Correlation of Upper Permian localities in the Kuh-e-Ali Bashi area, NW Iran: old collections, old and new data

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Introduction

The controversial history of the Kuh-e-Ali Bashi localities was revised in Permophiles 51, (Henderson et al., 2008): the problem concerns the wrong correlations between locality 1 and locality 4 of the Kuh-e-Ali Bashi area (Fig. 1) figured and published by Teichert et al. (1973).

Old collections and old data

During October 1972, I had the opportunity to visit the area with the Professors P. Brönnimann and L. Zaninetti (Geneva University) and with the Dr F. Bozorgnia (NIOC, Tehran). We sampled the Upper Permian and the Lower Triassic, but focused our research on the Elika Formation. The rock collection was stored at the NIOC in Tehran and the thin sections sent to the Paleontological Institute of Geneva University. Later we published a note in Paläontologisches Zeitschrift on the Elika Formation at Kuh-e-Ali Bashi (Baud *et al.* 1974).

During the late seventies, B. Kummel sent a Permian-Triassic rock collection of the Kuh-e-Ali Bashi localities to the Paleontological Institute of Geneva University for thin section analysis, with the reported sample number of Teichert *et al.* (1973). D. Altiner, a PhD student, worked on the micropaleontological content and published it in Altiner *et al.* (1980). I described the detailed lithology and the sedimentological evolution, and in figure 4 of this paper, we illustrated the profile of locality 1 of Teichert *et al.* (1973), in which the corresponding samples of locality 4 were marked by * and placed according to the Teichert *et al*. (1973) correlations. In this open marine deep-water red limestones and marls, it was not possible to discriminate the Dzhulfian from the Dorashamian foraminifer occurrences.

This Kuh-e-Ali Bashi Permian-Triassic collection, with the thin sections, was given in 1984 to the Geological Museum of Lausanne, Switzerland, and as Curator I used part of these samples for geochemical analysis and isotope studies. The Kuh-e-Ali Bashi (Julfa) C isotope profile was published in Baud *et al.* (1989), based on our own collection (Baud *et al.*, 1974) and partly on the Kummel collection from locality 1. We analyzed separately the samples of the upper part of the locality 4, but never published it.

New data

After reading in Permophiles 51 the conclusions of Henderson *et al*., 2008 on reported Upper Permian conodont occurrences from northwestern Iran, I went to the Geological Museum of Lausanne to restudy the thin sections of the Kummel's Kuh-e-Ali Bashi collection. After careful examination of the thin sections from the upper part of the locality 4 of Teichert *et al*. (1973), I noted that the microfacies of samples 69SC-TL and -TM correspond closely to the microfacies of the samples 69SA-0 at the base of their locality 1 (ostracod-rich lime mudstone) and that the microfacies of samples 69SC-TU from the top of their locality 4 is very similar to the microfacies of the sample 69SA-2 (lime mudstone with spicules) of the lower part of their locality 1 (see Fig. 2).

All of these microfacies (Fig. 2) are significantly different from those of the *Paratirolites* beds (nodular lime mudstone with intraclasts and with micro-ammonoid and bivalve shells) at the top of locality 1 and those of the lower part of the Upper Julfa beds from the base of locality 4, a crinoid lime wackestone that corresponds to the crinoid limestones of Stepanov *et al*., 1969 (see Fig. 3).

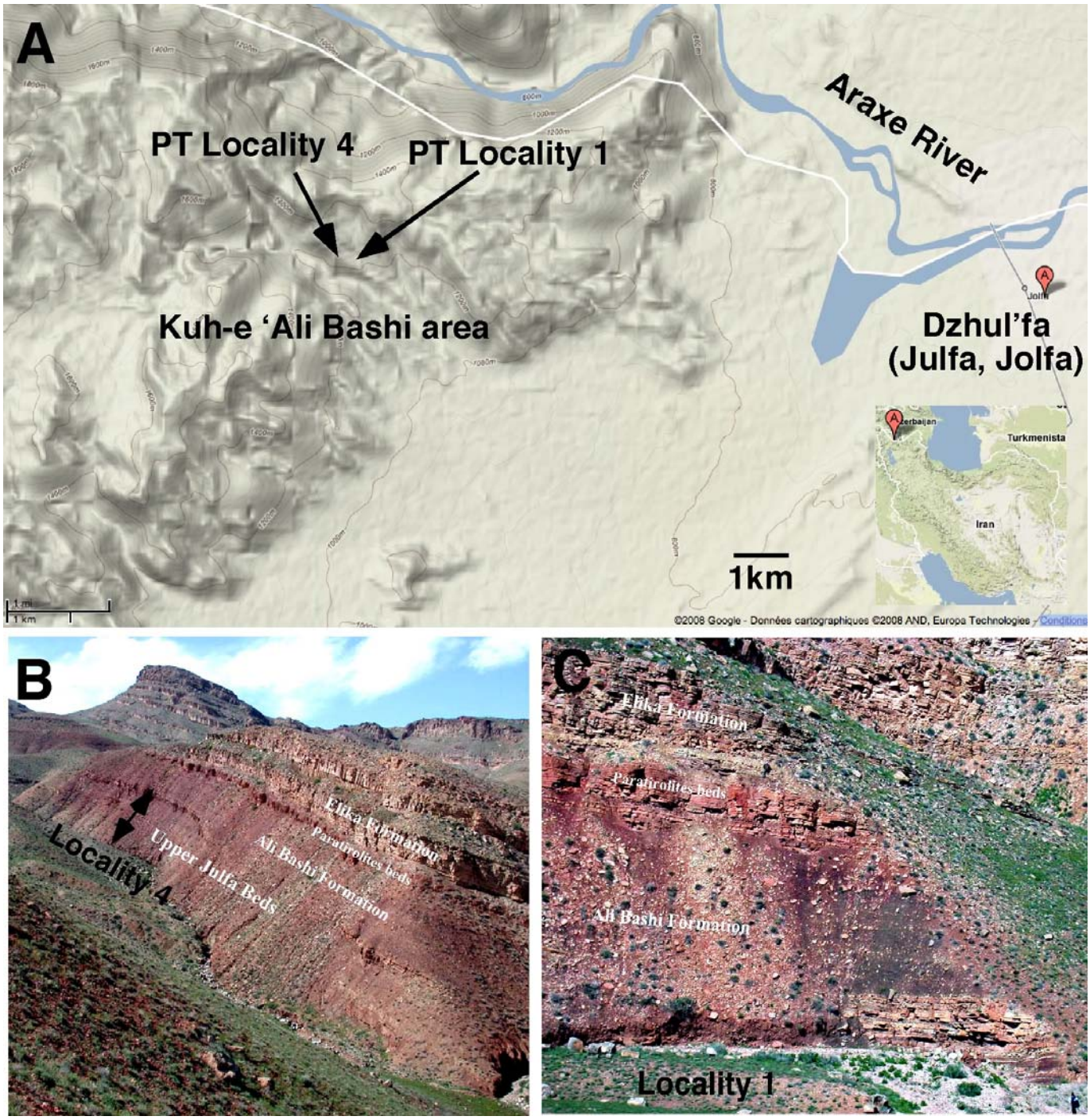

Fig. 1. A: Sketch from Google Map, showing all of the Kuh-e-Ali Bashi – Julfa region of NW Iran and the location of localities 1 and 4 of Teichert *et al.* (1973). B: View of locality 4, the base is in the gully and the top is the prominent bed overlying the upper Julfa Beds (double arrow). C: View close to locality 1, 500m downward of locality 4. B and C: photos from the author © 2002.

Conclusions

I totally agree with the conclusions of Henderson *et al.* (2008) that established that locality 1 strata are the continuation of locality 4 strata and not the repetition of the same lithologic unit along strike as published by Teichert *et al*. (1973). In fact, it is possible to exactly correlate the last beds of locality 4 with the first beds of locality 1. This new correlation was first considered by Sweet and Mei (1999a and b) where they showed that locality 4 strata are Wuchiapingian in age and that locality 1 strata below the Elika Formation are Changhsingian. Shen (2007) examined the *C. orientalis* conodont population from Kuh-e-Ali Bashi and from S. China and came also to the same conclusion as Sweet and Mei (1999a and b).

I visited again the Kuh-e-Ali Bashi localities in 2002 during a field workshop organized by the Geological Survey of Iran, by Professors R. Brandner, L. Krystyn and Dr. P. Mohtat-Aghai from Austria. S. Richoz, my PhD student, published a new very detailed C isotope curve from the P-T transition in this area and compared it with curves from other Iranian sections (Richoz, 2006).

In Fig. 4, the old unpublished C isotope curve of the locality 4 is drawn in correct according to newly revised stratigraphic position with the published curve of locality 1

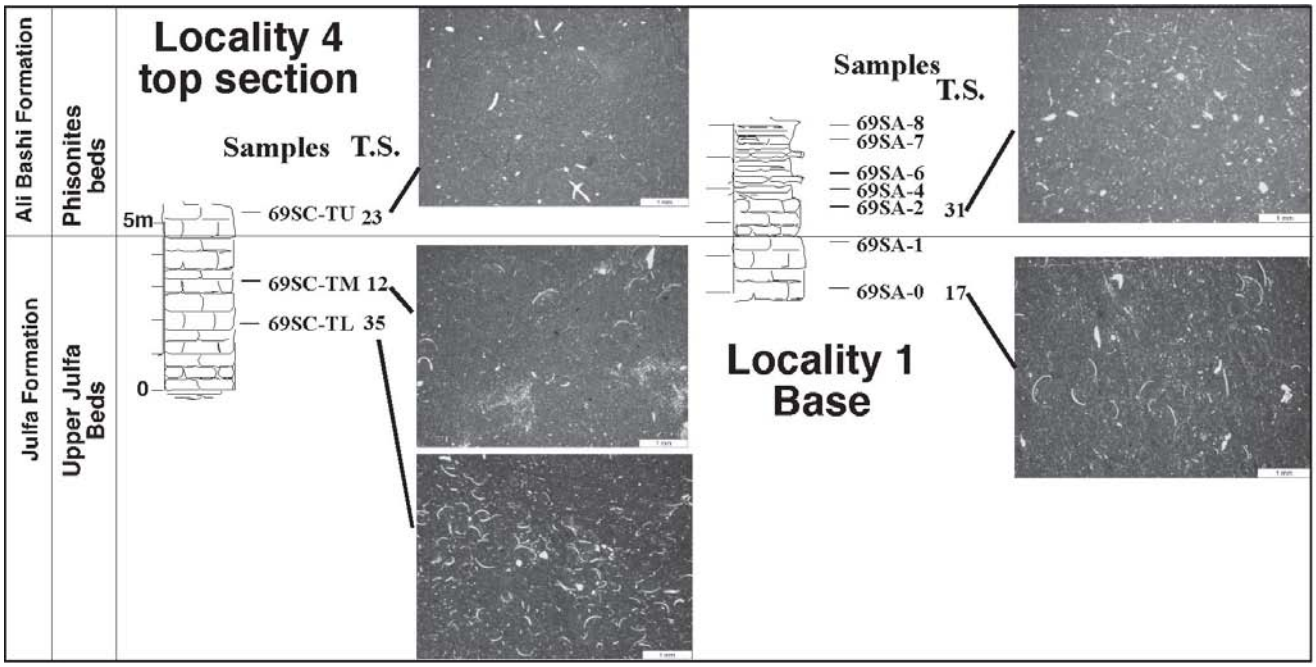

Fig. 2: Comparison of the microfacies from the upper part of locality 4 ofTeichert *et al*. (1973) and from the basal part of locality 1, an ostracod lime mudstone that corresponds to the Upper Julfa bedsThe microfacies of the basal part of the Ali Bashi Formation is a typical dark lime mudstone with spicules and is found at the locality 1 sample 69SA-2 and corresponds to the microfacies of the top sample of the locality 4 (69SC-TU). Scale bar=1mm

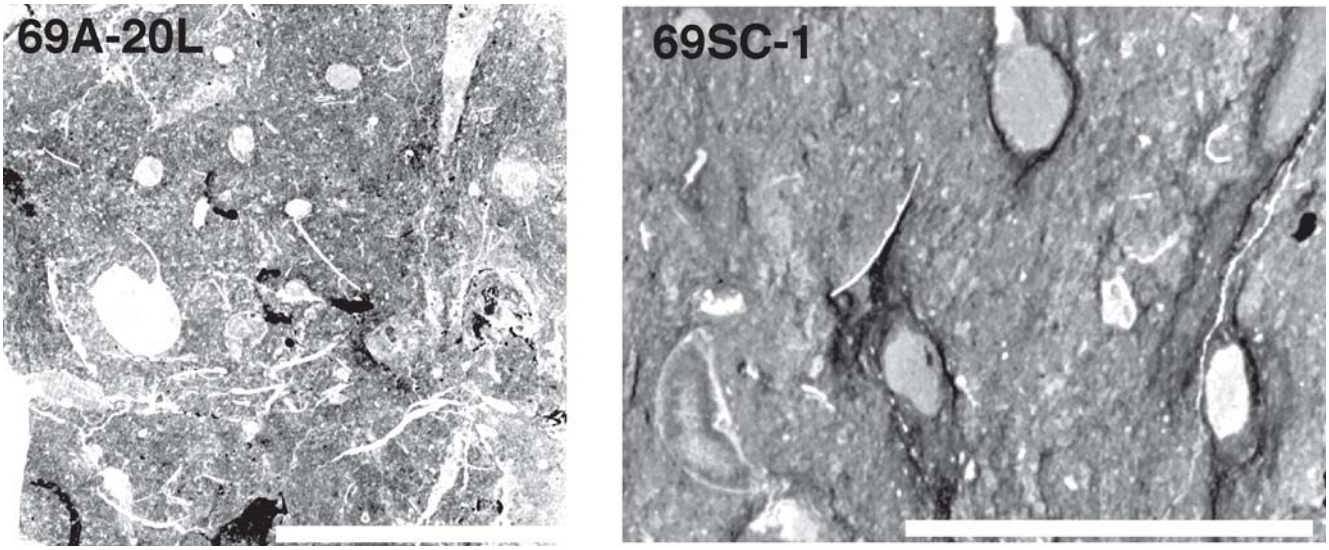

Fig. 3: 69A-20L, locality 1, microfacies of the *Paratirolites* beds, a nodular lime mudstone with intraclasts and with micro-ammonoid and bivalve shells. 69SC-1, locality 4, microfacies of the lower part of the Upper Julfa beds, a crinoid lime wackestone. Scale bar=1cm

from Baud *et al*., (1989). The Julfa beds values are close to the same age values of the nearby Zal locality C isotope curve published by Richoz, 2006 and also correspond to values given by Kakuwa and Matsumoto (2006), on Julfa beds C isotope.

The foraminifer occurrences according to Altiner *et al.* (1980, fig, 4) from locality 4 and locality 1 of Teichert *et al.* (1973), are reinterpreted and illustrated in Fig. 5 according to the newly revised correct sample positions.

In their paper, Henderson *et al.* (2008) showed the incomprehensible mistake ofTeichert *et al.* (1973). The question is how could Teichert and Kummel, have miscorrelated the sections at localities 1 and 4? Both sections started with red limestones in the same gully on the north slope of a small valley and both have near their top a small cliff of red limestones. The thickness was very close, but as written by Henderson*et al.* (2008, p. 9), "they apparently did not finish the section at Locality 4, and somehow failed to show that in their notes or subsequent papers".

Henderson *et al.* (2008) showed also the fact that Kozur in Korte and Kozur (2004, p. 123) and in his other papers on the Permian of Iran, was premature to criticize Mei's conclusions in Mei in Sweet and Mei (1999a and b). Kozur largely commented on so-called

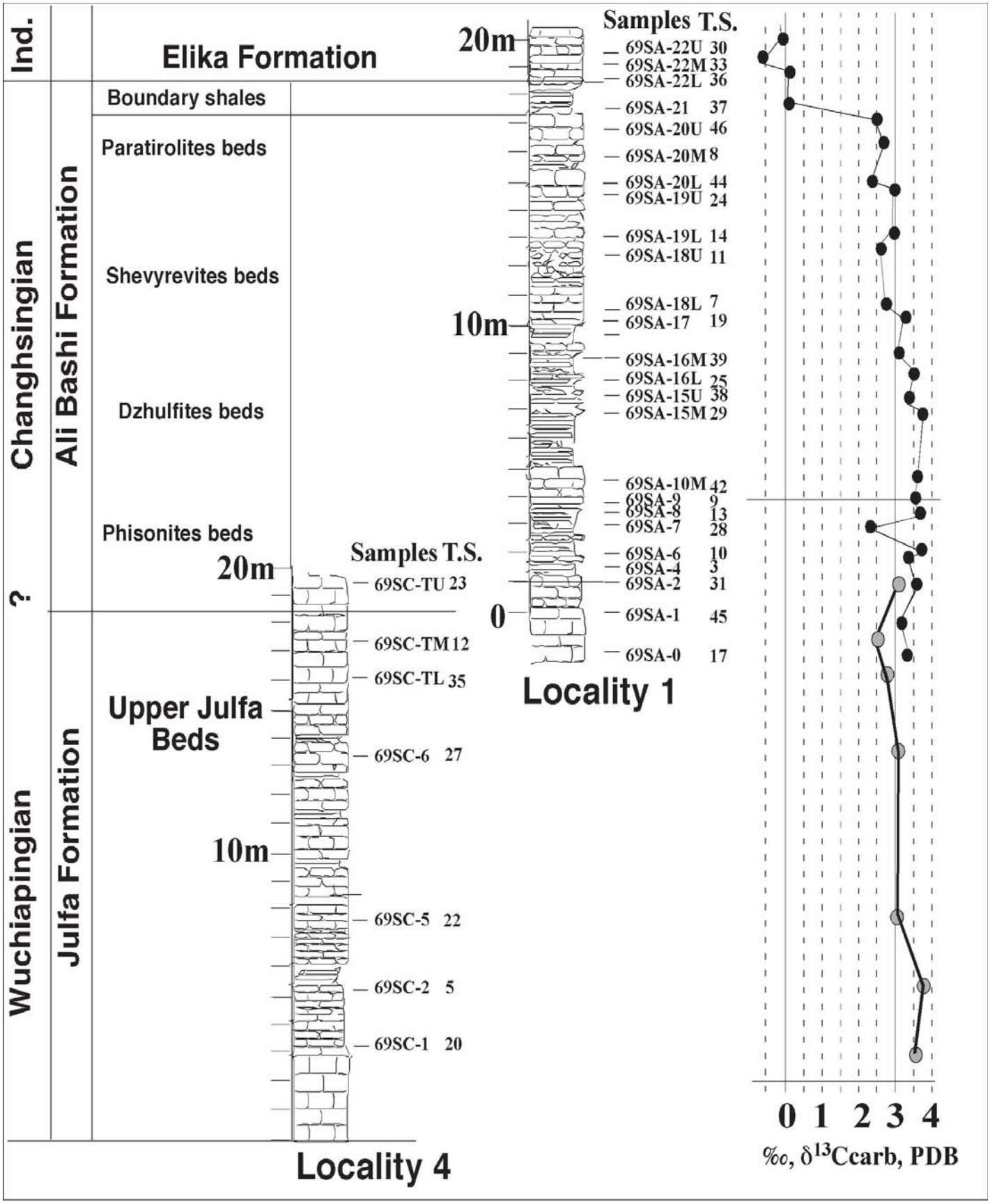

Fig. 4: Carbon isotope values and lithostratigraphy of Kuh-e-Ali Bashi localities 1 and 4 with the sample numbers of Teichert *et al.* (1973). The former, unpublished C isotope values of the locality 4 in Baud *et al.*, 1989, are in grey

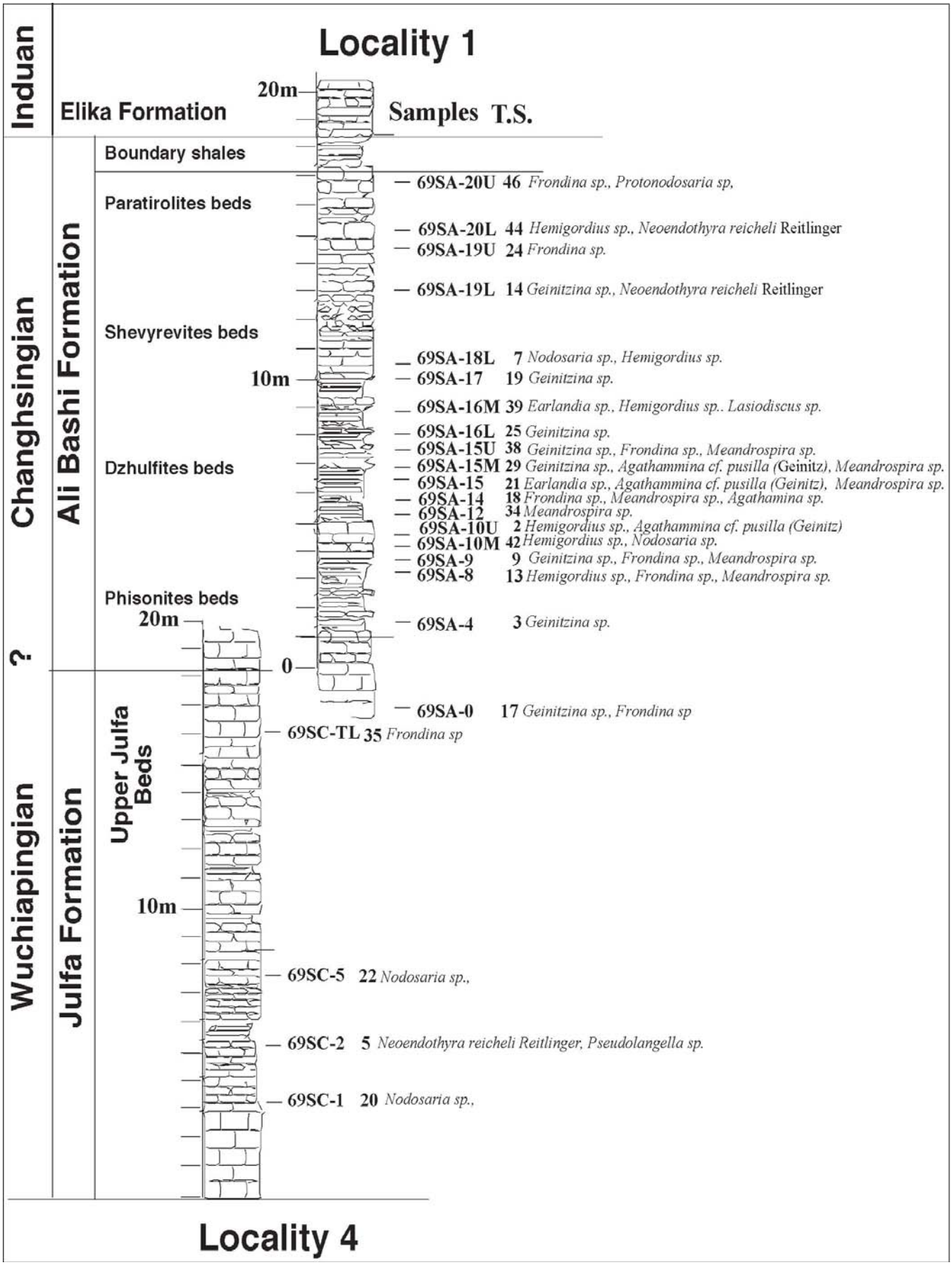

Fig. 5: Occurrence of benthic foraminifers from locality 4 and locality 1 of Teichert *et al.* (1973), according to D.Altiner, in Altiner *et al.*, 1980.

errors of Mei in his locality 4 conodont determination and comparison with the same age fauna from South China, but Mei's work was scientifically correct. Shen (2007) and Henderson *et al.* (2008) demonstrated that there are two distinct homeomorphs of *Clarkina* (*C. orientalis* of Late Wuchiapingian and *C. abadehensis* of Late Changhsingian).

It is not the first time that I ask readers to consider carefully the methods and papers of Kozur as I do in Albertiana (Baud, 2008) on Kozur's new methods of correlation applied to the Induan-Olenekian Boundary.

Acknowledgements
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