

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

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### **INTRODUCTION**

The genus *Pardailhanian* 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 (Rasetti, 1972), Turkey (Shergold and Sdzuy, 1984) and Morocco (Geyer and Landing, 1995).

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

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

*Pardailhanian* 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 *Pardailhanian* species (Thoral, 1947; Sdzuy, 1968; Courtessole, 1973; Liñán and Gozalo 1986; Álvaro, 1996; Álvaro and Vizcaino, 1997).

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

*Pardailhanian 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 *Solenopleuropsis* 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 *Solenopleuropsis*.

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 RV<sub>1</sub> and RV<sub>2</sub> sections (Murero, Cadenas Ibéricas, 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 recognise 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 restrict 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*.

Series	Stage	Cadenas Ibéricas zones	Trilobites	
MIDDLE CAMBRIAN	Languedocian	Unnamed		
		<i>S. thoralis</i> + <i>S. marginata</i>		
	Caesaraugustan	upper	<i>Solenopleuropsis simula</i>	
			<i>S. verdiagana</i> + <i>S. rubra</i>	
			<i>S. riberoi</i> + <i>S. verdiagana</i>	
		middle	<i>Solenopleuropsis riberoi</i>	
			<i>Pardailhanian szduyi</i>	
			<i>Pardailhanian multispinosa</i>	
		lower	<i>Pardailhanian hispida</i>	
			<i>Badulesia/Badulesia paschi granieri/Badulesia juliverti</i>	
			<i>Badulesia tenera</i>	
	Leonian	<i>Eccaparadoxides asturianus</i>	<i>Pardailhanian hispida</i>	
<i>Eccaparadoxides szduyi</i>		<i>Pardailhanian multispinosa</i>		
<i>Acadaparadoxides mureroensis</i>		<i>Pardailhanian szduyi</i>		
L.C.	Bilbilian (pars)	<i>Protolenus jilocanus</i>		

Figure 1. Proposal of a new zonation for the middle Caesaraugustan of the Cadenas Ibéricas.

## 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 interbedded carbonate nodules containing trilobites (polimeroids and agnotids), bradoriids, other arthropods, echinoderms (cineta, eocrinoida and edrioasteroidea), algae, linguliformea brachiopods, sponges, ecdisozoa, hyolits 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 *Pardailhanian hispida* characterises the beginning of the middle Caesaraugustan and the FAD of *Solenopleuropsis riberoi* 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 Vizcaino (1998) proposed four range zones or the same substage: *P. hispida*, *P. multispinosa*, *P. morisca* and *P. szduyi*.

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 szzuyi* zone [which include the former *P. multispinosa* zones of Szdzy (1968) and Liñán & Gozalo (1986) and the *P. morisca* and *P. szzuyi* zones of Álvaro and Vizcaíno (1998)].

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