

BOUNDARY SEDIMENTS OF VISEAN AND SERPUKHOVIAN STAGE IN BIG KARATAU (SOUTH KAZAKHSTAN)

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ABSTRACT

The article describes the foraminiferal Visean and Serpukhovian zones in the Big Karatau. In uppervisean substage there are distinguish zones *Endothyranopsis compressa* - *Paraarchaediscus krestovnikovi*, *Eostaffella proikensis* - *Asteroarchaediscus*, *Eostaffella ikensis* and *Eostaffella tenebrosa*. In Serpukhovian stage discovered a complex area *Neoarchaediscus parvus*. According to new data in thin sections *Janischewskina delicata* was founded. This article description the foraminiferal zones from different sections of the Big Karatau.

Keywords: *Eostaffella*, *Endothyranopsis*, *Neoarchaediscus*.

INTRODUCTION

Kazakhstan is part of the unified global community in which there is the International Union of Geological Sciences (IUGS) and International Union Commission on Stratigraphy (IUC). International Commission on Stratigraphy involved in the creation of the International Stratigraphic Scale (ISS) [1, 2]. In this regard, they practice stages of stratotypes and points of global stratotypes boundaries of systems and stages (PGSB). After the special stratigraphic-paleontological studies conducted in the last decade around the world, was adopted last option ISS approved by the 31st, 32nd and 33rd sessions of the International Geological Congress (IGC) in Rio de Janeiro, in the Florence and Brisbane. In Russia and the post-Soviet republics adopted General Stratigraphic Scale (GSS), approved by ICS (Russia) in 1997, which largely coincides with the ISS [3]. Kazakhstan has also used the GSS, adopted in 1992 in Russia, but without the changes approved by ISS Russia in 1997 [4].

Variant of General Stratigraphic Scale of Carboniferous System used in Kazakhstan has developed in Russia in the 70s and then was adopted in 1986 by the Stratigraphic Meeting, after which no change in the Scale of Kazakhstan, because Stratigraphic Commission of Kazakhstan doesn't work last time. Thus, there are questions about the boundary Visean and Serpukhovian sediments which reviewed earlier and continue studied [5].

The upper limit of Visean accepted parastratotype in France and upper boundary is drawn of Goniatits zone E1, which corresponds to lower boundary of Foraminiferal zones Cf₇ in Franco-Belgian Basin and lower boundary of Foraminiferal zones *Pseudoendothyra globosa-Neoarchaediscus parvus* of the Biostratigraphic Zonal Standard [6,7,8].

RESEARCH

In Russia, also was studied the characteristics of the Serpukhovian stratotype, which is in Moscow suburb [9]. Reference points in Kazakhstan can serve well characterized by fauna of the section of Serpukhovian stage in Big Karatau [10, 11].

The best studied sections in the north-western part of the Big Karatau are Zhanakurgan, Aktobe, Akuyuk, Zhertansay, Ushozen, etc. (Figure 1). The authors think that studying and revising the biostratigraphic units of sediments in Big Karatau are not considered complete, and suppose depth study of Foraminifera and other organic residues in this stratigraphic level for to more accurately solve the problem.

Due to the fact that the Visean stage is divided into two substages the top boundary of Upper Visean is the *Endothyranopsis compressa - Paraarchaediscus krestovnikovi* zone [12].

Zone Endothyranopsis compressa - Paraarchaediscus krestovnikovi is determined in sections of Zhertansay -"lower", Zhanakurgan, Akuyuk, Ushozen, Aktobe.

This zone is determined in section Zhertansay-"lower" by the availability of type-indexes *Endothyranopsis compressa* (Raus. et Reitl.) and *Paraarchaediscus krestovnikovi* Raus., and the typical *Archaediscus*, *Brunsia* (*B. irregularis* Moell., *B. lenensis* Bog. et Juf., *B. pulchra* Mikh., *Omphalotis omphalota* Raus. et Reitl., *O. angusta* Durk.).

In section Zhanakurgan this area is highlighted by type-indices *Endothyranopsis compressa*-*Paraarchaediscus krestovnikovi*. Besides them there are *Archaediscus grandiculus* Schlyk., *A. karreri* Brady., *Brunsia lenensis* Bog. et Juf., *B. irregularis* Moell., *B. pulchra* Mikh., *B. spirillinoides* Grozd. et Leb., *Lituotubella*, *Eostaffella*.

Due to organic poverty and identity systems in section Akuyuk it is difficult to separate the two areas. Here the age of this interval of the section is indicated by the fossils *Endothyranopsis cf. compressa* Raus. et Reitl., *Omphalotis* (*Omphalotis cf. omphalota* Raus. et Reitl., *O. pannusaeformis* Schlyk., *O. tantilla* Schlyk., *O. minima* Raus. et Reitl.), *Globoendothyra cf. globulus* Eichw., as well as other *Endothyranopsis* and *Endothyra*. There are species and types: *Mediocris*, *Endostaffella*, *Lituotubella*, *Pojarkovella*. The upper section there are a large number of fossils: *Tetrataxis* (*Tetrataxis angusta* Viss., *T. conica* Ehrenb., *T. obtusa* Mal, *T. paraminima* Viss., *T. acutus* Durk, etc.) (Figure 2).

Zone *Eostaffella proikensis* - *Asteroarchaediscus* recorded in the same section. M.M Marfenkova divided upper Permian sediments of Big Karatau into two zones: the lower *Endothyranopsis crassa* - *Valvulinella angulata* - *Asteroarchaediscus rugosus* and upper *Forschiella prisca* - *Bradyina rotula* - *Howchinia gibba* [11]. Then despite the limited researched material, her division was extended to the entire Big Karatau and were distributed to two zones (lower and upper): the first - *Endothyranopsis crassa* - *Asteroarchaediscus* and second *Bradyina rotula* - *Howchinia gibba*, and the lower bound upper Permian substage taken at the base of the zone *Endothyranopsis crassa* - *Asteroarchaediscus* [12]. On the Russian platform this stratigraphic level was recorded as the emergence *Endothyranopsis crassa*, *Archaediscus gigas* and *Eostaffella proikensis* and this complex was identified with the sole area *Eostaffella proikensis* - *Archaediscus gigas* [Uniform ..., 1990] and on the correlation this border with the Franco-Belgian pool is roughly equivalent to border regional divisions *Livian* - *Warnantian*, slightly above the foraminiferal zones Bf₆, in the sole conodont zone *Gnathodus bilineatus* [7, 13]. For International correlations foraminifera this level is fixed by the appearance of representatives *Asteroarchaediscidae* [14].

In section Zhertansay with high granularity identified there are three foraminiferal zones, which by its characteristics resemble the closest complexes with views of the former top-indices visa Russian platform. The complex *Eostaffella proikensis* replaced with complex *Eostaffella ikensis* and ends with complex *Eostaffella tenebrosa*, characteristics of which are given below.

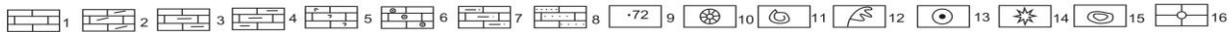
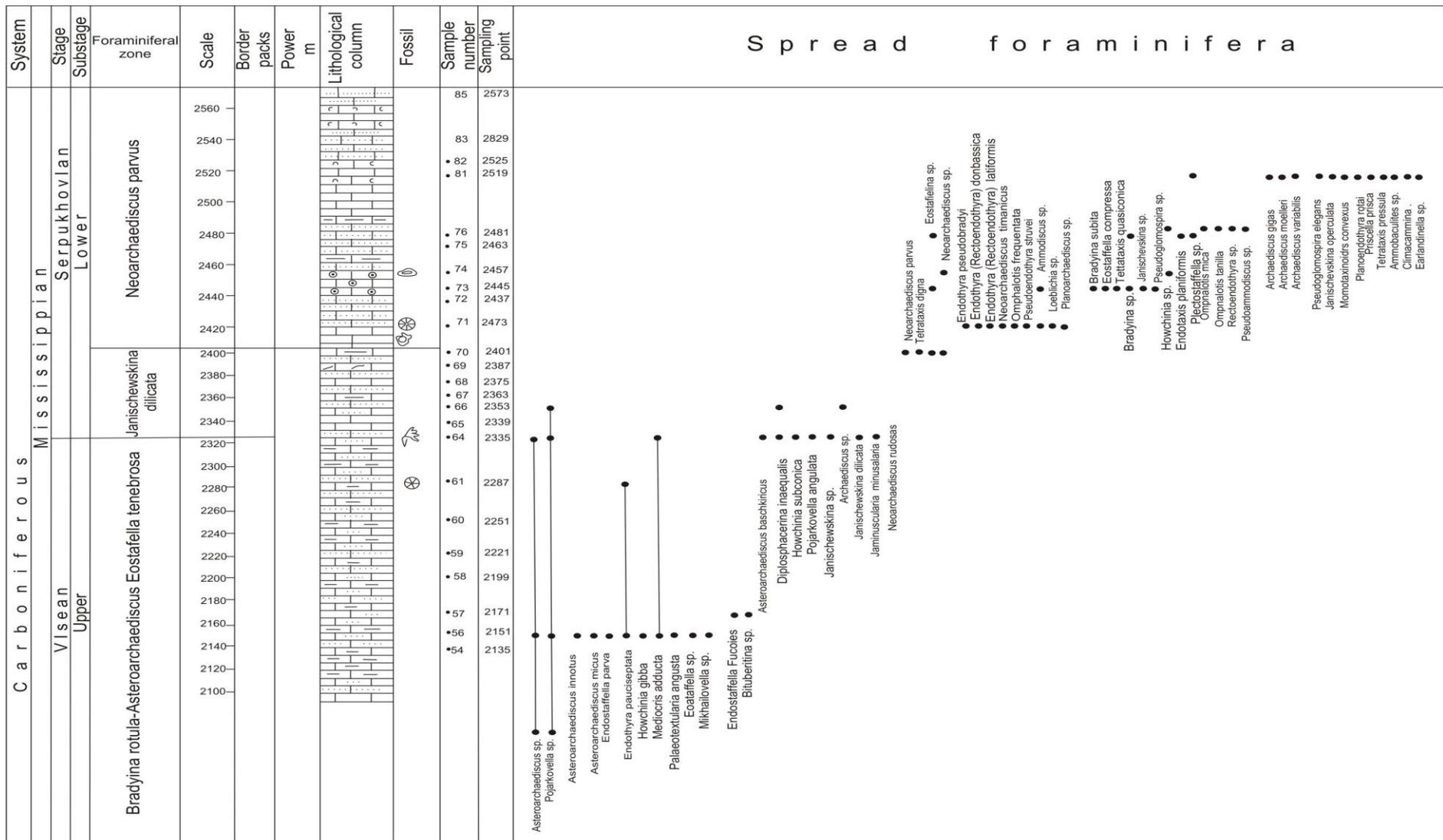
The base area *Eostaffella proikensis*-*Asteroarchaediscus* was established by the appearance of *Asteroarchaediscus sp.*, unknown to the older sediments. The overlying layers of the section due to the nature of sediments the results for foraminifera were not given. Perhaps this is due to the large sampling interval of the section, and only 40 meters above complex appears, similar the zone *Eostaffella proikensis* - *Archaediscus gigas*, known in Moscow syncline [15]. Sediments of Big Karatau were characterized by finding *Asteroarchaediscus* (*Asteroarchaediscus cf. baschkiricus* Krest. Et Theod., *A. ovoides* Krest. Et Raus., *A. rugosus* Raus., *Endothyranopsis crassa* (Brady), *E. compressa* Raus. et Reitl., many *Archaediscus* (*Archaediscus gigas* Raus., *A. kottjubensis* Raus.), there *Forschia*, *Pseudolituotubella*, *Palaeotextularia*, *Cribrostomum*, *Omphalotis*, *Bradyina* and *Globoendothyra*. Besides the index species *Eostaffella proikensis* noted the appearance and *Eostaffella mosquensis* Viss. continue

to exist *Eoendothyranopsis* (*Eoendothyranopsis mediocriformis* Sol., *E. cf. scitula* Toomey).

An updated complex of **zones** *Eostaffella ikensis* met in the section of Zhertansay, Zhanakurgan, Akuyuk, Ushozen, Aktobe.

Apart from the species index *Eostaffella ikensis* Viss. appear following: *Janischevskina*, *Bradyina rotula* (Eichw.), *B. cf. potanini* Venuk. There are widely developed *Archaediscus karreri* Brady, *Omphalotis minima* Raus. et Reitl., *O. involuta* Brazhn., *O. samarica* Raus. and others.

Asteroarchaediscus, various *Eostaffella*, *Endostaffella*, *Plectogyranopsis*, *Pojarkovella nibelis* Durk., *P. ketmenica* Sim. continue their development. *Cribrospira*, *Lituotubella* and *Haplophragmella* reducing the number. Increasing role of *Pseudoendothyra*. They are dominated by *Pseudoendothyra* (*Parastaffella*) *concinna* Schlyk., *P. angulata* Raus., *P. sublimis* Schlyk., *P. cf. struvei* Moell. etc.



1-limestones; 2-dolomitic limestones; 3-clay limestones; 4-Limestone with siliceous rod; 5-clastic limestone organo; 6- crinoid limestone; 7-limestone aleurolite; 8-granular limestone; 9-sampling points and their numbers; 10-foraminifera; 11- brachiopods; 12- conodonts; 13- crinoids; 14-sponges; 15-weed; 16- radiolarians

Figura 2. Distribution of foraminifera in the border Visean-Serpukhov sediments sections Zhankurgan (Big Karatau)

Zone *Eostaffella tenebrosa* is allocated in the section of Zhertansay. Poor complexes are found in sections Zhanakurgan and Akuyuk.

In section Zhertansay this zone allocated by the appearance of index species *Eostaffella tenebrosa* Viss., but most of the known forms from the underlying sediments. Those are *Eostaffella ikensis* Viss., *E. parastruvei* Raus., *Eoendothyranopsis*, *Endothyranopsis*, *Endostaffella* and *Mediocris*. The first is *Biseriella*. This complex on the upper part of zone is very peculiar. It is characterized by a predominance of different species of the genus *Eoendothyranopsis*. This is *Eoendothyranopsis scitula* Toomey, occurring in older sediments. *Eoendothyranopsis ermakiensis* (Leb.), *E. aff. spiroides* Zell. are discovered at first, and apparently new or unknown types of this genus (*Eoendothyranopsis sp. nov.*) found in Karatau. Together with *Eoendothyranopsis* present huge forms of the genus *Pseudoendothyra*, for example such as *Pseudoendothyra cf. ornata* Durk., *P. bona* Ros., *P. ampla* and others. The structure of the wall of *Eoendothyranopsis* and *Pseudoendothyra* are similar, although the morphology of the shell is difference. There are individual species *Endothyranopsis cf. crassa* Brady, *Eostaffella cf. ikensis* Viss., but *Tetrataxis* with a thick layer of glass wool-radiant is badly preserved. The complex shows the pool was shallow.

The upper part of upper Visayan sediments of Zhanakurgan were not divided into three biozone. As in section Zhertansay the boundary between zones is traced by the first appearance *Asteroarchaediscus*. Together with them in this section were appeared *Bradyina rotula* Eich. and *Forschia mikhailovi* Dain., which in the section of Zhertansay were found in the sediments above the first appearance of *Asteroarchaediscus*. May be fractional interval of sampling, this boundary in the section of Zhanakurgan may descend down of the section to 100 meters. The complex of foraminifers from upper Visayan of Zhanakurgan section is typical for the area *Bradyina rotula-Howchinia gibba*, previously selected in the Big Karatau [11, 12]. As already mentioned, in the complex were appeared *Asteroarchaediscus* (*Asteroarchaediscus innotus* Sim., *A. micus* Pojark., *A. baschkiricus* Krest. Et Theod.), *Bradyina rotula* Eichw., *B. cf. modica* Reitl, and *Howchinia cf. gibba* Moell., *H. subconica* Brazhn., *Endothyranopsis crassa* Brady are rare and there are in the upper part of the zone. *Globoendothyra* (*Globoendothyra globulus* Eichw., *G. parva* Tchern.), *Mediocris*, *Pojarkovella*, *Endostaffella*, *Endothyra*, *Pseudoendothyra*, *Palaeotextularia* widespread. There are *Cribrostomum*, *Forschia*, rarely *Eostaffella*, *Archaediscus*, and single *Mikhailovella*. This entire complex is present on *Asteroarchaediscus*, *Bradyina*, etc. can be associated with zones of *Eostaffella ikensis* and *Eostaffella tenebrosa* section Zhertansay. In addition there are *Archaediscus grandiculus* Schlyk., *A. karreri* Brady, various *Brunsia*, *Lituotubella* and *Eostaffella*. Apparently, the complex of zone *Eostaffella proikensis* - *Asteroarchaediscus* discharged from sampling interval in the section of Zhanakurgan not met.

In section Akuyuk foraminiferal complex of upper Visayan is poor and does not allow to allocate zonal sequence. The main background is *Endostaffella*, *Endothyranopsis*, *Plectogyranopsis*, *Mediocris*, and *Calcisphaera*, *Eotuberitina*, *Earlandia*, etc. The appearance of rare *Forschia*, *Loeblichia*, *Endothyranopsis cf. crassa* Brady, *Endothyra cf. pauciseptata* Raus. indicates the upper Visayan age of the surrounding sediments. There are *Archaediscus* and *Propermodiscus*, and *Omphalotis wjasmensis* Gan., *O. pannusaeformis* Schlyk., *O. mica* Pojark., *O. omphalota* Raus. and other.

Dzhamansorina, *Valvulinella*, *Uralodiscus* and *Pseudoendothyra* are rare. *Planoarchaediscidae* continues to exist. Described complex characterizes the upper Visean **zone *Endothyranopsis crassa* - *Archaediscus gigas*** of biozonal standard [8].

In all of the sections of upper Visean sediments there are one and two-chamber foraminifers: *Galcisphaera*, *Eotuberitina*, *Tuberitina*, *Diplosphaerina*, *Earlandia*, *Earlandinella* etc.

Currently the Serpukhovian border in sediments of the Lower Carboniferous of Big Karatau adopted on the lower boundary of foraminiferal **zones *Neoarchaediscus parvus* - *Pseudoendothyra globosa***. However, correlation Serpukhovian (Russian platform) (has been isolated in the Moscow Carboniferous paleobasin [Nikitin, 1890]) with Namur (Franco-Belgian basin) is problem. Due to chosen index-species for the lower Serpukhovian *Neoarchaediscus parvus* in the Franco-Belgian Basin appears in Foraminifera Zone Cf₆, which is interpreted as upper Visean. This specie is sometimes described as Venevsk horizon of Russian platform; it is difficult to understand the exact thickness of Serpukhovian [15]. The second spice-index *Pseudoendothyra globosa* in lower zone of serpukhov sediments in Big Karatau is extremely rare. The zonal subdivision of Serpukhovian in Russia were proposed by E.I. Kulagina and N.B. Gibshman, and they allocated zone *Neoarchaediscus postrugosus* - *Eolasiiodiscus donbassicus* - *Janischewskina delicata* in the lower part of Serpukhovian [9]. Needs for more detailed to study of this interval and determination of index species for the border Visean and Serpukhovian in the Big Karatau, which is supposed to make further studies.

Serpukhov stage, lower substage, zone *Neoarchaediscus parvus*. Zone was allocated according to preliminary data. The complex of this zone met in sections Zhertansay, Zhanakurgan, Aktobe and Ushozen.

Zone ***Janischewskina delicata* - *Neoarchaediscus postrugosus*** lower Serpukhovian substage determine according the new data, because in the section Zhanakurgan is found *Janischewskina delicata*.

The complex of zone is found in the section Zhanakurgan. There are *Archaeosphaera grandis* Lipina, *Diplosphaerina maljavkini* Mikhailov, *D. inaequalis* (Derville), *D. insiquus* Conil et Lys, *Tuberitina bulbacea* Gallovei et Harlton, *Earlandia elegans* (Rausser et Reitlinger), *Paracaligelloides serpuchoviensis* Brazhnikova, *Paracaligella antropovi* Lipina, *Endothyranopsis crassa* Brady, *En. compressa* (Rausser et Reitlinger), *Omphalotis minima* (Rausser et Reitlinger), *Globoendothyra globulus* (Eichwald), *G. aff. inconstans* Grozdilova et Lebedeva, *Eostaffella aff. mosquensis* Vissarionova, *Planoendothyra spirilliniformis* (Brazhnikova et Potievskaja), *Eoendothyranopsis cf. scitula* (Toomey), *E. mediocriformis* Solovjeva, *E. cf. donica* (Brazhnikova et Rostovzeva), *E. aff. ermakiensis* (Lebedeva), *E. contracta* Simonova, *Bradyina rotula* (Eichwald), *Janischewskina minuscularia* (Ganelina), *Jan. typica* Mikhailov, *Jan. delicata* (Malakhova), *Mirifica mirifica* Rausser, *Mikhailovella cf. gracilis* Ganelina, *Endostaffella cf. discoidea* Girty, *En. shamordini* (Rausser), *En. delicata* Rosovskaja, *En. fucoides* Rosovskaja, *Endothyra aff. bowmani* Phillips, *Mediocris mediocris* (Vissarionova), *Mediocris brewiscula* Ganelina, *Biseriella aff. procera* (Postojalko), *Asteroarchaediscus subbaschkiricus* (Reitlinger), *Globivalvulina aff. pulchra* Reitlinger, *Archaediscus grandiculus* Schlykova, *A.aff. angulatus* Sosnina, *Asteroarchaediscus baschkiricus* (Krestovnikov et Theodorovich), *Biseriella cf. parva* N. Tschernysheva.

Further study of the border Visian and Serpukhovian in other sections of the Big Karatau is needed. Determination of the lower boundary of Serpukhovian and the choice of its stratotype (GSSP) are included among the priority tasks, International Working Group of the Sub-Commission on the Stratigraphy of the Carboniferous system (ISC) have worked since 2002.

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