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SYSTEMATICS OF THE GENUS *DYSDERA* (ARANEAE, DYSDERIDAE) IN THE EASTERN CANARY ISLANDS

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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***, 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* Simon 1907 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. *Dysdera nesiotes* is reported for the first time in the eastern Canaries. Morphological affinities and distribution patterns are discussed. The remarkably lower number of endemic species harbored by the eastern islands, when compared with other Canarian islands similar in size but younger in age, is proposed to be the result of a major extinction event in the eastern Canaries due to climatic change.

Keywords: Spider taxonomy, oceanic islands, colonization, extinction

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 favor 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, 1998) 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.

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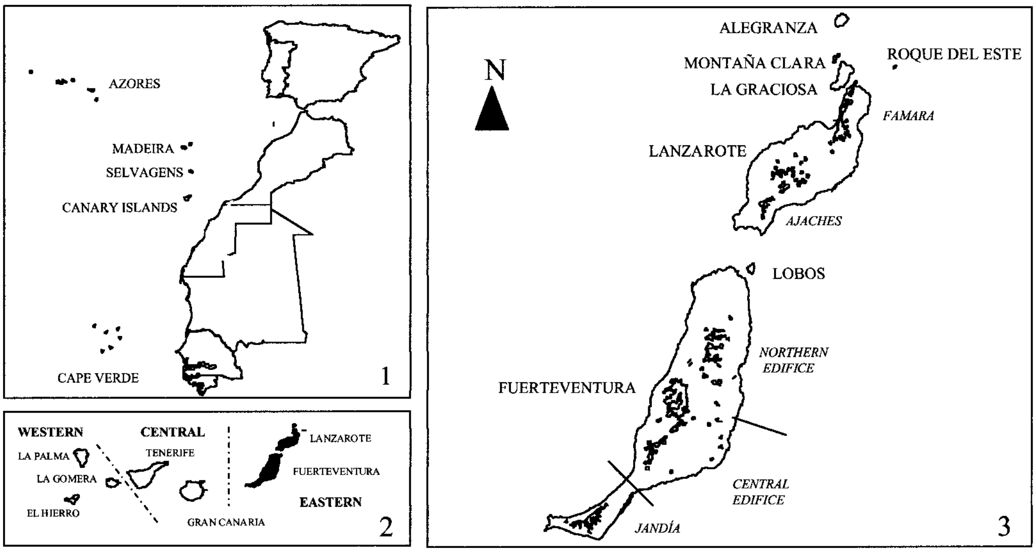
The genus *Dysdera* Latreille 1804 comprises more than 200 species of nocturnal wandering spiders spread over the circum-Mediterranean region. About a quarter of these species have been described from the Macaronesian archipelagos (Fig. 1), representing the most species-rich spider genus reported in them. Nevertheless, the Macaronesian endemics are far from being equally distributed. The Canary Islands harbor 43 of these endemics, while five endemics have been documented from Madeira (Denis 1962; Wunderlich 1994). The Açores, Cabo Verde and Selvagens Islands each have a single species (Arnedo unpubl. data; Berland 1936; Kulczynski 1899). The unusually large number of species in the Canaries suggests many evolutionary and ecological questions. A research program is currently underway to resolve some of the problems posed by the genus in the archipelago (Ribera & Arnedo 1994; Arnedo & Ribera



Figures 1–3.—1, Location of the Canaries and the remaining Macaronesian archipelagos; 2, The Canary Islands; 3, Fuerteventura, Lanzarote and the islets.

1996; Arnedo et al. 1996; Arnedo & Ribera 1997).

Although the geological processes that created the Canary Islands are still a matter of debate (Anguita & Hernán 1975; Carracedo et al. 1998a 1998b), the first island most likely arose about 25 My ago. The seven main islands lie 100 km from the northwestern coast of Africa in a roughly straight line (Fig. 2). 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 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. 3). The maximum ocean depth between these islands is barely 40 m 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 Mya, the Central edifice 22.5 Mya, the northern edifice 17.0 Mya in Fuerteventura (Ancochea et al. 1996) and Ajaches 15.5 Mya and Famara 10.2 Mya 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. Surprisingly, subfossil ostrich eggs have 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.

Before the present study five *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.

After taking into account their age and size, the number of *Dysdera* endemic species harbored by the eastern Canaries is remarkably low when compared with the remaining islands in the archipelago. The three endemic species from Fuerteventura represent less than half the number of endemic species known from the similarly sized but younger Gran Canaria, and much less than the 21 endemic species from the slightly larger but younger Tenerife. Lanzarote has the same number of endemic species as La Palma, which is similar in size but ten-fold younger, while eight species are known from La Gomera, only half its size and age. It is possible that the depauperate species composition in the eastern islands is the result of undersampling or, more generally, of the poor taxonomic knowledge of these islands. However, if these disparities are in fact real, the ecological and evolutionary processes that underlay them need to be elucidated.

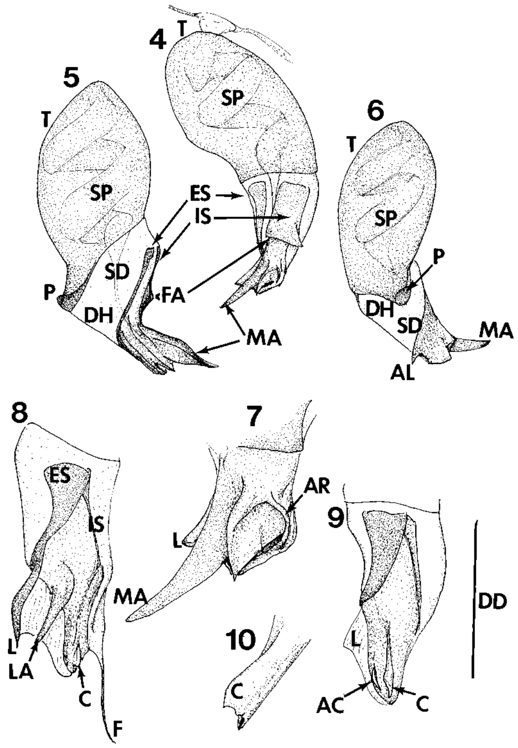
METHODS

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).

Character definition and terminology.— Characters were examined under a Wild Heerbrugg (12–100× magnification) dissecting microscope and measurements were taking using an ocular micrometer. Female vulvae were 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.

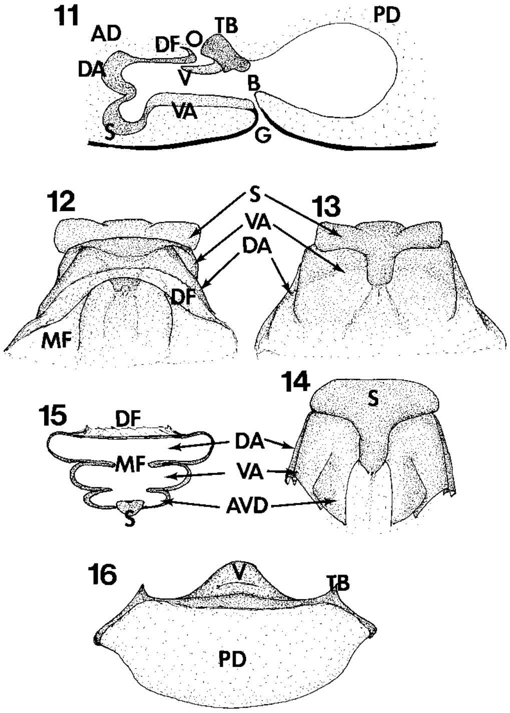
Characters examined for taxonomic revision and their diagnostic resolution have been discussed elsewhere (Arnedo et al. 1996; Arnedo & Ribera 1997). Leg spination was recorded using the codification method fully described in Arnedo & Ribera (1997). Structures of the male bulbus and female endogyne were mostly named following 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 (see also Arnedo & Ribera 1997).

Male bulbus: (Figs. 4–10) 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 haematodochae as well as the sclerites I (= subtegulum) are very



Figures 4–10.—Diagrams showing the male copulatory bulbus characters discussed in text. 4, Frontal view; 5, External view; 6, Posterior view. 7–10, Different types of DD: 7–9, Frontal view; 10, DD type 9, Distal tip internal view.

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, and holds a posterior apophysis (P). The T externally covers the spermophore (= reservoir or sperm duct) (SP). The distal division (DD) of the bulb includes the membranous distal haematodocha (DH), which includes the seminiferous duct (SD) inside, and the sclerite III (= embolic division). 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 or embolic division, 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). Schult (1980, 1983) proposed that the posterior apophysis (P) and the external sclerite (ES) were homologues to the median apophysis and the conductor, respectively, of the Araneoclada. However, both the median apophysis and the conductor are developed from the claw fundamental dorsal lobe, which separates early in its ontogeny from the rest of the bulb. As a consequence, the two structures should be intimately related and more or less independent from the rest of the sclerites (Coddington 1990). Nevertheless, the posterior apophysis and external sclerite of *Dysdera* are not only clearly separated one from the other but they form part of the sclerites, the tegulum and the embolic division, respectively, that are supposed to be independently derived during ontogeny. Therefore, the posterior apophysis and the external sclerite are better considered as apomorphic features of *Dysdera*. The relative development and degree of fusion of the external and internal 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 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, not shown). 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



Figures 11–16.—Diagrams showing the vulva characters discussed in text. 11, Sagital section of the female genital region; 12, Anterior diverticle, dorsal view; 13, Anterior diverticle (AVD absent), ventral view; 14, Anterior diverticle (AVD present), ventral view; 15, Transversal section of the anterior diverticle (AVD present), posterior view; 16, Posterior diverticle, dorsal view.

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).

Vulva: (Figs. 11–16) The female genitalia are entirely internal. Mcheidze (1972) coined the term ‘‘endogynum’’ to refer to this structure in contrast to the ‘‘epigynum’’ or external female genital structures of the entelegyne spiders, although the more general term vulva was preferred in this study. 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 ‘‘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 vulva 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.

Spinnerets and associated spigot glands were assigned after Platnick et al. (1991). All taxonomic characters were recorded in DELTA format (Dallwitz 1980, 1993). All measurements are in mm. Abbreviations used in text and figures are as follows. Eyes: AME: anterior medial eyes, PME: posterior medial eyes, PLE: posterior lateral eyes; cheliceral teeth: B: basal tooth, M: medial tooth, D: distal tooth; male copulatory bulb: T: tegulum, SP: spermophore, DD: distal division, IS: internal sclerite, FA: frontal apophysis, ES: external sclerite, DH: distal haematodoca, SD:

seminiferous duct, C: crest, AR: arch-like ridge, MA: medial apophysis, AC: additional crest, LF: lateral fold over L, between internal and external sclerites, L: lateral sheet, LA: lateral sheet apophysis, AL: additional lateral sheet at back internal border, F: flagellum, P: posterior apophysis; female genitalia: G: genitalic furrow, B: internal bursa, AD: anterior diverticle, PD: posterior diverticle, O: oviduct opening, DA: dorsal arch, DF: dorsal fold, MF: major fold, S: spermatheca, TB: transversal bar, V: bursal valve, VA: ventral arch, AVD: additional ventral diverticle; spinnerets: ALS: anterior lateral spinnerets, PMS: posterior medial spinnerets, PLS: posterior lateral spinnerets, ms: major ampulate gland spigot, ps: polar pyriform gland spigot.

In order to test if the eastern islands were significantly poorer in number of endemic species that the remaining Canaries, the log-transformed number of *Dysdera* species in each island was plotted against the log-transformed island age. The regression coefficient and a 95% confidence interval were calculated for the whole set of islands and with the eastern islands removed.

RESULTS

Family Dysderidae

Genus *Dysdera* Latreille 1804

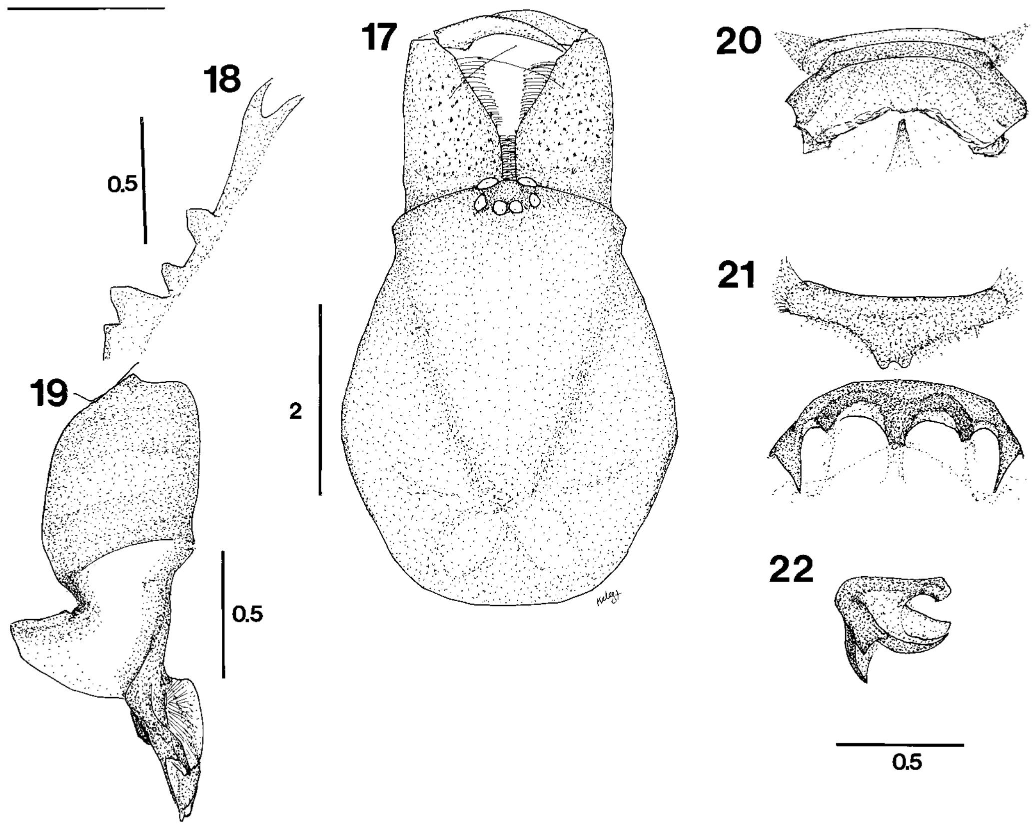
Dysdera alegranzaensis Wunderlich 1991
Figs. 17–22, 23–26, 27, 28

Dysdera alegranzaensis Wunderlich 1991: 287–288, figs. 7–9 [♂,♀]. (Holotype male; from the ridge of the Caldera, Alegranza; June 1990; P. Oromí leg.; #02748, stored at UL; examined).

Diagnosis.—This species closely resembles *D. longa*, *D. nesiotes* and *D. spinisorsum* in somatic morphology and genitalia. Males are distinguished from the former species by showing a remarkable reduction in size of the bulb crest (C) (Fig. 24) and lacking the flagellum (Fig. 23). In females, vulva DA is distinctly shortened in length and back lateral margins are truncated (Fig. 20). Additionally, males can be distinguished from the sympatric *D. nesiotes* by having a distal division (DD) not bent in relation to the tegulum (T) (Fig. 19) and having the lateral sheet apophysis (LA) expanded over the lateral sheet (L) (Fig. 23).

Description.—*Male holotype:* (Figs. 17–19, 23–24). Carapace (Fig. 17) 4.48 long; maximum width 3.43; minimum width 2.31. 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 ½–⅗ 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; PLE 0.2; PME 0.16; AME on edge of frontal border, separated from one another by about ⅔ diameter, close to PLE; PME very close to each other, about ⅓ 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. 18) 1.96 long, about ⅓ of carapace length in dorsal view; fang medium-sized, 1.4; basal segment dorsal, ventral side completely covered with piligerous granulations. Chelicera inner groove short, about ⅓ cheliceral length; armed with three teeth and lamina at base; B > D > M (similar in size); D round, located roughly at center 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; 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; relative length: 1-2-4-3; fe palp 2.23; pa palp 1.12; ti palp 0.93; ta palp 0.88; total 5.16. Spination: palp, leg1, leg2 spineless. Fe3d spines in one row: 2-3; ti3d spines arranged in two bands: proximal 1.2.1; distal 1.0.1; ti3v spines arranged in two bands: proximal 1.0.1; distal 1.0.0; with two terminal spines. Fe4d spines in two rows: anterior 3; posterior 6; ti4d spines arranged in two bands: proximal 1.1.1; distal 1.0.1; ti4v 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 long;



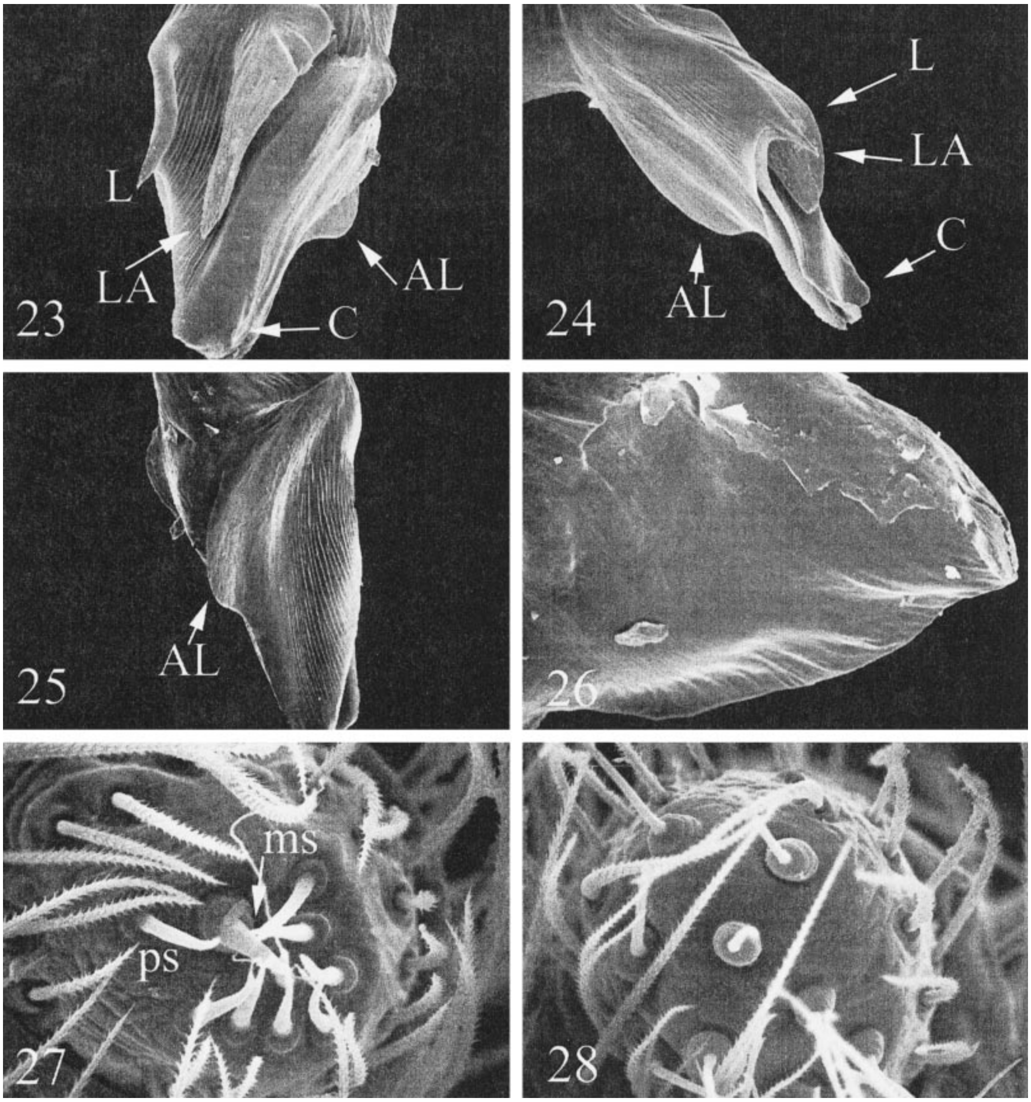
Figures 17–22.—*Dysdera alegranzaensis*. 17, Carapace, dorsal; 18, Left chelicera, ventral; 19, Right male bulbus, external. 20–22, Vulva anterior diverticle: 20, Dorsal; 21, Ventral (S separated); 22, Lateral. Scale bars in mm.

cream-colored; cylindrical. Abdominal dorsal hairs 0.144 long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

Male copulatory bulbus (Fig. 19) 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 (Figs. 23–25) 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. 26) fused to T; perpendicular to T in lateral view; lateral length from ½–⅔ of T width; ridge present, perpendicular to T; distinctly expanded, right-angled; upper margin smooth; not distally projected; back margin not folded.

Female: (Figs. 20–22, 27, 28). All characters as in male except: Carapace 5.25 long; maximum width 4.02; minimum width 2.83. Deep red. Back lateral borders straight. AME diameter 0.25; PLE 0.21; PME 0.2.

Chelicerae 2.33 long; fang 1.57. D = B > M (similar). Legs dark orange. Lengths of female described above: fe1 4.19; 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; relative length 1-2-4-3; fe palp 2.14; pa palp 1.21; ti palp 0.98; ta palp 1.16; total 5.49. Spination:



Figures 23–28.—*Dysdera alegranzaensis*, right male bulbus. 23, DD frontal; 24, DD external; 25, DD posterior; 26, P internal. 27–28, *Dysdera alegranzaensis*, spinnerets. 27, Right ALS; 28, Right PLS.

palp, leg1, leg2 spineless. Fe3d spines in one row: 1; ti3d spines arranged in two bands: proximal 1.2.1; distal 1.0.1.; ti3v spines arranged in two bands: proximal 1.0.0; distal 1.0.0; with two terminal spines. Fe4d spines in two rows: anterior 1; posterior 5; ti4d spines arranged in two bands: proximal 1.1.1; distal 1.0.1; ti4v spines arranged in two bands: proximal 1.0.1; distal 0.0.1; with two terminal spines.

Abdomen 10.74 long. Abdominal dorsal hairs 0.18. Vulva (Fig. 20–22) 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. 27) with PS; remaining piriform spigots

Table 1.—Intraspecific spination variability of *Dysdera alegranzaensis*.

	Proximal	Medial-proximal	Medial-distal	Distal
Tibia 3 dorsal	1.2–4.1	0	0	1.0–1.1
Tibia 4 dorsal	0–1.0–1.1	0	0	0–1.0–1.0–1
Tibia 3 ventral	1.0.0–1	0.0.0–1	0	0–1.0.0–1
Tibia 4 ventral	1.0.1	0.0.0–1.	0	0–1.0.1
		Number of rows		Number of spines
Femur 3 dorsal		0–1		0–1
Femur 4 dorsal		2		1–3/2–6

more external than MS, arranged in two rows; 8 + 1 piriform gland spigots; PMS, PLS (Fig. 28) with 10–15 aciniform gland spigots.

Intraspecific variation.—Male cephalothorax ranges in length from 3.99–4.48, female from 3.57–5.25. AME separation from ⅗–⅘. PLE-PME from ⅓ PME diameter to ½. Carapace ornamentation somewhat reduced, nearly smooth. Chelicera relative size up to ⅖ 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.

Additional material examined.—**Alegranza:** El Faro, 6 April 1993, 1♂, (P. Oromí, 2530 UL). Inside the Caldera, June 1990, 1juv., (P. Oromí, 2735 UL). Unknown locality, 3rd week March 1995, 1♂, (P. Oromí, 4106 UB); June 1990, 1♀, 3 juv., (P. Oromí, 2733 UL). **La Graciosa:** Caldera de Pedro Barba, 30 March 1996, 1♂, (P. Oromí, 3134 UB). Montaña del Mojón, 30 March 1996, 1♀, (P. Oromí, 3137 UB). **Lanzarote:** *Haría*: Montañas de Famara, around Mirador del Río, November 1988, 1♀, (A. Enghoff, 2670 ZMK); 22 February 1995, 3♂ (Arnedo, Ribera & Oromí, #2858-59, 4076 UB); 3♀, (Arnedo, Ribera & Oromí, #4080, 4104-5 UB). *Yaiza:* Montañas de Femés, Atalaya de Femés; 22 February 1995, 2♀, (Arnedo, Ribera & Oromí, #4089-90 UB).

Distribution.—Endemic species from Lanzarote and Northern islets.

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

Dysdera lancerotensis Simon 1907
Figs. 29–34, 36, 38–40, 41, 42

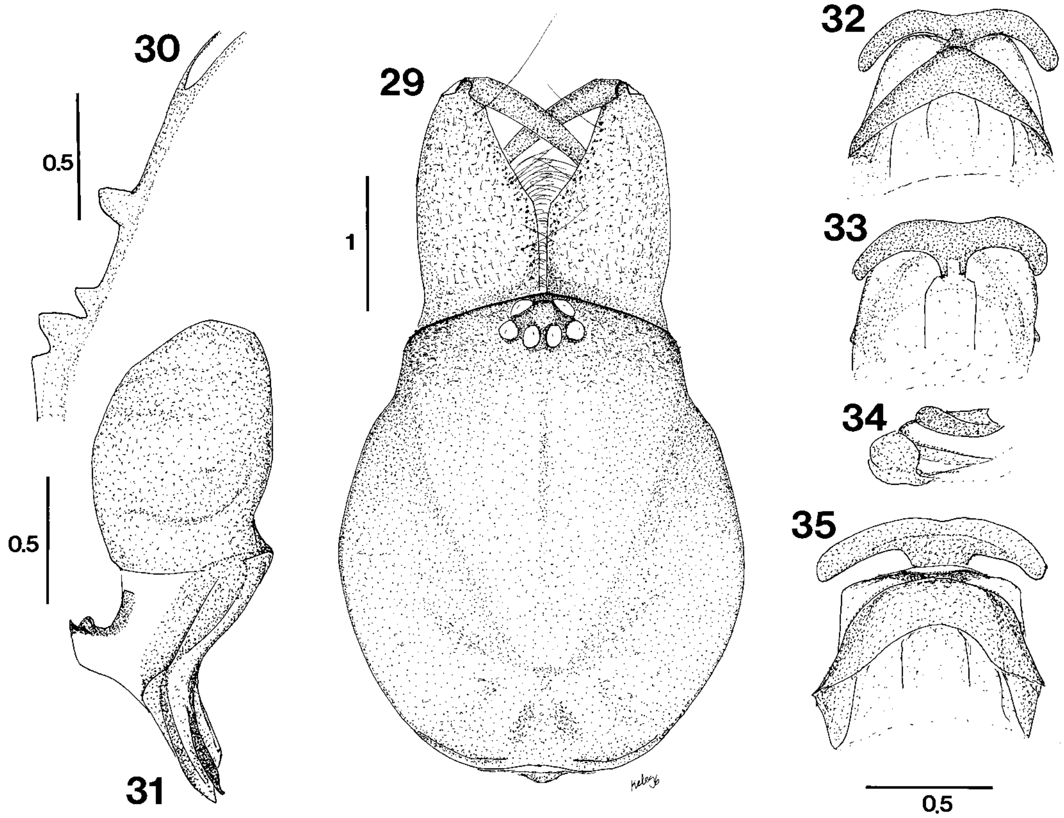
Dysdera crocata lancerotensis Simon 1907: 258. (Types; 3♂3♀; unknown locality, Lanzarote; Ch. Alluaud leg.; #15586, stored at MHNP; examined).

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 both sexes can be distinguished by a spiny fe1 (although is not always so), males by the shape of the distal division (DD) tip in frontal view (Fig. 36–38) and the presence of two or three ridges on the posterior apophysis (P) upper margin (Fig. 39), and females by the dorsal shape of the dorsal arch (DA), the frontal projection of the ventral arch (VA) under the dorsal one (DA) and the presence of a tiny strip connecting frontally the dorsal arch with the spermatheca (S) attachment (Figs. 32, 35).

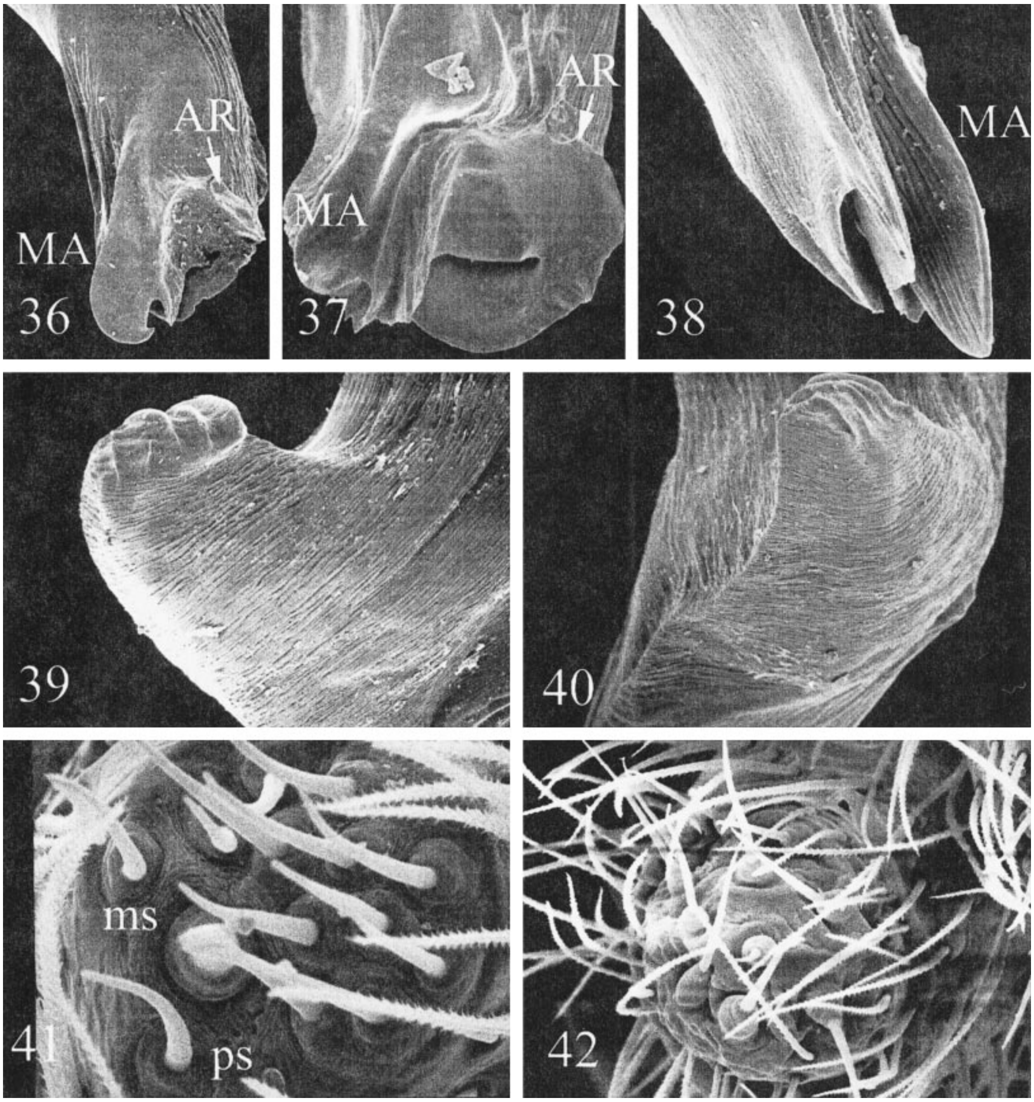
Description.—*Male:* (Figs. 29–31, 36, 38–39). Carapace (Fig. 29) 3.43 long; maximum width 2.87; minimum width 2.1. Uniformly dark red, slightly foveate at borders, slightly wrinkled with small black grains mainly at front. Frontal border roughly round, about ⅗ carapace length; anterior lateral borders 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; PLE 0.18; PME 0.14; AME slightly back from frontal border, separated from one another by about ⅔ diameter, close to PLE; PME very close to each other, less than ¼ PME diameter from PLE. Labium trapezoid-shaped, base wider than distal part; as long as wide at base; semicircular groove at tip. Sternum uniformly orange; very slightly wrinkled, mainly be-



Figures 29–35.—*Dysdera lancerotensis*. 29, Carapace, dorsal; 30, Left chelicera, ventral; 31, Right male bulbus, external. 32–34, Vulva anterior diverticle: 32, Dorsal; 33, Ventral; 34, Lateral. 35, *Dysdera crocota*, vulva anterior diverticle, dorsal. Scale bars in mm.

tween legs and frontal border; uniformly covered in slender black hairs. Chelicerae (Fig. 30) 1.82 long, about ½ of carapace length in dorsal view; fang long, 1.54; basal segment dorsal side completely covered with piligerous granulations (sparse), ventral side smooth. Chelicera inner groove long, about ½ 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; 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; relative length: 1-4-2-3; fe palp 1.67; pa palp 0.93; ti palp 0.79; ta palp 0.93; total 4.32. Spination: palp, leg1, leg2 spineless. Fe3d spineless; ti3d spines arranged in two bands: proximal 1.0.1; distal 1.0.1; ti3v spines arranged in one band: proximal 0.1.0; with two terminal spines. Fe4d spines in one row: 3; ti4d spines arranged in two bands: proximal 1.0.1; distal 1.0.1; ti4v 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 long; whitish; cylindrical. Abdominal dorsal hairs 0.036 long; thin, roughly straight, not compressed, blunt, tip enlarged; uniformly, scantly distributed.

Male copulatory bulbus (Fig. 31) T as long as DD; external distal border straight; internal projected at middle. DD bent about 45° in lateral view; internal distal border not expanded. ES wider, more sclerotized than IS; IS continuous to tip. DD tip (Figs. 36, 38–39) straight in lateral view; posterior (lower) sheet projected under frontal (upper) one; posterior



Figures 36–42.—*Dysdera lancerotensis*, right male bulbus. 36, DD frontal; 37, DD frontal of *Dysdera crocota*; 38, DD, external; 39, DD posterior; 40, P external. 41–42, *Dysdera lancerotensis*, spinnerets. 41, Right ALS; 42, Right PLS.

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. 40) not fused to T; parallel to T on its proximal part, perpendicular on distal; lateral length from $\frac{1}{3}$–$\frac{2}{5}$ 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. 32–34, 41, 42). All characters as in male except: carapace 3.85 long; maximum width 3.22; minimum width 2.38. AME diameter 0.21; PLE 0.18; PME 0.16. Chelicerae 2.03 long; fang long, 1.89. Lengths of female described above: fe1 2.8; 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; relative length 1-4-2-3; fe palp 1.86; pa palp 0.83; ti palp 0.79; ta palp 1.26; total 4.74. Spination: palp

Table 2.—Intraspecific spination variability of *Dysdera lancerotensis.*

	Proximal	Medial-proximal	Medial-distal	Distal
Tibia 3 dorsal	1.0.1	0	0	1.0.1
Tibia 4 dorsal	0–1.0.1	0–1.0.0	0	0–1.0.1
Tibia 3 ventral	0–1.0–2.0	0	0	0
Tibia 4 ventral	0–1.0–2.0	0	0	0
		Number of rows		Number of spines
Femur 1 frontal distal		2		0–2
Femur 2 frontal distal		1		0–1
Femur 3 dorsal		0		0
Femur 4 dorsal		2		0–1/0–3

spineless. Fe1 two terminal spines on anterior margin. Fe2 one terminal spine on the anterior margin. Fe3d spineless; ti3d spines arranged in two bands: proximal 1.0.1; distal 1.0.1; ti3v spines arranged in one band: proximal 0.1.0; with two terminal spines. Fe4d spines in one row: 3-2; ti4d spines arranged in two bands: proximal 0.0.1; distal 1.0.1-0; ti4v 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 long; whitish; cylindrical. Abdominal dorsal hairs 0.054 long; thin, roughly straight, not compressed, blunt, tip enlarged; uniformly, scantly distributed. Vulva (Fig. 32–34) 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. 41) with PS; remaining piriform spigots more external than MS, arranged in three rows; 12 + 1 piriform gland spigots; PMS, PLS (Fig. 42) with 10–15 aciniform gland spigots.

Intraspecific variation.—Male cephalothorax ranges in length from 2.81–4.06, female from 2.94–4.69. AME separation ranging from ⅔ diameter to 1. PLE-PME ranging from ¼ PME diameter to $\frac{2}{5}$. 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. Spination variability in Table 2.

Additional material examined.—**Alegranza:** unknown locality, 3rd week March 1995, 2♂, (P. Oromí, #4115 UB, #2892 UL); unknown date, 1♀; (P. Oromí, #4173 UB). **Fuerteventura:** *La Oliva*: E from Punta Ballena, N from Cotillo; 6 September 1990, 1♀, (H. Enghoff & M. Báez, #2631 ZMK). Cotillo-Los Lagos; 10 February 1997, 1♀, (P. Oromí, 3185 UL). Malpaís de Bayuyo, 20 February 1995; 1♂, (Arnedo, Ribera & Oromí, #2855 UB); 2♀, (Arnedo, Ribera & Oromí, #2856, 4071 UB). *Pájara*: Bco. del Ciervo, Morro de Cavedero N from Morro Jable, Jandía, 4 January 1990, 4♂, (H. Enghoff & M. Báez, #2633-35 ZMK); 1♀, (H. Enghoff & M. Báez, #2632 ZMK); 1juv., (H. Enghoff & M. Báez, #2633 ZMK); 17 February 1995, 2♂, (Arnedo, Ribera & Oromí, #2840, 4057 UB). **La Graciosa:** Caleta del Sebo; 31 March 1996, 1♀, (P. Oromí, 3135 UB). Playa Lambra, 1 April 1996, 1juv., (P. Oromí, 3136 UB). **Lanzarote:** *Haría:* Famara, Mirador del Río, 15 March 1995, 2♂, (unknown, #4103, 4179 UB). *Yaiza*: Montañas de Femés, Atalaya de Femés, 22 February 1995, 2♂, (Arnedo, Ribera & Oromí, #2869, 4092 UB); 1♀, (Arnedo, Ribera & Oromí, #2870 UB). **Montaña Clara:** La Caldera, 23 February 1995, 2♂, (Arnedo, Ribera & Oromí, #2871, 2872 UB); 1juv., (Arnedo, Ribera & Oromí, #4178 UB).

Distribution.—Endemic species from the eastern Canaries.

Dysdera liostethus Simon 1907

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

D. clavisetae Wunderlich 1991: 291–292, figs. 24–27 [♂,♀] (Holotype female; Mirador de Frontera, El Golfo, El Hierro, 8 July 1973, J. Wunderlich leg., not examined. Paratypes; 1♂, Mirador de Frontera, El Golfo, El Hierro, 8 July 1973, J.

Wunderlich leg., #03842, stored at UL, examined. 1♂, MSS Salvador-3, El Hierro, 19 August 1987, A.L. Medina leg., #H-C3-378, stored at UL, examined). -Arnedo et al. 1996: 247–251, figs. 6A-D, 7A-D and 8A-B [♂,♀]. **New synonymy.**

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 sole exception of *D. lancerotensis*, all male types of the seven Canarian species described by Simon, which were supposed to be stored at MHNP, seem to have been lost (Wunderlich 1987). These type material could not be located either in other museums where Simon's type material from Iberian and north African species (MNCN and BMNH) or other Canarian types (MCNT and UL) were kown to be stored. Finally, the late arachnologist Dr. P. Brignoli had been loaned a significant amount of type material from various European museums. Because Dr. Brignoli had published a number of papers on the family Dysderidae, there was a chance that some of Simon's material from the Canaries was in his possession. However, the current curators of his personal collection were unable to locate these specimens.

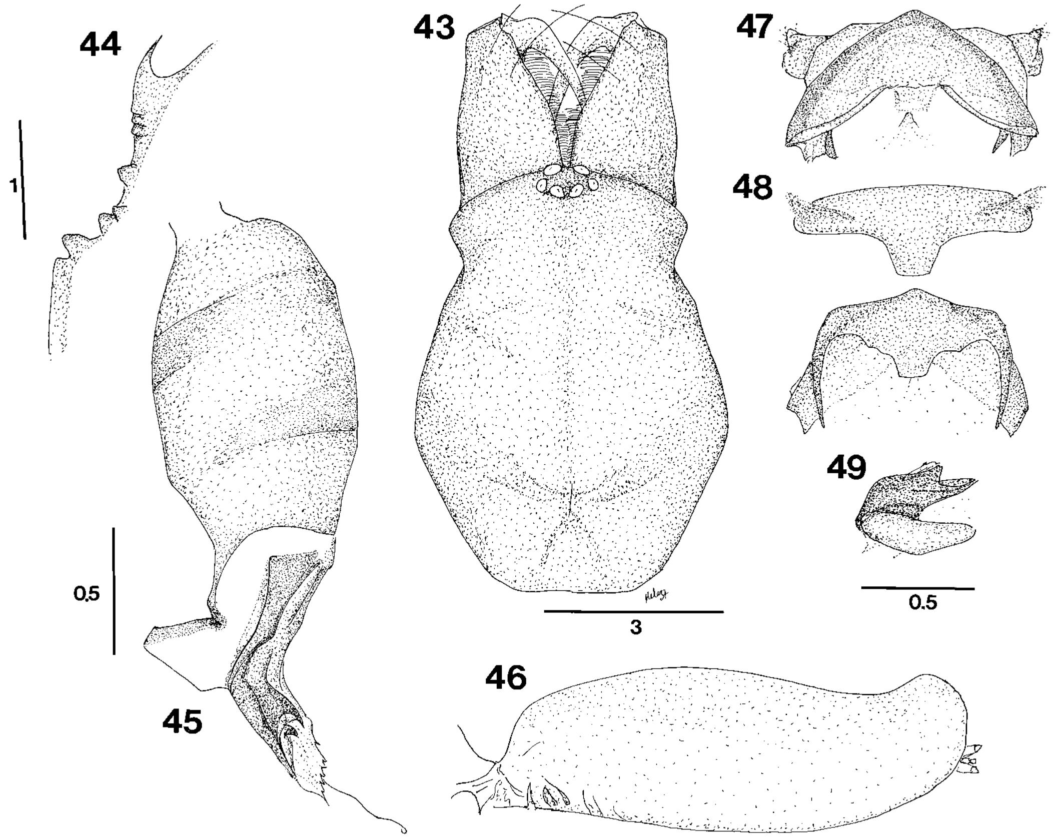
Most of characters given in the original description of *D. liostethus* are not species-diagnostic for Canarian *Dysdera*. However, the spination pattern is, in this case, very informative. This species is said to share a similar chaetotaxia with *D. rugichelis* Simon 1907. Femora with numerous spines 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. *Dysdera verneaui* could be removed from the list because it was described by the same author and a synonymy is very unlikely. *Dysdera 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. However, P development has been shown to be polymorphic in other Canarian endemic *Dysdera*, e.g., *Dysdera macra* Simon 1883 (Arnedo & Ribera 1999). 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. The drawing of the male palp of *D. liostethus* suggest a combination of characters that has only been observed in endemic species from the central and western islands. This genitalic pattern is characterized by a tegulum (T) slightly smaller than the distal division (DD), a short but well-developed crest (C), which is located at the DD distal tip, a well-developed lateral sheet (L) with a membranous external lateral border and without apophysis (LA), and a poorly developed AC.

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.

Dysdera longa Wunderlich 1991
Figs. 43–49, 50–53, 54, 55

Dysdera longa Wunderlich 1991: 298, figs. 53–56 [♂,♀]. (Holotype male; Morro de Cavedero N from Morro Jable, Pájara, Fuerteventura; 4 January 1990; H. Enghoff & M. Báez leg.; #298, stored at ZMK; examined. Paratypes: 1♂, 1♀, 2 juv.; Cumbres de Jandía, Pájara, Fuerteventura; 27 February 1990; P. Oromí leg.; #2710, stored at UL; examined).

Diagnosis.—Very large *Dysdera* similar to remaining eastern species, apart from *D. lan-*



Figures 43–49.—*Dysdera longa*. 43, Carapace, dorsal; 44, Left chelicera, ventral; 45, Right male bulbus, external; 46, Male abdomen, lateral. 47–49, Vulva anterior diverticle: 47, Dorsal; 48, Ventral (S separated); 49, Lateral. Scale bars in mm.

cerotensis, especially in genitalic pattern. Both sexes can be distinguished from the former species by its larger size (carapace length > 6), the dorsal projection of the distal region of the abdomen (mainly in males) (Fig. 46), and the lanceolated hairs not being posteriorly curved. Males have bulb tegulum (T) markedly larger than the distal division (DD) (Fig. 45) and having a sheet-like crest (C) laterally expanded (Fig. 51), while in females the vulva dorsal (DA) and ventral (VA) archs lateral borders are separated (Fig. 49).

Description.—*Male holotype:* (Figs. 43–46, 50–53). Carapace (Fig. 43) 7.07 long; maximum width 5.53; minimum width 3.29. 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 ½–⅗ carapace length; anterior lateral borders convergent; pointed at maximum dorsal width, back lateral borders straight; back margin wide, straight. AME diameter 0.36; PLE 0.31; PME 0.25; AME on edge of frontal border, separated from one another by about ⅔ diameter, close to PLE; PME very close to each other, less than ¼ 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.

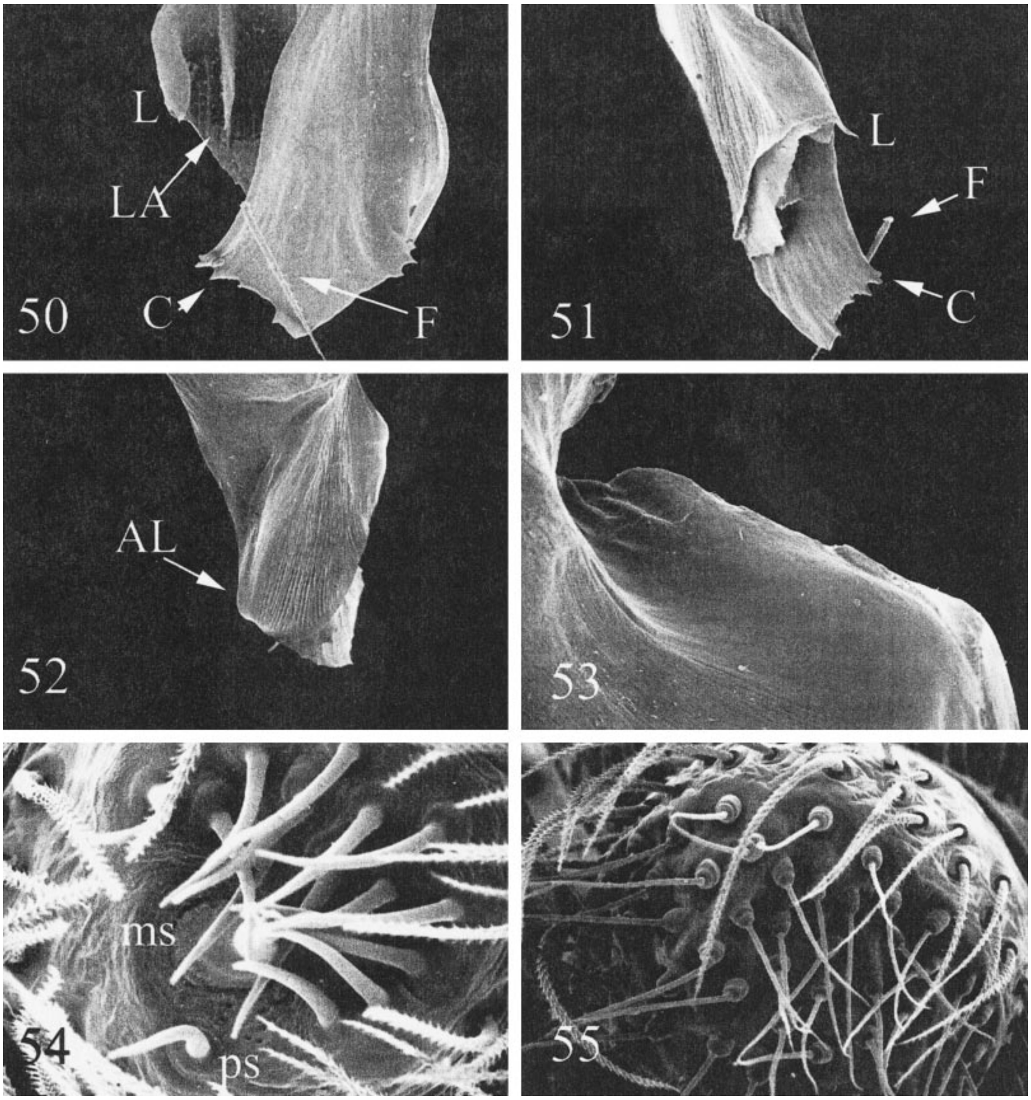
Chelicerae (Fig. 44) 3.29 long, about ⅖ of carapace length in dorsal view; fang medium-sized, 2.5; basal segment dorsal, ventral side completely covered with piligerous granulations. Chelicera inner groove short, about ⅓ cheliceral length; armed with three teeth and lamina at base, additional ventral tooth on left chelicera; B > D = M (similar); D round, located roughly at center 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; 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; relative length: 1-2-4-3; fe palp 3.49; pa palp 1.63; ti palp 1.77; ta palp 1.63; total 8.52. Spination: palp, leg1, leg2 spineless. Fe3d spineless; ti3d spines arranged in two bands: proximal 1.0.0; distal 1.0.1; ti3v spines arranged in one band: proximal 0.0.1; with two terminal spines. Fe4d spines in one row: 13; ti4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; ti4v 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 long; cream-colored; back end projected upwards in lateral view (Fig. 46). Abdominal dorsal hairs 0.108 long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

Male copulatory bulbus (Fig. 45) 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 (Figs. 50–52) 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. 53) fused to T; perpendicular to T in lateral view; lateral length from ½–⅔ of T width; ridge present, perpendicular to T; distinctly expanded, right-angled; upper margin smooth; not distally projected; back margin not folded.

Female paratype: (Figs. 47–49, 54, 55). All characters as in male except: Carapace 6.79 long; maximum width 5.25; minimum width 3.78. Back lateral borders straight. AME diameter 0.36; PLE 0.32; PME 0.27; AME on edge of frontal border, separated from one another by about ⅔ diameter, close to PLE; PME very close to each other, less than ¼ PME diameter from PLE. Chelicerae 3.12 long; fang medium-sized, 2.9; B > D = M (similar). Legs dark orange-colored. Lengths of female described above: fe1 8.26; 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; relative length 1-2-4-3; fe palp 4.9; pa palp 2.66; ti palp 2.1; ta palp 2.8; total 12.46. Spination: palp, leg1, leg2 spineless. Fe3d spineless; ti3d spines arranged in two bands: proximal 1.1.0; distal 1.0.1; ti3v spines arranged in one band: proximal 1.0.0; with two terminal spines. Fe4d spines in one row: 11-10; ti4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; ti4v 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 long; cream-colored; back end projected upwards in lateral view (slightly). Abdominal dorsal hairs 0.56 long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed. Vulva (Figs. 47–49) 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. 54) with PS; remaining piriform spigots more external than MS, arranged in two rows; 13 + 1 piriform gland spigots; PMS, PLS (Fig. 55) with more than 20 aciniform gland spigots.

Intraspecific variation.—Male cephalothorax ranges in length from 6.30–7.21, female from 6.02–7.35. AME separation from ⅓ diameter to ½. PLE-PME from ⅓ PME diamater to ⅖. Sternum ornamentation sometimes reduced. Relative size of cheliceral teeth variable although no large differences in size. P



Figures 50–55.—*Dysdera longa,* right male bulbus. 50, DD frontal; 51, DD external; 52, DD posterior; 53, P internal. 54–55, *Dysdera longa,* spinnerets. 54, Right ALS; 55, Right PLS.

Table 3.—Intraspecific spination variability of *Dysdera longa*.

	Proximal	Medial-proximal	Medial-distal	Distal
Tibia 3 dorsal	1.0–2.0–1	0	0	1.0.0–1
Tibia 4 dorsal	0–1.0.0–1	0	0–1.0.0	0–1.0.0–1
Tibia 3 ventral	1.0–1.0	0	0	0–1.0.0–1
Tibia 4 ventral	0–1.0.0–1	0	0	0
		Number of rows		Number of spines
Femur 3 dorsal		0		0
Femur 4 dorsal		1		8–13

back margin slightly folded. Spination variability in Table 3.

Additional material examined.—**Fuerteventura:** *Pájara*: Bco. del Ciervo, Cumbres de Jandía, N slope, 17 February 1995, 2♂, (Arnedo, Ribera & Oromí, #2836 UB, 2838 UL); 7♀, (Arnedo, Ribera & Oromí, #2837, 3183 UL, 4054-56, 4058, 4117 UB); 10juv., (Arnedo, Ribera & Oromí, #2831-35, 2839, 4050-53 UB); 27 February 1990, 1♀, (P. Oromí, #2621 MCNT).

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

Dysdera nesiotes Simon 1907
Figs. 56–63, 64–67, 68, 69

Dysdera nesiotes Simon 1907: 260–261, fig. 4G [♂] (Type lost).—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. Wunderlich 1991: 312. Fig. 129 [♂]
Dysdera wollastoni nesiotes Simon 1912: 59–60.—Denis 1941: 108.

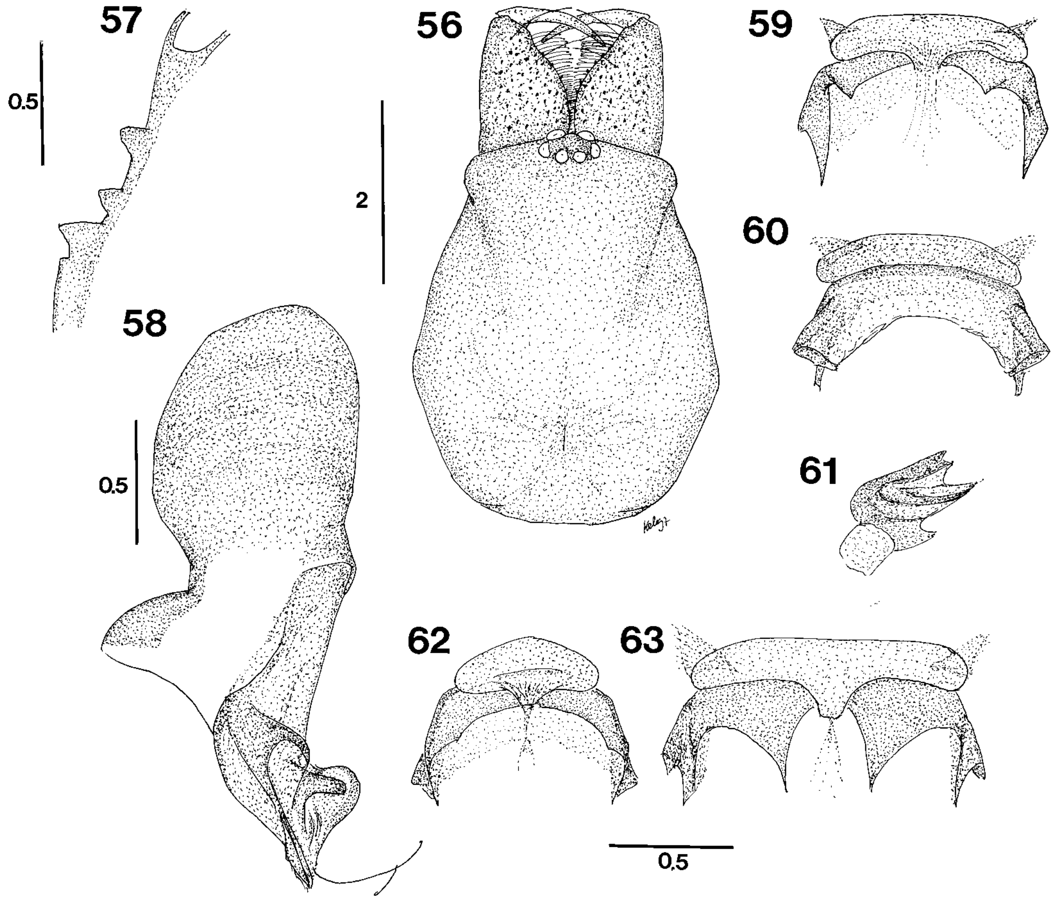
Types.—Neotypes, by present designation, 1♂,1♀, 3juv.; label states: ''*Dysdera wollastoni* Blackwall, Ins. Salvages (Garreta leg.)''; #B 536 (jar number), stored at MHNP.

Diagnosis.—This species strongly resembles *D. spinidorsum*. Males can be distinguished from the latter by the short lateral apophysis (LA) (Fig. 64), the moderately expanded crest (C) (Fig. 65), and the presence of a fold between the additional lateral sheet (AL) and the flagellum (F) (Fig. 66). Female vulva has the backwards projection of the medial fold (MF) not so well developed (Fig. 59) and displays posterior sclerotization of the ventral arch (VA) (Fig. 60).

Description.—*Male neotype:* (Figs. 56–58, 64–67). Carapace (Fig. 56) 4.23 long; maximum width 3.71; minimum width 2.2. Dark brownish-orange, frontally darker, becoming lighter towards back; smooth with some small black grains mainly at front. Frontal border roughly triangular, from $\frac{1}{2}$–$\frac{3}{5}$ carapace length; anterior lateral borders convergent; rounded at maximum dorsal width point, back lateral borders straight; back margin wide, straight. AME diameter 0.27; PLE 0.21; PME 0.18; AME on edge of frontal border, separated from one another by about ⅔ diameter, close to PLE; PME very close to each other, about ⅓ 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. 57) 1.82 long, about ⅓ of carapace length in dorsal view; fang medium-sized, 1.05; basal segment dorsal, ventral side completely covered with piligerous granulations. Chelicera inner groove short, about ⅓ 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; 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; relative length: 1-2-4-3; fe palp 2.1; pa palp 1.12; ti palp 1.13; ta palp 1.13; total 5.48. Spination: palp, leg1, leg2 spineless. Fe3d spineless; ti3d spines arranged in two bands: proximal 1.0.1; distal 1.0.1; ti3v spines arranged in two bands: proximal 1.0.0; distal 1.0.0; with two terminal spines. Fe4d spines in two rows: anterior 4; posterior 6-7; ti4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; ti4v 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 long; whitish; cylindrical. Abdominal dorsal hairs 0.11 long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

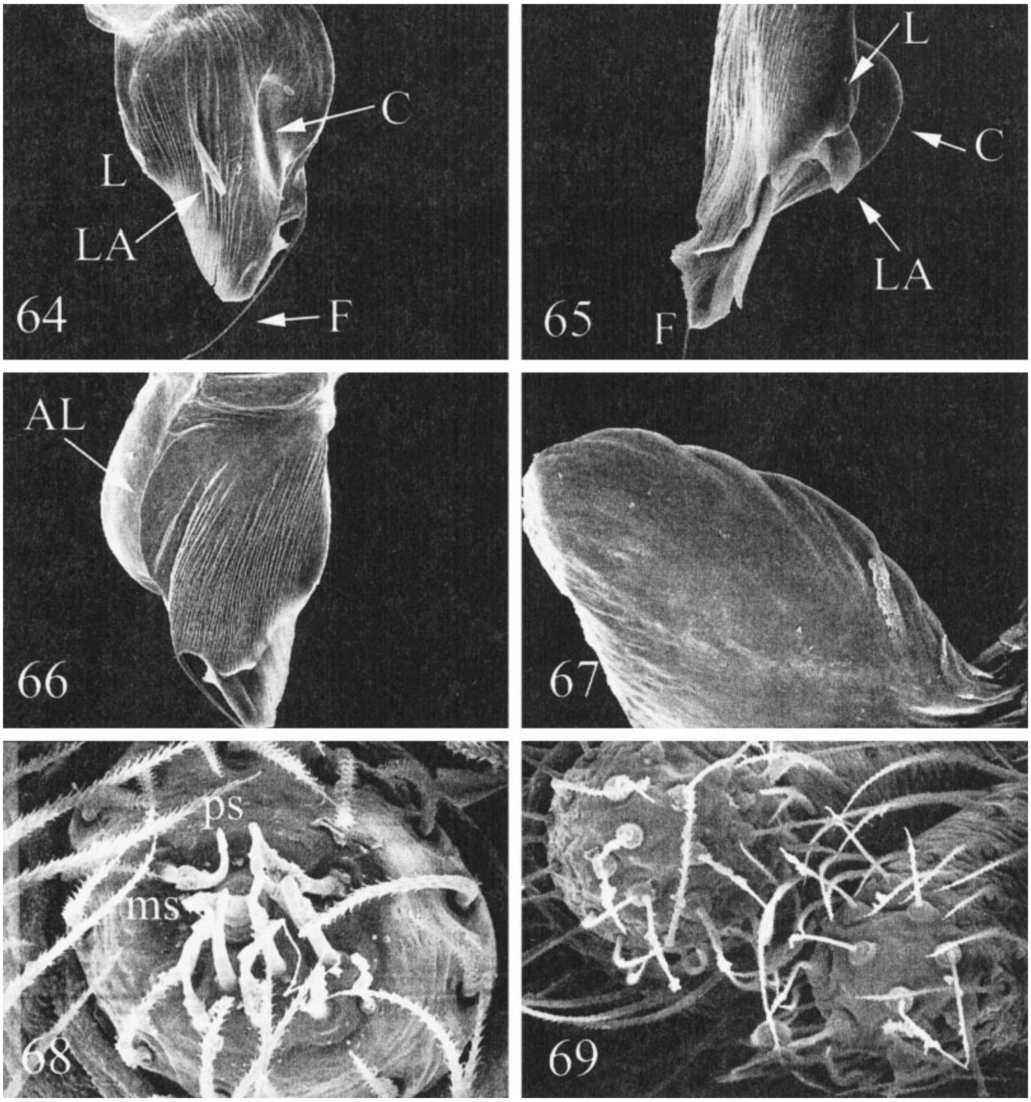
Male copulatory bulbus (Fig. 58) T as long as DD; external, internal distal border sloped backwards. DD bent about 45° in lateral view; internal distal border markedly expanded. ES wider, more sclerotized than IS; IS continuous to tip (diffused). DD tip (Figs. 64–67) straight in lateral view; frontal (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



Figures 56–63.—*Dysdera nesiotes*. 56, Carapace, dorsal; 57, Left chelicera, ventral; 58, Right male bulbus, external. 59–63, Vulva anterior diverticle: 59, Dorsal; 60, Ventral; 61, Lateral. 62, 63, Variability, ventral. Scale bars in mm.

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. 67) fused to T; perpendicular to T in lateral view; lateral length from ½–⅔ 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. 60, 61, 68, 69). All characters as in male except: carapace 4.55 long; maximum width 3.71; minimum width 2.38. AME diameter 0.27; PLE 0.21; PME 0.18; AME separated from one another by about ⅖ diameter. Chelicerae 1.92 long; fang medium-sized, 1.19. B $>$ D $>$ M (similar). Front legs dark orange, back legs yellow. Lengths of female described above: fe1 3.36; 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; relative length 1-2-4-3; fe palp 2.2; pa palp 0.98; ti palp 0.84; ta palp 1.19; total 5.21. Spination: palp, leg1, leg2 spineless. Fe3d spineless; ti3d spines arranged in two bands: proximal 1.0.1; distal 1.0.0; ti3v spines arranged in two bands: proximal 1.0.0; distal 1-0.0.0; with two terminal spines. Fe4d spines in two rows: ante-



Figures 64–69.—*Dysdera nesiotes*, right male bulbus. 64, DD frontal; 65, DD external; 66, DD posterior. 67, P external. 68–69, *Dysdera nesiotes*, spinnerets. 68, Right ALS; 69, Right PMS (lower) and PLS (upper).

rior 1; posterior 6-5; ti4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; ti4v spines arranged in two bands: proximal 1.0.1; distal 1-2.0.0-1; with two terminal spines.

Abdomen 6.86 long; whitish; cylindrical. Abdominal dorsal hairs 0.126 long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed. Vulva (Fig. 60, 61) 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. 68) with PS; remaining piriform spigots more external

Table 4.—Intraspecific spination variability of *Dysdera nesiotes*.

	Proximal	Medial-proximal	Medial-distal	Distal
Tibia 3 dorsal	1.0–2.0–1	0	0	1.0.0–1
Tibia 4 dorsal	0–1.0.1	0	0	0–1.0.1
Tibia 3 ventral	0–2.0.0–1	0	0	0–1.0.0
Tibia 4 ventral	0–1.0–1.0–1	0	0	0–1.0.0–1
		Number of row		Number of spines
Femur 3 dorsal		0–1		0–2
Femur 4 dorsal		2		1–6/4–7

than MS, arranged in two rows; 10 + 1 piriform gland spigots; PMS, PLS (Fig. 69) with 10–15 aciniform gland spigots.

Intraspecific variation.—Male cephalothorax ranges in length from 3.64–4.48, female from 3.92–5.46. AME separation from ⅓ diameter to ⅘. PLE-PME from ⅓ PME diameter to ½. 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. 62) 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. 63) 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.

Additional material examined.—**Alegranza:** unknown locality, 3rd week March 1995, 1♂, (P. Oromí, #2890 UB); 3♀, (P. Oromí, #2891, 4109, 4107 UB). **Lanzarote:** *Haria*: Malpaís de la Corona, Charcos de marea, 25 February 1995, 1♂, (Arnedo, Ribera & Oromí, 2887 UB). Montañas de Famara, around Mirador de Haría; 22 February 1995, 1♂, (Arnedo, Ribera & Oromí, 2866 UB); 1♀, (Arnedo, Ribera & Oromí, 4087 UB). Montañas de Famara, around Mirador del Río, 22 February 1995; 6♂, (Arnedo, Ribera & Oromí, #2861, 2863, 4072-3 UL, 4075, 4077 UB); 7♀, (Arnedo, Ribera & Oromí, #2857, 2860, 2862 UL, 2936, 4082, 4084-5 UB). *Yaiza*: Montañas de Femés, Atalaya de Femés, 1♂, 22 February 1995, (Arnedo, Ribera & Oromí, 2868 UB); 1♀, (Arnedo, Ribera & Oromí, 2867 UB). **Montaña Clara:** La Caldera, 23 February 1995, 4♂, (Arnedo, Ribera & Oromí, #2873, 2878, 2888-9 UB); 8♀, (Arnedo, Ribera & Oromí, #2818, 2874, 2876, 2879, 2880, 4093-95 UB). **Ilhas Selvagens:** 3♂, 1♂ subad., 1♀, 1juv.; label states: ''*Dysdera verneaui* Simon, Grant coll.''; #BM1897.10.18.41–46 BMNH.

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

Comments.—The male type material of this species, which is the only type known since the females were found to be a wrong identification (Arnedo & Ribera 1999), has been lost. Comments for *D. liostethus* are equally appliable to this species. Due to the taxonomic confusion that has surrounded *D. nesiotes*, and according to article 75 of the ICZN (4th edition), a neotype was designated. The neotype was selected from a series of specimens studied by Simon (a label stating this is included in the specimen's vial), the original author of *D. nesiotes*. Simon identified these specimens as *D. wollastoni* sensu Kulczynski 1899, which was, subsequently, considered a junior synonym of *D. nesiotes* (Denis 1963). The locality of the neotypes does not match the original type locality. Howevere, the last is considered to be doubtful (see discussion below).

Before the present study, it was suggested 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 (Simon 1907). 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 by us, they turned out to belong to the species *Dysdera propinqua* Ribera, Ferrández & Blasco 1986 (Arnedo & Ribera 1999). 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 1997). Moreover, the geographical distribution of certain morphological characters (e.g., the presence of LA and F is restricted to endemic species from the eastern Canaries), give support to the absence of *D. nesiotes* from the western and central Canaries.

Dysdera wollastoni Blackwall 1864 was considered a junior synonym of *D. crocota* by Denis (1963), based on revision of the type material. Recently, Wunderlich (1991) has rejected this synonymy based solely on the fact that *D. crocota* is so well known that it would be unlikely that a trained arachnologist would commit such mistake. However, Wunderlich himself has described a new Canarian endemism that was subsequently synonymized with *D. crocota* (Arnedo & Ribera 1999). In any case, Blackwall's actual description corresponds to *D. crocota*. Kulczynski (1899) published a thorough and nicely illustrated redescription of what he wrongly identified as *D. wollastoni*, based on specimens also collected in the Selvagens. This redescription was similar to Simon's original description of *D. nesiotes* (Simon 1883) to such an extent that Simon subsequently considered *D. nesiotes* as a subspecies of *D. wollastoni* (Simon 1912). Lately, Denis (1963) claimed to have found no morphological evidence to justify a subspecies status for the Canarian specimens, and, because Kulczynski's redescription was based on a wrong identification, *D. nesiotes* was the senior synonym. Recently, Wunderlich (1991) has considered that the synonymy of *D. wollastoni* and *D. nesiotes* is also based on a misidentification. Nevertheless, we have been unable to find any diagnostic difference between the studied populations of *D. nesiotes* from the Selvagens Islands and those from the eastern Canaries, and thus we consider them as allopatric populations of the same species.

Dysdera sanborondon new species
Figs. 70–75, 76–79, 80, 81

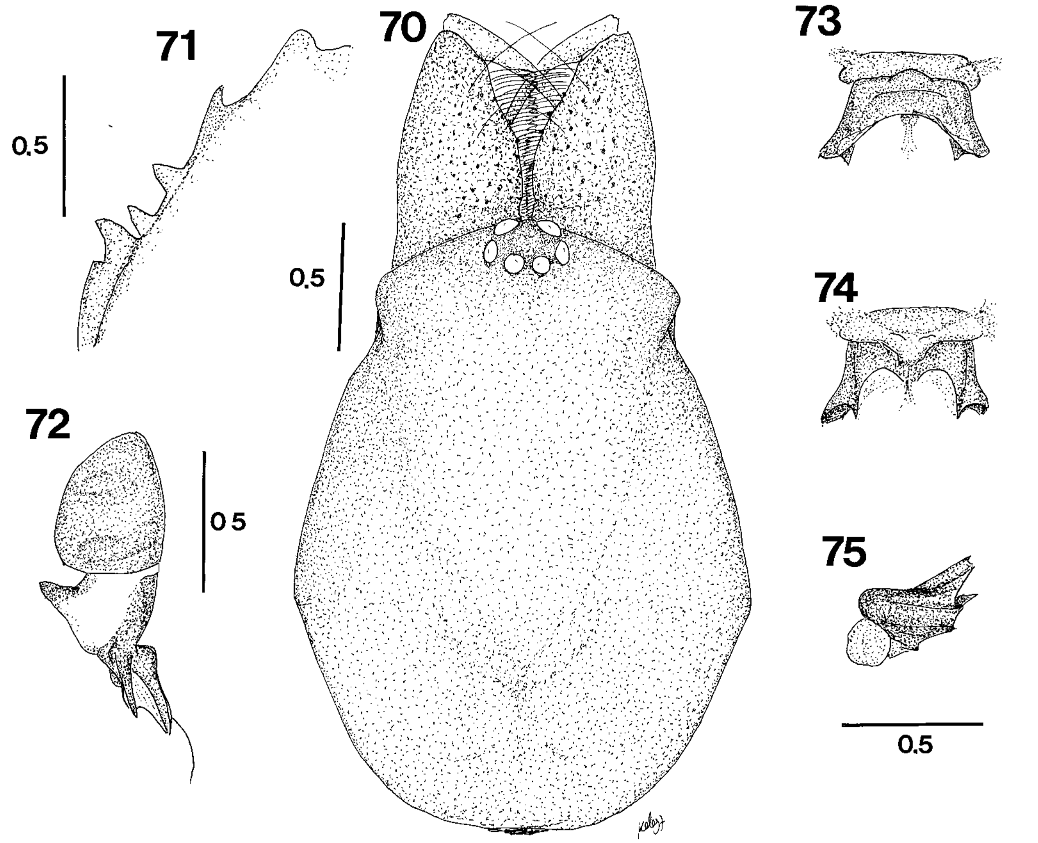
Types.—Holotype male from Montañas de Tegú, Betancuria, Fuerteventura; 18 February 1995, (Arnedo, Ribera & Oromí, #2850 UB). Paratype female from Cuchillos de Jacomar, between Valle de Jacomar and Valle de los Toneles, Tuineje, Fuerteventura; 19 February 1995, (Arnedo, Ribera & Oromí; #2852 UB).

Etymology.—The name in apposition of this species refers to San Borondón, the fastasy 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* (carapace length < 3). Even though this species shows a similar genitalic pattern to the remaining eastern species (with the exception of *D. lancerotensis*) both sexes can be easily distinguished by its smaller size and lack of lanceolate abdominal hairs. Males have neither lateral sheet apophysis (LA) (Fig. 76) nor additional lateral sheet (AL) (Fig. 78), and in females, the posterior region of the ventral arch (VA) is markedly sclerotized (Fig. 74).

Description.—*Male holotype:* (Figs. 70–72, 76–79). Carapace (Fig. 70) 2.33 long; maximum width 1.72; minimum width 1.12. Uniformly dark brownish-orange, heavily wrinkled, foveate, covered with small black grains. Frontal border roughly triangular, from $\frac{1}{2}$–$\frac{3}{5}$ carapace length; anterior lateral borders convergent; rounded at maximum dorsal width point, back lateral borders straight; back margin narrow, straight. AME diameter 0.16; PLE 0.14; PME 0.11; AME on edge of frontal border, separated from one another by less than ¼ diameter, close to PLE; PME very close to each other, less than ¼ 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.

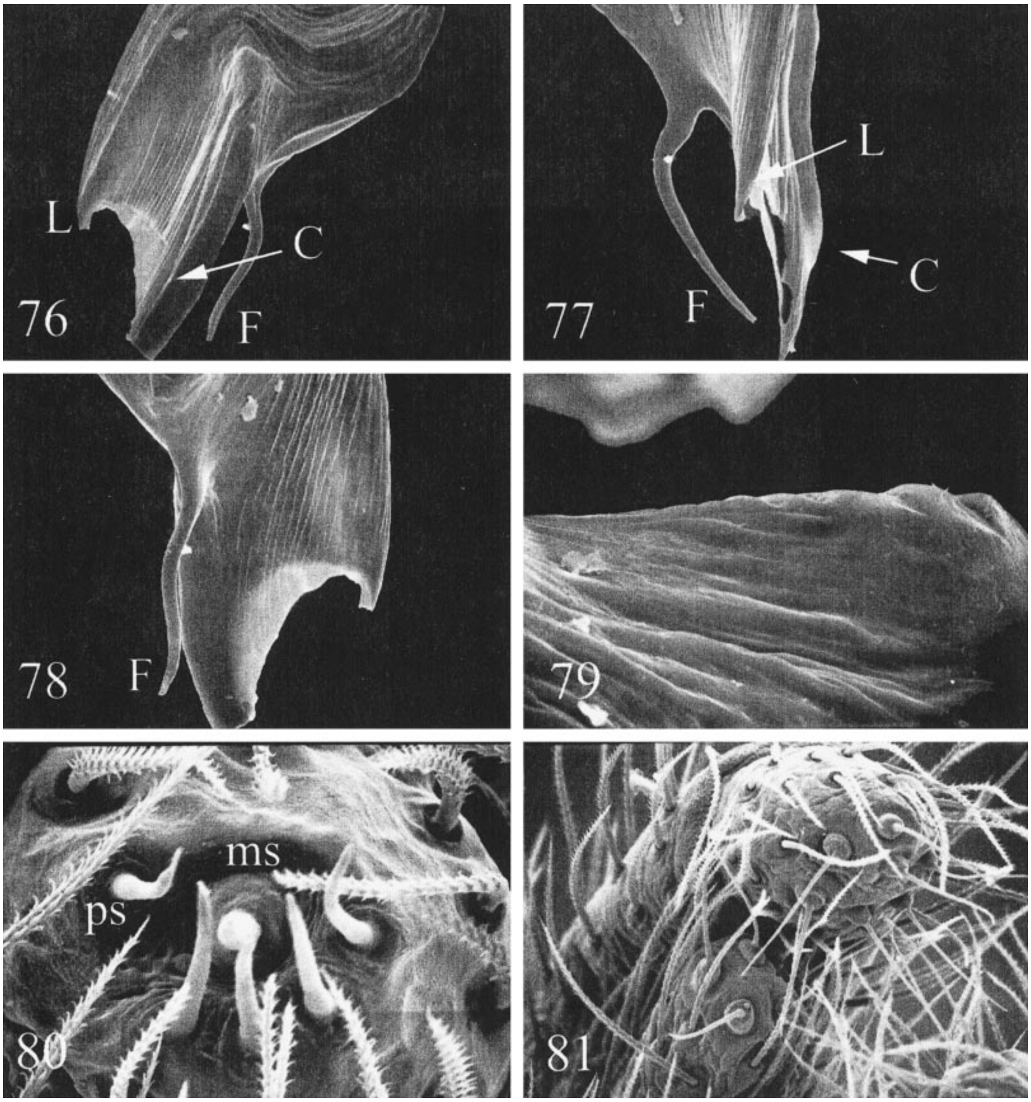
Chelicerae (Fig. 71) 1.09 long, about ⅓ of carapace length in dorsal view; fang medium-



Figures 70–75.—***Dysdera sanborondon*** new species. 70, Carapace, dorsal; 71, Left chelicera, ventral; 72, Right male bulbus, external. 73–75, Vulva anterior diverticle: 73, Dorsal; 74, Ventral; 75, Lateral. Scale bars in mm.

sized, 0.74; basal segment dorsal, ventral side completely covered with piligerous granulations. Chelicera inner groove medium-size, about $\frac{2}{5}$ cheliceral length; armed with three teeth and lamina at base; D = B > M (similar); D triangular, located roughly at center of groove; B close to basal lamina; M at middle of B and D. Legs orange. Lengths of male described above: fe1 1.86; 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; relative length: 1-4-2-3; fe palp 0.93; pa palp 0.51; ti palp 0.46; ta palp 0.56; total 2.46. Spination: palp, leg1, leg2 spineless. Fe3d spineless; ti3d spines arranged in two bands: proximal 1.0.1; distal 1.0.0; ti3v spines arranged in one band: proximal 1.0.0; with two terminal spines. Fe4d spines in two rows: anterior 1; posterior 2; ti4d spines arranged in two bands: proximal 1.0.1; distal 0.0.1; ti4v 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 long; whitish. Abdominal dorsal hairs 0.027 long; medium thickness, roughly straight, not compressed, blunt, tip not enlarged; uniformly, thickly distributed.

Male copulatory bulbus (Fig. 72) 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. 76–78) straight in lateral view. C present, long; distal border rounded, smooth,



Figures 76–81.—***Dysdera sanborondon*** new species, right male bulbus. 76, DD external; 77, DD frontal; 78, DD posterior; 79, P internal. 80–81, ***Dysdera sanborondon*** new species, spinnerets. 80, Right ALS; 81, Right PMS (lower) and PLS (upper).

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. 79) fused to T; markedly sloped on its proximal part, perpendicular on distal; lateral length from ½–⅔ 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.

Female paratype: (Figs. 73–75, 80, 81). All characters as in male except: Carapace 2.79 long; maximum width 2.05; minimum width 1.35. AME diameter 0.16; PLE 0.16; PME 0.12.

Chelicerae 1.3 long; fang medium-sized, 0.93; 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; 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; relative length 1-4-2-3; fe palp 1.12; pa palp 0.6; ti palp 0.51; ta palp 0.7; total 2.93. Spination: palp, leg1, leg2 spineless. Fe3d spineless; ti3d spines arranged in two bands: proximal 1.0.1; distal 1.0.0; ti3v spines arranged in one band: proximal 1.0.1; with two terminal spines. Fe4d spines in one row: 2; ti4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; ti4v spines arranged in two bands: proximal 1.0.1; medial-proximal 0.0.1; with two terminal spines. Abdomen 6.8 long; whitish; cylindrical. Abdominal dorsal hairs 0.063 long; thin, curved, compressed, pointed; uniformly, thickly distributed.

Vulva (Fig. 73–75) 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. 80) with PS; remaining piriform spigots more external than MS, arranged in one row; 4 + 1 piriform gland spigots; PMS, PLS (Fig. 81) with 5–10 aciniform gland spigots.

Intraspecific variation.—Unknown.

Distribution.—Endemic species from central Fuerteventura.

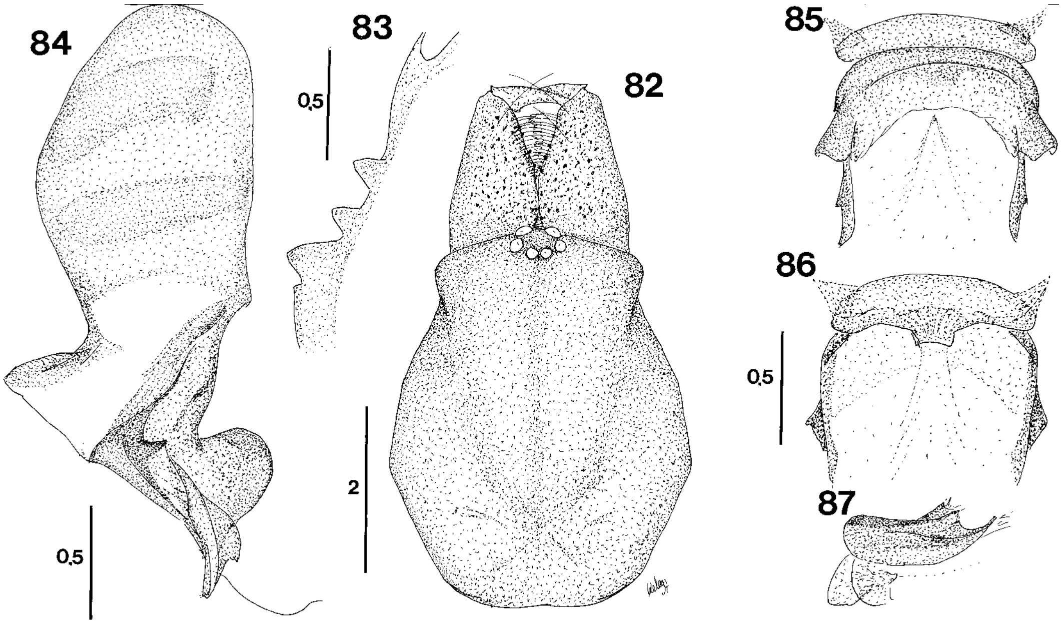
Dysdera spinidorsum Wunderlich 1991
Figs. 82–87, 88–91, 92, 93

Dysdera spinidorsum Wunderlich 1991: 307–308, figs. 101–102 [♀]. (Holotype female; NE road to Betancuria (550 m), Betancuria, Fuerteventura; 5 January 1990; H. Enghoff, M. Báez, ♀, leg.; #307, stored at ZMK; examined.)

Diagnosis.—Both sexes of this species can be distinguished from the sympatric *D. sanborondon* by its larger size (carapace length > 4) and lanceolate abdominal hairs. Males display both a well-developed lateral sheet apophysis (LA) (Fig. 88) and additional lateral sheet (AL) (Fig. 90). In females, the posterior region of the ventral arch (VA) is membranous (Fig. 86). Males differ from the morphologically closely related *D. nesiotes* by having the tegulum (T) longer than the distal division (DD) (Fig. 84), the lateral sheet apophysis (LA) being frontally projected (Fig. 88) and the crest (C) distinctly expanded (Fig. 89). In females, the medial fold (MF) is markedly projected backwards (Fig. 85) and the ventral arch (VA) shows a reduction of its ventral sclerotization (Fig. 86).

Description.—*Male:* (Figs. 82–84, 88–91). Carapace (Fig. 82) 4.9 long; maximum width 3.64; minimum width 2.59. 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 $\frac{1}{2}$–$\frac{3}{5}$ carapace length; anterior lateral borders convergent; pointed at maximum dorsal width, back lateral borders straight; back margin wide, straight. AME diameter 0.23; PLE 0.22; PME 0.17; AME on edge of frontal border, separated from one another by about ⅔ diameter, close to PLE; PME very close to each other, about ⅓ 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. 83) 2.1 long, about ⅖ of carapace length in dorsal view; fang medium-sized, 1.4; basal segment dorsal, ventral side completely covered with piligerous granulations. Chelicera inner groove medium-size, about ⅖ cheliceral length; armed with three teeth and lamina at base; B > D = M (similar); D round, located roughly at center of groove; B close to basal lamina; M at middle of B and D. Legs yellow. Lengths of male described above: fe1 3.82; 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; relative length: 1-2-4-3; fe palp 2.1; pa palp 1.16; ti palp 0.93; ta palp 1.12; total 5.31. Spination: palp, leg1, leg2 spineless. Fe3d spineless; ti3d spines arranged in two bands: proximal 1.2.1; distal 1.0.1; ti3v spines arranged in two bands: proximal 1.0.1-0; distal 1-0.0.0; with two terminal spines. Fe4d spines in two rows: anterior 1; posterior 5; ti4d spines arranged in two bands:



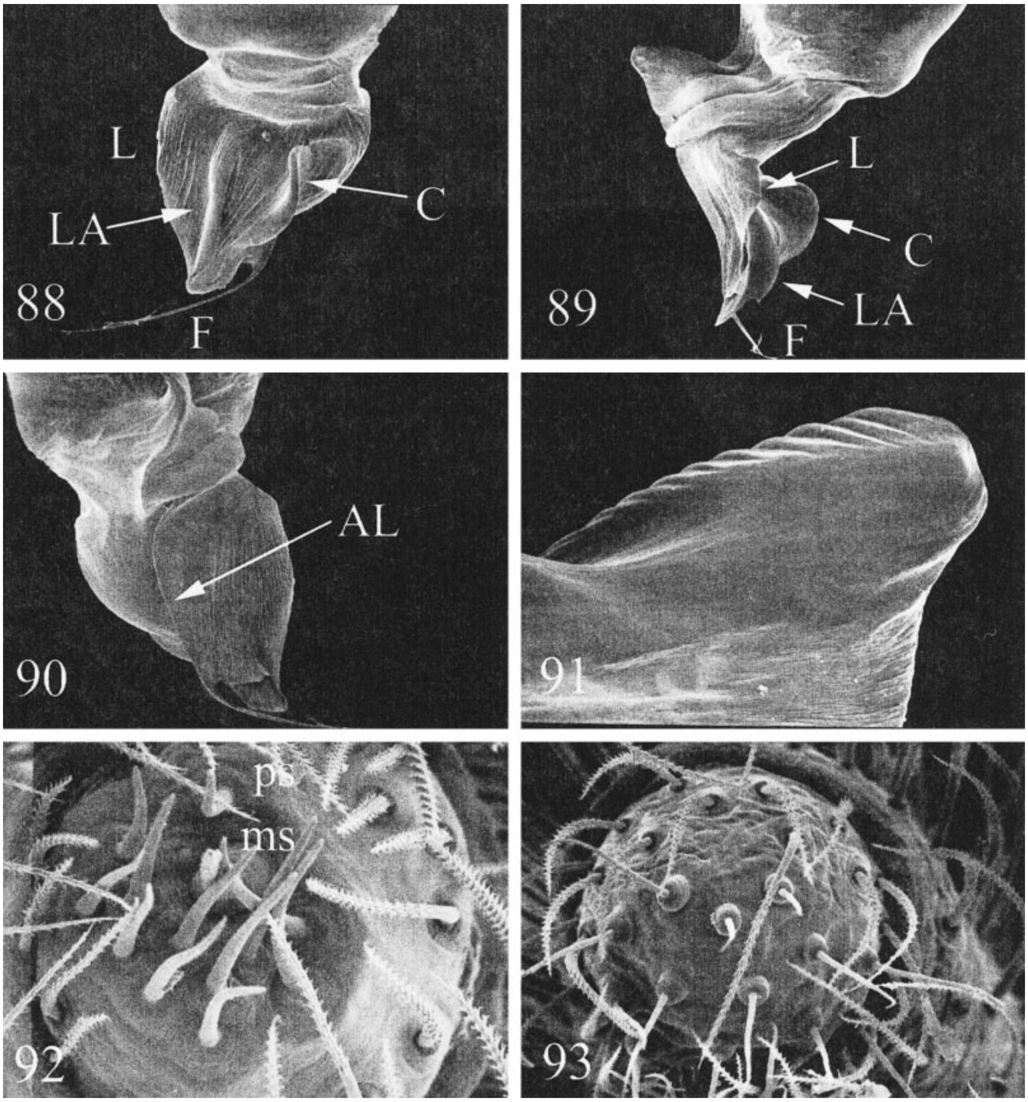
Figures 82–87.—*Dysdera spinidorsum*. 82, Carapace, dorsal; 83, Left chelicera, ventral; 84, Right male bulbus, external; 85–87, Vulva anterior diverticle: 85, Dorsal; 86, Ventral; 87, Lateral. Scale bars in mm.

proximal 0.0.1; distal 0.0.1; ti4v 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 long; cream-colored; cylindrical. Abdominal dorsal hairs 0.2 long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed.

Male copulatory bulbus (Fig. 84) T slightly longer than DD; external, internal distal border sloped backwards. DD bent about 45° in lateral view; internal distal border markedly expanded. ES wider, more sclerotized than IS (slightly); IS continuous to tip (diffuse). DD tip (Fig. 88–90) 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. 91) fused to T; perpendicular to T in lateral view; lateral length from ½–⅔ 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.

Female holotype: (Figs. 85–87, 92, 93). All characters as in male except: Carapace 4.9 long; maximum width 3.85; minimum width 2.73. AME diameter 0.29; PLE 0.23; PME 0.2; PME less than ¼ PME diameter from PLE.

Chelicerae 2.38 long, about $\frac{2}{5}$ of carapace length in dorsal view; fang medium-sized, 1.47. Lengths of female described above: fe1 3.63; 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; relative length 1-4-2-3; fe palp 2.23; pa palp 1.16; ti palp 0.93; ta palp 1.3; total 5.62. Spination: palp, leg1, leg2 spineless. Fe3d spineless; ti3d spines arranged in two bands: proximal 1.2.1; distal 1.0.1.; ti3v spines ar-



Figures 88–93.—*Dysdera spinidorsum*, right male bulbus. 88, DD frontal; 89, DD external; 90, DD posterior; 91, P internal. 92–93, *Dysdera spinidorsum*, spinnerets. 92, Right ALS; 93, Right PLS.

ranged in two bands: proximal 1.0.0; distal 1.0.0; with two terminal spines. Fe4d spines in two rows: anterior 2; posterior 6; ti4d spines arranged in two bands: proximal 0.0.1; distal 0.0.1; ti4v spines arranged in two bands: proximal 1.0.1; distal 1.0.1; with two terminal spines. Abdomen 5.88 long; whitish; cylindrical. Abdominal dorsal hairs 0.37 long; thick, roughly straight, compressed, lanceolate; uniformly, thickly distributed. Vulva (Figs. 85–87) 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. 92) with PS; remaining piriform spigots more external than MS, arranged in two rows; 11 + 1 piriform gland spigots; PMS, PLS (Fig. 93) with 10–15 aciniform gland spigots.

Intraspecific variation.—Male cephalothorax ranges in length from 4.41–4.69, fe-

Table 5.—Intraspecific spination variability of *Dysdera spinidorsum*.

	Proximal	Medial-proximal	Medial-distal	Distal
Tibia 3 dorsal	1.1–2.1	0	0	1.0.1
Tibia 4 dorsal	0–1.0–1.1	0	0	0.0.1
Tibia 3 ventral	1.0.0–1	0	0	0–1.0.0
Tibia 4 ventral	1.0.0–1	0	0	0–1.0.0
		Number of rows		Number of spines
Femur 3 dorsal		0		0
Femur 4 dorsal		2		1–2/4–8

male from 4.55–5.67. PLE-PME from $\frac{1}{3}$ PME diameter to $\frac{2}{5}$. Cheliceral granulations distally reduced in some females. Spination variability in Table 5.

Additional material examined.—Fuerteventura: *Antigua*: Montañas de Tegú, road Antigua-Betancuria; N slope, 18 February 1995, 2♂, (Arnedo, Ribera & Oromí, #2841 UL, 2842 (description) UB); 6♀, (Arnedo, Ribera & Oromí, #2843-45 UL, 2849, 4066 UB); 10 juv., (Arnedo, Ribera & Oromí, #2846-48 UL, 4059-65 UB). *Betancuria*: Betancuria, around village, 18 February 1995, 2♀, (Arnedo, Ribera & Oromí, #2851, 4067 UB). *La Oliva*: N. of La Oliva (175 m), 6 January 1990, 1 juv., (H. Enghoff & M. Báez, 2668 ZMK). *Puerto del Rosario*: La Matilla, near village, 20 February 1995, 2♀, (Arnedo, Ribera & Oromí, #2854, 4069); 1 juv., (Arnedo, Ribera & Oromí, #4070 UB). From Montaña Muda to La Matilla, 6 January 1990, 1 juv., (H. Enghoff & M. Báez, 2664 ZMK). *Tuineje*: Cuchillos de Jacomar, between Jacomar and Toneles Valley 19 February 1995, 2 juv., (Arnedo, Ribera & Oromí, #2852, 4068 UB).

Distribution.—Endemic species from central and northern Fuerteventura.

When the log-transformed number of *Dysdera* species in each Canarian island is plotted against the log-transformed island age, a clear linear relationship is observed (Fig. 94). However, the statistical regression obtained was very poor ($r^2 = 0.317$). When a 95% confidence interval was considered, two islands seemed to depart from the general trend: Tenerife had more species than expected while Lanzarote was poorer in species than expected. Removing both values did not result in a much better fit for the regression ($r^2 = 0.620$). Nevertheless, when the two eastern islands were removed from the analysis (Fig. 95), the relationship was markedly improved ($r^2 = 0.866$).

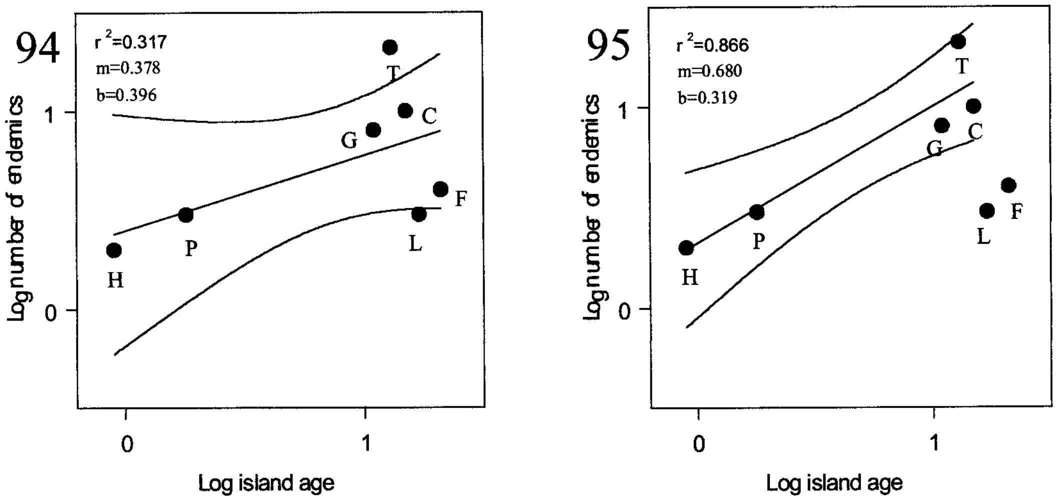
Table 6.—Number of endemics and the estimated age of each Canarian island. The values in brackets in the island age column are the ones used in the regressions.

Island	Num. of endemics	Island age (Mya)
Fuerteventura (F)	4	20–22 (21)
Lanzarote (L)	3	15–19 (17)
Gran Canaria (C)	10	14–16 (15)
Tenerife (T)	21	11.6–14 (13)
La Gomera (G)	8	10–12 (11)
La Palma (P)	3	1.6–2 (1.8)
El Hierro (H)	2	0.8–1 (0.9)

DISCUSSION

Morphological characters, and male genitalia in particular, suggest that with the exception of *D. lancerotensis*, the eastern endemic species are very closely related. Putative synapomorphies of this group include: the presence in the male bulb of a well-developed crest (C) along the internal margin of the anterior distal half region of the distal division, the presence of a lateral sheet apophysis and the presence of thick, lanceolate abdominal dorsal hairs. *D. sanborondon* only shares the first of these characters, which may indicate that it is basal. The presence of a flagellum in the male bulb, found in all but *D. alegranzaensis*, can also be found in some continental taxa, and is therefore likely to be a plesiomorphic state. Several characters support a sister-species relationship between *D. nesiotes* and *D. spinidorsum*: the enlargement of the internal margin of the anterior distal region of the distal division of the male bulb, and the posterior projection of the major fold (MF) lateral margins of the vulva.

Male bulb characters such as the presence



Figures 94, 95.—Regression plots of the log-transformed number of endemics against log-transformed island ages (upper and lower curves representing 95% confidence interval). 94, all the islands included in the regression; 95, Eastern islands excluded from the regression. (r^2 = regression coefficient, m = slope, b = constant). Abbreviations as in Table 6.

of the medial apophysis (MA), an arch-like ridge at the distal division anterior distal tip, and a free posterior apophysis, ally the eastern endemic *D. lancerotensis* to the "crocota" group of species proposed by Deeleman-Reinhold & Deeleman (1988), which are distributed through southwestern Europe and northern Africa. Therefore, *D. lancerotensis* could be the result of an independent colonization event of the eastern islands.

A striking feature of Canarian *Dysdera* is that their distribution areas largely overlap (Arnedo et al. 1996; Arnedo & Ribera 1997). This pattern is also present in the eastern islands. In Fuerteventura, *D. spinidorsum* is found in the two known localities of *D. sanborondon*, while in Lanzarote and the northern islets *D. alegranzaensis* and *D. nesiotes* co-occurred in most of the collection localities. Although clear size segregation exists between *D. sanborondon* and *D. spinidorsum*, no morphological differentiation that would seem relevant to ecological differentiation is found between *D. alegranzaensis* and *D nesiotes*. The species *D. longa* from Fuerteventura presents the only case of intra-island allopatric distribution, as it is restricted to the peninsula of Jandía. Several examples of allopatric distributions in arthropods and slugs between Jandía and the remaining regions of Fuerteventura have also been reported (Hutterer 1989; Juan et al. 1998). Finally, *D. lancerotensis* is spread throughout the eastern islands and is sympatric with all other eastern endemics.

While the sympatric distribution of *D. lancerotensis* may have secondarily resulted from an independent colonization, this does not seem to be the case for the remaining species. As described above, the eastern Canaries are part of a single volcanic ridge parallel to the African coast. The depths between the islands are small (less than 40 m between Fuerteventura, Lanzarote and the islets) and it is probable that all were connected several times during glaciation events. This would help to explain the presence of the same three *Dysdera* species inhabiting both Lanzarote and the northern islets. However, this geological scenario raises some questions regarding species distributions on the two main islands. Only one of the six eastern endemic species is shared between Lanzarote and Fuerteventura. This pattern could suggest several rounds of species exchange, with some recent enough to preclude morphological differentiation *D. lancerotensis* provides an example. In contrast, the allopatric distribution of *D. nesiotes*-*D. spinidorsum* sister species pair suggests a more ancient vicariance event.

The presence of *D. nesiotes* in the Selvagens Islands is also unusual. Other examples of shared species between Lanzarote-northern islets and the Selvagens are also known: the spiders *Oecobius lampeli* (Araneae, Oecobiidae) and *Ozyptila atlantica* (Araneae, Thomisidae) have been reported from the Selvagens and the eastern Canaries (Wunderlich 1991); the beetle *Macrocoma oromiana* (Coleoptera, Chrysomelidae) can be found both in Selvagens and Alegranza; the genus *Ifnidius* (Coleoptera, Malachiidae) includes one species from Ifni, one species from Lanzarote-Alegranza and one species from the Selvagens; and the Selvagens endemic *Cardiophorus oromii* (Coleoptera, Elateridae) has its closest relatives in the eastern Canaries. Although the origin of the Selvagens Islands traces back to the Oligocene, most of the present-day emergent lands is likely to be the result of quaternary volcanic activity after a long period of immersion under the ocean (Bravo & Coello 1978). Therefore, *D. nesiotes* probably colonized the Selvagens Islands from Lanzarote-northern islets in relatively recent times.

Surprisingly, none of the material studied here could be assigned to the cosmopolitan species *D. crocota*. This species is widely distributed in places disturbed by human activity not only in the remaining Canaries but throughout the world. The same result was found by Wunderlich (1991), who also considered the only known report of this species in the eastern islands (Schmidt 1975) to be doubtful. Competitive exclusion by the presence of the very closely related *D. lancerotensis* may explain the absence of *D. crocota* in these islands.

The species diversity of an oceanic island is the product of colonization and local diversification (Paulay 1994). The relative contribution of each process to the actual species number is heavily influenced by parameters like the island area, the distance from biota sources and the geological age. Plots of number of species, after a substantial improvement of taxonomic knowledge, against island age indicates that the eastern islands harbor a significant lower number of endemic *Dysdera* species than the rest of the Canaries. A major ecological differentiation exists between the eastern Canaries and both the central and western ones. In the Canaries, a zone of temperature inversion is formed at an altitude of roughly 1000 meters. This is the result of the joint effect of the humid and cool tradewinds of the NE and the dry trade winds from the NW. An almost permanent cloud belt is formed in this zone. This cloud belt is the main water supply of the islands. Due to their greater age, the eastern islands have been strongly eroded and their mountains rarely reach altitudes above 800 m. This fact prevents these islands from capturing the clouds and the humid trade winds. Moreover, a very dry and dusty wind blows from the nearby Sahara desert. This climatic regime brings about a lower diversity of habitats in the eastern islands compared to the central and western Canaries. The low number of endemics in the eastern islands could therefore be explained by extinction mainly related to the major environmental change that took place on these islands. The distribution of the eastern endemic specimens seems to support this hypothesis. Most of the specimens were collected from sites located on the northern slopes of massifs over 400 m high. These places represent the wettest parts of these islands. The single specimen (belonging to *D. nesiotes*) found in a dry habitat (the sand dunes of Malpaís de Corona) was captured by night. Nevertheless, *Dysdera lancerotensis* constitutes an exception to the rule. This species is spread over most of the island habitats, from mountain summits to lava fields, including places disturbed by human activity. An extremely high level of tolerance to a wide range of environmental conditions has already been reported for a closely related species, *D. crocota* (Cooke 1968).

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