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TYPE SPECIMENS OF THE SPECIES OF THE GENUS *PAPILLICALYMENE* (ARTHROPODA, TRILOBITA) FROM UKRAINE DESCRIBED BY LEONID KONSTANTYNENKO

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Type Specimens of the Species of the Genus *Papillicalymene* (Arthropoda, Trilobita) from Ukraine Described by Leonid Konstantynenko. Dernov, V. — The article presents diagnoses and information on the type series of two trilobite species of the genus *Papillicalymene* Shirley, 1936: *P. dnistroviana* Konstantynenko, 2006 and *P. sokoliana* Konstantynenko, 2006 from the Ludlow (Upper Silurian) of Podillia in western Ukraine. This study confirms the validity of these trilobite species, as their original description did not include type specimen numbers, their storage place, and their diagnoses.

Key words: trilobites, species diagnosis, type series, Ludlow, western Ukraine.

Introduction

Trilobites were a typical component of Early Palaeozoic marine palaeoecosystems (Harrington et al., 1959; Fortey, 2014). They are important for the Cambrian–Silurian biostratigraphy and, due to their considerable systematic diversity and wide geographical distribution, they are also of great palaeobiogeographical significance. In Ukraine, trilobites are known from the entire Palaeozoic section, from the Cambrian to the Permian (e. g., Kargin, 1911; Chernyshev, 1922; Toumansky, 1930; Weber,

1933; Tumanskaya, 1935; Balashova, 1968, 1975; Konstantynenko, 2007, 2008, 2009; Mychko, 2012; Dernov, 2024), but much of the data on the systematic composition of trilobite assemblages needs to be revised.

In 2014, the collection of Ordovician–Carboniferous trilobites, belonging to the late Dr. Leonid Ivanovych Konstantynenko (1943–2014), was transferred to the Department of Geology, National Museum of Natural History of the National Academy of Sciences of Ukraine (NMNH) in Kyiv (Grytsenko, 2015). This collection includes about 8000 trilobite specimens from a number of regions of Ukraine (Volyn-Podillia Monocline, Lviv Palaeozoic Trough, Dnipro-Donets Depression, and Donets Basin) and a number of foreign regions (Baltic, Urals, Central Asia, etc.). The vast majority of the specimens in the collection are unpublished, but some part of material, including specimens belonging to new species, is described in a series of articles by Leonid I. Konstantynenko (2005 a, b, 2006, 2007, 2008, 2009). Unfortunately, the described specimens, including holotypes, are scattered in the collection. In addition, the numbers of type specimens of new species are not given by Konstantynenko in his works (only the field numbers of holotypes are available). For this reason, the revision of the Konstantynenko's collection in order to find the described fossils, primarily holotypes and paratypes, from the total number of specimens, was made.

This paper presents the first results of this study concerning the trilobite genus *Papillicalymene* Shirley, 1936 from the Upper Silurian of Podillia in western Ukraine. Species of *Papillicalymene* are widespread in the Ludlow-aged deposits of Europe (Shirley, 1936; Schrank, 1970; Tomczykowa, 1970; Whittington, 1971; Kutscher, 2008), and before Konstantynenko's studies, only the type species of this genus, *Papillicalymene papillata* (Lindström, 1885), was known in Podillia (Tomczykowa, 1970). Generally, the Silurian trilobites from Podillia are relatively well studied (Balashova, 1968, 1975; Konstantynenko, 2005 a, b, 2007, 2008, 2009 and references therein), as this region is a stratotypic area of a number of the Silurian stratigraphic units of the East European Platform (Konstantynenko & Tsegelnyuk, 2013). Therefore, the new data on the systematic composition of trilobite assemblages obtained by Dr. Konstantynenko are of important stratigraphic and palaeobiogeographical significance.

The aim of the paper is to record the type series of new species of the genus *Papillicalymene* Shirley, 1936 from the Silurian deposits of Ukraine. For two new species, *Papillicalymene dnistroviana* Konstantynenko, 2006 and *P. sokoliana* Konstantynenko, 2006, diagnoses are provided, which was not done by Konstantynenko in the original descriptions.

Material and Methods

The studied material is represented by 96 well and moderately-preserved specimens of complete dorsal exoskeletons, sometimes enrolled ones, as well as their fragments (specimens NMNH-G 8973/01 to NMNH-G 8973/96). Exoskeletons and their fragments sometimes bear malformations (e.g., Fig. 5, B) or post-mortem bioerosions (e. g., Fig. 7, D). The latter is likely to indicate the postmortem exposure of exoskeletons on the sea floor surface for a long time.

Scheme of dimensions of a cranidium of the genus *Papillicalymene* according to Whittington (1971: Text-fig. 2) is given in Fig. 1. Measurements of other parts of the exoskeleton are traditional (e.g., Chernysheva et al., 1982: figs 26, 27). The trilobite specimens were coated with ammonium chloride (NH_4Cl) before being photographed.

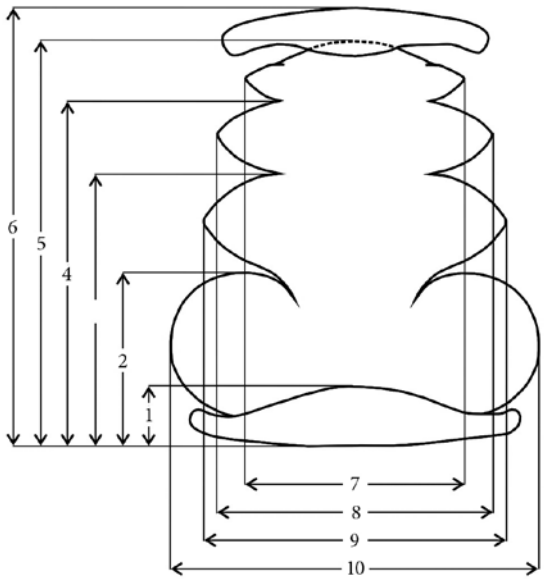

Fig. 1. Scheme of dimensions of a cranidium of the species in the genus *Papillicalymene* Shirley, 1936. Modified after Whittington (1971: Text-fig. 2).

Konstantynenko (2006) described seven species of the genus *Papillicalymene* Shirley, 1936, including two previously unknown species, *P. dnistroviana* Konstantynenko, 2006 (represented by four specimens) and *P. sokoliana* Konstantynenko, 2006 (represented by 31 specimens), as well as five taxa in open nomenclature(*P.* aff. *moa* Schrank, 1970 (13 specimens), *P.* aff. *papillata* (Lindström, 1885) (five specimens), *P.* sp. A (16 specimens), *P.* sp. B (five specimens), and *P.* sp. C (seven specimens)).

Konstantynenko (2006) notes that the studied collection of *Papillicalymene* consists of 81 specimens, including 38 pygidia, 35 cranidia, six complete or nearly complete dorsal exoskeletons, and two free cheeks. Of these fossils, only 24 are figured in the plates in Konstantynenko (2006), including ten cranidia, nine pygidia, and five almost complete dorsal exoskeletons. Of the 24 figured specimens, 20 were found in the Konstantynenko's collection (Table 1), including holotypes of two new species. Thus, 61 specimens of the genus *Papillicalymene* and four figured trilobites (Konstantynenko, 2006: pl. 1, figs 1, 8; pl. 2, fig. 7; pl. 3, fig. 7) were not found or recognised in the collection consisting of 8000 trilobite specimens. However, it should be noted that 76 specimens of trilobites in boxes labelled "*Papillicalymene*" have been found in the Konstantynenko's collection. Among them are probably some of the 61 described but unidentified specimens.

All the representatives of the genus *Papillicalymene* discovered in the Konstantynenko's collection are included in the collection NMNH-G 8973, which is deposited in the Department of Geology of the National Museum of Natural History, National Academy of Sciences of Ukraine (Kyiv).

Abbreviations used in the section "Systematic palaeontology" below are as follows: L — exoskeleton length, L_C — cephalon length, W_C — cephalon width, L_G — glabella length, W_G — maximum glabella width, L_T — thorax length, W_T — maximum thorax width, W_{TA} — maximum thorax axis width, L_P — pygidium length, W_P — pygidium width, W_{PA} — maximum width of the pygidium axis, L_{PA} — length of the pygidium axis.

Table 1. **Some specimens of *Papillicalymene* Shirley, 1936 described by Konstantynenko (2006)**

New number	Taxon	Locality number	Age	Figures	
				In Konstantynenko, 2006	In this paper
NMNH-G 8973/01	*P.* sp. A	42	Konivka Fm.	Pl. 1, fig. 4	Fig. 6, E, G
NMNH-G 8973/02	*P.* sp. A	42	Konivka Fm.	Pl. 1, fig. 3	Fig. 6, D
NMNH-G 8973/03	*P.* sp. A	42	Konivka Fm.	Pl. 1, fig. 2, a	Fig. 7, E
NMNH-G 8973/04	*P.* sp. B	42	Konivka Fm.	Pl. 1, fig. 6	Fig. 7, F, G
NMNH-G 8973/05	*P.* sp. B	91	Konivka Fm.	Pl. 1, fig. 5	Fig. 6, F
NMNH-G 8973/06	*P.* sp. C	21	Rykhta Fm.	Pl. 3, fig. 4	Fig. 6, M
NMNH-G 8973/07	*P.* sp. C	43	Rykhta Fm.	Pl. 3, figs 2, a, 2, b	Fig. 6, I
NMNH-G 8973/08	*P.* sp. C	20	Rykhta Fm.	Pl. 3, figs 3, a, 3, b	Fig. 6, N
NMNH-G 8973/09	*P.* sp. C	43	Rykhta Fm.	Pl. 3, fig. 6	Fig. 6, K
NMNH-G 8973/10	*P.* sp. C	20	Rykhta Fm.	Pl. 3, fig. 5	Fig. 6, A–C
NMNH-G 8973/11	*P.* aff. *moa* Schrank, 1970	21	Rykhta Fm.	Pl. 2, figs 6, a, 6, b	Fig. 6, J
NMNH-G 8973/12	*P.* aff. *moa* Schrank, 1970	150	Rykhta Fm.	Pl. 2, figs 5, a, 5, b	Fig. 6, H
NMNH-G 8973/13	*P.* aff. *papillata* (Lindström, 1885)	151-A	Konivka Fm.	Pl. 1, fig. 10	Fig. 6, L
NMNH-G 8973/14	*P.* aff. *papillata* (Lindström, 1885)	151	Konivka Fm.	Pl. 1, figs 7, a–c	Fig. 7, A–C
NMNH-G 8973/15	*P.* aff. *papillata* (Lindström, 1885)	151A	Konivka Fm.	Pl. 1, fig. 9	Fig. 7, D
NMNH-G 8973/16	*P. dnistroviana* Konstantynenko, 2006	21	Rykhta Fm.	Pl. 3, figs 1, a–d	Fig. 4
NMNH-G 8973/17	*P. sokoliana* Konstantynenko, 2006	9	Tsviklivtsi Fm.	Pl. 2, figs 1, a–d	Fig. 5, A–C
NMNH-G 8973/18	*P. sokoliana* Konstantynenko, 2006	42	Tsviklivtsi Fm.	Pl. 2, fig. 4	Fig. 5, G
NMNH-G 8973/19	*P. sokoliana* Konstantynenko, 2006	9	Tsviklivtsi Fm.	Pl. 2, fig. 3	Fig. 5, F
NMNH-G 8973/20	*P. sokoliana* Konstantynenko, 2006	42	Tsviklivtsi Fm.	Pl. 2, figs 2, a, 2, b	Fig. 5, D, E

Geological context

The trilobites examined come from the Ludlow (Upper Silurian) deposits exposed at nine outcrops in the Dniester River basin area in the Volyn-Podillia Monocline, which is situated in the southwestern part of the East European Platform, bordering the Ukrainian Shield in the northeast and the Precarpathian Trough in the west (Tsegelnyk et al., 1983; Konstantynenko & Tsegelnyk, 2013) (Fig. 2). Unfortunately, using the article by Konstantynenko (2006), it is possible to locate only the fossil sites of specimens figured in this article (i. e. 24 specimens out of approximately 81 specimens of *Papillicalymene* mentioned by Konstantynenko; see details above), including the holotypes of two species.

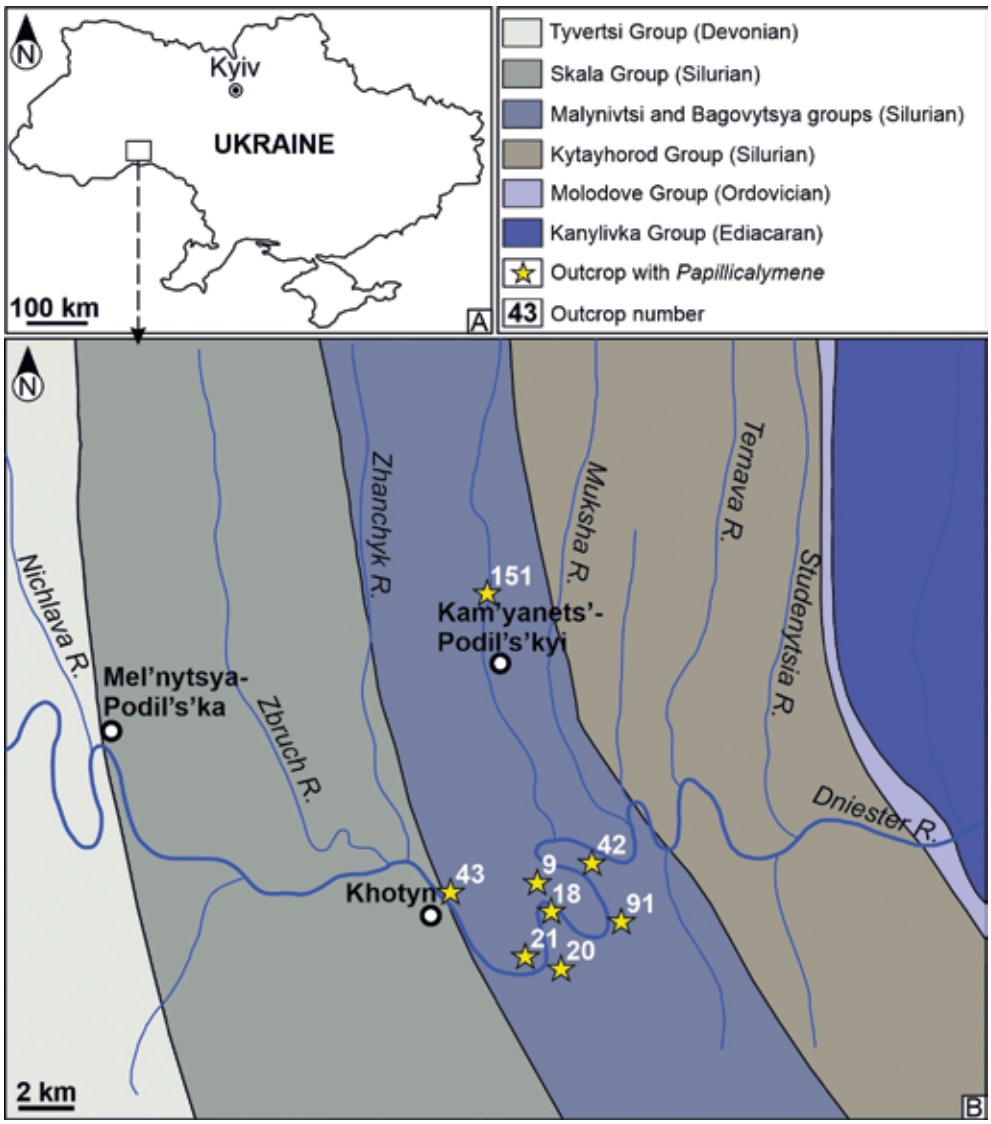

Fig. 2. Geographical location of the trilobite-bearing outcrops. Geological map of the Palaeozoic deposits (with removed cover of the Meso-Cenozoic rocks) in Fig. 2, B modified after Tsegelnyuk et al. (1983: Fig. 2). Abbreviation: *R.* — River

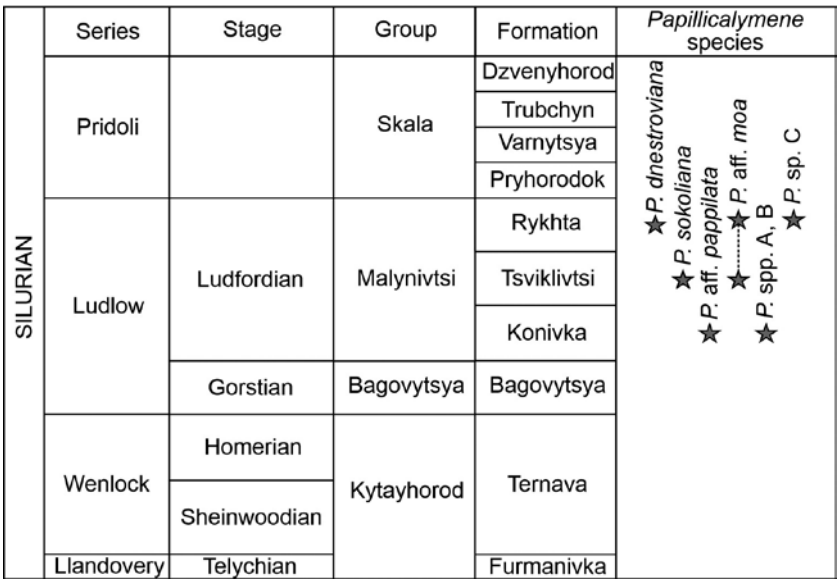

Fig. 3. Silurian stratigraphy of Podillia and stratigraphic distribution of the species of the genus *Papillicalymene*. Stratigraphic scheme modified after Konstantynenko & Tsegelnyuk (2013: Scheme 5.1)

The trilobites described by Konstantynenko (2006) come from the following outcrops (numbers of outcrops according to Tsegelnyuk et al. (1983); see Fig. 2, B): (1) Outcrop No. 9: Sokil Subformation, Tsviklivtsi Formation, Ludlow; (2) Outcrop No. 20: Hrynkivtsi Subformation, Rykhta Formation, Ludlow; (3) Outcrop No. 21: Hrynkivtsi Subformation, Rykhta Formation, Ludlow; (4) Outcrop No. 42: Holoskiv Subformation, Konivka Formation, Ludlow; (5) Outcrop No. 42: Sokil Subformation, Tsviklivtsi Formation, Ludlow; (6) Outcrop No. 43: Hrynkivtsi Subformation, Rykhta Formation, Ludlow; (7) Outcrop No. 150: Rykhta Formation, Ludlow; (8) Outcrop No. 151: Shutnivtsi Subformation, Konivka Formation, Ludlow; (9) Outcrop No. 151-A: Shutnivtsi Subformation, Konivka Formation, Ludlow.

Unfortunately, the geographical location of the outcrop No. 151-A is not known as it is not mentioned by Tsegelnyuk et al. (1983). It is likely that this outcrop was discovered by Dr. Konstantynenko and, judging by its number, is located near the outcrop No. 151.

The Upper Silurian deposits of Podillia are represented by the Malynivtsi Group (Konivka, Tsviklivtsi, and Rykhta formations) and Skala Group (Pryhorodok, Varnytsya, Trubchyn, and Dzvenyhorod formations) (Fig. 3). The trilobites described by Konstantynenko (2006) come from the Konivka, Tsviklivtsi, and Rykhta formations, i.e. from the entire section of the Malynivtsi Group.

The Konivka Formation is distributed within the western slope of the Ukrainian Shield and the eastern slope of the Lviv Palaeozoic Trough. It is a 25.0–37.0-m-thick succession of limestones with marlstone interbeds. Small bioherms measuring 1.0–2.0 m occur in the lower part of the formation.

The upper part of the formation is composed of dolomites and domerites with limestone interbeds. In Volyn (northwestern Ukraine), the Konivka Formation is laterally replaced by domerites belonging to the Semeryns'ke Formation and dolomites of the Lokachi Formation, and in the northwestern part of the eastern slope of the Lviv Palaeozoic Trough by bioclastic limestones of the Ditkivtsi Formation. Based on the lithological features, the Konivka Formation subdivided into the Holoskiv Subformation (marlstones, argillaceous and bioherm limestones) and the Shutnivtsi Subformation (bedded limestones) (Tsegelnyuk, 1974, 1980; Tsegelnyuk et al., 1983; Konstantynenko & Tsegelnyuk, 2013). The formation contains a rich normal marine biota including algae, corals, brachiopods, bivalves, tentaculitids, ostracods, and conodonts (Tsegelnyuk, 1974; Tsegelnyuk et al., 1983 and references therein).

The Tsviklivtsi Formation is ranged in the western slope of the Ukrainian Shield and the eastern slope of the Lviv Palaeozoic Trough. In the stratotype section near the village of Tsviklivtsi (Khmelnytskyi Oblast), it is a 43–49-m-thick sequence of argillaceous limestones and marlstones with thick-bedded limestone intercalations in the upper part. In the western part of the Lviv Palaeozoic Trough, it is composed of limestone and marlstone succession up to 56 m thick. To the east, the Tsviklivtsi Formation is laterally replaced by bioclastic limestones of the Ditkivtsi Formation and, within Volyn, by dolomites of the Lokachi Formation. Based on the lithological features, the formation subdivided into Sokil Subformation (argillaceous limestones and mudstones) and Bernove Subformation (bioclastic limestones) (Tsegelnyuk, 1974, 1980; Tsegelnyuk et al., 1983; Konstantynenko & Tsegelnyuk, 2013). A rich normal marine biota including calcareous algae, chitinozoans, corals, brachiopods, bivalves, and ostracods have been recorded from this formation (Tsegelnyuk, 1974; Tsegelnyuk et al., 1983 and references therein).

The Rykhta Formation is distributed within the Volyn-Podillia Monocline and the western part of the eastern slope of the Lviv Palaeozoic Trough, where it is represented by a 22–48-m-thick sequence of argillaceous limestones with marlstone interbeds and thin-bedded dolomites. The upper part of the formation in the Dniester River area is composed of a succession of domerites and dolomites up to 7 m thick. To the north of the stratotype section near the village of Rykhta (Khmelnytskyi Oblast), the formation is laterally replaced by dolomites belonging to the Toky Formation and by domerites of the Velytsi Formation. Based on the lithological features, the formation subdivided into the Hrynchuk Subformation (argilla-

Table 2. **Dimensions of the cranidium in the holotype of *Papillicalymene dnistroviana* Konstantynenko, 2006 (see Fig. 1 for the scheme of dimensions)**

Specimen	Measuresments, mm									
	1	2	3	4	5	6	7	8	9	10
NMNH-G 8973/16	1.9	4.2	6.0	7.4	10.5	13.2	6.6	7.0	8.0	9.2

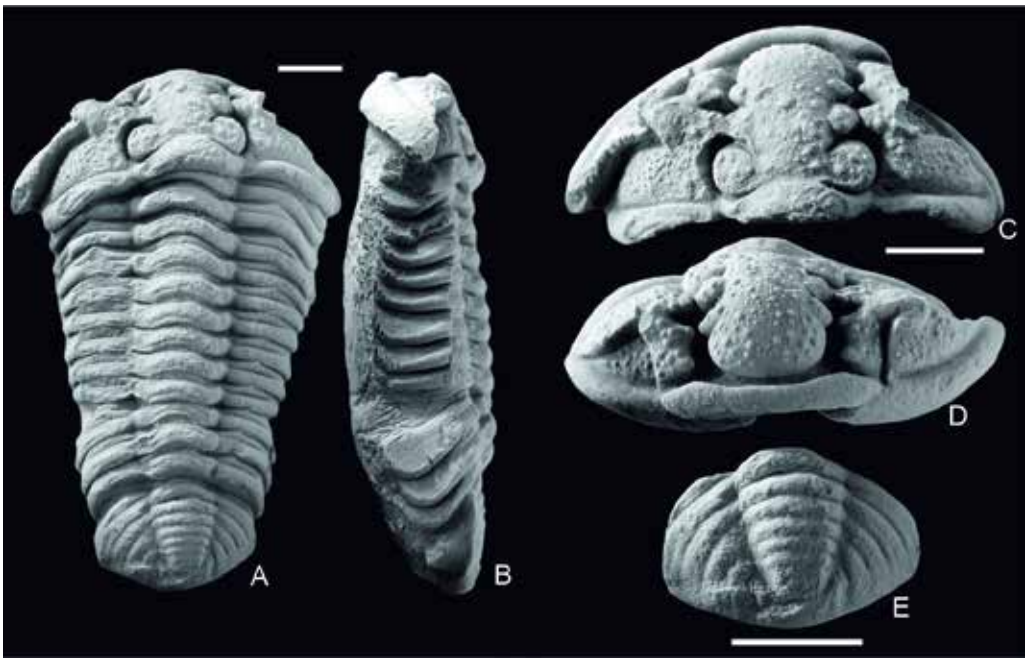

Fig. 4. The holotype of *Papillicalymene dnistroviana* Konstantynenko, 2006 (specimen NMNH-G 8973/16): A, B — nearly complete dorsal exoskeleton (A — dorsal view, B — lateral view), C, D — enlarged cephalon (C — dorsal view, D — anterior view), E — enlarged pygidium. Scale bars 5 mm

Table 3. **General dimensions of the holotype of *Papillicalymene dnistroviana* Konstantynenko, 2006**

Specimen	Measuresments, mm											
	L	L_C	W_C	L_G	W_G	L_T	W_T	W_{TA}	L_P	W_P	W_{PA}	L_{PA}
NMNH-G 8973/16	40.0	11.7	26.0	9.6	8.9	~23.0	21.2	7.5	8.7	12.6	5.0	7.0

ceous limestones and marlstones) and the Isakivtsi Subformation (thin-bedded dolomites) (Tsegelnyuk, 1974, 1980; Tsegelnyuk et al., 1983; Konstantynenko & Tsegelnyuk, 2013). The formation contains a rich normal marine biota including calcareous algae, chitinozoans, corals, stromatoporoids, brachiopods, bivalves, tentaculitids, and ostracods (Tsegelnyuk, 1974; Tsegelnyuk et al., 1983 and references therein).

Systematic palaeontology

The diagnoses of two new species of trilobites, *Papillicalymene dnistroviana* Konstantynenko, 2006 and *P. sokoliana* Konstantynenko, 2006, from the Upper Silurian of Podillia, are presented below. New permanent numbers are proposed for most of the specimens (20 out of 24) figured by Konstantynenko (2006: pls 1–3), including holotypes and paratypes.

Class Trilobita
Order Phacopida
Family Calymenidae
Genus *Papillicalymene* Shirley, 1936
Type species. *Calymene papillata* Lindström, 1885; by original designation.
Diagnosis. See Whittington (1971: p. 462).
Papillicalymene dnistroviana Konstantynenko, 2006 (Fig. 4; Tables 2, 3)

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Papillicalymene dnestroviana Konstantynenko, 2006: 18.
Papillicalymene dnistroviana Konstantynenko, 2006: 23, pl. 3, Fig. 1.

Holotype. Specimen NMNH-G 8973/16 (nearly complete dorsal exoskeleton) in the Department of Geology, National Museum of Natural History of the National Academy of Sciences of Ukraine, Kyiv. Figured by Konstantynenko (2006: pl. 3, Figs 1, a–d) and in Fig. 4 in this paper.

Other material. Only the holotype is known. Three paratypes mentioned by Konstantynenko (2006) are probably lost or have not been recognised, as they are not figured and have no inventory numbers.

Type stratigraphic horizon. Upper Silurian, Ludlow, Malynivtsi Group, Rykhta Formation, Hrynchuk Subformation (see Fig. 3).

Type locality. Ukraine, Khmelnytskyi Oblast, the left bank of the Dniester River near the village of Hrynchuk, the outcrop No. 21 in Tsegelnyuk et al. (1983).

Diagnosis. Species of *Papillicalymene* with semicircular in outline, wide cephalon and short, evenly tapered forward glabella that has three pairs of lateral glabellar lobes separated by wide and deep furrows. The first lobes rounded-convex, large; the second and third lobes papillate. Frontal lobe convex, steeply inclined downwards. Anterior edge of frontal lobe hangs over anterior border furrow. Anterior marginal furrow deep and flask-like. Occipital furrow narrow. Anterior margin short, low, keel-shaped in front of glabella. Anterior parts of fixigena inclined forward, their inner margins serrated, papillose, overhanging dorsal furrows, sometimes connected with glabellar lobes. Palpebral lobes small, smooth, slightly elevated above glabella. Librigena convex, with wide lateral border. Surface of cranidium bears large tubercles. Anterior margin and lateral borders densely covered with very small wrinkles. Thorax consists of 13 segments with wide axis and broad and flattened pleurae. Pygidium rounded-trapezoidal with broad axis consisting of six rings and five pairs of pleural ribs, last of which poorly developed.

Nomenclatural remarks. Konstantynenko (1993, 2006) presented two spellings of the species epithet, namely *dnistroviana* (in the main text of Konstantynenko, 2006) and *dnestroviana* in the English- and Ukrainian-language abstracts and captions of Pl. 3 in Konstantynenko, 2006 and in the text of the unpublished PhD thesis of Konstantynenko (1993). This misunderstanding is probably caused by different ways of transliteration of the name of the Dniester River (from Ukrainian and Russian, respectively). Using the right of the First Reviser, according to paragraph 32.2.1 of the International Code of Zoological Nomenclature (International…, 1999: p. 39), the author proposes to choose the species epithet '*dnistroviana*' as correct (etymology: from the Ukrainian-language spelling of the name of the Dniester River); the epithet '*dnestroviana*' is recognised as incorrect.

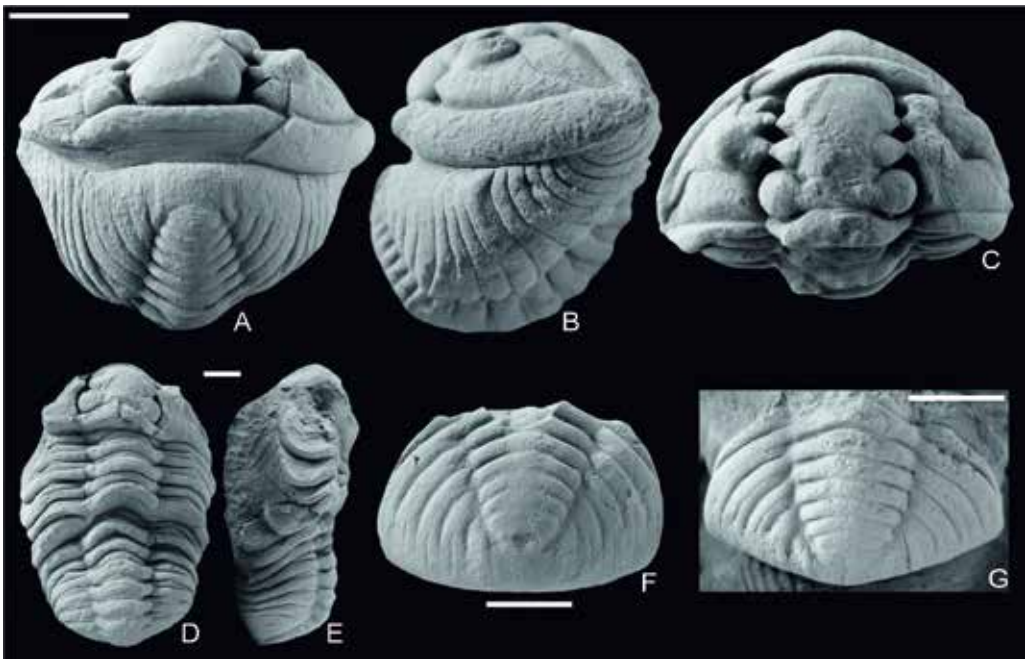

Fig. 5. The type series of *Papillicalymene sokoliana* Konstantynenko, 2006. A–C — holotype NMNH-G 8973/17 (A — antero-posterior view of the enrolled specimen, B — lateral view, C — cephalon). D, E — paratype NMNH-G 8973/20 (D — dorsal view, E — lateral view). F — paratype NMNH-G 8973/19 (dorsal view of the pygidium). G — paratype NMNH-G 8973/18 (dorsal view of the pygidium). Scale bars 5 mm

Comparative remarks. Specimen NMNH-G 8973/16 is represented by a nearly completely preserved dorsal exoskeleton, but the cephalon is diagenetically slightly pushed onto the thorax and almost completely overlaps two of its segments, which gives the impression in the images of this specimen (Fig. 4A) that the thorax consists of 11 segments, which is not true. Thus, the values of the exoskeleton length and thorax length in Table 3 are approximate.

Papillicalymene dnistroviana differs from *P. papillata* (Lindström, 1885) and other representatives of *Papillicalymene* from the Silurian of Podillia by a long, steeply overhanging frontal lobe of the glabella and fixed cheeks, coarse cephalon ornamentation, narrow pygidium with a wide axis (Konstantynenko, 2006). Indeed, in *P. papillata*, the lateral lobes of the glabella are probably somewhat more elongated than in *P. dnistroviana*. *P. dnistroviana* differs from *P. sinuata* Kutscher, 2008 primarily by the presence of tubercles on the cephalon. The 1–3 lateral lobes of the glabella in *P. sinuata* are very similar in size, while in *P. dnistroviana* they differ significantly in size. The first pair of the lateral lobes in *P. sinuata* is slightly elongated, while in *P. dnistroviana* it is almost rounded. In addition, the anterior margin of *P. sinuata* overhangs the glabella, covering its anterior part.

The morphological differences between *Papillicalymene dnistroviana* and *P. husseyi* Stumm & Kauffman, 1958, probably the oldest representative of this genus at the moment (Ordovician of Michigan, USA), are the presence of tubercles on the surface of the cephalon and the semicircular shape of the frontal lobe of the glabella with a rather con-

vex preglabellar furrow in *P. dnistroviana*, while in *P. husseyi* the preglabellar furrow is not significantly convex, and the frontal lobe of the glabella tapers to the base. Probably, in *P. husseyi*, compared to other representatives of the genus, including *P. dnistroviana*, buttresses opposite the lateral glabellar lobes are not well developed. However, this morphological feature may be due to the peculiarities of preservation of the holotype and the only known specimen of *P. husseyi*. A more detailed comparison of *P. dnistroviana* and *P. husseyi* is hampered by the poor preservation of the holotype of the latter species. It is worth noting that the aforementioned circumstances, namely the poor preservation of the only specimen of the type series of *P. husseyi* and the absence of one of the most characteristic morphological characters of the genus *Papillicalymene*, namely well-developed buttresses opposite the lateral glabellar lobes, makes me doubt that this species belongs to the genus *Papillicalymene*. In addition, all currently known representatives of the genus *Papillicalymene* are known from the Ludlow, while the holotype of *P. husseyi* was found in the Upper Ordovician deposits.

Distribution. Ludlow (Upper Silurian) of Podillia, western Ukraine.

Papillicalymene sokoliana Konstantynenko, 2006 (Fig. 5; Tables 4, 5)

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Papillicalymene sokoliana Konstantynenko, 2006: 20, pl. 2, Figs 1–4.

Holotype. Specimen NMNH-G 8973/17 (nearly complete enrolled specimen) in the Department of Geology, National Museum of Natural History of the National Acad-

Table 4. **Dimensions of the cranidium in the type specimens of *Papillicalymene sokoliana* Konstantynenko, 2006 (see Fig. 1 for the scheme of dimensions)**

Specimen	Measuresments, mm									
	1	2	3	4	5	6	7	8	9	10
NMNH-G 8973/17	2.9	5.0	6.8	9.0	12.0	12.0	6.8	8.0	8.5	9.8
NMNH-G 8973/20	2.2	4.4	6.0	8.8	10.4	11.9	7.3	8.2	8.6	10.4

Table 5. **General dimensions of the type specimens of Papillicalymene sokoliana Konstantynenko, 2006**

Specimen	Measuresments, mm											
	L	L_C	W_C	L_G	W_G	L_T	W_T	W_{TA}	L_P	W_P	W_{PA}	L_{PA}
NMNH-G 8973/17	*c.* 60.0	12.0	24.5	12.0	9.8	34.0	22.0	8.5	9.8	13.4	6.5	7.3
NMNH-G 8973/18	–	–	–	–	–	–	–	–	9.0	13.7	5.7	8.5
NMNH-G 8973/19	–	–	–	–	–	–	–	–	12.0	17.7	8.0	9.9
NMNH-G 8973/20	*c.* 50.5	11.9	*c.* 25.5*	10.4	10.4	*c.* 27.0	21.0	7.6	11.6	15.0	5.4	8.9

*Reconstructed.

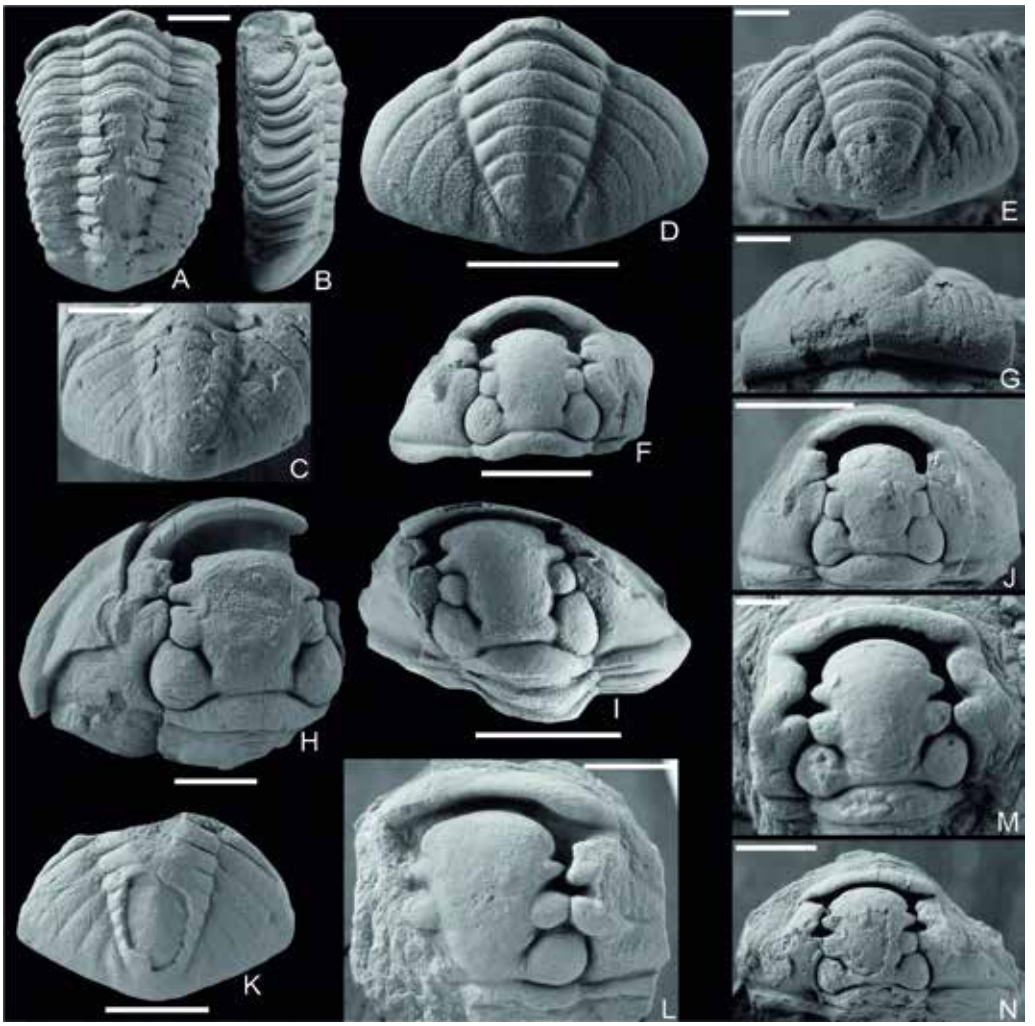

Fig. 6. Representatives of the genus *Papillicalymene* from the Silurian of Podillia. A–C, I, K, M, N — *Papillicalymene* sp. C (A–C — thorax and pygidium NMNH-G 8973/10 in dorsal (A) and lateral views (B), enlarged pygidium (C); I — cephalon NMNH-G 8973/07 in dorsal view; K — pygidium NMNH-G 8973/09 in dorsal view; M — cranidium NMNH-G 8973/06 in dorsal view; N — cranidiun NMNH-G 8973/08 in dorsal view). D, E, G — *Papillicalymene* sp. A (D — pygidium NMNH-G 8973/02 in dorsal view; E, G — pygidium NMNH-G 8973/01 in dorsal (E) and posterior views (G)). F — *Papillicalymene* sp. B (cranidium NMNH-G 8973/05 in dorsal view). H, J — *Papillicalymene* aff. *moa* Schrank, 1970 (H — cephalon NMNH-G 8973/12 in dorsal view; J — cephalon NMNH-G 8973/11 in dorsal view). L — *Papillicalymene* aff. *papillata* (Lindström, 1885) (cranidium NMNH-G 8973/13 in dorsal view). Scale bars 5 mm

emy of Sciences of Ukraine, Kyiv. Figured by Konstantynenko (2006: pl. 2, Figs 1a–d) and in Fig. 5, A–C in this paper.

Other material. Three paratypes (NMNH-G 8973/18 to NMNH-G 8973/20). Other 27 paratypes mentioned by Konstantynenko (2006) are probably lost or have not been recognised, as they are not figured and have no inventory numbers.

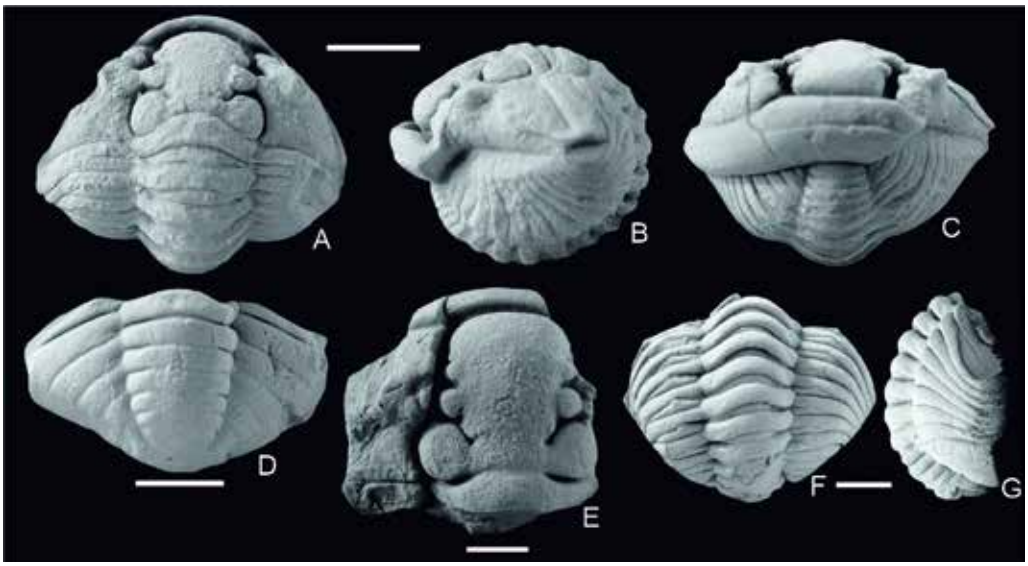

Fig. 7. Representatives of the genus *Papillicalymene* from the Silurian of Podillia. A–D — *Papillicalymene* aff. *papillata* (Lindström, 1885) (A–C — complete enrolled exoskeleton NMNH-G 8973/14 in dorsal (A), lateral (B), and antero-posterior views (C); D — pygidium NMNH-G 8973/15 in dorsal view). E — *Papillicalymene* sp. A (cranidium NMNH-G 8973/03 in dorsal view). F, G — *Papillicalymene* sp. B (thorax NMNH-G 8973/04 in dorsal (F) and lateral (G) views). Scale bars 5 mm

Type stratigraphic horizon. Upper Silurian, Ludlow, Malynivtsi Group, Tsviklivtsi Formation, Sokil Subformation.

Type locality. Ukraine, Khmelnytskyi Oblast, the left bank of the Dniester River near the village of Slobidka-Malynovets'ka, the outcrop No. 9 in Tsegelnyuk et al. (1983).

Diagnosis. Species of *Papillicalymene* with semicircular in outline, wide cephalon bearing moderately convex, narrowed and rounded anteriorly glabella with three pairs of lateral lobes. Anterior lobes convex, rounded. Lobes of the second and third pairs are papillate. Inner margins of fixed cheeks forming arched bridges over deep and wide dorsal furrows. Frontal lobe of glabella long, convex, and its anterior margin overhangs the anterior furrow. Anterolateral angles of fixed cheeks acute, overhanging dorsal furrows. Anterior marginal border low, narrow, and spiny in front of glabella. Palpebral lobes semicircular. Width of fixed cheeks at the level of second lobe is 25% width of glabella. Occipital furrow is broad. Free cheeks slightly convex, elongated, with wide lateral border. Thorax rounded. Pleural furrows nhas 13 segments and broad axis. Thorax pleurae broad, flattened, their ends arrow, not reaching the ends of pleurae. Pygidium narrow, rounded-trapezoidal with five pairs of pleural ribs and broad axis consisting of six flattened rings. Pleurae flattened, their margins are slanted backwards, furrows are found only near axis. The fifth pair of ribs is barely marked in the form of swollen ridges. The ornamentation of dorsal exoskeleton microtuberculate.

Comparative remarks. *Papillicalymene sokoliana* differs from *P. papillata* (Lindström, 1885) by a shorter glabella, long frontal lobe and elongated free

cheeks, a narrower pygidium, posterior margin of which is flat and without a pit (Konstantynenko, 2006). Differences from other Podillian species are presented in the description of *P. dnistroviana*.

Papillicalymene sokoliana differs from *P. sinuata* Kutscher, 2008 by the glabella narrowing to the anterior margin, while the glabella of *P. sinuata* is almost parallel-sided. The 1–3 lateral lobes of the glabella in *P. sinuata* are very similar in size, while in *P. sokoliana* they differ significantly in size. The first pair of the lateral lobes in *P. sinuata* is slightly elongated, while in *P. sokoliana* it is almost rounded. The anterior margin of *P. sinuata* overhangs the glabella, covering its anterior part, while in *P. sokoliana* the frontal lobe is significantly raised above the anterior margin.

Distribution. Ludlow (Upper Silurian) of Podillia, western Ukraine.

Other Podillian representatives of *Papillicalymene*

Among other Podillian representatives of the genus *Papillicalymene* Shirley, 1936, also described by Konstantynenko (2006) as "*P.* aff. *moa* Schrank, 1970" (Fig. 6J, H), "*P.* aff. *papillata* (Lindström, 1885)" (Figs 6, L; 7, A–D), and "*P.* spp. A, B, C" (Figs 6, A–G, I, K, M, N; 7, E–G). The systematic affiliation of these trilobites made by Konstantynenko are left unrevised in this paper.

Conclusion

Comparative diagnoses of two trilobite species, *Papillicalymene dnistroviana* Konstantynenko, 2006 and *P. sokoliana* Konstantynenko, 2006, from the Ludlow of Podillia, described by Dr. Leonid Konstantynenko, are provided. The type series of these species are recognised among the specimens in Konstantynenko's collection. Comparison with other species of the genus *Papillicalymene* showi that these species differ significantly morphologically from them, primarily in the morphology of the cranidia.

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