
The family Orthonemidae (Gastropoda) from Middle and Upper Carboniferous of the Central part of Russian Plate

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ABSTRACT. The genera *Altadema* Kues, *Arribazona* Kues, *Laschmaspira* gen. nov. and *Callispira* Nelson are mentioned for the first time from the Middle and Upper Carboniferous of the Central part of Russian Plate. Seven new species are described here. *Altadema* and *Arribazona* were previously known as monotypic. A new genus *Laschmaspira* gen. nov. is proposed here for one new species from the studied region, and four other species previously described by Licharew from Fergana valley. Two new species and 3 species described by Yakowlew and Licharew are assigned here to *Arribazona*. The diagnoses of studied genera were specified. Together with taxa described in two previous papers [Mazaev 2001, 2002], the family Orthonemidae is represented by 8 genera and 28 species in the studied region. From them, only 8 species are known from other regions (Illinois Basin and New Mexico, North-Western China, Central Asia, Central Urals, and Donetsk Basin). The stratigraphic and geographical distribution of these taxa is discussed.

Gastropods of the family Orthonemidae Nützel et Bandel are common faunal elements in many localities in most Carboniferous marine units in the Central part of Russian plate. The representatives of the family are among the most diverse and species-rich in the studied region. Twenty species assigned to four genera, *Stegocoelia* Donald, 1889, *Vebericochlis* Licharew, 1967, *Orthonema* Meek et Worthen, 1862 and *Cibecua* Winters, 1956 were for the first time found in the region and described in two previous papers [Mazaev 2001, 2002]. Other 8 new species from four genera *Callispira* Nelson, 1947, *Arribazona* Kues, 1990, *Altadema* Kues, 2002 and *Laschmaspira* gen. nov. are described in this paper. Thus, 28 taxa representing 8 genera have been found and described from the region. This result is based on over 350 specimens collected from 49 localities. The stratigraphic occurrences of studied species are shown in Fig. 1. Among those species only 8 proved to be common for other areas: *Stegocoelia alta* Licharew, *S. knighti* (Licharew), and *Vebericochlis arguta* (Licharew) from Urals province, *Stegocoelia berestovensis* Zernetskaja from Donetsk Basin, *Orthonema frequens* Licharew from Middle Asia, *Orthonema marvinwelleri* Knight from Illinois Basin,

Orthonema cochleoides Yin from Central Asia and North-Western China; possibly the latter species was described as *Orthonema telescopiforme* Erwin from New Mexico [Kues, Batten 2001: 52], and *Cibecua magnum* Mazaev also was described as *Orthonema* sp. 2 Kues et Batten [2001: 57] from New Mexico. The above-listed taxa, except for *Stegocoelia alta*, *S. knighti*, and *S. berestovensis*, appeared in the studied region earlier than in other areas. *Stegocoelia alta* and *S. knighti* appeared in different regions almost simultaneously. *Stegocoelia berestovensis* were found in later deposits in the studied region than in Donetsk Basin.

Material

Over 160 specimens from the Moscow Basin and Oksko-Tzninskiy Swell have been studied during preparation of the paper. Many taxa are represented by few specimens, which is, however, adequate to describe their morphology in detail. All the material was represented by imprints and studied with using their latex moulds. Some samples demonstrated fine imprints of aperture margin with complete slit (Fig. 2 M) or well preserved fine growth lines that distinctly reflect the morphology of the slit (Figs. 2 B, 3 A, G, J). This type of preservation is unique and allows to observe the morphology of aperture margin of the genera for the first time. All the material described here is housed in the Paleontological Museum of the Russian Academy of Sciences (Moscow), collection No. 4471. Register of the localities was given in one of preceding papers [Mazaev, 1997].

Taxonomy

The systematic position of the family Orthonemidae has been discussed in the previous paper [Mazaev, 2002]. Many genera, which formerly belonged to Acanthonematidae and Murchisoniidae, were referred to the Orthonemidae in that work. The generic composition of the family was changed, and 12 genera were referred to it. Although *Bicuerda* Kues et Batten, 2001 have been originally assigned to Orthonemidae [Kues, Batten, 2001], this taxon had not been mentioned in the conducted revision. The assignment of *Bicu-*

System	Carboniferous											
Series	Middle					Upper						
Stage	Moskopian					Kasimovian		Gzhelian				
Regional Stages	Vereian	Kashirian	Podolskian	Myachkovian	Kreyvakian	Khamovnikian	Dorogomilovian	Yauzian	Rechtizian	Ameruvian	Pavlovoposadian	Noginskian
<i>Stegocoelia alta</i> Licharew, 1975				X	X							
<i>Stegocoelia klyazmaensis</i> Mazaev, 2001									X	X		
<i>Stegocoelia turabievoensis</i> Mazaev, 2001										X		
<i>Stegocoelia acuta</i> Mazaev, 2001				X	X				X	X		
<i>Stegocoelia acutiformis</i> Mazaev, 2001			X	X	X							
<i>Stegocoelia gzheliensis</i> Mazaev, 2001									X	X		
<i>Stegocoelia berestovensis</i> Zernetskaja, 1983				X								
<i>Stegocoelia knighti</i> (Licharew, 1975)				X	X				X	X		
<i>Stegocoelia okaensis</i> Mazaev, 2001				X					X	X		
<i>Stegocoelia korobcheevoensis</i> Mazaev, 2001				X	X							
<i>Stegocoelia laschmaensis</i> Mazaev, 2001				X								
<i>Vebericochlis arguta</i> (Licharew, 1975)		X		X								
<i>Orthonema frequens</i> (Licharew, 1975)				X	X				X	X		
<i>Orthonema borovskensis</i> Mazaev, 2002	X											
<i>Orthonema paulum</i> Mazaev, 2002			X									
<i>Orthonema marvinwelleri</i> Knight, 1934				X								
<i>Orthonema cochleoides</i> (Yin, 1932)		X		X					X	X		
<i>Orthonema simplex</i> Mazaev, 2002										X		
<i>Cibecua sinelnikovae</i> Mazaev, 2002				X								
<i>Cibecua magnum</i> Mazaev, 2002	X	X		X								
<i>Altadema cryptocarina</i> Mazaev, sp.nov.											X	
<i>Altadema altadema</i> Mazaev, sp.nov.				X					X	X		
<i>Altadema lira</i> Mazaev, sp.nov.				X								
<i>Lashmaspira rara</i> Mazaev, sp.nov.				X								
<i>Arribazona devispira</i> Mazaev, sp.nov.				X	X				X	X		
<i>Arribazona nodolira</i> Mazaev, sp.nov.								X	X			
<i>Callispira okaensis</i> Mazaev, sp.nov.				X								
<i>Callispira bellula</i> Mazaev, sp.nov.										X		

FIG. 1. Stratigraphic occurrence of Middle and Late Carboniferous gastropods of the family Orthonemidae in the Central part of the Russian Plate.

РИС. 1. Стратиграфическое распространение средне- и верхнекарбоновых гастропод семейства Orthonemidae в Центральной части Русской Плиты.

erda to Orthonemidae seems questioned, since the growth lines of the genus are prosocline, like in many loxonematid gastropods.

The genus *Callispira* was placed in Turritellidae by Knight et al. [1960]. This genus is assigned here to the Orthonemidae. The findings of the genus are rare and only few specimens were described. Ob-

viously all-available specimens of the genus are not well preserved. The protoconch and apertural margin and selenizone are unknown. The growth lines on the shells of the genus are very fine and usually hardly recognized. Only some specimens allow to assume that growth lines were almost orthocline or weakly sinuous, with very shallow and moderately

U-shaped wide notch situated nearly between upper (first) and third spiral lirae. Presently this is a single character based on which the taxon may be considered as belonging to Orthonemidae.

Three other described here genera possess a distinct selenizone situated above mid-part of whorl face. *Arribazona* and *Altadema*, like *Cibecua*, *Ferganispira* Licharew, 1967, *Loxosonia* Batten, 1985, *Concinnispira* Zernetskaja, 1983 and *Hermosanema* Kues et Batten, 2001 have a tendency to reduction of spiral ornamentation. The sculpture of these genera is mainly represented by selenizone and fine growth lines. The main distinctions between these taxa are different combinations of characters: whorl profiles, structure of apical whorls and types of selenizone. *Laschmaspira* gen. nov. has unusual spiral ornamentation represented by dense spiral lirae almost without interspaces between them.

Order Pleurotomariiformes Thiele, 1925

Suborder Murchisonioidei
Cox & Knight, 1960

Family Orthonemidae Nützel et Bandel, 2000

Genus *Altadema* Kues, 2002

Altadema: Kues, 2002: 53.

Type species – *Altadema convexa* Kues, 2002.

Diagnosis. Shell small, moderately high-spired; juvenile whorls smooth, gently rounded, with weak angulation; profile of adult whorls strongly convex, sometimes with obscure angulation near selenizone; suture impressed; selenizone placed above mid-whorl face, gently concave, bordered by distinct to obscure spiral lira or fine stria from each side or distinguished from adjacent shell surface by flat profile only; spiral lirae absent or obscure to distinct, 1 to 4 in number with equal interspaces between them; two upper lirae (if present) border selenizone; growth lines very faint, gently prosocline and arcuate (convex-forward) above selenizone, forming lunulae on selenizone band, and gently opisthocline and arcuate (convex-forward) below selenizone.

Discussion. This genus most closely resembles *Concinnispira*, *Hermosanema*, and *Arribazona*. Many characters in different combination are common for these genera. The number of spiral lirae on whorl face attains 4, and by this character *Altadema* is close to *Stegocoelia*, *Taosia* Girty, 1939, *Vebericochlis*, *Concinnispira*, *Hermosanema* and *Orthonema*. *Altadema* is similar to *Concinnispira* and *Hermosanema* in change of number of lirae during ontogenesis and differs from these taxa mainly by almost rounded juvenile whorls. From *Arribazona* this genus differs by evenly rounded whorl profile, whereas the middle whorls of shells of *Arribazona* are flattened in profile, with rounded angulation between whorl face and whorl base.

All specimens of *Altadema* were found in lagoon facies.

Occurrence. One species from Middle Pennsylvanian of Texas and 3 species from Middle and Upper Carboniferous of the Central part of Russian Plate.

Altadema cryptocarina Mazaev, sp. nov.

(Figs. 2 A-E)

Types. Holotype: No. 4471/76/18, paratypes: Nos. 4471/76/1, 4471/76/11, 4471/76/14, 4471/76/18, 4471/76/28.

Type locality. Moscow Region, outcrops near Gubino village, Pavlovo-Posadian (?) Regional Stage, Gzhelian Stage.

Description. Very small, moderately high-spired shell (up to about 7 mm high), with up to 8 nearly rounded or slightly angular whorls, suture impressed. Protoconch not preserved. Rate of whorl increase not constant, spire angle from 35° to 50°. Whorl face smooth or ornamented at adult stages with one weak spiral lira placed below selenizone. This lira in some large specimens may form carina on last whorls. Selenizone obscure, flush with shell surface, defined by flattened profile, shifted from upper suture at distance nearly equal to its width. Growth lines not preserved. Sole specimen with single hardly impressed growth line, which is slightly prosocline between upper suture and selenizone, forming sinus on selenizone, depth of sinus slightly larger than its width, gently prosocline and slightly inclined below selenizone. Aperture subrounded in shape, angulated in parieto-palatal part. Outer and inner lips thin, columella slightly arched or straight, lapel of inner lip forming very small false umbilicus at adult stages.

[**Описание.** Очень маленькая, умеренно высококоническая раковина (примерно до 7 мм в высоту), из 6–7 почти округлых или слабо угловатых оборотов, шов вдавленный. Протоконх не сохранился. Скорость роста оборотов не постоянная, спиральный угол варьирует от 35° до 50°. Боковая поверхность оборотов гладкая или орнаментирована на взрослых стадиях одним слабым спиральным ребрышком, расположенным под селенизоной. У некоторых крупных экземпляров это ребрышко формирует на последнем обороте киль. Селенизона нечеткая, лежит в одной плоскости с поверхностью оборота, выделяется уплощенным профилем, смещена от верхнего шва на расстояние, примерно равное ее ширине. Линии роста не сохранились. Единственный экземпляр демонстрирует одну сильно вдавленную линию роста, которая слегка наклонена между верхним швом и селенизоной, образует синус внутри селенизоны, глубина синуса немного больше его ширины, под селенизоной линия роста слабо выгнутая и слегка наклонена вперед. Форма устья округлая, угловатая в парieto-палатальной части. Внешняя и внутренняя губы тонкие; столбик слегка выгнутый или прямой; на взрослых стадиях отворот внутренней губы образует очень маленький ложный пупок.]

Discussion. The species is similar to *A. altadema* sp. nov. but differs by less number of whorls. From *A. convexa* Kues 2002, this species differs by whorl

profile, which at adult stages becomes angular below selenizone.

Measurements (mm):

Specimen	Height	Max. diameter
4471/76/18 holotype	6.0	2.4
4471/76/1 paratype	6.2	2.7
4471/76/11 paratype	>6.0	3.2
4471/76/14 paratype	4.7	2.5

Material examined: 10 specimens from type locality.

Occurrence. Type locality only.

Etymology. *Crypticus* (Latin) – hidden, and *carina* (Latin) – keel.

Altadema altadema Mazaev, sp. nov.

(Figs. 2 F-H)

Types. Holotype: No. 4471/16/13, paratypes: Nos. 4471/16/8, 4471/16/17.

Type locality. Vladimir Region, Dobryatino quarry near Murom town, Rechitzian Provincial Stage, Gzhelian Stage.

Description. Very small, moderately high-spined shell (up to 6 mm high), consists of 10 nearly rounded whorls, suture impressed. Protoconch not preserved. Spiral angle vary from 25° to 40°. Whorls surface smooth, with flattened selenizone that slightly downgraded or flush with shell surface and may be bordered by weak spiral stria from each side. Selenizone situated almost just below upper suture. Whorl profile convex, with periphery at about mid-height of whorl, slightly angular below selenizone. Some specimens possess obscure fine spiral lirae below selenizone which start at third whorl and disappear on two last whorls. Shell anomphalous or with false umbilicus that formed by lapel of inner lip. Growth lines fine, distinct, arcuate within selenizone, prosocyrct and slightly opisthocyrct below selenizone. Margin of outer lip and slit not preserved, depth of slit unknown. Aperture subrounded in shape, angular in parieto-palatal part. Outer and inner lips thin, columella nearly straight.

[**Описание.** Очень маленькая, умеренно высококоническая раковина (до 5,5 мм в высоту), состоит из 10 почти округлых оборотов, шов вдавленный. Протоконх не сохранился. Спиральный угол варьирует от 25° до 40°. Поверхность оборотов гладкая. Селенизона уплощенная, слабо вдавленная или лежит в одной плоскости с поверхностью оборота, может быть ограничена слабой спиральной бороздкой с каждой стороны. Селенизона расположена почти сразу под верхним швом. Профиль оборотов выпуклый, с периферией около середины оборота, слегка угловатый под селенизоной. Некоторые экземпляры обладают тонким, нечетким спиральным ребром, которое появляется начиная с третьего оборота и исчезает на последних двух оборотах. Раковина без пупка или с ложным пупком, который формируется отворотом внутренней губы. Линии роста тонкие, четкие, изогнутые внутри селенизоны, выгнутые вперед и слегка наклоненные назад под селенизоной. Край внешней губы и вырез не сохранились, глубина выреза неизвестна. Форма устья округлая, угловатая в парieto-палатальной части.

Внешняя и внутренняя губа тонкие, столбик почти прямой.]

Discussion. The intraspecific variability of the species shows itself in exceptionally different spiral angles of studied specimens. The position of selenizone almost just below upper suture distinctly distinguishes this species from others.

Measurements (mm):

Specimen	Height	Max. diameter
4471/16/13 holotype	6.0	2.2
4471/16/8 paratype	5.0	2.4
4471/16/11 paratype	5.4	2.0
4471/16/17 paratype	5.3	2.7
4471/16/22 paratype	4.5	2.3

Material examined: loc. 16 – 10 specimens; loc. 20 – 1 specimen.

Occurrence. Central part of the Russian Plate: Krevyakinian, and Rechitzian Provincial Stages.

Etymology. *Altus* (Latin) – high and *dema* (Greek) – band.

Altadema lira Mazaev, sp. nov.

(Figs. 2 I-M)

Types. Holotype: No. 4471/77/1, paratypes: No. 4471/77/19, Nos. 4471/77/32, 4471/77/66, 4471/77/68, 4471/77/110, 4471/77/142, 4471/77/147, 4471/77/152.

Type locality. Akishino quarry (near Laschma village), Ryazan Region; fine coarse grainstone with *Meekella* in upper part of Korobcheevo Formation, Myachkovian Provincial Stage, Moscovian Stage.

Description. Small, moderately high-spined shell (up to 10 mm high), consists of 9 rapidly increasing, rounded whorls, anomphalous, suture impressed. Protoconch badly preserved, consists of about 2 smooth rounded whorls. Juvenile whorls nearly rounded, slightly angular below gently concave selenizone. Profile of adult whorls rounded. Whorls surface ornamented with selenizone only or with 4 obscure to distinct spiral lirae. Lirae separated by equal interspaces, upper and lower lirae separated from sutures by same interspaces. Upper pair of lirae bordered selenizone. Additional weaker lirae may appear below 2, 3 and 4 lirae. Selenizone of some specimens flush with shell surface and bordered by fine stria from each side or defined by concave or convex profile only. Aperture subrounded in shape, angular in parieto-palatal part. Outer and inner lips thin, columella short, gently arched. Growth lines thin, distinct, gently prosocyrct and prosocline above selenizone, forming lunulae within selenizone, and prosocyrct and opisthocline below selenizone. Sometimes selenizone smooth, without growth lines. One specimen with completely preserved slit, its depth four times larger than width, margins of slit narrowing toward aperture margin.

[**Описание.** Маленькая, умеренно высококоническая раковина (до 10 мм в высоту), состоит из 9 быстро нарастающих, округлых оборотов, шов вдавленный.

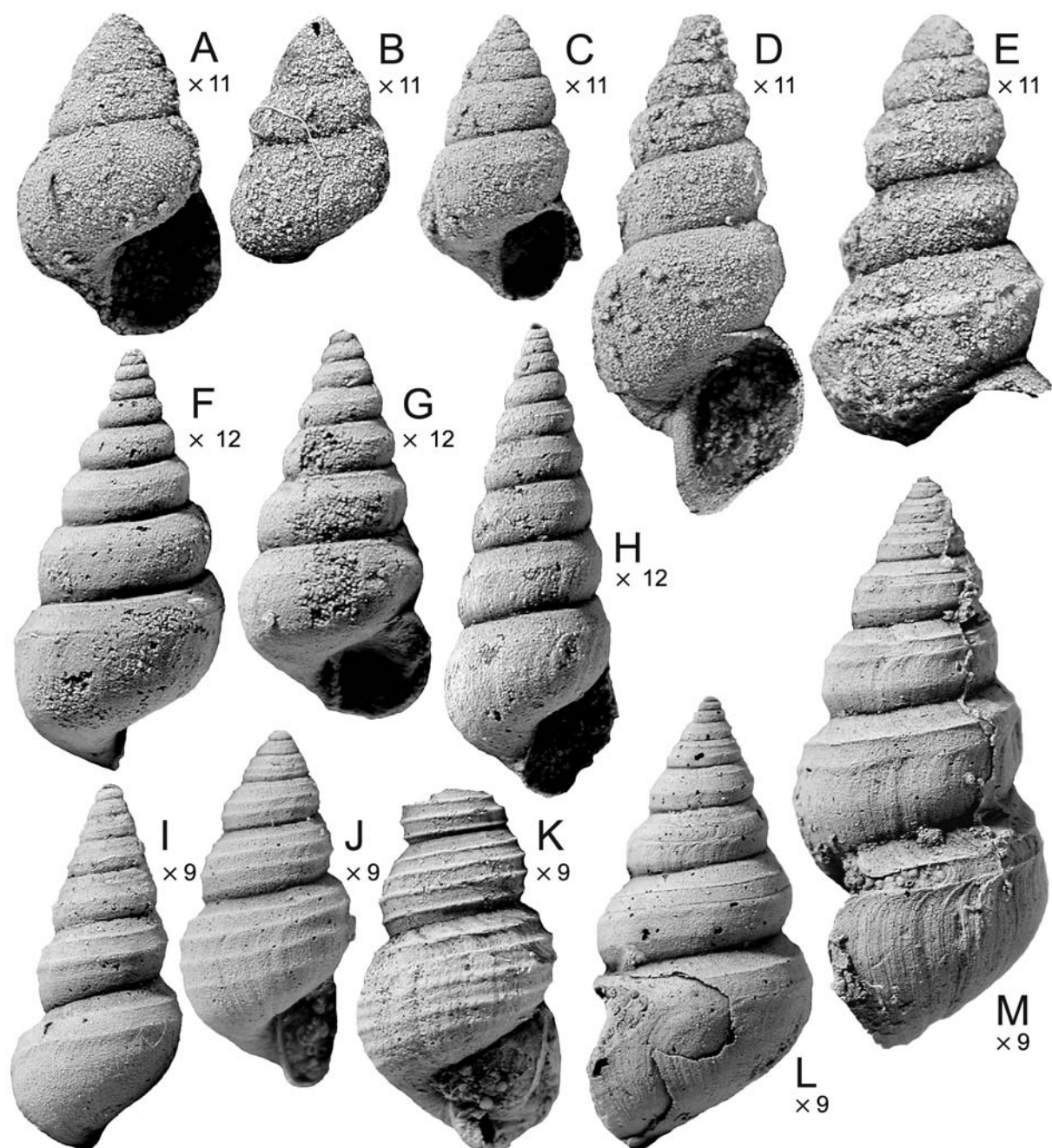


FIG. 2. A-E – *Altadema cryptocarina* sp. nov.: No. 4471/76/14, No. 4471/76/28, No. 4471/76/18 (holotype), No. 4471/76/1, No. 4471/76/11, quarry near Gubino village, Moscow Region, Gzhelian Stage; F-H – *Altadema altadema* sp. nov.: No. 7741/16/17, No. 4471/16/8 (holotype), No. 4471/16/13, Dobryatino quarry, Vladimir Region, Rechitzian Provincial Stage; I-M – *Altadema lira* sp. nov.: No. 4471/77/66; No. 4471/77/110; No. 4471/77/147; No. 4471/77/32, No. 4471/77/1 (holotype), Akishino quarry, Ryazan' Region, Korobcheevo Formation.

РИС. 2. А-Е – *Altadema cryptocarina* sp. nov.: No. 4471/76/14, No. 4471/76/28, No. 4471/76/18 (голотип), No. 4471/76/1, No. 4471/76/11, карьер около деревни Губино, Московская обл., Гжельский ярус; F-H – *Altadema altadema* sp. nov.: No. 7741/16/17, No. 4471/16/8 (голотип), No. 4471/16/13, Добрятинский карьер, Владимирская обл., речичский горизонт; I-M – *Altadema lira* sp. nov.: No. 4471/77/66; No. 4471/77/110; No. 4471/77/147; No. 4471/77/32, No. 4471/77/1 (голотип), Акишинский карьер, Рязанская обл., коробчевская свита.

Протоконх плохо сохранился, состоит из 2 гладких округлых оборотов. Ювенильные обороты почти округлые, слегка угловатые под немного вогнутой селенизой. Профиль взрослых оборотов округлый. Поверхность оборотов орнаментирована только селенизой или четырьмя неясными или четкими спираль-

ными ребрами. Ребра расположены с равными промежутками, верхнее и нижнее ребро смещены от швов на такие же промежутки. Верхняя пара ребер ограничивает селенизону. Дополнительные слабые ребра могут появляться под 2, 3 и 4 ребром. Селенизона некоторых экземпляров лежит в одной плоскости с

поверхностью оборота и ограничена слабой спиральной бороздкой с каждой стороны или определяется только по вогнутому или выпуклому профилю. Форма устья округлая, угловатая в парието-палатальной части. Внешняя и внутренняя губы тонкие, столбик короткий, слабо изогнутый. Линии роста тонкие, четкие, над селенизоной слегка изогнутые вперед и наклонены вперед, на селенизоне образуют лунулы, под селенизоной выгнуты вперед и наклонены назад. Иногда селенизона гладкая, без линий роста. Один экземпляр демонстрирует полностью сохранившийся вырез, глубина выреза в четыре раза больше его ширины, края выреза сужаются к краю устья.]

Discussion. The studied specimens show unusual intraspecific variability expressed in different number of spiral lirae (from 0 to 4) and different structure of selenizone. Most shells have 2 obscure to distinct spiral lirae bordering the selenizone (Fig. 2 I, M). Fewer specimens have no spiral lirae (Fig. 2 L). Another small part of shells is ornamented with 3 or 4 obscure to distinct spiral lirae and with additional weaker lirae placed between them (Fig. 2 J, K). Well development spiral ornamentation may disappear on last whorls (specimen No. 4471/77/9), which is typical of *Concinnispira* and *Hermosanema*.

Some specimens demonstrate gradual changes of selenizone at different ontogenetic stages (Fig. 2 L). Selenizone may be flat, placed slightly below shell surface or flush with shell surface and bordered by fine striae from each side which is typical of *Cibecua*, *Arribazona*, *Ferganispira* and *Cerithioides* Haughton, 1859. Selenizone may also be concave, bordered by lirae from each side which is typical of *Stegocoelia*, *Taosia*, *Vebericochlis*, *Orthonema* and *Goniasma* Tomlin, 1930. Additional weak spiral lirae on selenizone may be observed (specimen No. 4471/77/142). The same feature is sometimes present in shells of *Altadema convexa* [Kues 2002, figs. 2.3, 2.4], *Vebericochlis maclayi* (Licharew, 1967) and *Orthonema silinae* (Licharew, 1975) [Mazaev 2002, figs. 3 J, 5 D, E], *Stegocoelia gzheliensis* Mazaev, 2001 and *S. knighti* (Licharew, 1975) [Mazaev 2001, figs. 2 P, 3 A, C].

Measurements (mm):

Specimen	Height	Max. diameter
4471/77/1 holotype	10.0	4.5
4471/77/32 paratype	8.0	4.0
4471/77/19 paratype	7.0	3.5
4471/77/152 paratype	7.5	3.5
4471/77/110 paratype	6.0	3.5
4471/74/66 paratype	6.0	2.5
4471/74/142 paratype	7.0	3.0

Material examined: 49 specimens from type locality.

Occurrence. Type locality only.

Etymology. *Lira* (Latin) – lira, meaning bearing spiral lirae.

Genus *Laschmaspira* Mazaev gen. nov.

Type species – *Laschmaspira rara* sp. nov.

Diagnosis. Shell small, moderately high-spined; juvenile whorls gently angular; profile of adult whorls convex, sometimes with weak angularity below selenizone, base of body whorl gently convex, passing evenly into whorl face; selenizone placed above mid-whorl face, nearly flat, restricted by two fine striae or very weak lira when selenizone flush with whorl surface, or slightly depressed below the adjacent whorl surface; numerous (at least 6) closely spaced, obscure to distinct spiral lirae ornament whorl surface below selenizone; growth lines thin, distinct, gently prosocline and arcuate (convex-forward) above selenizone, forming lunulae on selenizone band, and gently opisthocline and arcuate (convex-forward) below selenizone.

[**Диагноз.** Раковина маленькая, относительно высококоническая; ювенильные обороты слегка угловатые; профиль взрослых оборотов выпуклый, иногда со слабой угловатостью под селенизоной, основание последнего оборота умеренно выпуклое, плавно переходит в боковую поверхность оборота; селенизона расположена над серединой боковой поверхности оборота, почти плоская, ограничена двумя тонкими бороздками, когда лежит в одной плоскости с поверхностью оборота, или расположена слегка ниже поверхности оборота; боковая поверхность раковины ниже селенизоны ornamentирована многочисленными (не менее 6) близко расположенными, неясными или четкими спиральными ребрышками; линии роста тонкие, четкие, над селенизоной изогнуты вперед и слегка наклонены вперед, на селенизоне формируют лунулы, под селенизоной изогнуты вперед и слегка наклонены назад.]

Discussion. This genus distinctly differs from other genera of Orthonemidae in having numerous (at least 6) closely placed spiral lirae below selenizone. The selenizone is nearly flat or slightly concave, bordered by weak lirae or fine striae and placed slightly below or above whorl surface. There are no specimens of the genus with completely preserved apertural margin. The hardly impressed growth lines of described here *Laschmaspira rara* permit to reconstruct the apertural margin and slit. Their structure is similar to that of *Stegocoelia*, which is typical for most taxa of the family.

Four species described by Licharew from Asselian of Southern Fergana possess characters allowing to assign them to this new genus. These species are: *Glyphodeta karatshatyrensis* Licharew, 1967, [Licharew, 1967: 54, except for figs. 7a, 7b, 13, tab.

FIG. 3. A-C – *Laschmaspira rara* gen. et sp. nov.: No. 4471/77/160, No. 4471/77/22 (holotype), No. 4471/77/117, Akishino quarry, Korobcheevo Formation; D-K – *Arribazona devispira* sp. nov.: D-F – No. 4471/79/123, No. 4471/79/166 (holotype), No. 4471/79/154, J, K – No. 44/78/31, No.4471/78/56, Akishino quarry, Domodedovo Formation; G-I – No. 4471/50/48 (different views of the specimen), Domodedovo quarry, Korobcheevo Formation; L – *Arribazona nodolira* Mazaev, sp. nov.: No. 4471/6/61 (holotype), Gzhelian quarry, Turabievo Formation; M – *Callispira okaensis* sp. nov.: No. 4471/96/1 (holotype), quarry near Taschenka village, Peski Formation; N – *Callispira bellula* sp. nov.: No. 4471/2/19 (holotype), Shchelkovo quarry, Turabievo Formation.

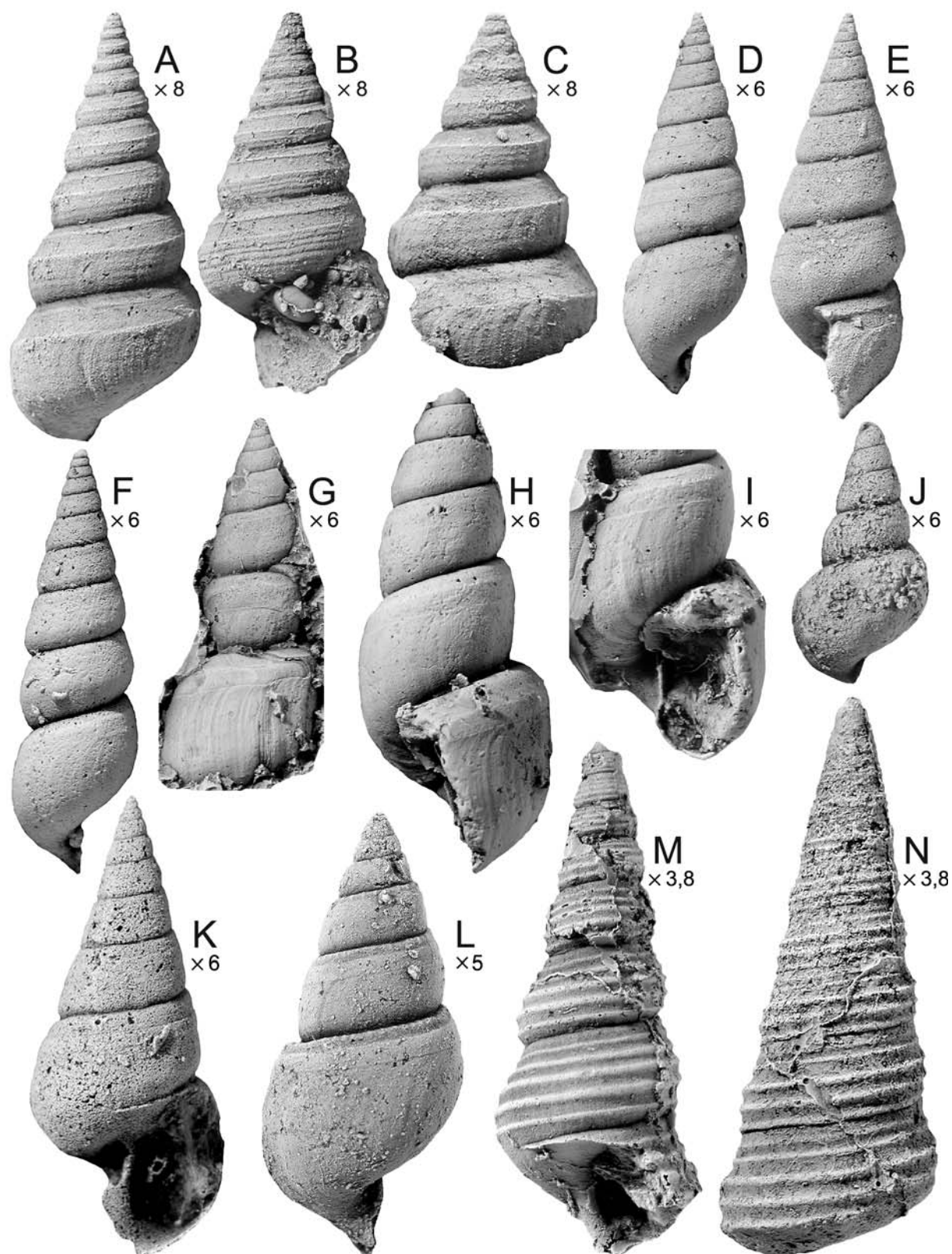


РИС. 3. А-С – *Laschmaspira rara* gen. et sp. nov.: No. 4471/77/160, No. 4471/77/22 (голотип), No. 4471/77/117, Акишинский карьер, Коробчевская свита; D-K – *Arribazona devispira* sp. nov.: D-F – No. 4471/79/123, No. 4471/79/166 (голотип), No. 4471/79/154, J, K – No. 4478/31, No. 4471/78/56, Акишинский карьер, Домодедовская свита; G-I – No. 4471/50/48 (различные виды одного экземпляра), Домодедовский карьер, Коробчевская свита; L – *Arribazona nodolira* Mazaev, sp. nov.: No. 4471/6/61 (голотип), Гжельский карьер, Турабьевская свита; M – *Callispira okaensis* sp. nov.: No. 4471/96/1 (голотип), карьер около д. Ташенка, песковская свита; N – *Callispira bellula* sp. nov.: No. 4471/2/19 (голотип), Щелковский карьер, Турабьевская свита.

XIII], *Callispira* ? sp. indet. Licharew, 1968, *Callispira* ? *conulus* Licharew, 1968 and *Callispira* ? *volgini* Licharew, 1968 [Licharew, 1968: 47, 48].

Occurrence. One species of the genus known from Myachkovian of Central part of Russian plate and 4 species from Asselian of Southern Fergana.

Etymology. *Laschma* — village near which the described here specimens were found and *spira* (Latin) — spire. Gender — feminine.

***Laschmaspira rara* Mazaev,**
gen. et sp. nov.

(Fig. 3 A-C)

Types. Holotype: No. 4471/77/22, paratypes: Nos. 4471/77/117, 4471/77/153, 4471/77/155, 4471/77/156, 4471/77/160, 4471/77/170.

Type locality. Akishino quarry (near Laschma village), Ryazan Region; fine coarse grainstone with *Meekella* in upper part of Korobcheevo Formation, Myachkovian Provincial Stage, Moscovian Stage.

Description. Shell small, moderately high-spined, anomphalous, consists of 11 whorls, suture impressed, not deep. Juvenile whorls ornamented with two spiral lirae below selenizone, upper lira forming weak angularity. Profile of adult whorls gently convex, obscure to distinct angularity appears just below selenizone. Base of body whorl gently convex, gradually passing into whorl face. Selenizone placed above mid-whorl face, distance between suture and selenizone slightly smaller than selenizone width. Selenizone flat, essentially flush with or distinctly depressed below adjacent shell surface, may be bordered by fine stria or very obscure lira on each side. Whorl face above selenizone almost straight and smooth. Whorl face below selenizone and whorl base ornamented with at least 6 distinct to obscure closely spaced lirae, interspaces between them nearly twice narrower than their width. Growth lines distinct, gently prosocline and arcuate (convex-forward) above selenizone, forming lunulae on selenizone band, and gently opisthocline and arcuate (convex-forward) below selenizone; depth of slit four times larger than its wide.

[Описание. Раковина маленькая, умеренно высококоническая; без пупка, состоит из 11 оборотов, шов вдавненный, неглубокий. Ювенильные обороты орнаментированы двумя спиральными ребрышками, которые расположены под селенизоной, верхнее ребрышко образует слабую угловатость. Профиль взрослых оборотов умеренно выпуклый, неясная или четкая угловатость появляется сразу под селенизоной. Основание последнего оборота умеренно выпуклое, равномерно переходит в боковую поверхность оборота. Селенизона расположена выше середины боковой поверхности оборота, расстояние между швом и селенизоной немного меньше ширины селенизоны. Селенизона плоская, в основном находится на одном уровне или отчетливо вдавлена ниже прилегающей поверхности раковины, может быть ограничена тонкой бороздкой или очень неясным ребрышком с каждой стороны. Поверхность оборота ниже селенизоны и основание раковины орнаментированы по крайней мере 6 четкими или неясными близко расположенными ребрышками, расстояния между ними примерно в два раза

меньше их ширины. Линии роста четкие, тонкие, над селенизоной изогнуты вперед и слегка наклонены вперед, на селенизоне формируют лулулы, под селенизоной изогнуты вперед и слегка наклонены назад. Глубина выреза в четыре раза больше его ширины.]

Discussion. The variability consists in different development of spiral lira below selenizone, which sometimes forms shouldered whorl outline. The spiral lirae of many specimens are weak to obscure (Figs. 3 A, C), which, however, may be connected with corroded shell surface. At the same time these specimens demonstrate sharply impressed growth lines on two last whorls that distinctly reflect out line of apertural margin with slit.

Laschmaspira rara as well as *Altadema lirata* sp. nov. has been obtained in grainstone with *Meekella* cf. *venusta*, characterized as shallow-water, apparently lagoonal limestone with extreme depositional regime and signs of episodic emergence. These two and some other species, which have been previously described from this locality (*Microdoma pagoda*, *M. laschmensis* [Mazaev, 1997], *Stegococelia laschmaensis* [Mazaev, 2001]), form an unusual gastropod community, which does not repeat in Carboniferous units of the region.

Measurements (mm):

Specimen	Height	Max. diameter
4471/77/22 holotype	8.0	4.0
4471/77/153 paratype	12.5	5.5
4471/77/156 paratype	6.5	3.3
4471/77/160 paratype	9.3	4.2
4471/77/170 paratype	7.0	3.8

Material examined: 12 specimens from type locality.

Occurrence. Type locality only.

Etymology. *Rara* (Latin) — rare.

Genus *Arribazona* Kues, 1990

Arribazona: Kues, 1990: 252; Kues, Batten, 2001: 51.

Type species — *Arribazona hesperia* Kues, 1990.

Diagnosis. Shell small to medium-sized, high-spined; suture impressed, not deep; juvenile whorls smooth, gently convex; face of adult whorls weakly convex to nearly flat, gently rounded near upper and lower suture; whorl face gradually passing into base on last whorls or separated by weak angularity on middle whorls; base of body whorl gently convex; shell ornamented with selenizone and weak growth lines; selenizone placed above mid-whorl face, gently elevated or flush with shell surface, may be bordered by fine stria from each side; additionally weak sutural lira and very weak narrow to obscure spiral lirae below selenizone on whorl face and whorl base may appear on last whorl; growth lines very faint, gently prosocline and arcuate (convex-forward) above selenizone, forming lunulae on selenizone band, and gently opisthocline and arcuate (convex-forward) below selenizone.

Discussion. This genus is closely related to *Altadema* and *Laschmaspira* gen. nov. *Arribazona* possesses smooth, slightly convex (not evenly rounded) whorl face, without variously developed spiral lirae near selenizone (except for sutural lira). The type species, *Arribazona hesperia*, possesses weak spiral ornamentation below selenizone, but these lirae are very narrow to obscure and not so well developed as in species of *Laschmaspira*. *Arribazona* is also similar to *Ferganispira*, but *Ferganispira* possesses subsutural ramp, forming distinct shoulder just above selenizone, which marks periphery of the whorls, whereas the whorl periphery of *Arribazona* is placed at mid-whorl face or below it. Another characteristic feature of *Arribazona* is a weak, rounded angularity between whorl face and whorl base, which, however, never forms a distinct carina. This angularity is usually displayed just above lower suture and disappears on the last whorls, which become more rounded.

The genus *Arribazona* was known as monotypic. However, besides the two new species, this genus should include many other species. They are *Murchisonia* (*Glyphodeta*) *tschernyschewi* Yakowlew from Kulogory Formation, Archangelsk Region, *Murchisonia* (*Glyphodeta*) *permiana* Yakowlew from Upper Carboniferous of Oksko-Tzninskiy Swell [Yakowlew, 1899: 39, 40], *Murchisonia* (*Hormotoma*?) *tschernyschewi* (Yakowlew) reported by Licharew [1967: 49] from Asselian of Southern Fergana, and two other specimens designated by him as Genus (*C*) [Licharew, 1967: 72].

Occurrence. Species of the genus are known from Middle Pennsylvanian of Texas and New Mexico, Middle and Upper Carboniferous of Central part of Russian Plate, Lower Permian of Southern Fergana and Archangelsk Region.

Arribazona nodolira Mazaev, sp. nov.

(Fig. 3 L)

Types. Holotype: No. 4471/6/61, paratype: No. 4471/6/113.

Type locality. Moscow Region, quarry about 1.5 km to the north of Gzhel station, base of unit yellow dolomitic limestone with abundant fossils, upper part of section of motley shales, Turabievo Formation, Amerevian Provincial Stage, Gzhelian Stage.

Description. Shell of moderate size, up to 15 mm in height, moderately high-spired, consists of 7 rapidly increasing smooth whorls. Protoconch not preserved. Juvenile whorls smooth, slightly convex. Adult whorls slightly convex, lower part of 4th and 5th whorl face nearly straight, subsequent whorls gently convex, gradually passing into smooth slightly convex whorl base. Suture impressed, shallow. Weaker sutural lira with numerous fine nodes well developed on last whorls, placed just below suture. Interspace between suture and selenizone equal to width of selenizone. Selenizone flat or gently convex, bordered by fine striae, flush with shell surface

or weakly lifted above it. Structure of aperture margin unknown. Growth lines very faint, gently prosocline and arcuate (convex-forward) above selenizone, forming lunulae on selenizone band, and gently opisthocline and arcuate (convex-forward) below selenizone.

[Описание. Раковина среднего размера, до 15 мм в высоту, умеренно высококоническая, состоит из 7 быстро нарастающих гладких оборотов. Протоконх не сохранился. Ювенильные обороты гладкие, немного выпуклые. Взрослые обороты немного выпуклые, нижняя часть боковой поверхности 4 и 5 оборотов почти прямая, последующие обороты слабо выпуклые, равномерно переходят в гладкое, слегка выпуклое основание оборотов. Шов вдавленный, мелкий. Слабое подшовное ребро с многочисленными мелкими бугорками хорошо развито на последних оборотах, расположено сразу под швом. Промежуток между швом и селенизоной равен ширине селенизоны. Селенизона плоская или немного выпуклая, ограничена тонкими бороздками, лежит в одной плоскости с поверхностью оборота или слабо возвышается над ней. Строение края устья неизвестно. Линии роста очень тонкие, над селенизоной изогнуты вперед и слабо наклонены вперед, на селенизоне формируют лулулы, под селенизоной изогнуты вперед и слабо наклонены назад.]

Discussion. This species distinctly differs from others in having fine nodose sutural lira.

Measurements (mm):

Specimen	Height	Max. diameter
4471/6/61 holotype	15.0	7.0
4471/17/23	7.2	3.5
4471/17/12	9.0	4.3

Material examined: Loc. 6 – 2 specimens, loc. 17 – 4 specimens, loc. 99 – 1 specimen.

Occurrence. Central part of the Russian Plate: Yauzian, Rechitzian and Amerevian Provincial Stages.

Etymology. *Nodosum* (Latin) – nodose and *lira* (Latin) – lira.

Arribazona devispira Mazaev, sp. nov.

(Fig. 3 D-K)

Types. Holotype: No. 4471/79/166, paratypes: No. 4471/79/5, Nos. 4471/79/45, 4471/79/123, 4471/79/140, 4471/79/154, 4471/79/157, 4471/79/186, 4471/79/217, 4471/79/253.

Type locality. Ryazan Region, Akishino quarry (near Laschma village); base of thick (5 m) unite light lime mudstones, Domodedovo Formation, Myachkovian Provincial Stage, Moscovian Stage.

Description. Shell small, up to 14 mm in height, high-spired, consists of 10 smooth rounded whorls. Protoconch not preserved. Juvenile whorls smooth, gently convex. Adult whorls nearly flat, gently convex near upper suture, weakly angular above lower suture. Last whorl more convex, gradually passing into whorl base. On last whorls suture shifting toward down at upper part of base. Base of body whorl smooth, gently convex. Suture impressed, shallow,

on posteriormost whorls deeper. Selenizone placed above mid-whorl face, distance between selenizone and upper suture nearly equal to width of selenizone, selenizone flat or gently convex, bordered by fine striae, flush with shell surface or weakly lifted above it. Aperture suboval. Outer, basal and columellar lips thin, lapel of columellar lip forming columella and very small false umbilicus. Columella moderately long, nearly straight. Outer lip with slit, slit three times deeper than wide. Growth lines very faint, gently prosocline and arcuate (convex-forward) above selenizone, forming lunulae on selenizone band, and gently opisthocline and arcuate (convex-forward) below selenizone.

[**Описание.** Раковина маленькая, до 14 мм в высоту, высококоническая, состоит из 10 гладких округлых оборотов. Протокопх не сохранился. Ювенильные обороты гладкие, слабо выпуклые. Взрослые обороты почти плоские, слабо выпуклые около верхнего шва, слабо угловатые выше нижнего шва. Последний оборот обычно становится более выпуклым, равномерно переходит в основание оборота. На последних оборотах шов смещается к низу на верхнюю часть основания оборота. Основание оборота гладкое, слабо выпуклое. Шов вдавленный, мелкий, на последнем обороте более глубокий. Селенизона расположена выше средней части боковой поверхности оборота, расстояние между селенизоной и верхним швом примерно равно ширине селенизоны, селенизона плоская или немного выпуклая, ограничена тонкими бороздками, лежит в одной плоскости с поверхностью оборота или слабо возвышается над ней. Устье субовальное. Внешняя, базальная и колломеллярная губа тонкие, отворот колломеллярной губы образует столбик и очень маленький пупок. Столбик умеренно длинный, почти прямой. Внешняя губа с мантийным вырезом, глубина выреза в три раза больше его ширины. Линии роста очень тонкие, над селенизоной изогнуты и слабо наклонены вперед, на селенизоне формируют лулулы, под селенизоной изогнуты вперед и слабо наклонены назад.]

Discussion. This species differs from the type species by smooth shell surface (without very weak spiral lirae below selenizone). From *Murchisonia* (*Glyphodeta*) *tschernyschewi* and *Murchisonia* (*Glyphodeta*) *permiana*, *A. devispira* differs by more flattened whorl face. Obviously, the species also differs by width/height ratio of middle whorls, varying from 1,8 to 2,0. However, on the latest whorls due to increase of whorls translation, the width/height ratio may change to 1,35. This deviation is also seen in changes of whorl profile (Fig. 3 E, H).

This species moderately wide distributed in offshore marine facies.

Measurements (mm):

Specimen	Height	Max. diameter
4471/79/166 holotype	11.5	4.0
4471/79/5 paratype	7.5	2.5
4471/79/123 paratype	11.0	3.5
4471/79/140 paratype	7.5	3.0
4471/79/154 paratype	11.5	3.5
4471/79/157 paratype	9.0	3.5
4471/79/253 paratype	9.0	3.0

Material examined: loc. 16 – 1 specimen; loc. 18 – 1 specimen; loc. 26 – 1 specimen; loc. 50 – 2 specimens; loc. 70 – 1 specimen; loc. 79 – 52 specimens; loc. 78 – 7 specimens; loc. 86 – 1 specimen.

Occurrence. Central part of the Russian Plate: Myachkovian, Krevyakinian, and Rechitzian Provincial Stages.

Etymology. *Devius* (Latin) – deviated and *spira* (Latin) – spire.

Genus *Callispira* Nelson, 1947

Callispira: Nelson, 1947: 463; Knight et al., 1960: B17; Kues et Batten, 2001: 59.

Type species – *Callispira quinquecostata* Nelson, 1947.

Diagnosis. Shell of moderate size to relatively large; high-spined; whorl face profile convex or flattened, gently concave below suture; ornamented with five distinct spiral cords; upper cord shifted from suture, may be smaller than other; base of body whorl gently convex, smooth or ornamented with obscure spiral lirae; growth lines very fine, nearly orthocline, with a very shallow labral U-shaped sinus which culminated near two upper cords but not restricted by them; selenizone absent.

Discussion. Four species of this genus are known from the Pennsylvanian of North America [Nelson, 1947; Hoare, 1961; Kues, 1994; Hoare et al., 1997; Kues, Batten 2001]. However, only two of them may certainly be assigned to the genus: *C. quinquecostata* Nelson, 1947 and *C. grossa* Hoare Anderson et Sturgeon, 1997. The systematic position of *C. novemcostata* Nelson, 1947, and *Callispira?* sp. A Kues et Batten, 2001 is uncertain, because the first species has numerous spiral lirae on the whorl surface (more than five) and the second species possesses a distinct selenizone and flattened smooth band below it. These morphological features of the species do not allow to refer them to any existing genera. The similar situation takes place with four species from Asselian Stage of Kara-Chatyr Ridge (Uzbekistan), which have been tentatively assigned to *Callispira* by Licharew [1968: 46]. Most of these species are referred in this paper to *Laschmaspira* gen. nov.

Two new, described here species: *C. okaensis* sp. nov. and *C. bellula* sp. nov. have five distinct spiral lirae on whorl face, and smooth whorl base, which is typical of the genus.

The findings of *Callispira* are rare in the studied region and associated mainly with offshore marine facies.

Occurrence. Middle and Upper Carboniferous of North America and Central part of Russian Plate.

Callispira okaensis Mazaev, sp. nov.

(Fig. 3 M)

Types. Holotype: No. 4471/96/1, paratype: No. 4471/96/2.

Type locality. Quarry near Taschenka village, Ryazan Region; Peski Formation, Myachkovian Provincial Stage, Moscovian Stage.

Description. Shell of moderate to large size, high-spired, anomphalous, consists of at least 10 rounded whorls. Suture distinct, fine, channeled. Whorls face convex, nearly flat below suture, gradually passing into convex base of body whorl. Whorl face ornamented with 5 distinct spiral cords, upper cord slightly smaller than other, additional weaker sutural lira appears on last whorls. Cords separated by equal interspaces, upper and lower cords separated from sutures by same interspaces. Base of body whorl smooth. Apertural margin not preserved. Columella massive, almost straight, inclined to shell axis. Growth lines almost inconspicuous. Protoconch and apical whorls unknown.

[**Описание.** Раковина от среднего до крупного размера, высококоническая, без пупка, состоит по меньшей мере из 10 округлых оборотов. Шов четкий, тонкий, канальчатый. Боковая поверхность оборота выпуклая, под швом почти плоская, плавно переходит в выпуклую базальную поверхность оборота. Боковая поверхность оборота ornamentирована 5 четкими спиральными ребрами, верхнее ребро немного меньше чем остальные, дополнительное очень слабое подшовное ребро появляется на последних оборотах. Ребра расположены с равными промежутками, верхнее и нижнее ребро смещены от швов на такие же промежутки. Базальная часть оборота гладкая. Край устья не сохранился. Столбик массивный, почти прямой, наклонен к оси раковины. Линии роста почти незаметны. Протоконх и апикальные обороты неизвестны.]

Discussion. This species distinctly differs from *C. quinquecostata* Nelson, 1947 and *C. quinquelira* sp. nov. in having more convex whorl profile without concave surface below suture. From *C. grossa* Hoare, Anderson et Sturgeon, 1997, this species differs in slenderer shell appearance. The width/height ratio of last whorls of *C. okaensis* sp. nov. is 1.8 to 1.6, whereas this ratio for *C. grossa* is 2 to 2.4.

Measurements (mm):

Specimen	Height	Max. diameter
4471/96/1 holotype	>23.0	9.5
4471/96/2 paratype	>12.0	5.5

Material examined: 4 specimens: loc. 20 – 1 specimen, loc. 21 – 1 specimen, loc. 96 – 2 specimens.

Occurrence. Myachkovian Regional Stage of Moscow Stage, Moscow Basin, Oksko-Tzninsky Swell.

Etymology. The species is named after the Oka River in basin of which the species has been collected.

Callispira bellula Mazaev, sp. nov.

(Fig. 3 N)

Types. Holotype: No. 4471/2/19.

Type locality. Quarry near Shchelkovo Town, yellow dolomitic limestone, 4.5 m above the top of

motley shales, Turabievo formation, Ameruvian Provincial Stage, Gzhelian Stage.

Description. Shell of moderate size, high-spired, anomphalous, consists of at least 10 slightly convex whorls. Suture very fine and shallow. Whorls face profile gently convex in lower part and gently concave in upper part. Whorl face ornamented with 5 distinct spiral cords. Two upper cords slightly smaller than other, interspace between them equal to interspace between upper cord and suture. Interspace between second and third cords distinctly wider than interspace between upper pair of cords and equal to interspaces between others cords. Third cord separates upper concave and lower convex surfaces of whorl face, forms weak shoulder. Fifth cord distinctly separates whorl face from base of body whorl, forms weaker rounded keel. Whorl base weakly convex, smooth. Growth lines almost inconspicuous. Protoconch, apical whorls and aperture not preserved.

[**Описание.** Раковина среднего размера, высококоническая, без пупка, состоит по меньшей мере из 10 слабо выпуклых оборотов. Шов очень тонкий и мелкий. Боковая поверхность оборота умеренно выпуклая в нижней части и умеренно вогнутая в верхней части. Боковая поверхность ornamentирована 5 четкими спиральными ребрами. Два верхних ребра немного меньше чем остальные, промежуток между ними равен промежутку между верхним ребром и швом. Промежуток между вторым и третьим ребром заметно шире промежутка между верхней парой ребер и равен промежуткам между остальными ребрами. Третье ребро отделяет верхнюю вогнутую и нижнюю выпуклую поверхности боковой поверхности оборота, формирует слабое плечо. Пятое ребро четко отделяет боковую поверхность оборота от базальной, формирует слабый округлый киль. Базальная поверхность оборота слабо выпуклая, гладкая. Линии роста незаметны. Протоконх, апикальные обороты и устье не сохранились.]

Discussion. This species is similar to *C. quinquecostata* Nelson, 1947 but distinctly differs by upper cord placed closer to suture, from *C. grossa* Hoare, Anderson et Sturgeon, 1997 and *C. okaensis* sp. nov. distinctly differs by whorl profile.

Measurements (mm):

Specimen	Height	Max. diameter
4471/2/1 holotype	26	10

Material examined: holotype only.

Occurrence. Type locality only.

Etymology. *Bellulus* (Latin) – graceful and *lira* (Latin) – lira, referring to the shell ornamented with five spiral lirae.

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Семейство Orthonemidae (Gastropoda) из среднего и верхнего карбона центральной части Русской плиты

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РЕЗЮМЕ. Роды *Altadema* Kues, *Arribazona* Kues, *Laschmaspira* gen. nov. и *Callispira* Nelson впервые отмечены для отложений среднего и верхнего карбона Центральной части Русской плиты. Семь новых видов описаны и отнесены к этим родам. До настоящей работы *Altadema* и *Arribazona* были известны как монотипические. Новый род *Laschmaspira* gen. nov. предложен для одного нового вида, найденного в изучаемом районе, и 4 видов, ранее описанных Лихаревым из Ферганской долины. Два новых вида и 3 ранее описанные Яковлевым и Лихаревым, отнесены к *Arribazona*. Диагнозы изученных родов уточнены. Всего, вместе с таксонами описанными в двух предыдущих статьях [Mazaev 2001, 2002], в изучаемом регионе семейство Orthonemidae представлено 8 родами и 28 видами. Из них только восемь видов известны из других регионов (Иллинойский бассейн и Нью-Мексико, Северозападный Китай, Средняя Азия, Средний Урал и Донецкий Бассейн). Обсуждается стратиграфическое и географическое распределение этих таксонов.