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A new species of the beetle genus *Holcoptera* (Coleoptera: Coptoclavidae) from the Upper Triassic of east Ukraine

Новый вид жука рода *Holcoptera* (Coleoptera: Coptoclavidae) из верхнего триаса восточной Украины

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КЛЮЧЕВЫЕ СЛОВА: ископаемые жуки, новый вид, триас, Украина.

ABSTRACT. A new species, *Holcoptera rasnitsyni* **sp.n.** (Coleoptera: Coptoclavidae), is described based on four specimens from the Upper Triassic (Upper Carnian–Lower Norian) of east Ukraine. The attribution of these fossils to Coptoclavidae is confirmed by analysis of hind wing venation. The generic name *Stargelytron* Ponomarenko, 2015 is synonymized under *Holcoptera* Handlirsch, 1907, **syn.n.**

РЕЗЮМЕ. На основании четырёх экземпляров из верхнего триаса (верхний карний–нижний норий) восточной Украины описывается новый вид жука, *Holcoptera rasnitsyni* **sp.n.** (Coleoptera: Coptoclavidae). Принадлежность этих ископаемых к коптоклавидам подтверждено анализом жилкования задних крыльев. Родовое название *Stargelytron* Ponomarenko, 2015 синонимизировано с *Holcoptera* Handlirsch, 1907, **syn.n.**

Fossil beetles of the genus *Holcoptera* have been recorded from a variety of Mesozoic deposits. The peculiar coloration of their elytra, with alternating light and dark longitudinal stripes, makes them easy to pick out from unsorted specimens in fossil assemblages, which has resulted in hundreds of *Holcoptera* specimens accumulated in museum collections. Shortly before a revision of *Holcoptera* was published [Kelly et al., 2017], similar forms had been described from the Triassic of Germany as a separate new genus *Stargelytron* Ponomarenko, 2015 [Ponomarenko et al., 2015], which is here regarded as a junior subjective synonym of *Holcoptera* Handlirsch, 1907, **syn.n.**

The time range of *Holcoptera* is rather narrow. These fossil beetles have been found in sediments of all ages between the Middle Triassic (beginning from the Anisian) and the Lower Jurassic (Sinemurian). Elytra with longitudinal stripes have also been recorded from the Lower–Middle Anisian of eastern France; although very similar generally to *Holcoptera*, these can have twice as many stripes. These fossils have been described as a new species [Papier et al., 2005, species 10], but its holotype has never been established, so the species remains unnamed.

The geographic range of *Holcoptera* is also highly interesting. They are known from the eastern part of North America, England, southern Germany and northern Italy, with the easternmost occurrence in east Ukraine (described herein). There are no records from northern Germany, Eastern Europe, Siberia, Middle Asia, China, Japan, South America, Australia, or southern Africa, although numerous localities containing beetle fossils are known from these territories.

The taphonomy and paleoecology of *Holcoptera* are also unusual. Remains of *Holcoptera* are very abundant at many localities, resulting in hundreds of museum specimens being kept in England and USA. These mostly include elytra or hind wings, which generally serve for species identification, whereas some prothoracic and abdominal structures are not frequent and generally remain unidentified. Another peculiarity is enigmatic: *Holcoptera* hind wings, isolated and sometimes even unfolded, are very frequent in many taphocoenoses. For instance, among the abundant beetle remains collected

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in some of the localities within the Middle Keuper deposits of Lower Franconia (South Germany), there are numerous hind wings (over a hundred in total) that belonged exclusively to *Holcoptera* [Fedorenko, 2014; Ponomarenko et al., 2015].

Material and methods

This publication is based on a collection of beetles from the Upper Triassic (upper Carnian–lower Norian, according to Dobruskina [1982]) deposits of the Garazhovka locality in east Ukraine (Seversky Donets River basin). Insect remains at Garazhovka were first discovered in the early 1970s by geologist and paleobotanist F.A. Stanislavsky, who sent them to the Paleontological Institute in Moscow (PIN) for study and deposition. The greater part of the material was obtained during subsequent expeditions undertaken by N.S. Kalugina in 1976–1977. She also brought a large amount of fossiliferous rock samples from the insect-bearing bed to PIN for further investigation, but unfortunately, this has never been completed. The available collection currently includes *ca*. 580 inventoried insect specimens, including *ca*. 290 beetles, among which the four specimens belong to *Holcoptera*, representing a new species described below.

All specimens including types are deposited at the Borissiak Paleontological Institute, Russian Academy of Sciences, Moscow (PIN).

The fossils were photographed using a Leica M165C stereomicroscope equipped with a Leica DFC425 digital camera. The description of hind wings and concluding remarks were written by the second author. For nomenclature of wing veins and other structures, see Fedorenko [2009].

Suborder Adephaga Schellenberg, 1806
Superfamily Dytiscoidea Leach, 1815
Family Coptoclavidae Ponomarenko, 1961
Subfamily Coptoclaviscinae Soriano, Ponomarenko et Delclòs, 2007

Holcoptera Handlirsch, 1907

Harpalus: Giebel, 1856: 63.
Holcoptera: Handlirsch, 1906–1908: 453.
Holcoëlytrum: Handlirsch, 1906–1908: 453.
Stargelytron: Ponomarenko in Ponomarenko, Prokin et Bashkuev, 2015: 1337, **syn.n**

COMPOSITION. About ten species (high variation of elytral patterns precludes a more exact estimation) from the Anisian–Sinemurian deposits of North America and Europe.

DIAGNOSIS. Body oblong and small. Head longer than pronotum. Metanotum more strongly sclerotised than other parts of body. Metaventrite transverse, metacoxa short, with small rounded femoral plates. Elytron subconvex, not wide, each with four dark longitudinal stripes. Wing short and wide, oblongum cell large and oval.

REMARKS. The genus is distinctive in having the body small and the elytra lacking grooves, each with four longitudinal dark stripes.

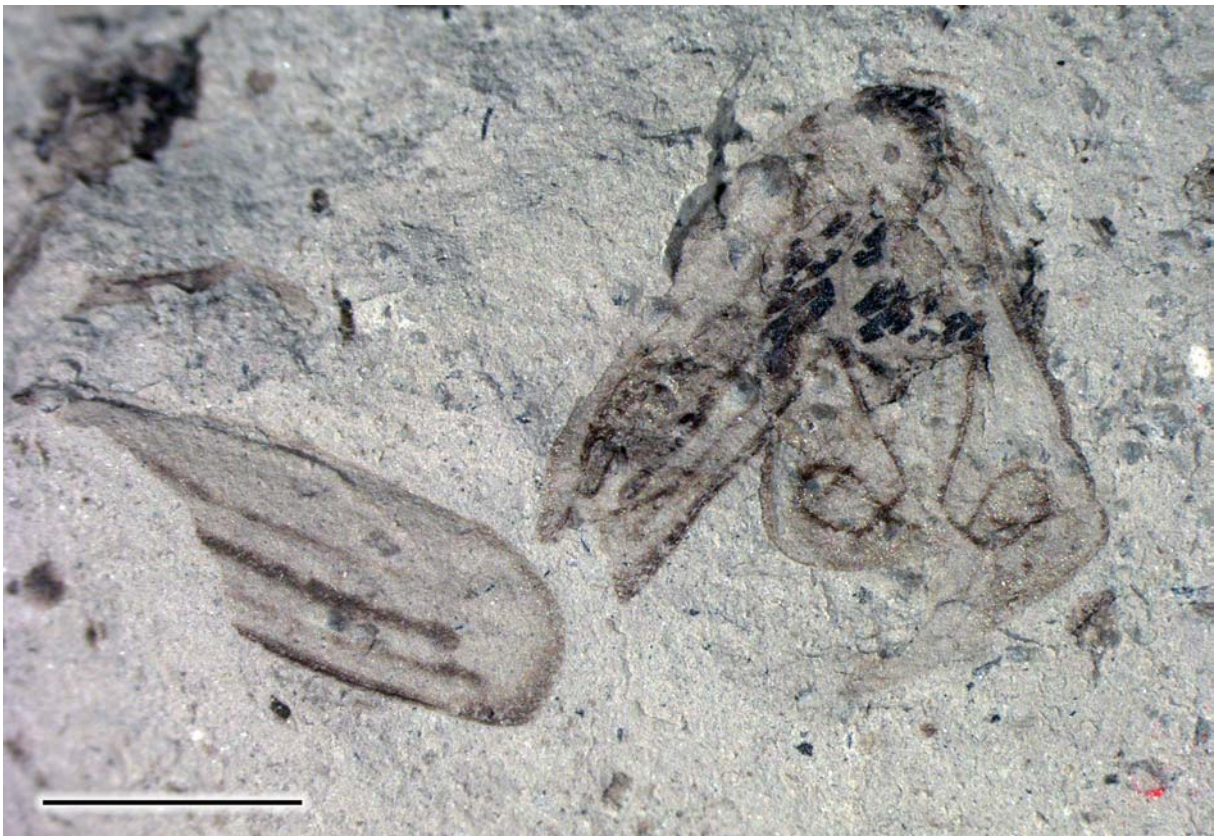


Fig. 1. *Holcoptera rasnitsyni*, **sp.n.**: holotype PIN 3320/204a. Scale bar: 2.0 mm.
Рис. 1. *Holcoptera rasnitsyni*, **sp.n.:** голотип ПИН 3320/204а. Масштаб: 2,0 мм.

Holcoptera rasnitsyni
Ponomarenko et Fedorenko, **sp.n.**
Figs 1–5.

MATERIAL. Holotype: PIN 3320/204a±, imprint of incomplete beetle with carbonized organic matter, head, thorax, elytra and hind wings. Paratypes: PIN 3320/113a± (Figs 3–4), 3320/205a, incomplete beetles; 3320/206a, isolated elytron (Fig. 5).

LOCALITY AND HORIZON. Ukraine, Kharkov Region, Izyum District, the right bank of the Bereka River (tributary of the Seversky Donets River), 3 km north of the Velikaya Kamyshevakha village, Dolgy Jar ravine, Garazhovka locality; Upper Triassic, upper Carnian–lower Norian, Protopivka Formation.

DIAGNOSIS. The new species has the palest elytra among its congeners, with the external pale field occupying about 2/5 of the elytron width.

DESCRIPTION. Body oval, about twice as long as wide. Elytra pale, each with four, dark, longitudinal stripes in inner three fifths; these stripes subequally distant *inter se*; sutural stripe curved slightly laterad along apical margin; outer three reaching neither base nor apex.

Head about as long as wide. Eyes small and round. Pronotum wider than long. Profemur 2.3 times as long as wide. Protibia slender, curved, slightly longer than femur. Metanotum heavily sclerotized, twice as wide as long. Elytra subconvex, with apices widely rounded, less so at sutural angle.

Wings, holotype PIN, No. 3320/204a (Figs. 1–2). Two almost completely folded hind wings visible, with apex of right wing somewhat unfolded; no distinct folds. Two longitudinal wing axes located in basal part of hind wing. Costal bar (*cb* = C+ScA+ScP+R) distinctly and densely cross-striated, consisting of strong vein C+ScA+ScP and barely detectable radial vein (R), which is narrow and desclerotized distally. Cubital bar (Cu–CuA) broken into fragments, entire in distal half only, distally extended into large, well-defined, slightly transverse oblongum cell. Cubital joint at respective pivot on CuA proximal in position, so that CuA is abruptly geniculate at considerable distance from oblongum cell in both folded wings. Median bar (M–MP) not visible except small distal section apparently retained in form of vein '*y*' in left hind wing.

Clavus and jugal lobe with few veins, broken and shifted basad, two vein fragments being only detectable: (1) CuP without apical section and (2) fragment of clavus "skeleton" with remains of first and second anal cells. Distinct line '*z*' on the imprint apparently represents no vein, but posterobasal wing margin or jugal fold.

Venation of central region of wing hardly detectable. Region around first radial cell and probably also inner bor-

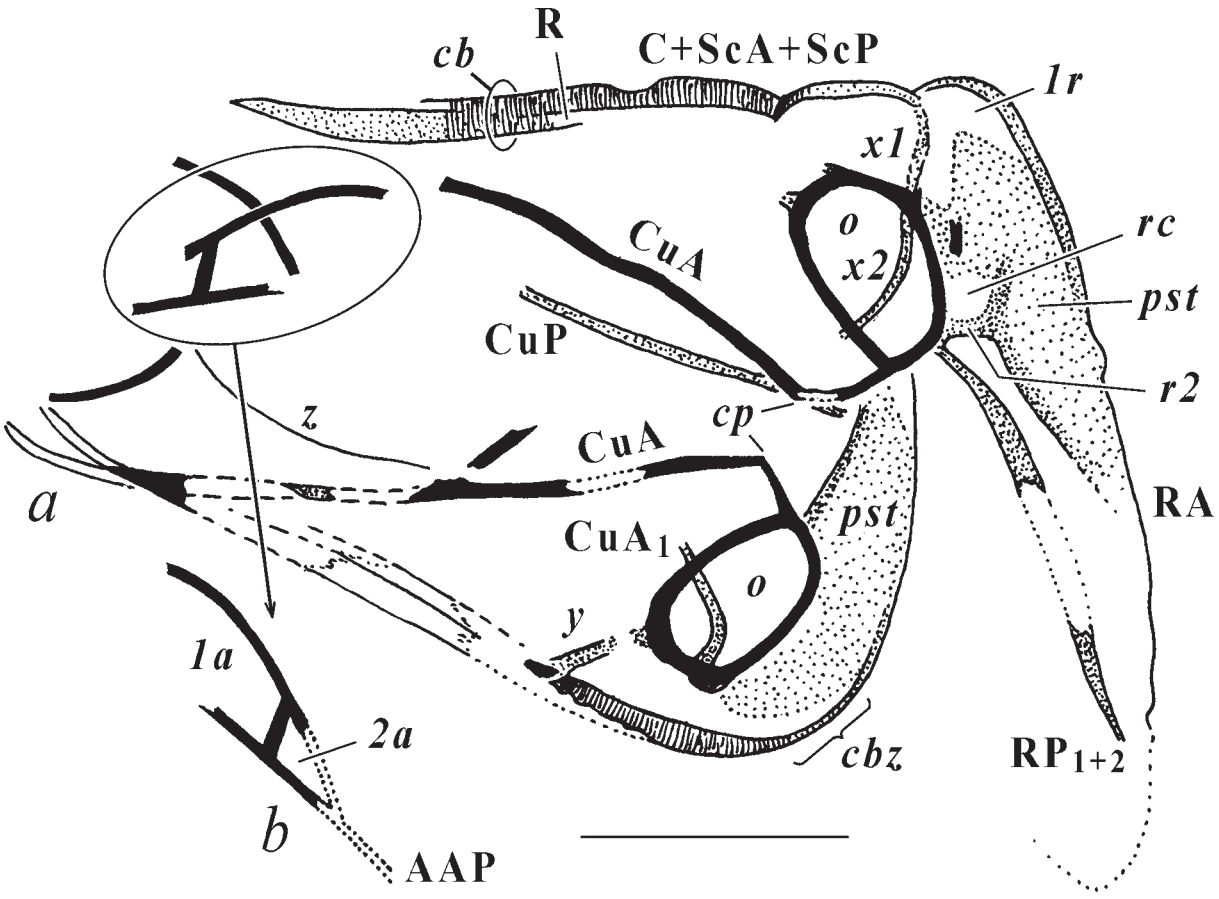
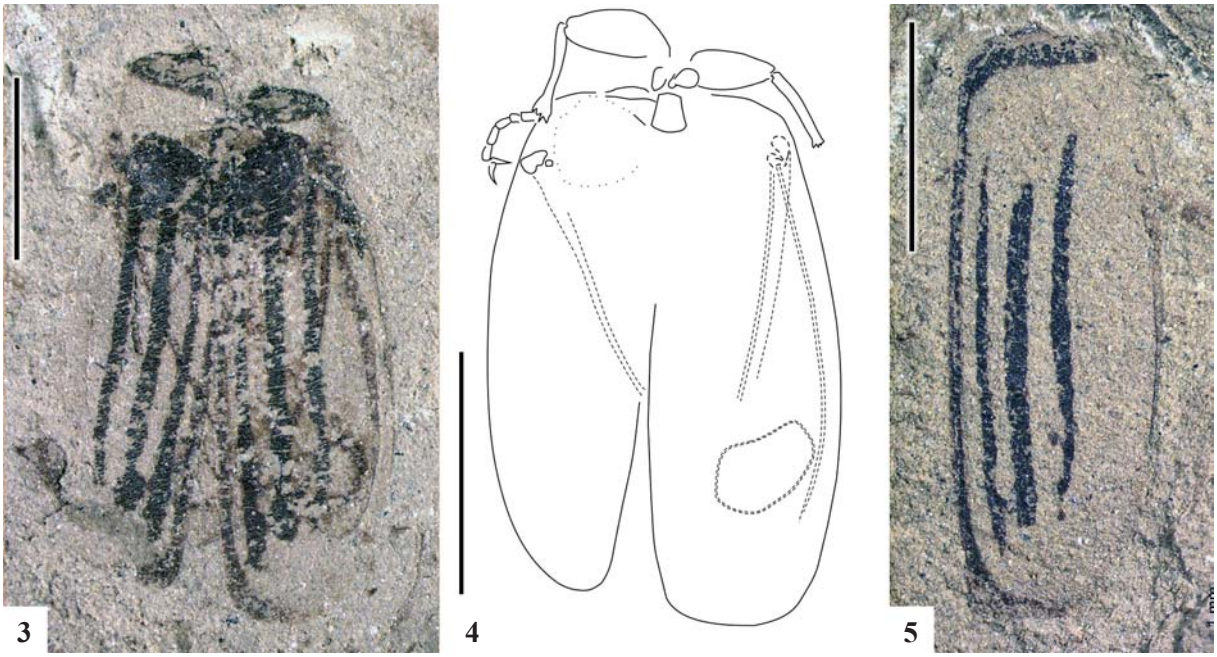


Fig. 2. *Holcoptera rasnitsyni*, **sp.n.**: holotype PIN 3320/204a, drawing of wings. Abbreviations: 1r — 1st radial cell; AAP — vein $AA_{3a''}+(AA_{3b}+(AA_4+AP_{1+2}))$; *cb* — costal bar; *cbz* — costal bending zone; *o* — oblongum cell; *pst* — pterostigma; *rc* — radial cell; *x1*, *x2*, *y* — veins; *z* — posterobasal margin of folded wing (jugal fold). Scale bar: 1.0 mm.

Рис. 2. *Holcoptera rasnitsyni*, **sp.n.**: голотип ПИН 3320/204a, прорисовка крыльев. Обозначения: 1r — 1-я радиальная ячейка; AAP — жилка $AA_{3a''}+(AA_{3b}+(AA_4+AP_{1+2}))$; *cb* — костальная ось; *cbz* — зона костального изгиба; *o* — продолговатая ячейка; *pst* — птеростигма; *rc* — радиальная ячейка; *x1*, *x2*, *y* — жилки; *z* — постеробазальный край сложенного крыла (югальная складка). Масштаб: 1,0 мм.



Figs 3–5. *Holcoptera rasnitsyni*, **sp.n.**: 3–4 — paratype PIN 3320/113a, photo and drawing (solid line — elytra, dashed line — wings, dotted line — metanotum); 5 — Paratype PIN 3320/206a. Scale bars: 2.0 mm.

Рис. 3–5. *Holcoptera rasnitsyni*, **sp.n.**: 3–4 — паратип PIN 3320/113a, фотография и прорисовка (сплошная линия — контуры надкрылий, пунктирная линия — крылья, точечная линия — заднеспинка); 5 — паратип PIN 3320/206a. Масштаб: 2,0 мм.

ders of carpal cell and first radial cell only traceable. This border is represented by vein *x1* identifiable as either base of RP or complex vein RP–MA. Vein *x2* looking like direct extension of vein *x1* caudad, suggesting that *x1–x2* may be simple vein. Yet, attribution of *x2* to left wing CuA_1 appears more appropriate.

Pterostigma and almost all veins are recognizable in anterior part of unfolded wing apex frontal to longitudinal axial fold. Radial cell apparently partly incorporated in complex pterostigma. Caudal and basal borders of this cell invisible, except for distal portion of radial cell limited by crossvein (r2).

MEASUREMENTS. Elytron length 5.0–6.0 mm, elytron width 1.7–2.5 mm.

REMARKS. The described hind wing is extremely similar to another unfolded wing of a coptoclavid beetle [Fedorenko, 2014]. It matches well the wing ground plan of Adephaga, notably Hydradephaga, virtually in all details. Only two features are worthy of note. Firstly, the large and elliptic oblongum cell is peculiar to nearly all Recent Hydradephaga. Secondly, the cubital joint is proximal, which has been observed in the most primitive representatives (Gyrinidae, Haliplidae) of Hydradephaga.

ETYMOLOGY. Named in honor of Alexandr Rasnitsyn.

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Competing interests. The authors declare no competing interests.

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