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Upper Silurian Acritarchs and Chitinozoans from the Suffi Formation in Borehole KH5/1, Western Iraqi Desert

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Abstract. Well-preserved acritarchs, chitinozoans and a few miospores have been reccorded from grey fissile shales at depths between 1520-1600m within the Suffi Formation in the western Iraqi desert. The acritarch and chitinozoan assemblages recovered indicate the material to be of late Ludlovian age.

Introduction

The Suffi Formation was named by Radosevice [1] after the Suffi village in the Gaara depression. The formation has no surface outcrops and is conformably overlain by the Gaara Formation. Its type locality is in borehole KH5/1, located approximately 60km north of Rutba city (Fig. 1). The borehole was drilled with several others as a part of a hydrogeological investigation in the Western desert. The borehole KH5/1 cuts through 1600m of sedimentary rocks belonging to two formations.

The Gaara Sandstone Formation (0-726m), which crops out in the Gaara depression, is mainly composed of white or purple red ferruginous quartzitic sandstone interbedded with white or grey kaolinitic claystone.

The newly named Suffi Formation is composed of sandstone, siltstone, marl and shale, with thin dolomite or dolomitic limestone beds. The studied part of the core comes from the 1520-1600m interval and is of dark grey fissile shale (Fig. 2).

Sample Preparation

All three samples (A237, A247, A253 at depths 1522m, 1570m, 1600m respectively) are composed of dark grey shale and productive. Each sample was washed and broken, where necessary, into 2mm fragments followed by treatment with con-

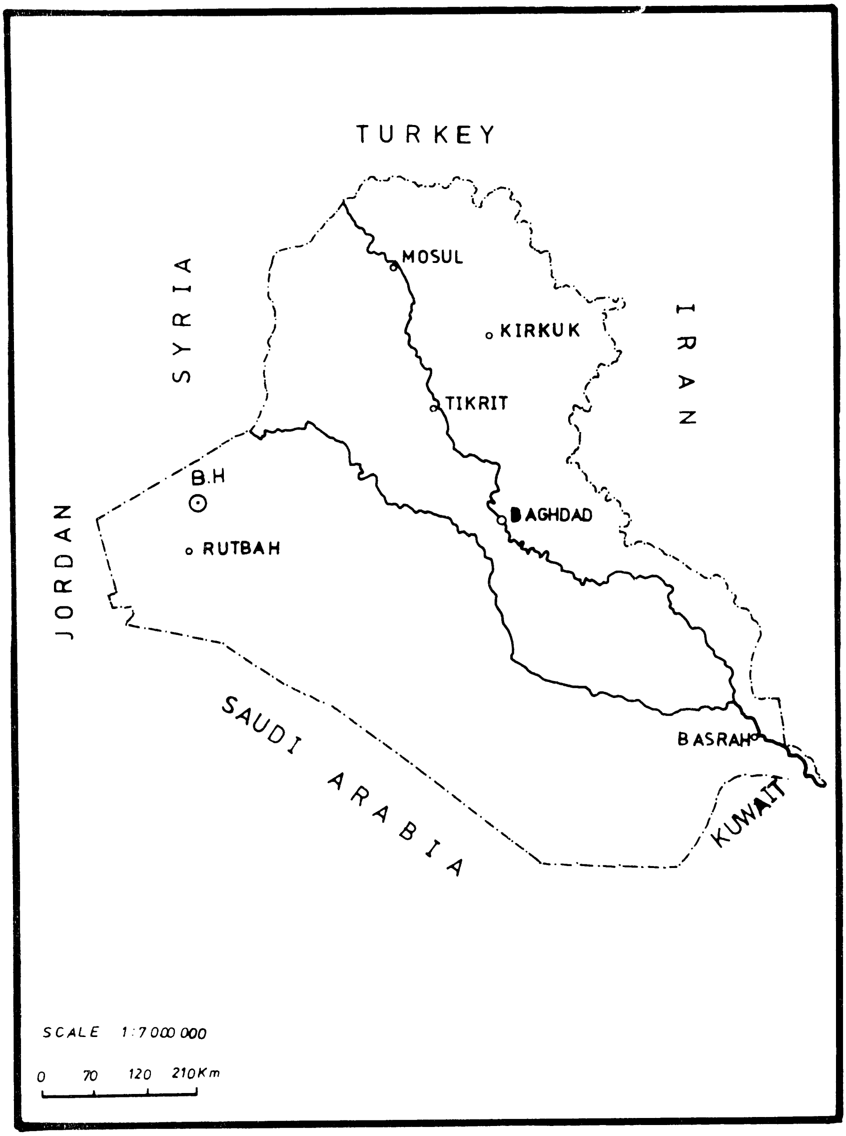

Fig. 1. Location of borehole KH5/1

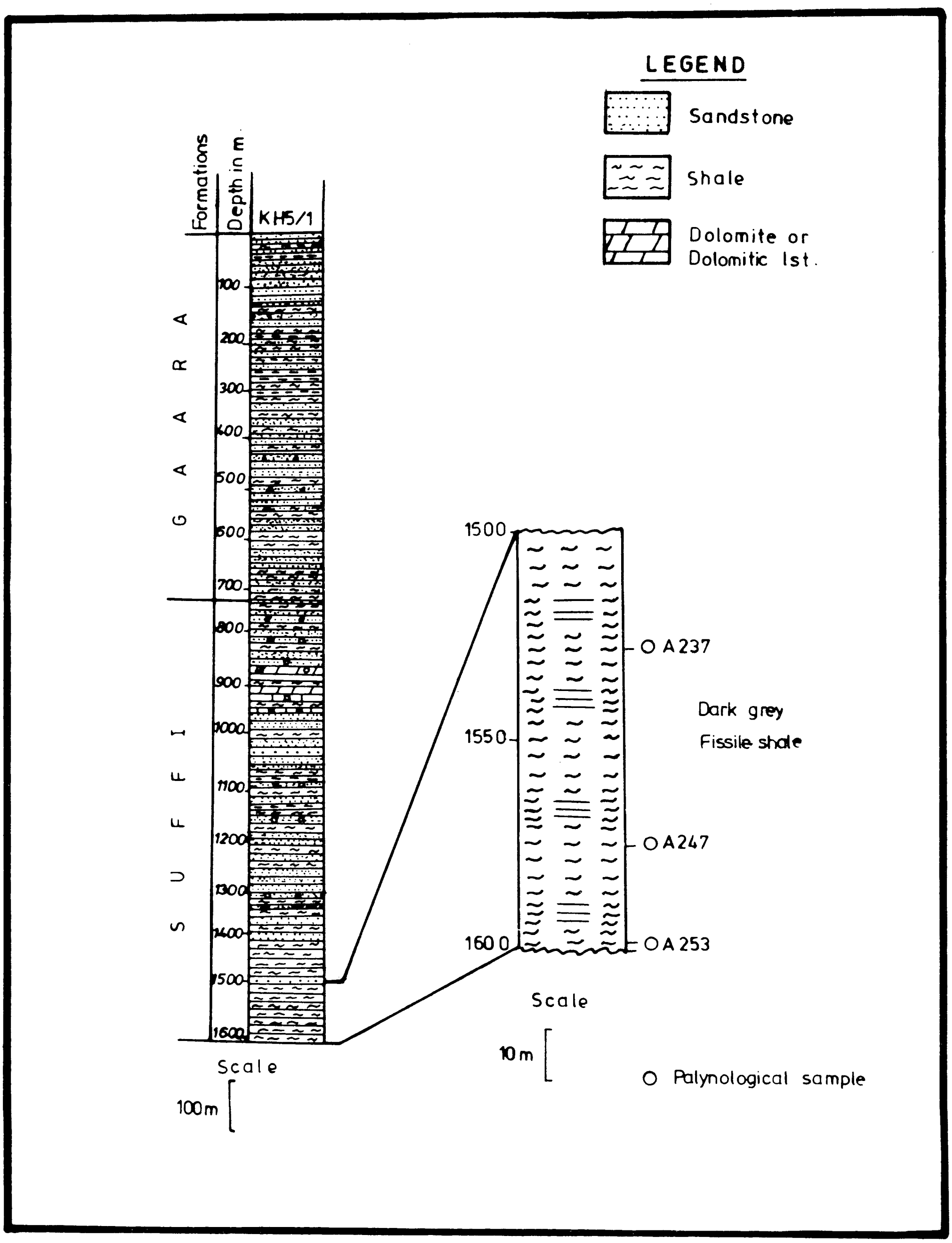

Fig. 2. Generalized succession and stratigraphic position of the samples studied from borehole KH5/1 Western Iraqi Desert.

centrated hydrochloric acid for 24 hr to remove soluble carbonate. The samples were washed with distilled water and treated with 37% hydrofluoric acid for 2-3 days. The samples were washed with distilled water until neutral and were then oxidised with concentrated nitric acid. Utmost care was exercised to prevent breakage of chitinozoa, thus no centrifuging or ultrasonic treatment were used in the process.

Permanent slides were prepared using Cellosize as a dispersant and Canada balsam as a mounting medium. Optical photographs were taken with Olympus BH-2 photomicrograph equipment. All figured specimens are located on assemblage slides and are housed in collections of the Department of Geology, Mosul University.

Stratigraphic Palynology

The distribution of the microfossil taxa recovered from samples in borehole KH5/1 is shown in Fig. 3.

1 - Acritarch

The acritarch assemblages present in all the samples clearly belong to the *Neoveryhachium carminae* Biofacies of Cramer [2]. Acritarch assemblages identified in the studied section are: *Neoveryhachium carminae, Leiofusa estrecha, Diexallophasis denticulata, Cymbosphaeridium pilaris, Leiosphaeridia laevigata, Deflandrastrum millepiedi, Visbysphaera dilatispinosa, Dictyotidium dictyotum, Dictyotidium coarctatum, Micrhystridium* sp. 1. There are also long range species such as *Veryhachium trispinosum, V. valiente, V. irregulare* and other related Silurian forms. These taxa achieved worldwide abundance in the Upper Silurian and were extinct before the middle Gedinnian. According to Cramer [2] the genus *Deflandrastrum* appears to be restricted to the Ludlovian, but could range into the late Wenlockian and early Gedinnian.

Wicander [4] recorded, from Haragan Formation, Oklahoma, *Dictyotidium coarctatum,* a common Upper Silurian and Lower Devonian species with wide geographic distribution.

Jardine [5], Jardine and Yapaudjian [6], Jardine et al. [7], and Magloire [8] reported common Silurian genera from North Africa similar to those found in this work. These are *Cymbosphaeridium, Deflandrastrum,* and *Visbysphaera.*

2 - Chitinozoans

All the chitinozoan species recovered from the three samples are indicative of the Upper Silurian (Ludlovian) [9,10].

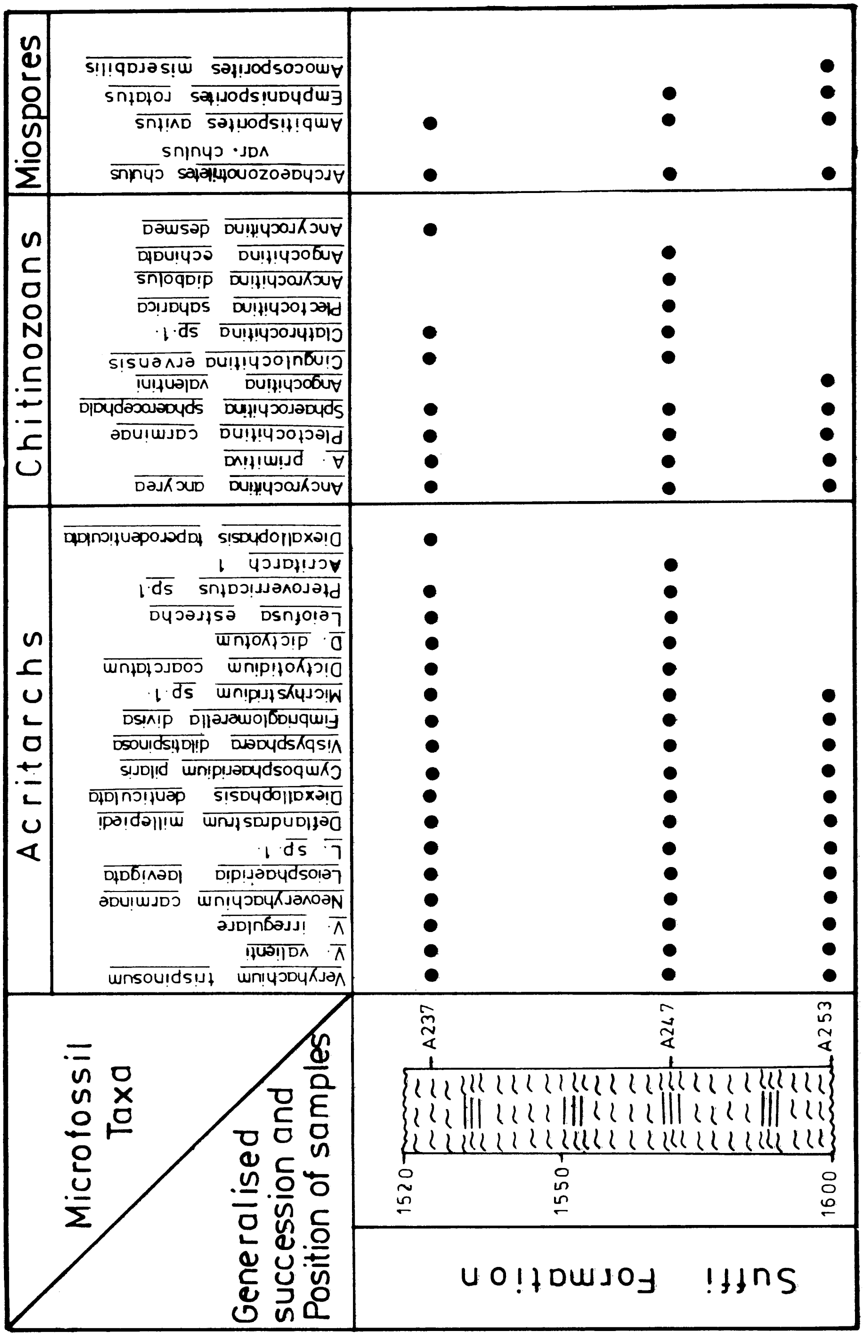

Fig. 3. Range chart of Microfossil taxa from Suffi Formation in borehole KH5/1 (Same key as in Fig. 2)

The chitinozoans identified in this work are: *Ancyrochitina ancyrea, A. desmea, A. diabolus, A. primitiva, Angochitina echinata, A. valentini, Plectochitina carminae, P. saharica, Sphaerochitina sphaerocephala, Cingulochitina ervensis*, and *Clathrochitina* sp. 1.

Paris [11] recorded the occurrance of the following Upper Silurian-Lower Devonian species from southwestern Europe: *Ancyrochitina ancyrea. A. primitiva, Sphaerochitina sphaerocephala, Angochitina* cf. *echinata,* and *Cingulochitina ervensis.* These species were also found in this study.

Laufeld [12] described Silurian chitinozoans from Gotland and gave the stratigraphic ranges of some important Upper Silurian species, among those are: *Ancyrochitina desmea, A. diabolus, Angochitina echinata,* and *Sphaerochitina sphaerocephala.* These taxa were also recorded in this study.

3 - Miospores

The few well-preserved miospore species recorded in the studied samples are identified as: *Archaeozonotriletes chulus* var. *chulus, Emphanisporites rotatus, Ambitisporites avitus,* and *Amocosporites miserabilis.* These species are indicative of Upper Silurian age.

Archaeozonotriletes chulus has been recorded from late Ludlovian and Downtonian from the Welsh borderland [13] and from Libya [14]. Cramer [15] described the palynomorphs from the Siluro-Devonian boundary (dated by invertebrate fossils as Ludlovian to lower Gedinnian) in northwest Spain and recorded *Ambitisporites avitus* and *Archaeozonotriletes* var. *chulus* (as *Retusotriletes chulus*).

Conclusion

Well-preserved and characteristic Upper Silurian acritarchs and chitinozoans were recovered from interval 1520-1600m of the Suffi Formation in borehole KH5/1. This is the first published report of Silurian organic-walled microphytoplankton and chitinozoans from Iraq in general and this borehole in particular.

The taxonomic composition of these assemblages closely compares with other Silurian palynomorphs from different parts of the world. It is, therefore, concluded on palynomorph evidence alone that the studied section from the Suffi Formation is of late Ludlovian age.

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اكريتارك وكايتينات السايلوري العلوي من تكوين الصوفي في بئر KH5/1 في الصحراء الغربية العراقية

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(استُلم في ٢٧ محرم ١٤٠٩هـ، قُبل للنشر في ٢٤ ذو القعدة ١٤٠٩هـ)

ملخص البحث. لقد تم استخلاص الاكريتارك والكايتينات المحفوظة جيدًا في طبقات الطفل الرمادي اللون على عمق بين ١٥٢٠ ـ ١٦٠٠م من تكوين الصوفي في الصحراء الغربية العراقية. وتدل حشود الاكريتارك والكايتينات المستخلصة على أن هذا الجزء من تكوين الصوفي هو بعمر أواخر اللدلو (السايلوري العلوي).