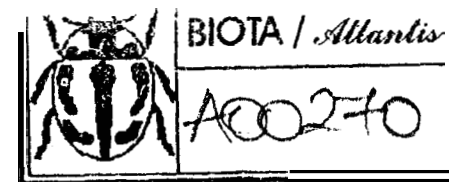


- JØRSTAD, I. (1958). Uredinales of the Canary Islands.- *Skr. Norske Vidensk.-Akad. Oslo, Mat.-Naturvidensk. Kl.*, No. 2: 1-182.
- MUMFORD, B. (1965). *List of Intercepted Plant Pests, 1964*: 66.- United States Department of Agriculture.
- MASSON, F. (1778). An Account of the Island of St. Miguel.- *Philos. Trans.* 68 (2): 601 - 610.
- SATO, S., K.KATSUYA & Y.HIRATSUKA (1993). Morphology, taxonomy and nomenclature of *Tsuga-Ericaceae* rusts.- *Trans. Mycol. Soc. Japan* 34: 47 - 62.
- SPOONER, U.M. & G.B.BUTTERFILL (in press).- Bibliography of Azores Mycology. *Arquipélago*.
- TRELEASE, W. (1897). Botanical observations on the Azores.- *Rep. (Annual) Missouri Bot. Gard.* 8: 77 - 220 (Fungi: 206 - 210).
- TUFFIN, T.G. & E.F.WARBURG (1932). Notes on the Flora of the Azores.- *J. Bot.* 70: 38 - 46.
- WILSON, M. & D.M.HENDERSON (1966). *British Rust Fungi*. - Cambridge University Press.



VIERAEA	Vol. 27	183-204	Santa Cruz de Tenerife, diciembre 1999	ISSN 0210-945X
---------	---------	---------	--	----------------

The millipedes of the Canary Islands (Myriapoda: Diplopoda)

MARÍA CRISTINA VICENTE* & HENRIK ENGHOFF**

*Departament de Biologia Animal, Biologia Vegetal i Ecologia,
Universitat Autònoma, E08193 Bellaterra (Barcelona), Spain.

**Zoologisk Museum, Københavns Universitet, Universitetsparken 15,
DK-2100 København Ø, Denmark.

VICENTE, M.C. & H. ENGHOFF (1999). Los milpiés de las islas Canarias (Myriapoda: Diplopoda) *VIERAEA* 27: 183-204.

RESUMEN: Se relacionan 77 especies de Diplópodos de las islas Canarias, incluyendo 7 nuevas citas para el archipiélago, así como numerosas citas de cuevas y del medio subterráneo superficial (MSS). Se eleva a categoría específica *Polydesmus laevidentatus* Loksa, 1967, que estaba considerado como una subespecie de *P. miguelinus* Attems, 1908. Se aporta un detallado informe sobre *Cynedesmus formicola* Cook, 1896, que se cita como nuevo para Madeira. Unas cuantas especies adicionales de Glomeridae y Polydesmidae quedan pendientes de identificación, 46 especies de *Dolichoiulus*, 3 de *Glomeris* y 1 de cada uno de los géneros *Polyxenus*, *Polydesmus*, *Acipes*, *Cylindroiulus* y *Anagaiulus* son endemismos canarios. 3 especies más (*Macroxenus enghoffi* Nguyen Duy-Jacquemini, 1996, *Hirudicryptus canariensis* (Loksa, 1967) y *Cynedesmus formicola*) son endemismos macaronésicos. Los parientes más próximos de estos endemismos se encuentran principalmente en otras islas de la Macaronesia o en el sudoeste europeo. 18 especies son introducciones obvias, que provienen principalmente de Europa. Finalmente, el estatus biogeográfico de 2 Polyxenida no endémicos se considera incierto.

Palabras clave: milpiés, Myriapoda, Diplopoda, *Cynedesmus*, islas Canarias.

ABSTRACT: 77 species of millipedes (Diplopoda) are listed from the Canary Islands, including 7 new records for the archipelago, and numerous records from caves and the mesocavernous shallow stratum (MSS). *Polydesmus laevidentatus* Loksa, 1967, is upgraded from subspecific status under *P. miguelinus* Attems, 1908, to full species status. A detailed account is given of *Cynedesmus formicola* Cook, 1896 which is also

recorded as new to Madeira. A handful of further species of Glomeridae and Polydesmidae await identification/naming. 46 species of *Dolichoiulus*, 3 of *Glomeris*, and 1 of each of the genera *Polyxenus*, *Polydesmus*, *Acipes*, *Cylindroiulus* and *Anagaidulus* are Canarian endemics. 3 further species (*Macroxenus enghoffi* Nguyen Duy-Jacquemin, 1996, *Hirudicryptus canariensis* (Loksa, 1967) and *Cynedesmus formicola*) are Macaronesian endemics. The closest relative of the endemics mostly live on other Macaronesian islands or in SW Europe. 18 species have obviously been introduced, mostly from Europe. Finally, the biogeographical status of 2 non-endemic Polyxenida is uncertain.

--- Millipedes: Merianoda, Diplopoda, *Cynedesmus*, Canary Islands

INTRODUCTION

Current knowledge of the fauna of the Canary Islands is very heterogeneous. Some groups have been studied quite intensively, e.g., birds, reptiles, beetles, whereas others have received only superficial attention. There is, however, good reason to invest much effort in investigating the Canarian fauna which is known to include a high percentage of endemic species and offers numerous opportunities to study insular evolution.

The millipedes (Diplopoda) were, until recently, known only from scattered reports, starting with that of Pocock (1893). During the eighties and nineties of the present century they have received renewed attention, and a number of groups have been revised, notably the Penicillata (Nguyen Duy-Jacquemin, 1996), the Glomeridae (Golovatch, 1986) and the speciose julid genus *Dolichoiulus* (Enghoff, 1992b).

The most recent comprehensive account of Canarian species is that of Verhoeff (1926-32: 1910-1914). Verhoeff mentioned that 21 species were known from the Canary Islands, but his table includes only 17 species - he apparently forgot to include the four species described by Attems (1911). In contrast, the updated list (Table I) includes 77 species, and a further handful await description.

Although there are still taxonomically unsolved problems among Canarian Glomeridae and Polydesmidae, we feel it appropriate to summarize knowledge of the Canarian millipede fauna now. The purpose of the present paper therefore is to present an updated list of Canarian millipedes, with notes on their occurrence in the archipelago, and to present a general account of the Canarian millipede fauna. (Enghoff [1992a] includes such account in the context of a general consideration of Macaronesian millipedes.)

MATERIAL

The present study is based mainly on the collections listed by Enghoff (1992b). Additional material from coll. Vicente, collected in part by MCV and R. Rodríguez (Barcelona, Spain), in part by P. Oromí and coworkers (La Laguna, Tenerife) has, however, also been considered, as well as a few samples from the Museo Nacional de

Ciencias Naturales in Madrid. An additional material of particular interest are the collections (kept in DZLL) made in the MSS („milieu souterrain superficiel“, or „mesocavernous shallow stratum“) by Ana Luisa Medina (La Laguna) and her coworkers.

Abbreviations of depositories

BASEL	Naturhistorisches Muscuii Basel (A. Hänggi)
BMNH	The Natural History Muscuii, Loidoi, Great Britain (P. Hillyard)
CZL	Centro de Zoologia, Lissabon (L.F. Mendes)
DZLL	Departamento de Biología Animal (Zoología), Universidad de La Laguna, Tenerife, Spain (P. Oromí)
IZUR	Istituto di Zoologia, Università degli Studi di Roma, Italy (A. Vigna)
MNCN	Musco Nacional de Ciencias Naturales, Madrid (O. Soriano)
MCSNV	Musco Civico di Storia Naturale, Vcroia (G. Oscila)
MCZ	Muscuin of Comparative Zoology, Harvard University (H.W. Levi)
NMA	Naturhistorisk Museum, Århus (C. Jensen)
NMG	Naturhistoriska Museet, Göteborg (G. Andersson, T. v. Proschwitz, H.W. Waldén)
NKS	Naturhistoriska Riksinsect, Stockholm (T. Kronstedt)
THALER	coll. K. Thaler, Innsbruck, Austria
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA (J. Coddington)
VICEN	coll. M.C. Vicente, Barcelona, Spain
ZIL	Zoological Institute, University of Lund (L. Cederholm)
ZMH	Zoological Museum, University of Helsinki (I. Valovirta)
ZMUC	Zoological Museum, University of Copenhagen, Denmark

The inter-archipelago distribution of the 77 millipede species now known from the Canary Islands is shown in Table I. The information on the extra-Canarian distribution is taken from a variety of sources including Demange (1970, Azores, Madeira) and Enghoff (1982b, Madeira).

NOTES ON THE SPECIES

For all species, except most of those of *Dolichoiulus*, synonyms used in the cited literature are given, previous records are summarized, new material is presented, the general distribution is summarized, and in some cases taxonomic or other notes are appended. Particular care has been taken to present records from caves, including the mesocavernous shallow stratum (MSS). In the case of *Cynedesmus formicola* more exhaustive account is given. Some groups are treated in detail in separate papers: order Polyxenida (Nguyen Duy-Jacquemin, 1996), *Hirudicryptus canariensis* (Enghoff & Golovatch, 1995), and genus *Dolichoiulus* (Enghoff, 1992b; Enghoff & Báez, 1993). Most of the numerous Canarian species of the latter genus are not commented on below; the reader is referred to the above-cited papers. A few new records are, however, included.

ORDER POLYXENIDA, FAMILY POLYXENIDAE

Polyxenus fasciculatus Say, 1821

Recorded by Nguyen Duy-Jacquemin (1996) from Gran Canaria, Tenerife, La Góllera and El Hierro. Widely distributed in the USA, also known from Madeira and the Bermuda islands.

Polyxenus uromii Nguyen-Duy-Jacquemin, 1996

Recorded by Nguyen Duy-Jacquemin (1996) from Fuerteventura, Tenerife and La Palma. Previously reported from La Palma as *P. cf. chalcidius* Condé & Nguyen Duy-Jacquemin, 1971, by Ashmole *et al.* (1992). Apparently an endemic species.

Macroxenus enghoffi Nguyen-Duy-Jacquemin, 1996

Recorded by Nguyen Duy-Jacquemin (1996) from Fuerteventura. *M. cf. enghoffi* was recorded by the same author from S. Antão, Cape Verde Islands.

Polyxenidae indet.

Ashmole *et al.* (1990) and Martini (1989) recorded unidentified polyxenids from Lanzarote.

FAMILY LOPHOPROCTIDAE

Lophoproctinus inferus (Silvestri, 1903) ssp. *maurus* Marquet & Condé, 1950

Recorded by Nguyen Duy-Jacquemin (1996) from Fuerteventura, Gran Canaria and Tenerife. The subspecies was previously known from Morocco, Algeria, and Tunisia; the nominal subspecies, *L. i. inferus* (Silvestri, 1903) was described from Italy.

OHDEK GLOMERIDA, FAMILY GLOMEKIDAE

Glomeris alluandi Brölemann, 1901

Recorded by Brölemann (1901) and Golovatch (1986) from Tenerife. Endemic.

Glomeris canariensis Golovatch, 1986

Material studied: numerous specimens from LA GOMERA, Parque Nacional de Garajonay (IZUR, ZMUC).

Recorded from La Góllera by Golovatch (1986). Endemic.

Glomeris gomerana Attems, 1911

Material studied: 3♂ LA GOMERA, Bosque del Cedro, near Montaña de la Asomada N La Laguna Grande, 1180 m, laurisilva, u. stolic, 6.11.1989. H. Enghoff leg. (ZMUC). - 1♂ LA GOMERA, Alto Garajonay, 1400 m; *Pinus canariensis* plantation with *Erica* & *Adenocarpus*, u. stone, 8.11.1989. H. Enghoff leg. (ZMUC).

Recorded from La Gomera by Attems (1911) and Golovatch (1986). Endemic.

Glomeris spp.

Additional material of *Glomeris* spp. is available from Gran Canaria (VICEN), Tenerife (VICEN, DZLL) and El Hierro (ZMUC, DZLL), but has not yet been examined. The specimens from Tenerife were caught in caves, are blind and completely depigmented, and were in part reported, as Glomeridae indet. from Cueva de la Chatarra and Cueva Felipe Reventón, by Martini (1992). Additional specimens are available from Cueva de los Roques, Cueva de Chio and Cueva del Viento (P. Oroiii, pers. comm.).

ORDER POLYZONIDA, FAMILY SIPHONOCRYPTIDAE

Hirudicryptus canariensis (Loksa, 1967)

(Syn., *Siphonocryptus* c.)

Material studied: 1 ♀ TENERIFE, Anaga, El Bailadero, 14/18.III.1984, A. Vigna leg. (IZUR). - several spms. TENERIFE, Anaga Mountains, Vueltas de Taganana, on fallen branches, 7.IX.1992, H. Enghoff leg. (ZMUC).

Recorded by Loksa (1967) and Eiglioff & Golovatch (1995) from Tenerife and La Góllera. Also reported, by the latter authors, from Madeira.

ORDER CHORDEUMATIDA, FAMILY OPISTHOCEIRIDAE

Ceratosphys poculifer (Brölemann, 1920)

Material studied: 1♂ 1♀ GRAN CANARIA, Cruz de Tejada, M. Almaderas, 1600-1700m, 20/25.III.1985, A. Vigna leg., J.-P. Mauriès det. (IZUR). - 1♂ GRAN CANARIA, Los Pechos, 1859m, 12.XII.1986, R. Rodriguez (VICEN). - 2♀ GRAN CANARIA, Teror, Finca de Osorio, 25.XII.1986, R. Rodriguez leg. (VICEN). - 1♂ 1♀ GRAN CANARIA, Cruz de Tejada, 26.XII.1986, R. Rodriguez (VICEN). - 1♂ GRAN CANARIA, Las Loigucras, 14.XII.1987, R. Rodriguez leg. (VICEN). - 1♂ 1♀ GRAN CANARIA, Teror, Finca de Osorio, 25.XII.1988, R. Rodriguez leg. (VICEN). - 2♀ GRAN CANARIA, Barranco La Mina, in rotten log, 31.XII.1987, M. Báez leg. (ZMUC). - 1♂ 1♀ GRAN CANARIA, Cuevas de Corcho, 1300 m; shady, mossy rock, under moss, 1.I.1990, M. Báez & H. Enghoff leg. (ZMUC). - 1♀ GRAN CANARIA, Mirador de Pinos de Gáldar, 1450 m, gravelly slope, in soil under *Adenocarpus* bush, 1.I.1990, M. Báez & H. Enghoff leg. (ZMUC).

New to the Canarian fauna (probably introduced). Apart from the Gran Canarian finds, *C. poculifer* is known only from the type locality in Ciudad Real, continental Spain. Originally described as the type species of the genus *Fuentea*, it was transferred to *Ceratosphys* by Mauriès (1990).

ORDER POLYDESMIDA, FAMILY PARADOXOSOMATIDAE

Oxidus gracilis (C.L. Koch, 1847)

(Syn., *Paradesmus* g., *Orthomorpha* g.)

Material studied: several specimens from TENERIFE, including: 1 ♂ TENERIFE PI-10-C, Cueva Piquetes, P. Oroiii leg. (DZLL). - 1♀ LA GOMERA, Santiago, 27.I.1971, Zool. Inst. exp. leg. (NMÁ). - several spms LA GOMERA, San Sebastián, 24.I.1971, Zool. Inst. exp. leg. (NMÁ). - 7♂ 10♀ 4 juv. LA GOMERA, S of Agulo, 11.IV.1967, H.W. Waldén leg. (NMG). - several samples from LA PALMA, including specimens from Garafia-Hoya Grande and Puntagorda, MSS, both A.L. Medina leg. (DZLL).

Recorded by Latzel (1895) and Martini *et al.* (1986, cave) from Tenerife. New to La Góllera and La Palma. Probably introduced. An extremely widespread species, presumably of East Asian origin. Also known from Madeira and the Azores.

Orthomorpha guerini (Gervais, 1836)

(Syn., *Orthomorpha* g., *Strongylosomum* g., *Strongylosoma lusitanum* Verhoeff, 1892).

Material studied: numerous specimens from FUERTEVENTURA, GRAN CANARIA, TENERIFE, LA GOMERA, LA PALMA. - 1 ♀ EL HIERRO: Los Palos Blancos, 25.III.1985, E. Colonnelli (IZUR). - Material from cave: 1 ♀, 3 j. FUERTEVENTURA, Cueva del Llano, 14.II.1992, Rando leg. (DZLL).

Recorded by Pocock (1893) and Loksa (1967) from Tenerife, by Latzel (1895) from Tenerife and La Palma, by Brölemann (1901) from Fuerteventura, Gran Canaria and Tenerife, by Attems (1911) from La Gomera. New to El Hierro and now known from all islands except Lanzarote. Seems to be absent from the driest areas. Probably introduced. Also known from NW Africa, SW Europe, Madeira and the Cape Verde Islands.

Stosatea italica (Latzel, 1886)

Material studied: Several ♂ ♀ GRAN CANARIA, Pico de Bandama near Tafira, 500m, gravel with scattered *Rumex*, *Echium* etc., under stones, 31.XII.1989, M. Báez & H. Enghoff (ZMUC). - 1 ♂ GRAN CANARIA, Los Tilos near Moya, 525 m, laurisilva, in logs, 31. XII. 1989, M. Báez & H. Enghoff (ZMUC).

New to the Canarian fauna (probably introduced). Known from Madeira and an area in Europe extending from the British Isles southeast to Italy (map in Kime, 1990).

FAMILY POLYDESMIDAE

Brachydesmus proximus Latzel, 1889

Material studied: Numerous specimens from GRAN CANARIA, TENERIFE, LA GOMERA, LA PALMA. - 1 ♂ FUERTEVENTURA, Tegú, 570 m, 10.III.1984, E. Colonnelli leg. (IZUR).

Material from the MSS, A. Medina leg.: 54 ♂ 58 ♀ TENERIFE, Monte del Agua, 1.IV.1990. - 4 ♂ same loc., 13.V.1990. - 1 ♂ same loc., 1.II.1990. - 9 ♂ 4 ♀ 3 juv ♂ same loc., 11.I.1990. - 1 ♀ same loc., 30.XII.1989. - 2 ♂ 6 ♀ TENERIFE, Cumbres de Anaga, 18.V.1990. - 3 ♂ 9 ♀ same loc., 18.III.1990. - 3 ♂ TENERIFE, Anaga, El Bailadero, 21.I.1990. - 1 ♀ same loc., 18.VII.1989. - 1 ♂ same loc., 26.XI.1989. - 3 ♂ 237 ♀ 1 juv ♂ (!) LANZAROTE, Haría, 31.III.1990 (all: DZLL).

Recorded by Latzel (1895) from Tenerife, by Brölemann (1901) from Gran Canaria, by Attems (1911) from La Gomera and by Loksa (1967) from Tenerife, La Gomera and La Palma. Very common in Italy, also known from S France, N Africa, Malta, Madeira and the Azores.

The sex ratio in the MSS samples from Lanzarote is remarkable and suggests a parthenogenetic population. Parthenogenesis has not been previously suspected in *B. proximus* (cf. Enghoff 1978).

Brachydesmus superus Latzel, 1884

Material studied: Numerous specimens from GRAN CANARIA, TENERIFE, LA GOMERA, LA PALMA, EL HIERRO.

Material from the MSS, A. Medina leg.: 2 ♂ 6 ♀ TENERIFE, Monte del Agua, 1.IV.1990. - 2 ♂ 4 ♀ TENERIFE, Cumbres de Anaga, 18.V.1990. - 6 ♂ 3 ♀ TENERIFE, Anaga, El Bailadero, 21.I.1990. - 3 ♀ same loc., 25.XI.1989. - 2 ♀ 2 juv ♂ LA PALMA, La Galga, 8.IV.1986. - 1 ♂ 49 ♀ LANZAROTE, Haría, 31.III.1990.

Material from caves: 1 ♂ TENERIFE, Cueva Belén (coll. Oromí) 1 ♂ TENERIFE, Cueva Sobrado. (all DZLL).

Recorded by Latzel (1895), Brölemann (1901) and Izquierdo *et al.* (1986) from Tenerife, and by Loksa (1967, as *B. s. humilis*) from Tenerife and La Palma. New to Lanzarote, Gran Canaria, La Gomera and El Hierro. Widespread in Europe, introduced to several exotic places. Also known from the Azores, Madeira and the Cape Verde Islands.

Loksa (1967) referred his Canarian material to *B. s. humilis* Attems, 1927. The numerous subspecies described under *B. superus* are in need of a modern revision and we prefer not to assign the Canarian *B. superus* to subspecies.

Carl (1902) reported *B. exiguus* Brölemann, 1894 from „Kanarische Inseln“ *B. exiguus* was described from Italy, and although it cannot be excluded that *B. exiguus* could have been introduced to the Canary Islands, a misidentification seems likely. We have examined the single ♂ (BASEL) on which Carl based his record. Unfortunately the gonopods are missing from the specimen, but in all external characters it agrees with *B. superus*, which Carl (1902) did not mention at all. A further hint that this may be the true identity of the specimen is that according to Carl (1902) it was collected in the company of *B. proximus*. We have often found *B. proximus* and *B. superus* in the same samples from the Canary Islands.

Just as in *B. proximus*, the MSS population on Lanzarote has a very skewed sex ratio (1 ♂/49 ♀), the normal sex ratio being ca. 1 ♂/3 ♀ (Stephenson, 1960). This suggests parthenogenesis, a phenomenon not previously reported from *B. superus* (cf. Enghoff, 1978).

Polydesmus coriaceus Porat, 1871

Material studied: Numerous specimens from laurisilva localities in LA PALMA, including 2 ♂ Cubo de la Galga, MSS, 8.IX.1986 & MSS-A 4.XI.1989, and 3 ♂ 2 ♀ same loc., MSS, 2.V.1989.

The only previous record of *P. coriaceus* from the Canary Islands is that by Verhoeff (1926-32) which did not specify individual islands. Widespread in western Europe, map in Kime (1990); also known from Madeira and the Azores.

Polydesmus laevidentatus Loksa, 1967, stat. nov.

(Syn., *P. miguelinus laevidentatus*).

Material studied: several ♂ ♀ TENERIFE, Monte del Agua, Los Silos, 27.VI.1954, J. Mateu leg. (CZL). - several ♂ ♀ same loc., 15.III.1984, E. Colonnelli, G. Carpaneto & A. Vigna leg. (IZUR). - 2 ♂ same loc., 3.III.1987, M. Báez & H. Enghoff leg. (ZMUC). - 3 ♂ 1 ♀ same loc., laurisilva, sifted from wood and soil, 19.XII.1982, A.H. Törnqvist leg. (NMG, ZMUC). - 1 ♂ TENERIFE, Palo Blanco, laurisilva, in soil, 5.III.1987, M. Báez & H. Enghoff leg. (ZMUC). - 2 ♂ 1 ♀ TENERIFE, Aguamansa, 11-1400 m, above Orotava, 13.II.1982, K. Thaler leg. (THALER, ZMUC). - 2 ♂ 1 ♀ TENERIFE, Agua Mansa, 2.III.1986, R. Sciaky leg. (MCSNV).

Material from the MSS: 1 ♂ 1 ♀ 1 juv ♂ TENERIFE, Monte del Agua, 1.IV.1990. - 1 ♀ same loc., 10.VII.1988. - 1 ♂ 1 ♀ TENERIFE, Monte del Agua, 11.I.1990. - 1 ♂ 5 ♀ TENERIFE, La Montañeta, 25.VI.1986. - 1 ♂ 1 ♂ TENERIFE, 25.VI.1986.

Material from Teneriffan caves, ex coll. Oromí (1994): 1 ♀ Be-Bo-B2-ol, Belén. 1 ♀ Galería Belén, iv.1994. - 1 ♀ Galería Belén. - 1 ♀ Cueva Felipe Reventón. - 1 ♀ Cueva del Viento. - 1 ♀ Cueva del Sobrado.

Recorded by Loksa (1967) from Tenerife.

This taxon was originally described as a subspecies of *Polydesmus miguelinus* Attems, 1908, known from the Azores and from Portugal. Ongoing revisionary studies by MCV on the species-group in question (? subgenus *Propolydesmus*) shows that *laevidentatus* is closer to *P. brincki* Demange, 1970, from Madeira and the Azores, than to *miguelinus*; we therefore elevate *laevidentatus* to full species rank.

Lohmander (1955: 61) recorded *Polydesmus miguelinus* from Tenerife. Despite efforts by T. v. Proschwitz and T. Kronstedt in NMG and NRS, respectively, Lohmander's specimens have not been found. Considering possible confusion with *P. miguelinus* s.s. in the Canarian species list

Polydesmus cf. *laevidentatus*

Two samples: 1♂ TENERIFE, Agua Garcia (soil), 18.II.1985, A.L. Medina leg. (DZLL), and 1♂ 3♀ TENERIFE, Barranco de San Antonio, 8.IV.1957, O. Lundblad leg. (NRS); the latter with reservation to *laevidentatus*. They are currently under study by MCV.

Polydesmidae genus?

Material studied: 1♂ LA GOMEKA, Valle Gran Key, A. Vigna leg. (IZUR).

J.-P. Mauriès, who has examined the specimen, thinks that it may be a teratological *Polydesmus*, its gonopods being quite deviating from anything else. Since no polydesmid of similar size is known from La Gomera, it may still represent an addition to the Canarian Fauna.

Polydesmidae genus?

Material studied: 1♀ EL TIERRO, track below Mirador de Jinama, 1030 m, laurisilva, u. stone, 31.I.1989, A. & H. Enghoff leg. (ZMUC).

This small female, with 18+1+T body rings, differs from all known Canarian polydesmids but cannot be referred even to genus in the absence of a male.

FAMILY PYRGODESMIDAE

Cynedesmus formicola Cook, 1896 Figs. 1-5.

Cynedesmus formicola Cook, 1896: 267; Silvestri 1947: 95; Chamberlin 1951: 76. „Cryptodesmide gen? sp?": Demange 1970: 18.

Material studied: 2♀ syntypes GRAN CANARIA: Telde 11/93 (USNM #2404). - 1 subad. ♀ (17+1+T) TENERIFE, A.S. Hirst (c.) 1920.5.26.25-28 (BMNH). - 1 subad. ♀ (17+1+T), 2j. TENERIFE: Los Cristianos, 29.I.1981, J. Mahler (ZMUC). - 1♀ (16+1+T), 2 subad. ♀ (17+1+T), 2j. LA GOMEKA: Valle Gran Rey, in banana plantation, 2.XII.1987, A. Fjellberg (ZMUC). - 1♀ MADEIRA: Funchal, Ribeiro Seco, 19.IV.1957, leg. P. Brinck & E. Dahl (ZIL). (the formulae indicate no. of podous body rings + no. of apodous body rings + telson, cf. Enghoff *et al.* 1993).

Recorded by Cook (1896) from Gran Canaria, and by Silvestri (1947) from Gran Canaria and Tenerife. New to La Gomera. Also known from Madeira (see below).

In his paper entitled „Summary of new Liberian Polydesmoidea“, O.F. Cook (1896) described not only Liberian species but also several species from other African countries, three from Java, and finally one, *Cynedesmus formicola*, from Gran Ca-

naria. Silvestri (1947) redescribed *C. formicola* from specimens collected by himself on Gran Canaria (Telde, Guía) and Tenerife (San Andrés, Orotava), his paper included a description of the male gonopods. Finally Chamberlin (1951) presented drawings of *C. formicola* based on two specimens.

The Canarian female pyrgodesmids studied by us agree perfectly with Cook's and Silvestri's descriptions of *C. formicola*, and with the two syntypes. The only exception concerns the body size. The body width was given as 1.25 mm by Cook, as 1.20 mm by Silvestri. I have measured one of the 18+1+T ♀ syntypes to 1.17 mm, and the largest ♀ in the new material measures 0.98 mm across. Since size is known to be quite variable in several polydesmidan millipedes, no taxonomic significance is ascribed to the differences.

C. formicola also occurs on Madeira; Demange (1970) recorded a „Cryptodesmide gen? sp?“ from „plusieurs exemplaires ♂ juv. et ♀“. A 20-segmented ♂ from this sample agrees perfectly well with *C. formicola*. Body width = 1.15 mm.

It should be noticed that although Cook (in Cook & Collins, 1895) designated *formicola* as type species of *Cynedesmus*, this designation is invalid, the type species of the genus being the Neotropical *Cryptodesmus ornamentatus* Karsch, 1880 (Jeckel, 1970). Whether the two species are at all closely related remains an open question. Chamberlin (1951), suggested that „*Treseolobus*“ *caribbeanus* Chamberlin, 1918, „seems to be a true *Cynedesmus*“. Comparison of the type specimens of *T. caribbeanus* (female holotype, paratype of indeterminable sex, MCZ) with specimens of *C. formicola* showed that although there is indeed a great resemblance, the paranota of *T. caribbeanus* are bigger and more horizontal than those of *C. formicola*. Figs. 1-5 show habitus and details of a ♀ (17+1+T) from La Gomera.

For the time being *C. formicola* may be regarded as a Macaronesian endemic, unlike the two pyrgodesmids of the Cape Verde Islands which turned out to have been described from Haiti and Brazil, respectively (Enghoff, 1993).

ORDER JULIDA, FAMILY BLANIULIDAE

Choneiulus palmatus (Nemec, 1895)

Material studied: 1♂ GRAN CANARIA, El Monte, 26.V. 1920, A.S. Hirst leg. (BMNH). - several ♀ TENERIFE, Agua Garcia, in log, 13.III.1987, M. Báez & H. Enghoff leg. (ZMUC). - 1♂ 10 TENERIFE, Barranco del Infierno, 8.XI.1989, R. Rodríguez leg. (VICEN). 2♂ 100 11 juv. TENERIFE, La Vega, MSS, 3.IV.1985, coll. P. Oromí (DZLL).

New to the Canarian fauna (probably introduced). Widespread in western Europe. Also known from the Azores and Madeira.

Choneiulus subterraneus (Silvestri, 1903)

Material studied: 1♀ TENERIFE, Cueva del Viento, above Icod de los Vinos, ca. 600m, mud & roots, 14.XI.1987, A. Fjellberg leg. (ZMUC). 40 TENERIFE, Cueva del Viento, 1994, coll. P. Oromí (DZLL).

Recorded from Tenerife (Costa del Silencio & Las Galletas) by Enghoff (1984). Also known from Italy and France (map in Kime, 1990).

***Nopoiulus kochii* (Gervais, 1847)**

Material studied: 1 ♀ GRAN CANARIA, El Monte, 26.V.1920, A.S. Hirst (BMNH). - 1 ♀ GRAN CANARIA, Los Tilos near Moya, 525m, laurisilva, in log, 31.XII.1989, M. Báez & H. Enghoff leg. (ZMUC). - 1 ♀ TENERIFE, Icod, Cueva Hoya San Felipe, 6.III.1992, Hernández leg. (DZLL). - 1 ♂ LA PALMA, Cumbre Nueva, E slope, brezal, under stone, 8.III.1987, M. Báez & H. Enghoff leg. (ZMUC). - several specimens LA PALMA, Los Tilos, laurisilva, in log, 7.III.1987, M. Báez & H. Enghoff leg. (ZMUC).

New to the Canarian fauna (probably introduced). Widespread in Europe and the Caucasian region, introduced to several exotic sites. Also known from the Azores and Madeira.

***Proteroiulus fuscus* (Am Stein, 1857)**

Material studied: numerous specimens (almost exclusively females) from laurisilva localities in LA GOMERA and LA PALMA. - 1 ♀ EL HIERRO, El Fayal c. 4 km SSW Mirador de Jinama, 1350 m, dense fayal-brezal, in & under log, 2.II.1989, A. & H. Enghoff leg. (ZMUC). - 2 ♀ EL HIERRO, young, open pine forest E of Mercadel, 1360 m, u. log bark, 2.II.1989, A. & H. Enghoff leg. (ZMUC).

New to the Canarian fauna (probably introduced). Very widespread in Europe, except in the south (map in Kime, 1990); introduced to several exotic sites. Also known from Madeira and the Azores.

***Acipes franzi* (Loksa, 1967)**

(Syn., *Choneiulus f.*)

Material studied: numerous specimens from laurisilva localities in TENERIFE and LA GOMERA, including two samples from the MSS: 1 ♀ TENERIFE, Anaga Mts., El Bailadero, 18.VII.1989 (DZLL). - 2 ♂ 1 ♀ LA GOMERA, El Cedro, 6.IX.1987 (DZLL). - 1 juv. (?) GRAN CANARIA, Barranco Oscuro at Valsendero near Valleseco, N-slope with laurisilva remnant, 725 m, under & in logs, 31.XII.1989, M. Báez & H. Enghoff leg. (ZMUC). - 1 ♂ GRAN CANARIA, Pico de Bandama near Tafira, 500m, gravelly slopes, *Kleinia*, *Rumex* etc., under stones, 7.I.1990, H. Enghoff leg. (ZMUC). - 2 ♂ LA PALMA, La Galga, MSS, 8.IX.1986 (DZLL). - 1 ♀ EL HIERRO, El Fayal c. 4 km SSW Mirador de Jinama, 1350 m, dense fayal-brezal, in & under log, 2.II.1989, A. & H. Enghoff leg. (ZMUC).

Recorded by Loksa (1967) from Tenerife and La Gomera. With the new records, *A. franzi* is now known from all the forested islands in the archipelago. A Canarian endemic; other members of the genus occur on Madeira (Enghoff, 1983) and in continental Spain (Enghoff, 1986).

***Blaniulus guttulatus* (Fabricius, 1798)**

Material studied: numerous specimens from GRAN CANARIA, TENERIFE, LA GOMERA, LA PALMA, and EL HIERRO.

Material from the MSS: 6 ♂, 1 juv. TENERIFE, La Vega, 3.IX.1985. - 1 juv ♂ TENERIFE, Pedro Álvarez, 30.VI.1988. - 1 ♀ LA GOMERA, Barranco del Cedro, 26.IV.1988. - 95 ♂ 195 ♀ 10 juv ♂ 7 juv ♀ LA PALMA, Cubo de la Galga, 4.XI.1989. All: DZLL.

Material from caves: several spms TENERIFE, Cueva del Sobrado, 1991-1994, P. Oromí leg. (DZLL). - several spms TENERIFE, Cueva Felipe Reventón, P. Oromí leg. (DZLL). - 1 ♀ Cueva del Viento, VBo-C, P. Oromí leg. (DZLL).

Recorded by Martín *et al.* (1986, wrongly spelled as *B. guttulatus* [Bosc]) from Tenerife (cave). One of the most frequently encountered species in Canarian caves. Widespread in western Europe, introduced to numerous exotic sites. Also known from Madeira and the Azores.

FAMILY JULIDAE***Brachyiulus pusillus* (Leach, 1815)**

(Syn., *B. littoralis* Verhoeff, 1898)

Material studied: Numerous specimens from TENERIFE, LA GOMERA, and LA PALMA. - 1 ♂ 1 ♀ EL HIERRO, Montaña de la Limera, fayal-brezal, 760 m, 28.III.1989, C. Vicente leg. (VICEN).

Recorded by Loksa (1967) from Tenerife and La Palma. New to La Gomera and El Hierro. Probably introduced. Widespread in western Europe; introduced to many exotic sites. Also known from Madeira and the Azores.

***Brachyiulus lusitanus* Verhoeff, 1898**

Material studied: 2 ♂ GRAN CANARIA, Barranco de la Virgen, Las Madres, 23.III.1984, G. Carpaneto leg. (IZUR). - 1 ♂ 1 ♀ GRAN CANARIA, Cuevas de Corcho, 1300 m, grassy slope, under stones, 1.I.1990, M. Báez & H. Enghoff leg. (ZMUC). - 2 ♂ LA PALMA, Cumbre Nueva, E slope, brezal, under stone, 8.III.1987, M. Báez & H. Enghoff leg. (ZMUC).

New to the Canarian fauna (probably introduced). Widespread in SW Europe; introduced to N. America. Also known from Madeira and the Azores.

***Cylindroiulus britannicus* (Verhoeff, 1891)**

Material studied: 5 ♂ 2 juv ♀ TENERIFE, Barranco del Dorujito (Orotava Valley), 820m, deep laurisilva litter, 28.XI.1987, A. Fjellberg leg. (ZMUC).

Mentioned from the Canary Islands, without further specification, by Verhoeff (1926-32). Probably introduced. Widespread in western and Central Europe (map in Kime, 1990), introduced to many exotic sites. Also known from Madeira and the Azores.

***Cylindroiulus latestriatus* (Curtis, 1845)**

Material studied: 1 ♂ TENERIFE, Agua Dulce, 16.I.1949 (ZMH). - several specimens TENERIFE, Playa Paraiso, in litter of shrubbery and under planks, near sea level, 3.I.1988, D. Kime leg. (ZMUC).

New to the Canarian fauna (probably introduced). Widespread in western and Central Europe (map in Kime, 1990), introduced to many exotic sites. Also known from Madeira and the Azores.

***Cylindroiulus disjunctus* Read, 1989**

Material studied: numerous specimens from LA PALMA and EL HIERRO.

Recorded by Read (1989a) from La Palma and El Hierro. A Canarian endemic, related to the *Cylindroiulus madeirae*-group from Madeira (Read, 1989a).

***Cylindroiulus truncorum* (Silvestri, 1896)**

Material studied: 1♂ GRAN CANARIA, Atalaya, 24-28.II.1949 (ZMH). - Numerous specimens from TENERIFE, Anaga Mts., laurisilva (THALER, ZMUC). - 1♂ 2♀ 1j. TENERIFE, Cuadras de Don Benito, 5.IV.1990, R. Rodríguez leg. (VICEN).

Mentioned from the Canary Islands, without further specification, by Korsós & Enghoff (1990). Probably introduced. Widespread in central and northwestern Europe, also in N Africa, introduced to N. and S. America. Also known from Madeira.

***Ommatoiulus moreleti* (Lucas, 1860)**

(syn.: *Schizophyllum m.*, *Julus karschi* Verhoeff, 1892).

Material studied: Numerous specimens from GRAN CANARIA, TENERIFE, LA GOMERA, LA PALMA, and EL HIERRO. - 1♀ FUERTEVENTURA, Tegú, 570m, 10.III.1984, E. Colonnelli leg. (IZUR).

Recorded by Latzel (1895) from Tenerife, by Brölemann (1901) from Gran Canaria and Tenerife, by Lohmander (1955) from Tenerife, by Loksa (1967) from Tenerife and La Palma, and by García and González (1998) from La Palma. Now known from all Canarian Islands except Lanzarote. On Gran Canaria, it is, however, conspicuously absent from the drier part in the south. This originally Iberian species has become very widespread by human transport and is often very numerous in allochthonous localities, attaining pest status in South Australia (Baker, 1978, 1979, 1985; Bailey, 1997). Baker & Báez (1989) studied the life history and body size of *O. moreleti* on Tenerife.

***Dolichoiulus* cf. *vosseleri* (Verhoeff, 1900)**

Material studied: 1♀ TENERIFE, Monte de Los Silos, V.1921, F. Escalera leg. (MNCN).

This specimen agrees with the single female identified as *D. cf. vosseleri* by Enghoff (1992) and, like it, comes from the NW part of Tenerife from where *D. vosseleri* is otherwise unknown.

***Dolichoiulus dendromystax* Enghoff, 1992**

Material studied: 1♂ 1♀ TENERIFE (NW), Monte del Agua, I.VII.1988, Naranjo leg. (VICEN).

This species was hitherto known only from the laurisilva in the Anaga Mts. (NE Tenerife), cf. discussion in Enghoff & Báez (1993).

***Dolichoiulus lasiurus* Enghoff, 1992**

Material studied: 1♂ TENERIFE, 900-1000m, IV.1935, C. Bolívar & F. Bonet leg. (MNCN).

This is the first record from NW Tenerife.

***Dolichoiulus baezi* Enghoff, 1992**

Material studied: 1♂ TENERIFE, Bajamar, IV.1921, F. Escalera leg. (MNCN).

Bajamar is situated more to the east than the previously known localities for this species.

***Dolichoiulus jandiensis* Enghoff, 1992**

Material studied: 4♀ FUERTEVENTURA, Cumbre Jandia, 14.II.1977, P. Oromi leg. (VICEN).

This species was hitherto known only from 3_ from the same locality.

***Dolichoiulus labradæ* Enghoff, 1992**

1♂ TENERIFE: P17-B3-ol, Cueva Piquetes, V. 1991, L. Sala leg. (DZLL).

This species was hitherto known from two other Teneriffan caves (Cueva Labrada and Cueva de Los Baldios).

***Dolichoiulus wunderlichi* Enghoff, 1992**

Material studied: 4♂ 4♀ ALEGGRANZA (islet near Lanzarote), Borde N de la Caldera, 3.V.1990, P. Oromi leg. (VICEN). - 2♂ 4♀ 1j♂ ALEGGRANZA, Caldera (interior), 4.V.1990, P. Oromi leg. (VICEN). - 1♂ same loc., 4.V.1993, P. Oromi leg. (DZLL). - 2♀ MONTAÑA CLARA (islet near Lanzarote), Caldera, 26.IV.1992, P. Oromi leg. (DZLL).

This species, described from Lanzarote, has now also been found on the neighbouring islets Alegranza and Montaña Clara.

***Dolichoiulus xylomystax* Enghoff, 1992**

Material studied: 1♂ TENERIFE, Monte del Agua, I.VII.1988, Naranjo leg. (VICEN).

Although known from two tiny laurisilva remains, in addition to the northeastern laurisilva in the Anaga Mts., this species was hitherto unknown from Monte del Agua in NW Tenerife, cf. discussion in Enghoff & Báez (1993).

***Dolichoiulus ypsilon* Enghoff, 1992**

Material studied: 1♀ TENERIFE, Cueva Felipe Reventón 7.V.1992, P. Oromi leg. (DZLL).

Already known from this cave.

***Anagaiulus blancatypa* Enghoff, 1992**

An endemic genus and species, known only from the laurisilva in the Anaga Mts., Tenerife.

THE CANARIAN MILLIPEDE FAUNA

A total of 77 species have been identified. Further species can be expected in Glomeridae and Polydesmidae.

The 77 species comprise 54 Canarian, 3 Macaronesian endemics and 20 further species which have probably all been introduced.

Canarian and Macaronesian endemics

The 46 endemic species of *Dolichoiulus* strongly dominate the endemic Canarian fauna. Only one of the species, *D. variabilis*, occurs on two islands, the others are monoisular. Further species of *Dolichoiulus* are known from Madeira, Porto Santo, the Salvage Islands, the Cape Verde Islands, NW Africa and SW Europe. However, *Dolichoiulus* is not a demonstrably monophyletic genus, and its

relationships to other pachyuline julids are unresolved (Enghoff, 1992b). A phylogenetic analysis of *Dolichoilulus* species (Enghoff, 1992b) which must, however, be regarded as very preliminary, did not indicate monophyly of a group consisting of the Canarian species. A number of subgroups of species, more or less convincingly supported by apomorphies, were found by Enghoff (1992b); each group mostly consisted of species from a single island.

The only other „species swarm“ among Canarian millipedes is constituted by the 3+ species in the *Glomeris alluaudi*-group. The relationships of this group to other species of the large, W Palaearctic genus *Glomeris* are unresolved (Golovatch, 1986).

There remain five Canarian endemics, each belonging to a different genus: *Polyxenus oromii* belongs to a small group of four species known from Italy, Corsica, Malta, and the Balkans, being particularly close to *P. chalcidius* Condé & Nguyen Duy-Jacquemin, 1971, from Greece (Nguyen Duy-Jacquemin, 1996). - *Polydesmus laevidentatus* is, as mentioned above, very closely related to *P. brincki* Demange, 1970, from Madeira and the Azores. The two unidentified *Polydesmus* species are also very close to *laevidentatus*, so perhaps we here have a third Canarian species swarm (endemic to Tenerife). As to the wider relationships of „the *P. laevidentatus* group“, *P. miguelinus* Attems, 1908, from Portugal and the Azores, is a strong candidate for the sister group. - *Acipes franzi* is a member of a genus the other species of which occur on Madeira (3), Porto Santo (3) and in continental Spain (1) (Enghoff, 1983, 1986). - *Cylindroiulus disjunctus* is a member of the *C. madeirae*-group, the other species of which occur on Madeira (29), Porto Santo (1), and the Azores (1 species, ?introduced from Madeira) (Enghoff, 1992a). Read (1989a) regarded the closest relative of *C. disjunctus* to be *C. transmarinus* Enghoff, 1982, from Porto Santo. On a higher level, the sister-group of the *C. madeirae*-group is supposed to be the small *C. perforatus*-group from the Iberian Peninsula (Read, 1989a,b) - *Anagailulus blancatypa* represent a monotypic pachyuline genus of uncertain relationships (Enghoff, 1992b).

The three Macaronesian endemics are *Hirudicryptus canariensis* and *Cynedesmus formicola* which are both also known from Madeira, and *Macroxenus enghoffi* which is also (although somewhat dubiously) known from the Cape Verde Islands. The wider geographical affinities of these species are highly variable:

Hirudicryptus is a monotypic genus; its sister group, *Siphonocryptus* is known (two species) from Sumatra and continental Malaysia (Enghoff & Golovatch, 1993).

The problems with the genus *Cynedesmus* were outlined above. It is at present not possible to guess at the phylogenetically closest relative to *C. formicola*. The Pyrgodesmidae are, however, mostly a tropical family.

Of the genus *Macroxenus*, two further species are known, one from North Africa and one from Brazil (Nguyen Duy-Jacquemin, 1996).

Polyxenida

Some Polyxenida have unexpectedly large ranges, and it is possible that these tiny, bristly millipedes possess other means of dispersal than do the generally very stationary chilognathans. In addition to the two endemics mentioned above, there are two Canarian polyxenidans: *Polyxenus fasciculatus* is a North American species also known from Madeira; *Lophoproctinus inferus maurus* is known from NW Africa (Nguyen Duy-Jacquemin, 1996).

Introduced species

All remaining species can be regarded as having been introduced to the Canary Islands by man. Inferring the original distribution of these species is hampered by their general tendency to anthropochory; Table III represents our best estimates.

DISCUSSION

As Table II clearly shows, the Canarian endemics have strong geographical relationships to other Macaronesian islands. Six out of ten „instances of endemism“ show relationship to (or identity with in the case of Macaronesian endemics) Madeiran (incl. Porto Santo) endemics, two are related to Cape Verdean taxa, one to Azorean, and one to Salvagean taxa. In three instances, there are, however, no Macaronesian relatives. Tracing the relationships further reveals a more varied pattern. There is a preponderance of „tracks“ connecting the Canarian endemics (and their Macaronesian relatives where such have been identified) with taxa in SW Europe and NW Africa (5 cases). This agrees with the tendency seen in many other groups of organisms (Báez, 1982; Waldén, 1984).

There are, however, also tracks to Italy and the Balkans, the W Palaearctic region in general, and - most surprisingly - to Sumatra and the Malacca peninsula in SE Asia. Enghoff & Golovatch (1993) list several other such examples of „illogical“ tracks of Canarian endemics.

In two cases, extra-Macaronesian relationships of the endemics cannot at present be assessed.

The two non-endemic Polyxenida, which may not be introduced, include one representing the „classical“ geographical connection, viz., to NW Africa, and one representing an unexpected connection to N America.

Finally, among the 18 introduced species, the Macaronesian affinity becomes very clear (Table III): Sixteen of them are known from Madeira, 13 from the Azores, and two from the Cape Verde Islands. With one exception, the original distributions of these species (cf. reservations above) include Europe, W Europe and the Iberian Peninsula being particularly strongly represented. This is hardly surprising, considering the climatic similarities and historical connections between Europe and the Canary Islands. The exception, *Oxidus gracilis*, is virtually a cosmopolitan, although it is supposed to be originally East Asian; its occurrence on the Canary Islands therefore is not surprising.

ACKNOWLEDGEMENTS

We extend our gratitude to the curators mentioned in the material chapter, to A. Fjellberg, R.D. Kime, P. Oromi, and K. Thaler for placing further newly collected material at our disposal, to J.-P. Mauries for useful discussion, to M. Báez and P. Oromi for information and comments on the manuscript, and to G. Brovad (ZMUC) for photographic work.

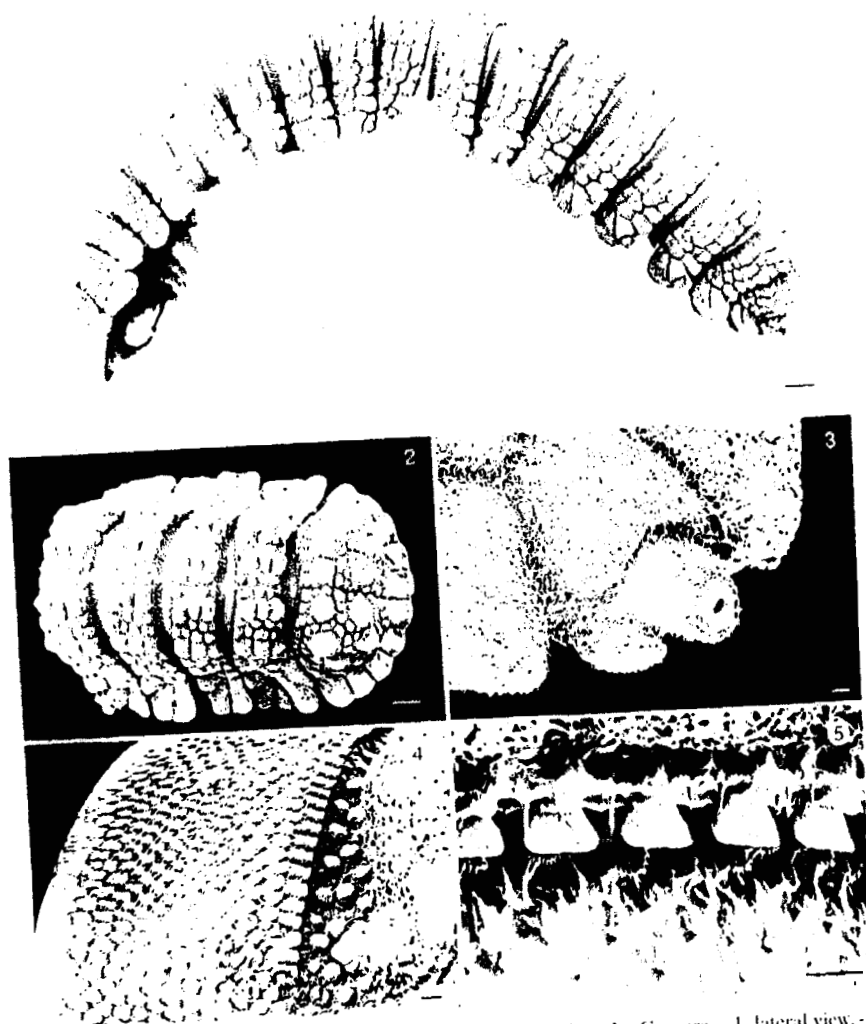
REFERENCES

- ASHIMOLE, N.P., M.J. ASHIMOLE & P. OROMÍ (1990). Arthropods of recent lava flows on Lanzarote. *Vieraea* 18: 171-187.
- ASHIMOLE, N.P., P. OROMÍ, M.J. ASHIMOLE & J.L. MARTÍN (1992). Primary faunal succession in volcanic terrain: lava and cave studies on the Canary Islands. *Biological Journal of the Linnean Society* 46: 207-234.
- ATTEMS, C. (1911). Myriopoden von Gomera. Gesammelt von Prof. W. May. *Archiv für Naturgeschichte* 1, 2. Supplementum: 107-118, 1 pl.
- BÁEZ, M. (1982). Consideraciones sobre las características zoogeográficas de la fauna de Canarias. - pp. 21-70 in: *Instituto de Estudios Canarios 50 Aniversario*. Tenerife: Instituto de Estudios Canarios (C.E.C.E.L.), Aula de Cultura del Excmo. Cabildo Insular de Tenerife.
- BAILEY, P.T. (1997). Decline of an invading millipede, *Ommatoiulus moreleti* in South Australia: the need for a better understanding of the mechanism (Diplopoda, Julida: Julidae). *Entomologica Scandinavica Supplement* 51: 241-244.
- BAKER, G.H. (1978). The distribution and dispersal of the introduced millipede, *Ommatoiulus moreletii* (Diplopoda: Julidae) in Australia. *Journal of Zoology* 185: 1-11.
- BAKER, G.H. (1979). Eruptions of the introduced millipede, *Ommatoiulus moreletii* (Diplopoda, Julidae), in Australia, with notes on the native *Australiosoma castaneum* (Diplopoda, Paradoxosomatidae). *South Australian Naturalist* 53,3: 36-41.
- BAKER, G.H. (1985). The distribution and abundance of the Portuguese millipede *Ommatoiulus moreletii* (Diplopoda: Julidae) in Australia. *Australian Journal of Ecology* 10: 249-259.
- BAKER, G.H. & M. BÁEZ (1989). Life history and body size of the introduced millipede *Ommatoiulus moreleti* (Lucas, 1860) (Diplopoda: Julidae) at different altitudes on Tenerife (Canary Islands). *Revue d'Écologie et de Biologie du Sol* 26: 473-489.
- BRÖLEMANN, H.W. (1901). Voyage de M. Ch. Alluaud aux Iles Canaries (Novembre 1889-Juin 1890). Myriapodes. *Mémoires de la Société zoologique de France* 13: 431-452, 1 pl.
- CARL, J. (1902). Exotische Polydesmiden. *Revue suisse de Zoologie* 10: 563-679, pl. 10-12.
- CHAMBERLIN, R.V. (1951). On Diplopoda of North-East Angola. *Publicações culturais da Companhia de diamantes de Angola* 10: 65-93.
- COOK, O.F. (1896). Summary of New Liberian Polydesmoids. *Proceedings of the Academy of Natural Sciences of Philadelphia* 1896: 257-267.
- COOK, O.F. & G.N. COLLINS (1895). The Craspedosomatidae of North America. *Annals of the New York Academy of Sciences* 9, 1: 1-100, 12 pl.
- DEMANGÉ, J.-M. (1970). Myriapodes diplopes de Madère et des Açores. *Boletim do Museu municipal do Funchal* 25, 107: 5-43.
- ENGHOFF, H. (1978). Parthenogenesis and spanandry in millipedes. *Abhandlungen und Verhandlungen des Naturwissenschaftlichen Vereins in Hamburg (NF)* 21/22: 73-85.
- ENGHOFF, H. (1983). *Acipes* - a Macaronesian genus of millipedes (Diplopoda, Julida, Blaniulidae). *Steenstrupia* 9: 137-179.
- ENGHOFF, H. (1984). Revision of the millipede genus *Chonciulus* (Diplopoda, Julida, Blaniulidae). *Steenstrupia* 10: 193-203.
- ENGHOFF, H. (1986). A continental species of *Acipes* Attems 1937. *Senckenbergiana biologica* 67: 207-209.
- ENGHOFF, H. (1992a). Macaronesian millipedes (Diplopoda) with special emphasis on endemic species swarms on Madeira and the Canary Islands. *Biological Journal of the Linnean Society* 46: 153-161.
- ENGHOFF, H. (1992b). *Dolichoiulus* - a mostly Macaronesian multitude of millipedes. With the description of a related new genus from Tenerife, Canary Islands (Diplopoda, Julida, Julidae). *Entomologica Scandinavica Supplement* 40: 1-158.
- ENGHOFF, H. (1993). Cape Verdean millipedes (Diplopoda). *Tropical Zoology* 6: 207-216.
- ENGHOFF, H. & M. BÁEZ (1993). Evolution of distribution and habitat patterns in endemic millipedes of the genus *Dolichoiulus* (Diplopoda: Julidae) on the Canary Islands, with notes on distribution patterns of other Canarian species swarms. *Biological Journal of the Linnean Society* 49: 277-301.
- ENGHOFF, H., W. DOHLE & J.G. BLOWER (1993). Anamorphosis in millipedes (Diplopoda) - the present state of knowledge with some developmental and phylogenetic considerations. *Zoological Journal of the Linnean Society* 109: 103-234.
- ENGHOFF, H. & S.I. GOLOVATCH (1995). A revision of the Siphonocryptidae (Diplopoda, Polyzoniida). *Zoologica Scripta* 24: 29-41.
- GARCÍA, R. & J.A. GONZÁLEZ (1998). Estudio faunístico de la cueva del Llano de Los Caños (La Palma, Islas Canarias). *Vieraea* 26: 113-119.
- GOLOVATCH, S.I. (1986). The *alluaudi*-group of *Glomeris*, another Macaronesian species swarm in millipedes (Diplopoda: Glomeridae). *Entomologica Scandinavica* 17: 503-509.
- IZQUIERDO, I., A.L. MEDINA & M. DÍAZ (1986). La fauna invertebrada en las cuevas La Labrada y Las Mechas (Tenerife, Islas Canarias). *Vieraea* 16: 309-320.
- JEEKE, C.A.W. (1970). Nomenclator generum et familiarum Diplopodorum: A list of the genus and family-group names in the Class Diplopoda from the 10th edition of Linnaeus, 1758, to the end of 1957. *Monografieën van de Nederlandse Entomologische Vereniging* 5: i-xii + 1-412.
- KIME, R.D. (1990). A provisional atlas of European myriapods Part 1. *Fauna Europaea Invertebrata* 1: 1-109.
- KORSÓS, Z. & H. ENGHOFF (1990). The *Cylindroiulus truncorum*-group (Diplopoda: Julidae). *Entomologica Scandinavica* 21: 345-360.

- LATZEL, R. (1895). Beiträge zur Kenntnis der Myriopodenfauna der Selvages und den Canarischen Inseln. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten* 12, Beiheft: 113-122.
- LOHMANDER, H. (1955). Die Arthropodenfauna von Madeira nach den Ergebnissen der Reise von Prof. Dr. O. Lundblad Juli-August 1935. XXXIV. Diplopoda. *Arkiv för Zoologi Ser. 2* 9,1: 1-65.
- LOKSA, I. (1967). Diplopoden aus den Sammlungen von Prof. Dr. H. Franz auf den Kanarischen Inseln. *Opuscula Zoologica Budapest* 7: 133-145.
- MARTÍN, J.L. (1989). Fauna invertebrada del Parque Nacional de Timanfaya (Lanzarote - I. Canarias). *Servicio Publicaciones de la Caja General de Ahorros de Canarias* 145 (Investigación 36): 1-166.
- MARTÍN, J.L. (1992). *Caracterización ecológica y evolución de las comunidades subterráneas en las islas de Tenerife, El Hierro y La Palma* (Canarias). Tesis, Departamento de Biología Animal, Universidad de La Laguna, 342 pp.
- MARTÍN, J.L., P. OROMÍ & J.J. HERNÁNDEZ (1986). El tubo volcánico de la Cueva de San Marcos (Tenerife, Islas Canarias): origen geológico de la cavidad y estudio de su biocenosis. *Vieraea* 16: 295-308.
- MAURIÉS, J.-P. (1990). Diplopodes de la péninsule ibérique: Deux espèces nouvelles du genre *Ceratosiphys* Ribaut, 1920 (Diplopoda, Craspedosomida, Opisthocheiridae). *Miscellanea Zoológica* 14: 115-123.
- NGUYEN DUY-JACQUEMIN, M. (1996). Systématique et biogéographie des diplopodes pénilles des îles Canaries et du Cap Vert. *Mémoires du Muséum national d'Histoire naturelle, Paris* 169: 113-126.
- POCOCK, R.I. (1893). Report upon the Myriopoda of the 'Challenger' Expedition, with remarks upon the fauna of Bermuda. *Annals and Magazine of Natural History* 6. Ser. 11: 121-142, 1 pl.
- READ, H. (1989a). New species and records of the *Cylindroiulus madeirae*-group, with notes on phylogenetic relationships (Diplopoda, Julida, Julidae). *Entomologica Scandinavica* 19: 333-347.
- READ, H. (1989b). The *Cylindroiulus perforatus*-group, with the description of a new species and notes on variation within *C. perforatus* Verhoeff, 1905 (Diplopoda, Julida, Julidae). *Entomologica Scandinavica* 20: 243-249.
- SILVESTRI, F. (1947). Ridescrizione del genere *Cynedesmus* O.F. Cook (Diplopoda, Polydesmoidea). *Bollettino del Laboratorio di Entomologia Agraria Portici* 7: 93-96.
- STEPHENSON, J.W. (1960). The biology of *Brachydesmus superus* (Latz.) (Diplopoda). *Annals and Magazine of Natural History*, 13th Ser. 3: 311-319.
- VERHOEFF, K.W. (1926-32). Klasse Diplopoda. *Bronn's Klassen und Ordnungen des Tierreichs* 5(2), I-XII + I-VI + 1-2084.
- WALDÉN, H.W. (1984). On the origin, affinities, and evolution of the land Mollusca of the Mid-Atlantic islands, with special reference to Madeira. *Boletim do Museu municipal do Funchal* 36, 158: 51-82.

species which are I: endemic to a single island, C: endemic to the Canary Islands, M: endemic to Macaronesia s.s. (Canaries, Selvages, Madeira and Azores).

	Lanzarote	Fuerteventura	Gran Canaria	Tenerife	La Gomera	La Palma	El Hierro	endemic
ORDER POLYXENIDA, FAMILY POLYXENIDAE								
<i>Polyxenus fasciculatus</i> Gay, 1821			+	+	+	+	+	
<i>Polyxenus oromii</i> Nguyen Duy-Jacquemin, 1996		+	+	+	+	+	+	C
<i>Macroxenus enghoffi</i> Nguyen Duy-Jacquemin, 1996		+						M
<i>Polyxenidae</i> indet.								
FAMILY LOPHOPROCTIDAE								
<i>Lophoproctus inferus maurus</i> Marquet & Condé, 1955		+	+	+				
ORDER GLOMERIDA, FAMILY GLOMERIDAE								
<i>Glomeris alluaudi</i> Brölemann, 1901				+	+	+	+	
<i>Glomeris canariensis</i> Golovatch, 1986				+	+	+	+	
<i>Glomeris gomerana</i> Attems, 1911				+	+	+	+	
<i>Glomeris</i> spp.			+	+	+	+	+	
ORDER POLYZONIIDA, FAMILY SIPHONOCRYPTIDAE								
<i>Hirudicryptus canariensis</i> (Loksa, 1967)				+	+			M
ORDER CHORDEUMATIDA, FAMILY OPISTHOCHERIDAE								
<i>Ceratosiphys poculifer</i> (Brölemann, 1920)			+					
ORDER POLYDESMIDA, FAMILY PARADOXOSOMATIDAE								
<i>Oxidus gracilis</i> (C.L. Koch, 1847)			+	+	+	+	+	
<i>Oranmorpha guerini</i> (Gervais, 1837)		+	+	+	+	+	+	
<i>Sfosatea italica</i> (Latzel, 1886)			+	+	+	+	+	
FAMILY POLYDESMIDAE								
<i>Brachydesmus proximus</i> Latzel, 1889		+	+	+	+	+	+	
<i>Brachydesmus superus</i> Latzel, 1884		+	+	+	+	+	+	
<i>Polydesmus coriaceus</i> Porat, 1871			+	+	+	+	+	
<i>Polydesmus laevidentatus</i> Loksa, 1967				+	+	+	+	
<i>Polydesmus</i> n.sp.?				+	+	+	+	
<i>Polydesmus</i> n.sp.?				+	+	+	+	
<i>Polydesmidae</i> genus?				+	+	+	+	
<i>Polydesmidae</i> genus?				+	+	+	+	
FAMILY PYRGODESMIDAE								
<i>Cynedesmus formicola</i> Cook, 1896			+	+	+	+	+	M
ORDER JULIDA, FAMILY BLANIULIDAE								
<i>Choneiulus palmatus</i> (Nemec, 1895)				+	+	+	+	
<i>Choneiulus subterraneus</i> (Silvestri, 1903)				+	+	+	+	
<i>Nopoiulus kochii</i> (Gervais, 1847)				+	+	+	+	
<i>Proteroiulus fuscus</i> (Am Stein, 1857)				+	+	+	+	
<i>Acipes franzi</i> (Loksa, 1967)				+	+	+	+	C
<i>Bianiulus guttulatus</i> (Fabricius, 1798)				+	+	+	+	
FAMILY JULIDAE								
<i>Brachyiulus pusillus</i> (Leach, 1815)				+	+	+	+	
<i>Brachyiulus lusitanus</i> (Verhoeff, 1898)				+	+	+	+	



Figures 1-5. *Cynedesmus formicola* Cook, 1896. (17+14°) from La Gomera. - 1. lateral view. - 2. collum and body rings 2-5, dorsal. - 3. left porostele on body ring 7. - 4. prozonal sculpture. - 5. limbus. - Scales: figs. 1-2: 0.1mm; figs. 3-5: 0.01mm

Fecha de recepción: 21 octubre 1998

Fecha de aceptación: 15 diciembre 1998

Consideraciones acerca del género *Pennisetum* en Canarias (Magnoliophyta, Poaceae)

JORGE ALFONSO REYES-BETANCORT, M. CATALINA LEÓN ARENCIBIA & ANTONIO GARCÍA GALLO

Departamento de Biología Vegetal (Botánica). Universidad de La Laguna. 38271 La Laguna. Tenerife. Islas Canarias.

REYES-BETANCORT, J.A., M.C. LEÓN ARENCIBIA & A. GARCÍA GALLO (1999). Considerations about the genus *Pennisetum* (Poaceae) in the Canary Islands. *VIERAEA* 27: 205-216.

ABSTRACT: A biosystematic study of *Pennisetum* J.M.C.Rich. in Pers. (Cenchrinae, Paniceae, Panicoideae, Poaceae) in the Canary Islands is presented. Considerations about the morphology, nomenclature as well as ecology, chorology and phytosociology are made. *P. clandestinum* is reported for the first time from the Canary Islands (Tenerife and Gran Canaria).

Key words: Poaceae, *Pennisetum*, flora, morphologic, nomenclature, ecology, chorology, Canary Islands.

RESUMEN: Se presenta un estudio biosistemático de los taxa de *Pennisetum* J.M.C.Rich. in Pers. (Cenchrinae, Paniceae, Panicoideae, Poaceae) en Canarias. Además se hacen consideraciones morfológicas, nomenclaturales, ecológicas, corológicas y fitosociológicas. Se cita por primera vez, *P. clandestinum* para las Islas Canarias (Tenerife y Gran Canaria).

Palabras claves: Poaceae, *Pennisetum*, flora, morfología, nomenclatura, ecología, corología, Islas Canarias.

INTRODUCCIÓN

Pennisetum es un género de Poaceae (Graminae) fundamentalmente tropical. 80 especies, que se localizan en bosques, sabanas e incluso en lugares donde crecen las consideradas malas hierbas. Los caracteres que definen a *Pennisetum* son: espiguillas bifloras reunidas en grupos de 1 a 4, encerradas en un involucre de cerdas más o menos filiformes, libres en toda su longitud. Es muy variable y está cercanamente emparentado con *Cenchrus* L., sobre todo a través de las especies africanas, que a veces son difíciles de separar. Hemos seguido a Clayton & Renvoize (1986), que separan estos taxa genericos en función de la morfología de las cerdas o setas de los involucros: *Cenchrus* con cerdas aplanadas y connadas en la base, las cuales forman una especie de copa; y *Pennisetum* con cerdas filiformes y libres, que no constituyen copa.