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Middle and Late Carboniferous gastropods from the Central part of the Russian Plate: part 2. Platyceratidae

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The systematic diversity and stratigraphic distribution of the gastropod family Platyceratidae from the Middle and Upper Carboniferous rocks of the Central part of the Russian Plate have been studied.

The previously known species, *Capulus parasiticus* Trautschold, 1867, is redescribed as *Platyceras (Platyceras) parasiticum*. The well-known associations of *P. (P.) parasiticum* with crinoids are recognized as commensalism. The mode of life of *P. (P.) parasiticum* and ***P. (Orthonychia) egorovi* sp. nov.** and its influence on their individual variation types, as well as feasible reasons of the appearance of these types are discussed.

The muscle scar patterns of the platyceratid gastropods are studied. An attempt of analysis of functional morphology of columellar and dorsal muscles of platyceratid gastropods has been made.

Numerous findings of platyceratids attached to crinoid calyxes are considered to be an evidence of the premature death of both of them as a result of catastrophic events. Most of layers containing patches with abundant complete fossilized crinoids with attached platyceratids are suggested to be tempestites.

The genera *Strophostylus*, *Platyceras* (subgenera: *Platyceras* and *Orthonychia)* and species *S. girtyi* (Knight, 1934) are reported from the Middle and Late Carboniferous of the region for the first time.

New species described in this paper are: ***Platyceras (Platyceras) neverovoensis, P. (Orthonychia) ivanovi, P. (O.) egorovi, Strophostylus sitnyensis.***

Средне- и позднекаменноугольные гастроподы центральной части Русской плиты: часть 2. Platyceratidae.

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Изучен систематический состав и стратиграфическое распределение представителей семейства Platyceratidae из отложениий среднего и верхнего карбона Центральной части Русской плиты.

Уточнена диагностика и систематическое положение *Platyceras (Platyceras) parasiticum* (Trautschold, 1867). Хорошо известная ассоциация *P. (P.) parasiticum* с криноидеями рассматривется как комменсализм. Рассмотрены образ жизни *P. (P.) parasiticum* и его влияние на типы изменчивости, и возможные причины образования этих типов.

Изучены мускульные отпечатки платицератид. Проведен морфофункциональный анализ коллюмелярного и дорзального мускулов платицератидных гастропод.

Многочисленные находки платицератид, прикрепленных к чашечкам криноидей, рассматриваются как свидетельство преждевременной смерти обоих организмов в результате катастрофических явлений. Предполагается, что большинство слоев, содержащих участки с обильными неразрозненными остатками криноидей с прикрепленными платицератидами являются штормовыми отложениями (темпеститами).

Впервые в отложениях среднего и верхнего карбона Центральной части Русской плиты отмечается присутствие родов *Platyceras* и *Strophostylus*, подродов *Platyceras* и *Orthonychia*, а также вида *S. girtyi* (Knight, 1934). Описаны новые виды: ***Platyceras (Platyceras) neverovoensis, P. (Orthonychia) ivanovi, P. (O.) egorovi, Strophostylus sitnyensis.***

INTRODUCTION

This article continues the study of the Middle and Late Carboniferous gastropods from the Central part of the Russian Plate and includes descriptions of members of the family Platyceratidae.

Only two works concerning the systematics of platyceratid gastropods of the Middle and Later Carboniferous of the Central part of the Russian Plate have been published more than a century ago. Trautschold [1867] described a new species, *Capulus parasiticus*, from a quarry near Myachkovo village, Myachkovian and Krevyakinian Provincial Stages. In the present paper I have transferred this species to *Platyceras (Platyceras)*. Later Trautschold [1874] described two new species: *Capulus mitraeformis* and *Capulus pumilis*. Unfortunately, their holotypes have been lost and the figures are not good enough for the comparison with the collection materials available. There are also several papers containing figures of *Platyceras (Platyceras) parasiticum* attached to the crinoid calyxes from the quarry near Myachkovo village: Trautschold [1867, pl. 5, fig. 5 a; 1879, pl. 3, figs. 7, 8]; Yakowlew and Ivanov [1956, pl. 2, fig. 1b]; Yochelson [1956, pl. 23, figs. 17-20].

In this paper, in addition to previously known *P. (P.) parasiticum*, one new species of the subgenus *Platyceras*, two new species of the subgenus *Orthonychia* Hall, 1843, and two species of the genus *Strophostylus* Hall, 1859 (one of them, *S. girtyi* (Knight, 1934), was previously known from the Mid-Pennsylvanian of Kansas) are described here. The species of *Platyceras, Orthonychia*, and *Strophostylus* are recorded for the first time in the region studied.

Over and above, the material from the Moscow Basin was used in several works for the consideration of crinoid-platyceratid relationships.

Trautschold [1879] noted that shells of *Platyceras (Platyceras) parasiticum* were attached near anal opening of a crinoid and therefore suggested that the mollusk could obviously utilize some of crinoid food or/and fecal materials.

Yakowlew in 1926 and in the second edition of the paper of 1956 considered crinoid-platyceratid relationships as a cleaning symbiosis or commensalism. He based on the fact, that the apertural margin of platyceratid reflects the irregularity of the tegmen surface of the host crinoid and leaves rounded imprints on the latter. The relationships were very stable according to Yakowlew [1926], the crinoid-platyceratid connection was so close that the mollusk could not leave his host after the death of the crinoid and therefore sometimes platyceratid gastropods were buried being attached to the crinoid calyxes. However, this seems to be an aspect of taphonomy rather than that of ethology. On the other hand, crinoid-platyceratid relationships were a very stable cleaning symbiosis. I believe that the relationships are commensalism.

MATERIAL AND STRATIGRAPHIC DISTRIBUTION

All specimens used in this study were found in numerous quarries and outcrops in the Moscow Basin. The localities are shown in Fig. 1. Stratigraphic settings of several main localities are shown in Fig. 2. The stratigraphic scheme of the Middle Carboniferous of the Central part of the Russian Plate has been accepted from Shik [1979]. The total register of localities of the Middle and Upper Carboniferous gastropod specimens is given in the Supplement, with additions and corrections as compared to the register in the preceding paper [Mazaev, 1994].

The collection was supplemented by the private collection of A.P.Ivanov. The latter consists of not numerous but very important specimens some of which were taken as holotypes of ***Platyceras (Orthonychia) ivanovi* sp. nov.** and ***Strophostylus sitnyensis* sp. nov**. The crinoid calyxes with attached *P. (P.) parasiticum* were kindly offered to me by J.A. Arendt (Paleontological Institute, Russian Academy of Sciences).

All platyceratid gastropods including specimens of *Strophostylus* have fine-preserved calcite shells. It is all the more interesting because