Cainozoic Research, **9**(1), pp. 135-137, June 2012

An addition to the tonnoidean gastropods of the middle Miocene Paratethys: the genus *Pisanianura* Rovereto, 1899

Bernard Landau[1] & Mathias Harzhauser[2]

[1] *Departamento de Geologia e Centro de Geologia. Faculdade de Ciências. Universidade de Lisboa. Campo Grande, 1749-016 Lisboa, Portugal and International Health Centres, Av. Infante de Henrique 7, Areias São João, P-8200 Albufeira, Portugal; e-mail:bernielandau@sapo.pt*
[2] *Natural History Museum Vienna, Burgring 7, 1010 Vienna, Austria; e-mail: mathias.harzhauser@nhm-wien.ac.at*

Received 25 April 2012; accepted 27 April 2012

The genus *Pisanianura* Rovereto, 1899, is described in the middle Miocene of the Paratethys for the first time, represented by *Pisanianura craverii* (Bellardi, 1873). The presence of the species in the Paratethys during the mid-Miocene Climate optimum, and the relations with the proto-Mediterranean Sea, are discussed.

KEY WORDS: middle Miocene, Paratethys, Tonnoidea, Pisanianuria

Introduction

The tonnoidean gastropods from the Neogene Paratethys were recently reviewed in detail by Landau *et al*. (2009). It is quite remarkable that after more than 200 years of collecting and research new records for the area still arise on a regular basis. This is in no small amount thanks to the tireless efforts of excellent local collectors such as Anton Breitenberger, from Bad Vöslau, Austria, who recently discovered the first species of the genus *Pisanianura* Rovereto, 1899, for the Paratethys.

Geological setting

The specimen comes from a field north of Grund in Lower Austria in the eastern part of the North Alpine Foreland Basin (Fig. 1). The deposits belong to the lower middle Miocene Grund Formation and are Langhian in age, corresponding to the early Badenian regional stratigraphy (Ćorić *et al*., 2004). The sandy shell-rich deposits have been famous for their rich mollusc fauna (see Zuschin *et al*., 2004; 2011 for a synopsis and species lists). They formed as allochthonous event beds, containing channel-structures with sharp erosive bases as proximal tempestites. Sedimentology and taphonomic features suggest that transport occurred from wave- or current-agitated nearshore habitats into a dysaerobic, pelitic, inner shelf environment (Zuschin *et al*., 2004; 2005).

Systematic palaeontology

Superfamily Tonnoidea Suter, 1913 (= Cassoidea Latreille, 1825)
Family Laubierinidae Warén & Bouchet, 1990
Genus *Pisanianura* Rovereto, 1899

Remarks – The genus *Pisanianura* Rovereto, 1899, has often been included in the Buccinidae Rafinesque, 1815. It was transferred by Warén & Bouchet (1990) to the Ranellidae Gray, 1854, on the basis of soft part anatomy and radular characters, and placed in the newly erected subfamily Pisanianurinae. Beu (*in* Beesley *et al*., 1998, p. 799) elevated the subfamily to family rank Pisanianuridae. However, Beu & Bouchet (pers. comm.) pointed out the strong similarities between *Akibumia* Kuroda & Habe, 1959 and *Pisanianura*, and transferred *Pisanianura* to the family Laubierinidae. For further information see Landau *et al.* (2004).

***Pisanianura craverii* (Bellardi, 1873)**
Fig. 2

*1873 *Anura craverii* Bellardi, p. 204, pl. 11, fig. 23.
1981 *Anura craverii* Bellardi, 1872 [sic] – Ferrero Mortara *et al.*, p. 53, pl. 7, fig. 8.

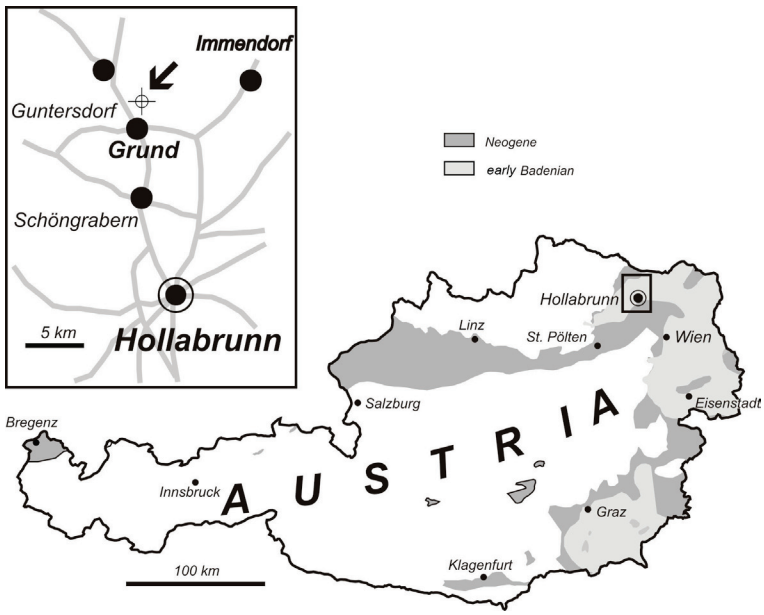

Figure 1. Geographic position of the locality, modified from Zuschin *et al*. (2004).

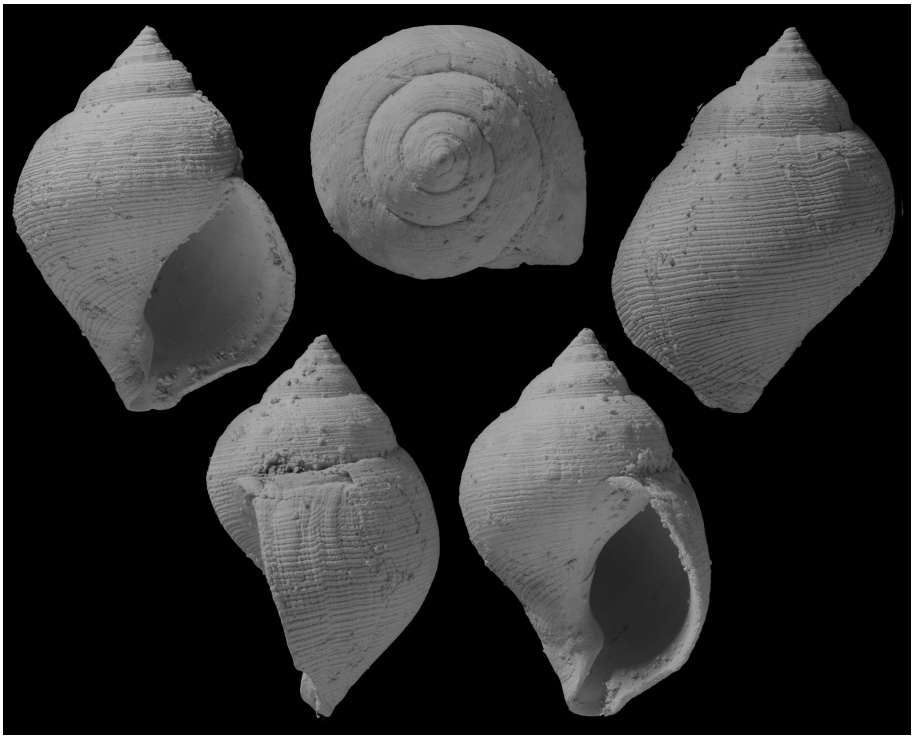

Figure 2. *Pisanianura craverii* (Bellardi, 1873); Grund, Austria, early Badenian (Langhian), height 35.9 mm (collection Anton Breitenberger, nr. AB2476).

Material – One specimen, height 35.9 mm, width 25.6 mm; Grund, Lower Austria; private collection Anton Breitenberger, nr. AB2476.

Discussion – The genus *Pisanianura* Rovereto, 1899, in the European Neogene was discussed by Landau *et al*. (2006). The Austrian shell is almost identical in shape and size to the holotype, refigured by Ferrero Mortara *et al*. (1981, pl. 7, fig. 9), but possibly slightly thinner-shelled. The species was first described from the Burdigalian of the Colli Torinesi of Italy, where it seems to be extremely rare. As far as we are aware this is only the second specimen figured. *Pisanianura craverii* (Bellardi, 1873) is characterized by the absence of prominent axial sculpture and

tubercles, which are present in its European congeners *Pisanianura inflata* (Brocchi, 1814), which ranges from the late Oligocene to early Pliocene and *Pisanianura borsoni* (Bellardi, 1873) from the Burdigalian of Italy. Several other superficially similar species were described by Bellardi (1873) from the Colli Torinesi deposits: *Anura ovata, A. striata, A. craverii, A. pusilla* and *A. sublaevis* (see Ferrero Mortara *et al*., 1981). The specimens are poorly preserved and the apertures obscured by callus, which makes it unclear if they are truly congeneric.
Pisanianura gaboraroni Csepreghy-Meznerics, 1969 from the Badenian of Borsod in Hungary differs distincly from *Pisanianura craverii* in its high and conical spire and is probably a littorinid.

Distribution – Early Miocene: Proto-Mediterranean Sea (Burdigalian): Termô-Fôra, Colli Torinesi, Italy (Bellardi, 1873; Ferrero Mortara *et al.,* 1981); middle Miocene: Paratethys (Langhian-Serravallian): North Alpine Foreland Basin, Austria (this paper).

Discussion and conclusions

During the early middle Miocene the Paratethys experienced a bloom in mollusc species. The dramatic increase in diversity from the late early Miocene Karpatian to the early middle Miocene Badenian was termed the early Badenian build-up event (EBBE) by Harzhauser & Piller (2007) and was also documented for tonnoideans by Landau *et al*. (2009). This event was tentatively related to the mid-Miocene Climate optimum, which allowed a northward migration of thermophilic taxa from the proto-Mediterranean Sea (Harzhauser *et al*., 2003). The first occurrence of *Pisanianura craverii* (Bellardi, 1873) in the Burdigalian of the proto-Mediterranean Sea and its later appearance in the Paratethys Sea might corroborate this interpretation. Nevertheless, the distinctly lower amount of Karpatian (early Miocene) assemblages, compared to the frequent middle Miocene Paratethyan ones, might influence the picture as well. In any case, the finding of this very rare species documents the close biogeographic relation of the Paratethys and the proto-Mediterranean seas and shows that our knowledge on the seemingly well studied Paratethyan faunas is still fragmentary.

Acknowledgments

Our thanks to Anton Breitenberger (Bad Vöslau, Austria) for allowing us access to this and many other of his new and exciting Paratethyan discoveries. Frank P. Wesselingh (NCB Naturalis, Leiden, The Netherlands) commented on the manuscript.

References

Bellardi, L. 1873. I molluschi dei terreni terziarii del Piemonte e della Liguria1: Cephalopoda, Pteropoda, Heteropoda, Gasteropoda (Muricidae e Tritonidae). *Memorie della Reale Accademia delle Scienze di Torino* (2) 27: 33-294 (reprint 264 p.).

Beesley, P.L. , Ross, G.J.B. & Wells, A. (eds) 1998. *Mollusca: the southern synthesis. Fauna of Australia* 5. Melbourne. (Australian Biological Resources Study, Canberra. CSIRO Publishing). Part A: i-xvi, 1-563; Part B: i-viii, 565-1234.

Ćorić, S., Harzhauser, M., Hohenegger, J., Mandic, O., Pervesler, P., Roetzel, R., Rögl, F., Spezzaferri, S., Stingl, K., Svábenická, L., Zorn, I. & Zuschin, M. 2004. Stratigraphy and correlation of the Grund Formation in the Molasse Basin, northeastern Austria (middle Miocene, lower Badenian). *Geologica Carpathica* 55: 207–215.

Csepreghy-Meznerics, I. 1969. Nouvelles gastropodes et lamellibranches pour la faune hongroise des gisements tortoniens-inférieurs de la Montagne de Bükk. *Annales historico-naturales Musei nationalis hungarici* 61: 63-127.

Ferrero Mortara, E.L., Montefameglio, L., Pavia, G. & Tampieri, R. 1981. Catalogo dei tipi e degli esemplari figurati della collezione Bellardi e Sacco I. *Museo Regionale di Scienze Naturali di Torino, Cataloghi* 6: 327 pp.

Harzhauser, M. & Piller, W.E. 2007. Benchmark data of a changing sea. Palaeogeography, palaeobiogeography and events in the Central Paratethys during the Miocene. *Palaeogeography, Palaeoclimatology, Palaeoecology* 253: 8–31.

Harzhauser, M., Mandic, O. & Zuschin, M. 2003. Changes in Paratethyan marine molluscs at the early/middle Miocene transition - diversity, paleogeography and paleoclimate. *Acta Geologica Polonica* 53: 323–339.

Landau, B.M., Beu, A. & Marquet, R. 2004. The early Pliocene Gastropoda (Mollusca) of Estepona, southern Spain 5. Tonnoidea, Ficoidea. *Palaeontos* 5: 35-102.

Landau, B., Harzhauser, M. & Beu, A.G. 2009. A revision of the Tonnoidea (Caenogastropoda, Gastropoda) from the Miocene Paratethys and their palaeobiogeographic implications. *Jahrbuch der Geologischen Bundesanstalt* 149: 61–109.

Warén, A. & Bouchet, P. 1990. Laubierinidae and Pisanianurinae (Ranellidae), two new deep-sea taxa of the Tonnoidea (Gastropoda: Prosobrachia). *The Veliger* 33: 56-102.

Zuschin, M., Harzhauser, M. & Mandic, O. 2004. Taphonomy and palaeoecology of the lower Badenian (middle Miocene) molluscan assemblages at Grund (Lower Austria). *Geologica Carpathica* 55: 117–128.

Zuschin, M., Harzhauser, M. & Mandic, O. 2005. Influence of size-sorting on diversity estimates from tempestitic shell beds in the middle Miocene of Austria. *Palaios* 20: 142–158.

Zuschin, M., Harzhauser, M. & Mandic, O. 2011. Disentangling palaeodiversity signals from a biased sedimentary record: An example from the early to middle Miocene of the Central Paratethys. *In*: McGowan, A.J. & Smith, A.B. (eds). Comparing the geological and fossil records: Implications for biodiversity studies. *Geological Society, London, Special Publications* 358: 123–139.