

吉林二道沟组的床板珊瑚型珊瑚^{*}

邓占球

(中国科学院南京地质古生物研究所 南京 210008)

郑春子

(吉林省区域地质调查所 长春 130022)

提要 二道沟组床板珊瑚型珊瑚群含有常见于欧亚地区下泥盆统的一些重要属种, 如 *Favosites multiplicatus*, *Squameofavosites gurjevskiensis* 和 *Pachyfavosites rariporosus*, 同时未发现常见于上志留统的分子。据此, 二道沟组珊瑚群时代应是早泥盆世而不是过去所谓的晚志留世。二道沟组与南天山的阿尔皮什麦布拉克组可能相当, 同属于下泥盆统下部。描述床板珊瑚和日射珊瑚 8 属 16 种, 其中 4 新种: *Pachyfavosites impurus* sp. nov., *Squameofavosites vescus* sp. nov., *Paraheliolites obvellatus* sp. nov., *Pseudoplasmonora yaokengensis* sp. nov.; 2 新亚种: *Favosites polaris similus* subsp. nov., *Mesofavosites jilinensis yongjiensis* subsp. nov.。

关键词 床板珊瑚 日射珊瑚 下泥盆统 二道沟组 吉林

1 前言

吉林市西十余公里腰坑的二道沟组, 迭经中外学者, 如 Yabe 等(1944, 1945), 俞建章等(1951), 穆恩之(1962), 郭鸿俊(1962), 俞昌民等(1963) 和刘发、黄柱熙(1977) 等分别对其地层古生物进行专题研究, 积累了一些有价值的地质资料, 但对该组属于晚志留世或属于早泥盆世意见不一。迨至廖卫华、郑春子(1986) 和廖卫华、戎嘉余等(1995) 对二道沟组所含的四射珊瑚群进行研究, 他们的结论认为二道沟组的地质年代为早泥盆世早期。

本文研究的珊瑚化石均采自吉林市西腰坑的二道沟组。

2 二道沟组床板珊瑚和日射珊瑚的年代

池永一在《华北地区古生物图册, 内蒙古分册(一)》(1976) 和《东北地区古生物图册(一)》(1980) 分别描述二道沟组的一些床板珊瑚和日射珊瑚, 但

他把二道沟组归入上志留统。其后, 林宝玉等(1988) 在“中国床板珊瑚型珊瑚种的特征检索表”中, 仅把二道沟组的层位列属于下泥盆统, 但无进一步的阐明。

本文笔者有机会研究采自腰坑二道沟组的床板珊瑚和日射珊瑚化石标本, 同时尽可能结合池永一报道过的珊瑚文献资料一并进行地质年代讨论。现把已知二道沟组的床板珊瑚和日射珊瑚的属种列于表 I。

在表 I 的珊瑚属种中, 不乏有早泥盆世的种或与早泥盆世的种近似的类型, 例如: *Favosites multiplicatus* 曾经在俄罗斯库兹涅茨和东乌拉尔的早泥盆世早期地层出现; *Favosites polaris similus* subsp. nov. 与产于俄罗斯西乌拉尔、科累马的下泥盆统以及在我国新疆和布克赛尔下泥盆统芒克鲁组的 *Favosites polaris* 的特征近似, 尤其与新疆地区的标本更为相似, 仅在体壁更薄一些。 *Squameofavosites gurjevskiensis* 过去曾在俄罗斯乌拉尔与库兹涅茨下泥盆统下部的 ТOMB-ЧУМЫШСЬК 层发现。 *Pachyfavosites rariporosus* 亦在库兹涅茨早泥盆世地层找到过。 *Pachyfavosites impurus* sp. nov. 与新疆和布克赛尔芒克鲁组的 *Pachyfavosites hamatus* 的形态

收稿日期: 2000-01-27

^{*} 国家自然科学基金资助项目(49872007)研究成果

特征十分相似。

表 I 吉林二道沟组的床板珊瑚和日射珊瑚

List of tabulate and heliolitid corals from the Erhtaokou Formation, Jilin Province

(带·者是 1980 年池永一描述的属种)

- *Favosites multiplicatus* Yanet (in Dubatolov, 1959)
- F. polaris similis* subsp. nov.
- *Mesofavosites jilinensis* Tchi, 1980
- M. jilinensis yongjiensis* subsp. nov.
- Pachyfavosites rariporosus* Dubatolov, 1959
- P. impurus* sp. nov.
- *Squameofavosites gurjevskiensis* Mironova, 1961
- *S. jilinensis* Tchi, 1980
- S. aff. jilinensis* Tchi, 1980
- *S. regularis* Tchi, 1980
- S. vescus* sp. nov.
- S. cf. socialisformis* Dubatolov, 1969
- S. sp.*
- *Parathamnopora thamnoporoides* Tchi, 1980
- *P. yongjiensis* Tchi, 1980
- *P. minor* Tchi, 1980
- *Striatopora macroseptata* Tchi, 1980
- Parastriatopora* sp.
- *Squameostriatopora ferospina* Tchi, 1980
- *Aulopora* sp.
- *Paraheliolites jilinensis* (Tchi, 1980)
- P. obvellatus* sp. nov.
- *P. salairicus* (Tchernychev, 1951)
- *P. lindstromi* (Kovalevsky, 1960)
- *Squameolites anomalus* Tchi, 1980
- Pseudoplasmapora yaokengensis* sp. nov.
- P. aff. aseptata* (Regnell, 1941)

日射珊瑚类的 *Pseudoplasmapora* 在我国早泥盆世除二道沟的 *Pseudoplasmapora yaokengensis* 和 *Pseudoplasmapora aff. aseptata* 外, 还有产在新疆吐鲁番下泥盆统阿尔皮什麦布拉克组的 *Pseudoplasmapora aseptata*, *P. aseptata minor*, 以及云南丽江下泥盆统班满到地组的 *Pseudoplasmonora salairicus* (俞昌民等, 1978; 邓占球, 1986)。其中二道沟组与阿尔皮什麦布拉克组的 *Pseudoplasmapora* 分子更接近, 它们的时代都可能是早泥盆世早期。

目前记述的二道沟组的珊瑚群中还未见有典型晚志留世的种, 因此, 二道沟组的地质年代应是早泥盆世早期。这与廖卫华、郑春子确定的二道沟组的年代结论相同。

蜂巢珊瑚科 Family Favositidae Dana, 1846

蜂巢珊瑚属 Genus *Favosites* Lamarck, 1816

多皱蜂巢珊瑚 *Favosites multiplicatus* Yanet (in Dubatolov, 1959)

(图版 II, 图 5, 6)

1959 *Favosites multiplicatus* Yanet (in Dubatolov), p. 20, pl. IV, figs. 1, 2.

1980 *Favosites multiplicatus*d, 池永一, 154 页, 图版 68, 图 3a-b.

块状复体, 由相互毗连的角柱状个体组成。个体横切面多边形、四—七边形, 个体体径基本在 1.5—1.7mm, 个别个体体径小于 1.5mm。体壁厚度 0.07—0.1mm; 壁孔 1 列, 偶见 2 列, 孔径约 0.1mm, 孔间间距不清楚; 床板完全, 水平, 床板之间的间距为 0.25—0.5mm。

比较 池永一(1976)描述的志留系和泥盆系的 2 块标本差别明显, 故存有疑问, 他于 1980 年描述二道沟组的标本与上述 2 块标本也存异。本文描述标本与 Dubatolov (1959)描述的库兹涅茨的标本相比较, 前者除壁孔欠发达外, 其余特征基本相同。

两极蜂巢珊瑚相似亚种(新亚种) *Favosites polaris similis* subsp. nov.

(图版 I, 图 5, 6)

块状复体, 由相互毗连的角柱状个体组成。个体有大小之分, 不规则相互毗连。个体三一五边形, 体径 0.7—1.0mm, 大个体六一八边形, 体径 1.4—2.0mm。体径直, 中间线不清楚, 厚度 0.1—0.15mm; 壁孔 1 列, 但稀少, 孔径 0.05—0.1mm, 孔间间距约 0.15mm。壁刺小和少; 床板完全、水平, 床板之间的间距为 0.6—1.0mm。

比较 与早泥盆世的 *Favosites polaris* (Dubatolov, 1969; 邓占球, 1999)相比, 新亚种在个体大小及复体的毗连上极相似, 不同之处是新亚种的壁刺小而少, 体壁薄和壁孔少。

中巢珊瑚属 Genus *Mesofavosites* Sokolov, 1951

吉林中巢珊瑚永吉亚种(新亚种) *Mesofavosites jilinensis yongjiensis* subsp. nov.

(图版 II, 图 3, 4)

块状复体, 由相互毗连的角柱状个体组成。个体横切面三一六边形, 三一四边形个体体径为 1.0—1.25mm, 五一六边形个体体径为 1.5—1.7mm。体壁直, 厚度为 0.1—0.15mm; 壁刺稀少或无。壁孔稀, 直径约 0.15mm, 孔间间距约 0.8mm; 角孔直径约 0.25mm, 间距不清楚。床板完全, 水平的为主, 少数微下凹或微倾斜, 床板之间的间距为 0.5—1.5mm。

比较 *Mesofavosites jilinensis* (池永一, 1980)复体内个体大小差别明显, 而新亚种的个体大小差

别不明显。*Mesofavosites boculiformis* (邓占球, 1986)有较发育的壁刺与新亚种不同。

厚巢珊瑚属 Genus *Pachyfavosites* Sokolov, 1952
稀孔厚巢珊瑚 *Pachyfavosites rariporosus* Dubatolov, 1963

(图版II;图7)

1963 *Pachyfavosites rariporosus* Dubatolov, p. 24, pl. X, figs. 1a-b, 2, 3.

不规则的块状复体,由相互毗连的不大的角柱状个体组成。个体横切面四—六边形,体径0.7—0.8mm,个别体径达1mm。薄的个体体壁厚度约0.1mm,但增厚的体壁厚度可达0.2mm,体壁中间缝局部出现。壁孔在部分个体上出现,孔径约0.15mm。壁刺细小,发育不均匀,常见于较厚体壁的个体内。床板完全,水平,床板间距为0.5—0.6mm,靠近复体表面床板较密集,间距为0.2—0.4mm。

比较 描述标本个体大小和壁刺特征与Dubatolov(1963)描述的库兹涅茨早泥盆世的标本基本相同,但当前描述标本的壁孔更明显和略多些。

不纯厚巢珊瑚(新种) *Pachyfavosites impurus* sp. nov.

(图版IV,图7,8)

块状复体,由相互毗连的角柱状个体组成。个体横切面四—六边形,体径0.7—0.8mm为主。体壁直,厚度为0.1—0.15mm。壁孔稀少,壁孔的直径约0.05mm;壁刺稀少,短和钝;床板完全,水平。分布不均匀,大部分的间距为0.25—0.5mm,在近复体边部的间距较密集。

比较 新种个体毗连形态可与新疆和布克赛尔下泥盆统芒克鲁组的*Pachyfavosites hamatus*(王宝瑜,1981)近似,但后者有明显的隔壁刺及发育的壁孔与新种不同。内蒙古上志留统西别河组的*Pachyfavosites neimongoensis*(池永一,1976)与新种也有类似的个体特征,但新种的个体较小而与前者不同。

鳞巢珊瑚属 Genus *Squameofavosites* Tchernychev, 1941

古尔耶夫斯克鳞巢珊瑚 *Squameofavosites gurjevskiensis* Mironova, 1961

(图版III,图3,4)

1961 *Squameofavosites gurjevskiensis* Mironova, p. 151, pl. III, fig. 2;

pl. IV, figs. 1,

1963 *Squameofavosites gurjevskiensis*, Dubatov, p. 40, pl. XVI, figs. 1a-6, 2a-r.

1980 *Squameofavosites gurjevskiensis*, 池永一, 157页, 图版68, 图4a-6。

块状复体,由相互毗连的角柱状个体组成。个体横切面多边形,三—四边个体体径1.0—1.5mm,五—七边个体体径2.0—2.8mm。体壁直,较厚,厚度约0.2mm。个体的壁刺局部发育,钝刺状;壁孔1列,偶见2列,孔径约0.15mm,孔间间距为0.15—0.2mm。床板完全,水平,床板之间的间距为0.2—0.4mm。

比较 本种在俄罗斯库兹涅茨和北乌拉尔的早泥盆世早期地层中常见,池永一(1980)认为本种产出层位是上志留统二道沟组。当前标本与池永一描述的标本特征一致,因池永一所附的图版不够清楚,故作者补充新的图影。

吉林鳞巢珊瑚(亲近种) *Squameofavosites aff. jilinensis* Tchi, 1980

(图版IV,图3,4)

块状复体,由相互毗连的角柱状个体组成。个体横切面多边形,常见为三—七边形,体径为0.5—1.8mm。体壁直,厚度为0.1—0.15mm,在个体交角处稍厚些。壁孔1—2列,圆形,孔径约0.2mm,孔间间距为0.15—0.2mm。壁刺发育,在个体横切面上呈三角形。床板完全,水平,密集,床板之间的间距为0.2—0.25mm。

比较 在个体大小上,当前标本与池永一(1980)描述的标本相同,主要差别在于本文描述标本的床板更密集。

瘦弱鳞巢珊瑚(新种) *Squameofavosites vesus* sp. nov.

(图版II,图1,2)

块状复体,由相互毗连的角柱状个体组成。个体横切面多边形,三—六边形,体径为0.8—1.5mm。体壁直,厚度为0.1mm,壁刺细小,分布不均匀,在个体横切面上呈小型三角形刺状。壁孔1列,孔径为0.15mm,孔之间间距约0.5mm,部分壁孔靠近个体交角处分布。床板完全,水平,床板之间的间距为0.3—0.5mm。

比较 从个体的壁刺细小和分布不均匀以及个体毗连状态等特征看,新种与产于库兹涅茨早泥盆世早期的*Squameofavosites thetidis* Dubatolov相近似,但后者的个体明显大于新种;内蒙古格少庙上志

留统西别河组的 *Squameofavosites multiporus* (池永一, 1980) 个体形态与新种亦近似, 但前者的个体明显大于后者。

群居状鳞巢珊瑚 (比较种) *Squameofavosites cf. socialiformis* Dubatolov, 1969

(图版 III, 图 9; 图版 IV, 图 1, 2)

不规则树枝状复体。枝体横切面浑圆形, 8—12mm。个体在枝体轴部向上生长, 呈扇状排列, 与枝体表面呈锐角相交。轴部个体横切面多边形, 四—八边形, 体径 0.5—1.5mm; 边部个体体径稍增大。个体体壁厚度约 0.1mm, 到枝体边部未见明显增厚。壁刺在纵切面上的个体明显可见, 呈钝刺状。壁孔圆形, 1 列, 孔径 0.15mm, 孔间间距约 0.25mm。床板完全, 水平, 床板之间的间距 0.6—0.8mm。

比较 枝状复体的 *Squameofavosites* 很少, 俄罗斯东北部早泥盆世的 *Squameofavosites socialiformis* (Dubatolov, 1969) 具有枝状复体, 但有明显鳞刺状壁刺以及缺乏枝体边缘厚结带等特征与有边缘厚结带的 *thamnoporids* 枝体不同。当前标本与 *Squameofavosites socialiformis* 枝体内的个体不同的是后者个体较大, 个体体壁较厚, 壁刺更明显。

鳞巢珊瑚 (未定种) *Squameofavosites* sp.

(图版 III, 图 7, 8)

不规则的树枝状复体。枝体横切面浑圆, 直径 18—20mm。个体在枝体轴部向上生长, 呈扇形排列, 与枝体表面斜交; 个体横切面多边形, 主要是四—六边形, 体径 1.0—2.0mm。个别直径少于 1.0mm。个体体壁厚度约 0.15mm, 到枝体表面也不增厚。壁孔发育, 1—2 列, 部分壁孔靠近个体交角处, 孔径 0.2mm, 孔间间距为 0.25—0.3mm。壁刺细小, 但发育, 侧面尖三角形。床板完全, 水平, 床板之间的间距 0.3—0.4mm, 靠近枝体表面时的间距约 0.2mm。

比较 描述标本虽为枝状复体, 因未见边缘加厚带并且出现很发育的尖三角形壁刺及发育的壁孔, 暂作鳞巢珊瑚未定种。

厚孔珊瑚科 Family Pachyporidae Gerth, 1921

沟孔珊瑚属 Genus *Striatopora* Hall, 1851

巨萼沟孔珊瑚 *Striatopora macrosepala* Tchi, 1976

(图版 III, 图 1, 2)

1976 *Striatopora macrosepala* Tchi, 池永一, 114 页, 图版 41, 图 4a-b。

1980 *Striatopora macrosepala*, 池永一, 168 页, 图版 70, 图 4a-b。

树枝状复体, 枝体截面浑圆形, 直径 6.0—7.0mm。横切面上枝体轴部个体多边形, 四—六边形, 体径 0.5—1.0mm, 枝体边部的个体明显增长, 体径 1.25—1.3mm。枝体轴部个体体壁厚度约 0.1mm, 而边部个体体壁明显增厚, 厚度为 0.25—0.5mm。壁孔少, 仅在纵切面上看到。床板完全, 水平, 轴部个体的床板间距约 0.5mm, 边部个体床板间距约 0.3mm。

比较 描述标本除枝体轴部个体稍多之外, 其他特征与池永一(1980)描述的标本基本一致。

准沟孔珊瑚科 Family Parastriatoporidae Tchudinova, 1959

准沟孔珊瑚属 Genus *Parastriatopora* Sokolov, 1949

准沟孔珊瑚 (未定种) *Parastriatopora* sp.

(图版 III, 图 5, 6)

1 块不完整的标本。树枝状复体, 直径约 4mm。个体在枝体轴部呈扇状排列, 向上生长, 与枝体表面呈直角相交。横切面上轴部个体多边形, 四—六边形, 体径 0.2—0.5mm。体壁薄, 厚度约 0.2mm。个体向枝体表面体径加大, 通常约 1.25mm, 体壁增厚至 0.5mm。枝体边缘灰质加厚带不明显, 纵切面上具排列不规则及长短不一的隔壁刺, 壁孔稀少, 孔径约 0.15mm。床板未见, 可能因体壁增厚之故。

比较 当前标本为枝状复体以及有枝体边缘厚结带, 鉴于边部体壁有长短不一的壁刺, 内见不等长度的羽楣, 可归入 *Parastriatopora*。因标本不完整故作为未定种。

日射珊瑚科 Family Heliolitidae Lindstrom, 1876

准日射珊瑚属 Genus *Paraheliolites* Tong-Dzuy Thanh, 1966

模式种 *Paraheliolites minutus* Tong-dzuy Thanh, 1966, 越南北部, 下泥盆统。

复体多样, 个体截面浑圆形, 隔壁刺刺状或缺失, 床板完全, 水平或微波曲。中间管截面多边形, 横板完全, 水平或微波曲状。

比较 *Heliolites* 有 12 个板状隔壁, 而本属则有壁刺或缺失。

时代分布 志留纪至中泥盆世, 世界各地。

吉林准日射珊瑚 *Paraheliolites jilinensis* (Tchi, 1980)

(图版IV, 图5, 6)

1980 *Heliolites jilinensis* Tchi, 池永一, 184页, 图版70, 图6a-b.

块状复体, 由圆柱状个体和角柱状中间管组成。个体横切面圆形, 体径0.8—0.9mm。体壁一般圆滑, 厚度约0.05mm。未见壁刺。床板完全, 大部分平坦, 稀少微波曲。床板之间的间距0.3—0.8mm。个体周围有16—17个中间管。相邻个体之间的间距为0.4—1.25mm, 其间有2—4列中间管。中间管横切面四—六边形, 管径0.2—0.25mm。管壁厚度约0.03mm。管内横板完全, 平坦, 横板之间的间距为0.2—0.3mm。

比较 当前标本与池永一(1980)记述标本的特征基本相同。

隐藏准日射珊瑚(新种) *Paraheliolites obvellatus* sp. nov.

(图版I, 图7, 8)

块状复体, 由圆柱状个体和个体之间的中间管共同组成。个体截面圆形, 体径1.4—1.55mm。体壁不圆滑, 多呈纵皱状, 体壁厚度0.05—0.1mm。隔壁刺呈长刺状, 在一些个体内出现, 分布不均匀。床板完全, 水平, 少数倾斜, 床板之间的间距约为0.5—0.9mm。个体之间有3—5列角柱状中间管, 中间管截面四—六边形, 管径0.4—0.5mm。管壁厚度约0.05mm, 个体周围有14个中间管围绕。管内横板完全, 水平, 横板之间的间距0.25—0.4mm。

比较 新种与 *Paraheliolites jilinensis*, *P. salairicus* (池永一, 1980) 相比较, 不同之处是新种的个体较大, 具更多的壁刺。

假网膜珊瑚科 Family Pseudoplasmodoridae Bondarenko, 1963

假网膜珊瑚属 Genus Pseudoplasmodora Bondarenko, 1963

模式种 *Pseudoplasmodora conspecta* Bondarenko, 1963, 俄罗斯哈萨克斯坦, 上志留统。

块状复体, 由圆柱状个体和个体之间的角柱状中间管组成。个体体壁及隔壁的结构相同。隔壁或为刺状, 或缺失。床板完全, 平坦。每个个体被12个中间管围绕, 中间管横切面多边形。横板完全, 水平, 稀少不完全(Bondarenko, 1992)。

比较 本属主要特点是横切面上围绕个体的

12个中间管呈放射状分布, 并且它们也较邻近的中间管体径大些。

时代分布 欧、亚和美洲, 志留纪至早泥盆世。

腰坑假网膜珊瑚(新种) *Pseudoplasmodora yao-kengensis* sp. nov.

(图版I, 图1, 2)

块状复体, 由圆柱状个体和角柱状中间管组成。个体横截面圆形, 体径1.4—1.55mm。体壁厚度0.05—0.08mm。部分个体可见少量壁刺。床板完全, 水平或波曲。床板之间间距为0.25—0.5mm, 个别床板不完全, 下倾。个体被12个中间管围绕, 这12个中间管截面呈拉长的四—五边形, 管径为0.05—0.07 mm × 0.04—0.06mm。管壁厚度约0.05mm。相邻个体之间普遍为2列中间管, 偶尔为3列, 相邻个体的间距为0.75—1.2mm, 中间管内横板以完全的为主, 不完整的很少; 完全的横板以水平为主, 少数微倾斜。它们的间距为0.3—0.5mm。少量不完全横板呈倾斜。

比较 除腰坑地区之外, 本属早泥盆世的种目前仅见于南天山地区, 新种体径均大于南天山地区早泥盆世的种(邓占球, 1997)。新种的床板和横板更规则排列有别于中哈萨克斯坦早泥盆世的 *Pseudoplasmodora regularis* (Bondarenko, 1966)。

无刺假网膜珊瑚(亲近种) *Pseudoplasmodora aff. aseptata* (Regnell, 1941)

(图版I, 图3, 4)

块状复体, 由圆柱状和角柱状中间管组成, 个体横截面圆形, 体径1.25—1.3mm。体壁圆滑, 厚度约0.05mm, 未见壁刺。床板完全, 水平, 床板之间的间距为0.5—0.7mm。个体被12个中间管围绕, 呈放射状排列。相邻个体之间通常有2列中间管, 围绕个体的中间管截面呈拉长的多边形, 大小为0.5—0.8 mm × 0.4—0.6mm。中间管的管壁厚度约为0.05mm, 中间管的横板完全, 水平, 它们之间的间距为0.4—0.6mm。

比较 新种与 *Pseudoplasmodora aseptata* (Regnell, 1941) 相比, 个体与中间管的毗连形态近似, 但当前标本个体更大些。

感谢廖卫华馈赠部分化石标本; 程西亭代为制片, 陈周庆代为照相, 笔者在此一并致谢。

参 考 文 献

- 王宝瑜, 1981. 床板珊瑚、日射珊瑚部分. 见: 新疆地质局区域地质调查大队等主编. 西北地区古生物图册. 新疆维吾尔自治区分册(一). 北京: 地质出版社. 39—72
- 王宝瑜, 1988. 新疆天山志留纪生物群及古地理特征. 新疆地质, 6(4): 40—51
- 邓占球, 1986. 云南丽江、宁蒗早、中泥盆世床板珊瑚和日射珊瑚. 中国科学院南京地质古生物研究所丛刊, 7: 287—310
- 邓占球, 1997. 塔里木及其邻区志留纪、泥盆纪珊瑚. 古生物学报, 36(增刊): 116—135
- 邓占球, 1999. 新疆北部一些古生代床板珊瑚. 中国科学院南京地质古生物所著. 新疆北部古生代化石. 南京: 南京大学出版社. 187—269
- 邓占球, 杨道荣, 1985. 内蒙古达尔罕茂明安联合旗志留-泥盆纪床板珊瑚. 李文国、戎嘉余、董德源主编. 内蒙古达尔罕茂明安联合旗巴特敖包地区志留-泥盆纪地层与动物群. 呼和浩特: 内蒙古人民出版社. 103—144
- 刘发, 黄柱熙, 1977. 吉林省中部的志留纪地层及动物群. 长春地质学院学报, 7(1): 52—79
- 池永一, 1976. 床板珊瑚亚纲和日射珊瑚亚纲. 内蒙古自治区地质局等主编. 华北地区古生物图册、内蒙古分册. 北京: 地质出版社. 109—129
- 池永一, 1980. 床板珊瑚亚纲. 见: 沈阳地质矿产研究所等编. 东北地区古生物图册(一)、古生代分册. 北京: 地质出版社. 153—188
- 林宝玉, 池永一等, 1988. 床板珊瑚型珊瑚(一)、(二). 北京: 地质出版社. 1—454, 1—493
- 俞昌民, 吴望始, 赵嘉明, 张肇诚, 1963. 中国的珊瑚化石. 北京: 科学出版社. 1—390
- 俞昌民, 廖卫华, 1978. 云南丽江阿冷初下泥盆统四射珊瑚. 古生物学报, 17(5): 245—266
- 俞建章, 张文堂, 1951. 北满海相地层. 科学通报, 2(6): 625—629
- 郭鸿俊, 1962. 吉林二道沟群的志留纪三叶虫. 古生物学报, 10(3): 369—385
- 廖卫华, 郑春子, 1986. 吉林早泥盆世二道沟群的珊瑚群. 古生物学

- 报, 25(6): 622—635
- 廖卫华, 戎嘉余, 胡兆麟等, 1995. 吉林中部志留-泥盆纪生物地层、群落生态及生物古地理. 地层学杂志, 19(4): 241—249
- 穆恩之, 1962. 中国的志留系. 全国地层会议学术报告汇编. 北京: 科学出版社. 1—88
- Bondarenko O B. 1966. Heliolitoida of the Isenian Formation. In: Chetverikova N P and others (eds.). Stratigraphy and fauna of the Silurian and Lower Devonian deposits of the Nurin synclinerium. 145—197
- Bondarenko O B. 1992. Heliolitoid System. 1—204
- Dubatulov V N. 1959. Silurian and Devonian Tabulata, Heliolitida, and Chaetetida from the Kuznetsk Basin. Vses. Neft. Nauchno-issled. Geol. razved. Inst. (VNIGRI), Tr., 139: 1—293
- Dubatulov V N. 1962. Tabulata and Heliolitida of Silurian and Devonian sediments from Rudno Altai. M. ezd'no Akad Nauk SSSR. 3—80
- Dubatulov V N. 1963. Late Silurian and Devonian Tabulata, Heliolitida, and Chaetetida from the Kuznetsk Basin. Akad Nauk SSSR (Moscow), 193 p.
- Dubatulov V N. 1969. Tabulata and biostratigraphy of the Lower Devonian of the North-Eastern USSR. Akad Nauk SSSR, Sibirskoe otd., Inst. Geol. Geofiz., Tr., 70: 1—179
- Hill, D., 1981. Rugosa and Tabulata. In: Teichert C. (ed.). Treatise on invertebrate paleontology, Part F. Coelenterata, Supplement 1 (in 2 vols.) Geological Society of America and University of Kansas. 1—762
- Mironova N V. 1961. New genus of Tabulata of the Family Coenitidae. Sibirskogo Nauchno-issled. Inst. Geol. Geofiz. Mineral. Syrya (SNIIGGIMS), 15: 177—179
- Regnell G. 1941. On the Silur-Devonian Fauna of Choltagh Eastern Tien-Shan. Part. 1, Anthozoa. Pal. Sinica, Rept. Sino-Swartz Mem. Exp. publ., 17
- Yabe H. Eguchi M. 1944. Discovery of *Pseudomophyma* in the limestone of Erhtaokou near Kirin, Manchuri. Proc. Imp. Acad. Tokyo. 20
- Yabe H. Eguchi M. 1945. *Spongophyllum* from the middle Gotandian limestone of Erhtaokou near Kiturin, Mansyu. Japan Academy, Proceedins, 21(9): 431—434

TABULATOMORPHIC CORALS FROM THE ERHTAOKOU FORMATION OF JILIN PROVINCE

DENG Zhan-Qiu

(Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing 210008)

ZHENG Chun-Zi

(Regional Geological Survey Institute of Jilin Province, Changchun 130022)

Key words Tabulata, Heliolitida, Erhtaokou Formation, Early Devonian, Jilin

Summary

For dozens of years, the faunas from the Ertaokou Formation of Jilin have been studied successively by some palaeontologists, such as Yabe H. and Eguchi M. (1944, 1945); Yu Jian-zhang and Zhang Wan-tong (1951); Mu En-zhi (1962); Guo Hong-jun (1962); Yu Chan-ming and others (1963); Liu Fa and Huang Zhu-xi (1997) and others. Their works provided usefully paleontologic and stratigraphic data about this formation. In 1976 and 1980, Tchi Yong-yi worked on some tabulate and heliolid corals from the Ertaokou Formation but he assigned the coral-bearing formation to Upper Silurian. In 1986, Liao Wei-hua and Zheng Chun-zi studied some rugosan corals from the same formation and they pointed out that these rugosan corals from this formation were peculiar to early Early Devonian.

The corals described here were collected from the Ertaokou Formation at Yaokeng (Key locality), western Jilin City by Liao Wei-hua and Zheng Chun-zi in 1984 and they contain both tabulate and heliolid corals (including 8 genus, 16 species) and are listed as follows (cf. Table 1):

Favosites multiplicatus Yanet, *F. polaris similus* subsp. nov., *Mesofavosites jilinensis yongjiensis* subsp. nov., *Pachyfavosites rariporus* Dubatolov, *P. impurus* sp. nov., *Squameofavosites gurjevskiensis* Mironova, *S.* aff. *jilingensis* Tchi, *S. vescus* sp. nov., *S.* cf. *socialisformis* Dubatolov, *S.* sp., *Striatopora macroseptata* Tchi, *Parastriatopora* sp., *Paraheliolites jilinensis* (Tchi, 1980), *P. obvellatus* sp. nov., *Pseudoplasmodora yaokengensis* sp. nov., *P.* aff. *aseptata* (Regnell, 1941).

In the above-stated corals, *Favosites multiplicatus* had been found from Early Devonian strata of Kuznetsk Basin and eastern Ural. In the features of corallites and tabulae, *Favosites polaris similus* is similar to *Favosites polaris* known from Early Devonian of western Ural, Kolyma and Xinjiang. *Squameofavosites gurjevskiensis* had been reported from the Early Devonian strata of Ural and from the Tom-Chumysh bed of early Early Devonian of Kuznetsk Basin. *Pachyfavosites rariporus* had been also known from the late Early Devonian strata of

Kuznetsk Basin. The character of *Pachyfavosites impurus* may be comparable to *Pachyfavosites hamatus* occurring in the Monklu Formation of late Early Devonian strata, northern Xinjiang.

Among the heliolid corals, *Pseudoplasmodora* aff. *aseptata* bears a close resemblance to *Pseudoplasmodora aseptata* from the Arpishmebulaq Formation of eastern Xinjiang by some features about corallites and coenenchymal tubules but differs from the latter by larger corallites. It is well known that the Arpishmebulaq Formation had been assigned to Upper Silurian (Wang Bao-yu, 1980) but it has been assigned to lower Lower Devonian now (Deng Zhan-qiu, 1999). Thus, the Ertaokou Formation may be equivalent to the Arpishmebulaq Formation in geologic age.

As stated above, the tabulate and heliolid corals of the Ertaokou Formation have close relationship with those of Early Devonian, in other words, the geologic age of the coral-bearing formation is not Late Silurian but early Early Devonian, as concluded by Liao and Zheng.

DESCRIPTION OF NEW SPECIES

Family Favositidae Dana, 1846

Genus *Favosites* Lamarck, 1816

Favosites polaris similus subsp. nov.

(Pl. I, figs. 5, 6)

Corallum massive and hemispherical. Prismatic corallites adjoined one another and polygonal in outline, tri-octagonal in general. Large corallites hexa-octagonal, 1.4–2.0 mm in diameter, small ones, tri-pentagonal, 0.7–1.0 mm in diameter. Corallite walls straight, 0.1–0.15 mm in thickness; median line (or suture) in wall is not clear. Mural pores form one row on the wall surface, 0.05–0.1 mm in diameter, spaced about 0.15 mm apart. Septal spines are small and rare. Tabulae complete, horizontal, spaced 0.6–1.0 mm apart.

Comparison The subspecies is compared with *Favosites polaris* (Dubatolov, 1969; Deng Zhan-qiu, 1997), both of them resemble each other by features of corallites adjoining one another, but the former differs from the latter in having thinner walls and smaller mural pores as well as smaller and less septal

spines.

Genus *Mesofavosites* Sokolov, 1951

Mesofavosites jilinensis yongjiensis subsp. nov.

(Pl. II, figs. 3, 4)

Massive Corallum consists of prismatic corallites. In transection, corallites have polygonal outline, generally tri-hexagonal. The large corallites penta-hexagonal, 1.5–1.7mm in diameter, small ones tri-triangular, 1.0–1.25mm in diameter, corallite walls straight, 0.1–0.15mm in thickness. Septal spines are small and rare or absent. Mural pores not many, about 0.15mm in diameter, spaced about 0.8mm apart, corner pores of corallites are rare, about 0.05mm in diameter. Tabulae complete, horizontal, slightly oblique and concave in a few and spaced 0.5–0.15 apart.

Comparison *Mesofavosites jilinensis* and the subspecies resemble each other in the features of corallites, but the former differs from the latter by a great disparity between the large and the small corallites in size. *Mesofavosites boculiformis* (Deng Zhan-qiu, 1986) differs from the subspecies in having more septal spines.

Genus *Pachyfavosites* Tchernychev, 1951

Pachyfavosites impurus sp. nov.

(Pl. IV, figs. 7, 8)

Corallum massive, consists of prismatic corallites. In transection, corallites have polygonal outline and are tetra-hexagonal and 0.7–0.8mm in diameter. Corallite walls straight and 0.1–0.15mm in thickness. Mural pores are rare and form one row on the corallite wall, about 0.05mm in diameter. Septal spines few, thin and short. Tabulae complete, horizontal and not well distributed, spaced 0.25–0.5mm apart but denser near surface of corallum.

Comparison The species is similar to *Pachyfavosites hamatus* (Wang Bao-yu, 1981) by aspect of corallites forming in corallum, but differs the latter by poorly developed both septal spines and mural pores.

Genus *Squameofavosites* Tchernychev, 1941

Squameofavosites vescus sp. nov.

(Pl. II, figs. 1, 2)

Irregular massive corallum, prismatic corallites

adjoined one another, and polygonal in outline, tri-hexagonal in general, 0.8–1.5mm in diameter. Corallite walls straight and 0.1mm in thickness. Mural pores generally one row on the wall surface, about 0.15mm in diameter and spaced about 0.5mm apart, moreover, some other mural pores visible near the corner of wall. Septa are small and mainly in the form of trigonal spines in transection of some corallites. Tabulae complete, horizontal and oblique in a few, spaced 0.3–0.5mm apart.

Comparison This species bear a resemblance to *Squameofavosites thetidis* (Dubatolov, 1962), in having similar corallites and small trigonal spines in some corallites but differs the latter by smaller corallites. *Squameofavosites multiporus* (Tchi Yong-yi, 1980) resembles this species by features of corallites but differs from this species by larger corallites.

Family Heliolitidae Lindstrom, 1873

Genus *Paraheliolites* Tong-Dzuy Thanh, 1966

Paraheliolites obvellatus sp. nov.

(Pl. I, figs. 7, 8)

Corallum massive, composed of cylindrical corallites and tubular coenenchyme. In transection, corallites circular in outline, 1.4–1.5mm in diameter, corallite walls 0.05–0.1mm in thickness and septal spines partly long and thick. Tabulae complete, horizontal, few slightly concave, spaced 0.5–0.9mm apart. Corallite is usually surrounded by 14 coenenchymal tubules with complete wall. 3–5 rows of coenenchymal tubules stand between corallites and the distances between corallites are 0.5–0.9mm. The tubules are tetra-hexagonal in outline, 0.4–0.5mm in diameter and tubular walls about 0.05mm in thickness. Diaphragms complete, horizontal, spaced 0.25–0.4mm apart.

Comparison The present species differs from both *Paraheliolites jilinensis* and *P. salairicus* (Tchi Yong-yi, 1980) by larger corallites and well septal spines partly. This species is also similar to *Paraheliolites uncinatus similis* (Deng Zhan-qiu, 1997) by the size of corallites but differs from the latter by well-developed septal spines and corallite with 14 coenenchymal tubules surroundingly.

Family Pseudoplasmodiidae Bondarenko, 1963

Genus *Pseudoplasmodora* Bondarenko, 1963*Pseudoplasmodora yaokengensis* sp. nov.

(Pl. I, figs. 1, 2)

Corallum massive, composed of cylindrical corallites and tubular coenenchyme. In transection, corallites circular in outline, 1.4—1.55mm in diameter, corallite walls 0.05—0.08mm in thickness and septal spines rare. Tabulae complete, horizontal or slightly concav, spaced 0.25—0.6mm apart. Corallite is surrounded by 12 coenenchymal tubules. The corallites are spaced 0.75—1.2mm apart and in between 2 (rarely 3) rows of coenenchymal tubules developed. These tubules are generally elongately tetra-hexagonal in outline, 0.05—0.07mm × 0.04—0.06mm in diameter. Tubular walls about 0.05mm in thickness, diaphragms complete, horizontal, spaced 0.3—0.5mm apart.

Comparison This species differs from *Pseudoplasmodora aseptata minor* and *P. turpanensis* (Deng Zhan-qiu, 1997) in having larger corallites and larger coenenchymal tubules and differs from *Pseudoplasmodora regularis* (Bondarenko, 1966) by larger corallites and more frequently 2 rows coenenchymal tubules between corallites.

图版说明

全部标本均取自吉林市西郊的腰杠剖面(T-II),薄片保存在中国科学院南京地质古生物研究所标本室。

图版 I

- 1, 2. *Pseudoplasmodora yaokengensis* sp. nov.
 1. 横切面, ×4; 2. 纵切面, ×4; 登记号: 132041, 132042; 采集号: T-II-31; holotype。
- 3, 4. *Pseudoplasmodora* aff. *aseptata* (Regnell, 1941)
 3. 横切面, ×4; 4. 纵切面, ×4; 登记号: 132043, 132044; 采集号: T-II-172。
- 5, 6. *Favosites polaris similis* subsp. nov.
 5. 横切面, ×4; 6. 纵切面, ×4; 登记号: 132015, 132016; 采集号: T-II-82; holotype。
- 7, 8. *Paraheliolites obvellatus* sp. nov.
 7. 横切面, ×4; 8. 横切面, ×4; 登记号: 132045, 132046, 132047;

采集号: T-II-114; holotype。

图版 II

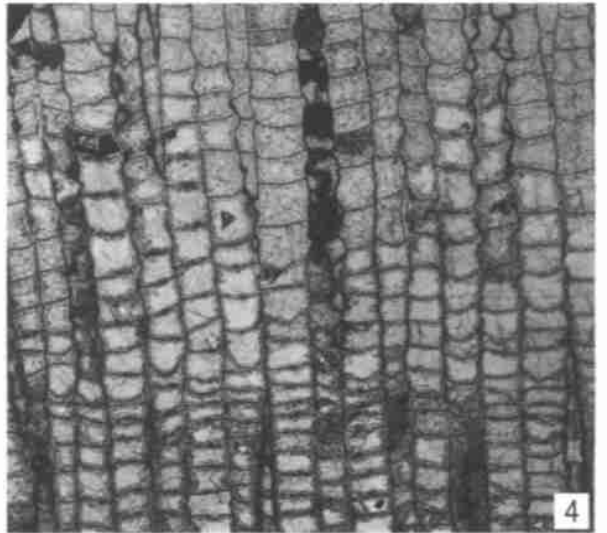
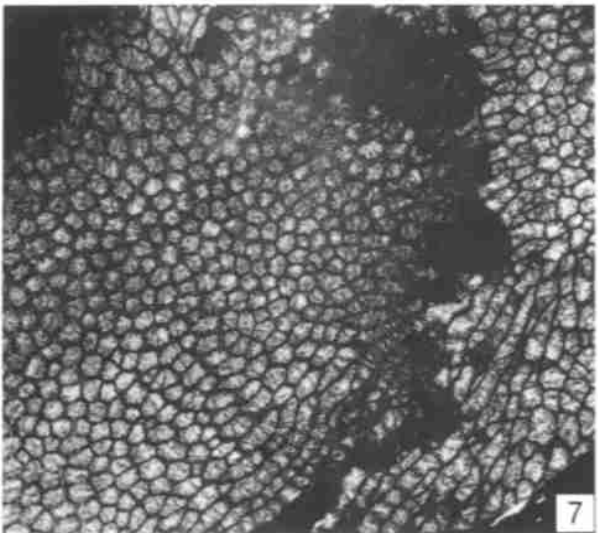
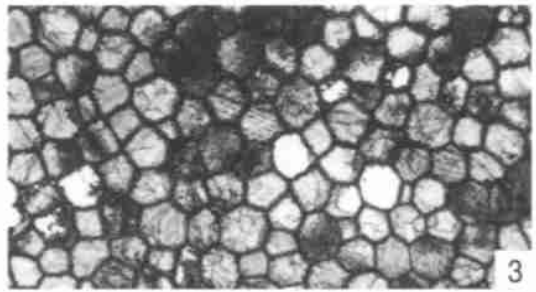
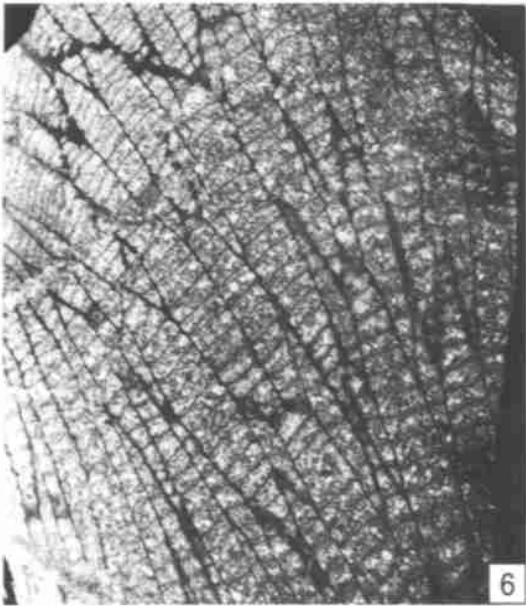
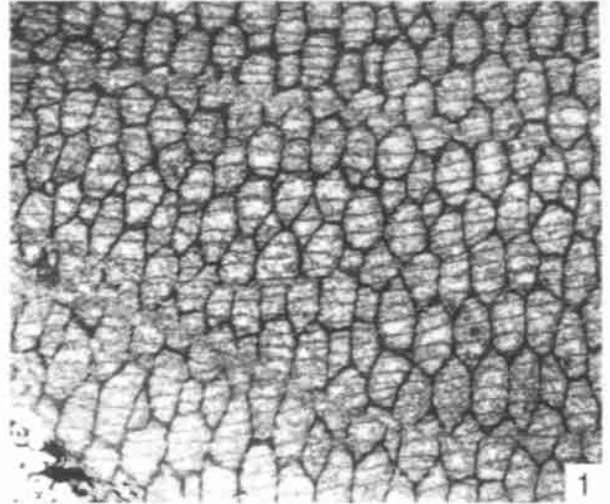
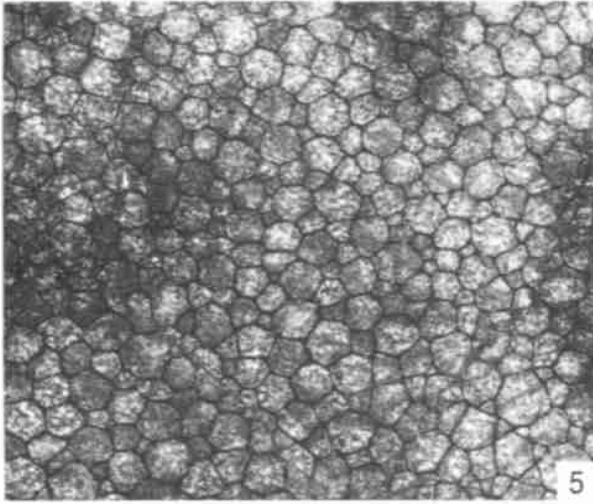
- 1, 2. *Squameofavosites vesus* sp. nov.
 3. 横切面, ×4; 4. 纵切面, ×4; 登记号: 132021, 132022; 采集号: T-II-152; holotype。
- 3, 4. *Mesofavosites jilinensis yongjiensis* subsp. nov.
 3. 横切面, ×4; 4. 纵切面, ×4; 登记号: 132019, 132020; 采集号: T-II-108; holotype。
- 5, 6. *Favosites multiplicatus* Yanet (in Dubatolov, 1959)
 5. 横切面, ×4; 6. 纵切面, ×4; 登记号: 132017, 132018; 采集号: T-II-53。
7. *Pachyfavosites raiporosus* Dubatolov, 1963
 - 横切面, ×3; 登记号: 132014; 采集号: T-II-170-1。

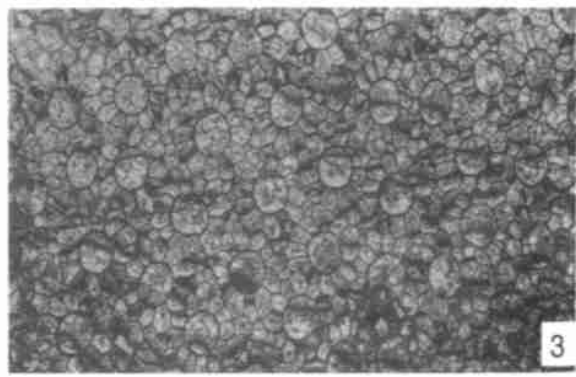
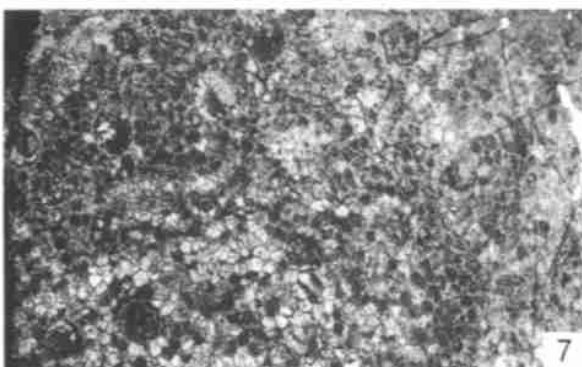
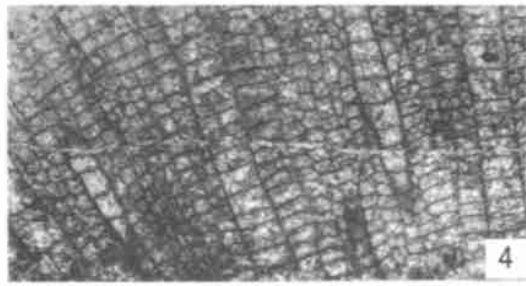
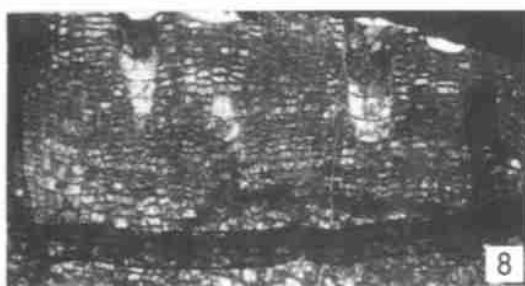
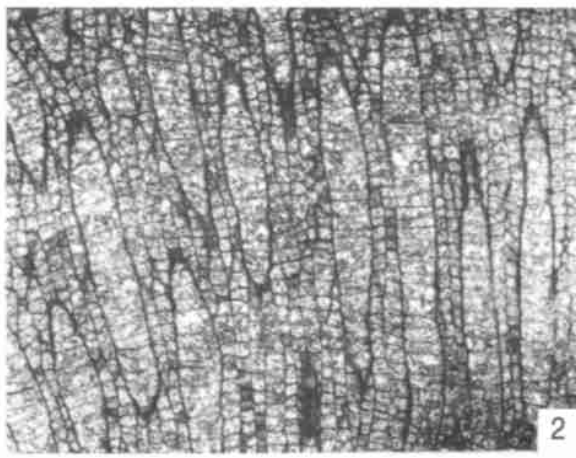
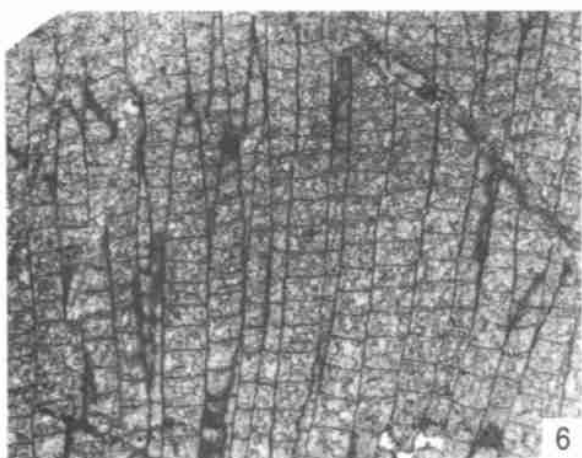
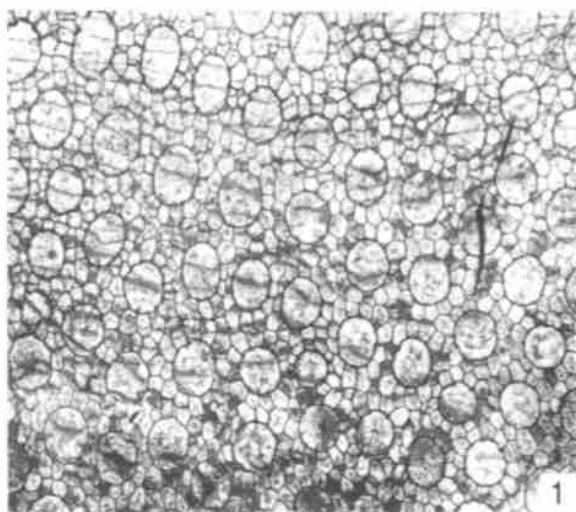
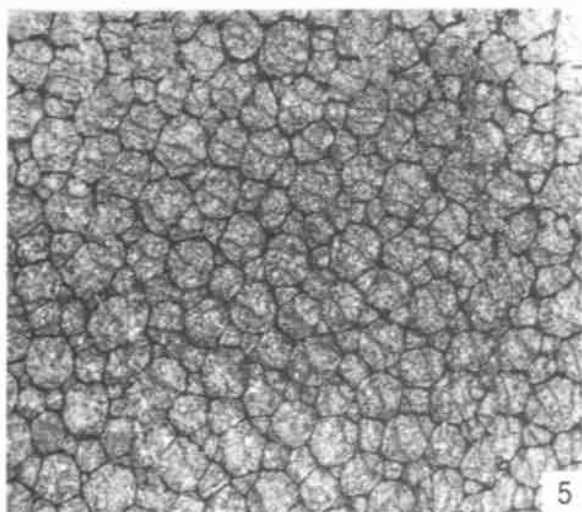
图版 III

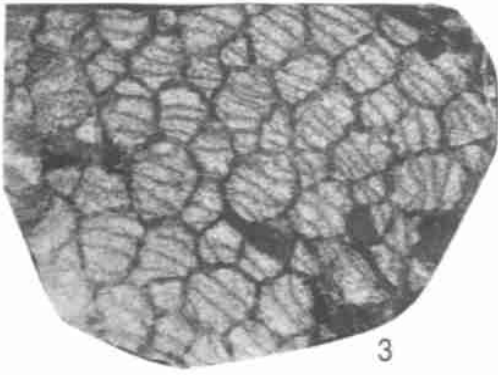
- 1, 2. *Striatopora macroseptata* Tchi, 1980
 1. 横切面, ×10; 2. 纵切面, ×10; 登记号: 132024, 132025; 采集号: T-II-7。
- 3, 4. *Squameofavosites gurjevskiensis* Mironova, 1961
 3. 横切面, ×4; 4. 纵切面, ×4; 登记号: 132026, 132027; 采集号: T-II-44。
- 5, 6. *Parastriatopora* sp.
 5. 横切面, ×10; 枝体表面存在? *Alveolites* sp.; 6. 纵切面, ×10, 围绕枝体的? *Alveolites* sp.; 登记号: 132028, 132029; 采集号: T-II-75。
- 7, 8. *Squameofavosites* sp.
 7. 横切面, ×3; 8. 纵切面, ×3; 登记号: 132030, 132031; 采集号: T-II-62。
9. *Squameofavosites* cf. *socialisformis* Dubatolov, 1969
 - 横切面, ×6; 登记号: 132032; 采集号: T-II-10。

图版 IV

- 1, 2. *Squameofavosites* cf. *socialisformis* Dubatolov, 1969
 1. 横切面, ×6; 2. 纵切面, ×6; 登记号: 132033, 132034; 采集号: T-II-10。
- 3, 4. *Squameofavosites jilinensis* Tchi, 1980
 3. 横切面, ×4; 4. 纵切面, ×4; 登记号: 132035, 132036; 采集号: T-II-39。
- 5, 6. *Paraheliolites jilinensis* (Tchi, 1980)
 5. 横切面, ×4; 6. 纵切面, ×4; 登记号: 132037, 132038; 采集号: T-II-101。
- 7, 8. *Pachyfavosites impurus* sp. nov.
 7. 横切面, ×6; 8. 纵切面, ×6; 登记号: 132039, 132040; 采集号: T-II-11; holotype。







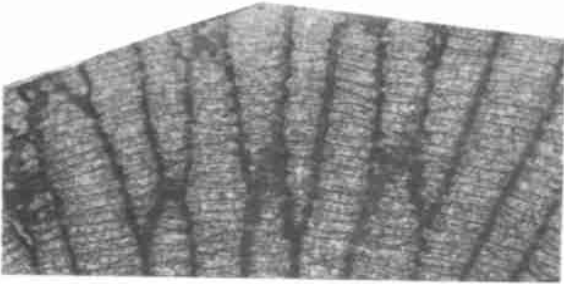
3



9



1



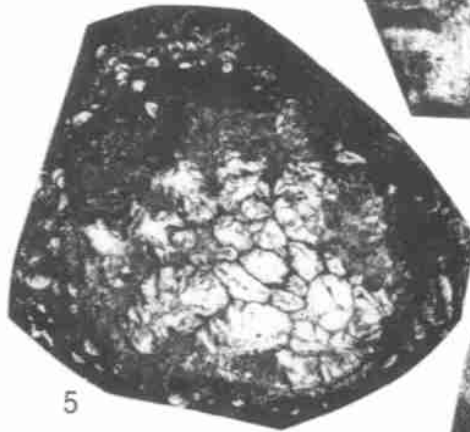
4



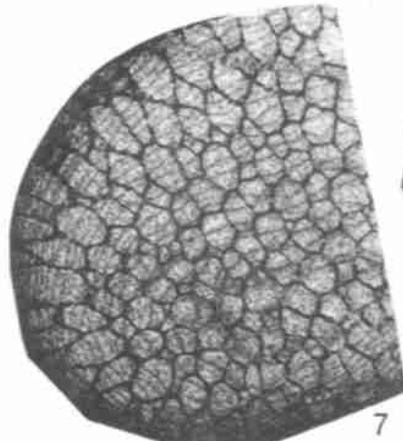
2



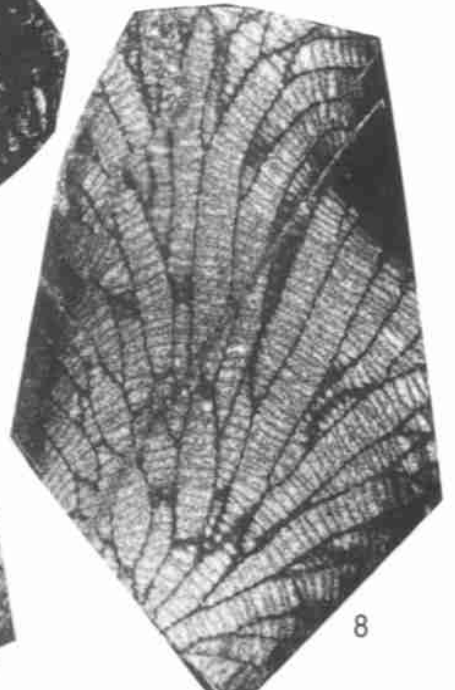
6



5



7



8

