the Belgian Miocene, Rasmussen for Denmark, Anderson for Germany and Janssen for Dutch and German assemblages (*e.g.*, Voorthuysen, 1944; Glibert, 1952; Rasmussen, 1956; Sorgenfrei, 1958; Anderson, 1964; Janssen, 1967, 1969, 1972, 1983, 1984; Nordsieck, 1972). All these authors noted the presence of Cancellariidae, including the genus *Trigonostoma* Blainville, 1827, in the North Sea Basin. The family even received special attention in several monographs (Janssen, 1983; Jansen, 2016).

While studying the lots of Cancellariidae from the Miocene (Langhian) of Dingden Königsmühle in the collections of the Natuurhistorisch Museum Rotterdam and Naturalis Biodiversity Center, several specimens were found that could not be matched with any known species from the Middle Miocene of the North Sea Basin. In this paper, the species is described and compared to similar congeners.

Stratigraphic setting

All specimens are present in the collections of the Natuurhistorisch Museum Rotterdam and Naturalis Biodiversity Center. They were recovered from an artificial exposure in the riverbed near the Königsmühle in Dingden, Germany (Janssen, 1967). These deposits are part of the so called Reinbek-Stufe, which was previously assigned to the local stage Reinbekian. According to Anderson (1964) the upper clayey deposits belong to the Dingdener Schichten and the lower sandy deposits to the Bislicher Schichten. Janssen (1967) stated that, because of insufficient palaeontological research on the type locality of the Bislicher Schichten, it is impossible to assign the lower sandy deposits at Dingden to it. He proposed to call the upper beds Dingdener Glimmerton and the lower Dingdener Feinsand. Together they form the present-day Dingden Member, part of the Breda Formation (Hiss, 2013; Menning & Hendrich, 2016). The age of the Dingden Member is Late Langhian to Serravallian (Menning & Hendrich, 2016).

Systematical part

Collections studied – Natuurhistorisch Museum Rotterdam (NMR), Rotterdam, The Netherlands; Naturalis Biodiversity Center (RGM), Leiden, The Netherlands; Museo Regionale di Scienze Naturali Torino, Turin, Italy.

Family Cancellariidae Forbes & Hanley, 1851

Genus *Trigonostoma* Blainville, 1827

Type species – *Delphinula trigonostoma* Lamarck, 1822 (= *Trigonostoma scalare* (Gmelin, 1791)), by monotypy. Present day, Indo-Pacific.

***Trigonostoma* (*Trigonostoma*) *ariejansseni* nov. sp.**
Plate 1, fig. 1-2

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2001 *Trigonostoma* (*T.*) *protrigonostoma* (Sacco, 1894) – Wienrich, p. 517, pl. 107, fig. 3 [non Sacco, 1894]
2016 *Trigonostoma* (*T.*) *protrigonostoma* (Sacco, 1894) – Jansen, pl. 89, fig. 3 [non Sacco, 1894]

Type locality – Germany, Nordrhein-Westfalen, Dingden, Königsmühle.

Type stratum – Breda Formation, Dingden Member, Dingdener Feinsand Bed (Miocene, Upper Langhian to Serravallian).

Etymology – Named after Arie W. Janssen, a well-known Dutch palaeontologist, malacologist and mentor to the author; he passed away in August 2021.

Type material – Holotype: adult specimen (Pl. 1, fig. 1), RGM.1363262, leg. A.W. Janssen. Paratype 1: juvenile specimen (Pl. 1, fig. 2), NMR993000192259, from the type locality, Dingden Member, unknown bed, leg. J.G.B. Nieuwenhuis. Other paratypes: 10 juvenile specimens, RGM.1363261; 1 juvenile specimen, RGM.1363263; 1 juvenile specimen, RGM.1363264; 4 juvenile specimens, NMR993000004767, all leg. A.W. Janssen and originating from the type locality and type stratum. Adult specimen, NMR993000192258, from the type locality, Dingden Member, unknown bed, leg. J.G.B. Nieuwenhuis.

Additional material – 1 fragment, NMR993000192260, from the type locality, Dingden Member, unknown bed, leg. J.G.B. Nieuwenhuis

Locality data – Germany, Nordrhein-Westfalen: Dingden, Königsmühle (type locality) & Kevelaer (Wienrich, 2001); The Netherlands, Gelderland: Winterswijk-Miste (Jansen, 2016).

Diagnosis – Small shell, of medium width for the genus, with a relatively tall, strongly scalate spire; subhorizontal subsutural platform; spinous shoulder cord; maximum of five primary spiral cords on the teleoconch; subobsolete secondary spiral threads, triangular aperture and wide, deep umbilicus.

Measurements – All dimensions are in millimetres (mm).
Holotype: H: 9.4; W: 7.7
Paratype 1: H: 4.6; W: 4.1

Description – Shell small, medium width for genus, with relatively tall, strongly scalate spire. Protoconch multispiral, naticoid, 2.5 strongly convex whorls, with small nucleus. Junction with teleoconch marked by scar. Teleoconch of up to four strongly tabulate whorls, with broad, sub-horizontal subsutural platform, delimited by a sharply angled spinous shoulder cord, whorl profile weakly convex below. Suture narrowly impressed, undulating. Sculpture of narrow, sharp, elevated, prosocline ribs, overrun by weak, narrow spiral cords, three on first teleoconch whorl, shoulder spiral slightly stronger, four on second whorl with subobsolete spiral treads just visible in interspaces. Open spines developed at sculptural intersections at shoulder, small point tubercles as intersections below. Last whorl 68% of total height, strongly spinous at shoulder, evenly convex below, with five spiral cords. Base broadly and deeply umbilicate, umbilicus delimited by elevated ridge, with ribs forming spines over peribasal cord. Aperture 36% of total height, subtriagonal. Outer lip angled at shoulder and peribasal cord, not thickened, lirated within. Columella straight, strongly oblique, slanting abaxially, bearing two sharp columellar folds placed mid height.

Distinction – Placement in the genus *Trigonostoma* is based on the strongly tabulate whorls, sub-triagonal aperture and the presence of only two folds on the columella (Cahuzac *et al*., 2004). *Trigonostoma ariejansseni* sp. nov. belongs to a group of North Sea Basin *Trigonostoma* species characterised by an exceptionally broad and squat last whorl and a broad, deep umbilicus. This group includes species such as *T. apertum* (Beyrich,1856)*, T. barnardi* A.W. Janssen, 1983 and *T. lindeni* A.W. Janssen, 1983. All three have more crowded spiral sculpture, a narrower subsutural ramp and a more conical spire. *Trigonostoma apertum* and *T. lindeni* also differ by their more numerous, weaker axial ribs (Plate 1, figs 3-4; Janssen, 1983; 1984).
Scalptia spinosa (Grateloup, 1827) from the Lower Miocene of France is superficially similar in having a broad, horizontal, subsutural platform and having a spinous shoulder, but is immediately separated by having three columellar folds and the much narrower umbilicus (Cahuzac *et al.,* 2004). *Scalptia calais* (Kautsky, 1925) differs even more from *T. ariejansseni* sp. nov. by having much more and weaker spirals, and in general a more rounded shoulder (Plate 1, fig. 6; Kautsky, 1925).
Specimens of *T. (T.) protrigonostoma* (Sacco, 1894), identified by Wienrich (2001, p. 517, pl. 107, fig. 3) and Jansen (2016, p. 89, pl. 2 figs 3a-3d) seem to represent *T. ariejansseni* sp. nov. *Trigonostoma protrigonostoma* differs from the new species by its larger size at the same whorl count, more prominent axial ribs, larger but less developed spiral cords, disjunct last whorl and overall slenderer shape (Plate 1, Figs 5a-b; Sacco, 1894; Mortara *et al*., 1984).

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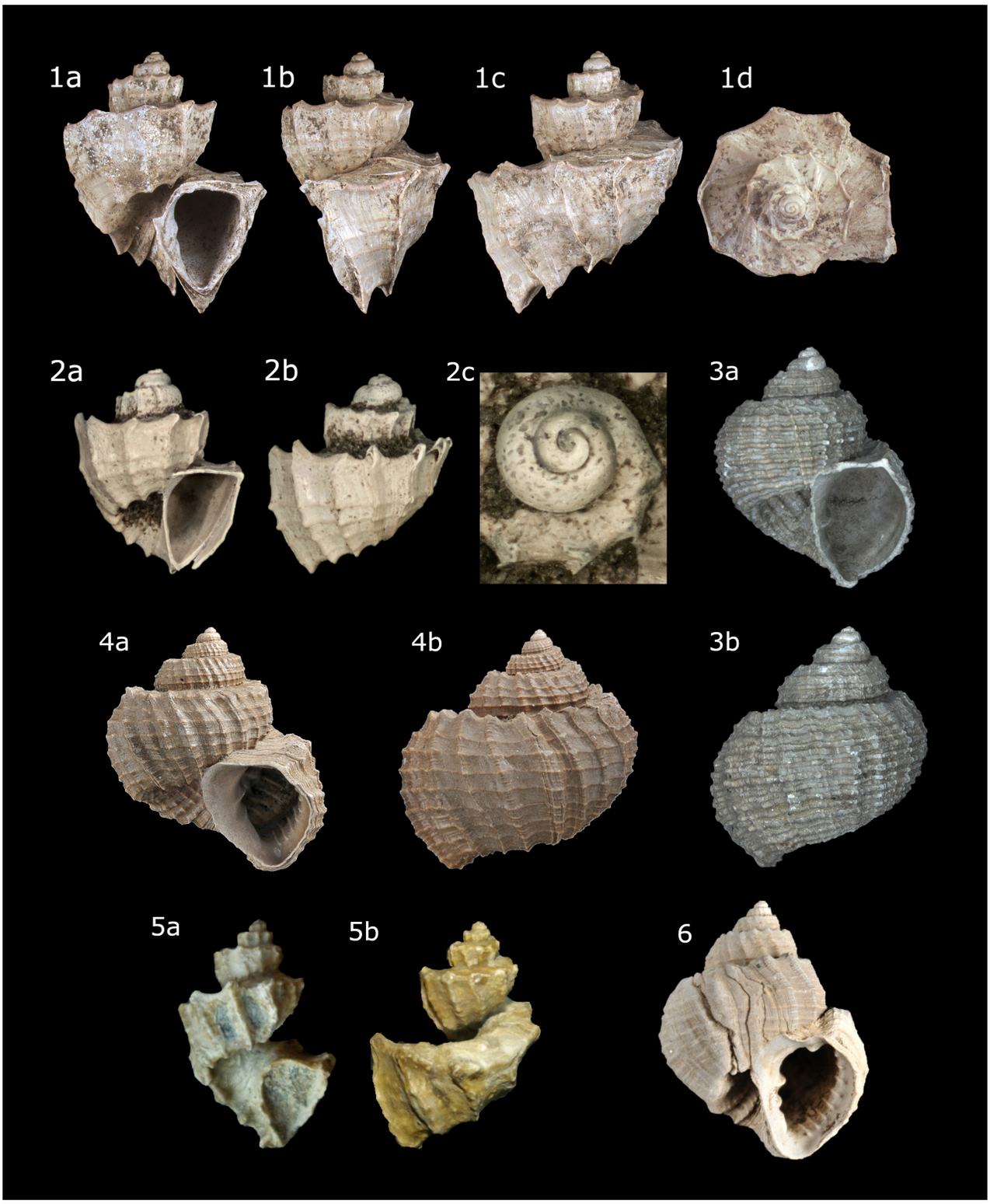

Plate 1.

1a-1d. *Trigonostoma ariejansseni* nov. sp., Dingden, Königsmühle (Germany), RGM.1363262, **Holotype**, H: 9.4 W: 7.7 mm.
2a-2c. *Trigonostoma ariejansseni* nov. sp., Dingden, Königsmühle (Germany), NMR9930-192259, **Paratype 1**, H: 4.6 W: 4.1 mm.
3a-3b. *Trigonostoma lindeni* Janssen, 1984, Winterswijk-Miste (The Netherlands), RGM.225169, **Paratype**, H: 13.0 W: 10.5 mm.
4a. *Trigonostoma apertum* (Beyrich, 1856), Winterswijk-Miste (The Netherlands), RGM.225158.a, H: 20.0 W: 17.4 mm.
4b. *Trigonostoma apertum* (Beyrich, 1856), Winterswijk-Miste (The Netherlands), RGM.225158.b, H: 18.0 W: 17.5 mm.
5a-b. *Trigonostoma protrigonostoma* Sacco, 1894, Collini Torinesi, Turin region (Italy), BS.045.01.002, **Syntype**, H: 18 mm (pers. com. Pistarino, 2022).
6. *Scalptia calais* (Kautsky, 1925), Dingden Königsmühle (Germany), RGM.1363279, H: 20.7 W: 16.5 mm.

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