New records of zerconid mites from the Iberian Peninsula and the Macaronesian region
(Acari: Mesostigmata: Zerconidae)

MARÍA L. MORAZA
Departamento de Zoología y Ecología, Facultad de Ciencias, Universidad de Navarra, C/ Irunlarrea s/n, Pamplona 31080, (Navarra), Spain. e-mail: mlmoraza@unav.es

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ABSTRACT

Based on material collected from different habitats (natural, reforested and felled habitats) of Navarra (northern Spain), five species of the family Zerconidae are newly recorded and a key to the 29 species found in the Iberian Peninsula and the Macaronesian region, based on adult females, is provided. Ecological requirements, in terms of habitat preference, vertical distribution in the soil, and seasonal population changes of several species, are given.

Key words: Acari, Mesostigmata, Zerconidae, taxonomy, Iberian Peninsula, Macaronesian region.

RESUMEN

Nuevas citas de ácaros zercónidos para la Península Ibérica y la región Macaronésica (Acari: Mesostigmata: Zerconidae)

Sobre material recolectado en diferentes habitats (naturales, bosques de reforestación y talados), de Navarra (Norte de España), se citan por primera vez para la fauna española cinco especies de la familia Zerconidae y se aporta una clave sistemática para hembras adultas de las 29 especies encontradas en la Península Ibérica y región Macaronésica. Para las especies más importantes se detallan algunos requerimientos ecológicos, tales como preferencia de hábitat, distribución vertical en el suelo y cambios estacionales de su población.

Palabras clave: Acari, Mesostigmata, Zerconidae, taxonomía, península Ibérica, región Macaronésica.
INTRODUCTION

Zerconid mites, an important constituent of soil microhabitats of the northern hemisphere, are relatively well known and until to date 21 species have been described from Spain (Athias-Henriot, 1961, Moraza, 1989, 1990, 1991, 2006). In the present paper, besides the species newly recorded for the Iberian fauna, some information on the ecological requirements of zerconids and the manner in which alterations in natural habitats may affect them, is given. The data may aid in the understanding of the biology of this group of mites.

MATERIAL AND METHODS

The mites were collected by the Department of Zoology and Ecology of the University of Navarra during soil ecology studies in habitats (natural forests, reforested forest, felled forest) of different climatic regions of Navarra (Table 1). Most specimens come from sampling performed once each season at each site. Every sample was 25 x 25 cm, being of different depths depending upon the amount of litter present. Although the global results are presented here, samples were extracted layer by layer (leaf litter, humus and mineral soil). Population densities are based on 1000 gr. dry weight of sample. Relative abundance refers to the number of specimens in relation to the total number of mesostigmatid mites in the sample. Mites of all developmental stages were collected (Lv: larva, Pn: protonymph; Dn: deutonymph; Ad: adult).

Other specimens are from the soil of reforested forests of *Pinus nigra* of different ages and from different areas of Navarra (localities bearing an asterisk in table 1).

Extraction method

The mesofauna of microarthropods was extracted using the Tullgren’s method. Specimens examined using light microscopy were cleared in Nesbitt’s solution and mounted in Hoyer’s medium.

Specimens are deposited in the Acarology Collection (Acarology Laboratory) of The Ohio State University (Columbus, Ohio, USA) (OSAL) and in Museo de Zoología, Universidad de Navarra (MZUNAV).
RESULTS

Currently, the family Zerconidae Berlese, 1892 is represented in Spain by 23 species. In the present paper, five species, with new localities and habitats in Spain, are recorded for the first time (Table 1, 2).

Prozercon cambriensis Skorupski & Luxton, 1996
Western European species, found here in soil of a natural oak forest (Quercus robur) in Leiza, on a silicean substrate with a mean Ph of 4.17 (Table 3). The species is newly rerecorded for the Iberian Peninsula.
Table 2. Presence (+) of zerconid species in different habitats of Navarra (* new records for the Iberian Peninsula).

Tabla 2. Presencia (+) de especies de zercónidos, in diferentes hábitats de Navarra (* nuevas citas para la Península Ibérica).

<table>
<thead>
<tr>
<th>Zerconidae species</th>
<th>Bush</th>
<th>Beech</th>
<th>Oak</th>
<th>Larch</th>
<th>Pine</th>
<th>Prairie</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Prozercon cambriensis</em> Skorupski &amp; Luxton, 1996*</td>
<td></td>
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<tr>
<td><em>Prozercon davidi</em> Moraza, 2006</td>
<td>+</td>
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<tr>
<td><em>Prozercon escalai</em> Moraza, 1988</td>
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<td>+</td>
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<tr>
<td><em>Prozercon fimbriatus</em> (C.L.Koch, 1839)</td>
<td>+</td>
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<tr>
<td><em>Prozercon juanensis</em> Moraza 1988</td>
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<td><em>Prozercon lutulentus</em> Halasková, 1963</td>
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<tr>
<td><em>Prozercon masani</em> Moraza, 2006</td>
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<tr>
<td><em>Prozercon ornatus</em> (Berlese, 1904)</td>
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<tr>
<td><em>Prozercon tellecheai</em> Moraza, 1988</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
<td><strong>Prozercon</strong> - Species richness</td>
<td><strong>3</strong></td>
<td><strong>3</strong></td>
<td><strong>2</strong></td>
<td><strong>5</strong></td>
<td><strong>3</strong></td>
<td></td>
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<tr>
<td><em>Zercon aberrans</em> Mihelcic, 1960</td>
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<tr>
<td><em>Zercon arcuratus</em> Trägårdh 1931</td>
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<tr>
<td><em>Zercon blesti</em> Evans, 1954*</td>
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<tr>
<td><em>Zercon franzi</em> Willmann, 1943*</td>
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<td><em>Zercon hugoi</em> Moraza, 2006</td>
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<td><em>Zercon italicus</em> Sellnick, 1944*</td>
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<td><em>Zercon montigenus</em> Blaszak 1972*</td>
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<tr>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
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<tr>
<td><em>Zercon parivus</em> Moraza, 1991</td>
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<td><em>Zercon peltatus</em> CL Koch 1836</td>
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<td><em>Zercon pinicola</em> Halasková, 1969</td>
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<tr>
<td><em>Zercon pustulescens</em> Athias-Henriot, 1961</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
<td><em>Zercon subguttulatus</em> Moraza, 2006</td>
<td></td>
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<tr>
<td><em>Zercon sp.</em></td>
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<tr>
<td><strong>Zercon</strong> – species richness</td>
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<td><strong>5</strong></td>
<td><strong>7</strong></td>
<td><strong>4</strong></td>
<td><strong>6</strong></td>
<td><strong>6</strong></td>
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<td><strong>1</strong></td>
<td><strong>8</strong></td>
<td><strong>9</strong></td>
<td><strong>6</strong></td>
<td><strong>11</strong></td>
<td><strong>9</strong></td>
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</table>

*Prozercon fimbriatus* (C.L.Koch, 1839)

Palearctic species, found in the soil of prairies, beech forests (Moraza, 1988) and pine forests. In the beech forest, deutonymphs and adult mites were collected in the summer; in pine forests, the species was collected in late spring.

In the prairie of Quinto Real is found one of the most abundant and frequent species of soil mesostigmatid mites. Winter appears to be the least favourable season for its populations (lower density and lower relative abundance in the community) (Table 3). *Pr. fimbriatus* lives indistinctly on the surface and in humus. Immature instars appear throughout the year.

New material studied – From beech forest: Irati (12♀♂, 7♂♂, 2Dn, 1Lv, 18.I.83; prairie: Quinto Real (2♀♂, 1♂, 2Lv, 08.III.1983; 7♀♂, 4♂♂, 1Dn, 1Pn, 26.VIII.1982; 9♀♂, 1♂, 1Pn, 10.XI.1982); pine forest: Gulina (2♀♂, 2♂♂, 3Dn, 1Lv, 11.VI.1986).

**Table 3.** Seasonal abundances/relative abundance of species of *Prozercon* in sampled habitats and localities (S= spring; S’= summer; A= autumn; W= winter; Be=Beunza; Bi=Bigüézal; BR=Bardenas Reales; Ca=Carrascal; Er=Erize; I=Iratí; Le=Leiza; Sa=Sansoain).

<table>
<thead>
<tr>
<th>Prozercon</th>
<th>S</th>
<th>S’</th>
<th>A</th>
<th>W</th>
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</thead>
<tbody>
<tr>
<td>Pr. cambriensis</td>
<td>7</td>
<td>?</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Oak Leiza*</td>
<td>16/13</td>
<td>44/12</td>
<td>37/12</td>
<td>2/6</td>
</tr>
<tr>
<td>Pr. fimbriatus</td>
<td>—</td>
<td>70/7</td>
<td>—</td>
<td>—</td>
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<td>Beech Irati</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>7/1</td>
</tr>
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<td>Pr. lutulentes</td>
<td>—</td>
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<td>—</td>
</tr>
<tr>
<td>Larch Q.R.</td>
<td>26</td>
<td>?</td>
<td>47</td>
<td>?</td>
</tr>
<tr>
<td>Pine Gulina*</td>
<td>3/1</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Pr. ornatus</td>
<td>7/4</td>
<td>—</td>
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<td>—</td>
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<tr>
<td>Larch Be</td>
<td>66/11</td>
<td>—</td>
<td>190/39</td>
<td>110/34</td>
</tr>
<tr>
<td>Oak Be</td>
<td>—</td>
<td>20/2</td>
<td>17/4</td>
<td>2/1</td>
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<tr>
<td>Oak Sa</td>
<td>12/4</td>
<td>—</td>
<td>19/7</td>
<td>24/4</td>
</tr>
<tr>
<td>Oak Le</td>
<td>18</td>
<td>?</td>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

Prozercon lutulentus Halasková, 1963
Central European species found in a reforested larch forest (Moraza, 1988) established on the middle of a natural beech forest, and in pine forest litter. Specimens were not collected in summer and autumn and it prefers deeper layers of soil. Immature instars are found most frequently in the spring, however the species overwinters as an active population with all types of development instars.

New material studied – From pine forest: Gulina (5 ♀♀, 1Pn, 1 Dn, 24.XI.1986; 2♀♂, 1♂, 1Dn, 11.VI.1986).

Prozercon tellecheai Moraza, 1988
This species has frequently been found in the soil of oak forests (Moraza, 1988) and in the reforested forest of Larix kaempferi, and is one of the most abundant species. The species prefers the oak forest in summer and the larch forest in winter. It prefers the surface and organic layers of soil (litter). Their immature instars (larva, protonymph and deutonymph) have been found in fall and winter.

The substitution of the natural oak forest of Beunza by larch trees in the same area (Erize), produces an increase in absolute and relative abundance of Pr. tellecheai (Table 3). However, the substitution of the oak forest by a pine forest in Sansoain produces the opposite effect and populations of Pr. tellecheai have difficulty adapting to the new ecological conditions and subsequently disappear.


Zercon aberrans Mihelcic, 1960
Species found in the felled habitat of Bigüezal. As most species of Zercon, the favorable season is autumn and the critical time is summer. Immature instars have been found in the fall and winter seasons. In the fall, its relative abundance is high and represents more than 50% of the mesostigmatid soil community.


Zercon arcuatus Trägårdh 1931
Material studied – From leaf litter (8 specimens) and humus (2) from the beech forest of Irati (3♀♀, 3♂♂, 4Dn, 08.VI.1982).
Zercon blesti Evans, 1954 (Fig. 1)

The species is newly recorded in the Iberian Peninsula.

Material examined - From beech forest litter: Barranco de Minchate, (4♀, 1Dn, 07.X.1990); from Beunza oak forest litter, (1♀, 23.XI. 1989).


Zercon franzi Willmann, 1943
The species is newly recorded in the Iberian Peninsula.
Material examined - One female of Carrascal (Bardenas Reales) pine forest in winter (18.I.1983).

Zercon guadarramicus Mihelcic, 1960
Material examined - From larch forest litter: Brangueta (Q.R) (1♀, 01.VI.1982; 1♂ 26.VIII.1982); from beech forest humus: Irati (1♀, 1♂, 08.VI.82)

Zercon italicus Sellnick, 1944
The species is newly recorded in the Iberian Peninsula.
Material examined - Species found under the surface layer of a prairie: Biguezal (1♀, 27.IV.82).

Zercon keiseri Schweizer, 1949
Material examined - Species found in larch forest litter of Brangueta (Q.R) (3♂♂, 1Dn, 01.VI.1982; 1♂, 08.III.1983).

Zercon montigenus Blaszak, 1972
The species is newly recorded in the Iberian Peninsula. It has been found in litter of several pine forests of Pinus nigra: Marcalain (6 ♀♂, 1Pn, 1Dn, 4.VI.1986), Itoiz (5♀♂, 1♂, 3Dn, 21.V.1986), Zabaldica (3♀♀, 21.V.1986), Arostegui (5♀♀, 5♂♂, 11.VI.1986)

Zercon navarrensis Moraza, 1989
This species lives in oak forests and in several reforested pine forests. The species appears to behave differently from one habitat to another, however, if we focus on the mean population dynamics, its absolute and relative abundance is highest in autumn, although the latter index remains virtually unchanged throughout the year.
In oak forests, the species inhabits leaf litter and humus, and in pine forests the species can also be found in the deepest mineral soil. Immature instars (Lv, Pn and Dn) may be collected throughout the year.
The substitution of natural oak forest by pine forests of Pinus nigra in Sansoain, just as the substitution of oak forest in Beunza by larch forest (Erice), results in a decrease in its population abundance, although Z. navarrensis is able to adapt to the new conditions.
New material examined: pine forests: Biguezal (15♀♀, 10♂♂, 3Dn, 2Lv, 27.IV.1982; 25♀♀, 1♂, 1Dn, 03.VIII.1982; 44♀♀, 8♂♂, 10Dn, 24Pn, 34 Lv, 17.XI.1982; 2♀♀, 6Dn, 6Pn, 25.1.1983), Zabaldica (9♀♀, 3♂♂, 1Dn),

_Zercon paenenedus_ Athias-Henriot, 1961 (Figs. 2, 3)

First described in the Valle de Ordena (Western Pyrenees, Spain) by Athias-Henriot (1961), until now only females had been found. In describing the species in this paper, notation of dorsal idiosomal setae follows Lindquist & Moraza (1999) and dorsal adenotaxy and poroidotaxy follows Johnston & Moraza (1991) and Našán & Fenda (2004).

**Diagnosis** - Anterior margin of ventrianal shield with two pairs of setae. Dorsal fossae scacerly developed (outer fossae at least twice as large as inner fossae and axes of outer fossae are inclined with respect to the longitudinal axis of the body). Glands _gdJ4_ (Po3) situated between J and Z- setal row, on the line connecting setae _Z4_ and _J5_ or on the line conecting _Z3_ and _Z4_. Setae _J1-J3_, not reaching the bases of following setae; setae _J4_ and _J5_ longer (_J4<_ _J5_), reaching the bases of following setae; setae _J5_ absent. Setae _Z2_ and _Z3_ similar in form and length, smooth, needle-like; setae _Z4_, _Z5_, _S4_ and _S5_ prolonged, with undulate and a thread-like apical part, and at least twice as long as the other opisthonotal setae. Setae _S4_ reaching beyond the margin of the idiosoma. Lateral margins of opisthonotum with shallow and obtuse serration, marginal setae _R_ long, extending beyond the bases of the following setae, similar in shape to other dorsal setae. Opisthonotal shield with reticulate pattern and smooth posterior part (Fig. 19).

**MALE** - Length of idiosoma 540 µm, width 380 µm. Dorsum similar to the female (Fig. 2).

Venter (Fig. 3) - Sternogenital shield completely fused to the endopodal shields and with four pairs of sternal setae, smooth and needle-like in shape. An unsclerotized sternal area between setae _stI_ and _st2_; wide posterior edge of shield at level of posterior margin of coxae IV. Large ventrianal shield with one pair of setae at the anterior margin and glands _gv2_ triple and with the openings included in the shield.

Studied material – From oak forest litter, Leiza (1♂, 1♀, 16.XII.1993); from leaf litter and soil of beech forest, Barranco de Minchate (13♀♀, 2♂♂, 10.VIII.1990); from prairie, Barranco de Minchate (6♀♀, 10.VII.1990).

_Zercon parivus_ Moraza, 1991

Species well represented in the oak forest of Beunza and in the beech forest of Irati (Moraza, 1991) (table 4), has been found again in the larch forest of Brangueta and infrequently in other habitats (table 2). It always lives beneath the leaf litter layer.

New material examined – From humus of pine forests: Sansoain (1♀, 01.XII.1982); from larch forest litter: Brangueta (Q.R) (1♀, 01.VI.1982; 1♂, 08.III.1983).

_Zercon peltatus_ C.L Koch, 1836.

Species found in leaf litter from oak forest leaf litter, Beunza (1♀, 10.V.1982).

_Zercon pustulescens_ Athias-Henriot, 1961

The species is generally found in leaf litter (except for the oak forest of Beunza) of oak, larch and pine forests. Autumn is the season when the species exhibits maximum population density and relative abundance (Table 4) and when highest number of larvae, protonymphs and deutonymphs were collected in the pine forest (_Pinus sylvestris_) of Biguezal.

Although _Z. pustulescens_ has been collected in _Pinus nigra_ pine forests, the substitution of the natural oak forest of Beunza with this type of pine forest appears to cause the species to disappear from the habitat (Table 4).

Material examined - Pine forest: Bardenas (1Dn, 30.III.1982), Biguezal (19♀♂, 6♀♂, 03.VIII.1982; 10♀♀, 3Dn, 8Pn, 52 Lv, 17.XI.1982), Marcalain (3♀♂, 3♂♀, 4.VI.1986), Beorburu (1dn, 4.VI.1986), Arostegui (1♀, 11.VI.1986), Barranco de Minchate (1♀, 18.VII.1990); larch forests: Brangueta (Q.R) (1♂, 2Dn, 10.XI.1982; 1♂, 1Dn, 1Lv, 08.III.1983); Erreguerena (1♀, 10.XI.1982); oak forests: Beunza (3♀♀, 2♂♂, 2Dn, 11.VI.1982; 3♀♀, 10.VIII.1982); Carrascal (1 Dn, 03.X.1982); Sansoain (5♀♀, 1♂♀, 01.XII.1982; 8Dn, 1Pn, 1Lv, 22.II.1983); Leiza (1♀, 02.VII.1992).

**Habitat preference of zerconid mites in Navarra**

When comparing population densities of _Prozercon_ in different habitats which have been studied throughout the year (Tables 2, 3), the greatest abundance of these mites is found in the soil of the larch forest (_Larix kaempferi_) in Erice (49% of the specimens were collected from this habitat), which replaces the natural oak forest of the region. However, comparing the species richness among the habitats, the pine forest of _Pinus nigra_ hosts the greatest number of species (five) (Table 2).

Population densities of _Zercon_ in different habitats which have been studied throughout the year are greater in oak and pine forest in Sansoain and Bigüezal (Table 4). Oak forests, pine forests and prairies are the habitats...
**Table 4.** Seasonal abundances/relative abundance of species of *Zercon* in sampled habitats and localities (S= spring; S´= summer; A= autumn; W= winter; Be=Beunza; Bi=Bigüezal; BR=Bardenas Reales; Ca=Carrascal; Er=Erise; I=Irati; Le=Leiza; Sa=Sansoain).

<table>
<thead>
<tr>
<th>Zercon</th>
<th>S</th>
<th>S´</th>
<th>A</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Z. aberrans</em></td>
<td>17/10</td>
<td>—</td>
<td>84/59</td>
<td>10/12</td>
</tr>
<tr>
<td>Prairie Bi</td>
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<td><em>Z. arcuatus</em></td>
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</tr>
<tr>
<td>Beech Irati</td>
<td>30/17</td>
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<td><em>Z. franci</em></td>
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<td>Pine BR</td>
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preferred by Zercon (Table 2). Z. navarrensis and Z. pustulescens are the species most frequently found.

Differences among species are highlighted in the following key for females (measurements are given in micrometers: idiosomal length and idiosomal width).

**Key to species of the genus Prozercon (females) from the Iberian Peninsula**

1. Peritrematal setae \( r1 \) (p1) plumose or apically serrated .......................... 4
2. All central and submarginal podonotal setae, except \( j1 \) and \( j2 \), are smooth; setae \( S2 \) smooth; tips of opisthonotal setae, except \( J3 \) and \( Z3 \), do not reach the bases of the following setae; setae \( S3-S5 \) and \( Z5 \) are the longest setae; body size: 355 long, 250 wide..................Pr. lutulentus
3. Podonotal central setae, except \( j1 \), \( z6 \) and \( s5 \), smooth; submarginal podonotal setae plumose; \( S2 \) plumose, nearly equal in length to pilose setae \( Z1 \) and \( J1 \) and located in front of \( Z1 \); tips of \( J3 \) reach the bases of the following setae; bases of \( J3-J5 \) on the same incline direction; body size: 360 long, 240 wide.................. Pr. masani
4. Peritrematal setae \( r1 \) smooth.............................................................. 1
5. All marginal opisthonotal setae (\( S1 \) and \( R1-R7 \)) smooth; podonotal setae \( z6 \) and \( s5 \) pilose ............................................................... 10
6. Setae \( S2 \) similar in length and shape to setae \( J1 \) and \( Z1 \); setae \( S2 \) pubescent; \( S2 \) located behind \( Z1 \); bases of setae \( J3 \), \( J4 \) and \( J5 \) in the same horizontal direction; body size: 331 long, 270 wide.......... Pr. tellecheai
7. Setae \( S2 \) smooth and different from \( J1 \) and \( Z1 \); setae \( S2 \) nearly 1/2 as long as \( Z1 \).......................................................... 6
8. Setae \( S2 \) located at the same level as \( Z1 \); bases of setae \( J3-J5 \) on the same incline line; setae \( S2 \) smooth; body size: 350 long, 260 wide......

.................................................. Pr. fimbriatus
9. Setae \( S2 \) located in front of \( Z1 \); bases of \( J3 \), \( J4 \) and \( Z4 \) horizontally, in the same direction; setae \( s2 \) pilose; body size: 353 long, 302 wide..........

.................................................. Pr. davidi
10. One or more marginal opisthonianal setae are plumose, central podonotal setae \( z6 \) and \( s5 \) pilose or plumose .......................................................... 5
11. Only marginal setae \( R1 \) pilose; setae \( s2 \) smooth; fossae indistinct; body size: 326 long, 262 wide..........................Pr. juanensis
12. All marginal opisthonianal setae pubescent; all podonotal setae plumose except \( J5 \)

13 Setae $J1-J4$ along two parallel lines; $gdJ3$ (Po3) paraxial to the line connecting $Z3-Z4$; dorsal fossae indistinct; body size: 328 long, 250 wide .................................................................................... Pr. escalai

14 Setae $J1-J4$ not parallel lines; $gdZ3$ (Po3) antiaxial to the line connecting $Z3-Z4$; dorsal fossae distinct; distance between setae $J4$ twice as long as between setae $J3$; body size: 335 long, 260 wide................

Key to the species of Zercon (adult females) from the Iberian Peninsula, and the Balearic and Canary Islands

1 Anterior margin of the ventrianal shield with one pair of ventrianal setae .......................................................... 4

2 The axes of the outer opisthonotal fossae are inclined toward the longitudinal axis of the body. Glands Po3 in position $gdJ4$, on the line connecting $J5-Z4$; setae $S5$ seated on a sharp triangular tubercle: body size: 450 long, 330 wide.................Z. klingei Mihelcic 1960

3 The axes of the inner fossae are inclined toward the longitudinal axis of the body. Dorsal setae heterogeneous; setae $S4$, $S5$, $Z4$, $Z5$ and $J5$ are distally expanded with a flattened, rounded tip; body size: 430 long, 325 wide.................................Z. balearicus Athias-Henriot, 1961

4 Anterior margin of the ventrianal shield with two pairs of ventrianal setae ........................................................................................................ 1

5 Opisthonotum with an incomplete complement of setae: setae $S2$ and $S3$ absent ..................................................................................................... 8

6 Setae $J1-J5$ short; setae $Z3-Z5$, $S4$ and $S5$ thickened, apically pilose and with paddle-like hyaline ending and about two and a half times as long as smooth setae $Z2$; Glands Po3 in position $gdJ4$, situated along the line connecting setae $Z4$ and $J4$; body size: 403 long, 322 wide......Z. hugoi

7 Setae $J1-J4$ short, other opisthonotal setae are long and finely serrated distally; outer fossae at least twice as large as the inner fossae; $gdJ4$ on the line connecting $J4-Z4$; body size: 410 long, 300 wide..................Z. aberrans

8 Opisthonotum with a complete complement of setae (setae $S2$ and $S3$ present)............................................................................. 5

9 Po3 in position “gdZ”: between $Z3$ and $Z4$ or somewhat antiaxial or medially to the line connecting $Z3$ - $Z4$ ................................. 28

10 Glands Po3 in position $gdZ3$, medially along the line connecting $Z3$ and $Z4$ ...................................................................................... 13
Longest setae Z4, Z5, S3-S5 with expanded and rounded tips; setae R longer than Z1 and serrated; body size: 420 long, 310 wide. Z. cazorlensis Athias-Henriot, 1961

Longest setae are not expanded; setae R as short as setae J; setae J1 and J2 longer than J3-J5; setae Z3 are three times longer than Z2; body size: 470 long, 330 wide. Z. franci

Glands gdZ3 (Po3) antiaxial to the line connecting Z3 and Z4. Z. guttulatus Athias-Henriot, 1961

Opisthomonal shield, except for the anterolateral corners, completely covered with small tubercles; setae Z4, Z5 and S5 with expanded, rounded tips; body size: 500 long, 385 wide. Z. pustulescens

Opisthomonal shield is not completely covered with small tubercles. Z. subguttulatus

Setae Z3 are one and a half times longer than Z1; all marginal opisthomonat setae, Z3 to Z5 and S5 with flattened, oar-shaped hyaline rounded tips; setae J3-J5 do not extend beyond the bases of the following setae; body size: 532 long, 457 wide. Z. italicus

Setae Z4 situated laterally to the outer fossae.

Setae Z4 and J5 located at the same level; the bases of J1-J5 and Z1-Z5 are situated along a straight line; body size: 540 long, 330 wide. Z. keiseri

Setae Z4 and J5 are not located at the same level.

At least all marginal opisthomonatal setae with flattened, oar-shaped and rounded tips.

All opisthomonatal setae, except J1, J2, Z1 and Z2, flattened, oar-shaped and rounded tip; setae J3-J5 extend beyond the bases of the following setae; body size: 590 long, 500 wide. Z. guttulatus Athias-Henriot, 1961

Marginal setae “R”, S1, Z2, S3, S5 with a flattened, oar-shaped hyaline rounded tip; longest setae with a hyaline extension; opisthomonatal fossae paired; setae J5 in front of the inner fossae; body size: 447 long, 461 wide. Z. parivus

Marginal setae “R”, S1, Z2, S3, S5 pointed, smooth, without a hyaline rounded tip; opisthomonatal setae uniformly short; setae Z4 and J4 are located at the same level.
NEW RECORDS OF ZERCONID MITES FROM THE IBERIAN PENINSULA...

26 J5 twice as long as J1 and located close to the inner fossae; Z5 are the longest setae; body size: 630 long, 515 wide.................... Z. arcuatus
27 J5 equal in length to J1; body size: 620 long, 460 wide................
................................................................. Z. montanus Willmann, 1953
28 Po3 in position gdJ3, paraxial to the line connecting Z3 - Z4.........9
29 Setae Z4 situated in front of the outer fossae; gdJ3 close to the base of Z4; longest setae are smooth below their tapered tips; 455 x 325 µm; body size: 408 long, 322 wide................................. Z. navarrensis
30 Setae Z4 situated laterally to the outer fossae
31 Dorsal shields ornamentation weakly expressed; gdJ3 along the line connecting J5-Z4; setae J5 shortest setae of the series J; longest setae thin and smooth; setae S3 do not reach the margin of the shield; body size: 415 long, 290 wide................................. Z. blesti
32 Dorsal shield ornamentation very distinct
33 Setae J1-J5 short, of homogeneous length and/or uniform structure....
................................................................. 38
34 Seta S3 extend beyond the margin of the shield; gdJ3 on the line connecting J4-Z4; setae S4, Z3 y Z4 do not reach the bases of the following setae; body size: 520 long, 400 wide ........... Z. berlesei Sellnick, 1958
35 Setae S3 do not extend beyond the margin of the shield; gdJ3 along the line connecting J5-Z4 or behind the line J4-Z4; Z4 equal in size to Z5
36 Setae Z1-Z3 uniform in length and shape and shorter than setae S2 and S3; longest setae reach the bases of the following setae; longest setae without hyaline endings; body size: 420 long, 300 wide........................
................................................................. Z. guadarramicus
37 Setae Z1-Z2 uniform in length and shape and similar in length to S2 and S3; longest setae with hyaline ending; body size: 576 long, 447 wide........................................... Z. tenerifensis Moraza, 2006
38 Setae J1-J5 of heterogeneous length and/or structure ................33
39 J1 are the short setae in series “J”; body rounded; distance between setae J2 three times J3-J3 and longer than J1-J1; gdJ3 in front of the line connecting J5-Z4; posterior half of opisthontal shield smooth; body size: 440 long, 430 wide................. Z. latissimus Sellnick, 1944
40 Setae J1 and J2 are short, the other setae J are longer and thicker......
................................................................. 45
41 Setae S3 long, their tips reach the bases of S4; gdJ3 on the line connecting J5-Z4......................................................... 44
42 Setae S3-S5 and Z5 with flattered, expanded hyaline tips and serrate before the end; setae J3-J5 plumose; distance between setae J5 twice the distance between J4; gdJ3 on the line connecting J5-Z4; body size: 450 long, 340 wide........................................ Z. montigenus

43 Setae S3-S5 and Z5 without flattened, expanded hyaline tips and smooth; setae J3-J5 thickened and smooth; distance between setae J5 twice the distance between J3............................ Z. triangularis C.L. Koch, 1936
44 Setae S3 short, their tips do not reach the bases of S4; setae Z3 plumose; opisthonotal shield covered with small pits; setae J1, J2, Z1, Z2, homogeneous in length and shape; gdJ3 in front of the line connecting J5-Z4; body size: 420 long, 320 wide.......Z. hispanicus Sellnick, 1958
45 Setae J1–J3 are short, the rest are longer and thicker .................. 51
46 Fossae not developed; setae Z3 smooth; gdJ3 in front of the line connecting J4-Z4; body size: 540 long, 380 wide .............. Z. paen nudus
47 Fossae well developed
48 gdJ3 on the line connecting J5-S5 in front of the outer fossae
49 Longest setae slightly barbed; body size 330 x 360................. Z. similis
50 Longest setae thick, pubescent; tips of smooth setae J3 reach the bases of J4; body size: 340 long, 380 wide............................... Z. peltatus
51 J1-J4 smooth and short; setae J5 pilose; gdJ3 on the line connecting J5-Z4; setae Z3-Z5 and S4-S5 pilose before the hyaline rounded end; opisthonotal shield, except for the anterolateral corners, completely covered with small pits; body size: 480 long ...................... Z. pinicola

ACKNOWLEDGEMENTS

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REFERENCES


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