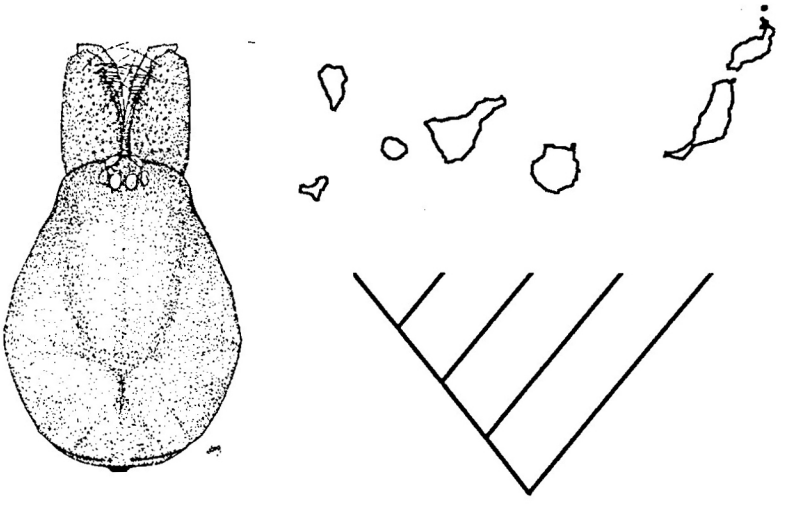
Departament de Biologia Animal
Facultat de Biologia
Universitat de Barcelona

Tesi Doctoral

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



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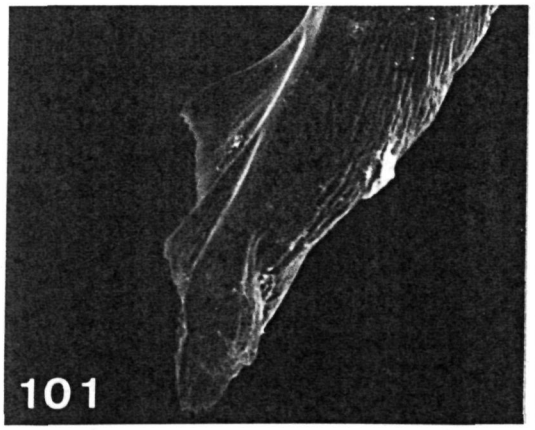
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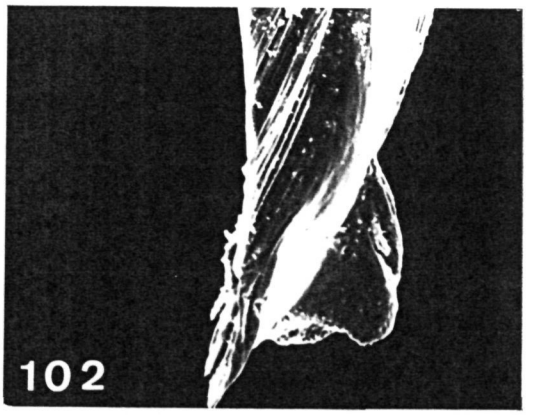
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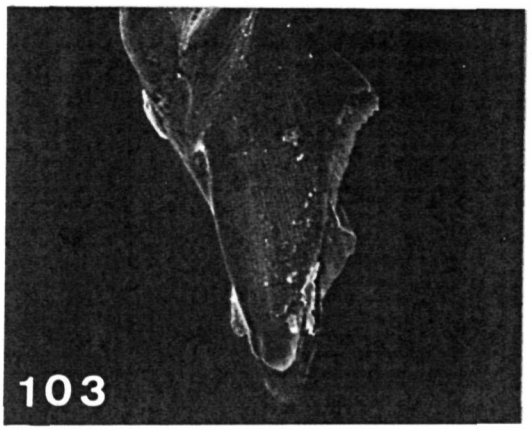
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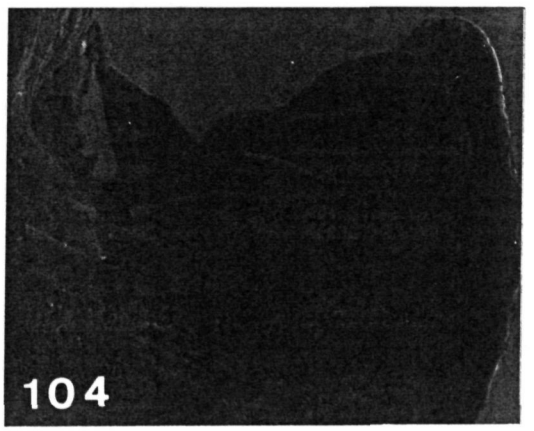
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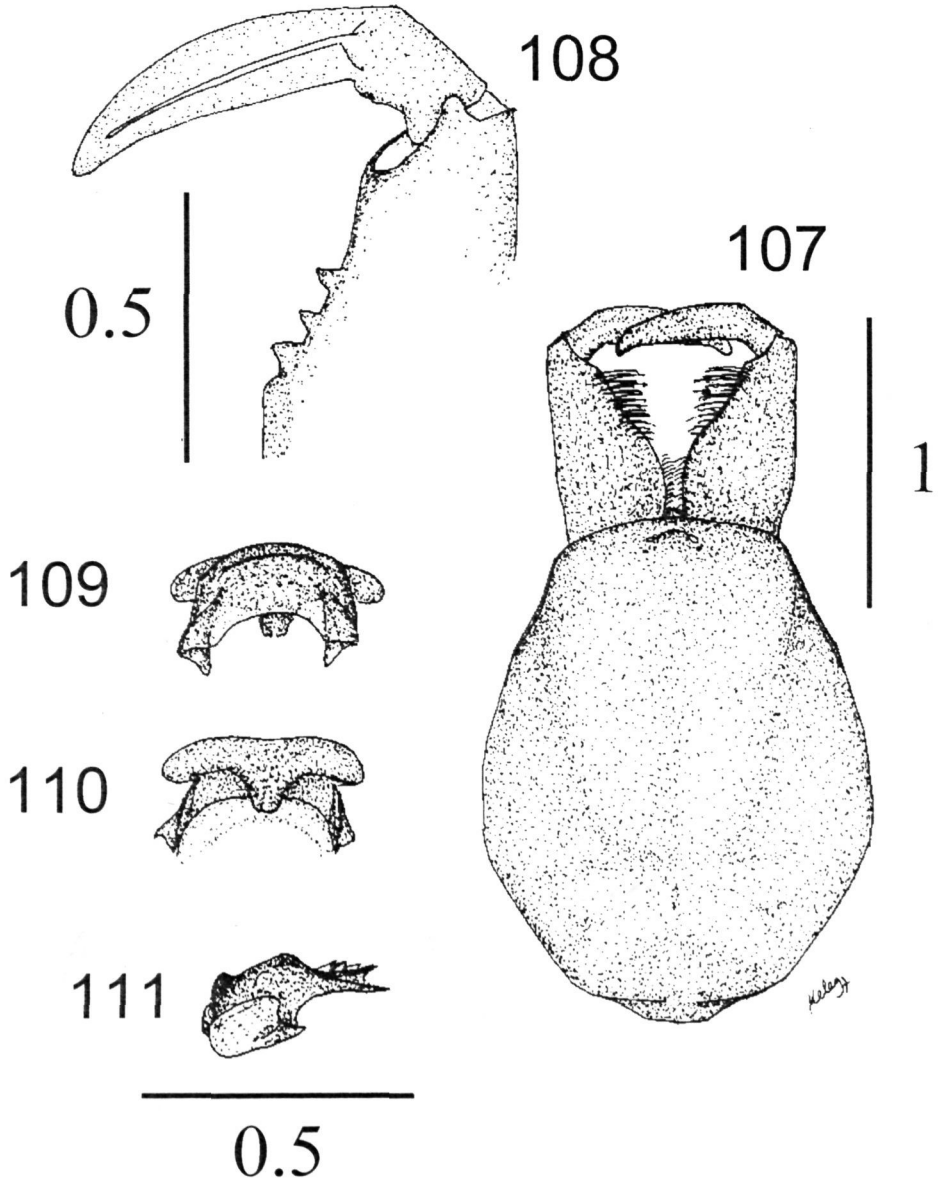
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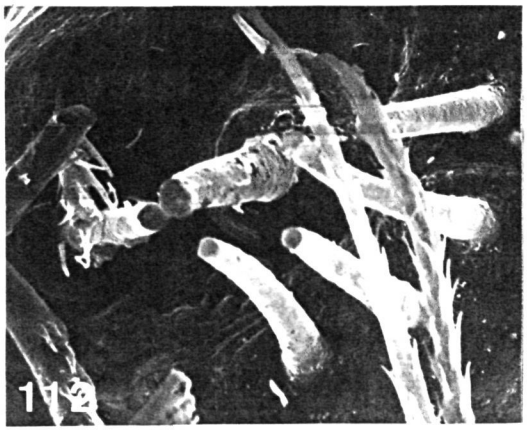
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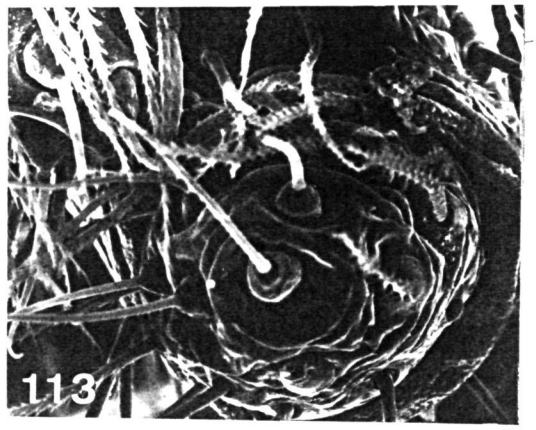
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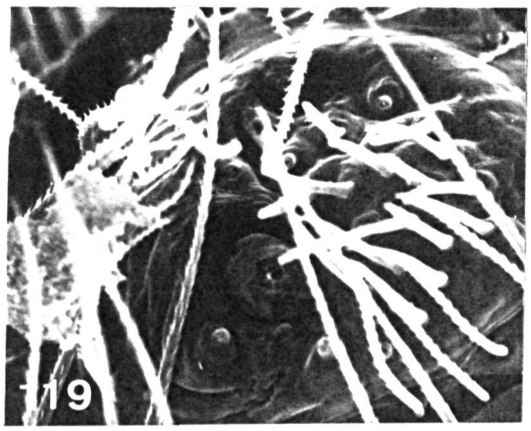
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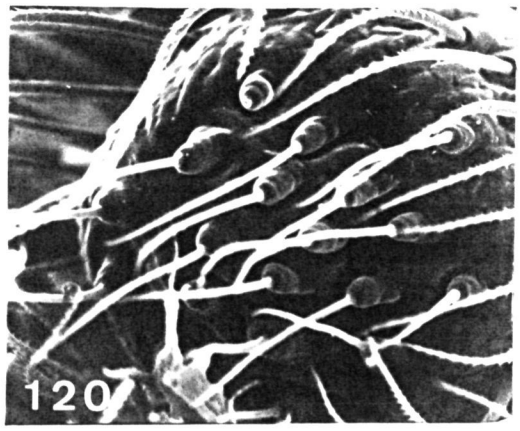
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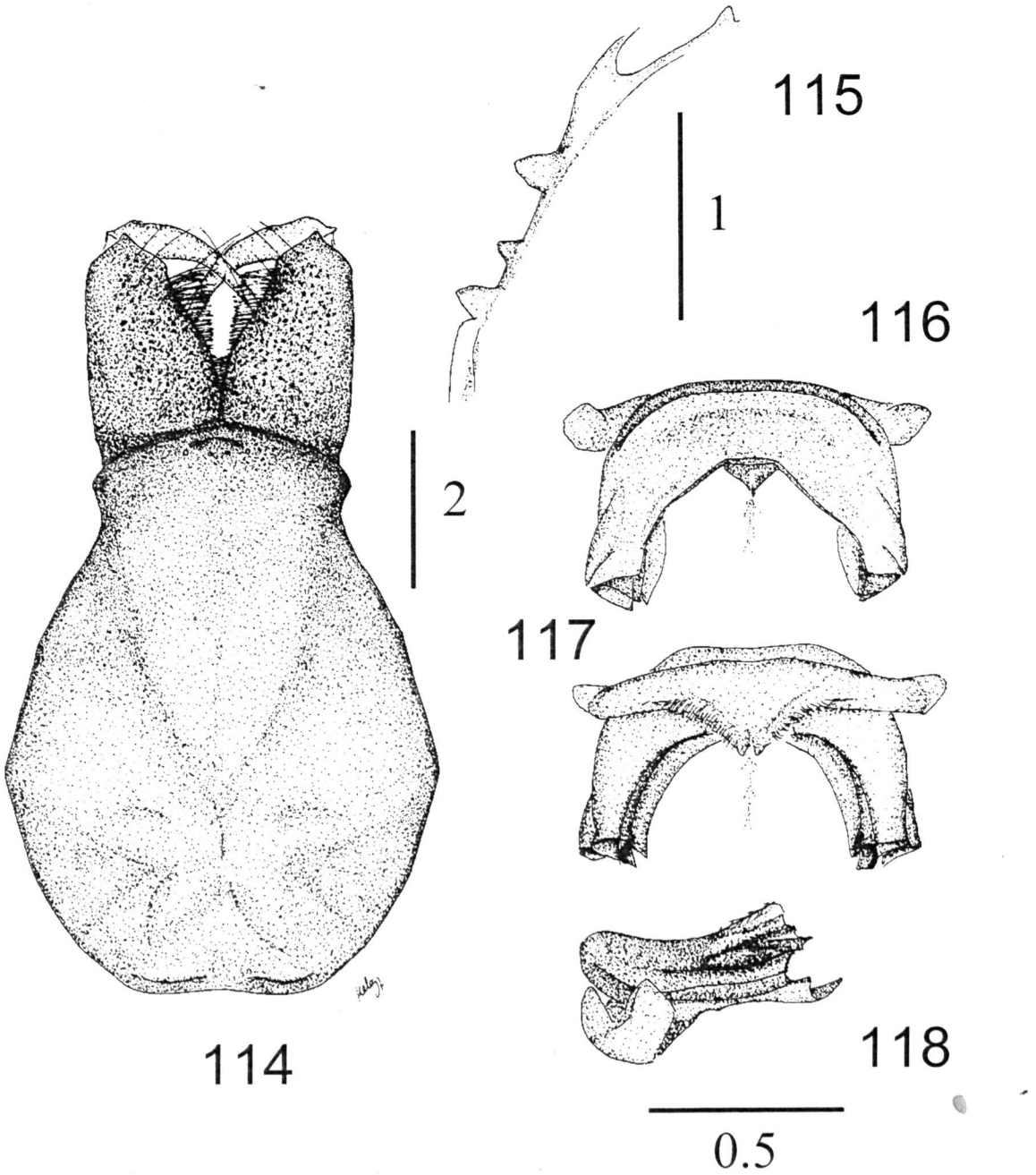
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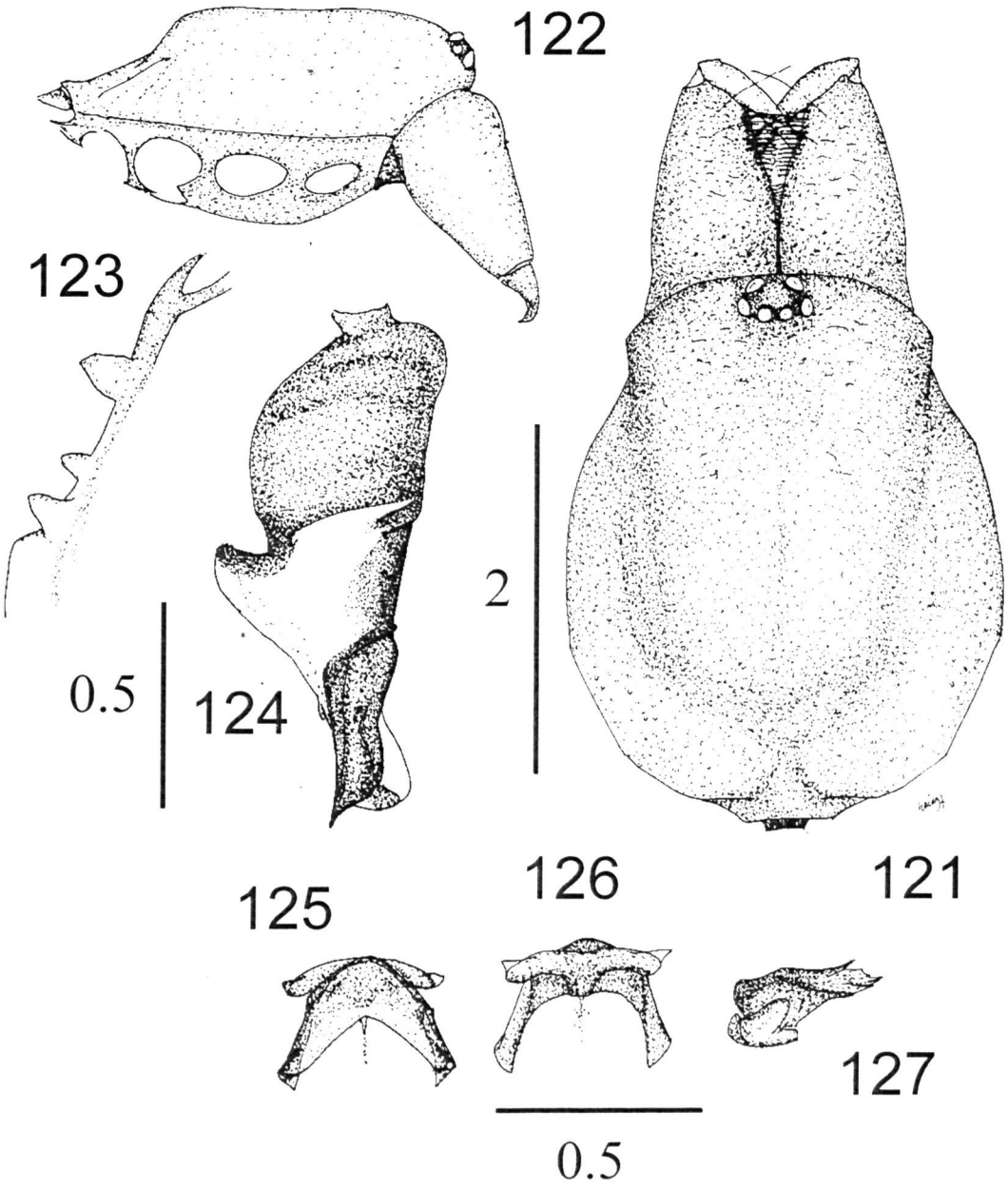
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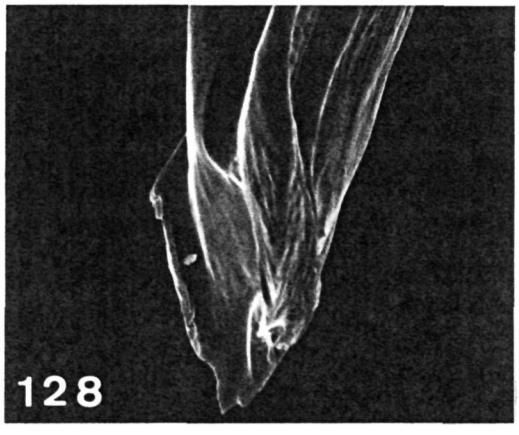
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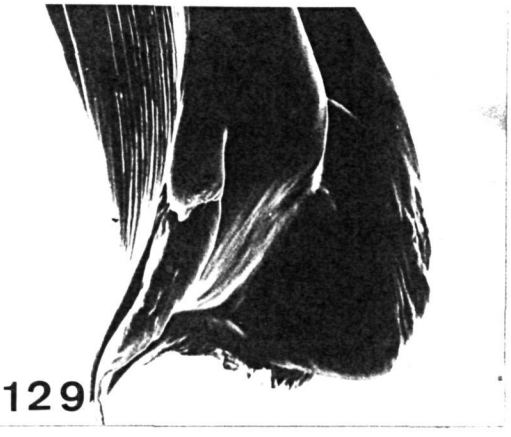
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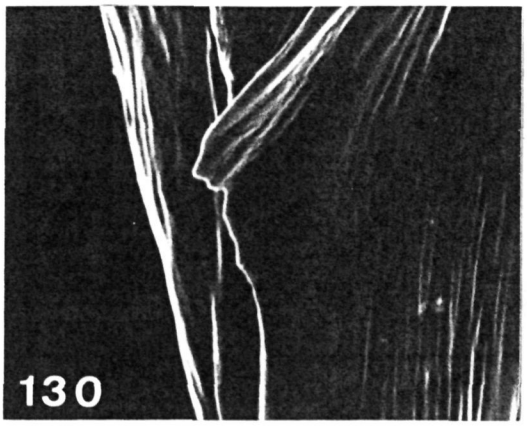
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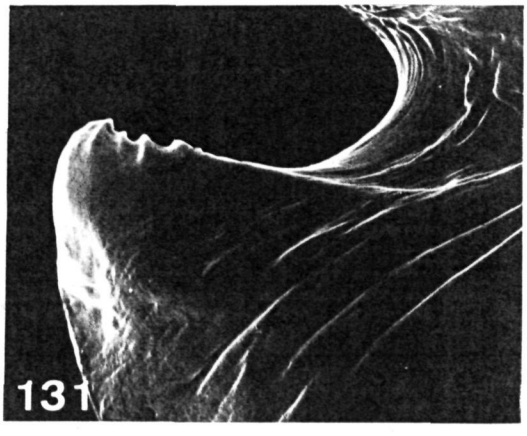
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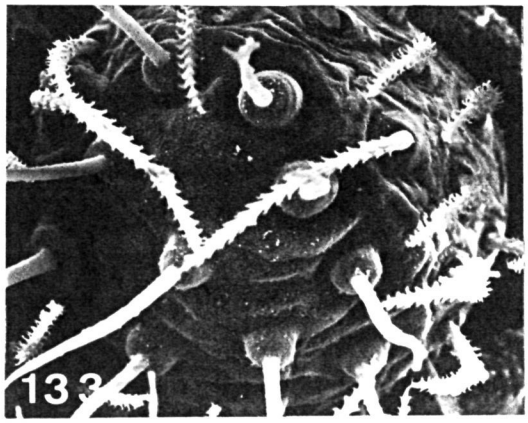
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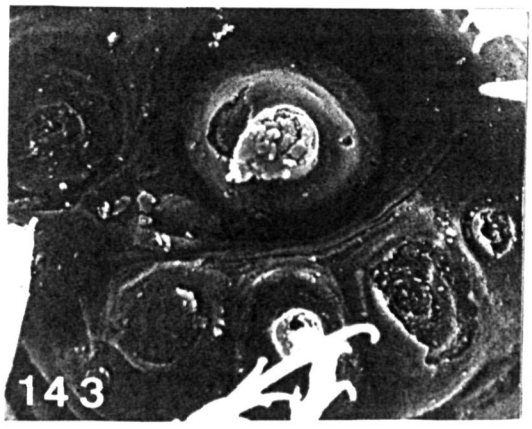
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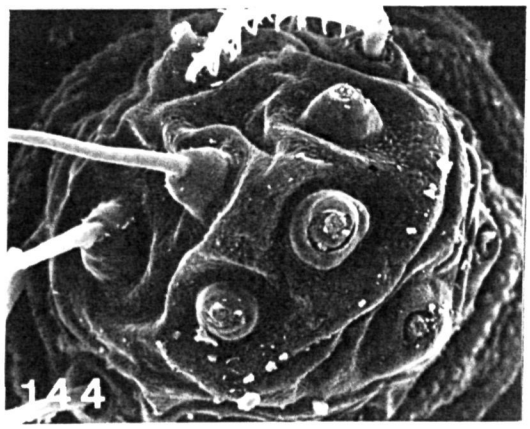
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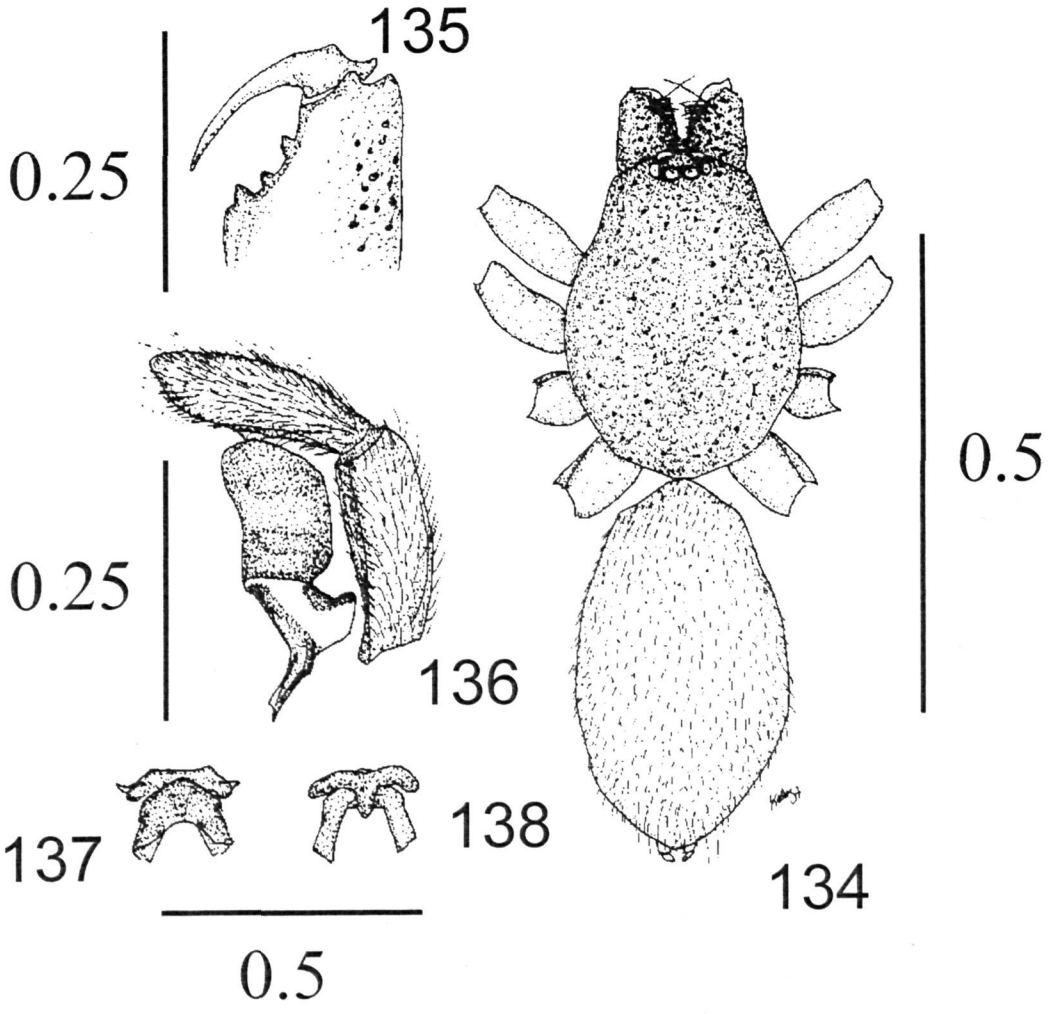
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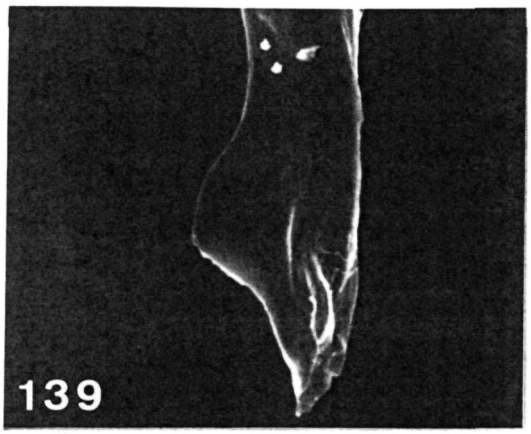
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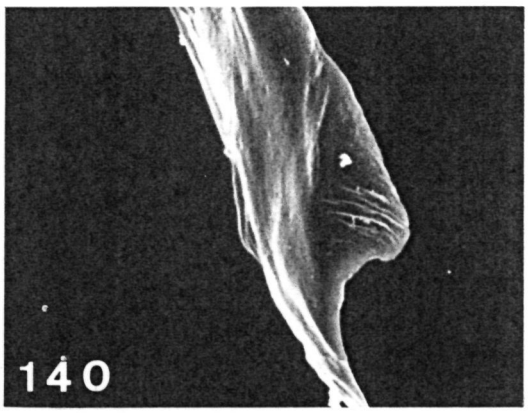
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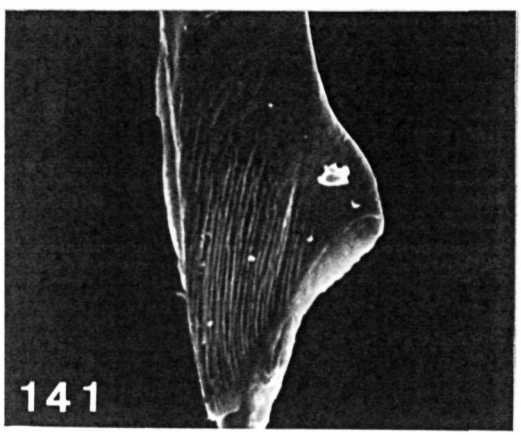
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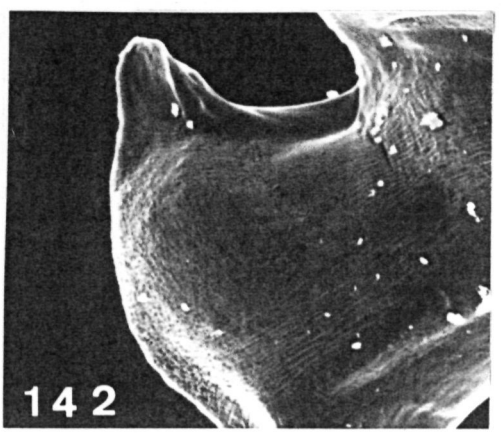
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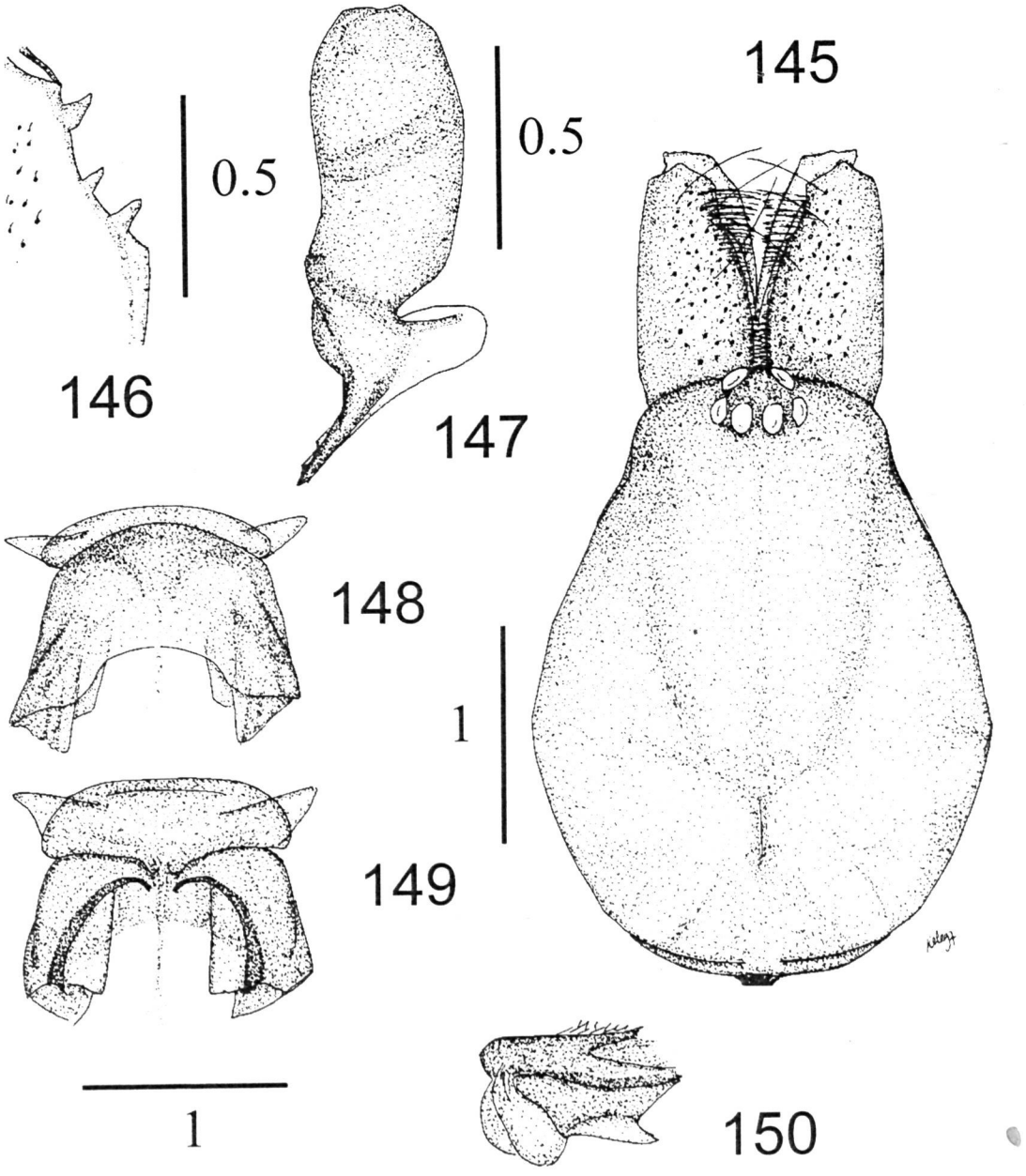
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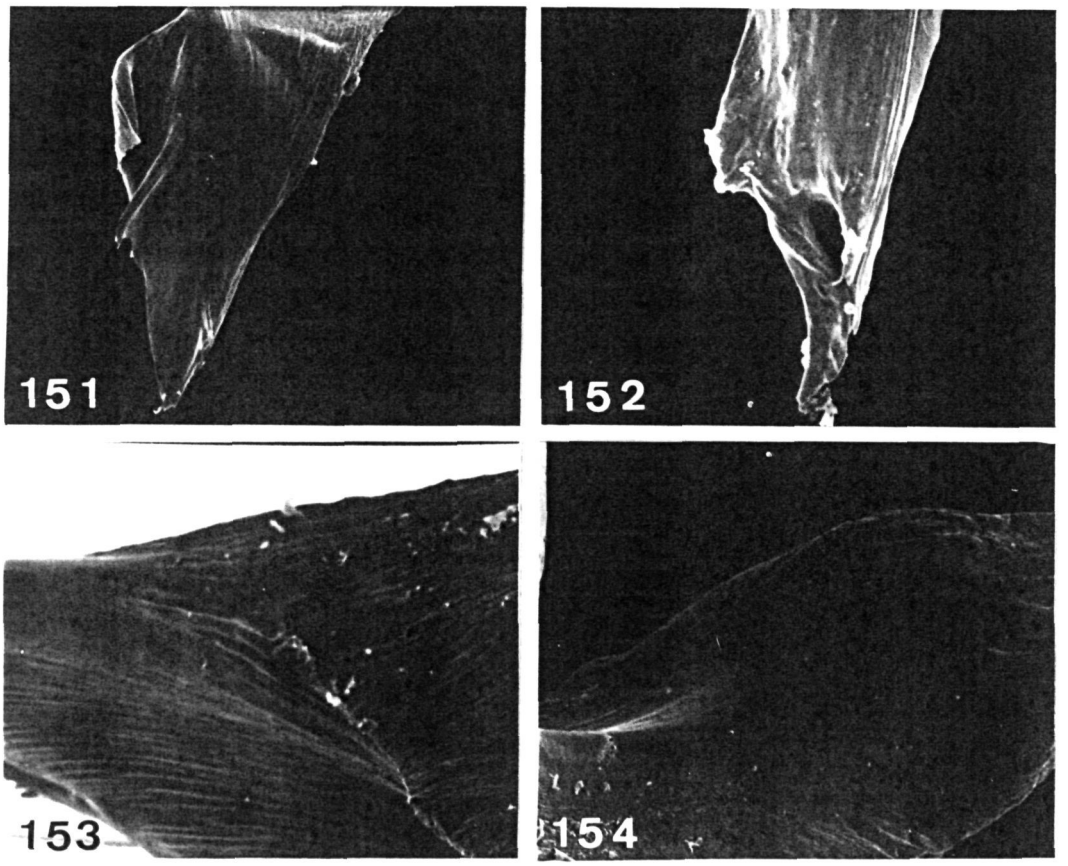
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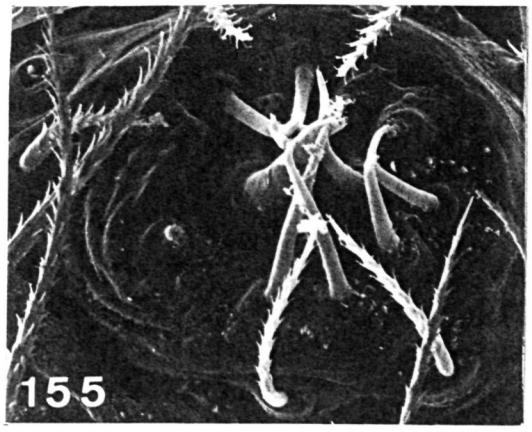
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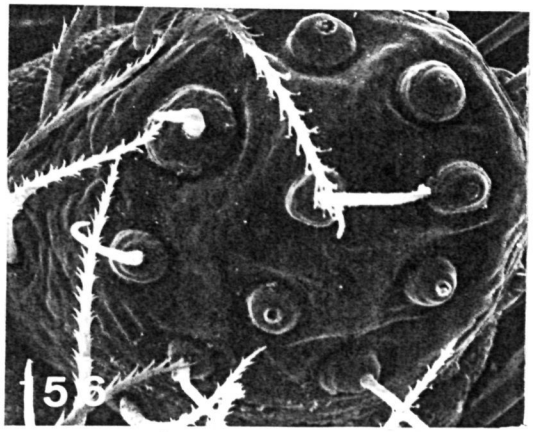
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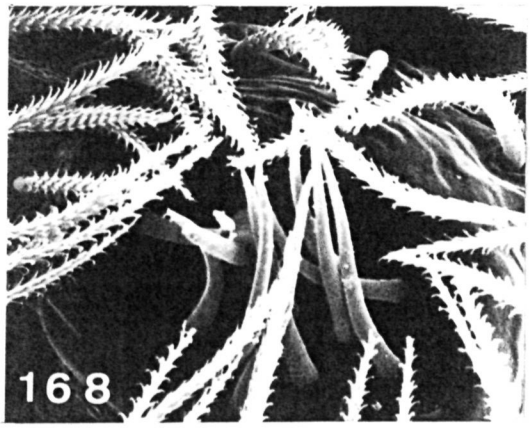
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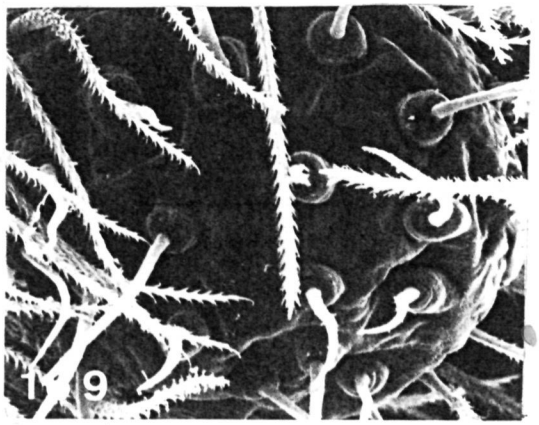
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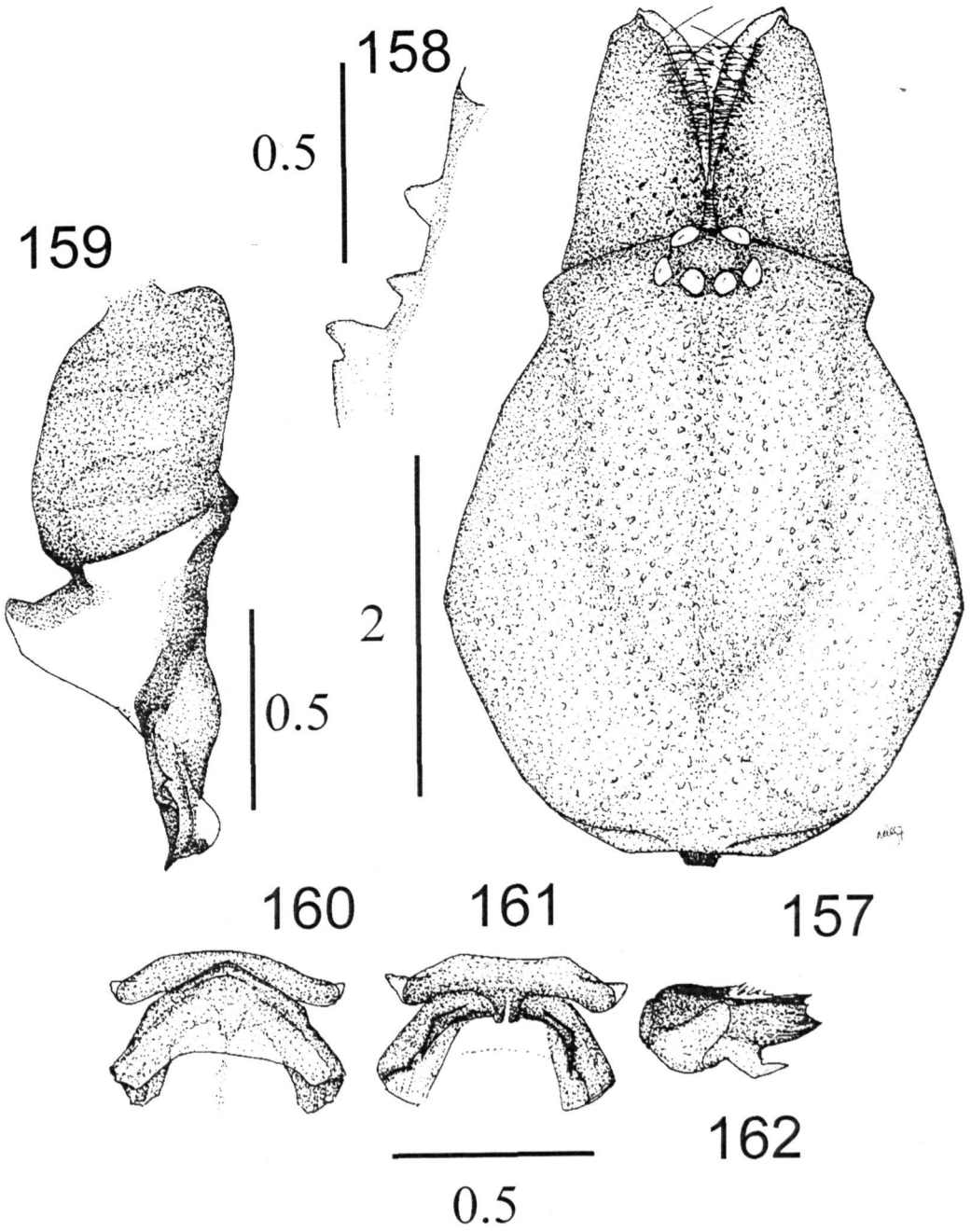
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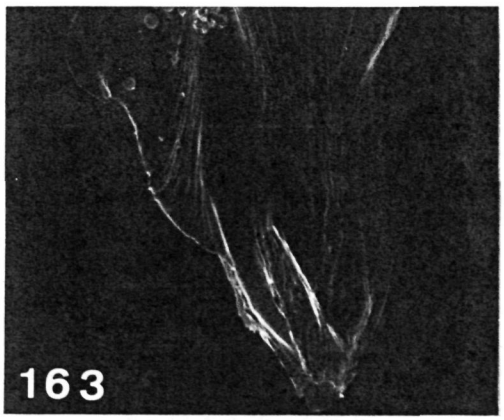
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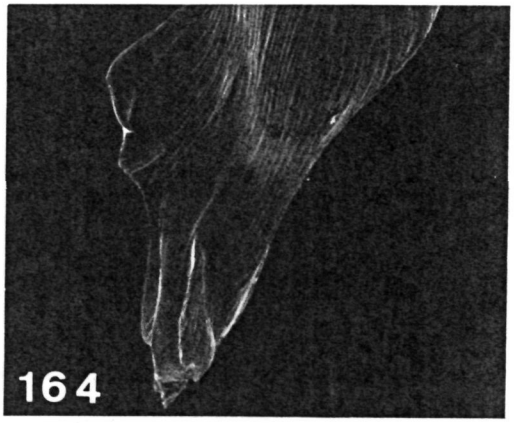
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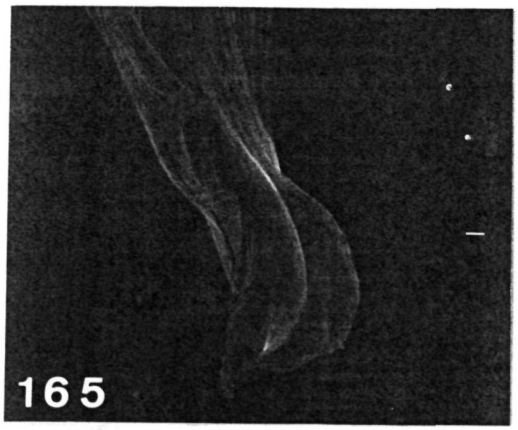
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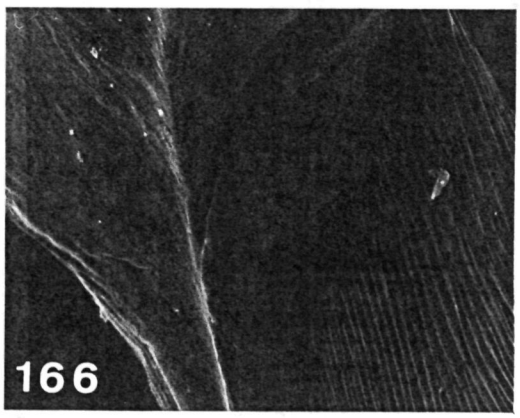
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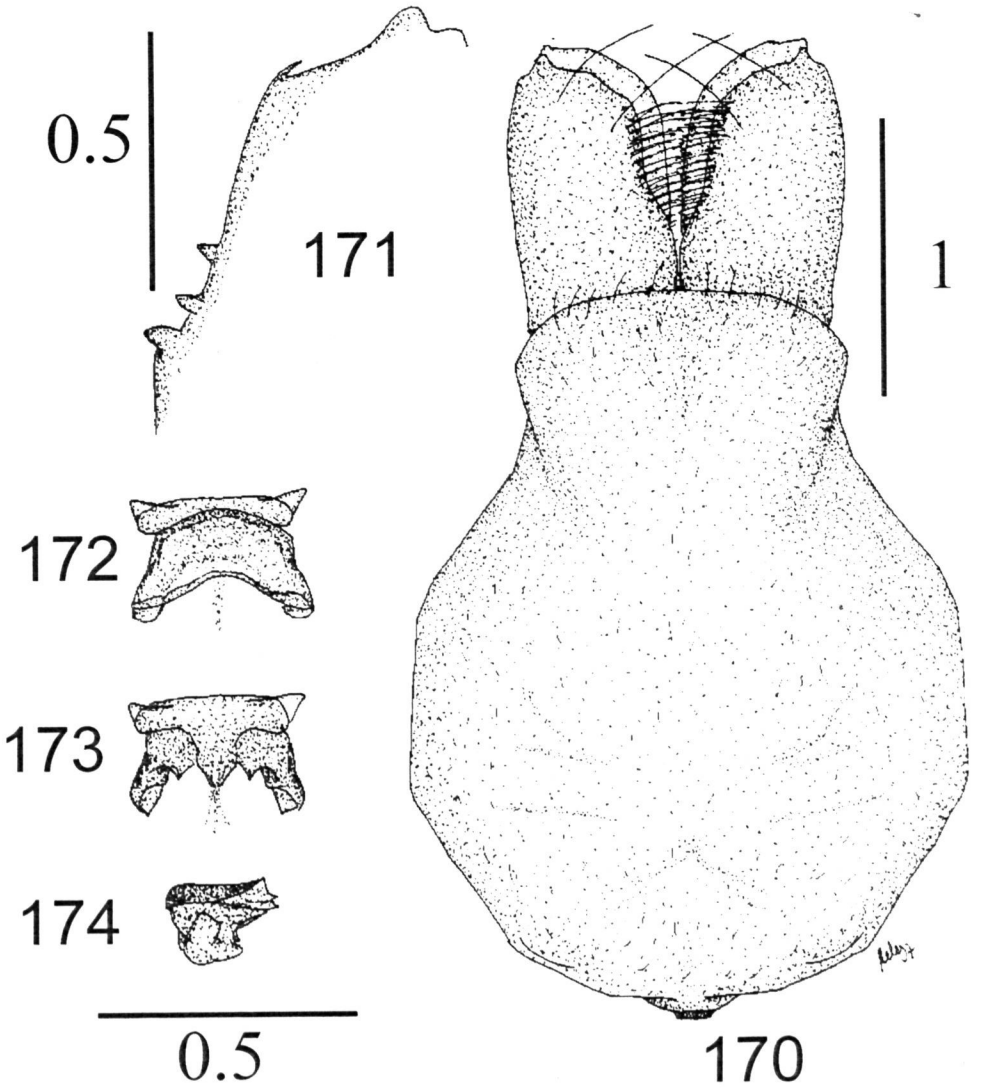
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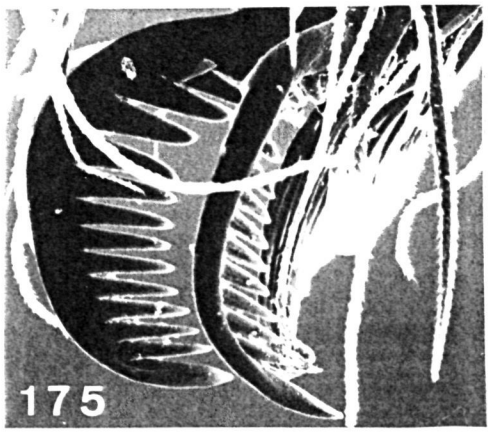
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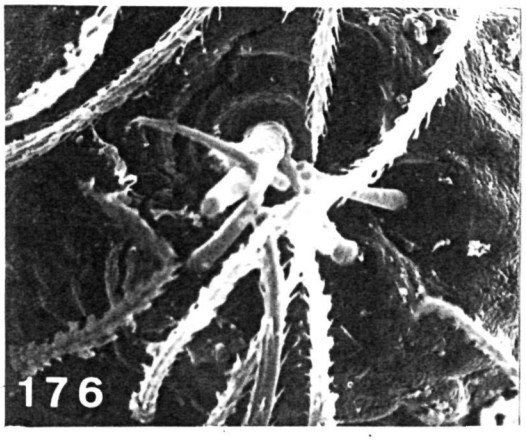
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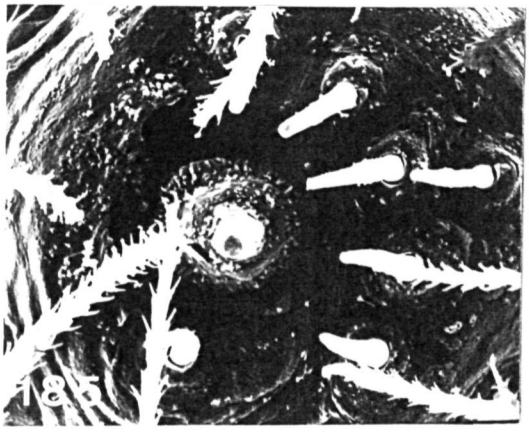
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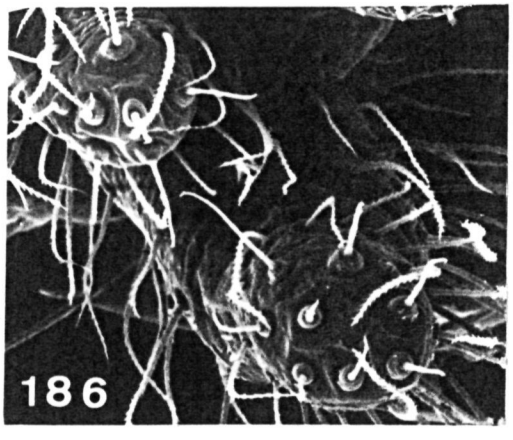
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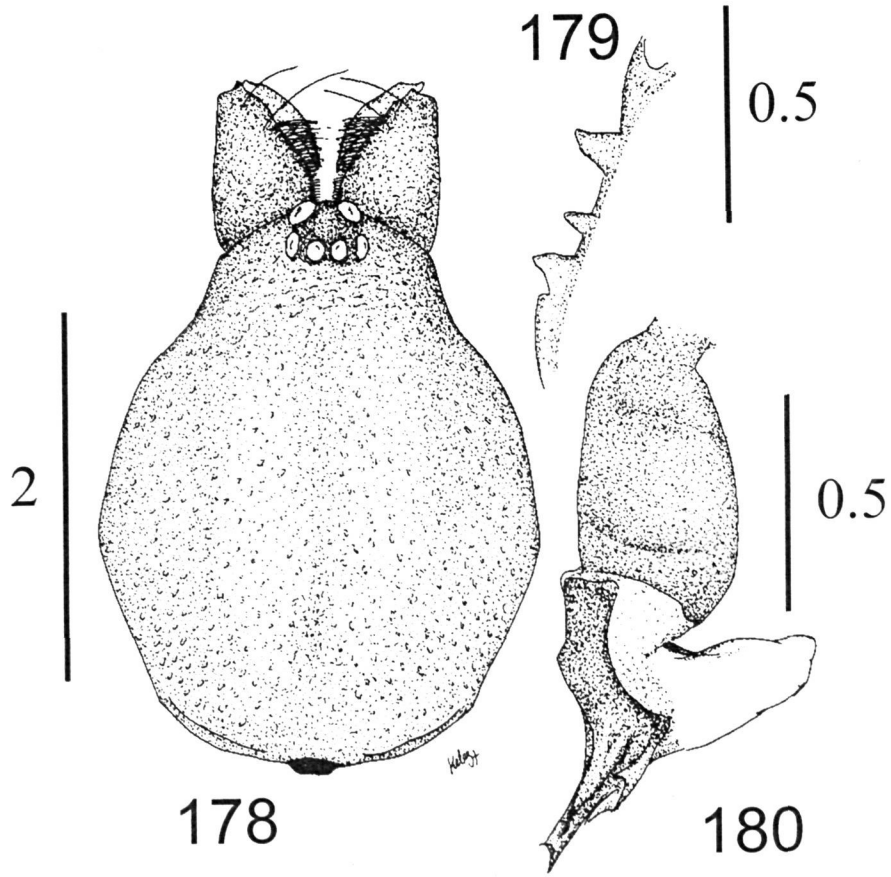
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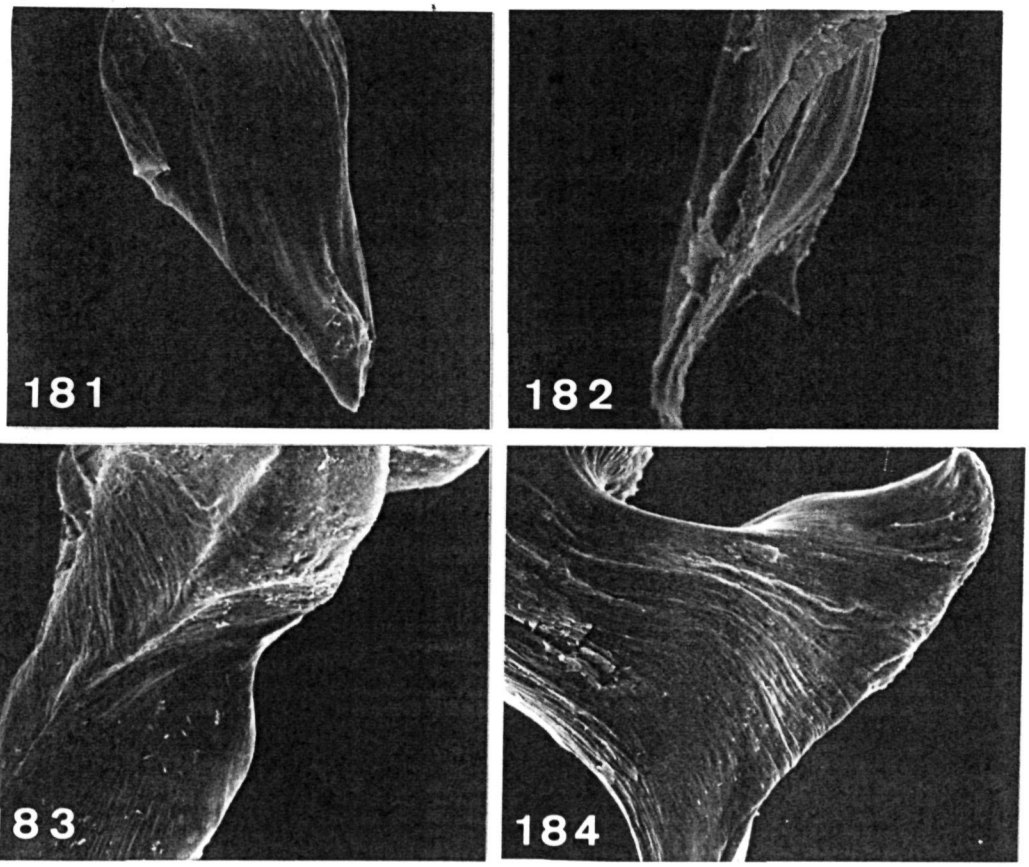
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4.1.4. Les illes orientals: Fuerteventura, Lanzarote i els illots

Arnedo, M. A., Oromí, P. & Ribera, C. Systematics of the genus *Dysdera* (Araneae, Haplogynae, Dysderidae) in the eastern Canary Islands.- *Zoological Journal of the Linnean Society* (en revisió).

ABSTRACT

The circum-Mediterranean spider genus Dysdera has undergone an outsanding species radiation in the volcanic archipelago of the Canary Islands. The present study deals with the endemic species that inhabit the older and ecologically distinct islands of Fuerteventura, Lanzarote and their nearby islets. A new species, *Dysdera sanborondon* sp. n., is described. The male of *D. spinidorsum* Wunderlich, 1991, is described for the first time. Five species are redescribed: *D. alegranzaensis* Wunderlich, 1991; *D. lancerotensis* Simon, 1907; *D. longa* Wunderlich, 1991; *D. nesiotes* Simon, 1907, and *D. spinidorsum* Wunderlich, 1991. The species *D. liostethus* is proposed to be a senior synonym of *D. clavisetae* Wunderlich, 1991 and its presence in the eastern islands is considered to be doubtful. A neotype is designated for *D. nesiotes.* The distribution of *D. alegranzaensis* is extended to Lanzarote and the other northern islets. *D. nesiotes* is reported for the first time in the eastern Canaries. A cladistic analysis of the eastern species and a sample of species from the rest of the Canaries and continental species is performed. The preferred cladogram supports a diphyletic origin of the Canarian fauna, all the Canarian species being monophyletic with the exception of *D. lancerotensis.* The main Canarian clade is further split into two monophyletic groups: one containing all the eastern endemic species and the other the species sampled from the remaining islands. Several scenarios that account for the observed patterns are considered. The possibility of a major extinction event in the Eastern Canaries due to climatic change is proposed. Distribution patterns and internal colonization of the Eastern Islands are discussed.

KEY WORDS: -Oceanic islands-cladistic analysis-colonization-extinction

INTRODUCTION

The patterns and processes underlying biodiversity are so complex that it is almost impossible to recover them. In the so-called 'experimental sciences', current approximations to otherwise untractable problems usually involve isolation, simplification and acceleration of the processes being studied. Fortunately, nature offers such 'experimental' conditions to systematists in the shape of oceanic islands. Studies in oceanic archipelagos have become crucial in the rise and development of evolutionary thinking and the present Darwinian paradigm. To date, the role played by the different islands has been highly biased in favour of the Pacific Archipelagos (the Hawaiian Islands and the Galapagos). Nevertheless, in the last few years a growing number of studies on the systematics of such diverse groups as lizards (Thorpe *et al.*, 1994, 1995; González *et al.*, 1996; Rando *et al.*, 1997), beetles (Juan *et al.*, 1995, 1996a, 1996b, in press) or plants (Böhle *et al.*, 1996, Francisco-Ortega *et al.*, 1996, Kim *et al.*, 1996, Mes & T'Hart, 1996) have revealed an additional excellent model for the study of biodiversity in the Atlantic region: the Macaronesian archipelagos, and in particular the Canary Islands.

The genus Dysdera

The genus *Dysdera* Latreille, 1804, comprises more than 200 species of nocturnal wandering spiders spread over the circum-Mediterranean region. About a quarter of these species have been described from the Macaronesian archipelagos (Fig. 1A), representing the most species-rich spider genus reported in them. Nevertheless, the Macaronesian endemics are far from being equally distributed. The Canary Islands harbour 40 of these endemics, while five endemics have been documented from Madeira. The Açores, Cabo Verde and Selvagens Islands each have a single species. The unusually large number of species in the Canaries arises many evolutionary and ecological questions. A research programme is currently underway to resolve some of the problems posed by the genus in the archipelago (Ribera &

Arnedo, 1994; Arnedo & Ribera 1996; Arnedo *et al.* 1996; Arnedo & Ribera, 1997).

Geographical and geological setting

The Canary Islands arose through several rounds of volcanic activity coupled with orogenic pulses in the Atlas about 25 Myr (Anguita & Hernán 1975). The seven main islands lie 100 km from the Northwestern coast of Africa in a roughly straight line (Fig. 1B). A geographical gradation in their geological age exists, the islands being older in the East and becoming younger to the West . The estimated geological age for each island is: Fuerteventura 20-22 My, Lanzarote 15-19 My, Gran Canaria 14-16 My, Tenerife 11.6-14 My, La Gomera 10-12 My, La Palma 1.6-2 My and El Hierro 0.8-1 My (Cantagrel *et al.* 1984, Mitchell-Thomé 1985, Ancochea *et al.* 1990, Coello *et al.* 1992, Fuster *et al.* 1993, Ancochea *et al.* 1994, 1996). Unlike some well-known oceanic archipelagos such as the Hawaiian Islands, the growth of the islands extended over long periods of time (Coello at al. 1992), and volcanic activity is cyclic and is not restricted to the younger islands. These features together with the absence of a subduction region which would promote subsidence of the older islands, as is the case in several Pacific archipelagos (Paulay, 1994), allow the islands to reach later stages of ecological succession.

The so-called Eastern Canaries are the emergent regions of a volcanic ridge, running parallel to the African coast in a NNE-SSW direction (Coello et al, 1992). It comprises two main islands, Fuerteventura at the SSW and Lanzarote at the NNE end, and several islets: Lobos, between the two big islands, and La Graciosa, Roque del Este, Roque del Oeste, Montaña Clara and Alegranza, to the north of Lanzarote (Fig. 1C). The maximum ocean depth between these islands is barely 40m and thus it is very likely that they were connected during glaciation periods. The islands are the result of five volcanic complexes that arose from the ocean in a temporal succession: The Peninsula of Jandía 20.7 Myr, the Central edifice 22.5 Myr, the Northern edifice 17.0 Myr in Fuerteventura (Ancochea *et al.*, 1996) and Ajaches 15.5 Myr and Famara 10.2 Myr in Lanzarote (Coello *et al.*, 1992). The Eastern Canaries have undergone

several subaerial cycles of volcanic activity. A major gap in activity between the Miocene and the Pliocene periods brought about an extensive erosion of the edifices. Postmiocene activity was limited to Central and Northern Fuerteventura and Lanzarote (Coello *et al.* 1992). In these regions, recent volcanic activity, and historical eruptions in the case of Lanzarote, have been documented. Apart from the lack of recent volcanic activity, the peninsula of Jandía, in southern Fuerteventura, is characterized by its 'ecological' isolation. It is separated from the rest of the island by an isthmus which is extensively covered with eolic sands.

The geological structure of the sea floor between the Eastern Canaries and Africa is obscured by thick sediments in the region. Moreover, subfossil ostrich eggs have surprisingly been found in the islands. These data have driven some authors to claim a continental origin for the Eastern Canaries with subsequent episodes of volcanic activity (Sauer & Rothe, 1972). However, geological data accumulated during the last few years strongly disagree with this view, pointing to a strictly oceanic origin of the islands.

Previous taxonomic knowledge

Before the present study 5 *Dysdera* species were reported to be present in the Eastern Canaries (Wunderlich, 1991; Arnedo *et al.* 1996): *Dysdera longa* Wunderlich, 1991, and *D. spinidorsum* Wunderlich, 1991, from Fuerteventura; *D. liostethus* Simon, 1907, from Lanzarote; *D. alegranzaensis* from the islet of Alegranza and *D. lancerotensis* Simon, 1907, reported from the two major islands. Two of these species, *D. liostethus* and *D. spinidorsum*, were known from single specimens: a male and a female respectively.

MATERIAL & METHODS

Material was made available from scientific institutions (as well as personal

collections) and collection expeditions to the islands by the authors. The following colleagues and museums kindly supplied material for the present study: Dr. E. Enghoff from the Zoologisk Museum of Copenhagen (ZMK), O. Escolà from the Museu de Zoologia de Barcelona (MZB), Dr. P. D. Hillyard from the Natural History Museum of London (BMNH), Dr. P. Oromí from the Universidad de La Laguna (UL), Dr. G. Ortega from the Museo de Ciencias Naturales de Santa Cruz de Tenerife (MCNT), Dr. C. Rolland from the Muséum National d'Histoire Naturelle de Paris (MNHN) and Miguel Villana (MNCN). Material from the authors' expeditions is stored in the collection of Arachnids of the University of Barcelona, Spain (UB).

Applied species concept

The so-called 'diagnosability' (Baum, 1992) phylogenetic species concept (Nelson & Platnick, 1981; Nixon & Wheeler, 1990, 1992; Wheeler & Nixon, 1990, Davis & Nixon, 1992) was adopted in the taxonomic revision. Species are recognized as the most exclusive set of populations that display a certain combination of character-states, when semaphoronts are compared (Davis & Nixon 1992). The selection of this concept was based on its practical applicability, lack of assumptions about processes and its compatibility with a phylogenetic framework. In the present approximation only morphological characters were considered in species delimitation. This probably underestimates the actual number of 'diagnosable' species using additional data sets, i.e. molecular, ecological or behavioral characters.

Character definition and terminology

Characters were examined under a Wild Heerbrugg (12-100x magnification) dissecting microscope. Female endogyne (Mcheidze 1972) was removed and muscle tissues were digested using a KOH (35%) solution before observation. Male bulbi and spinnerets were removed, cleaned by means of ultrasound and examined using a

HITACHI S-2300 Scanning Electron Microscopy at 10-15 Kv. Drawings of dorsal carapace, ventral chelicera, male palp and female endogyne were made with the aid of a drawing grid.

Characters examined for taxonomic revision and their diagnostic resolution have been discussed elsewhere (Arnedo *et al.*, 1996; Arnedo & Ribera, 1997). Structures of the male bulbus and female endogyne were mostly named after Deeleman-Reinhold & Deeleman (1988). However, after examination of a large number of continental representatives it was realized that some of the terms included very different and probably non-homologous characters. With the aim of clarifying character terminology a full description and definition of characters are provided for *Dysdera* male and female genitalia.

Male bulbus (Fig. 2A-G)

The genus *Dysdera* has one of the most complex bulbs in the whole family Dysderidae. Schult (1980, 1983) was the first to establish the homologies between the *Dysdera* bulb and the spider ground plan as suggested by Kraus (1978). In *Dysdera*, the basal and medial haemotodochae as well as the sclerites I (=subtegulum) are very reduced and hardly visible. On the other hand, the sclerite II or tegulum (t) is very well-developed, representing in most cases half of the bulbus. The T holds a posterior apophysis (p), which is homologous to the tegular or medial apophysis of the entelegynes. The T externally covers the spermophore (= reservoir) (sp). The so-called distal division (dd) of the bulb includes the membranous distal haemotodocha (dh), which includes the seminiferous duct (sd) inside, and the sclerite III (=conductor + embolus). The DH is usually truncated at its distal tip, where the seminiferous duct opening is found. Sometimes, the internal distal tip of the DH projects as a finger-like structure. Sclerite III, which is located on the anterior side of the bulb, is divided into two branches, the internal branch or internal sclerite (is) and the external one (es). The relative development and degree of fusion of both sclerites is variable. The IS is usually more or less straight. A frontal apophysis (fa) is sometimes present in IS proximal region. In some species, an expansion of the distal internal part of the DH

has been observed. When this happens the IS usually covers the external and anterior sides of the expansion, thus assuming the appearence of a crest, here referred to as the 'DD internal expansion'. However, this structure is different from some crest-like ridges that may be present on the anterior distal part of the IS. These ridges may be straight and parallel to the IS, which characterizes the Canarian *Dysdera* species, or arch-like and opened to the distal tip. Hereafter, the former crest is referred to as C (c) while the second one is simply called 'arch-like ridge' (ar). The distal external margin of the IS may be already expanded. This expansion is sheet-like and laterally projected over the ES and is called the 'lateral fold' (lf). The lateral fold has several levels of development. In some Canarian species, it is very reduced and only visible at the distal tip of the DD, being called the 'additional crest' (ac) . In other instances, the LF is strongly sclerotized and apophysis-like, and is referred to as the 'medial apophysis' (ma). The ES is markedly bent in the middle, going from the anterior side to the posterior one. Therefore, the distal part of the DH is anteriorly covered by the IS and posteriorly covered by the ES. The ES is usually laterally expanded in a sheet-like structure called the 'lateral sheet' (l). The external margin of this structure may be sclerotized. The degree of development of the L is very variable. In some Canarian species, a small apophysis, anteriorly projected, has been recorded, and is named the 'lateral sheet apophysis' (la). Posteriorly, the ES border may be fused to the DH or may form a rim, which is called the 'additional lateral sheet' (al). The border of this rim is generally smooth, although some species have a toothed margin. Finally, in some species the distal tip of the AL is projected in a flagellum (f).

Endogyne (Fig. 3A-F)

The female genitalia are entirely internal. Mcheidze (1972) coined the term 'endogyne' to refer to this structure in contrast to the 'epigyne' or external female genital structures of the entelegyne spiders. The genitalic furrow (g), located in the anterior ventral region, gives rise to the internal bursa (b) which is divided into two diverticles, an anterior diverticle (ad) and a posterior one (pd). These two pouches are

also separated dorsally by the oviduct opening (o). The posterior diverticle is usually more developed than the anterior one and is mostly membranous with the single exception of the transversal bar (tb). This structure is located on the anterior dorsal margin of the posterior diverticle. There is a semicircular sheet-like expansion on its anterior border, the so-called 'bursal valve' (v), which fits with the anterior diverticle, closing the oviduct opening to the bursa. The anterior diverticle holds nearly all the female genitalic characters used in the taxonomy not only of the genus but of the entire family. The anterior diverticle is further divided into two pouches, a dorsal diverticle and a ventral one, by a middle invagination of its lateral walls. This fold is called the 'major fold' (mf). The dorsal anterior diverticle is commonly highly sclerotized, and is referred to as the 'dorsal arch' (da). The dorsal side of the DA, called the 'dorsal fold' (df), is responsible for locking the V. Additional lateral folds may be found in the DA. The ventral diverticle is called the 'ventral arch' (va) in contrast to the DA. It roughly corresponds to the 'ventral plate' defined by Deeleman-Reinhold & Deeleman (1988). The anterior part of the VA is bent upwards, limiting the most anterior margin of the DA. An additional lateral fold of the VA, resulting in an 'additional ventral diverticle' (avd), has been reported in some Canarian *Dysdera*. The level of sclerotization of the VA is very variable and is very useful in both taxonomy and phylogeny. Unfortunately, drawings of the ventral endogyne are very scarce in the taxonomic studies of the Dysderidae. Finally, a T-shaped, completely sclerotized spermatheca (s) is found in the anterior ventral region of the VA.

Other abbreviations used in text and figures are:

Eyes

AME: anterior medial eyes

PME: posterior medial eyes

PLE: posterior lateral eyes

Cheliceral teeth

B: basal tooth

M: medial tooth

D: distal tooth

Spinnerets

ALS: anterior lateral spinnerets

PMS: posterior medial spinnerets

PLS: posterior lateral spinnerets

ms: major ampulate gland spigot

ps: polar pyriform gland spigot

Spinnerets and associated spigot glands were assigned after Platnick *et al.* (1991). All taxonomic characters were recorded in DELTA format (Dallwitz, 1980, 1993).

Cladistic analysis

Both binary and multistate characters were recorded. Multistate characters were treated as non-additive, i.e. unordered. An outgroup was introduced in the data matrix to orientate the resulting unrooted cladograms (Nixon & Carpenter, 1993). Three different sorts of analyses were performed. In the first analysis, characters were equally weighted. In the second analysis characters were weighted according to the successive weighting approach described by Carpenter (1988). In both cases data were analyzed with the computer program Hennig86 (Farris, 1988). In the third analysis, the optimality criterion of maximum parsimony was replaced with the criterion of maximizing a concave function of the homoplasy, as proposed by Goloboff (1993). This was implemented in the computer program PEE-WEE (v 2.50 Goloboff, 1996a).

Resulting cladograms were checked against zero-length branches (Coddington & Scharff, 1994) and semistrict support (Nixon & Carpenter, 1996). The branch support (b) and the weighted branch support (b_w) (Bremer, 1994) were calculated with the computer program PHAST (v 1.1 Goloboff, 1996b) (command sequence: hold 25000, suboptimal 30, mult*100, max*; bsupport) and the b_w was further rescaled (b_{wr}) (Gustafsson & Bremer, 1995) by hand. A similar measure was applied to the trees of maximum fit. In this case, trees of lesser fit were used to assess the clade support,

as implemented in PEE-WEE (command sequence: hold 25000, suboptimal 100, mult*100, max*; bsupport). Unambiguous characters state changes for resulting cladograms were obtained by means of the computer program NONA (v 1.5.1 Goloboff, 1996c).

RESULTS

Taxonomy

Family DYSDERIDAE

Genus *Dysdera* Latreille, 1804

D. alegranzaensis Wunderlich, 1991

(Figs 4A-F, 5A-D, 6A-B)

Dysdera alegranzaensis Wunderlich, 1991: 287-288, fig. 7-9 [♂,♀]. (Holotype male; from the ridge of the Caldera, Alegranza; ?/6/90; P. Oromí leg.; num. 02748, stored at UL; examined)

Diagnosis. This species closely resembles *D. longa*, *D. nesiotes* and *D. spinisorsum* in somatic morphology and genitalia. A strong reduction in size of C (Fig. 5B), absence of F (Fig. 5A) and DA distinctly shortened in length with truncated back lateral margins (Fig. 4D) differentiates it from the remaining species. Additionally, it can be distinguished from the sympatric *D. nesiotes* by DD not inclined (Fig. 4C), and LA projected over L (Fig. 5A).

Holotype male (Figs 4A-C, 5A-B). Carapace (Fig. 4A) 4.48 mm long; maximum width 3.43 mm; minimum width 2.31 mm. Brownish red, frontally darker, becoming lighter

towards back; slightly foveate at borders, slightly wrinkled with small black grains mainly at front. Frontal border roughly triangular, from 1/2 to 3/5 carapace length; anterior lateral borders convergent (very slightly); rounded at maximum dorsal width point, back lateral borders straight; back margin wide, straight. AME diameter 0.25 mm; PLE 0.2 mm; PME 0.16 mm; AME on edge of frontal border, separated from one another by about 2/3 diameter, close to PLE; PME very close to each other, about 1/3 PME diameter from PLE. Labium trapezoid-shaped, base wider than distal part; longer than wide at base; semicircular groove at tip. Sternum orange, frontally darker, becoming lighter towards back; very slightly wrinkled, mainly between legs and frontal border; uniformly covered in slender black hairs.

Chelicerae (Fig. 4B) 1.96 mm long, about 1/3 of carapace length in dorsal view; fang medium-sized, 1.4 mm; basal segment dorsal, ventral side completely covered with piligerous granulations. Chelicera inner groove short, about 1/3 cheliceral length; armed with three teeth and lamina at base; B>D>M (similar in size); D round, located roughly at centre of groove; B close to basal lamina; M at middle of B and D. Front legs dark orange, back legs yellow. Lengths of male described above: fe1 3.73 mm (all measurements in mm); pa1 2.56; ti1 3.77; me1 3.45; ta1 0.7; total 14.21; fe2 3.4; pa2 2.33; ti2 3.62; me2 3.54; ta2 0.79; total 13.68; fe3 2.61; pa3 1.44; ti3 1.72; me3 2.47; ta3 0.63; total 8.87; fe4 3.54; pa4 2; ti4 2.65; me4 3.4; ta4 0.79; total 12.38; fe Pdp 2.23; pa Pdp 1.12; ti Pdp 0.93; ta Pdp 0.88; total 5.16; relative length: 1>2>4>3. Spination: palp, leg1, leg2 spineless. Fe3d spines in one row: 2-3; tb3d spines arranged in two bands: proximal 1.2.1; distal 1.0.1.; tb3v spines arranged in two bands: proximal 1.0.1; distal 1.0.0; with two terminal spines. Fe4d spines in two rows: forward 3; backward 6; tb4d spines arranged in two bands: proximal 1.1.1; distal 1.0.1; tb4v spines arranged in two bands: proximal 1.0.1; distal 1.0.1; with two terminal spines. Dorsal,ventral side of pedipalp covered with small piligerous grains (scarcely); very long hairs on back legs as well as on pedipalps. Claws with 8 teeth or less; hardly larger than claw width.

Abdomen 10.7 mm long; cream-coloured; cylindrical. Abdominal dorsal hairs 0.144 mm long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

Male copulatory bulbus (Fig. 4C) T as long as DD; external, internal distal border sloped backwards. DD not bent in lateral view; internal distal border markedly expanded. ES wider, more sclerotized than IS; IS continuous to tip. DD tip (Fig. 5A-C) straight in lateral view. C present, short; distal end on DD internal tip; poorly developed; located close to DD distal tip; proximal border sharply decreasing; distal border truncated, upper tip not projected, rounded, external side smooth. LF absent. L well-developed; external border sclerotized, laterally markedly folded, distally projected; distal border divergent, continuous. LA present, sheet-like; as long as L, distally not fused. F absent. AL present, well-developed; proximal border in posterior view smooth, not fused with distal haematodoca. P (Fig. 5D) fused to T; perpendicular to T in lateral view; lateral length from 1/2 to 2/3 of T width; ridge present, perpendicular to T; distinctly expanded, right-angled; upper margin smooth; not distally projected; back margin not folded.

Female (Figs 4D-F, 6A-B). All characters as in male except: Carapace 5.25 mm long; maximum width 4.02 mm; minimum width 2.83 mm. Deep red. Back lateral borders straight. AME diameter 0.25 mm; PLE 0.21 mm; PME 0.2 mm.

Chelicerae 2.33 mm long; fang 1.57 mm. D=B>M (similar). Legs dark orange-coloured. Lengths of female described above: fe1 4.19 mm (all measurements in mm); pa1 2.89; ti1 4.47; me1 3.73; ta1 0.74; total 16.02; fe2 3.63; pa2 2.61; ti2 3.45; me2 3.62; ta2 0.7; total 14.01; fe3 2.98; pa3 1.81; ti3 2.09; me3 2.98; ta3 0.74; total 10.6; fe4 3.96; pa4 2.28; ti4 2.89; me4 3.86; ta4 0.84; total 13.83; fe Pdp 2.14; pa Pdp 1.21; ti Pdp 0.98; ta Pdp 1.16; total 5.49; relative length 1>2>4>3. Spination: palp, leg1, leg2 spineless. Fe3d spines in one row: 1; tb3d spines arranged in two bands: proximal 1.2.1; distal 1.0.1.; tb3v spines arranged in two bands: proximal 1.0.0; distal 1.0.0; with two terminal spines. Fe4d spines in two rows: forward 1; backward 5; tb4d spines arranged in two bands: proximal 1.1.1; distal 1.0.1; tb4v spines arranged in two bands: proximal 1.0.1; distal 0.0.1; with two terminal spines.

Abdomen 10.74 mm long. Abdominal dorsal hairs 0.18 mm.

Endogyne (Fig. 4D-F) DA not distinguishable from VA; rectangular; DA twice as wide as long; DF wide in dorsal view. MF well-developed, completely sclerotized.

VA frontal region completely sclerotized; posterior region sclerotized at most anterior area; tooth-shaped expansion from internal back border, not joined to lateral sclerotization, about half of DF lateral margins; AVD absent. S attachment projected under VA; arms as long as DA, straight; tips dorsally projected; neck as wide as arms. TB usual shape.

ALS (Fig. 6A) with PS; remaining piriform spigots more external than MS, arranged in two rows; 8+1 piriform gland spigots; PMS, PLS (Fig. 6B) with 10-15 aciniform gland spigots.

Intraspecific variation. Male cephalothorax ranges in length from 3.99 mm to 4.48 mm, female from 3.57 mm to 5.25 mm. AME separation from 3/5 diam. to 4/5. PLE-PME from 1/3 diam. to 1/2. Carapace ornamentation somewhat reduced, nearly smooth. Chelicera relative size up to 2/5 of the carapace length. Distal reduction of the chelicera granulations in some female specimens. Relative size of B and D variable, M always the smallest. Some female palps with ventral granulation. Spination variability in Table 1.

Distribution. Endemic species from Lanzarote and Northern islets.

Material examined. Alegranza: El Faro; 1♂; 6/4/93; P. Oromí leg.; 2530 UL. Unknown locality; 1♂; 3rd week/3/95; P. Oromí leg.; 4106 UB. Inside the Caldera; 1juv.; ?/6/90; P. Oromí leg.; 2735 UL. Unknown locality; 1♀, 3juv.; ?/6/90; P. Oromí leg.; 2733 UL. La Graciosa: Montaña del Mojón; 1♀; 30/3/96; P. Oromí leg.; 3137 UB. Caldera de Pedro Barba; 1♂; 30/3/96; P. Oromí leg.; 3134 UB. Lanzarote: Haría : Famara mountains, around Mirador del Río; 22/2/95; Arnedo, Ribera & Oromí leg.; 3♂ num. 2858-59, 4076; 3♀ num. 4080, 4104-5, stored at UB. 1♀; ?/11/88; A. Enghoff leg.; 2670 ZMK. Yaiza: Femés mountains, Atalaya de Femés;22/2/95; Arnedo, Ribera & Oromí leg.; 2♀ num. 4089-90, stored at UB.

Comments. This species had only been reported from the rocky island of Alegranza before the present study.

D. lancerotensis Simon, 1907

(Figs 7A-F, 8A, 8C-E, 9A-B)

Dysdera crocata lancerotensis Simon, 1907:258. (Types; 3♂, 3♀; unknown locality, Lanzarote; Ch. Alluaud leg.; num. 15586, stored at MHNP).

Dysdera crocota lancerotensis Denis, 1941: 108.- Schmidt, 1973: 360-361.

Dysdera lancerotensis Wunderlich, 1991: 296-298, figs 50-52 [♂, ♀].

Diagnosis. This species strongly differs from any other Canarian endemics. It closely resembles the cosmopolitan species *D. crocota* C. L. Koch, 1839, from which it can be distinguished by spiny fe1 (not always so), shape of DD tip in frontal view (Fig. 8A-B), presence of two or three ridges on P upper margin (Fig. 8E), dorsal shape of DA, frontal projection of VA under DA and presence of a tiny strip connecting DA frontally with S attachment (Figs 7D, 7G).

Male (Figs 7A-C, 8A, 8C-E). Carapace (Fig. 7A) 3.43 mm long; maximum width 2.87 mm; minimum width 2.1 mm. Dark red, uniformly distributed; slightly foveate at borders, slightly wrinkled with small black grains mainly at front. Frontal border roughly round, about 3/5 carapace length; anterior lateral borders convergent (slightly); rounded at maximum dorsal width point, back lateral borders rounded; back margin wide, bilobulated; slightly stepped in lateral view. AME diameter 0.2 mm; PLE 0.18 mm; PME 0.14 mm; AME slightly back from frontal border, separated from one another by about 2/3 diameter, close to PLE; PME very close to each other, less than 1/4 PME diameter from PLE. Labium trapezoid-shaped, base wider than distal part; as long as wide at base; semicircular groove at tip. Sternum orange, uniformly distributed; very slightly wrinkled, mainly between legs and frontal border; uniformly covered in slender black hairs.

Chelicerae (Fig. 7B) 1.82 mm long, about 1/2 of carapace length in dorsal view; fang long, 1.54 mm; basal segment dorsal side completely covered with piligerous granulations (sparse), ventral side smooth. Chelicera inner groove long, about 1/2 cheliceral length; armed with three teeth and lamina at base; D=B>M; D trapezoid,

located roughly at centre of groove; B close to basal lamina; M close to B. Legs orange. Lengths of male described above: fe1 2.56 mm (all measurements in mm); pa1 1.58; ti1 2.24; me1 2.33; ta1 0.65; total 9.36; fe2 2.28; pa2 1.4; ti2 1.96; me2 2.1; ta2 0.65; total 8.39; fe3 2; pa3 1.16; ti3 1.3; me3 1.77; ta3 0.56; total 6.79; fe4 2.47; pa4 1.3; ti4 1.91; me4 2.33; ta4 0.65; total 8.66; fe Pdp 1.67; pa Pdp 0.93; ti Pdp 0.79; ta Pdp 0.93; total 4.32; relative length: 1>4>2>3. Spination: palp, leg1, leg2 spineless. Fe3d spineless; tb3d spines arranged in two bands: proximal 1.0.1; distal 1.0.1; tb3v spines arranged in one band: proximal 0.1.0; with two terminal spines. Fe4d spines in one row: 3; tb4d spines arranged in two bands: proximal 1.0.1; distal 1.0.1; tb4v spines arranged in one band: proximal 0.0-1.0; with two terminal spines. Dorsal side of frontal legs covered with small piligerous grains; ventral side covered with hairs, lacking grains. Claws with 8 teeth or less; hardly larger than claw width.

Abdomen 4.48 mm long; whitish; cylindrical. Abdominal dorsal hairs 0.036 mm long; thin, roughly straight, not compressed, blunt, tip enlarged; uniformly, scantly distributed.

Male copulatory bulbus (Fig. 7C) T as long as DD; external distal border straight; internal projected at middle. DD bent about 45º in lateral view; internal distal border not expanded. ES wider, more sclerotized than IS; IS continuous to tip. DD tip (Figs 8A, 8C-D) straight in lateral view; posterior (lower) sheet projected under frontal (upper) one; posterior sheet distal internal margin sloped; arch-like ridge present. MA present; hook-like; single pointed projection at internal base. C absent. L absent or hardly visible. LA absent. F absent. AL absent. P (Fig. 8E) not fused to T; parallel to T on its proximal part, perpendicular on distal; lateral length from 1/3 to 2/5 of T width; ridge present, parallel to T; not expanded; upper margin markedly toothed, on its distal part, very few teeth (1-3); not distally projected; back margin not folded.

Female (Figs 7D-F, 9A-B). All characters as in male except: Carapace 3.85 mm long; maximum width 3.22 mm; minimum width 2.38 mm. AME diameter 0.21 mm; PLE 0.18 mm; PME 0.16 mm.

Chelicerae 2.03 mm long; fang long, 1.89 mm. Lengths of female described above: fe1 2.8 mm (all measurements in mm); pa1 1.72; ti1 2.33; me1 2.33; ta1 0.6;

total 9.78; fe2 2.56; pa2 1.49; ti2 2.1; me2 2.19; ta2 0.56; total 8.9; fe3 1.96; pa3 1.16; ti3 1.4; me3 1.91; ta3 0.56; total 7; fe4 2.61; pa4 1.4; ti4 1.86; me4 2.56; ta4 0.65; total 9.08; fe Pdp 1.86; pa Pdp 0.83; ti Pdp 0.79; ta Pdp 1.26; total 4.74; relative length 1>4>2>3. Spination: palp spineless. Fe1 two terminal spines on forward margin. Fe2 one terminal spine on the forward margin. Fe3d spineless; tb3d spines arranged in two bands: proximal 1.0.1; distal 1.0.1; tb3v spines arranged in one band: proximal 0.1.0; with two terminal spines. Fe4d spines in one row: 3-2; tb4d spines arranged in two bands: proximal 0.0.1; distal 1.0.1-0; tb4v spines arranged in one band: proximal 0.1.0; with two terminal spines. Dorsal, ventral side of pedipalp covered with hairs, lacking grains.

Abdomen 5.95 mm long; whitish; cylindrical. Abdominal dorsal hairs 0.054 mm long; thin, roughly straight, not compressed, blunt, tip enlarged; uniformly, scantly distributed.

Endogyne (Fig. 7D-F) DA clearly distinguishable from VA; DA slightly wider than long; DF narrow in dorsal view. MF margins not fused, poorly developed, membranous. VA rectangular; projected under DA; frontal region with a narrow sclerotized band connecting S attachment to DA; posterior region not sclerotized; AVD absent. Ventral narrow dark bands developed from S attachment. S attached to membranous VA; arms as long as DA, clearly curved; tips not projected; neck as wide as arms. TB usual shape.

ALS (Fig. 9A) with PS; remaining piriform spigots more external than MS, arranged in three rows; 12+1 piriform gland spigots; PMS, PLS (Fig. 9B) with 10-15 aciniform gland spigots.

Intraspecific variation. Male cephalothorax ranges in length from 2.81 mm to 4.06 mm, female from 2.94 mm to 4.69 mm. AME separation ranging from 2/3 diam. to 1. PLE-PME ranging from 1/4 diam. to 2/5. Sternum moderately wrinkled. D from markedly larger than B to as large as B. One specimen from La Graciosa has D under groove middle point. P transversal ridges reduced to two. DA frontal border sometimes straight. S shape somewhat variable (Fig.). Spination variability in Table 2.

Distribution. Endemic species from the Eastern Canaries.

Material examined. Alegranza: unknown locality; 3rd week/3/95; P. Oromí leg.; 2♂ num. 4115 stored at UB, num. 2892 stored at UL; 1♀; ?; P. Oromí leg.; 4173 UB. Fuerteventura: La Oliva : E from Punta Ballena, N from Cotillo; 1♀; 6/9/90; H. Enghoff & M. Báez leg.; num. 2631 ZMK. Cotillo-Los Lagos; 1♀; 10/2/97; P. Oromí leg.; 3185 UL. Malpaís de Bayuyo;20/2/95; Arnedo, Ribera & Oromí leg.; 1♂ num. 2855; 2♀ num. 2856, 4071; stored at UB. Pájara : Bco. del Ciervo, Morro de Cavedero N from Morro Jable, Jandía; 4/1/90; H. Enghoff & M. Báez leg.; 4♂ num. 2633-35; 1♀ num. 2632; 1juv. num. 2633; stored at ZMK. 17/2/95; Arnedo, Ribera & Oromí leg.; 2♀ num. 2840, 4057; stored at UB. La Graciosa: Caleta del Sebo; 1♀; 31/3/96; P. Oromí leg.; 3135 UB. Playa Lambra; 1 juv.; 1/4/96; P.Oromí leg.; 3136 UB. Lanzarote: Haría : Famara, Mirador del Río; 15/3/95; unknown leg.; 2♂ num. 4103, 4179; stored at UB. Yaiza: Femés mountains, Atalaya de Femés; 22/2/95; Arnedo, Ribera & Oromí leg.; 2♂ num. 2869, 4092; 1♀ num. 2870; stored at UB. Montaña Clara: La Caldera; 23/2/95; Arnedo, Ribera & Oromí leg.; 2♂ num. 2871, 2872; 1 juv. num. 4178; stored at UB.

D. liostethus Simon, 1907

Dysdera liostethus Simon, 1907:261, fig. 4E [♂]. Type lost.

D. clavisetae Wunderlich, 1991: 291-292, figs 24-27 [♂,♀].-Arnedo *et al.*, 1996: 247-251, figs 6A-D, 7A-D & 8A-B [♂,♀]. **Syn. nov.**

Distribution. Widely spread species in the islands of La Gomera and El Hierro (Wunderlich, 1991; Arnedo *et al.* 1996). Its presence in Lanzarote is considered to be doubtful.

Comments. The only known material assigned to this species was a male used in the original description (Simon, 1907). With the only exception of *D.lancerotensis*, all the male types of the Canarian species described by Simon (seven species), which were supposed to be stored at MHNP, seem to have been lost. Most of characters given

in the original description are not species-diagnostic for Canarian *Dysdera*. However, the spination pattern is, in this case, very informative. This species is said to share a similar chaetotaxia with *D. rugichelis* Simon, 1907. Femora with numerous spines arranged in two assymetric rows and a strongly spinate posterior tibiae characterize the latter species. This spination pattern is very particular and has only been observed in *D. clavisetae* Wunderlich, 1991, *D. enghoffi* Arnedo, Oromí & Ribera 1996, *D. hirguan* Arnedo, Oromí & Ribera 1996, from La Gomera, *D. ratonensis* Wunderlich, 1991, from La Palma and *D. verneaui* Simon, 1883, from Gran Canaria. *D. verneaui* could be removed from the list because it was described by the same author and a synonymy is very unlikely. *D. ratonensis* and *D. hirguan* are very large species (more than 14 mm in total length), which does not fit with the total length reported for *D. liostethus* (8 mm). Finally, in *D. enghoffi* the dorsal side of the basal segments of the chelicerae is completely covered with granulations and its copulatory bulbus is characterized by a T and a DD of equal size. In contrast, *D. liostethus* is supposed to have chelicerae in which the basal segment is scarcely covered with granulations, and in the drawing of the male palp, a markedly longer DD than T can be observed. The only remaining species *D. clavisetae* fits these features perfectly. However, there are still two arguments against the synonymy. First, the P of the male bulbus in Simon's drawing is very short while *D. clavisetae* has a long P. The second problem has to do with the original type locality. However, this argument is not against this synonymy in particular but to any presence of this kind of male genital pattern in the Eastern Canaries. A clear segregation in male genitalia exists between the Western and Central islands and the Eastern ones. The drawing of the male palp of *D. liostethus* correponds to the Western-Central type, which in addition has never been reported to be present neither in Lanzarote nor in Fuerteventura. Moreover, additional cases of mistakenly assigned localities in the same article have been demonstrated (Arnedo *et al.* 1996). Therefore, the original type locality of *D. liostethus* is considered to be doubtful, at least. Finally, a synonymy of both species is considered to be preferable to an unnecessary proliferation of names.

D. longa Wunderlich, 1991

(Figs 10A-G, 11A-D, 12A-B)

Dysdera longa Wunderlich, 1991: 298, figs 53-56 [♂, ♀]. (Holotype male; Morro de Cavedero N from Morro Jable, Pájara, Fuerteventura; 4/1/90; H. Enghoff & M. Báez leg.; num. 298, stored at ZMK; examined. Paratypes; 1♂ 1♀, 2 juv.; Cumbres de Jandía, Pájara, Fuerteventura; 27/2/90; P. Oromí leg.; num 2710, stored at UL; examined).

Diagnosis. Very large *Dysdera* closely related to remaining eastern species, apart from *D. lancerotensis*, especially by genitalic pattern. It can be distinguished from these species by its larger size, dorsal projection of distal region of abdomen (mainly in males) (Fig. 10D), lanceolated hairs not posteriorly curved, T markedly larger than DD (Fig. 10C), C sheet-like and laterally expanded (Fig. 11B) and DA separated from VA at lateral margins (Fig. 10G).

Holotype male (Figs 10A-D, 11A-D). Carapace (Fig. 10A) 7.07 mm long; maximum width 5.53 mm; minimum width 3.29 mm. Reddish orange, frontally darker, becoming lighter towards back; slightly foveate at borders, slightly wrinkled with small black grains mainly at front. Frontal border roughly round, from 1/2 to 3/5 carapace length; anterior lateral borders convergent; pointed at maximum dorsal width, back lateral borders straight; back margin wide, straight. AME diameter 0.36 mm; PLE 0.31 mm; PME 0.25 mm; AME on edge of frontal border, separated from one another by about 2/3 diameter, close to PLE; PME very close to each other, less than 1/4 PME diameter from PLE. Labium trapezoid-shaped, base wider than distal part; longer than wide at base; semicircular groove at tip. Sternum reddish orange, frontally darker, becoming lighter towards back; very slightly wrinkled, mainly between legs and frontal border; uniformly covered in slender black hairs.

Chelicerae (Fig. 10B) 3.29 mm long, about 2/5 of carapace length in dorsal view; fang medium-sized, 2.5 mm; basal segment dorsal, ventral side completely covered with piligerous granulations. Chelicera inner groove short, about 1/3 cheliceral length; armed with three teeth and lamina at base, additional ventral tooth on left

chelicera; B>D=M (similar); D round, located roughly at centre of groove; B close to basal lamina; M at middle of B and D. Front legs dark orange, back legs yellow. Lengths of male described above: fe1 5.81 mm (all measurements in mm); pa1 3.91; ti1 6.16; me1 5.81; ta1 1.12; total 22.81; fe2 4.9; pa2 3.5; ti2 4.97; me2 4.55; ta2 1.02; total 18.94; fe3 3.64; pa3 2.33; ti3 3.64; me3 2.59; ta3 0.84; total 13.04; fe4 4.83; pa4 3.03; ti4 4.13; me4 4.69; ta4 1.07; total 17.75; fe Pdp 3.49; pa Pdp 1.63; ti Pdp 1.77; ta Pdp 1.63; total 8.52; relative length: 1>2>4>3. Spination: palp, leg1, leg2 spineless. Fe3d spineless; tb3d spines arranged in two bands: proximal 1.0.0; distal 1.0.1; tb3v spines arranged in one band: proximal 0.0.1; with two terminal spines. Fe4d spines in one row: 13; tb4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; tb4v spines arranged in one band: proximal 0.0.1; with two terminal spines. Dorsal, ventral side of pedipalp covered with hairs, lacking grains; very long hairs on back legs as well as on pedipalps. Claws with 8 teeth or less; hardly larger than claw width.

Abdomen 11 mm long; cream-coloured; back end projected upwards in lateral view (Fig. 10D). Abdominal dorsal hairs 0.108 mm long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

Male copulatory bulbus (Fig. 10C) T twice as long as DD; external, internal distal border sloped backwards. DD bent about 45° in lateral view; internal distal border not expanded. ES wider, more sclerotized than IS; IS continuous to tip (slim). DD tip (Fig. 11A-C) straight in lateral view. C present, long; distal end beside DD internal tip; distal border truncated, toothed, markedly expanded, projected over DD external part. LF absent. L well-developed; external border sclerotized, laterally markedly folded, distally projected; distal border divergent, continuous. LA present, hook-like; shorter than L. F present, straight, proximally fused to DD. AL present, well-developed, joined to flagellum; proximal border in posterior view smooth, not fused with distal haematodoca. P (Fig. 11D) fused to T; perpendicular to T in lateral view; lateral length from 1/2 to 2/3 of T width; ridge present, perpendicular to T; distinctly expanded, right-angled; upper margin smooth; not distally projected; back margin not folded.

Paratype female (Figs 10E-G, 12A-B). All characters as in male except: Carapace

6.79 mm long; maximum width 5.25 mm; minimum width 3.78 mm. Back lateral borders straight. AME diameter 0.36 mm; PLE 0.32 mm; PME 0.27 mm; AME on edge of frontal border, separated from one another by about 2/3 diameter, close to PLE; PME very close to each other, less than 1/4 PME diameter from PLE.

Chelicerae 3.12 mm long; fang medium-sized, 2.9 mm; B>D=M (similar). Legs dark orange-coloured. Lengths of female described above: fe1 8.26 mm (all measurements in mm); pa1 5.6; ti1 7.21; me1 7.21; ta1 1.4; total 29.68; fe2 6.65; pa2 5.18; ti2 6.02; me2 6.02; ta2 1.47; total 25.34; fe3 5.25; pa3 3.15; ti3 3.85; me3 5.04; ta3 1.26; total 18.55; fe4 7; pa4 3.92; ti4 5.6; me4 6.58; ta4 1.75; total 24.85; fe Pdp 4.9; pa Pdp 2.66; ti Pdp 2.1; ta Pdp 2.8; total 12.46; relative length 1>2>4>3. Spination: palp, leg1, leg2 spineless. Fe3d spineless; tb3d spines arranged in two bands: proximal 1.1.0; distal 1.0.1; tb3v spines arranged in one band: proximal 1.0.0; with two terminal spines. Fe4d spines in one row: 11-10; tb4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; tb4v spines arranged in one band: proximal 1.0.1; with two terminal spines. Dorsal side of frontal legs covered with small piligerous grains (sparse).

Abdomen 11 mm long; cream-coloured; back end projected upwards in lateral view (slightly). Abdominal dorsal hairs 0.56 mm long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

Endogyne (Fig. 10 E-G) DA clearly distinguishable from VA; DA slightly wider than long; DF wide in dorsal view. MF margins not fused, well-developed, anterior region sclerotized. VA rectangular, pointed expansion at middle frontal part; projected under DA; frontal region completely sclerotized; posterior region sclerotized at lateral margins; AVD absent. S attachment projected under VA; arms as long as DA, straight; tips not projected; neck as wide as arms. TB usual shape.

ALS (Fig. 12A) with PS; remaining piriform spigots more external than MS, arranged in two rows; 13+1 piriform gland spigots; PMS, PLS (Fig. 12B) with more than 20 aciniform gland spigots.

Intraspecific variation. Male cephalothorax ranges in length from 6.30 mm to 7.21 mm, female from 6.02 mm to 7.35 mm. AME separation from 1/3 diam. to 1/2. PLE-PME

from 1/3 diam. to 2/5. Sternum ornamentation sometimes reduced. Relative size of cheliceral teeth variable although no large differences in size. P back margin slightly folded. Spination variability in Table 3.

Distribution. Endemic species from the Jandía peninsula, at southern Fuerteventura.

Material examined. Fuerteventura: Pájara: Bco. del Ciervo, Cumbres de Jandía, N slope; 17/2/95; Arnedo, Ribera & Oromí leg.; 2♂ num. 2836, 2838; 7♀ num. 2837, 3183, 4054-56, 4058, 4117; 10 juv. num. 2831-35, 2839, 4050-53; stored at UB and UL; 27/2/90; P. Oromí leg.; 1♂; num. 2621 stored at MCNT.

D. nesiotes Simon, 1907

(Figs 13A-H, 14A-D, 15A-B)

Dysdera nesiotes Simon, 1907: 260-261, fig. 4G [♂].- Reimoser 1919: 200.- Denis, 1963: 37-38.- Schmidt, 1973: 360-361.- Rambla, 1978: 132-133. - Arnedo *et al.*, 1996.

Dysdera wollastoni Blackwall, 1864 nec. Kulczynski, 1899: 23-26. fig. 22-24 [♂].- Reimoser, 1919: 200.- Berland & Denis, 1946: 224.

Dysdera wollastoni nesiotes Simon, 1912: 59-60.- Denis 1941: 108.

Diagnosis. This species strongly resembles *D. spinidorsum*. It can be distinguished from the latter by short LA (Fig. 14A), C expanded to a lesser degree (Fig. 14B), presence of a fold between AL and F (Fig. 14C), MF backwards projection not so well developed (Fig. 13D) and presence of posterior sclerotization of the VA (Fig. 13E).

Neotype male (Figs 13A-C, 14A-D). Carapace (Fig. 13A) 4.23 mm long; maximum width 3.71 mm; minimum width 2.2 mm. Dark brownish orange, frontally darker, becoming lighter towards back; smooth with some small black grains mainly at front. Frontal border roughly triangular, from 1/2 to 3/5 carapace length; anterior lateral

borders convergent; rounded at maximum dorsal width point, back lateral borders straight; back margin wide, straight. AME diameter 0.27 mm; PLE 0.21 mm; PME 0.18 mm; AME on edge of frontal border, separated from one another by about 2/3 diameter, close to PLE; PME very close to each other, about 1/3 PME diameter from PLE. Labium trapezoid-shaped, base wider than distal part; longer than wide at base; semicircular groove at tip. Sternum orange, frontally darker, becoming lighter towards back; very slightly wrinkled, mainly between legs and frontal border; uniformly covered in slender black hairs.

Chelicerae (Fig. 13B) 1.82 mm long, about 1/3 of carapace length in dorsal view; fang medium-sized, 1.05 mm; basal segment dorsal, ventral side completely covered with piligerous granulations. Chelicera inner groove short, about 1/3 cheliceral length; armed with three teeth and lamina at base; D=B>M (similar); D round, located roughly at centre of groove; B close to basal lamina; M at middle of B and D. Front legs dark orange, back legs yellow. Lengths of male described above: fe1 3.5 mm (all measurements in mm); pa1 2.45; ti1 3.5; me1 3.29; ta1 0.63; total 13.37; fe2 3.08; pa2 2.1; ti2 2.8; me2 2.94; ta2 0.7; total 11.62; fe3 3.26; pa3 1.4; ti3 1.75; me3 2.17; ta3 0.7; total 9.28; fe4 3.29; pa4 1.68; ti4 2.7; me4 3.15; ta4 0.7; total 11.52; fe Pdp 2.1; pa Pdp 1.12; ti Pdp 1.13; ta Pdp 1.13; total 5.48; relative length: 1>2>4>3. Spination: palp, leg1, leg2 spineless. Fe3d spineless; tb3d spines arranged in two bands: proximal 1.0.1; distal 1.0.1; tb3v spines arranged in two bands: proximal 1.0.0; distal 1.0.0; with two terminal spines. Fe4d spines in two rows: forward 4; backward 6-7; tb4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; tb4v spines arranged in two bands: proximal 1.0.1; distal 0-1.0.0-1; with two terminal spines. Dorsal side of frontal legs covered with small piligerous grains; ventral side covered with hairs, lacking grains; very long hairs on back legs as well as on pedipalps. Claws with 8 teeth or less; hardly larger than claw width.

Abdomen 6.86 mm long; whitish; cylindrical. Abdominal dorsal hairs 0.11 mm long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

Male copulatory bulbus (Fig. 13C) T as long as DD; external, internal distal border sloped backwards. DD bent about 45º in lateral view; internal distal border markedly expanded. ES wider, more sclerotized than IS; IS continuous to tip

(diffused). DD tip (Fig. 14A-C) straight in lateral view; frontal (upper) sheet internal part markedly projected above posterior (lower) sheet. C present, long; distal end beside DD internal tip; distal border rounded, smooth, markedly expanded, perpendicular to DD. LF absent. L well-developed; external border sclerotized, laterally markedly folded; distal border divergent, continuous. LA present, hook-like; shorter than L. F present, tip bent backwards, proximally fused to DD. AL present, well-developed, not joined to flagellum; proximal border in posterior view smooth, not fused with distal haematodoca. P (Fig. 14D) fused to T; perpendicular to T in lateral view; lateral length from 1/2 to 2/3 of T width; ridge present, perpendicular to T; distinctly expanded, rounded; upper margin slightly toothed, mainly on external side, along its extent, few teeth (4-6); not distally projected; back margin not folded.

Female (Figs 13E-F, 15A-B). All characters as in male except: Carapace 4.55 mm long; maximum width 3.71 mm; minimum width 2.38 mm. AME diameter 0.27 mm; PLE 0.21 mm; PME 0.18 mm; AME separated from one another by about 2/5 diameter

Chelicerae 1.92 mm long; fang medium-sized, 1.19 mm. B>D>M (similar). Front legs dark orange, back legs yellow. Lengths of female described above: fe1 3.36 mm (all measurements in mm); pa1 2.38; ti1 2.94; me1 2.8; ta1 0.63; total 12.11; fe2 3.86; pa2 2.1; ti2 2.66; me2 2.66; ta2 0.63; total 11.91; fe3 2.24; pa3 1.4; ti3 1.75; me3 2.31; ta3 0.63; total 8.33; fe4 3.5; pa4 1.68; ti4 2.66; me4 3.22; ta4 0.7; total 11.76; fe Pdp 2.2; pa Pdp 0.98; ti Pdp 0.84; ta Pdp 1.19; total 5.21; relative length 1>2>4>3. Spination: palp, leg1, leg2 spineless. Fe3d spineless; tb3d spines arranged in two bands: proximal 1.0.1; distal 1.0.0; tb3v spines arranged in two bands: proximal 1.0.0; distal 1-0.0.0; with two terminal spines. Fe4d spines in two rows: forward 1; backward 6-5; tb4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; tb4v spines arranged in two bands: proximal 1.0.1; distal 1-2.0.0-1; with two terminal spines.

Abdomen 6.86 mm long; whitish; cylindrical. Abdominal dorsal hairs 0.126 mm long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

Endogyne (Fig. 13E-F) DA not distinguishable from VA; rectangular; DA twice as wide as long; DF wide in dorsal view. MF well-developed, completely sclerotized, projected backwards, shorter than DA lateral length. VA frontal region completely

sclerotized; posterior region sclerotized in most anterior area; tooth-shaped expansion from internal back border; not joined to lateral sclerotization, about half of DF lateral margins; AVD absent. S attachment not projected under VA; arms as long as DA, slightly curved; ends projected forwards; neck hardly visible. TB usual shape.

ALS (Fig. 15A) with PS; remaining piriform spigots more external than MS, arranged in two rows; 10+1 piriform gland spigots; PMS, PLS (Fig. 15B) with 10-15 aciniform gland spigots.

Intraspecific variation. Male cephalothorax ranges in length from 3.64 mm to 4.48 mm, female from 3.92 mm to 5.46 mm. AME separation from 1/3 diam. to 4/5. PLE-PME from 1/3 diam. to 1/2. In general, B largest, D clearly above groove middle point and M position variable. Some female specimens have abdominal hairs that are not clearly lanceolated. An unusual range of variability in DA shape can be observed. Two extreme types can be recognized although several intermediate forms have been recorded. The first of them (Fig. 13G) is distinguished by a markedly wide DA in dorsal view, with rectangular anterior lateral borders, tooth-like ventral sclerotization which is restricted to the frontal region, and S as long as DA. The second one (Fig. 13H) shows a moderately wide DA, with its anterior frontal margins rounded, more developed sclerotization of the frontal region with tooth-like projection hardly noticeable, and S markedly shorter than DA. Female specimens from the Selvagens Islands as well as a single specimen from Northeastern Lanzarote fit the first type, while the second one is spread over the remaining localities. Spination variability in Table 4.

Distribution. This species is spread over Lanzarote, the Northern islets and the Selvagens Islands.

Material examined. Neotypes, by present designation, 1♂, 1♀, 1juv.; label states: '*Dysdera wollastoni* Blackwall, Ins. Salvages (Garreta leg.)'; stored at MHNP. Alegranza: unknown locality; 3rd week/3/95; P. Oromí leg.; 1♂ num. 2890; 3♀ num. 2891, 4109, 4107; stored at UB. Lanzarote: Haria: Malpaís de la Corona, Charcos de

marea; 1♀; 25/2/95; Arnedo, Ribera & Oromí leg.; 2887 UB. Famara mountains, around Mirador de Haria; 22/2/95; Arnedo, Ribera & Oromí leg.; 1♂2866; 1♀ 4087; UB. Famara mountains, around Mirador del Río; 22/2/95; Arnedo, Ribera & Oromí leg.; 61♂ num. 2861, 2863, 4072-3, 4075, 4077; 7♀ num. 2857, 2860, 2862, 2936, 4082, 4084-5; stored at UB and UL. Yaiza: Femés mountains, Atalaya de Femés; 22/2/95; Arnedo, Ribera & Oromí leg.; 1♀ 2868 UB; 1♂ 2867 UB. Montaña Clara: La Caldera; 23/2/95; Arnedo, Ribera & Oromí leg.; 4♂ num. 2873, 2878, 2888-9; 8♀ num. 2818, 2874, 2876, 2879, 2880, 4093-95; stored at UB. Ilhas Selvagens: 3♂, 1♂ subad., 1♀, 1juv.; label states: '*Dysdera verneaui* Simon, Grant coll.'; num. BM1897.10.18.41-46; stored at BMNH.

Comments. Before the present study, it was claimed that *D. nesiotes* was present in the Canarian islands of La Palma and Tenerife and in the Selvagens Islands, a group of three islets located between Madeira and the Canaries about 150 km north of Tenerife. Nevertheless, no specimens assigned to this species have ever been reported from La Palma or Tenerife after the original description. The supposed presence of this species in Tenerife could be explained by a misidentification. Simon transferred three females originally assigned to *Dysdera insulana* Simon, 1883, to *D. nesiotes*. After examination of these females they turned out to belong to the species *Dysdera propinqua* Ribera, Ferrández & Blasco, 1986 (Arnedo & Ribera, submitted). The latter species is widely distributed in Tenerife. Probably, this locality was erroneously assigned after misidentification of additional labeled female material. The presence of *D. nesiotes* in La Palma is even more difficult to explain. However, other cases of possible wrongly assigned localities have been proposed in other Canarian *Dysdera* described by Simon , e.g. the presence of *D. insulana* in La Palma and Lanzarote (Arnedo & Ribera, 1996). Moreover, the geographical distribution of certain morphological characters, i.e. LA and F presence, give support to the absence of *D. nesiotes* from the Western and Central Canaries.

D. sanborondon sp. nov.

(Figs 16A-F, 17A-D, 18A-B)

Holotype male. 18/2/95; Arnedo, Ribera & Oromí leg.; num. 2850; Stored at UB.

Type locality. Montañas de Tegú, Betancuria, Fuerteventura.

Allotype female. Cuchillos de Jacomar, between Valle de Jacomar and Valle de los Toneles, Tuineje, Fuerteventura; 19/2/95; Arnedo, Ribera & Oromí leg.; num. 2852, Stored at UB.

Etymology. The name in apposition of this species refers to San Borondón, the fantastic island that the first Spanish settlers of the 15th and 16th centuries believed they saw from the Canaries on extremely clear days.

Diagnosis. Very small *Dysdera*. Even though this species shows a similar genitalic pattern to the remaining eastern species (with the exception of *D. lancerotensis*) it can be easily distinguished by its smaller size, lack of lanceolate abdominal hairs, lack of both LA (Fig. 17A) and AL (Fig. 17C), and more developed VA posterior sclerotization (Fig. 16E).

Holotype male (Figs 16A-C, 17A-D). Carapace (Fig. 16A) 2.33 mm long; maximum width 1.72 mm; minimum width 1.12 mm. Dark brownish orange, uniformly distributed; heavily wrinkled, foveate, covered with small black grains. Frontal border roughly triangular, from 1/2 to 3/5 carapace length; anterior lateral borders convergent; rounded at maximum dorsal width point, back lateral borders straight; back margin narrow, straight. AME diameter 0.16 mm; PLE 0.14 mm; PME 0.11 mm; AME on edge of frontal border, separated from one another by less than 1/4 diameter, close to PLE; PME very close to each other, less than 1/4 PME diameter from PLE. Labium trapezoid-shaped, base wider than distal part; as long as wide at base; semicircular groove at tip. Sternum dark orange, uniformly distributed; wrinkled; uniformly covered in slender black hairs.

Chelicerae (Fig. 16B) 1.09 mm long, about 1/3 of carapace length in dorsal view; fang medium-sized, 0.74 mm; basal segment dorsal, ventral side completely covered with piligerous granulations. Chelicera inner groove medium-size, about 2/5

cheliceral length; armed with three teeth and lamina at base; D=B>M (similar); D triangular, located roughly at centre of groove; B close to basal lamina; M at middle of B and D. Legs orange. Lengths of male described above: fe1 1.86 mm (all measurements in mm); pa1 1.16; ti1 1.54; me1 1.44; ta1 0.42; total 6.42; fe2 1.54; pa2 1.02; ti2 1.35; me2 1.35; ta2 0.42; total 5.68; fe3 1.26; pa3 0.7; ti3 0.84; me3 1.12; ta3 0.32; total 4.24; fe4 1.77; pa4 0.88; ti4 1.4; me4 1.63; ta4 0.42; total 6.1; fe Pdp 0.93; pa Pdp 0.51; ti Pdp 0.46; ta Pdp 0.56; total 2.46; relative length: 1>4>2>3. Spination: palp, leg1, leg2 spineless. Fe3d spineless; tb3d spines arranged in two bands: proximal 1.0.1; distal 1.0.0; tb3v spines arranged in one band: proximal 1.0.0; with two terminal spines. Fe4d spines in two rows: forward 1; backward 2; tb4d spines arranged in two bands: proximal 1.0.1; distal 0.0.1; tb4v spines arranged in one band: proximal 1.0.1; with two terminal spines. Dorsal side of frontal legs covered with small piligerous grains; ventral side covered with hairs, lacking grains. Claws with 8 teeth or less; hardly larger than claw width.

Abdomen 2.4 mm long; whitish. Abdominal dorsal hairs 0.027 mm long; medium-sized, roughly straight, not compressed, blunt, tip not enlarged; uniformly, thickly distributed.

Male copulatory bulbus (Fig. 16C) T slightly smaller than DD; external distal border straight; internal sloped backwards. DD bent about 45° in lateral view; internal distal border markedly expanded. ES wider, more sclerotized than IS; IS continuous to tip (slim). DD tip (Fig. 17A-C) straight in lateral view. C present, long; distal border rounded, smooth, slightly expanded, perpendicular to DD. LF absent. L well-developed; external border sclerotized, not folded, distally projected; distal border divergent, continuous. LA absent. F present, distally curved to external side, not fused to DD. AL absent. P (Fig. 17D) fused to T; markedly sloped on its proximal part, perpendicular on distal; lateral length from 1/2 to 2/3 of T width; ridge present, perpendicular to T; not expanded; upper margin markedly toothed, on its distal part, few teeth (4-6); not distally projected; back margin not folded.

Allotype female (Figs 16D-F, 18A-B). All characters as in male except: Carapace 2.79 mm long; maximum width 2.05 mm; minimum width 1.35 mm. AME diameter 0.16 mm;

PLE 0.16 mm; PME 0.12 mm.

Chelicerae 1.3 mm long; fang medium-sized, 0.93 mm; basal segment dorsal, ventral side completely covered with piligerous granulations (distally slightly reduced). B>D=M (similar). Legs yellow. Lengths of female described above: fe1 2 mm (all measurements in mm); pa1 1.35; ti1 1.68; me1 1.68; ta1 0.39; total 7.1; fe2 1.77; pa2 1.26; ti2 1.63; me2 1.63; ta2 0.42; total 6.71; fe3 1.49; pa3 0.84; ti3 0.98; me3 1.35; ta3 0.42; total 5.08; fe4 2.1; pa4 1.02; ti4 1.49; me4 1.86; ta4 0.42; total 6.89; fe Pdp 1.12; pa Pdp 0.6; ti Pdp 0.51; ta Pdp 0.7; total 2.93; relative length 1>4>2>3. Spination: palp, leg1, leg2 spineless. Fe3d spineless; tb3d spines arranged in two bands: proximal 1.0.1; distal 1.0.0; tb3v spines arranged in one band: proximal 1.0.1; with two terminal spines. Fe4d spines in one row: 2; tb4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; tb4v spines arranged in two bands: proximal 1.0.1; medial-proximal 0.0.1; with two terminal spines.

Abdomen 6.8 mm long; whitish; cylindrical. Abdominal dorsal hairs 0.063 mm long; thin, curved, compressed, pointed; uniformly, thickly distributed.

Endogyne (Fig. 16D-F) DA not distinguishable from VA; rectangular, pointed expansion at middle frontal part; DA slightly wider than long; DF wide in dorsal view. MF margins not fused, well-developed, completely sclerotized. VA frontal region completely sclerotized; posterior region sclerotized at lateral margins; AVD absent. S attachment projected under VA; arms as long as DA, straight; tips not projected; neck as wide as arms. TB usual shape.

ALS (Fig. 18A) with PS; remaining piriform spigots more external than MS, arranged in one row; 4+1 piriform gland spigots; PMS, PLS (Fig. 18B) with 5-10 aciniform gland spigots.

Intraspecific variation. Unknown.

Distribution. Endemic species from central Fuerteventura

D. spinidorsum Wunderlich, 1991

(Figs 19A-F, 20A-D, 21A-B)

Dysdera spinidorsum Wunderlich, 1991: 307-308, figs 101-102 [♀]. (Holotype female; NE road to Betancuria (550 m), Betancuria, Fuerteventura; 5/1/90; H. Enghoff & M. Báez leg.; num. 307, stored at ZMK; examined)

Diagnosis. This species can be distinguished from the sympatric *D. sanborondon* by its larger size, lanceolate abdominal hairs, presence of LA (Fig. 20A) and AL (Fig. 20C), and absence of VA posterior sclerotization (Fig. 19E). It differs from the morphologically closely related *D. nesiotes* by T longer than DD (Fig. 19C), frontally projected LA (Fig. 20A), distinctly expanded C (Fig. 20B), MF markedly backward projected (Fig. 19D) and reduced VA ventral sclerotization (Fig. 19E).

Male (Figs 19A-C, 20A-D). Carapace (Fig. 19A) 4.9 mm long; maximum width 3.64 mm; minimum width 2.59 mm. Reddish orange, frontally darker, becoming lighter towards back; slightly foveate at borders, slightly wrinkled with small black grains mainly at front. Frontal border roughly triangular, from 1/2 to 3/5 carapace length; anterior lateral borders convergent; pointed at maximum dorsal width, back lateral borders straight; back margin wide, straight. AME diameter 0.23 mm; PLE 0.22 mm; PME 0.17 mm; AME on edge of frontal border, separated from one another by about 2/3 diameter, close to PLE; PME very close to each other, about 1/3 PME diameter from PLE. Labium trapezoid-shaped, base wider than distal part; longer than wide at base; semicircular groove at tip. Sternum orange yellow, frontally darker, becoming lighter towards back; very slightly wrinkled, mainly between legs and frontal border; uniformly covered in slender black hairs.

Chelicerae (Fig. 19B) 2.1 mm long, about 2/5 of carapace length in dorsal view; fang medium-sized, 1.4 mm; basal segment dorsal, ventral side completely covered with piligerous granulations. Chelicera inner groove medium-size, about 2/5 cheliceral length; armed with three teeth and lamina at base; B>D=M (similar); D round, located roughly at centre of groove; B close to basal lamina; M at middle of B and D. Legs yellow. Lengths of male described above: fe1 3.82 mm (all measurements in mm); pa1 2.56; ti1 3.82; me1 3.49; ta1 0.74; total 14.43; fe2 3.49; pa2 2.37; ti2 3.35; me2 3.21;

ta2 0.84; total 13.26; fe3 2.7; pa3 1.58; ti3 1.86; me3 2.51; ta3 0.74; total 9.39; fe4 3.45; pa4 1.96; ti4 2.65; me4 3.4; ta4 0.79; total 12.25; fe Pdp 2.1; pa Pdp 1.16; ti Pdp 0.93; ta Pdp 1.12; total 5.31; relative length: 1>2>4>3. Spination: palp, leg1, leg2 spineless. Fe3d spineless; tb3d spines arranged in two bands: proximal 1.2.1; distal 1.0.1; tb3v spines arranged in two bands: proximal 1.0.1-0; distal 1-0.0.0; with two terminal spines. Fe4d spines in two rows: forward 1; backward 5; tb4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; tb4v spines arranged in two bands: proximal 0-1.0.1; distal 0-1.0.0; with two terminal spines. Dorsal side of frontal legs covered with small piligerous grains; ventral side covered with hairs, lacking grains; very long hairs on back legs as well as on pedipalps. Claws with 8 teeth or less; hardly larger than claw width.

Abdomen 4.9 mm long; cream-coloured; cylindrical. Abdominal dorsal hairs 0.2 mm long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

Male copulatory bulbus (Fig. 19C) T slightly longer than DD; external, internal distal border sloped backwards. DD bent about 45º in lateral view; internal distal border markedly expanded. ES wider, more sclerotized than IS (slightly); IS continuous to tip (diffuse). DD tip (Fig. 20A-C) straight in lateral view; frontal (upper) sheet internal part markedly projected above posterior (lower) sheet. C present, long; distal end beside DD internal tip; distal border rounded, smooth, markedly expanded, perpendicular to DD. LF absent. L well-developed; external border sclerotized, laterally markedly folded; distal border divergent, continuous. LA present, sheet-like; as long as L, completely fused. F present, tip divided, proximally fused to DD. AL present, well-developed, joined to flagellum; proximal border in posterior view smooth, not fused with distal haematodoca. P (Fig. 20D) fused to T; perpendicular to T in lateral view; lateral length from 1/2 to 2/3 of T width; ridge present, perpendicular to T; distinctly expanded, rounded; upper margin markedly toothed, along its extent, numerous teeth (more than 10); not distally projected; back margin not folded.

Holotype female (Figs 19E-F, 21A-B). All characters as in male except: Carapace 4.9 mm long; maximum width 3.85 mm; minimum width 2.73 mm. AME diameter 0.29 mm; PLE 0.23 mm; PME 0.2 mm; PME less than 1/4 diameter from PLE.

Chelicerae 2.38 mm long, about 2/5 of carapace length in dorsal view; fang

medium-sized, 1.47 mm. Lengths of female described above: fe1 3.63 mm (all measurements in mm); pa1 2.56; ti1 3.17; me1 3.08; ta1 0.7; total 13.14; fe2 3.4; pa2 2.42; ti2 3.12; me2 2.8; ta2 0.7; total 12.44; fe3 2.84; pa3 1.63; ti3 1.77; me3 2.66; ta3 0.74; total 9.64; fe4 3.77; pa4 2.1; ti4 2.8; me4 3.45; ta4 0.84; total 12.96; fe Pdp 2.23; pa Pdp 1.16; ti Pdp 0.93; ta Pdp 1.3; total 5.62; relative length 1>4>2>3. Spination: palp, leg1, leg2 spineless. Fe3d spineless; tb3d spines arranged in two bands: proximal 1.2.1; distal 1.0.1.; tb3v spines arranged in two bands: proximal 1.0.0; distal 1.0.0; with two terminal spines. Fe4d spines in two rows: forward 2; backward 6; tb4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; tb4v spines arranged in two bands: proximal 1.0.1; distal 1.0.1; with two terminal spines.

Abdomen 5.88 mm long; whitish; cylindrical. Abdominal dorsal hairs 0.37 mm long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

Endogyne (Fig. 19E-F) DA not distinguishable from VA; rectangular; DA twice as wide as long; DF wide in dorsal view. MF well-developed, completely sclerotized, projected backwards, longer than DA lateral length. VA frontal region completely sclerotized; posterior region sclerotized at most anterior area; AVD absent. S attached to membranous VA; arms as long as DA, clearly curved; ends projected forwards; neck hardly visible. TB usual shape.

ALS (Fig. 21A) with PS; remaining piriform spigots more external than MS, arranged in two rows; 11+1 piriform gland spigots; PMS, PLS (Fig. 21B) with 10-15 aciniform gland spigots.

Intraspecific variation. Male cephalothorax ranges in length from 4.41 mm to 4.69 mm, female from 4.55 mm to 5.67 mm. PLE-PME from 1/3 diam. to 2/5. Cheliceral granulations distally reduced in some females. Spination variability in Table 5.

Distribution. Endemic species from central and northern Fuerteventura

Material examined. Antigua: Montañas de Tegu, road Antigua-Betancuria; N slope; 18/2/95; Arnedo, Ribera & Oromí leg.; 2♂ num. 2841, 2842 (description); 6♀ num. 2843-45, 2849, 4066; 10 juv. num. 2846-48, 4059-65; stored at UB and UL.

Betancuria: Betancuria, around village; 18/2/95; Arnedo, Ribera & Oromí leg.; 2♀ num. 2851, 4067; stored at UB. La Oliva: N. de La Oliva (175 m); 1 juv.; 6/1/90; H. Enghoff & M. Báez leg.; 2668 ZMK. Puerto del Rosario: La Matilla, near village; 20/2/95; Arnedo, Ribera & Oromí leg.; 2♀ num. 2854, 4069; 1 juv. num. 4070; stored at UB. From Montaña Muda to La Matilla; 1 juv.; 6/1/90; H. Enghoff & M. Báez leg.; 2664 ZMK. Tuineje: Cuchillos de Jacomar, between Jacomar and Toneles Valley; 19/2/95; Arnedo, Ribera & Oromí leg.; 2 juv. num. 285, 4068; stored at UB.

Cladistic analysis

Taxon sampling

A cladistic analyis was performed in order to test the phylogenetic status of the *Dysdera* species inhabiting the Eastern Canaries. However, the phylogenetic position of these species is strongly dependent on their relationships with regards to the remaining Canarian representatives as well as continental species. About 40 endemics are found in the Western and Central Canary Islands. Five taxa were selected based on the criteria of maximizing the observed diversity in these islands: *D. ambulotenta* Ribera, Blasco & Ferrández, 1986; *D. enghoffi* Arnedo, Oromí & Ribera, 1996; *D. liostethus* Simon, 1907; *D. montanetensis* Wunderlich, 1991 and *D. tibicena* Arnedo & Ribera, 1997. In the absence of any information regarding theinternal phylogenetic relationships of *Dysdera*, the selection of putative continental relatives was based on the similarity in the genitalic pattern. The cosmopolitan species *D. crocota* and the Moroccan species *D. lucidipes melillensis* Simon, 1910, were selected because of their morphological affinity to *D. lancerotensis*. The remaining eastern species share some similarities with *D. mucronata* Simon, 1910,a species distributed in northern Morrocco and southern Iberian peninsula, and *D. scabricula* Simon, 1882, from northeastern Iberian peninsula and southeastern France .

Outgroup selection

The main problem to be faced in a quantitative cladistic analysis of any *Dysdera* group of species is the complete lack of any explicit statement of phylogenetic relationship not only in the genus but in the whole family. Several species groups in the genus have been proposed (Deeleman-Reinhold & Deeleman, 1988; Dunin, 1989; 1992; Ferrández 1996), although in all cases they are based on overall morphological similarity and no evaluation of the primary homology (De Pinna, 1991) nor the polarity of the characters has ever been formulated. Perhaps the only phylogenetic hypothesis in *Dysdera* was formulated by Deeleman-Reinhold & Deeleman (1988) in a revision of the species of the subfamily Dysderinae occurring between the line Triest-Benghasi and Kirgizia and Kashmir. In their study nine groups of *Dysdera* species were delimited. The so-called *aculeata* group was proposed to be the oldest based mainly on leg spination and zoogeographical considerations. The members of this group are distributed through Central Asia and the Caucasus with the single exception of *D. vivesi* Ribera & Ferrández, 1986, from the southern Iberian Peninsula (Deeleman-Reinhold & Deeleman, 1988). Because of its geographical proximity this species was selected as the outgroup. Unfortunately, the female of this species is unknown. Female genitalic character states were recorded from drawings of the female genitalia of the eastern representatives of the *aculeata* group.

Characters

A total of 34 characters were used in the analysis: 8 from somatic morphology, 20 from male copulatory bulbus and 6 from female endogyne. Many somatic characters recorded in the taxonomic revision were avoided. In some cases, character states for these characters are difficult to establish because intraspecific variability overlaps with interspecific variability, e.g. carapace ornamentation or cheliceral relative teeth. Moreover, most of the somatic characters show a high level of presumed instances of homoplasy when compared with the distribution of genitalic ones. A

scoring bias towards genitalic characters was preferred because of the assumption that ecological adaptation has a lower influence on them. Characters and their states are defined as follows:

Somatic morphology

1. *Carapace frontal border width;* 0, x < 0.6, 1, x ≥0.6.
2. *Carapace back margin shape (dorsal view);* 0, straight (e.g. Fig. 4A), 1, bilobulated (e.g. Fig. 7A).
3. *Chelicera basal segment granulations;* 0, dorsal side completely or mostly covered with granulations, 1, dorsal side lacking or scarcely covered with granulation at proximal region.

A basal segment completely covered with granulations is probably plesiomorphic for *Dysdera* as most of the genera of the subfamily Dysderinae show this state. However, a reduction in granulations seems to have occurred in parallel in several *Dysdera* lineages.

4. *Chelicera inner groove;* 0, short (<2/5 basal segment length), 1, long (about 1/2 basal segment length).
5. *Tibia dorsal spination pattern;* 0, three or more rows (Fig. 22A), 1, two rows (at least one spine at middle) (Fig. 22B), 2, cardinal (at least one spine) (Fig. 22C).
6. *Anterior femora spination;* 0, present, 1, absent.
7. *Femur 4 spination pattern;* 0, fe4 with more than five spines arranged in two rows (Fig. 22D), 1, fe4 with less than five spines grouped proximally (Fig. 22E), 2, spineless.

Leg spination has been one of the most extensively used characters in the taxonomy of the genus. In general, spines are only present on the dorsal femora and dorsal and ventral tibiae and metatarsi of the posterior legs. Exceptionally, spines can be found on the femora and tibiae of anterior legs, and even on pedipalps. Most of the interspecific variability affects both femora and tibiae and thus spination of metatarsi is not considered. Moreover, although both dorsal and ventral sides of the tibia show variability in their chaetotaxia, only dorsal spination is reported to simplify character definitions.

8. *Abdominal dorsal hair shape;* 0, usual shape, 1, thick, long, lanceolate. Wunderlich

(1987, 1991) was the first to recognize the interesting variability in the shape of the abdominal dorsal hairs in Canarian *Dysdera* species. The presence of large, thick and straight lanceolate hairs has only been observed in some Eastern Canarian species.

9. *T size with regard to DD (frontal view);* 0, T as long as or markedly longer than DD (e.g. Fig. 10C), 1, T markedly smaller than DD (e.g. Fig. 16C).
10. *DD spatial location with regard to T (lateral view);* 0, inclined (=45°) (e.g. Fig. 19C), 1, not inclined or only slightly (<45°) (e.g. Fig. 4C).
11. *DD internal margin expanded;* 0, present (e.g. Fig. 14A), 1, absent (e.g. Fig. 8A).
12. *DD sclerites relative development;* 0, IS wider than ES, both more or less parallel (e.g. Fig. 2A), 1, ES wider, more sclerotized than IS, roughly divergent (e.g. Fig. 2E).
13. *Frontal apophysis at proximal part of the IS;* 0, present (e.g. Fig. 2A), 1, absent (e.g. Fig. 2E). This character is widely distributed in continental *Dysdera* species but has never been reported in any Canarian endemic.
14. *DD frontal sheet distally projected over posterior one*; 0, absent or slightly (e.g. Fig. 5C), 1, present (e.g. Fig. 14C).
15. *Arch-like ridge at DD frontal distal tip;* 0, absent (e.g. Fig. 2E), 1, present (e.g. Fig. 2D).
16. *Internal margin of the seminiferous duct opening;* 0, subterminal (e.g. Fig. 5A), 1, subterminal projected in a F (e.g. Fig. 14A), 2, terminal (e.g. Fig. 8B).
17. *Lateral projection of the distal IS over the ES;* 0, well-developed (LF), 1, well-developed, strongly sclerotized (MA) (e.g. Fig. 2D), 2, poorly developed, reduced to the distal tip (AC) (e.g. Fig. 2F), 3, poorly developed, rim-like, 4, absent (e.g. Fig. 2E).
18. *Lateral projection shape;* 0, sheet-like (e.g. Fig. 2D), 1, hook-like (e.g. Fig. 8A).
19. *C;* 0, absent (e.g. Fig. 2D), 1, present (e.g. Fig. 2G). This character is a provisional synapomorphy of the Canarian endemics, with the exception of *D. lancerotensis*. This character was named after Deeleman-Reinhold & Deeleman (1988). However, during examination of several continental species that supposedely to possess a C, it was realized that very different non-homologous

characters had been included under this definition. In the present analysis the character C is restricted to the structure reported in Canarian representatives.

20. *C distal end location;* 0, external to internal margin of the seminiferous duct opening (e.g. Fig. 2F), 1, on the internal margin of the seminiferous duct opening (e.g. Fig. 2E).
21. *C expansion;* 0, expanded along its extent (e.g. Fig. 11B), 1, distally distinctly expanded (e.g. Fig. 5B), 2, proximally distinctly expanded (e.g. Fig. 14B).
22. *C distal border shape;* 0, inclined (e.g. Fig. 14B), 1, S-shaped or stepped (e.g. Fig. 2G), 2, toothed (e.g. Fig. 11B).
23. *L development;* 0, present, well-developed (e.g. Fig. 2E), 1, absent or hardly visible (e.g. Fig. 2A).
24. *L external border sclerotization;* 0, present (e.g. Fig. 2E), 1, absent (e.g. Fig. 2F).
25. *LA;* 0, absent (e.g. Fig. 2F), 1, present (e.g. Fig. 2E).
26. *AL;* 0, present, poorly developed, 1, present, well-developed (e.g. Fig. 2C), 2, absent (e.g. Fig. 8D).
27. *P fused to T;* 0, yes (e.g. Fig. 2C), 1, not (e.g. Fig. 7C).
28. *P upper margin toothed;* 0, absent (e.g. Fig. 5D), 1, present (e.g. Fig. 20D).
29. *DA relative size;* 0, as wide as or slightly wider than long (e.g. Fig. 7D), 1, about twice as wide as long (e.g. Fig. 13D).
30. *MF projected bacwards;* 0, absent (e.g. Fig. 4D), 1, present (e.g. Fig. 19D).
31. *VA dorsal shape;* 0, straight (e.g. Fig. 3B), 1, pointed, 2, mostly straight with a pointed projection in the middle (e.g. Fig. 16D).
32. *VA sclerotization pattern: frontal region;* 0, not sclerotized or reduced to a middle narrow strip (e.g. Fig. 7D), 1, completely sclerotized (e.g. Fig. 16E).
33. *VA sclerotization pattern: posterior region;* 0, absent (e.g. Fig. 7E), 1, present at most anterior part (e.g. Fig. 13E), 2, present, up to back edge (e.g. Fig. 16E).
34. *Additional ventral diverticle (AVD);* 0, absent (e.g. Fig. 3C), 1, present (e.g. Fig. 3D).