

TWO NEW TAXA OF PARHOLASPIDAE EVANS, 1956 (ACARI, MESOSTIGMATA) FROM TENERIFE (CANARY ISLANDS)

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ABSTRACT

Two new taxa of the family Parholaspidae Evans, 1965 —*Holaspina canariensis* **n. sp.** and *Gamasholaspis gamasoides canariensis* **n. subsp.**— are described on the basis of specimens collected in Tenerife (Canary Islands). Idiosomal chaetotaxy, poroidotaxy and adenotaxy of these two species are illustrated and the chaetotaxy of the caudal body region is discussed.

Key words: Acari, Mesostigmata, Parholaspidae, *Holaspina canariensis* sp. nov., *Gamasholaspis gamasoides canariensis* subsp. nov., taxonomy, Tenerife (Canary Islands).

RESUMEN

Dos nuevos taxa de Parholaspidae Evans, 1956 (Acari, Mesostigmata) en Tenerife (islas Canarias)

Sobre ejemplares recolectados en Tenerife (Islas Canarias), se describen dos nuevas especies de la familia Parholaspidae Evans, 1965 —*Holaspina canariensis* **sp. n.** y *Gamasholaspis gamasoides canariensis* **subsp. n.**—. Se ilustra la chaetotaxia, poroidotaxia y adenotaxia del idiosoma de las dos especies y se discute la chaetotaxia de la región caudal del cuerpo.

Palabras clave: Acari, Mesostigmata, Parholaspidae, *Holaspina canariensis* sp. nov., *Gamasholaspis gamasoides canariensis* subsp. nov., taxonomía, Tenerife, Canarias.

Introduction

The family Parholaspidae Evans, 1956 is found in tropical, subtropical and temperate zones with wet climate (Palearctic, Indomalayan, Neotropical and Nearctic regions). Except for the works of Krantz

(1960), Petrova (1967, 1970, 1977), Ishikawa (1978, 1980a, b), Datta & Bhattacharjee (1989, 1991) and Lee & Lee (2000), there are no extended publications of this family whose members are free living predaceous mites which live in litter, the surface layer of the soil, moss, in association with

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mammals Cricetidae, Muridae) (Gu & Guo, 1996; Chen *et al.*, 1994) and even in caves (Ishikawa, 1995, 2002).

The mesostigmatic fauna on the Canary Islands (307 kilometres off the west coast of Africa, at 28° north latitude) and in the Macaronesian Region is poorly studied and only 42 species have been reported (Estrada-Peña & Sánchez, 1988; Domingo-Quero *et al.*, 2003; Ferragut & Peña, 2003; Oromí & Báez, 2001; Machado, 2002; Moraza & Peña, 2005a, b; Moraza *et al.*, 2005). Additional surveys conducted in natural ecosystems on some other islands in the Macaronesian Region will contribute to the knowledge of the taxonomy of mites in this unique geographical region.

Material and methods

Mites were extracted from samples using Berlese Tullgren funnels. Specimens were mounted individually in Hoyer's medium and sealed with Glyptal insulating varnish. Morphological observations, measurements (given in micrometers and made with stage-calibrated eyepiece micrometers) and illustrations were made using compound microscopes equipped with phase-contrast optical systems. Idiosomal setal notation follows Lindquist & Evans (1965), with modifications for the caudal region as given by Lindquist (1994) and Lindquist & Moraza (1999); leg chaetotaxy follows Evans (1963). Idiosomal notation of glands and lyrifissures follows Johnston & Moraza (1991).

The ontogeny of dorsal and ventral idiosomal setae is based on descriptions of larva and protonymphal instars of *Gamasholapis variabilis* given by Petrova (1977), protonymph of *Parholaspulus breguetovae* given by Ma *et al.* (2001), deutonymph of *Gamasholapis browni* given by Petrova (1967, 1968) and deutonymph of *Parholaspulus paradichaetes* given by Ma *et al.* (2001). Several setae of the caudal body region bear two different notations: superior notation, referring to the notation widely used and recommended and smaller size notation, referring to the possible sixth elements of the opistonotal region discussed by Lindquist (1994).

In the discussions following descriptions of new species, the comparisons with previously described species are based solely on published descriptions.

Holaspina canariensis sp. nov. (Figs. 1-11)

MATERIAL STUDIED. Holotype adult female (mounted, permanent slide), 25.I.1997, M.A. Peña leg., from soil and litter beneath *Myrica faya* Ait., altitude 950 m, UTM coordinates: 28RCS 748 565 (T-44). Paratypes, five female and two males, with same data as for holotype.

TYPE-LOCALITY. Spain, Tenerife island (Canary Islands), Cruz del Carmen.

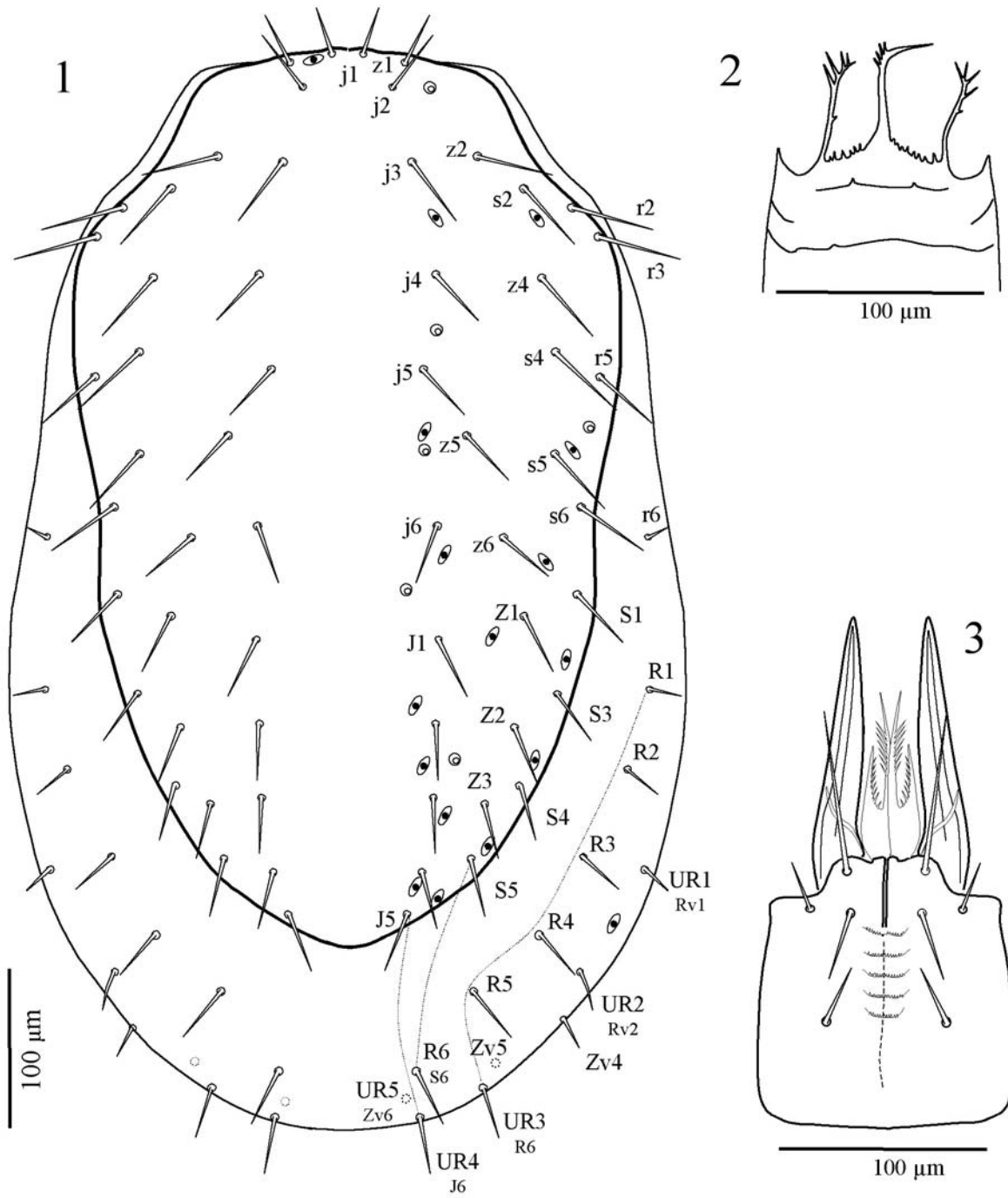
MATERIAL DEPOSITED. Museum of Zoology, Facultad de Ciencias, Universidad de Navarra (MZUNAV) (Spain).

MEASUREMENTS. Dorsal shield mean length 565 µm; width at level of humeral processes (at level of seta *r3*) 315 µm.

DESCRIPTION (Figs. 1-9). Adult female (holotype). Gnathosoma: Tectum (Fig. 2) with three ramose projections, medial projection distally bend toward the right side. Deutosternum (Fig. 3) with five rows of denticles, first row behind the insertion of setae *hp3*; hypostomal lacinea bifid, with internal branch longer than external branch. Corniculi long, similar in length to movable cheliceral digit, subequal to base of gnathosoma and 1.6 times the length of tibia I. Palp-trochanter (Fig. 7) with a thick distal seta in a small, rounded outgrowth. Cheliceral movable digits bidentate, as long as gnathosomal base (140 µm) and 1.7 times the length of tibia I; basal tooth strigulate. Fifex digit with two distal and three basal teeth. Arthrodistal membrane with weak corona and one brush; dorsal seta, pilis dentilus, dorsal lyrifissure and antiaxial lyrifissure normal.

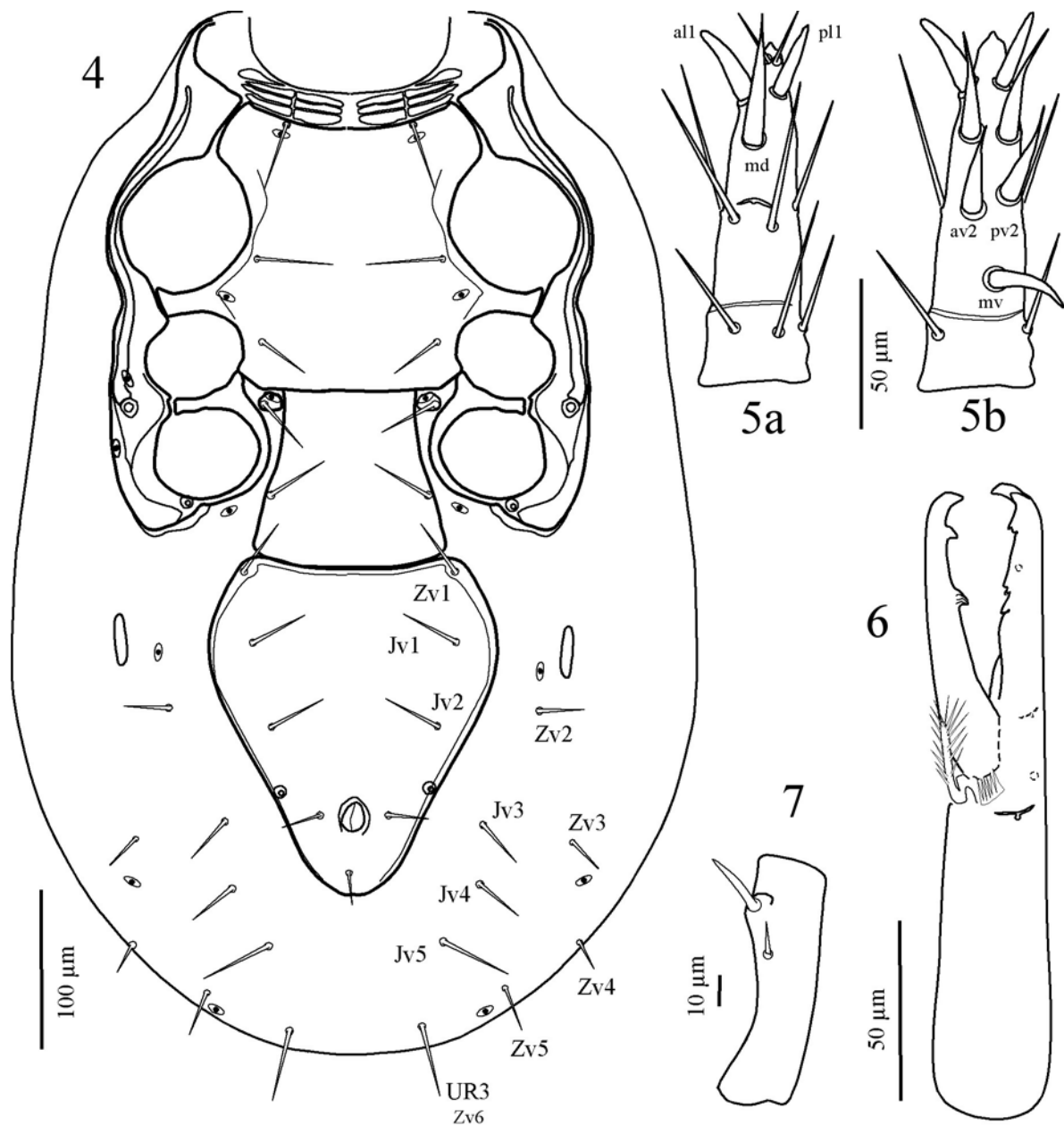
Idiosoma dorsum (Fig. 1): Dorsal shield narrows toward the posterior end of the body in such a way that the shield, at level of humeral setae *r3*, is nearly twice as wide as at level of setae *S5*. Shield with 30 pairs of thin, slightly pilose, dorsal setae: pair *j1* equal to *z1* (31 µm); setae *j2* are 1.4 times longer than *j1*; humeral setae *r2* and *r3* (51 µm) are slightly longer than other central setae; 12 pairs of setae are on the soft cuticle: *r6* (less than a third the size of other podonotal setae), *R1-R6*, *UR1-UR5*; *R1*, *R2*, *UR1* and *UR2* are nearly twice as long as *r6*. Dorsal and lateral adenotaxy and poroidotaxy as in Fig. 1 and include: on the podonotal shield *idj1*, *idj4*, *idj5*, *idj6*, *idz6*, *ids2*, *ids4*, *gdj4*, *gdj6*, *gdz1* and *gds4*; on the opisthonotal shield, *idJ1*, *idJ2*, *idJ3*, *idJ4*, *idZ1*, *idS1*, *idS3*, *idS4*, *idS5* and *gdZ2*; *idR3* on the soft marginal cuticle.

Idiosoma venter (Fig. 4): Presternal shields are fragmented in seven pairs of coalescent platelets. Sternal shield wide, fused with endopodal shields, with anterior margin slightly concave and posterior margin rather straight; three pairs of



Figs. 1-3.— *Holaspina canariensis*, female: 1) idiosoma dorsal; 2) tectum; 3) subcapitulum.

Figs. 1-3.— *Holaspina canariensis*, hembra: 1) idiosoma dorsal; 2) tectum; 3) subcapitulum.



Figs. 4-7.—*Holaspina canariensis*, female: 4) Idiosoma ventral; 5a) Tarsus II, dorsal view; 5b) Tarsus II, ventral view; 6) chelicera; 7) Male, palp-trochanter, ventral view.

Figs. 4-7.—*Holaspina canariensis*, hembra: 4) Idiosoma ventral; 5a) Tarsus II, vista dorsal; 5b) Tarsus II, vista ventral; 6) quelí-cero; 7) Macho, palpo-trocánter, vista ventral.

thin and smooth sternal setae and two pairs of lyrifissures (*iv1* and *iv2*). Setae *st4* on small metasternal shields together with *iv4*. Genital setae on the shield subtrapezoidal, with slightly convex poste-

rior margin and nearly 1.5 times narrower than sternal shield, ratio length/width <1 (0.9); genital setae on the shield and similar to *st4*; *iv5* off the shield. Ventrianal and genital shields coalescent;

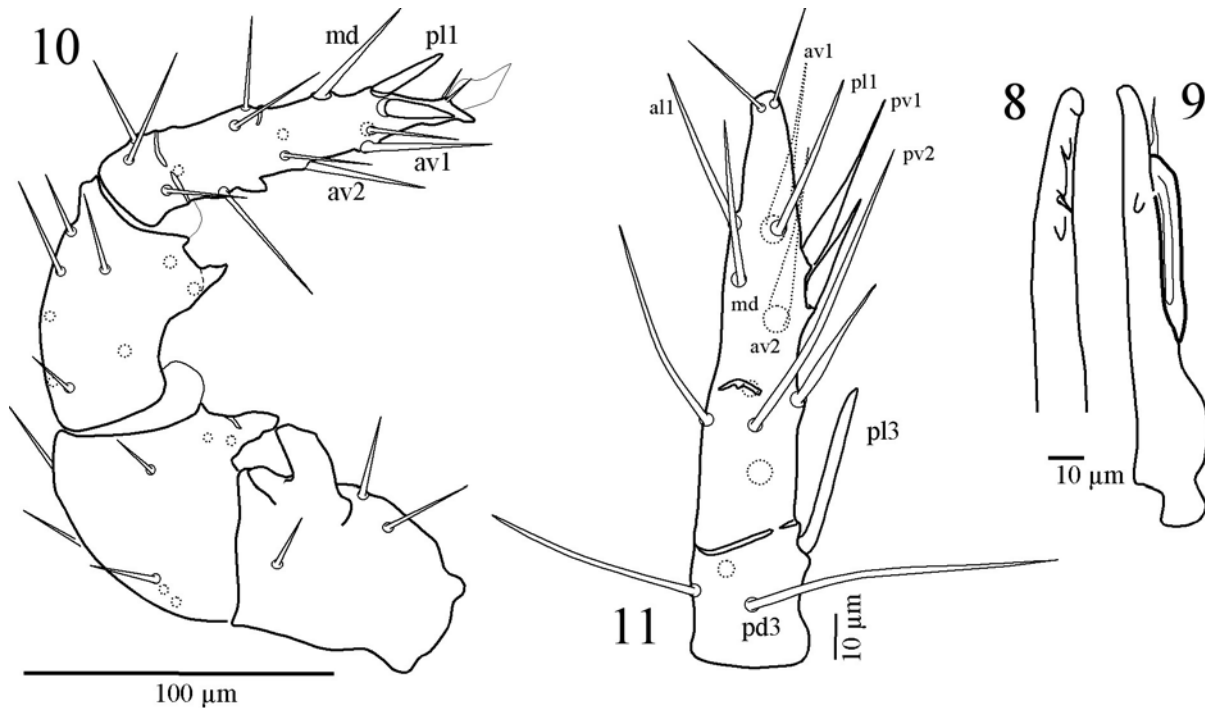


Fig. 8-11.—*Holaspina canariensis*, male: 8) detail of fixed cheliceral digit, ventral view; 9) movable cheliceral digit with spermatodactyl; 10) femora, genua, tibia and tarsus of leg II, anterolateral view; 11) leg IV, dorsal view.

Fig. 8-11.—*Holaspina canariensis*, macho: 8) detalle del dedo fijo del quelícero, vista ventral; 9) dedo móvil del quelícero con el espermatodáctilo; 10) fémur, genua, tibia y tarso de la pata II, vista anterolateral; 11) pata IV, vista dorsal.

ventrianal nearly twice as long and 1.5 times wider (at *Jv1* insertion point) than genital shield, with three pairs of opisthogastric setae: *Zv1* on the anterolateral corners of the shield, *Jv1* and *Zv1*; setae *Zv1* length 3.5 times the distance between their bases; paranal setae are slightly shorter than other opisthogastric setae and longer than postanal seta; glands *gv3* anterior to paranal setae. Seven pairs of opisthogastric setae and three pairs of lyrifissures in the soft cuticle; *Jv5* are the longest setae, 1.3 times *R4*.

Peritrematal shields fused with exopodals and extending behind posterior border of coxae IV. Peritreme do not reach posterior margin of coxae I. Small metapodal shields present.

Legs. Tarsus I without ambulacrum. Tarsus II (Figs. 5, 6) with one pair of spine-like distal setae (*al1* and *pl1*) with a blunt end; setae *av1*, *pv1*, *av2*, *pv2* and *mv* are enlarge, spine-like setae, longer than setae "11" and with acute end. Tarsus IV with

basitarsal *pd3* and telotarsal *pd2* macrosetae (74 μm), basitarsal seta *pl3* thick, spatulate and blunt (40 μm) and ventral setae spiny.

ADULT MALE. Measurements: Dorsal shield mean length 356 μm; width (at level of humeral processes, setae *r3*) 172 μm.

Gnathosoma: Tectum similar to female. Spermatodactyl (Fig. 9) 0.5 times shorter than basal length of unidentate movable digit; dorsally bend, with acuminate apex and a short pilose excrescence (almost one-third the spermatodactyl length). Fixed digit tridentate (Fig. 8), with simple *pilus dentilis*.

Idiosoma. Dorsal shield similar to female although not so posteriorly acuminate. Twelve pairs of dorsal setae (*r6*, *R1-R6* and *UR1-UR5*) and five pairs of opisthogastric setae on the soft cuticle (*Jv4*, *Jv5*, *Zv3-Zv5*). Holoventral shield with 10 pairs of setae in addition to three circumanal setae. Peritrematal shields similar to female.

Table 1.— List of samples of *Gamasholaspis gamasoides canariensis* (type material not included).Tabla 1.— Lista de muestras de *Gamasholaspis gamasoides canariensis* (no se incluye el material tipo).

| Code | Habitat | Altitude (m.a.s.l.) | Coordinates UTM | Locality | Date |
|-------|--|------------------------|--------------------|---------------------|-------------|
| T-39 | Mosses and hepatics on basaltic wall and logs | 750 | 28RCS 744 562 | Llano de los Viejos | 25.I.1997 |
| T-40 | Soil and leaf litter | 750 | 28RCS 744 562 | Llano de los Viejos | 25.I.1997 |
| T-47 | Lichens and mosses | 960 | 28RCS 757 572 | Pico del Inglés | 25.I.1997 |
| T-48 | Soil and humus, with <i>Senecio tussilaginis</i> , <i>Gesnouinia arborea</i> , <i>Echium</i> sp., <i>Erica arborea</i> , etc. | 850 | 28RCS 740 569 | Las Yedras | 25.I.1997 |
| T-49 | Earth wall with lichens, mosses and <i>Aeonium</i> sp. | 850 | 28RCS 739 569 | Las Yedras | 25.I.1997 |
| T-53 | Soil below <i>E. arborea</i> | 675 | 28RCS 823 586 | El Bailadero | 25.I.1997 |
| T-56 | Soil and humus of <i>Laurus azorica</i> | 750 | 28RCS 845 592 | El Pijaral | 25.I.1997 |
| T-59 | Cultivated soil decolonized by <i>Canarina canariensis</i> | 550 | 28RCS 867 606 | Chamorga | 25.I.1997 |
| T-127 | Soil and humus below <i>Phoenicium vulgare</i> | 630 | 28RCS 690 511 | Los Rodeos | 6.VIII.1997 |
| T-128 | Soil and humus below <i>Cynodon dactylon</i> | 630 | 28RCS 690 511 | Los Rodeos | 6.VIII.1997 |

Legs. Coxae I with a small spin-like apophysis in the anteroventral margin. Tarsus I without ambulacrum. Tarsus II (Fig. 10) with two apical spine-like setae (*all* and *pl1*), dorso medial seta (*md*) and three ventral setae (*av1*, *pv1*, *av2*) thicker than other setae of this segment and a small ventral apophysis in substitution of seta *mv*; genua and tibia II with a ventral spur; femur II with two ventral digitiform spurs, distal smaller than basal. Tarsus IV (Fig. 11) as in the female.

ETYMOLOGY. The species epithet “canariensis” is a reference to the name of the Islands—the Canary Islands—where the mite was found.

DISCUSSION. *Holaspina canariensis* belongs to the group of species without pretarsus I in both sexes, females with three pairs of opisthogastric setae on ventrianal shield, 30 pairs of dorsal setae and tarsus II with two spine-like latero-distal setae. *Holaspina canariensis* differs from *H. alstoni* (Evans, 1956) in the following characters: smaller body size of males in the new species (*H. alstoni* 480-500 μm); in *H. alstoni* spermatodactyl is longer, 2/3-3/4 of the length of basal part of movable digit; adanal setae are similar in length to preanal setae and distal seta in palp-trochanter is not enlarged. In *H. orientalis* Petrova, 1967, movable cheliceral digit of the female is similar in length to or slightly longer than tibia I and the male has the holoventral shield with nine pairs of setae instead of ten. *Holaspina pulchella* Berlese, 1916 shows the tectum with medial projection longer than lateral and dorsal setae are longer in such a way that all them reach the insertion point of the following

setae. *Holaspina kamezaticus* Petrova, 1977 has distal seta of palp-trochanter on a conspicuous digitiform protuberance in both sexes, 28 pairs of dorsal setae and small sclerites between genital and ventrianal shields.

Holaspina is found in Europe (Evans, 1956; Petrova, 1967, 1968, 1977), East and North America (Krantz, 1960) and Southeast Asia, in China (Lee & Lee, 1996; Ma, 1998; Ma *et al.*, 2001; Yin & Bei, 1993), Japan (Ishikawa, 1980a, b) and Korea (Lee & Lee, 2000).

***Gamasholaspis gamasoides canariensis* subsp. nov.**
(Figs. 12-19)

MATERIAL STUDIED. Holotype adult female (mounted, permanent slide), 25.I.1997, M.A. Peña leg., ex soil and wet litter from fayal – heath, altitude 950 m., UTM: 28RCS 756 572, (T-46). Paratypes: 10 females and one male from the same locality and date.

OTHER MATERIAL (see Table 1): one female in T-39; one female in T-40; 2 females in T-47; one female in T-48; five in T-49; one male in T-53; three females, two males and one deutonymph in T-56; one protonymph in T-59, eight in T-127 and one in T-128.

TYPE-LOCALITY. Spain, Tenerife Island (Canary Islands), Pico del Inglés.

MATERIAL DEPOSITED. Museum of Zoology, Facultad de Ciencias, Universidad de Navarra.

MEASUREMENTS. Dorsal shield length 582 μm ; width 315 μm .

DESCRIPTION (Figs. 12-19). Adult female (holotype). Gnathosoma (Figs. 13 y 14): Tectum (Fig. 13) with medial denticulate projection. Deutoster-

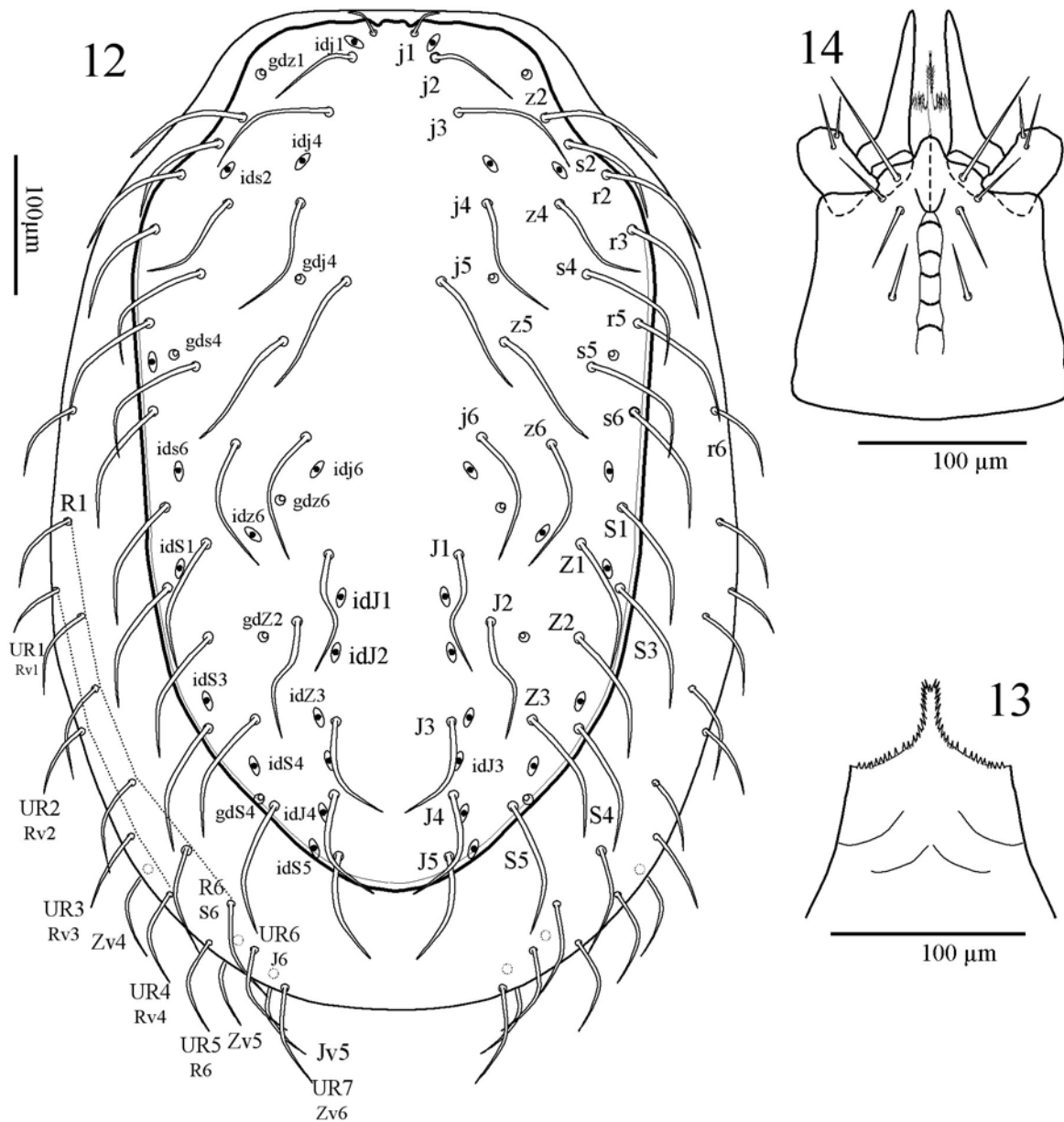


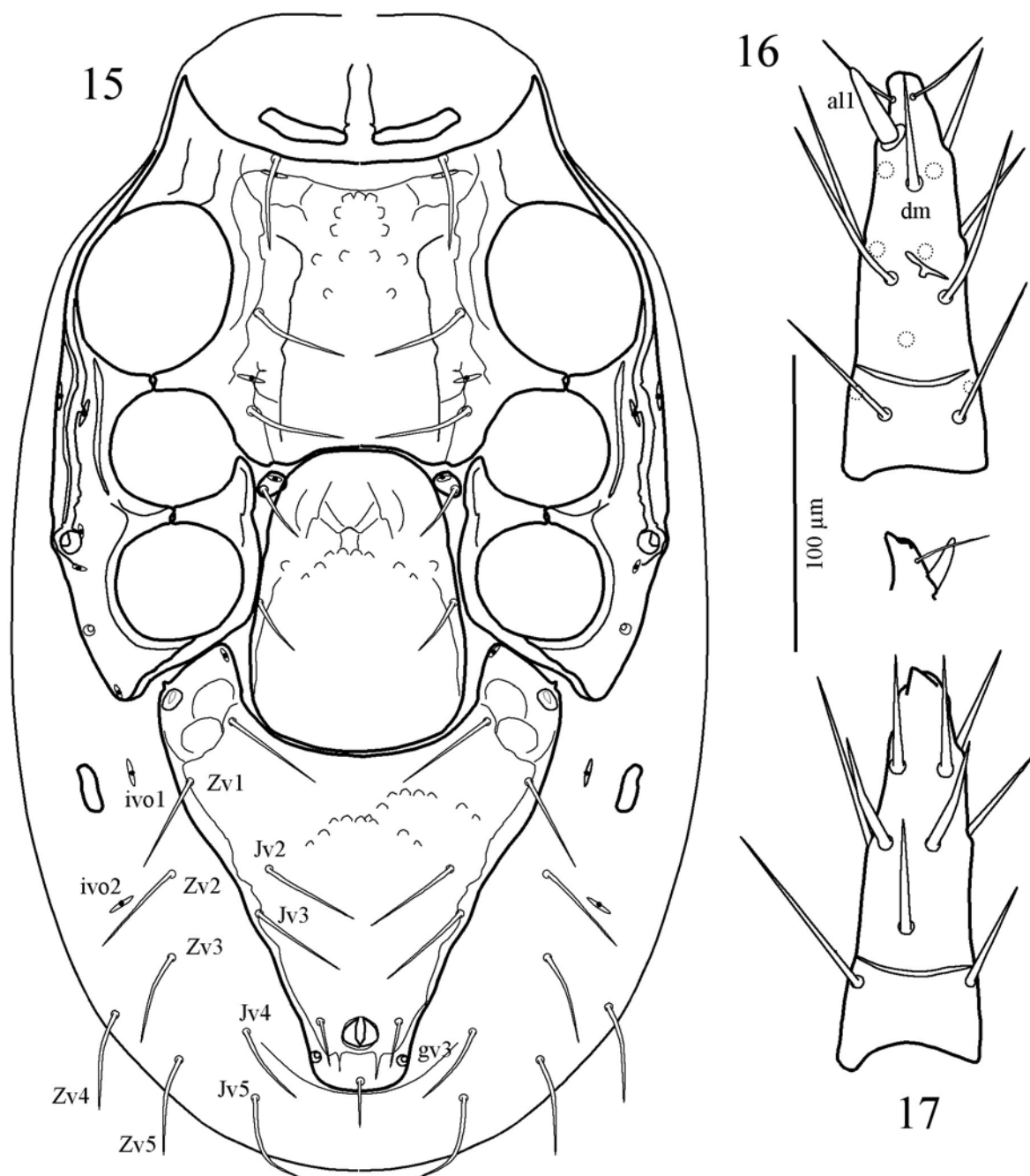
Fig. 12-14.— *Gamasholaspis gamasoides canariensis*, female: 12) idiosoma dorsal; 13) tectum; 14) subcapitulum.

Fig. 12-14.— *Gamasholaspis gamasoides canariensis*, hembra: 12) idiosoma dorsal; 13) tectum; 14) subcapitulum.

num with five rows of denticles, first row behind the insertion of *hp3*; hypostomal lacinea with internal branch longer than external branch. Corniculi long (145 µm), nearly 2.5 times longer than cheliceral movable digit, nearly half the gnathosoma base and 1.9 times tibia I. Cheliceral movable digit bidentate (77 µm), 0.4 times the

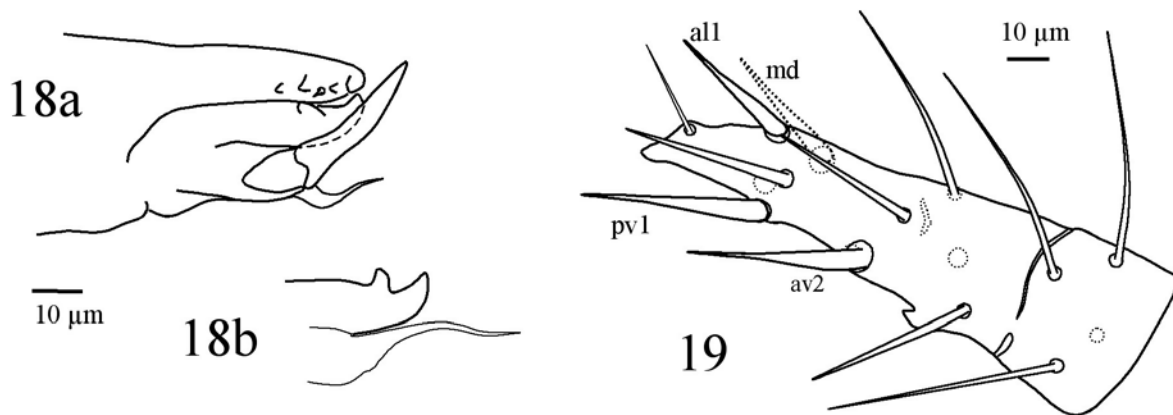
gnathosomal base and 0.8 times tibia I length; fixed digit with four teeth, the third tooth longer than the others and with pilus dentilis inserted at its base.

Idiosomal dorsum (Fig. 12): Dorsal shield with conspicuous humeral processes and posteriorly acuminate. Shield with 29 pairs of long, curved



Figs. 15-17.— *Gamasholaspis gamasoides canariensis*, female: 15) idiosoma ventral; 16) tarsus II, dorsal view; 17) tarsus II, ventral view.

Figs. 15-17.— *Gamasholaspis gamasoides canariensis*, hembra: 15) idiosoma ventral; 16) tarsus II, vista dorsal; 17) tarsus II, vista ventral.



Figs. 18-19.— *Gamasholaspis gamasoides canariensis*, male: 18a) chelicera and spermatodactyl, ventral view; 18b) detail of the spermatodactyl pilose excrescence; 19) tarsus II, anterolateral view.

Figs. 18-19.— *Gamasholaspis gamasoides canariensis*, macho: 18a) quelícero y espermatodáctilo; 18b) detalle de la excrecencia pilosa del espermatodáctilo; 19) tarsus II, vista anterolateral.

setae (92 µm), except *j1* (19 µm) which is almost three times shorter than *j2* (60 µm). Fourteen pairs of setae are on the marginal soft cuticle (*r6*, *R1-R6* and *UR1-UR7*): *r6*, *R1-R4*, *UR1-UR4* approximately half the size of setae on dorsal shield. Dorsal idiosomal pore-like structures positioned as in Fig. 12 and include: on the podonotal shield six pairs of lyrifissures (*idj1*, *idj4*, *idj6*, *idz6*, *ids2*, *ids4*) and four pairs of glands (*gdj4*, *gdz6*, *gdz1* and *gds4*); on the opisthonotal shield, nine pairs of lyrifissures (*idJ1*, *idJ2*, *idJ3*, *idJ4*, *idZ3*, *idS1*, *idS3*, *idS4*, *idS5*) and two pairs of glands (*gdZ2*, *gdS4*); *idR3* on the marginal soft cuticle.

Idiosomal venter (Fig. 15): One pair of presteral elongate shields. Sternal shield fused with endopodal shields I and II, with nearly linear anterior margin and slightly convex posterior margin. Sternal setae smooth, similar in length to other ventral setae (58 µm). Small and rounded sternal shields with *st4* (35 µm) and lyrifissures *iv4*. Genital shield with anterior rounded margin and genital setae 0.7 times shorter than sternal setae *st1-st3* and similar to *st4*; ratio length/width 1.4. Anterior margin of ventrianal shield with a deep notch in which is positioned the posterior part of the genital shield; maximum width 3.7 times wider than minimum width at level of postanal seta; shield has a pair of conspicuous glands ("posterosigmatal organ") *gv2* in the anterolateral corners associate with an ornate area and genital lyrifissures *iv5*; four pair of opisthogastric setae (*Jv1-Jv3* and

Zv1) similar to sternal setae on the ventrianal shield; paranal setae shorter; glands *gv3* posterior to paranal setae. Six pairs of opisthogastric setae on the soft ventral cuticle (*Jv4*, *Jv5*, *Zv2-Zv5*). Small metapodal shields. Peritrematal shields fused with exopodals, except for a short gap between coxae I and II and between posterior border of coxae II and posterior border of coxae III; shields extend behind coxae IV, reaching the position of glands *gv2*; pore-like structures positioned as in Fig. 15. Peritreme almost reaches the insertion of setae *j2*.

Legs. Tarsus I without pretarsus. Tarsus II (Figs. 16, 17) with acuminate distal end, one spine-like apical seta (*all*), seta *dm* and ventral setae slightly enlarge and shorter than other dorsal tarsal setae.

ADULT MALE. Measurements: Dorsal shield mean length 445 µm; mean width 258 µm.

Gnathosoma: Tectum similar to female. Spermatodactyl (Fig. 18a) similar in length to basal part of unidentate movable cheliceral digit (the base in considered as the anterior initial point of the spermatodactyl). Pilose excrescence at the base, as long as the spermatodactyl (Fig. 18b). Fixed digit tridentate.

Idiosoma. Dorsal shield similar to female with 11 pairs of dorsal setae on the soft cuticle (*r6*, *R1-R6*, four setae *UR*). Four pairs of opisthogastric setae on holovenal shield (*Jv1-Jv3*, *Zv2*, *Zv1* absent) and five pairs on the soft cuticle (*Jv4*, *Jv5*, *Zv3-Zv5*).

Legs. Tarsus I without pretarsus. Tarsus II (Fig. 19) with setae *all*, *dm*, *pv1* and *av2* slightly enlarged, no spine-like setae; a small spine-like ventral apophysis. Tibia II with a large ventral digitiform spur; genua and femur II with poor developed ventral spur.

ETYMOLOGY. The subspecies name “canariensis” refers to the Canary Islands, where the species was collected.

DISCUSSION. Although idiosomal characteristics of this taxa resemble *G. gamasoides* Berlese, 1904, absence of pretarsus I in both sexes, in addition to the absence of spine-like seta in tarsus II of the male and relative length of setae *j1*, provide sufficient reason to considered the Canarian specimens as members of a new subspecies. Other species lacking pretarsus I and *j1* less than half the length of *j2*, such as *G. incisus* Petrova, 1968, do not have the ventrianal notch and tectum has three points.

The genus *Gamasholaspis* has been reported in Russia, Italy and Argentina (Petrova, 1977), China (Gu, 1984; Lian *et al.*, 1993; Gu & Guo, 1996; Chen *et al.*, 1994; Ma & Yin, 1999), Korea (Lee & Lee, 1996), Thailand (Ishikawa & Saichuae, 1997), Japan (Ishikawa, 1995, 1980 b) and India (Roy, 1994).

General discussion

Concerning the idiosomal chaetotaxy, Lindquist (1994) did not recommend changing the notation for setal series *UR* to *RV*, as the siglum *UR* is well established and widely used. However, he did recommend its recognition and the denotation of ventral setae *Zv4* and *Zv5* because of their systematic importance. For *R6* and the other *UR* setae, he indicated that for *R6* and others *UR* setae it was probably impossible to precisely resolve which may represent the sixth elements of the dorsal or ventral series of setae. Based on positions of caudal setae present in the two taxa here described, and considering that the caudal bend discussed by (Lindquist, 1984) is retained, a tentative recognition of these caudal setae has been made, as can be see in figures 1, 4, 12 and 15.

In *Holaspina* and *Gamasholaspis*, dorsal series *J*, *S* and *R* and ventral series *J* and *Z* may be complete and as Lindquist (1994) suggested, *Jv6* may represent the proctal paraanal setae. This pattern is consistent with other Parholaspid genera.

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