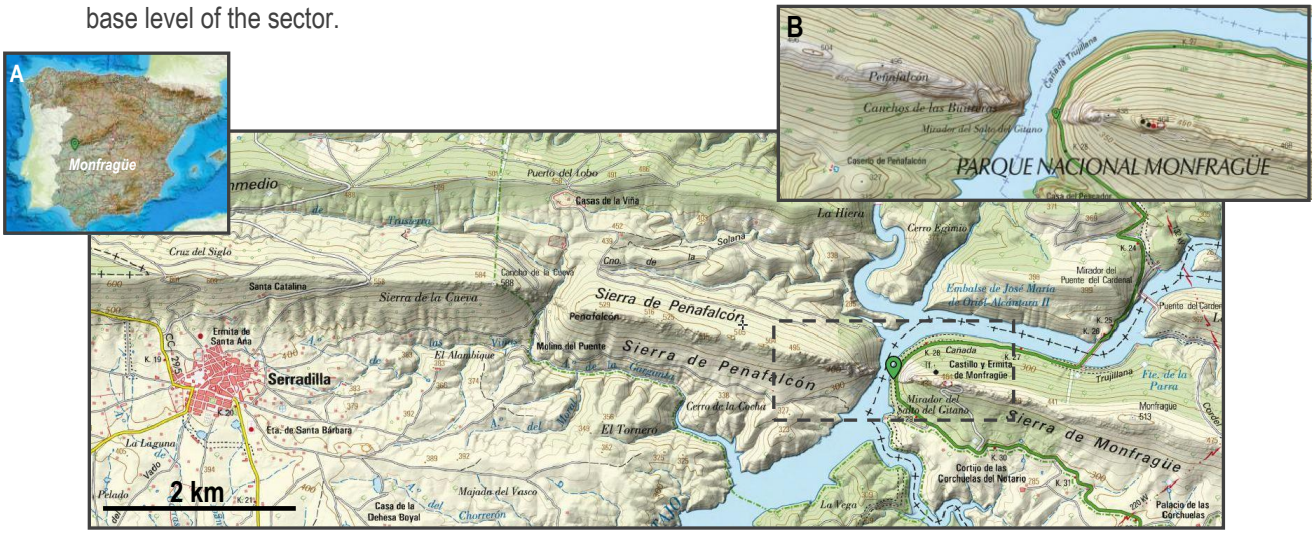
Griffon Vultures and Quartzites: The Monfragüe National Park (Spain)

R. Oyarzun & P. Cubas

Aula2puntonet - 2021

A griffon vulture (Gyps fulvus) from Monfragüe. Image: P. Cubas.

The entrance to the Monfragüe National Park through the "Salto del Gitano" viewpoint provides spectacular views of several features that would make any nature lover happy. Two stand out from the rest: 1. The huge number of griffon vultures (*Gyps fulvus*) in the sector (*counting the number of specimens in flight can prove to be a difficult task*); and 2. An imposing geological structure due to its size and significance: the Armorican Quartzite, which rises with its vertical layers for up to more than 80 m above the base level of the sector.



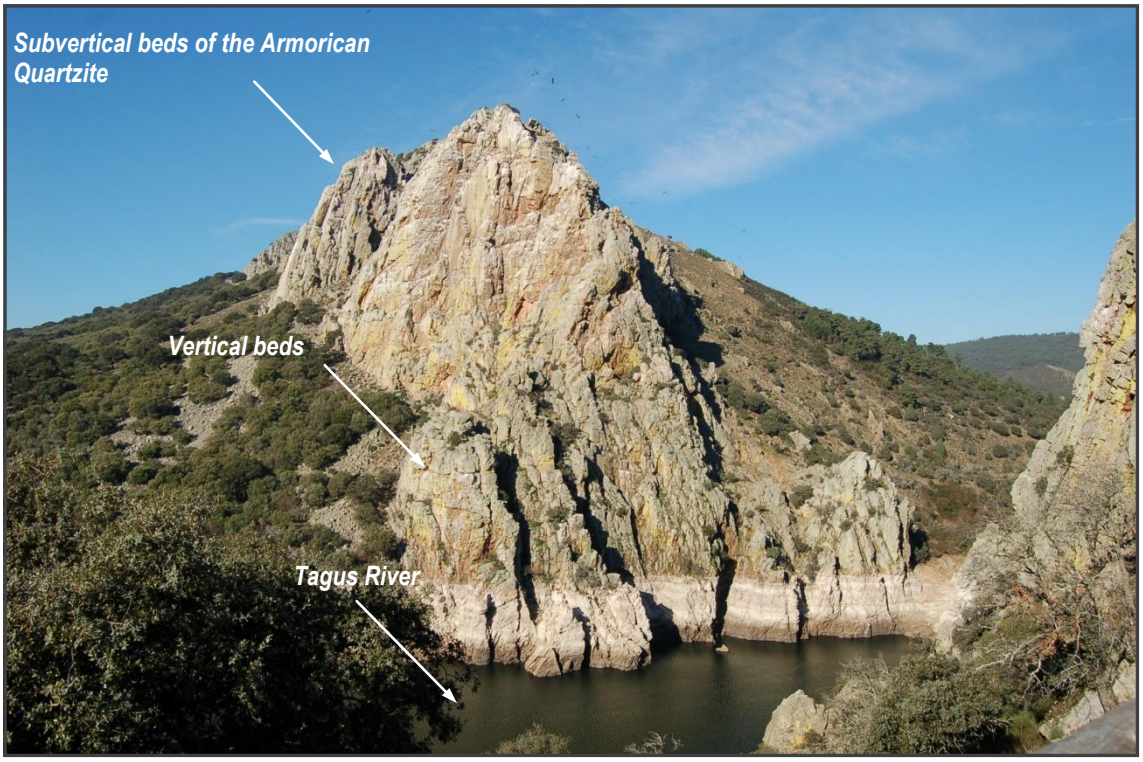
Salto del Gitano Viewpoint Sector (dashed line). The remarkable topographic high of the Peña Falcón (= Peñafalcón) and Monfragüe Sierras is conditioned by the verticality and resistance to erosion of the Armorican Quartzite layers. Boxes: A) Location of Monfragüe in Spain; B) Salto del Gitano Viewpoint area. The main access road to the park is the EX-208, green colour road on the map. IGN Images - Iberpix (www.ign.es/iberpix2/visor/).

R. Oyarzun and P. Cubas are Retired Associate Professors of Geology and Botany respectively

On the Armorican Quartzite

The Armorican Quartzite is a transgressive marine sedimentary unit of Arenig age (*Lower Ordovician*) that crops out in three European countries, starting with the Armorican Massif in France (*Brittany, type locality*) that gives it its name, and in Spain and Portugal (*in the Iberian Massif = Hesperic*). The Armorican Quartzite in France (*Grès Armoricain*) not only crops out in Brittany (*Armorican Massif*) (*e.g. Lardeux et al. 2005*) but can also be found further south in the Vendée Department (*e.g. Bouton et al. 2020*). Age, as in Spain, is assigned to the Arenig. In the sector that concerns us at the entrance to the Monfragüe Park, the Armorican Quartzite was deposited on top of Proterozoic materials belonging to the Schist Greywacke Complex.

We can say that the Hercynian Tectonic Cycle begins in Spain in the Arenig (*Lower Ordovician*) with the shallow marine sedimentation of quartz-rich sands that would later give rise to the formation of the Armorican Quartzite.



Eastern edge of the Peña Falcón Sierra: the Armorican Quartzite with vertical layers and some others with a strong dip. Below, the light-colored horizontal markings correspond to variations in the water level of the Tagus River. Image: R. Oyarzun.

On griffon vultures

The easiest vulture species to be observed in Spain is the griffon vulture (*Gyps fulvus*). The country is home to 90 percent of the European population of these birds and is home to 75 percent of the vultures of this group in the world (*Blue Sky Wildlife 2020*). Therefore, Spain is the right place for the observation of these vultures and Monfragüe in this regard is a premium destination; in a SEO survey in 1979 it was estimated that the number of breeding pairs of griffon vultures in the whole of Spain only amounted to 3,249, a number that today has increased to about 25,000 pairs, which is a triumph in the field of wildlife conservation (*Blue Sky Wildlife 2020*).

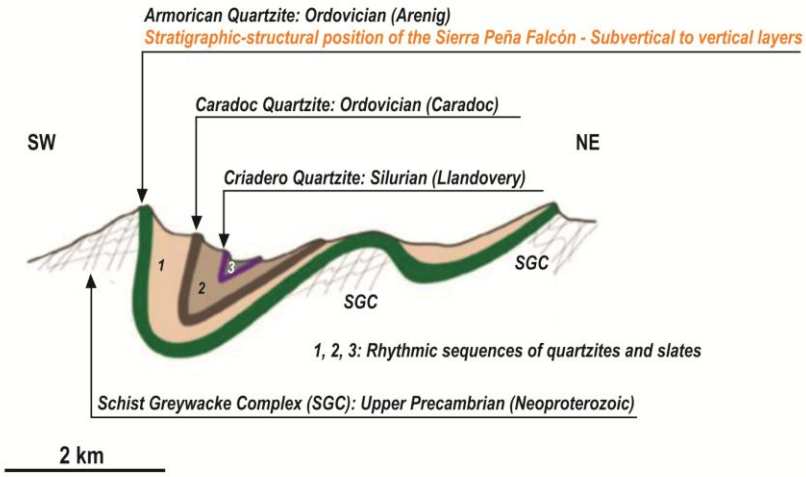
Griffon vultures have a size of 95-110 cm, a weight of 6-11 kg, a wingspan of 240-280 cm and a life expectancy of up to 37 years in captivity; the griffon vulture is sandy to dark brown in color, with a white head, neck and ruff whereas primary and tail feathers are dark brown to black (*Vulture Conservation Foundation 2021*). The griffon vulture is a colonial raptor that nests on cliffs and feeds on carrion from livestock and to a lesser extent on wild ungulates that have died in the field (*García-Ripollés et al. 2005*).

Griffon vultures near the Castle/Hermitage of Monfragüe (Sierra de Monfragüe) a few hundred meters east of Peña Falcón. Images: P. Cubas.

On griffon vultures, quartzites and the Hercynian orogeny

How are the Armorican Quartzite, the Hercynian orogeny and griffon vultures related? The key is in the Hercynian tectonics. The Ordovician and Silurian were 'quiet periods' in the Iberian Peninsula, marine silt and sand sedimentation, some alkaline basaltic intraplate volcanism and little else, but things were going to change in the Devonian, and towards the Early Carboniferous intense folding was developing in previously deposited layers (*e.g.* Gumiel et al. 2010). In this regard, the Hercynian Orogeny affected regions as distant as France (*with the formation of the Armorican and Central massifs*), North Africa (*the Atlas Mountains*) or Eastern North America (*the Appalachians*), among other realms.

In the case at hand, the Hercynian Orogeny gave rise in the Monfragüe area to the formation of a system composed of large asymmetric folds with inclined axial planes.



Schematic section along a SW to NE direction showing the large Hercynian folds present at Monfragüe. Adapted from Rodríguez Fernández (Ed.) (2018).

The SW flank of the folding system shows a generally vertical Armorican Quartzite that, as we can see in the Peña Falcón sector, generates a magnificent habitat for the nesting of griffon vultures, which seek the vertical walls (*i.e. the cliffs*) for the safety and isolation that these walls provide.

A griffon vulture perched on a ledge of the vertical quartzite wall. The yellow color corresponds to the lichen Acarospora. This lichen is an indicator of the cleanliness of the air, growing only in uncontaminated areas on quartzites bedding planes. Image: P. Cubas.

Above and below, griffon vultures flying in the Peña Falcón sector. Images: P. Cubas.

Griffon vultures fly in groups as the collective search is more effective when food is occasional; this has also caused griffon vultures to develop a collective life and the nesting in colonies (*Marinković & Karadžić 2008*). García-Ripollés et al. (2005) add that this collectivity is an evolutionary strategy selected as a consequence of the unpredictable distribution of food. In this context, the key element for the development of colonies of griffon vultures is the existence (*other than food*) of a landscape characterized by the presence of cliffs, a habitat that is wonderfully exemplified by the walls of Peña Falcón, which are the result

of the verticality of the Armorican Quartzite layers in the Peña Falcón sector, which in turn is derived from the Hercynian folding in the Lower Carboniferous.

References

Blue Sky Wildlife (2020) Spanish Vulture: Finding Vultures in Spain. www.blueskywildlife.com/spanish-vulture/

P. Bouton, C. Roy & J-M.Viaud (2020) Curiosités Géologiques des Plaines et Bocages de Vendée. BRGM Editions, 120 pp.

C. García-Ripollés, P. López-López, F. García-López, J.M. Aguilar & J. Verdejo (2005) Modelling nesting habitat preferences of Eurasian Griffon Vulture Gyps fulvus in Eastern Iberian Peninsula. Ardeola 52: 287-304.

P. Gumiel, R. Campos, P. Muñoz Barco & E. Martínez Flores (2010) Sinforme de Montfragüe. En: Patrimonio Geológico de Extremadura: Geodiversidad y Lugares de Interés Geológico P. Muñoz Barco & E. Martínez Flores (eds). Junta de Extremadura, 305-315. http://extremambiente.juntaex.es/files/biblioteca_digital/patrimonio_2010/Patrimonio%203.26.pdf

H. Lardeux et al. (2005) Guide Géologique de la Bretagne. Guides Géologiques Régionaux, Dunod, 221 pp.

S. Marinković & B. Karadžić (2008) Griffon Vulture. Institute for Biological Research "Siniša Stanković", Belgrade, Serbia. 72 pp. http://vulture.org.rs/wp-content/uploads/2017/10/SUP-eng.pdf

R. Rodríguez Fernández (Ed.) (2018) Parque Nacional de Monfragüe. Guía Geológica. Instituto Geológico y Minero – España, 176 pp.

Vulture Conservation Foundation (2021) Griffon vulture (Gyps fulvus). www.4vultures.org/vultures/griffon-vulture/