

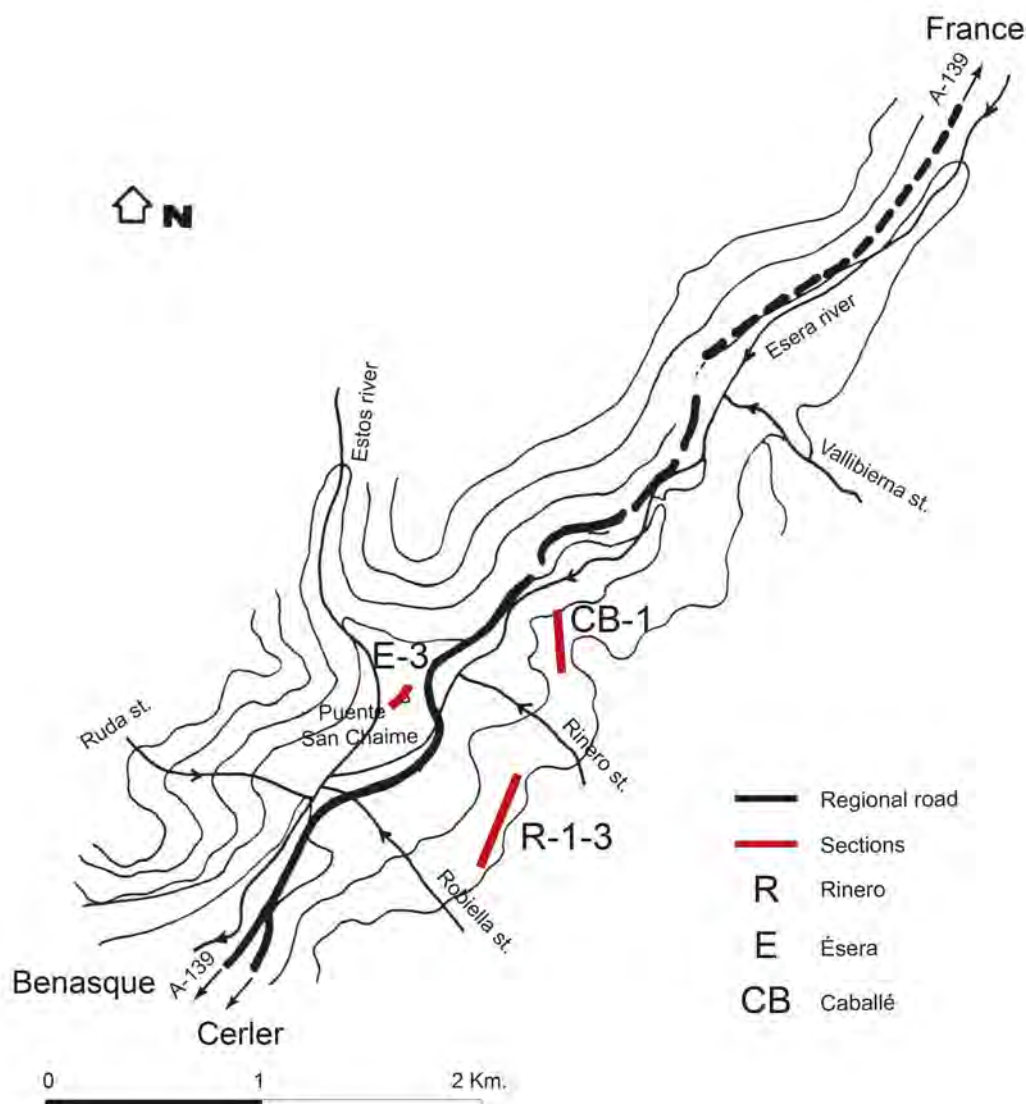
## Silurian to Devonian rocks of the upper Esera River (Huesca, Spain)

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The Silurian rocks in Spain mainly comprise terrigenous sediments with pelagic faunas, known as graptolitic black shales (Robardet & Gutiérrez-Marco, 2002). In the Pyrenees these black carbonaceous shales include black limestone beds and nodules in the middle and upper parts. Shales often contain graptolites and limestones regularly contain orthocertids, crinoid ossicles and bivalves and occasionally conodonts.

The Variscan and Alpine orogenies have affected the incompetent argillaceous shales; consequently, they were strongly deformed and, in many cases, partly removed. Therefore, there are only a few places where a fairly complete Silurian sequence is preserved (Degardin, 1977, 1988, 1990).



**Figure 1.** Location of the selected upper Esera river sections.

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The Sierra Negra region (SW of the Maladeta granitic massif) is one of these few places where Silurian rocks crop out extensively between the Esera and Noguera Ribagorzana rivers forming the core of an anticline verging westwards (Degardin, 1977). The thickness of Silurian rocks in the upper valley of the Esera River doesn't reach 200 m and the lower limit, the Ordovician/Silurian boundary, has not been observed (Degardin, 1988). This author recognized four lithologic units from base to top: 1) black graptolitic shales, Aeronian-Sheinwoodian (Llandovery-lower Wenlock) in age; 2) carbonate beds with orthoceratids and crinoids, uppermost Wenlock; 3) black schist, Ludlow and 4) black schist and black limestone, Pridoli. Lochkovian schist and calcschist overlain Silurian rocks. Degardin (1975, 1978) and Degardin & Waterlot (1974) had already reported the stratigraphic extension of the black limestones-shale unit into the Lower Devonian in the Sierra Negra area. Even Degardin (1988: 217-219) recorded conodonts from this unit in his Cavaler section and interpreted the sequence as spanning from the Pridolii through the Lochkovian. Valenzuela-Ríos (1994) indicates the presence of Devonian conodonts in the orthoceratid black limestones at the top of black schist of Degardin's unit 4 confirming the previous extension of these beds into the Lochkovian.

A set of four sections illustrates the stratigraphical sequence from the Wenlock to the Lochkovian in the Sierra Negra area (Fig. 1): Esera 3, Rinero 2, Caballé 1 and Rinero 3.

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