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Адрес редакции:
ул. Войкова, 21, 225404 г. Барановичи.
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E-mail: vestnik@barsu.by .

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Yu. U. Zaika

Unitary Enterprise "Geoservice", 53 Janki Maura Str., 220036 Minsk,
the Republic of Belarus, cyrtophyllum@gmail.com

ON *THAMNASTERIA CONCINNA* (GOLDFUSS) (SCLERACTINIA: THAMNASTERIIDAE) IN PLEISTOCENE ERRATICS OF BELARUS

For the first time, erratic Upper Jurassic Scleractinian corals are reported herein from Pleistocene outcrops of Belarus. The studied material belongs to a widespread species, *Thamnasteria concinna* (Goldfuss). These findings are of interest primarily because Jurassic erratic fossils are extremely rare in this region. The main distribution areas of *Thamnasteria concinna* (Goldfuss) in bedrock as well as erratics are located to the west of the places of its discovery in Belarus. Less often this species was reported further south. Previously the presence of *Thamnasteria concinna* (Goldfuss) was also mentioned in the Upper Jurassic biohermal deposits in the extreme southeast of Belarus. However, these deposits are overlain by younger sediments at a considerable depth and are therefore not regarded the most probable source of the material described here. If we consider the area of distribution of *Thamnasteria concinna* (Goldfuss) as erratics, then the localities closest to the Belarusian ones are confined to the north-west of Poland. As far as it can be judged from some previously published data, certain features of preservation of erratic specimens collected in Belarus resemble those from Poland, where, as it is assumed here, they may come from. Thus, their occurrence in Belarus is not readily explained by sublongitudinal glacial transport from the north and northwest, which is usually accepted for erratics. A probable explanation for this may be sublatitudinal transport by floating ice.

Key words: erratic; corals; *Thamnasteria concinna*; Upper Jurassic; Pleistocene.

Fig. 3. Ref.: 10 titles.

Ю. У. Заїка

Унітарнае прадпрыемства "Геасервіс", вул. Янкі Маўра, 53, 220036 Мінск,
Рэспубліка Беларусь, cyrtophyllum@gmail.com

АБ *THAMNASTERIA CONCINNA* (GOLDFUSS) (SCLERACTINIA: THAMNASTERIIDAE) У ПЛЕЙСТАЦЭНАВЫХ ВАЛУННА-ГАЛЬКАВЫХ АДКЛАДАХ БЕЛАРУСІ

Упершыню паведамляецца аб знаходках пераадкладзеных верхнеюрскіх каралаў у плейстацэнавых адкладах Беларусі. Даследаваны матэрыял прадстаўлены шырока распаўсюджаным відам склерактыній *Thamnasteria concinna* (Goldfuss). Знойдзеныя ўзоры цікавыя перш за ўсё па прычыне вялікай рэдкасці юрскіх пераадкладзеных выкапнёвых у гэтым рэгіёне. Асноўная вобласць пашырэння *Thamnasteria concinna* (Goldfuss) як у карэнных утварэннях, так і ў пераадкладзеным выглядзе прымеркавана да тэрыторый на захадзе ад Беларусі, у меншай ступені — на поўдні. Раней прысутнасць *Thamnasteria concinna* (Goldfuss) указвалася таксама для верхнеюрскіх біягермавых адкладаў на крайнім паўднёвым усходзе Беларусі. Аднак гэтыя ўтварэнні знаходзяцца дастаткова глыбока і перакрываюцца маладзейшымі асадкамі, па прычыне чаго не разглядаюцца як вельмі верагодная крыніца апісанага матэрыялу. Калі ж звярнуць увагу на раёны пашырэння рэшткаў *Thamnasteria concinna* (Goldfuss) не ў карэнных адкладах, а ў пераадкладзеным стане, іх найбліжэйшыя месцазнаходжанні будуць прымеркаваны да паўночна-заходняй Польшчы. Параўнанне беларускіх экзэмпляраў з раней апублікаваным апісаннем польскага матэрыялу па некаторых асаблівасцях захаванасці сведчыць аб іх падабенстве. Выказана меркаванне, што крыніцай беларускіх знаходак можа быць менавіта гэтая вобласць Польшчы. У такім выпадку яны паходзяць не з поўначы ці паўночнага захаду, як звычайна дапускаецца для валуноў і галек

паводле гіпотэзы ледавіковага пераносу. Магчымае тлумачэнне можа палягаць у субшыротным перамяшчэнні знаходак з паўночнага захаду на паўднёвы ўсход з удзелам плавучых льдоў.

Ключавыя словы: пераадкладзеныя рэшткі; каралы; *Thamnasteria concinna*; верхняя юра; плейстацэн.
Мал. 3. Бібліягр.: 10 назваў.

Introduction. According to the preliminary data, erratic pebbles of Jurassic sedimentary rocks in Pleistocene sediments are occasionally found in the west of Belarus. However, the systematic composition of the fossils that they contain, as well as their geological age, has not yet been studied. As for the central regions of Belarus, Jurassic erratic fossils are extremely rare here. Therefore, two Upper Jurassic Scleractinian coral specimens from the outskirts of Minsk are of interest in understanding the possible ways of transportation of erratic material in the Pleistocene Epoch.

Material and methods. A specimen of an aragonitic Scleractinian coral has been found by the author in a sand and gravel pit of Ledniki-1, which is 7 km to the west-northwest of the town of Fanipal in Minsk region (figure 1). The locality is confined to the upper Middle Pleistocene Sozh Formation and belongs to the southwestern margin of the Minsk Upland. The specimen is a rounded fragment of a lamellar colony 5.0 by 3.5 cm wide and 1.7 cm thick, penetrated by borings of 3.0 mm in diameter. Indications of the source rock are scarce: the borings as well as some interspaces within the colony are filled with a light grey and grey-brown material resembling argillaceous siltstone.

Another specimen has been collected by Dr. Dmitry Stepanenko (Belarusian State Technical University) from a road embankment near the city of Lagoysk, which is 40 km to the north-north-east of Minsk (figure 1) and is likely to have come from any of a number of neighboring sand pits that expose the upper Middle Pleistocene Sozh Formation. This area is confined closer to the northern part of the Minsk Upland. The collected specimen is a fragment of a lamellar colony 2.5 by 3.5 cm wide and 1.0 cm thick, with almost no traces of the source rock.



Figure 1. — Locality of material: 1 — Ledniki-1 sand and gravel pit; 2 — unknown locality in Lagoysk district. Dotted lines mark approximate limits of buried Oxfordian marine deposits (J₃₀) in the west and in the east of Belarus [2]

Малюнак 1. — Месцазнаходжанні матэрыялу: 1 — пясчана-жвіровы кар’ер Леднікі-1; 2 — прыблізнае месца знаходкі ў Лагойскім раёне. Пункцірам пазначаны межы пагружаных марскіх адкладаў оксфардскага яруса (J₃₀) на захадзе і ўсходзе Беларусі [2]

Research results and discussion. In accordance with identifications by Dr. Jarosław Stolar-ski (Polish Academy of Sciences) and Dr. Bogusław Kołodziej (Jagiellonian University), the mate-rial collected by the author belongs to *Thamnasteria concinna* (Goldfuss) (figure 2).



Figure 2. — *Thamnasteria concinna* (Goldfuss): polished cross section of part of the colony (1) and undamaged calicular surfaces (2, 3). Ledniki-1 sand and gravel pit near the town of Fanipal, Minsk Region, Belarus. Scale bars: 5 mm (1) and 3 mm (2, 3).

Малюнак 2. — *Thamnasteria concinna* (Goldfuss): паліраванае папярочнае сячэнне ўчастка калоніі (1) і ўчасткі з непашкоджанымі паверхнямі прымацавання паліпаў (2, 3). Пясчана-жвіровы кар’ер Леднікі-1 каля г. Фаніпалі, Мінская вобласць, Беларусь. Маштабныя палоскі: 5 мм (1) і 3 мм (2, 3).

The specimen collected by Dmitry Stepanenko has larger corallites (up to approx. 5 mm) and was identified as *Thamnasteria concinna* (Goldfuss) with some doubt.

Th. concinna (Goldfuss) is widespread in western and southern Europe from the Oxfordian to the Tithonian, with the maximal geographic distribution in the Middle and Upper Oxfordian [1].

The following possible sources for the Belarusian specimens of *Th. concinna* (Goldfuss) are discussed below: 1) local Upper Jurassic bedrock, 2) Upper Jurassic outcrops of neighboring eastern European regions, and 3) erratics delivered from the South Baltic region.

1. *Local Upper Jurassic bedrock.* There are no known places in Belarus where Upper Jurassic strata are exposed. Subsurface biohermal limestones occur in the Lower Oxfordian in the southeast and probably also in the Upper Oxfordian in the extreme west of Belarus, where they are overlain by younger Jurassic, Cretaceous and Cenozoic strata [2]. Based on the results of drilling in the Prypiat Trough, *Th. concinna* (Goldfuss) was previously reported in the lower Oxfordian in the southeast of Belarus [3]. However, since the Oxfordian limestones are submerged to a considerable depth under younger sediments, they cannot be considered the very likely source of the material described here.

2. *Upper Jurassic exposures in neighboring regions.* Oxfordian exposures in western Lithuania are represented mostly by black clays, silts and marls without fossil coral record [4]; Dr. Jens Koppka (Naturkundemuseum Gerolstein, Germany), personal communication]. Eastwards in the Moscow Syncline and the Voronezh Anticline there are also no published indications of *Th. concinna* (Goldfuss) in the Oxfordian-Tithonian interval [5].

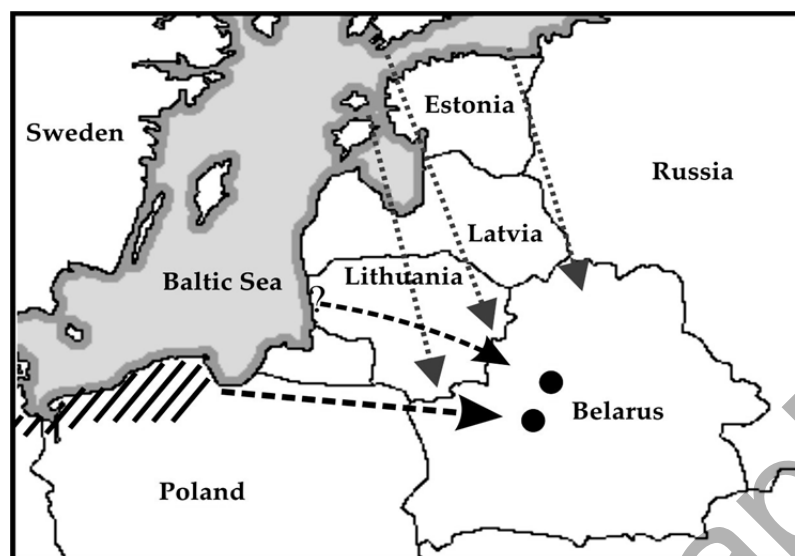
3. *Erratic rocks of South Baltics.* Scleractinian coral "*Thamnasteria microconus* Quenstedt" was reported in Upper Oxfordian limestones in several boreholes in western Lithuania, close to the Baltic Sea coast (Pierkulė District). However, these limestones are not exposed and are subjacent to Lower Cretaceous strata [5].


The most interesting in this regard are the previously reported data on the occurrence of *Th. concinna* (Goldfuss) in northern Poland, where numerous aragonitic specimens were discovered in Pleistocene gravels [6; 7]. It is significant to note that borings filled with grey-brown silt- and sandstone, mentioned herein for the Belarusian material, are especially characteristic for *Th. concinna* (Goldfuss) erratic fossils from Poland and neighboring part of northern Germany.

Thus, the South Baltic region and northern Poland in particular may probably be the nearest area of occurrence of the same kind of aragonitic *Th. concinna* (Goldfuss) erratics and could be presumed to be the most likely source for the specimens discovered in Belarus.

Assuming that this alternative is correct, the route of transport should be directed sublatitudinally from the west-northwest (figure 3). This contradicts the generally accepted hypothesis of longitudinal glacial transport from the north-northwest or northwest into the territory of Belarus [8] and may suggest some other way of delivering the *Th. concinna* (Goldfuss) material described herein. In the author's opinion, transportation by floating ice could be tentatively considered among the probable explanations. This fits a previously suggested idea of widespread occurrence of ice rafting of pebbles and boulders in Europe during the Pleistocene Epoch [9]. Examples of probable redeposition of erratic material by floating ice have already been reported by the author recently [10].

Another purely hypothetical alternative involves the transportation of erratics by fluvial ice via an ancient river system connecting the South Baltic area and the present-day Minsk region in the Middle Pleistocene or earlier. Other ways are also not excluded, but their probability seems very insignificant.



- - - - - → — the generally adopted conception of glacial movement /
 агульнапрынятая канцэпцыя ледавіковага пераносу;
 → — probable routes of transportation by floating ice /
 магчымыя шляхі пераносу плывучым ільдом;
 — probable source area / верагодны раён
 паходжання знаходак

**Figure 3. — Possible routes of delivering
Thamnasteria concinna (Goldfuss) material**

**Малюнак 3. — Магчымыя шляхі перамяшчэння
 знойдзеных узраў *Thamnasteria concinna* (Goldfuss)**

Conclusion. Two specimens of *Thamnasteria concinna* (Goldfuss) reported herein are the only undoubted Jurassic (Oxfordian-Titonian) erratics known in the central part of Belarus at the present time. Assuming that the source area of these specimens is in the South Baltic region, any possible route of their transport towards current locations should be directed sublatitudinally from the west or west-northwest. This does not correspond to the widely accepted idea that directions of glacial transport were sublongitudinal, coming from the north and north-northwest. An even less likely scenario in which the source area is situated within western Lithuania doesn't match entirely with the existing scheme of routes of the supposed late Middle Pleistocene Sozh glaciation which suggests glacial transport directed via the Gulf of Riga, central Latvia and central and eastern parts of Lithuania. Thus another way of delivery of the erratic material should be considered. Among possible means of transportation, floating ice may be proposed as a probable way to deliver *Thamnasteria concinna* erratics from the South Baltic region. Further study of sedimentary erratics and their possible source areas is necessary to shed light on this issue.

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У адрозненне ад палеазойскіх (пераважна ардовіцкіх, сілурыйскіх і дэвонскіх), а таксама крэйдавых парод і выкапнёвых рэшткаў, якія ў мностве сустракаюцца ў плейстацэнавых жвіровых адкладах, пераадкладзеныя знаходкі юрскага ўзросту на тэрыторыі Беларусі адносяцца да вельмі рэдкіх. Паводле папярэдніх звестак, яны нячаста трапляюцца ў заходніх раёнах, а ў цэнтральнай Беларусі вядомы толькі як адзінкавыя ўзоры. Да іх належаць два экзэмпляры верхнеюрскіх каралаў-склерактыній *Thamnasteria concinna* (Goldfuss), адшуканыя паблізу г. Лагойска і г. Фаніпаля ў Мінскай вобласці. Геалагічныя ўмовы амаль выключаюць як лакальнае паходжанне матэрыялу, так і яго занясенне з поўначы. Нягледзячы на прысутнасць гэтых каралаў на крайнім паўднёвым усходзе Беларусі, на поўдні Прыпяцкага прагіну, у карэнных адкладах оксфардскага яруса верхняй юры, іх наўрад ці трэба разглядаць як крыніцу апісанага вышэй пераадкладзенага матэрыялу. У Прыпяцкім прагіне карэныя верхнеюрскія (оксфардскія) адклады ў Беларусі залягаюць дастаткова глыбока і перакрываюцца больш малымі асадкавымі ўтварэннямі юрскага, крэйдавага і кайназойскага ўзростаў. Калі лічыць верагоднай крыніцай не карэныя, а жвірова-галькавыя адклады, можна зрабіць больш упэўненыя высновы пра накірунак паходжання беларускіх знаходак. З улікам некаторых асаблівасцяў захаванасці найбольш верагодна перамяшчэнне гэтых узораў з паўночна-заходняй Польшчы, дзе падобны матэрыял у вялікай колькасці знаходзяць у пясчана-жвіровых кар'ерах. Выказваецца меркаванне, што перанос галек ажыццяўляўся пры ўдзеле плавучага лёду ў субшыротным напрамку — з паўночнага захаду на ўсход. Падобны спосаб пераносу валунна-галькавага матэрыялу неаднаразова адзначаўся як магчымы ў розных літаратурных крыніцах.