Departament de Biologia Animal
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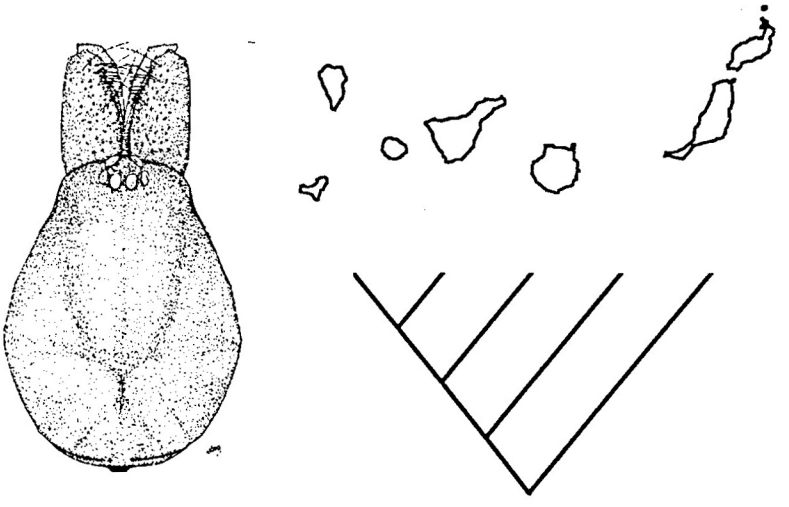
Tesi Doctoral

COLONITZACIÓ I RADIACIÓ DEL GÈNERE *Dysdera* (ARACHNIDA, ARANEAE) A LES ILLES CANÀRIES



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Radiation of the genus *Dysdera* (Araneae, Haplogynae, Dysderidae) in the Canary Islands: The western islands

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The spider genus *Dysdera* has undergone an extraordinary species radiation in the Canary Islands. As a first step towards the recovery of the endemic species phylogeny and the study of the evolutionary processes underlying its diversification, an exhaustive taxonomical work is required. The present paper deals with the endemic species that inhabit the western Canaries: La Gomera, La Palma and El Hierro. Four new species are described: *Dysdera enghoffi* sp. n., *D. hirguan* sp. n., *D. orahan* sp. n. and *D. ramblae* sp. n. Three new synonymies are reported: *D. palmensis* Schmidt, 1982 = *D. crocota* Koch, 1839, *D. multipilosa* Wunderlich, 1991 = *D. levipes* Wunderlich, 1987 and *D. silvatica* Schmidt, 1981 = *D. rugichelis* Simon, 1907. Four species are redescribed: *D. calderensis* Wunderlich, 1991 *D. clavisetae* Wunderlich, 1991 *D. levipes* Wunderlich, 1987 and *D. rugichelis* Simon, 1907 for which a neotype is designated. The presence on the western islands of the formerly described species *D. insulana* Simon, 1883, *D. macra* Simon, 1883 and *D. nesiotes* Simon, 1907 are considered to be doubtful. The citation of *D. cribellata* Simon, 1883 in La Palma (Simon, 1907) was based on a mis-identification. The species *D. gomerensis* Strand, 1911 is designated as a *nomen dubium*. Morphological affinities as well as ecology and distribution of the species are discussed.

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Introduction

The Canary Islands are a volcanic archipelago in the Atlantic Ocean, about 100 km from the north African coast. They comprise seven main islands and several islets, arranged roughly in a straight line. This arrangement represents a gradient of both closeness to the continent and age of origin, the eastern islands being the oldest and the others becoming younger to the west. The age of the main islands are: Fuerteventura 20 My, Lanzarote 15.5 My, Gran Canaria 14–16 My, Tenerife 11.6 My, La Gomera 10 My, La Palma 2 My and El Hierro 1 My (Anguita & Hernán, 1975; Ancochea *et al.*, 1990; Coello *et al.*, 1992).

A high habitat diversity in a relatively small area and initial emptiness with subsequent colonization events bring about an assortment of species which usually differ from their ancient ecosystems. These are common features not only of the Canary Islands but of most oceanic archipelagos. Due to the islands closeness to the continent, many organisms have colonized them through time, and some of them have undergone an explosive radiation.

One of the most endemic species-rich groups in the Canaries is the spider genus *Dysdera*. The presence of *Dysdera* in the Canary Islands was reported for the first time by Lucas (1839). Curiously the first captured specimens, originally assigned to the European *Dysdera erythrina* and reassigned to *Dysdera crocota* C. L. Koch by Simon (1883), turned out to be a cosmopolitan species. Nevertheless, in the same study Simon described the first endemic *Dysdera* species. At present, about 50 endemic species are recognized. Comparing that figure with those from, for instance, the Iberian Peninsula (about 25 species) or North Africa (about 30 species), as well as the rest of the so-called Macaronesian Archipelagos (the Azores with no endemic species, Madeira with five species and Cape Verde with only one species, Ferrández, 1987) we conclude that the genus has undergone a species radiation in the Canaries. The term species radiation is preferred to adaptive radiation because while the first term is purely descriptive, the second one is related to processes that have to be demonstrated (Brooks & McLennan, 1993).

An extraordinarily high number of endemic species, together with a great range of morphological variation and the colonization of most of the island habitats, makes this genus a perfect subject for studies dealing with speciation, diversification and adaptation, as well as any other evolutionary processes.

This study represents the first stage in an overall research programme dealing with the colonization processes and subsequent radiation of the genus *Dysdera* in the Canary Islands. This stage, which could be called the pre-cladistic phase (Mishler, 1993), is concerned with the basic taxonomy of the group. Its main goals are: a) to delimit the units of study (species) from a morphological, ecological and distributional point of view, and b) to construct a character-state data matrix for the species. Complete descriptions and redescriptions are needed in order to provide as much information as possible to build character-state matrices.

The next steps in the research programme involve the inference of the species phylogeny through a cladistic analysis. The causal processes can only be analysed after recovering the patterns displayed by the subject of study. Therefore, the last stage is the study of the evolutionary processes, i.e. colonization, adaptation, etc, from the point of view of phylogenetic results (Coddington, 1988; Wanntorp *et al.*, 1990; Brooks & McLennan, 1990; Funk & Brooks, 1991).

A Phylogenetic Species Concept (PSC) is used in order to recognize species. This concept is compatible with a cladistic framework and is free from hypotheses about the evolutionary process. Because knowledge of patterns is considered to be prior to the process study, process-dependent species concepts such as the Biological Species Concept were avoided. Several definitions of PSC have been proposed representing different views of the species problem (Baum, 1992). Some of the definitions, which could be called the 'diagnosability' PSC, consider species to be the smallest cluster of populations (or lineages) diagnosable by a unique combination of character-states (Cracraft, 1989; Wheeler & Nixon, 1990; Nixon & Wheeler, 1990; Davis & Nixon, 1992). On the other hand, some definitions, which could be called the 'exclusivity' PSC, consider species to be the most exclusive monophyletic group (Donoghue, 1985; Rosen, 1979; De Queiroz & Donoghue, 1988; Mishler & Brandon, 1987). The 'diagnosability' PSC was chosen because it allows identification of lineages to be used in cladistic analysis while the 'exclusivity' PSC requires a cladistic analysis to identify monophyletic lineages. In this study only morphological character-states have been used to diagnose species, although other character sets; behavioral, ecological, molecular, for example, could be equally useful.

This article, which represents one in a series of papers dealing with the basic taxonomy of the genus *Dysdera* in the Canary Islands, is concerned with the endemic species that inhabit the western islands: La Gomera, La Palma and El Hierro. Former knowledge about the genus in these islands comprised in eight endemic species and one subspecies described: *Dysdera calderensis* Wunderlich, 1987; *Dysdera clavisetae* Wunderlich, 1991; *Dysdera cribellata* Simon, 1883; *Dysdera insulana* Simon, 1883; *Dysdera insulana gomerensis* Strand, 1911; *Dysdera macra* Simon, 1883; *Dysdera nesiotes* Simon, 1907; *Dysdera palmensis* Schmidt, 1982; *Dysdera rugichelis* Simon, 1907 and *Dysdera silvatica* Schmidt, 1981; as well as the cosmopolitan species *D. crocota* C. L. Koch, 1839 that has been collected on all the islands.

Most of the specimens studied were collected, and kindly made available, by people from the Department of Animal Biology of the University of La Laguna, Tenerife (UL), Museo de Ciencias Naturales de Santa Cruz de Tenerife (MCNT), Dr Henrik Enghoff from the Zoologisk Museum at Copenhagen (ZMK), J. Wunderlich (Straubenhardt, Germany) and R. García (La Palma). Moreover, two research expeditions were performed by a team from both the University of La Laguna and the University of Barcelona. Material collected in the common expeditions is provisionally stored at the Department of Animal Biology of the University of Barcelona (UB). The following institutions kindly loaned type material of former described species: Forschungsinstitut und Naturmuseum Senckenberg (SMF), Muséum National d'Histoire Naturelle de Paris (MHNP), Universidad de La Laguna (UL).

Some specimens were not stored in 70% alcohol but frozen at −80° to be used in molecular studies. They are referred to in the text as 'Freezer'.

Material and methods

An effort was made to sample most of the islands' habitats. In La Gomera *Dysdera* specimens were collected from laurel forest: Agua de Los Llanos (UTM coordinates: 279,3115), Barranco de Aramaqué (283.059,3115), Barranco de Juel (289,3114), Barranco de Matarnos (281,3111), Las Campanas (281,3111), Monte del Cedro (281.231,3112), Monte de Juan Tomé (289.451,3113); 'fayal-brezal' forest: Laguna Grande (278,3114), Pajarito (279.768,3111); as well as their transition: Chorros de Epina (275,3118), Monte Teselinde (275,3121); and from halophytic coastal habitats (*Euphorbia balsamifera, Schyzogyne sericea, Zygophyllum fontanesii, Euphorbia parallias*): Puntallana (293.184,3112). Several kinds of 'disturbed' localities were sampled, either: Barranco de Majona (291.061,3114), degraded shrub with *Echium* and introduced *Pinus canariensis*; La Cerpa (281,3116), cultivated lands and degraded 'fayal-brezal', formerly a laurel forest; Ermita de Las Nieves (283.129,3109), degraded 'fayal-brezal'; Montaña del Dinero (280,3117), strongly degraded 'fayal-brezal' and Pinar del Infante (275,3112), a reforested *Pinus canariensis* forest. In La Palma pine forest: Lomos de María (220,3162), Pista de Machín (216,3186), Caldera de Taburiente (220.085,3180); halophytic coastal habitats (tabaibal-cardonal: *Euphorbia*): Juan Adalid (216,3195); high mountain shrubs (*Adenocarpus viscosus*): Roque de Los Muchachos (218,3184) and lava tubes: Cueva Arreboles (221,3156), Cueva de Callejones (2297,31673), Cueva de El Canal (2259,31602), Cueva de La Fajanita (2181 31935), Cueva Honda de Gallegos (223,3191), Cueva de Los Palmeros (220,3156), Cueva del Ratón (222,3152), Cueva de Tacande II (2186,31714) and Cueva del Salto del Tigalate (226,3159). Finally, in El Hierro laurel forest: El Derrabado (199,3070), Mirador de Jinama (206,3072); pine forest: Mirador de Las Playas (207.119,3070); halophytic coastal habitats (*Schyzogyne sericea*): Punta Arenas Blancas (191,3075); sabine open forest (*Juniperus phoenicea, Euphorbia obtusifolia*): El Sabinar (192,3073); as well as volcanic-MSS: Las Montañetas (209,3078) and lava tubes: Cuaclo de La Molera (190,3071), Cueva del Hoyo (204,3073), Cueva de Mauricio & Sima Palomas (198,3071).

Gross morphological features were investigated in 70% ethanol-preserved specimens using a Wild Heerbrugg (12–100 magnification) dissecting microscope. The endogyne (Mcheidze, 1972), female internal genitalia, was removed from the specimens and muscle tissues digested using a KOH (35%) solution. Male bulbus and spinnerets were removed and cleaned by means of ultrasound, dehydrated in a graded series of ethanol, subjected to critical-point drying, and mounted on an aluminium stub with double-sided adhesive tape. Preparations were coated with about 600 A of gold, and examined using a Scanning Electron Microscopy model HITACHI S-2300 at 10–15 Kv.

Characters examined

Quantitative characters (measurements) were taken of carapace length and width (maximum and minimum width, in dorsal view), eye diameter,

chelicera (lateral view), fang (from the basal segment condile to the tip), abdomen (dorsal view), abdomen hairs and leg segments (except for coxa and trochanter).

Qualitative characters were coded for:

Carapace. General colour and its distribution; ornamentation; shape of the frontal margin, anterior lateral margin, lateral at maximum width point margin and back margin; hairiness; frontal margin length in relation to total length and presence of a distinct step at the back border in lateral view.

Eyes. Putative reduction (cave-dwelling species); anterior medial eyes distance from the frontal margin, relative distance from each other and from posterior lateral eyes; posterior medial eyes relative distance from each other and from the posterior laterals.

Labium. Shape; relative length in relation to basal width and presence of a small groove at the tip.

Sternum. Colour and its distribution; ornamentation and hairiness.

Chelicerae. Relative size in relation to carapace length; fang shape; granulation of the basal segment; inner groove relative length in relation to basal segment length; groove teeth number, shape, relative size and location.

Appendages. Colour; relative length; hairiness and spination.

Abdomen. Colour; shape; shape of the dorsal hairs and distribution.

Male bulbus. (Fig. 1A–F). Tegulum size and spatial location in lateral view in relation to distal division; relative development of distal division sclerites; presence of a flagellum at the tip of the distal division; distal division upper location and projection over lower sheet; location of the tip in lateral view; presence, development, location and shape of the crest on the internal frontal side of the distal bulbus; presence of small additional crest at the external distal part of the bulbus in frontal view; presence of lateral fold over lateral sheet between internal and external sclerites; lateral sheet on the external side of the DD development and sclerotization, folding and shape of its external margin; presence of lateral sheet frontal apophysis; presence of small additional lateral sheet at the internal border, development and fusion with distal haematodoca; posterior apophysis development, fusion and location in relation to tegulum, shape, presence and development of teeth at its upper margin, and projection of its distal part.

Endogyne. (Fig. 2A–D). Dorsal arch sclerotization regions and fusion between them; size of the attachment fold around valva; frontal margin projection; shape of lateral margins; dorsal arch width in relation to its length; ventral sclerotization development; spermatheca arms shape and size in relation to dorsal arch; transversal bar shape.

Spinnerets. Anterior lateral spinnerets gland spigots number and distribution, posterior medial spinnerets and posterior lateral spinnerets spigots abundance.

All characters were recorded in DELTA format (Dallwitz, 1980 and Dallwitz *et al.*, 1983).

Terminology

Most of the terminology used is purely descriptive. For male bulbus and female endogyne structures, the terminology of Deeleman-Reinhold & Deeleman (1988) was used, with the addition of several features particular to Canarian *Dysdera*. Schult (1980, 1983) reported homology between the different parts of the haplogyne and the entelegyne bulbus. The *Dysdera* bulbus is divided into different parts: a completely sclerotized basal sclerite, homologous to the entelegyne tegulum (sclerite II), and a membranous, only partially sclerotized, distal part that corresponds both to an expansible distal haematodoca and the embolous–conductor–radix complex (sclerite III) of the entelegynes. The proximal and medial haematodocas as well as sclerite I are small and completely covered by the palp.

Spination was recorded using numerical notation. In the femora, the number of dorsal rows (parallel to the leg) as well as the number of spines per row were recorded, and the rows were named according to their position close to the front margin or close to the back one. In the tibiae, the number of bands (perpendicular to the leg) for both the dorsal and ventral sides (d and v, respectively) were recorded. The bands were named according to their arrangement with respect to the body axis (proximal or distal). For each band there are three possible locations for the spines: close to the front, in the mid part or close to the back margin; the number of spines at each position was recorded and separated by a point. When the number of spines between the two sides of the specimen were different, the left and the right number were recorded and were separated by a dash (intraindividual variation). When different specimens are compared, a dash separates the minimum and the maximum number (intraspecific variation).

The names of spinnerets as well as the types of spinneret spigot glands were assigned as in Platnick *et al.* (1991).

Diagnostic characters

Most of the diagnostic characters are located on the male bulbus, mainly at the distal division. The female endogyne has proved to be useful in most of the species, especially the character-states related with the ventral schleritization. Leg spination is usually quite variable, sometimes differing between right and left legs of the same specimen. Nevertheless, general patterns of spination, mainly those from the dorsal tibia and femur as well as spination in usually spineless segments (patella or palps) could be extremely useful for identifying some species. The relative size and position of chelicera teeth, together with the size and shape of the distal tooth, could help identification in some cases. The rest of the characters, in several combinations with the former ones, could be useful in the recognition of some species. Wunderlich (1987, 1991, 1994) used the shape of abdominal dorsal hairs as a diagnosis for certain species. Although some different kinds of hair shapes could be found in Canarian *Dysdera*, they are rarely species-specific. Spinneret external morphology is extremely conservative in the genus. Nevertheless, some species display a characteristic reduction in the number of spigots and a different distribution of these spigots.

Abbreviations used in text and figures

Eyes
AME anterior medial eyes
PME posterior medial eyes
PLE posterior lateral eyes

Male copulatory bulbus (Fig. 1A–F)
T tegulum
DD distal division
IS internal sclerite
ES external sclerite
DH distal haematodoca
F flagellum
C crest
AC additional crest
LF lateral fold over lateral sheet between internal and external sclerites
L lateral sheet
LA lateral sheet frontal apophysis
AL additional lateral sheet at the internal border
P posterior apophysis

Female genitalia (Fig. 2A–D)
G genital furrow
E endogyne
DA dorsal arch
DF dorsal arch fold
VS ventral sclerotization
S spermatheca
TB transversal bar
V valva

Spinnerets
ALS anterior lateral spinnerets
PMS posterior medial spinnerets
PLS posterior lateral spinnerets
MS major ampulate gland spigot
PS polar piriform gland spigot

Family DYSDERIDAE

Genus *Dysdera* Latreille, 1804

Dysdera calderensis Wunderlich, 1987 (Figs 3A–G, 4A–E, 5A–C)

Dysdera calderensis Wunderlich, 1987: 58, fig 7–11 [♂,♀]. -Wunderlich, 1991: 290–291, fig. 20 [♀].

Dysdera cribellata Simon, 1883 (nec. Simon, 1907: 258–259, fig. 257 [♂]); wrong identification.

Material examined. La Palma: Fuencaliente: Cueva de Arreboles; 1♀; 28/8/86; J. L. Martín leg.; 2544 104 UB. 1♀; J. L. Martín leg.; 2587 106 J. Wunderlich personal collection. Lomos de María; 1juv.; 29/10/94; Arnedo leg.; 4175 Freezer UB. Garafía: Juan Adalid, (redescription) 1♂,

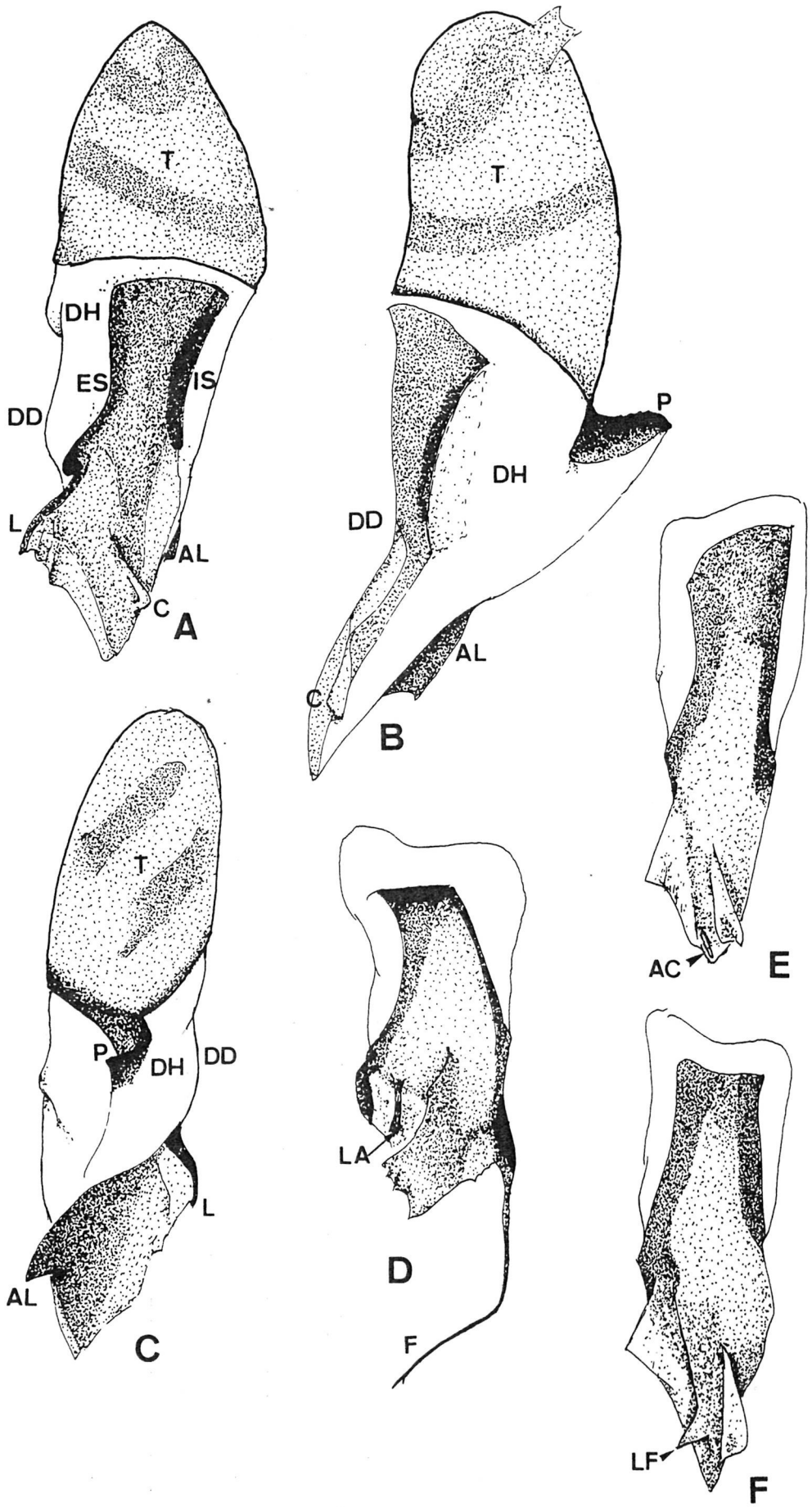


Fig. 1.—A–C. Dysdera rugichelis Simon, 1907; right male copulatory bulbus.—*A*. Frontal view.—*B*. Internal.—*C*. Posterior.—*D. Dysdera longa* Wunderlich, 1991; frontal right male copulatory bulbus.—*E. Dysdera calderensis* Wunderlich, 1987; frontal right male copulatory bulbus.—*F. Dysdera iguanensis* Wunderlich, 1987; frontal right male copulatory bulbus.

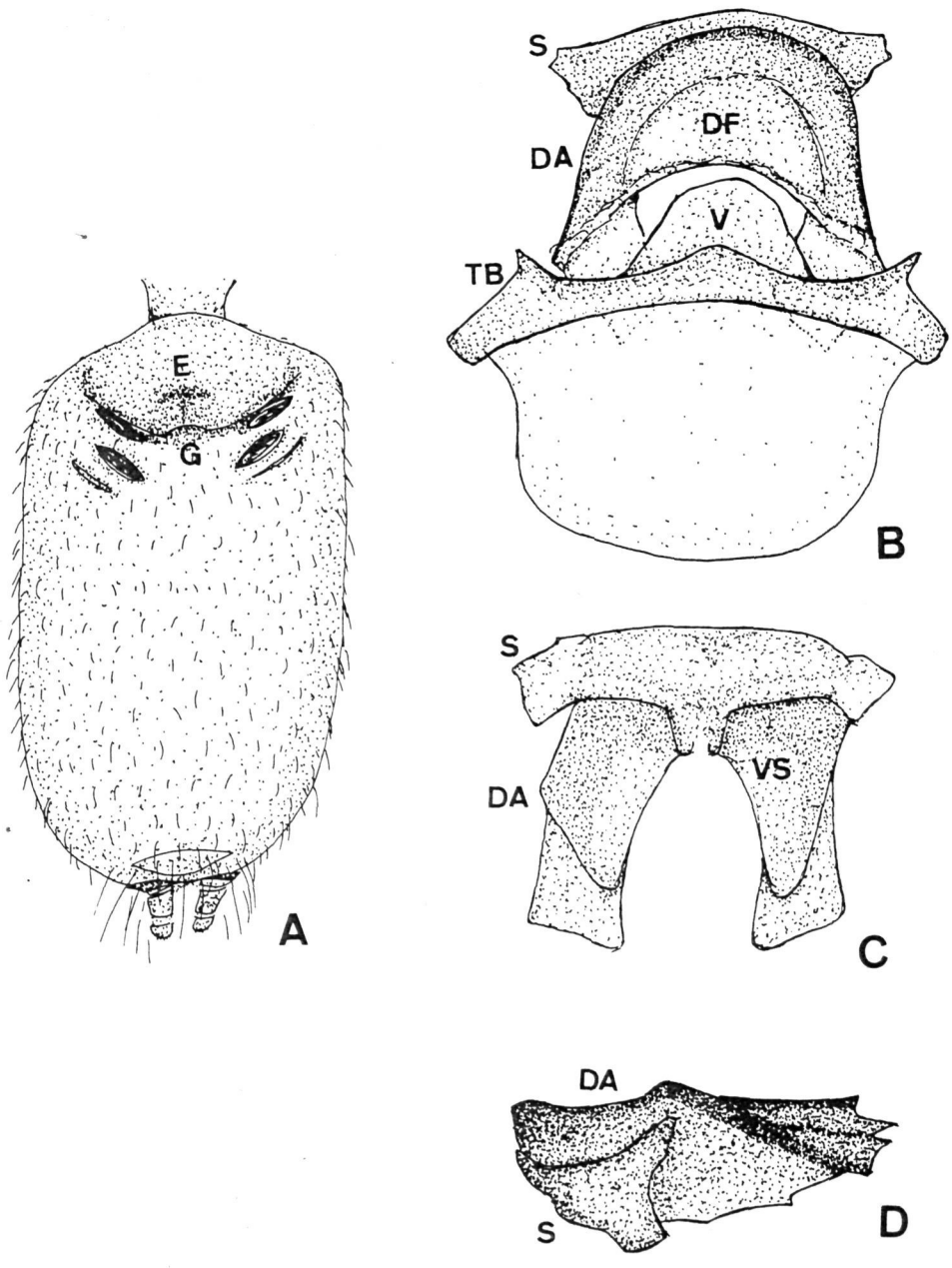


Fig. 2.—*A.* Female abdomen, ventral view.—*B–D.* Endogyne.—*B.* Dorsal.—*C.* Ventral.—*D.* Lateral.

1♀; 15/1/94; P. Oromí leg.; 2757 113 UB. 2♀; 15/1/94; P. Oromí leg.; 2758 113 UB. 1♂; 27/10/94; Arnedo leg.; 2957 121 UB. 1♀; Ribera & Serra leg.; 1♀ 4011 Freezer, 1♀ 4012 Freezer, 1♀ 4013 Freezer, 1♀ 4014 Freezer, 1♀ 4016 Freezer, 1♂ 4017 Freezer, 1♀ 4018 Freezer UB. Pista de Machín, Observatorio road to Garafía; 1♀; 28/10/94; Arnedo leg.; 2944 121 UB. 1♂ sub.; 28/10/94; Arnedo leg.; 2958 122 UB 1♂; 28/10/94; Arnedo leg.; 2961 122 UB. 1juv.; 28/10/94; Arnedo leg.; 2962 UB. La Gomera: Hermigua: Bco. de Aramaqué, near Los Acevinos; 1♀; 28/4/95; Oromí & Arnedo leg.; 4131 (48) Freezer UB. Monte de Juan Tomé, forest path to La Laja; 1♀; 28/4/95; Oromí & Arnedo leg.; 2893 118 UB. Pajarito; 1♀; 29/4/95; Oromí & Arnedo leg.; 4137 (70) Freezer UB. San Sebastián: Bco. de Juel; 1/5/95; Oromí & Arnedo leg.; 1♀ (+eggs) 4160 (114) Freezer UB, 1♀ (+eggs) 4167 (122) Freezer UB, 1♂ 4165 (119) Freezer UB. Vallehermoso: Chorros de Epina; 1♂; 30/4/95; Oromí & Arnedo leg.; 2945 121 UB. Forest path between Bco. Higuera and Bco. San Juan, road to Ermita de Sta. Clara; 1♀; 30/4/95; Oromí & Arnedo leg.; 2921 120 UB. Monte Teselinde, near road to Ermita de Sta. Clara; 1♀; 30/4/95; Oromí & Arnedo leg.; 2922 120 UB. Plain land between Bco. Higuera and Bco. San Juan, road to Ermita de Sta. Clara; 1♀; 30/4/95; Oromí & Arnedo leg.; 4146 (93) Freezer UB.

Diagnosis. Carapace cribellated, anterior lateral borders parallel, rounded at point of maximum dorsal width (Fig. 3A). Cheliceral basal segment scantly covered with granulations. DD bent about 45° in lateral view (Fig. 3C). This species can be distinguished from other carapace-cribellated species from La Gomera (*D. ramblae* sp. n. and *D. orahan* sp. n.) by long cheliceral basal segment and long fang (Fig. 3A).

Description. Male. (Fig. 3A–C, 4A–E). Carapace (Fig. 3A) 3.12 mm long; maximum width 2.47 mm; minimum width 1.63 mm. Reddish orange, uniformly distributed; cribellated, covered with circular depressions with some small black grains mainly anterior. Frontal border more or less rounded, about 1/2 of its length; lateral borders parallel; rounded at point of maximum dorsal width, with back lateral borders rounded; back margin narrow, straight. AME diameter 0.2 mm; PLE 0.2 mm; PME 0.14 mm; AME on edge of frontal border separated one from another about 2/3 of diameter, touching PLE; PME very close to each other, about 1/3 of PME diameter from PLE. Labium trapezoid-shaped, with base wider than distal

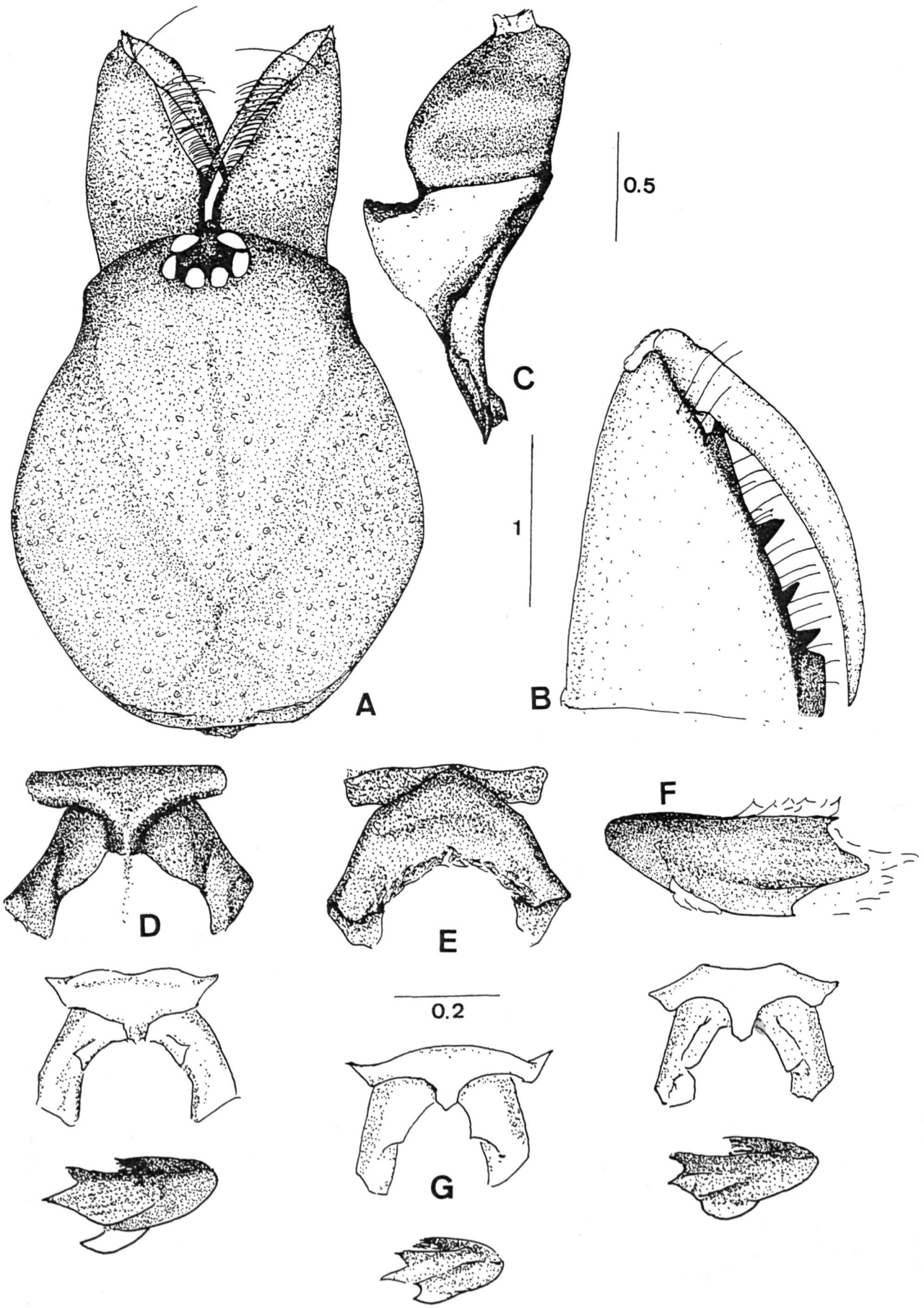


Fig. 3.—A–G. Dysdera calderensis Wunderlich, 1987.—*A*. Carapace, dorsal.—*B*. Right chelicera, ventral.—*C*. Right male bulbus, external.—*D*. Endogyne, ventral.—*E*. Endogyne, dorsal.—*F*. Endogyne, lateral.—*G*. Endogyne variability, ventral and lateral. Scale bars in millimetres.

part; longer than wide at base; with semi-circular groove at tip. Sternum dark orange, uniformly distributed; heavily wrinkled; covered in hairs mainly at margin.

Chelicerae (Fig. 3B) 1.61 mm long, about 1/3 of carapace length in dorsal view; fang 1.19 mm long; basal segment dorsal, ventral sides scantly covered with granulations, mainly on basal, inner sides. Chelicera inner groove long, more than 1/2 of cheliceral length; armed with three teeth and lamina at base; distal tooth largest, basal larger than medial; distal tooth triangular, located more or less at centre of or scantly above groove; basal tooth close to basal lamina; medial tooth close to basal one. Legs yellow. Lengths of male described above: fe1 2.52 mm (all measurements in mm); pa1 1.75; ti1 2.38; me1 2.24; ta1 0.56; total 9.45; fe2 2.31; pa2 1.57; ti2 2.17; me2 2.1; ta2 0.52; total 8.67; fe3 1.89; pa3 1.05; ti3 1.29; me3 1.75; ta3 0.49; total 6.47; fe4 2.66; pa4 1.4; ti4 2.24; me4 2.69; ta4 0.56; total 9.55; fe Pdp 1.36; pa Pdp 0.73; ti Pdp 0.73; ta Pdp 0.77; total 3.59; relative length: IV > I > II > III. Spination: Palp, leg1, leg2 spineless. Fe3d spineless; pa3 spineless; tb3d spines arranged in two bands; proximal 1.0.1; distal 1.0.0; tb3v spines arranged in one band; proximal 0.1.0; with two terminal spines. Fe4d spineless; pa4 spineless; tb4d spines arranged in two bands; proximal 1.0.1; distal 1.0.1; tb4v spines arranged in two bands; proximal 1.1.0; medial–distal 1.0.0; with two terminal spines.

Abdomen 3.91 mm long; whitish; cylindrical. Abdomen dorsal hair 0.072 mm long, thick, straight, not compressed, blunt, with tip not enlarged, uniformly, thickly distributed.

Copulatory bulbus (Fig. 3C) T scantly smaller than DD; DD bent about 45° in lateral view. DD sclerites equally developed; internal sclerite truncated at middle part of haematodoca. DD tip (Fig. 4A–D) with upper and lower sheets sticking together; upper sheet not projected over lower one; straight in lateral view. C present, well-developed; located close to tip of embolus; proximal border sharply decreasing; distal border stepped; upper tip projected, pointed; external side excavated. AC present. LF absent. L well-developed; external border not sclerotized, scantly fold, distal border divergent; continuous. LA absent. AL present, very poorly developed; proximal border fused with distal haematodoca. P (Fig. 4E) perpendicular to T in lateral view; fused to T; narrow, reduced to ridge; scantly toothed, mainly on external side, along upper margin; few teeth, about 4–6; not distally projected.

Female (Figs 3D–G, 4A–C). All characters as in male except: Carapace 3.45 mm long; maximum width 2.75 mm; minimum width 1.91 mm AME diameter 0.21 mm; PLE 0.21 mm; PME 0.14 mm.

Chelicerae 1.75 mm long; fang 1.4 mm long. Lengths of female legs described above: fe1 2.62 mm (all measurements in mm); pa1 1.92; ti1 2.34; me1 2.13; ta1 0.56; total 9.57; fe2 2.45; pa2 1.71; ti2 2.2; me2 2.13; ta2 0.56; total 9.05; fe3 2.1; pa3 1.15; ti3 1.57; me3 2; ta3 0.52; total 7.34; fe4 2.83; pa4 1.61; ti4 2.45; me4 2.73; ta4 0.56; total 10.18; fe Pdp 1.5; pa Pdp 0.84; ti Pdp 0.7; ta Pdp 0.87; total 3.91; relative length IV > I > II > III. Spination: Fe4d spines in one row, 3; tb4d spines arranged in two bands; proximal 1.1.1; distal 1.0.1; tb4v spines arranged in two bands; proximal 1.2.0; medial–distal 1.0.0.

Abdomen 4.75 mm long; whitish; cylindrical. Abdomen dorsal hairs 0.072 mm long, medium-sized, curved, compressed, pointed, uniformly, thickly distributed.

DA sclerotized around TB valva attachment as well as at ventral region; both regions completely fused, not distinguishable; DF around V wide. DA frontal border projected, pointed; lateral margins convergent in dorsal view; scantly wider than long. No sclerotized structure on ventral side; step discontinuity at internal borders. S arms as long as DA; straight; tips not projected; neck as wide as arms. TB usual shape.

ALS (Fig. 5A) with piriform gland spigot in polar position; remaining piriform spigots more external than major ampulate gland spigot; 8 + 1 piriform gland spigots; PMS and PLS (Fig. 5B–C) with 10–15 aciniform gland spigots.

Intraspecific variation. Cavernicolous specimens show carapace posterior lateral borders more straight than rounded. Eye distances larger: AME about 1 diam, PLE–PME about 1/2 diam, probably due to a slight eye reduction. Appendages are clearly longer. There is not any fixed character-state exclusive to the population from La Gomera. Some specimens are larger (carapace 3.68 mm long). PLE–PME distance about 2/5 diam. Female abdomen dorsal hairs are scantly longer (0.09–0.11 mm long). Great range of variation in ventral sclerotization of the endogyne (Fig. 3G): specimens with internal border scantly discontinuous, specimens with small tooth-like projections laterally turned, etc. Spination variability in Table 1.

Distribution. An abundant species distributed all over La Palma and in the laurel as well as the 'fayal-brezal' forest of La Gomera (Canary Islands).

Comments. The first descriptions of endemic *Dysdera* species (Simon, 1883) lacked of any type locality. In a subsequent paper (Simon, 1907) the original locations were assigned using new correctly labelled material. Nevertheless some of the collected material was wrongly determined and thus some of the locations were false. The male bulbus drawn in the redescription of *D. cribellata* (Simon, 1907) is quite different from the original one and strongly resembles *D. calderensis*. Hence the redescription of *D. cribellata* is considered to be a wrong identification and its presence in La Palma is considered to be a mistake.

***Dysdera clavisetae* Wunderlich, 1991** (Figs 6A–D, 7A–D, 8A–B)

Dysdera clavisetae Wunderlich, 1991: 291–292, fig 24–27 [♂,♀].

Material examined. Paratype male; El Hierro, El Golfo; 8/7/73; unknown leg.; num. 03842, Stored at UL. El Hierro: ?: Bajamar; fragmentary material; 7/11/87; J. J. Hernández leg.; AR-185 MCNT. Frontera: Cuaclo La Moleza; 1juv.; 19/4/85; J. L. Martín leg.; 2543 104 UB. Cueva del Hoyo; lexuvia juv.; 15/4/84; GIET leg.; 2787 114 UB. El Fayal, c. 4 km SSW Mirador de Jinama (1350 m); 2♀; 2/2/89; A. & H. Enghoff leg.; 2663 109 ZMK. El Golfo 1juv; 21/4/85; A. L. Medina leg.; 2752 113 UB. (redescription) 1♂; 8/7/73; R. Vonk leg.; 2742 113 UB. El Sabinar; 23/10/94; Arnedo leg.; 1juv. 2963 122, 1juv. 4180 Freezer UB; 27/10/94; Arnedo, Ribera & Serra leg.; 1juv. 4779 Freezer UB, 1juv. 4780 Freezer UB. Forest path El Derrabado; 1♀; 18/11/85; A. L. Medina leg.; 2541 104 UB. Mirador de Las Playas; 27/10/94; Arnedo, Serra & Ribera

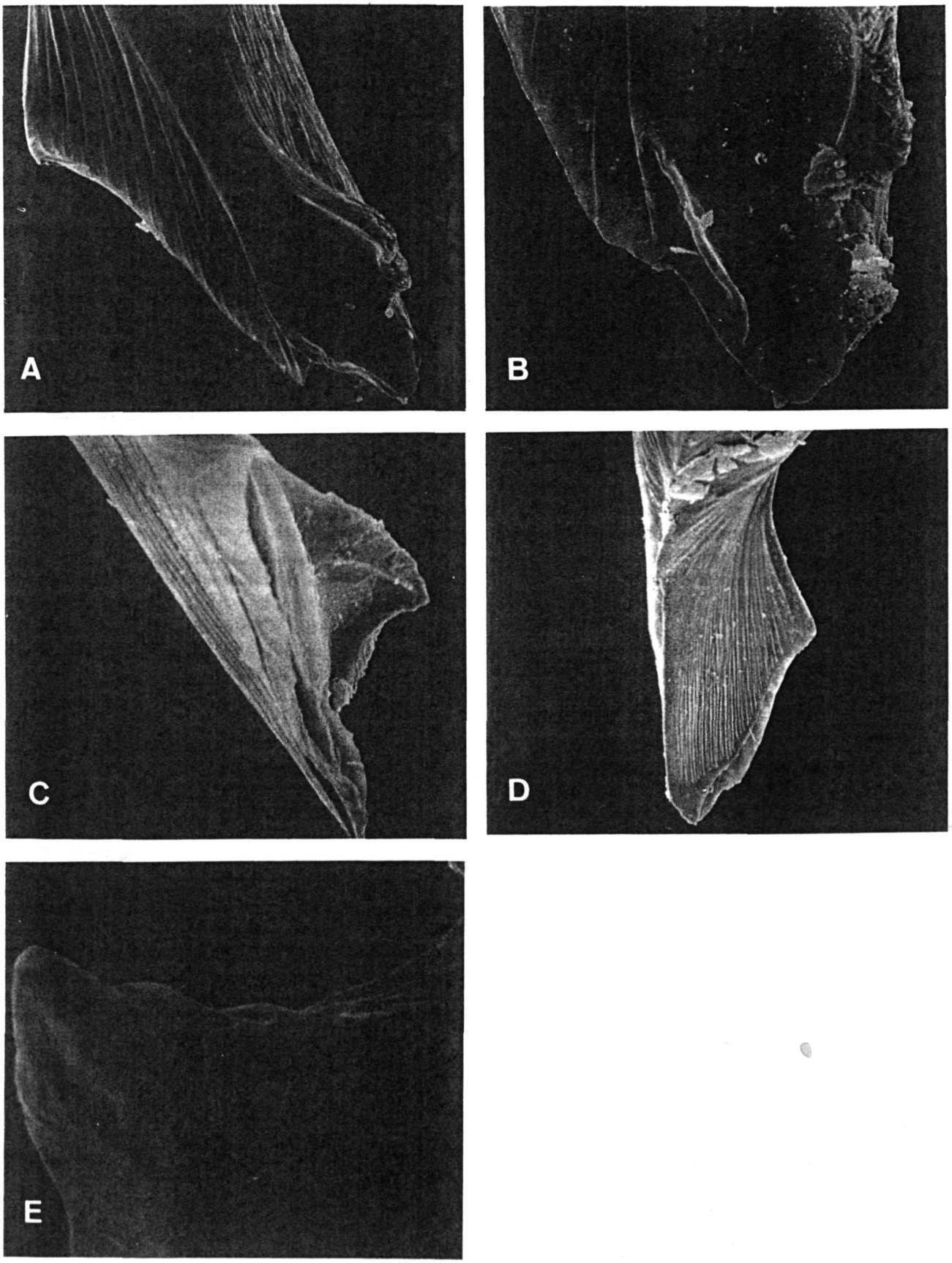
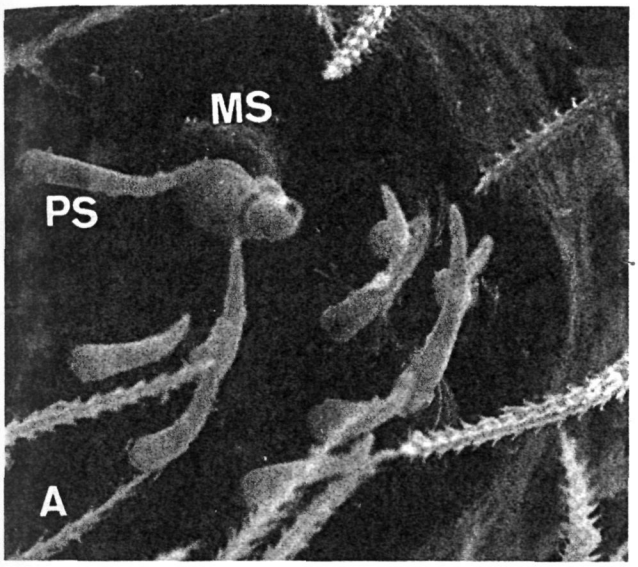
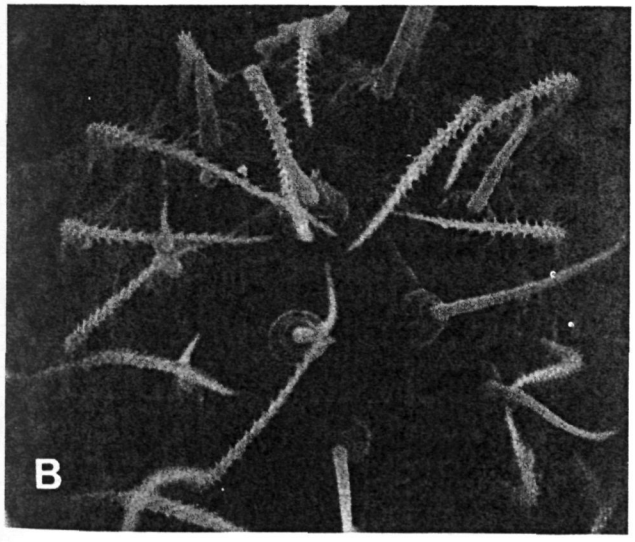


Fig. 4.—A–E. Dysdera calderensis Wunderlich, 1987; right male bulbus.—*A.* DD, frontal.—*B.* DD tip, frontal.—*C.* DD, external.—*D.* DD, posterior.—*E.* P, external.





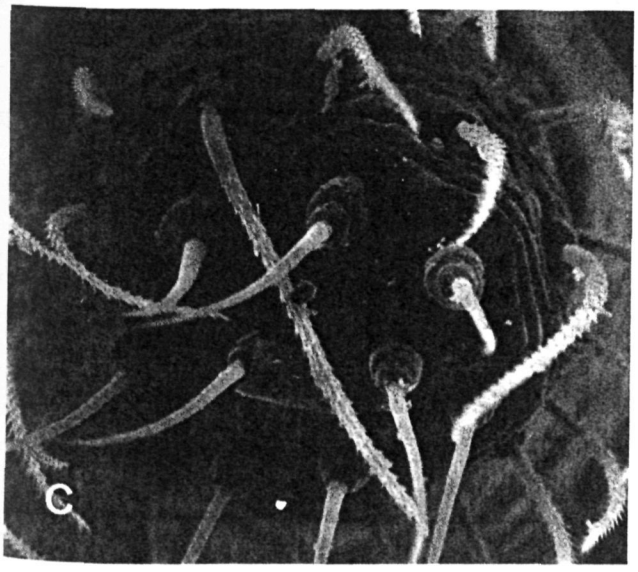


Fig. 5.—A–C. Dysdera calderensis Wunderlich, 1987; right female spinnerets.—*A*. ALS.—*B*. PMS.—*C*. PLS.

Table I. *Spination variability of* Dysdera calderensis

	Proximal	Med.–Proximal	Medial–Distal	Distal
Tibia 3 dorsal	1.0–1.0–1	0	0	1.0.0
Tibia 4 dorsal	1.0–1.1	0	0.1.0	1.0.1
Tibia 3 ventral	0–1.1–2.0	0	0	1.0.0
Tibia 4 ventral	1–2.1.0–1	0	1.0–1.0	0.0.1

	Number of rows	Number of spines
Femur 3 dorsal	0	0
Femur 4 dorsal	1	0–3

leg.; 1♂ sub. 2954 121, 1♂ 4007 Freezer, UB. MSS near Cueva de Mauricio; 1juv.; 21/4/85; GIET leg.; 2788 114 UB. 1juv.; 21/4/85; J. L. Martín leg.; 2789 114 UB. 2juv.; 21/4/85; J. L. Martín leg.; 2796 114 UB. 1♀; 21/4/85; J. L. Martín leg.; 2539 103 UB. 1♀; 21/4/85; J. L. Martín leg.; 2538 103 UB. Punta Arenas Blancas (over 10 m); 1♀; 1/2/89; H. Enghoff leg.; 2661 109 ZMK. Sima del Crater; 1♂, 1♀ fragmentary material; 6/11/87; J. J. Hernández leg.; AR-186 MCNT. Sima Palomas; 1juv.; 18/11/85; P. Oromí leg.; 2793 114 UB. 1juv.; 28/3/85; J. L. Martín leg.; 2542 104 UB.1juv.; 18/9/85; P. Oromí leg.; 2790 114 UB. Valverde: Las Montañetas; 1♂; 5/12/87; J. Meulengracht-Madsen leg.; 2653 109 ZMK. La Gomera: Hermigua: Bco. Matarnos; 1♀; 10/9/93; P. Oromí leg.; 2593 106 UB. Pajarito; 29/4/95; Oromí & Arnedo leg.; 1 ♂ 2914 119 UB, 1♂ 4133 (51) Freezer UB, 1♂ 4135 (65) Freezer UB, 1♀ 4137 (70) Freezer UB. San Sebastián: Bco. de Juel; 1♂; 1/5/95; Oromí & Arnedo leg.; 2926 120 UB. 1♀; 1/5/95; Oromí & Arnedo leg.; 4164 (118) Freezer UB. 1♂; 1/5/95; Oromí & Arnedo leg.; 4159 (113) Freezer UB. Bco. de Majona; 1♀; 1/5/95; Oromí & Arnedo leg.; 2924 120 UB. 600 m; 1♀; 9/12/94; P. Oromí leg.; 2827 115 UB. 1♂; 9/12/94; P. Oromí leg.; 2828 115 UB. 1♂ subad.; 9/12/94; P. Oromí leg.; 2829 115 UB. 1♂; 29/12/93; P. Oromí leg.; 2595 106 UB. 9/12/94; P. Oromí leg.; 1♂ 4019 Freezer UB, 1♀ 4020 Freezer UB. 1♀; 1/5/95; Oromí & Arnedo leg.; 4154 (103) Freezer UB. Ermita de las Nieves (1130 m); 1♂; 8/2/89; H. Enghoff leg.; 2657 109 ZMK. Vallehermoso; Pinar del Infante; 1♀; 2/1/82; P. Oromí leg.; 2783 114 UB. 1♀; 2/1/82; P. Oromí leg.; 2784 114 UB. Forest path between Bco. Higuera and Bco. San Juan, road to Ermita de Sta. Clara; 1♂; 30/4/95; Oromí & Arnedo leg.; 2919 120 UB. Plain land between Bco. Higuera and Bco. San Juan, road to Ermita de Sta. Clara; 1♀; 30/4/95; Oromí & Arnedo leg.; 4151 UB. 30/4/95; Oromí & Arnedo leg.; 1♀ 4151 (100 Freezer UB, 1♀ 4148 (95) Freezer UB. 1♀; 30/4/95 Oromí & Arnedo leg.; 4148 UB. Chorros de Epina; 30/4/95; Oromí & Arnedo leg.; 1♀ 4144 (85) Freezer UB, 1♀ 4143 (82) Freezer UB. Montaña del Dinero; 1♀; 29/12/94; Oromí leg.; 2971 122 UB.

Diagnosis. Carapace nearly smooth, lateral borders parallel (Fig. 6A). Chelicerae about 1/2 of carapace length. Fang very long; basal segment scantly covered with granulation; distal tooth largest and trapezoid-shaped (Fig. 6B). Strong spination of tibia III and IV, occasionally presence of one spine at the ventral surface of the patella. L Distal border more or less parallel to DD axis in frontal view (Fig. 7A). The most similar species, *Dysdera brevispina* Wunderlich, 1991 can be distinguished by distal tooth size and leg spination.

Description. Male. (Figs 6A–C, 7A–D). Carapace (Fig. 6A) 4.19 mm long; maximum width 3.3 mm; minimum width 2.23 mm. Reddish orange, uniformly distributed; scantly wrinkled with some granulation, mainly anterior, very small circular depressions at the lateral and back margins. Frontal border more or less rounded, about 1/2 of its length; lateral borders parallel; rounded at point of maximum dorsal width, with back lateral borders rounded; back margin narrow, straight; transversal suture on dorsal medial posterior surface. AME diameter 0.2 mm; PLE 0.2 mm; PME 0.14 mm; AME on edge of frontal border; about one diameter apart, touching PLE; PME very close to each other, about half PME diameter from PLE. Labium trapezoid-shaped, base wider than

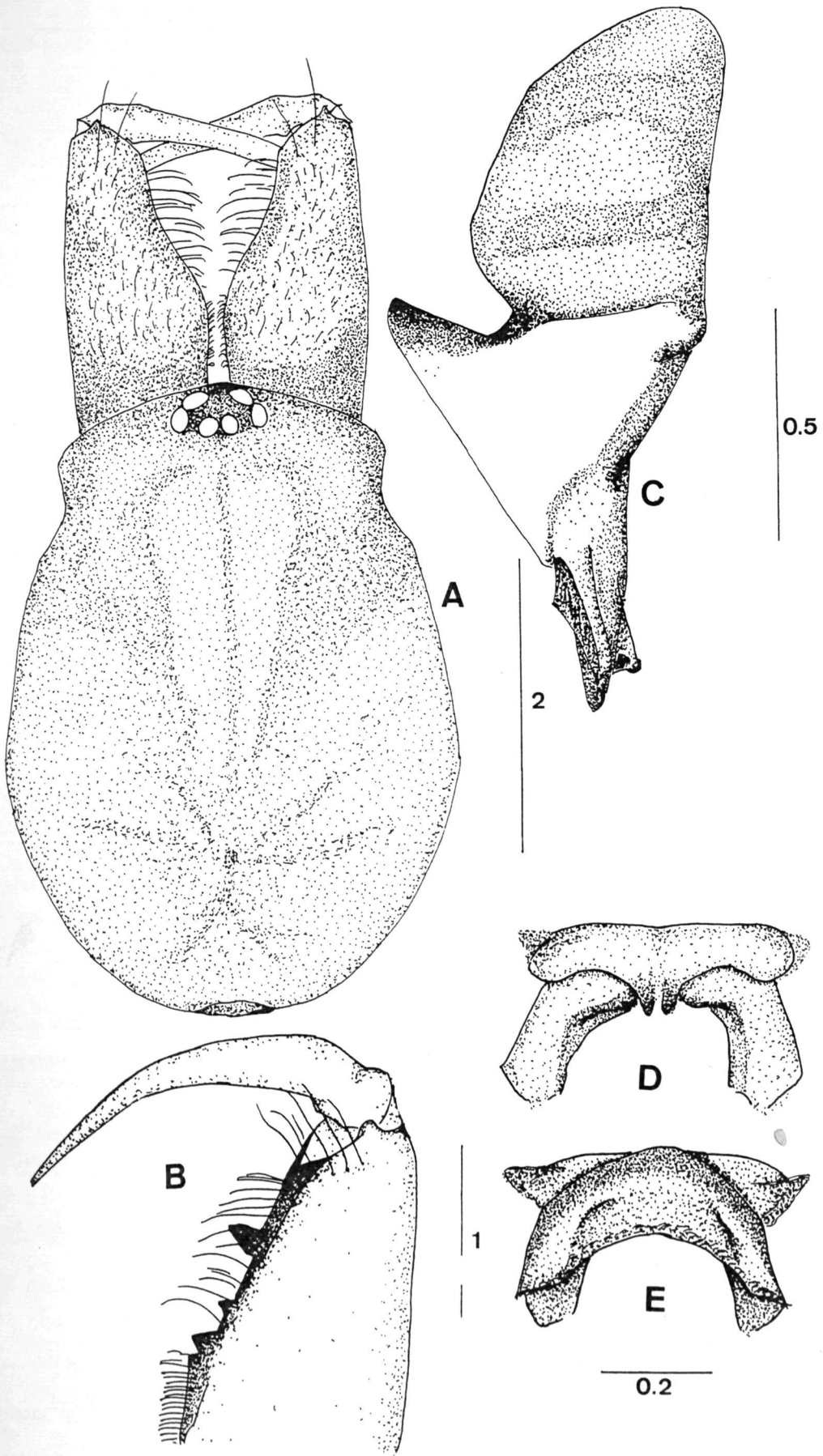


Fig. 6.—A–D. Dysdera clavisetae Wunderlich, 1991.—*A*. Carapace, dorsal.—*B*. Left chelicera, ventral.—*C*. Right male bulbus, external.—*D*. Endogyne, ventral.—*E*. Endogyne, dorsal. Scale bars in millimetres.

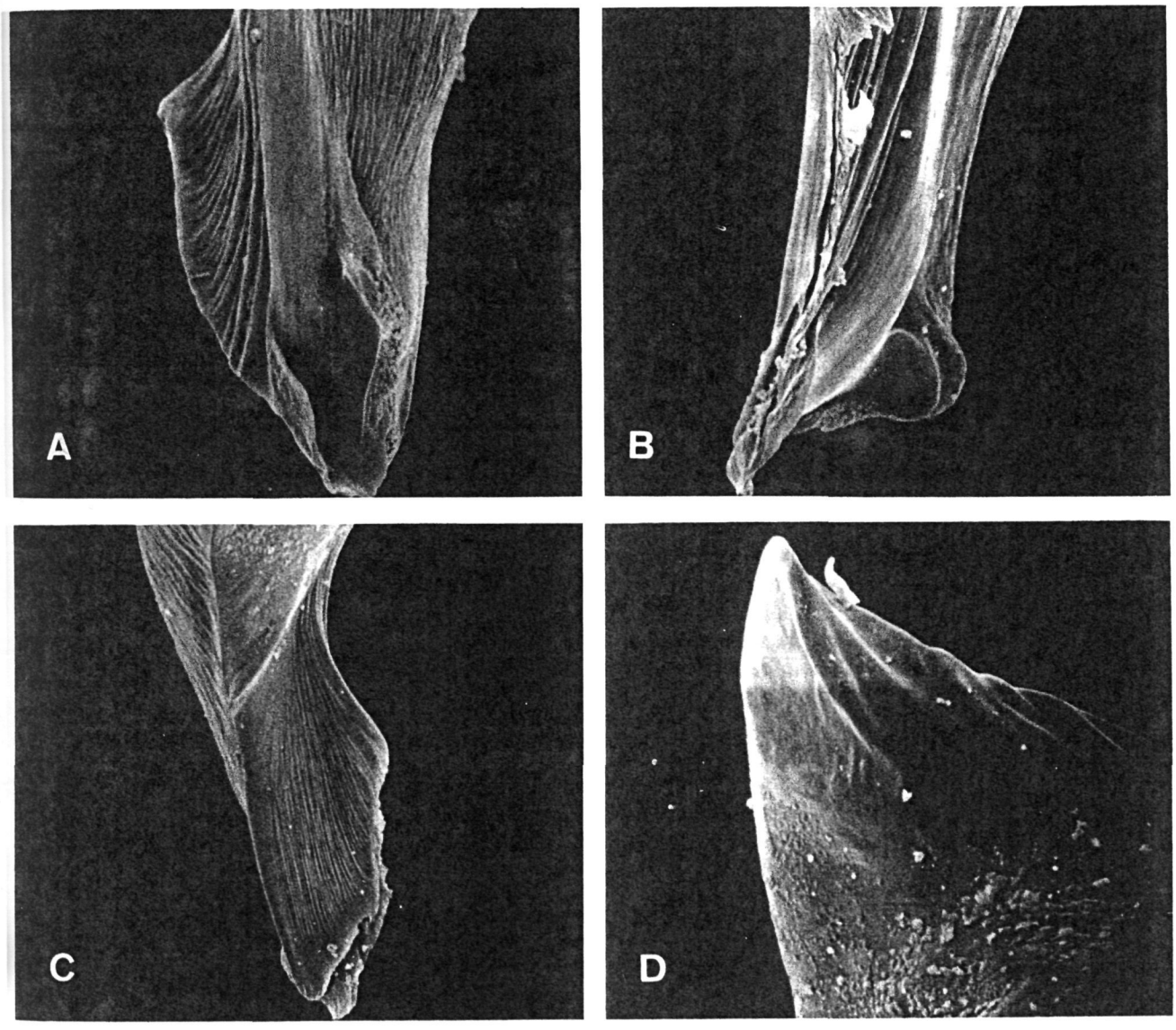


Fig. 7.—A–D. Dysdera clavisetae Wunderlich, 1991; right male bulbus.—*A*. DD, frontal.—*B*. DD, external.—*C*. DD, posterior.—*D*. P, external.

distal part; longer than wide at base; with semi-circular groove at tip. Sternum orange, uniformly distributed; very scantly wrinkled, mainly between legs and frontal border; uniformly covered in slender black hairs.

Chelicerae (Fig. 6B) 2.24 mm long, about 1/2 of carapace length in dorsal view; fang 1.75 mm long; basal segment dorsal side scantly covered with granulations. Chelicera inner groove long, more than 1/2 of cheliceral length; armed with three teeth and lamina at base; distal tooth largest, basal larger than medial; distal tooth trapezoid, located more or less at centre of or scantly above groove; basal tooth close to basal lamina; medial tooth close to basal. Legs yellow. Lengths of male described above: fe1 3.73 mm (all measurements in mm); pal 2.33; ti1 3.49; me1 3.17; ta1 0.7; total 13.42; fe2 3.31; pa2 2.14; ti2 2.89; me2 2.89; ta2 0.65; total 11.88; fe3 2.61; pa3 1.4; ti3 1.86; me3 2.51; ta3 0.65; total 9.03; fe4 3.3; pa4 1.72; ti4 2.65; me4 3.26; ta4 0.7; total 11.63; fe Pdp 2.1; pa Pdp 1.21; ti Pdp 1.12; ta Pdp 1.12; total 5.55; relative length: I > II > IV > III. Spination: Palp, leg1, spineless; leg2 one medial spine at the dorsal proximal border of the femur. Fe3d spines in one row, 2–1; pa3 spineless; tb3d spines arranged in three bands; proximal 2.2.1; medial–proximal 1.2.1; distal 1.0.1; tb3v spines arranged in three bands; proximal 0.2.1; medial–proximal 1.2.1; distal 1.1.1; with two terminal spines. Fe4d spines in two rows: forward 2, backward 4; pa4 with one ventral medial spine; tb4d spines arranged in four bands; proximal 2.0.0; medial–proximal 1.3.1; medial–distal 1.0.0; distal 1.1.1; tb4v spines arranged in four bands; proximal 1.2.1; medial–proximal 0.0–1.1; medial–distal 1.1.1; distal 0.1.0; with two terminal spines. Very long hairs on the back legs as well as at pedipalps.

Abdomen 4.8 mm long; whitish; cylindrical. Abdomen dorsal hairs 0.054–0.072 mm long, thick, straight, not compressed, blunt, with tip enlarged, uniformly, thickly distributed.

Copulatory bulbus (Fig. 6C) T scantly smaller than DD; both more or less in the same axis in lateral view. DD sclerites equally developed; internal sclerite truncated at middle part of haematodoca. DD tip (Fig. 7A–C) with upper and lower sheets sticking together; upper sheet not projected over lower one; straight in lateral view. C present, well-developed; located close to tip of embolus; proximal border continuously decreasing; distal border stepped; upper tip projected, rounded; external side

excavated. AC present. LF absent. L well-developed; external border not sclerotized, scantly fold, distal border more or less parallel; continuous. LA absent. AL present, very poorly developed; proximal border fused with distal haematodoca. P (Fig. 7D) perpendicular to T in lateral view; fused to T; narrow, reduced to ridge; scantly toothed, mainly on external side, along upper margin; few teeth, about 4–6; distally scantly projected.

Female (Figs 6D–E, 8A–B). All characters as in male except: Carapace 5.12 mm long; maximum width 3.87 mm; minimum width 2.65 mm AME diameter 0.21 mm; PLE 0.2 mm; PME 0.16 mm.

Chelicerae 2.73 mm long, fang 2.2 mm long; basal segment dorsal, ventral sides scantly covered with granulations, mainly on basal, inner sides. Lengths of female legs described above: fe1 4.24 mm (all measurements in mm); pa1 2.84; ti1 3.77; me1 3.49; ta1 0.7; total 15.04; fe2 3.73; pa2 2.56; ti2 3.4; me2 3.4; ta2 0.7; total 13.79; fe3 3.26; pa3 1.72; ti3 2.09; me3 2.93; ta3 0.7; total 10.7; fe4 4.1; pa4 2.28; ti4 3.12; me4 3.87; ta4 0.84; total 14.21; fe Pdp 2.19; pa Pdp 1.26; ti Pdp 0.93; ta Pdp 1.4; total 5.78; relative length I > IV > II > III.

Spination: Palp, leg1, leg2 spineless. Fe3d spineless; pa3 spineless; tb3d spines arranged in three bands; proximal 1.0.0; medial–proximal 1.2.1; distal 1.0.1; tb3v spines arranged in three bands; proximal 0.1.0; medial–proximal 1.2.1; distal 1.1.1; with two terminal spines. Fe4d two rows: forward 1, backward 4; pa4 with one ventral medial spine; tb4d spines arranged in four bands; proximal 1.0.1; medial–proximal 1.1.1; medial–distal 0.1–2.0; distal 1.0.1; tb4v spines arranged in four bands; proximal 1.2.1; medial–proximal 1.2.1; medial–distal 1.1.1; distal 0.1.0; with two terminal spines.

Abdomen 5.59 mm long; whitish; cylindrical. Abdomen dorsal hairs 0.072–0.108 mm long, thin, curved, not compressed, blunt with tip enlarged, uniformly, thickly distributed.

DA (Fig. 6D–E) sclerotized around TB valva attachment as well as at ventral region; both regions completely fused, not distinguishable; DF around V wide. DA frontal border projected, pointed; lateral margins convergent in dorsal view; scantly wider than long. Ventral small scale beside S attachment; internal borders more or less continuous. S arms as long as DA; scantly curved; tips dorsally projected; neck as wide as arms. TB usual shape.

ALS (Fig. 8A) with piriform gland spigot in polar position; remaining piriform spigots more external than major ampulate gland spigot; 8 + 1 piriform gland spigots; PMS and PLS (Fig. 8B) with 10–15 aciniform gland spigots.

Intraspecific variation. There is not any fixed character-state exclusive to the population from La Gomera. Some specimens show smaller AME and PLE–PME distances (AME about 4/5 diam, PLE–PME about 1/3), sternum wrinkled, distal tooth of the chelicera located close to the tip. Endogyne ventral sclerotization with internal border sometimes continuous or with a very thin scale from spermatheca attachment. Spination variability in Table II.

Distribution. An abundant species distributed all over El Hierro and laurel forest related habitats of La Gomera (Canary Islands).

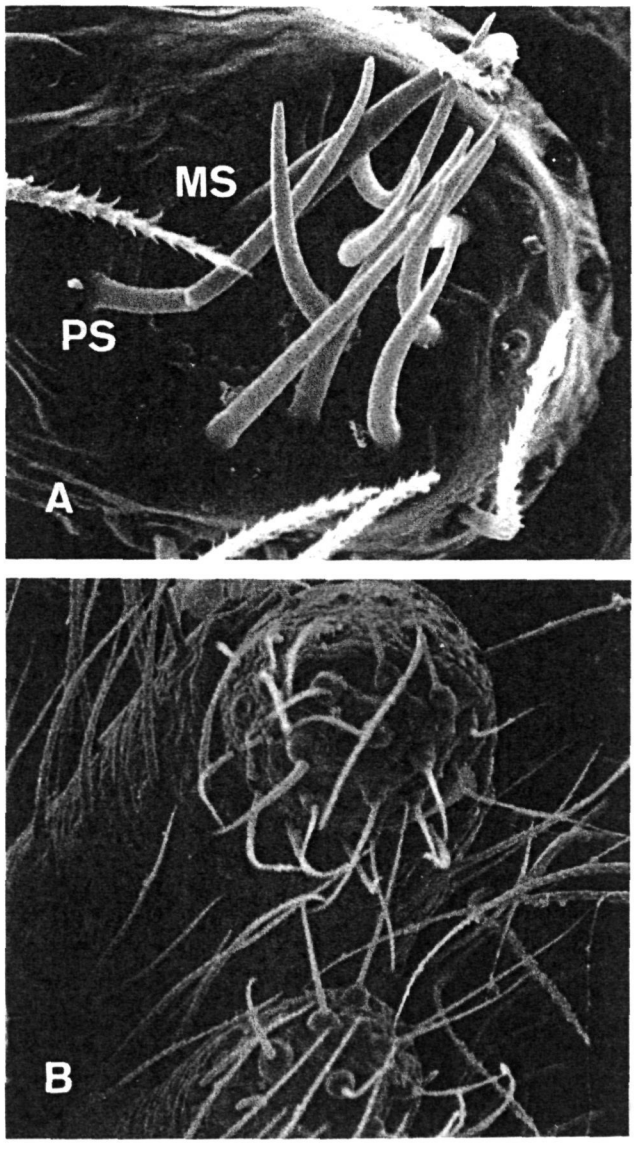


Fig. 8.—A–B. Dysdera clavisetae Wunderlich, 1991; right female spinnerets.—*A.* ALS.—*B.* PMS and PLS (upper).

Dysdera crocota C. L. Koch, 1839

Dysdera crocota C. L. Koch, 1839. -Schmidt, 1973: 360–361.
Dysdera macra Simon, 1883 (♀, non ♂): 89–90; wrong identification.
Dysdera palmensis Schmidt, 1982 395, Fig. 3 [♀]; new synonymy.

Material examined. Dysdera crocota: La Palma: Mazo: Cueva de Salto del Tigalate B, 1♀; 4/9/94; R. García leg.; 2952 UB. La Cumbrecita; 1♂; 7/5/73; J. M. Fernández leg.; 2501 102 UB. Los Sauces: Los Tilos; 1juv.; 27/10/94; M. A. Arnedo leg.; 4176 UB. 1juv.; 27/10/94; M. A. Arnedo leg.; 2950 121 UB. Nogales; 1♂, 1♀; 26/12/84; R. García leg.; 2606 107 MCNT. Sta. Cruz: Observatorio road from Sta. Cruz; 1♀; 31/10/94; Arnedo leg.; 4008 UB. Breña Alta; 1juv.; 3/12/93; M. A. Arnedo leg.; 2589 106 UB. La Gomera: Vallehermoso: Montaña del Dinero; 1♂ subad.; 28/4/95; Arnedo & Oromí leg.; 4781 UB. *Dysdera macra*: 1 juvenile paratype from Canary Islands, unknown exact locality; Verneau leg.; stored at MNHN. *Dysdera palmensis*: holotype ♀ from Mazo, La Palma; 19/3/1975; G. Schmidt leg.; 31618 SMF.

Diagnosis. Carapace nearly smooth; anterior lateral borders parallel; rounded at maximum width point; back margin scantly bilobulated. Chelicerae about 1/2 of

Table II. *Spination variability of* Dysdera clavisetae

	Proximal	Med.–Proximal	Medial–Distal	Distal
Tibia 3 dorsal	1–2.0–2.0–1	1.2–4.1	0.0–1.0	1.0.1
Tibia 4 dorsal	1–2.0–2.0–2	1.1–4.1	0.–1.0–2.0–1	1.0–1.1
Tibia 3 ventral	0.1–2.0–1	1.2.1	0	1.1.1
Tibia 4 ventral	1.2.1	0–1.0–2.1	1.0–2.1	0–1.1–2.0–1

	Number of rows	Number of spines
Femur 3 dorsal	1	0–2
Femur 4 dorsal	2	1–2/4

carapace length; fang very long; basal segment scantly granulated; basal tooth biggest and medial larger than distal. Tibia spination: two spines, one at proximal and another at distal part of tb3d frontal margin; four spines, one at proximal and another at distal part of tb4d frontal and back margins. Copulatory bulbus DD strongly bent, more than 45°; strong hook-like apophysis at frontal distal tip. P sclerotization greatly reduced, not fused to T. DA rectangular-shaped in dorsal view, lacking any ventral sclerotization. This species strongly differs from any other Canarian species except *Dysdera lancerotensis* Simon, 1907 from Lanzarote and Fuerteventura. *D. crocota* is distinguished from *D. lancerotensis* by: small distal tooth closer to basal than proximal half chelicera groove distance, tip of the male copulatory bulbus in frontal view, female abdomen hairs, thin in *D. crocota* and endogyne, laterally sclerotized in *D. crocota*.

Distribution. Cosmopolitan.

Comments. Although probably originating from North Africa, this species has spread all over the world through human introduction. In the Canaries, where it can be found in all the islands, it usually lives in very disturbed anthropophilus habitats, near villages and towns and around rural houses.

Morphology of both male and female genitalia differs strongly from the endemic Canarian *Dysdera*, except for the eastern Canarian species *D. lancerotensis*, formerly described as a subspecies of *D. crocota*. Examination of the holotype of *D. palmensis*, showed that species to be the same as *D. crocota*. The same is true for the supposedly female specimen, actually a juvenile, used in the description of *D. macra*. After examination, it turned out to be a juvenile of *D. crocota*.

***Dysdera enghoffi* sp. n.** (Figs 9A–E, 10A–D, 11A–C)

Holotype male. 10/2/89, H. Enghoff leg.; num. 2651/109, Stored at UB.
Type locality. Bosque de El Cedro, La Gomera, Canary Islands.
Allotype female. Bosque de El Cedro, La Gomera, Canary Islands; 6/2/89, H. Enghoff leg.; num. 2643/109, Stored at UB.
Paratypes. La Gomera: Agulo: Agua de de Los Llanos; 1juv.; 28/10/95; Oromí leg; 2970 122. Hermigua: Bco. de Matarnos; 1♀, 2juv.; 10/9/93; P. Oromí leg.; 2592 106 UB. Bosque del Cedro, 1–2 Km SSW La Cerpa (950–1000 m); 1juv.; 9/2/89; H. Enghoff leg.; 2667 109 ZMK. 1juv.; 6/2/89; H. Enghoff leg.; 2665 109 ZMK. Vallehermoso: Bosque del Cedro, near Montana Asomada, N La Laguna Grande (1180 m); 1♀; 6/2/89; H. Enghoff leg.; 2658 109 ZMK. Pinar del Infante; 1♀; 2/1/82; P. Oromí leg.; 2594 106 Col.leccio UB.
Etymology. This species is dedicated to Dr Henrik Enghoff, collector of the type specimen as well as most of the material studied in this work, and who has greatly contributed to the knowledge of the millipede fauna of the Canary Islands.

Diagnosis. Carapace nearly smooth; lateral borders convergent; sharpened at point of maximum dorsal width. Chelicera basal segment covered with granulation; distal tooth largest and trapezoid-shaped. This species can be distinguished by presence of well-developed AL, poorly-developed C located close to DD tip. Projected L, P scantly sloped forming an angle about 135° and endogyne ventral tooth-like projections longer than lateral sclerotization with short lateral slit differentiating it from *D. rugichelis*.

Description. Holotype male (Figs 9A–C, 10A–D). Carapace (Fig. 9A) 6.23 mm long; maximum width 5.39 mm; minimum width 3.36 mm. Brownish red, frontally darker and becoming lighter towards back; smooth with some small black grains mainly anterior. Frontal border more or less rounded, about 1/2 of its length; lateral borders convergent; sharpened at point of maximum dorsal width, with back lateral borders straight; back margin wide, straight. AME diameter 0.33 mm; PLE 0.33 mm; PME 0.25 mm; AME scantly back from frontal border; about one diameter apart, touching PLE; PME touching one to each other, about 2/5 of its diameter separated from PLE. Labium trapezoid-shaped, base wider than distal part; longer than wide at base; with semi-circular groove at tip. Sternum dark orange, frontally darker and becoming lighter towards back; wrinkled; uniformly covered in slender black hairs.

Chelicerae (Fig. 9B) 2.79 mm long, about 2/5 of carapace length in dorsal view; fang 2.14 mm long; basal segment dorsal, ventral sides completely covered with granulations. Chelicera inner groove long, more than 1/2 of cheliceral length; armed with three teeth and lamina at base; distal tooth largest, basal as large as medial; distal tooth trapezoid, located more or less at centre of or scantly above groove; basal tooth close to basal lamina; medial tooth close to basal one. Legs orange. Lengths of male described above: fe1 5.13 mm (all measurements in mm); pa1 3.17; ti1 3.91; me1 3.96; ta1 1.03; total 17.2; fe2 4.33; pa2 2.89; ti2 3.54; me2 3.96; ta2 1.03; total 1575; fe3 3.73; pa3 2.1; ti3 2.38; me3 3.73; ta3 1.17; total 7.78; fe4 4.89; pa4 2.61; ti4 3.63; me4 5.13; ta4 1.17; total 17.43; fe Pdp 3.03; pa Pdp 1.63; ti Pdp 1.49; ta Pdp 1.63; total 7.78; relative length: IV > I > II > III. Spination: Palp, leg1, leg2 spineless. Fe3d spineless; pa3 spineless; tb3d spines arranged in three bands; proximal 1.2–1.1; medial–proximal 1.1.1; distal 1.0.1; tb3v spines arranged in three bands; proximal