



Early Carboniferous spiriferoid brachiopods from the Qaidam Basin, Northwest China: Taxonomy, biostratigraphy and biogeography

G.R. Shi ^{a,*}, Zhong-Qiang Chen ^b, Sangmin Lee ^a, Li-Pei Zhan ^c

^a School of Life and Environmental Sciences (Burwood Campus), Deakin University, Geelong, Australia

^b State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences (Wuhan), Wuhan 430074, China

^c Institute of Geology, Chinese Academy of Geological Sciences, Beijing, China

Received 14 March 2016; received in revised form 25 June 2016; accepted 6 July 2016

Abstract

Six Early Carboniferous brachiopod species in four genera of the Superfamily Spiriferoidea are described from the Qaidam Basin, northwestern China, including a new genus, *Qaidamospirifer*, and two new species: *Grandispirifer qaidamensis* and *Qaidamospirifer elongatus*. Additionally, a new genus, *Triangulospirifer*, is also proposed to replace *Triangularia* Poletaev, 2001 that was preoccupied by a Devonian molluscan genus.

On the basis of the new material as well as published information, we have reviewed the taxonomic composition and the stratigraphic and palaeobiogeographic distributions of the three previously established genera from the viewpoint of palaeobiogeography. The study reveals that *Grandispirifer* has a relatively long stratigraphic range from the late Tournaisian to Serpukhovian. During this interval, the genus attained a wide geographical distribution, reaching Northwest China, western Yunnan of West China, Japan, as well as Iran and North Africa. *Angiospirifer* first occurred in western Europe in the Viséan, and later migrated to North Africa during the late Viséan. In the Serpukhovian, it migrated eastward, reaching the Donets Basin of Ukraine and the Qaidam Basin in Northwest China. *Anthracothyryna* evolved from *Brachythyryna* in North Africa in late Viséan, then dispersed north-westward to western and eastern Europe and, further eastward to the Qaidam Basin during the Serpukhovian.

© 2016 Elsevier B.V. and Nanjing Institute of Geology and Palaeontology, CAS. All rights reserved.

Keywords: Spiriferoid brachiopods; Lower Carboniferous; Palaeobiogeography; Qaidam Basin; *Qaidamospirifer*; *Triangulospirifer*

1. Introduction

The Early Carboniferous brachiopod faunas from the Qaidam Basin in Northwest China (Fig. 1) have received limited attention, due to the area's remoteness and poor accessibility. As a follow-up study of the Early Carboniferous athyridid brachiopods from the Qaidam Basin (Chen et al., 2003), the present paper focuses specifically on the spiriferoids. The detailed taxonomy of these spiriferoids not only allows us to further constrain the age of the faunas, but also provides new insights into the biogeographical aspects of the Early Carboniferous brachiopod faunas as constrained by the contemporaneous

palaeogeographic/palaeoclimatic conditions of the Qaidam Basin and neighbouring tectonic blocks.

2. Stratigraphy and age

Although a number of stratigraphic studies have been published for the Qaidam Basin in Northwest China (e.g., Lu and Zhao, 1962; Yang et al., 1962a, 1962b; Mu et al., 1963a, 1963b, 1963c; Wang, 1981, 1987, 1990; Shi, 1983), the detailed Lower Carboniferous stratigraphy of this basin was not firmly established until recent times. According to Chen et al. (2003), the Lower Carboniferous in the Qaidam Basin is sandwiched between the underlying Ordovician and overlying Upper Carboniferous rocks, and comprises the Chuanshangou, Chengqianggou, and Huaitoutala formations in ascending order (Fig. 2). Lithologically, the Chuanshangou Formation is characterized by the alternation of conglomerate and sandstone in

* Corresponding author at: 221 Burwood Highway, Burwood, Vic 3125, Australia.

E-mail address: grshi@deakin.edu.au (G.R. Shi).



Fig. 1. Simplified map showing the location of the Chuanshangou section of the Qaidam Basin, Qinghai Province, Northwest China (from Chen et al., 2003). Legends: (1) highway; (2) railway; (3) town; (4) city or county town; (5) salty lake; (6) outcrop section.

the lower part, and by various limestone facies in the upper part. The overlying Chengqianggou Formation is dominated by bioclastic limestone and sandstone, intercalated with minor cherty limestone, siltstone and black shale. The uppermost Huaitoutala Formation is defined by alternating sandstone and bioclastic limestone in the lower part and by argillaceous limestone in the upper part (Fig. 2). These three formations are exposed typically at the Chuanshangou section in the Amunike Mountain, Wulan County, Qinghai Province, Northwest China (Fig. 1), and all the brachiopod specimens described here were collected from this section (Fig. 2).

Several specimens of *Grandispirifer mylkensis* Yang came from the bioclastic limestone in the upper part of the Chengqianggou Formation. The co-existing brachiopods include *Schellwienella* sp., *Buxtonia* cf. *dengisi* Nalivkin, *Tylothyris laminosa* (McCoy), and *Cyrtina hibernica* Brunton (Fig. 2). Chen et al. (2003) referred the upper part of the Chengqianggou Formation to the late Tournaisian in age, based on brachiopod faunal correlation and the associated coral *Ekvasophyllum heijianshanensis*-*Cystocyathoclisia sinensis* Assemblage (Wang, 1987, 1990).

Grandispirifer mylkensis and *Grandispirifer* sp., as well as *Echinoconchella elegans* (McCoy) and *Fluctuaria undata* (Defrance), are present in the basal bed of the Huaitoutala Formation (Fig. 2). Although *G. mylkensis* persists from the underlying Chengqianggou Formation, *E. elegans* and *F. undata* are both characteristic of the Viséan in western Europe, the Urals, Russian Platform, central Asia, Northwest China and South China (e.g., Muir-Wood and Cooper, 1960; Litvinovitch, 1962; Galitzkaja, 1977; Yang, 1978). Accordingly, this brachiopod assemblage from the basal bed of the Huaitoutala Formation can be more precisely assigned to the Viséan.

The majority of the spiriferoid species described here were obtained from the upper part of the Huaitoutala Formation, containing *Grandispirifer qaidamensis* n. sp., *Grandispirifer* sp., *Angiospirifer trigonalis* (Martin), *Anthracothyrina bressoni* (Legrand-Blain), and *Qaidamospirifer elongatus* n. gen. n. sp. These spiriferoids are also associated with other brachiopods including *Gigantoproductus edelburgensis* (Phillips), *Kansuella kansuensis* Chao, and *Striatifera striata* (Fischer de Waldheim) (Fig. 2). This brachiopod assemblage is characteristic of the Serpukhovian in Northwest China, such as in the Tarim Basin (Ustritsky, 1960; Chen and Shi, 2003; Chen, 2004), Tianshan-Junggar areas (Yang, 1964; Zhang et al., 1983), and Qilianshan areas (Yang et al., 1962b; Jin et al., 1979). In addition, the *Gigantoproductus*-dominated brachiopod faunas are widely considered to indicate a middle Viséan–middle Serpukhovian age (Qiao and Shen, 2015, references therein cited). On this basis, the upper part of the Huaitoutala Formation can be assigned to the Serpukhovian in age.

3. Palaeobiogeographic distributions: centres of origin and migratory paths of *Grandispirifer*, *Angiospirifer*, and *Anthracothyrina*

Grandispirifer Yang, 1959 has been known from widely distributed areas in the Palaeo-Tethys during the Viséan (Table 1). The genus was originally erected with materials from the lower Viséan succession of the northern Tianshan areas, Xinjiang, Northwest China (Yang, 1959, 1964). Later, it was also reported from the Viséan of the southern Junggar Basin, Xinjiang, Northwest China (Zhang et al., 1983); of western Yunnan, Southwest China (Jin, 1987); and of the Akiyoshi Limestone Group, southwestern Japan (Yanagida, 1989; Tazawa et al., 2016). Further,

Download English Version:

<https://daneshyari.com/en/article/5788279>

Download Persian Version:

<https://daneshyari.com/article/5788279>

[Daneshyari.com](https://daneshyari.com)