

The Lower Devonian in the Segre sections

José I. Valenzuela-Ríos¹

¹Department of Botany and Geology, University of Valencia, c/Dr. Moliner 50, E-46100 Burjassot, Spain; jose.i.valenzuela@uv.es

The set of outcrops located about 7 km east of La Seu d'Urgell, on the right bank of the Segre River (Fig. 1) exhibits one of the best Lochkovian and Pragian (Lower Devonian) successions, whose conodont content is instrumental in establishing the biostratigraphical framework for these stages in the Pyrenees and for practicing global correlations (Valenzuela-Ríos, 1994a, b; Valenzuela-Ríos & Murphy, 1997; Valenzuela-Ríos et al., 2015).

The Lower Devonian of the Segre sections is compiled from five partial sections that crop on both flanks of a faulted anticline in a strongly folded area (Fig. 2). In the east flank, Valenzuela-Ríos (1994a) initially described the successions from section Segre 1, parts I-III in the former national road N-260 from La Seu d'Urgell to Puigcerdá. Ulterior works on the road affected partially this section in a way that the lower part was covered by tons of soil for protecting the new road against rock fallings. This affected mostly the lower Lochkovian strata, but middle and upper Lochkovian strata were only partially affected and the "bed by bed" sequence is possible to be followed uphill in physical continuity. At the same time, some of the former beds around the Lochkovian/Pragian boundary that were not accessible at that time are available

for study now. Similarly, parts II and III of Segre 1 were also partially affected. To make clear the different between the former Segre 1 and the new exposures, we termed the new outcrop Segre 2. For the Lochkovian part the bed number in both sections exactly coincides, except that Beds 1-3 from section Segre 1 are not accessible; thus, section Segre 2 starts with Bed 4. Beds 4-38 are the same in both sections. Now, Segre 2 has expanded the outcrop to Bed 50. The former Segre 1 parts II and III have partially been remeasured. Strata until former Segre 1 Bed 60 are renumbered as Segre 200-219. Beds 60-85 are identical to former ones, and keep the original labelling for sampling. New exposure facilitates to continue the section up to Bed 89.

The road works in the national road, briefly exposed the core of the anticline, and we were able to sample a few beds before it got destroyed; this section is termed Segre 3. On the west flank of the anticline, a new section was accessible, Segre 4. This section starts already in the middle Lochkovian (*trigonicus-kutscheri* Zone) and reaches the upper Lochkovian. Finally, recent works opened a new outcrop (Segre 5) that corresponds to part of the former core and the east limb of the anticline. The accessible part of this section spans from the lower Lochkovian (with *Ancyrodelloides carlsi* below lowest occurrence of *Lanea omoalpha*) through the middle Lochkovian *transitans-trigonicus* Zone.

The Segre area exhibits a set of Lochkovian (Lower Devonian) sections that yielded one of the best conodont sequences in the world, consisting of both cosmopolitan and endemic conodonts Valenzuela-Ríos, 1994a, b, 2002; Valenzuela-Ríos & Murphy, 1997; Murphy & Valenzuela-Ríos, 1999; Valenzuela-Ríos et al., 2015). The recognition of evolutionary steps of several genera (*Ancyrodelloides*, *Lanea*, *Flajsella*, *Masaraella*, *Pedavis*) allows a very fine subdivision of Lochkovian

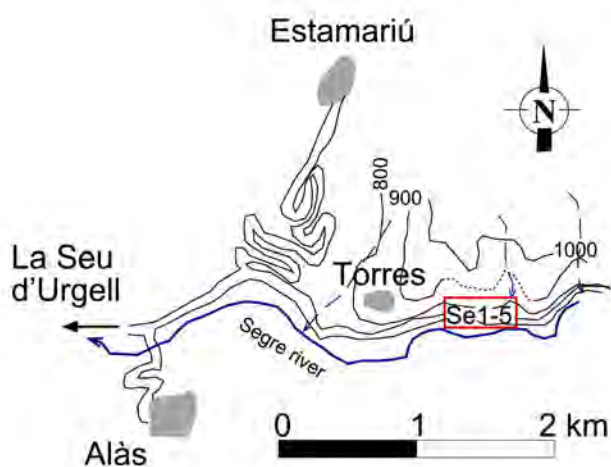


Figure 1. Location of the set of sections Segre 1 to Segre 5.



Figure 2. General view of the set of Segre sections in the core and flanks of the anticlinal structure that follows the large syncline of the Rueda Fm. seeing in the photograph. Se 1-2: Sections Segre 1-2; Se 4: Section Segre 4; Se 5: Section Segre 5.

strata that serves as a basis for the establishment of the middle and upper Lochkovian global zonation and its subsequent correlation with comparable sequences in western North America, Prague Synform and the Carnic Alps. The joint occurrence of “endemic” *Icriodus* facilitates direct comparison of biozonations with the Celtiberian and Armorican conodont successions. The great Lochkovian conodont biodiversity was drastically reduced during the Pragian as demonstrated by the Pyrenean yields. Only seven taxa have been hitherto documented, *Icriodus steinachensis*, *Pelekysgnathus serratus brunsvicensis*, *Pedavis mariannae*, *Polygnathus pireneae*, *Criteriaognathus steinhornensis*, *Sannemannia cf. furnishi* and *Wurmiella* sp. (Valenzuela-Ríos, 1994a). However, this sequence is important for European correlations and together with comparable Pragian successions in the Barrandian area

permitted the establishment of an alternative European conodont zonation for the early Pragian (Slavík et al., 2007).

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