

First Record of the Genus *Unionites* Wissmann (Bivalvia) in the Boreal Permian of Northeast Russia

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Abstract—Representatives of the bivalve genus *Unionites* Wissmann are found in the Upper Permian deposits of Northeast Russia, together with the typical high-Boreal *Inoceramus*-like bivalves *Intomodesma* sp. Previously, *Unionites* had been considered exclusively Triassic–Early Jurassic and were only recently found in the Upper Permian of Italy. The finding of representatives of the genus *Unionites* in the Boreal Upper Permian indicate increased connections of high-Boreal basins and Tethys Superrealm towards the end of the Permian, which began as early as the Middle and Late Wuchiapingian. A new species *U. kobyumensis* Biakov is described.

Keywords: Bivalvia, *Unionites*, Upper Permian, Northeast Russia

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INTRODUCTION

Bivalvia of the genus *Unionites*, marine representatives of the family Trigonoidae Modell, were for a long time considered exclusively Triassic (Nevesskaya et al., 2013). They often occur in the Triassic including Boreal (Spath, 1935; Dagus and Korchinskaya, 1987; Foster et al., 2017) and Tethyan (Kiparisova and Kurbatov, 1952; Ciriacks, 1963; Hofmann et al., 2013, 2015; Chu et al., 2016; Feng et al., 2019) basins, as well as the Panthalassa Ocean (Hofmann et al., 2014). Only recently, representatives of *Unionites* were found in the upper part of the Permian section (the upper part of the Changhsingian Stage) of Italy (Farabegoli et al., 2007; Posenato, 2009).

In Russia, the *Unionites* were also known exclusively from Triassic rocks of the northeastern Russia (Dagys et al., 1996) and Primorye (Kiparisova, 1938). In 2017, during the study of the boundary Permian–Triassic rocks of the South Verkhoyansk region (section along the Pravyi Suol Creek, a right tributary of the Setorym River, basin of the Vostochnaya Khandyga River, Fig. 1), we found a representative of this genus for the first time, *Unionites* cf. *canalensis* (Catullo) in the lower part of the *Otoceras* Beds (*Otoceras concavum* Zone), which were previously assigned to the Lower Triassic (Dagys et al., 1996) and are currently considered the uppermost part of the Chang-

hsingian Stage of the Upper Permian (Biakov et al., 2018).

Recently, however, during the study of the Lower Induan bivalves of Spitsbergen, Foster et al. (2017) expressed an opinion that *U. canalensis* can be assigned to a Miocene–Recent nuculanoid bivalve genus *Austrotindaria*. This suggestion is made taking into account the absence of data on the shell interior of type specimens of *Unionites canalensis*, and is based on similarity of these forms, according to Foster (2017), with *Austrotindaria*. In particular, according to Foster (2017, p. 861), this species is characterized by the central (median) position of its orthogyrate umbo.

At the same time, a simple comparison of typical *Unionites canalensis* with representatives of the genus *Austrotindaria*, including those described by Foster et al. (2017), in our opinion, cast doubts on the assignment of this species to *Austrotindaria*. Firstly, many previously described representatives of *Unionites canalensis* are characterized by a prosogyrate umbo slightly shifted to the anterior margin rather than the central orthogyrate (e.g., Ciriacks, 1963; Kumagae and Nakazawa, 2009; Song et al., 2019) and secondly it is massive rather than small (as typical of *Austrotindaria*). Thus, we conditionally retain this species within the genus *Unionites* because of lack of data on its internal morphology.