**PARDAILHANIA THORAL, 1947 (SOLENOPLEUROPSINAE, TRILOBITA) FROM CAESARaugaUSTAN (MIDDLE CAMBRIAN) OF THE CADENAS IBÉRICAS (NE SPAIN)**

Jorge Esteve¹, Rodolfo Gozalo², Eladio Liñán¹ and Juan B. Chirivella Martorell²

¹ Área y Museo de Paleontología, Departamento de Ciencias de la Tierra, Universidad de Zaragoza, 50009 Zaragoza, Spain. jorgeves@unizar.es, linan@unizar.es
² Departamento de Geología, Universitat de València, Dr Moliner 50, 46100 Burjassot, Spain. rodolfo.gozalo@uv.es

**Keywords:** Cadenas Ibéricas, middle Cambrian, Caesaraugustan, *Pardailhania*, evolutionary trend, Mediterranean Subprovince.

**INTRODUCTION**

The genus *Pardailhania* Thoral, 1947 is a biogeographically widespread trilobite from the middle Cambrian of the Mediterranean Subprovince. It was defined in the Montagne Noire (France; Thoral, 1947) and subsequently has been recognized in Spain (Sdzuy, 1958), Italy (Rasseti, 1972), Turkey (Shergold and Sdzuy, 1984) and Morocco (Geyer and Landing, 1995).

*Pardailhania* presents a short stratigraphical distribution that is confined to the middle Caesaraugustan stage and the lowermost part of the upper Caesaraugustan stage in the standard chronostratigraphical subdivision proposed for the middle Cambrian of the Mediterranean region (Liñán et al., 1993, 2002; Álvaro and Vizcaíno, 1998; Geyer and Landing, 2004; Dean, 2005).

**DISCUSSION AND BRIEF REVIEW OF PARDAILHANIA THORAL, 1947**

*Pardailhania* is a solenopleuropsinae genus characterized by the spines-like tubercle ornamentation, which shows regular arrangement in the glabella (see Sdzuy, 1968; Liñán and Gozalo, 1986). The number of rows in the preglabellar field, the number of rows in glabella and the size and density of tubercles have been used as diagnostic features to difference among *Pardailhania* species (Thoral, 1947; Sdzuy, 1968; Courtessole, 1973; Liñán and Gozalo 1986; Álvaro, 1996; Álvaro and Vizcaíno, 1997).

After Liñán and Gozalo (1986) revision, the genus comprises four species: *P. hispida*, *P. hispanica*, *P. multispinosa* and *P. sdzuyi*.

*Pardailhania hispida* Thoral, 1935, has one row of spine-like tubercles in the preglabellar field and four to five rows in the glabella.

*P. hispanica* Sdzuy, 1958 is characterised, according to the original diagnosis, by two rows of spine-like tubercles in the preglabellar field and five rows in the glabella.
*P. multispinosa* Thoral, 1948 shows two or three rows of spine-like tubercles in the preglabellar field, and also five rows in the glabella; in spite of Thoral citation, who described the holotype with only two rows in the preglabellar field and five in the glabella (Álvaro and Vizcaíno, 1997). Previously, Sdzuy (1958, 1961, 1968) had differentiated between *P. multispinosa* and *P. hispanica* for the size and density of the spine-like tubercle.

Following its original description, *P. sdzuyi* Liñán and Gozalo, 1986 bears three tubercle rows of spine-like tubercles in the preglabellar field and seven to eight rows in the glabella. It can seem a species of *Solenopleurosis* Thoral, 1947 due to the ornamentation with spine-like tubercles, but it differs in the lack of a symmetrical arrangement of the glabellar spine-like tubercles in *Solenopleurosis*.

According to Álvaro (1996) and Álvaro and Vizcaíno (1997) the genus has also four species; they are *P. hispida*, *P. multispinosa*, *P. morisca* Álvaro, 1996 and *P. sdzuyi*.

*P. hispida* has the same diagnosis based on the preglabellar field but with four to six rows of spine-like tubercles on the glabella.

We follow *P. multispinosa* species diagnosis of Thoral (1948) with two rows of spine-like tubercles in the preglabellar field and four to six rows of spine-like tubercles in the glabella. Therefore *P. hispanica* is synonymized with *P. multispinosa*.

The new species *P. morisca* Álvaro, 1996 is defined with three rows of spine-like tubercles in the preglabellar field and four to six rows of spine-like tubercles in the glabella. This species includes the specimens considered as *P. multispinosa* by Liñán and Gozalo (1986). Finally, they followed the original diagnosis of *P. sdzuyi*.

We have collected numerous specimens sampling at decimetric scale in the RV1 and RV2 sections (Murero, Cadenas Ibérica, see Liñán and Gozalo, 1986) during the last years. The new material shows an important variability in the number of the glabellar rows and size and density of the spine-like tubercles among specimens collected in the same level. Thus, although it is possible to recognize an evolutionary trend to increase the number of the rows from the oldest to the youngest specimens of *Pardailhania*, the number of rows in the glabella could be considered as intraspecific variability and not as diagnostic character.

The number of rows in the preglabellar field also shows an evolutionary trend to increase this number (see Álvaro and Vizcaíno, 2001); in this case this increment is produced in temporal order. The oldest specimens show only one row, and the youngest have three rows.

In summary, we propose to restring the number of *Pardailhania* species to three:

- *P. hispida* with one only row of spine-like tubercles in the preglabellar field as diagnostic character and four to six rows in the glabella.
- *P. multispinosa* with two rows of spine-like tubercles in the preglabellar field as diagnostic character and glabella bears among four to six rows. *P. hispanica* is considered as a junior subjective synonym of *P. multispinosa*.
- *P. sdzuyi* with three rows in the preglabellar field as diagnostic character and among six to nine rows in the glabella. *P. morisca* is considered as a junior subjective synonym of *P. sdzuyi*.  

Jorge Esteve, Rodolfo Gozalo, Eladio Liñán and Juan B. Chirivella Martorell
MIDDLE CAESARAUGUSTAN ZONATION

The material studied in this paper was collected in several localities of the Cadenas Ibéricas (NE Spain) and come from the Murero Formation. The Murero Formation is represented by siltstone and marly siltstones with interbeded carbonate nodules containing trilobites (polimeroids and agnotids), bradoriids, other arthropods, echinoderms (cincta, eocrinoidea and edrioasteroidea), algae, linguliformea brachiopods, sponges, ecdisoza, hyoliths and trace fossils. This assemblage represents sublittoral-neritic biomas installed in tropical latitudes (Gozalo et al., 2003; García Bellido et al., 2007).

The Caesaraugustan stage was subdivided in three substages recognised by the presence of Solenopleuropsinae gena (Sdzuy, 1971; Liñán et al., 1993). The FAD of Pardailhania hispida characterises the beginning of the middle Caesaraugustan and the FAD of Solenopleuropsis ribeiroi characterises the beginning of the upper Caesaraugustan.

The middle Caesaraugustan substage was divided in three zones named P. hispida, P. hispanica and P. multispinosa (see Sdzuy, 1968) zones. According to Liñán and Gozalo (1986) and Gozalo et al. (2003) the two first zones are phylozones and the third one is a range zone. Álvaro and Vizcaíno (1998) proposed four range zones or the same substage: P. hispida, P. multispinosa, P. morisca and P. sdzuyi.
The new proposal of taxonomy for *Pardailhania* implies changes in this zonation which can be now subdivided in three interval zones, in which guide species are phylogenetically related (Fig. 1). These are the *Pardailhania hispida* zone, *Pardailhania multispinosa* zone [including the former *P. hispanica*] and *Pardailhania sdzuyi* zone [which include the former *P. multispinosa* zones of Sdzuy (1968) and Liñán & Gozalo (1986) and the *P. morisca* and *P. sdzuyi* zones of Álvaro and Vizcaíno (1998)].

**Acknowledgements**

We are indebted to J. Álvaro and M. E. Dies (Universidad de Zaragoza) for revision and discussion of the manuscript. This paper is a contribution to the project Consolider CGL2006-12975/BTE from Spanish Ministerio de Educación y Ciencia and the Grupo de Investigación Consolidado E-17 from Gobierno de Aragón. Jorge Esteve has a pre-doctoral research grant from FPI program link to Consolider CGL2006-12975 project.

**REFERENCES**


