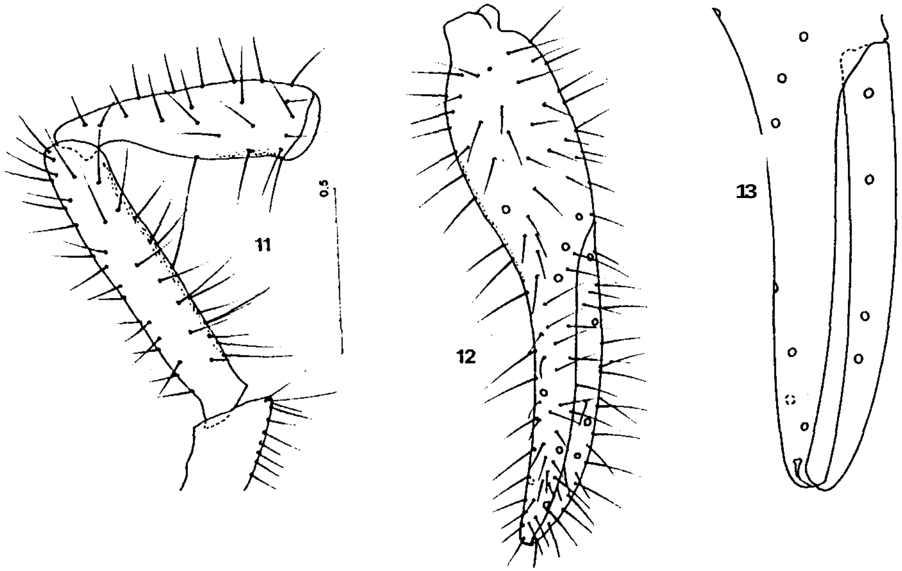
longueur de la pince avec pédicule 1,54-1,59; patte ambulatoire I: basifémur 0,47/0,10-0,12, télofémur 0,28-0,29/0,08-0,10, tibia 0,42-0,45/0,07-0,08, basitarse 0,23-0,24/0,06, télotarse 0,29-0,33/0,05; patte ambulatoire IV: fémur 0,73-0,76/0,17-0,19, tibia 0,64-0,65/0,09-0,11, basitarse 0,28-0,30/0,07-0,08, télotarse 0,35-0,37/0,06-0,07

Pseudoblothrus vulcanus n.sp. se distingue de l'espèce *oromii* n.sp. par des pattes-mâchoires plus élancées, une taille légèrement plus grande, des yeux un peu plus développés, la projection antérolatérale de la hanche I est plus épaisse et pourvue de spicules. Outre cela une différence semble exister dans le



Figs. 11 à 13: *Pseudoblothrus vulcanus* n.sp.; pédipalpe gauche

développement des tarses des pattes ambulatoires: chez *vulcanus* les télotarses I et IV sont relativement plus longs que les basitarses (1.26-1.37 resp.1,16-1.31) que chez *oromii* (1,50-1,64 resp. 1,36-1,42). Cette différence pourrait indiquer une séparation génétique bien établie de ces deux espèces, qui sont issues, à une époque assez récente, d'une souche ancestrale commune. Les îles de l'archipel des Açores sont toutes d'origine volcanique, Sao Jorge et Terceira font partie du groupe central, qui s'est probablement formé vers la fin du Miocène et qui a émergé durant le Pliocène.

Par la présence d'une glande sternale *oromii* (ci probablement aussi *vulcanus*) se rapproche de *P.strinatii* du Jura suisse, jusqu'ici seule espèce connue avec une telle glande abdominale. Ces espèces sont bien distinctes par d'autres caractères morphologiques et morphométriques.

BIBLIOGRAPHIE

BEIER, M. 1963. Ordnung Pseudoxorpionidea (Afterskorpione). Bestimmbücher Bodenfauna Europas 1: 313p.

-- 1969: Reliktformen in der Pseudoscorpioniden-Fauna Europas. Memorie Soc.ent.ital. 48:317-323.

MAHNERT,V.sous presse.Les pseudoscorpions (Arachnida) des grottes des Iles Canaries, avec description de deux espèces nouvelles du genre *Paraliochthonius* Ucier.Mém.Biospéol. 16

OROMI, P. J.L.MARTIN, N.P.ASHMOLE 1988.Las cavidades volcanicas en las Islas Azores. Actas las. Jornadas Atlanticas Mcio Ambiente.Angra do Heroismo,Jan 1988.

VACHON. M. 1954: Remarques morphologiques et anatomiques sur les Pseudoscorpions (Arachnides) appartenant au genre *Pseudoblothrus* (Ucicr) (Fam. Syarinidae J.C.C.). Bull. Mus. natn. Hist. nat. Paris, 2e sér.,26 (2):212-219.

-- 1969: Remarques sur la famille des Syarinidae J.C.Chamberlin (Arachnides, Pseudoscorpions) à propos de la description d'une nouvelle espèce: *Pseudoblothrus thiebaudi* ,habitant les cavernes de Suisse. Revue suisse Zool.76: 387-396.

Vieraea 18: 171-187
Junio 1990

ISSN 0210-945X

Arthropods of recent lava flows on Lanzarote

N. P. ASHMOLE*, M. J. ASHMOLE*& P. OROMÍ**

**Department of Zoology, Edinburgh University, West Mains Road, Edinburgh EH9 3JT, Scotland, U.K. **Departamento de Biología Animal (Zoología), Universidad de La Laguna, Islas Canarias*

(Aceptado el 15 de Enero de 1988

ASHMOLE, N. P., ASHMOLE, M. J. & OROMÍ, P., 1990. Arthropods of recent lava flows on Lanzarote. *Vieraea* 18: 171-187

ABSTRACT: Trapping and searching was used to investigate the arthropods of historic lava and adjacent islotes on Lanzarote. Recent lava away from the coast is poor in numbers of individuals and of species. Very close to the coast there are abundant Collembola and also a variety of larger arthropods, especially flightless Melyridae (Coleoptera), flightless Gryllidae (Orthoptera) and Isopoda (Crustacea). Islotes of older rocks have richer communities in which Diptera and Coleoptera are abundant but Collembola relatively scarce.
Key words: Arthropods. lava flow, cave, aeolian ecosystems, Timanfaya. Lanzarote, Canary Islands.

RESUMEN: Se utilizó un muestreo por trampeo y búsqueda para investigar la fauna de artrópodos de las lavas históricas y los islotes adyacentes en Lanzarote. La lava reciente alejada de la costa es pobre tanto en número de individuos como de especies; sin embargo muy cerca de la costa hay abundantes colémbolos y una amplia variedad de artrópodos de mayor tamaño, especialmente Isopoda (Crustacea) y ciertos insectos no voladores como Melyridae (Coleoptera) y Gryllidae (Orthoptera). Los islotes de rocas más antiguas sustentan comunidades más ricas en las que abundan coleópteros y dípteros, mientras que los colémbolos son relativamente escasos.
Palabras clave: Artrópodos, colada de lava, cueva, ecosistemas eólicos, Timanfaya. Lanzarote, Islas Canarias.

INTRODUCTION

The Parque Nacional de Timanfaya, on Lanzarote. Canary Islands, Spain, was established primarily because of the spectacular volcanic phenomena that it displays However, the lava flows and cinder cones of the park also have considerable biologica interest. KUNKEL (1981) has discussed the plant life of the park, and we report here on some preliminary investigations, in 1984 and 1985, of the arthropods living in the park and on similar areas nearby. We also include data on arthropods found during brief investigation of a lava tube in historic lava outside the park.

As Fig. 1 shows. the eruptions between 1730 and 1736 (and smaller ones in 1824) covered almost exactly a quarter of the island of Lanzarote (and almost the whole of the area that is now park) with lava and pyroclastic materials. Most of the recent lava is of the chaotic and jagged "aa" type. but there are some areas of the smoother "pahoehoe" lava (see MacDONALD, 1953). The volcanic deposits presumably sterilized the ground completely, but some old high volcanoes and some relatively flat areas were surrounded by ncw lava or pyroclasts without being coinpletely covered. These are perhaps best referred to as "kipukas", following the Hawaiian ierniinology (MUELLER-DOMBOIS et al., 1981), but on Lanzarote they are known as "islotes" of oldcr rock cincrging íroiii tlie surrounding rccciii "mar de lava".

Although recent lava ílows lack aiiy type of soil and are inhospitable for higher plaiits, colonization by microorganisms, licliens, and to some extent mosses seems to be possiblc almost at once, if adequate moisture is available (HENRIKSSON & IIODGEHS, 1978). On Lanzarote succession is doubtless helped by tlie accumulation of dust from the Sahara, which probobly arrives at a rate of several centinietres per 1000 years (SCHÜTZ et al.. 1981). The resultant dust deposits hold moisture, and are colonized by mosses aiid occasionally by higlicr plaiits. Indeed, KUNKEL (1981) points out that almost 400 plant species occur in the park. Apart froiii licliens, howcvcr, these plaiits are extremely scattered, and contribute little to the productivity *oí* the area. Licliens must achieve substantial priiiiary productioii where they are abundant, but populations oí licrbivorcs iii zones with licliens seem to be vcry sparse.

Because priiiiary production is so low on recent lava flows, and in dry climates succession is slow, tliese *areas can for some time be reasonably included in the* category *oí* "aeolian ecosystems" (EDWARDS, 1987), which are those where animal life depends iiiaiiily on tlie input of windborne organic material (which we refer to as "biological fallout" or "manna"). The resident animals are almost all carnivores or scavcngcrs. and their food consists mainly of windborne pollen, spores, seeds, plant fragments, nutrient particles derived from tlic sea and more productive land, aiid a wide variety of aerially dispersing arthropods (rcvicw in EDWARDS, 1987).

Colonization of the liistoric lava flows may have taken place partly íroiii populations thai survived on the islotes (cf. KUNKEL, 1981, p. 16), bui was probably mainly íroin the peripheral areas of older rocks. Some coastal animals inay have arrived by sea, aiid colonization by air would be possiblc for certain spiders aiid mites. Howcvcr. most members of tlic resident inland community are incapable of flight and evidently colonized the recent lava by walking on to it after it had cooled, or in some cases perhaps by travelling underground through tlie "MSS", íroiii tlie French term "milieu souterrain supcrficicl" (JUBERTHIE, 1983), which in English can be rendcred as the "mesocavernous shallow stratum" (cf. HOWARTH, 1983; OROMI, MEDINA si MARTIN, iii press). It has been shown that the fauna characteristic *oí* the MSS frequently occurs also in lava tubes (HOWARTH, 1983; OROMI, MEDINA & TEJEDOR, 1986). It is worth noting that the most practicable way *oí* deinonstrating the existence *oí* this underground movement would be by sampling in lava tubes situated in extensive lava flows. At tlic time oí this study it was thought that no substantial lava tubes wcrc present in tlie park.

The work on Lanzarote discussed in this papcr was carried out in two sections. In 1984 MJA aiid NPA collected samples at three sites on tlie liistoric lava flows, with the aim *oí* comparing the animal communities on these sites witli those on historic flows on Tenerife (ASHMOLE & ASHMOLE, 1987). The rcsults showed that tlie composition oí the fauna varied with tlic distance íroiii tlie sea and tliat in Tenerife there werc striking differences in tlic faunas of kipukas and tlie surroundiig recent lava. The work that we carried out together on Lanzarote in 1985 was planned taking these results into account. We obtained series of samples at different distances íroiii tlie coast aiid sampled two kipukas (see sampling sites).

In order to obtain an idea of tlic kind *oí* subtcrraiieaii fauna that could occur in tlie Timanfaya lava, we undertook saiiipliiig in 1985 in the Cueva de los Naturalistas, probably tlie most appropiate place for such a study despite its distaiice íroin tlie park (see Fig. 1).

COLLECTING METHODS

We used a trapping period oí four days and four different collecting methods. As we have discusscd elsewhere (ASHMOLE si ASHMOLE, 1987) each of tliese methods tends to be biassed toward tlic capture of *different groups oí* invertebrates. The use *oí* all four methods at each site, however, probably rcsults iii the capture *oí* representatives of most invertebrate taxa that play an important role iii the local community. Exceptions to our standard sampling routine are mentioned in the accounts of the sites concerned.

1. **Pitfall traps.** These traps wcrc screw-top straight-sided plastic jars oí 4.2 cm diameter and 8 crn depth, aiid contained 50 ml *oí* a 5% solution oí formalin (40% formaldehyde) in water with a little detergent. The traps wcrc shaded íroiii direct sunlight. Six wcrc used at each site in both years.
2. **Bottle traps wiih Turquin's liquid.** These were *250* ml disposable glass becr bottles witli 50 ml of Turquin's liquid (TURQUIN, 1973), designed to be attractive to arthropods. The modified form that we use consists of 10 g chloral hydrate, 5 ml formalin, 5 ml glacial acetic acid, 1 ml liquid detergent aiid water to 1 litre. Three *oí* these traps werc used at each site.
3. **Bottle traps with chcese.** Thc same type of bottle was used as with Turquin's liquid, but tlie bait was about 3 g *oí* "Danish Blue" cheese. Three of these traps were used at each site.
4. **Visual searches.** These wcrc carried out in the vicinity of tlie traps in daylight and iiornially lasted for a total oí 1.5 h at each site: this time was always split between two or more people.

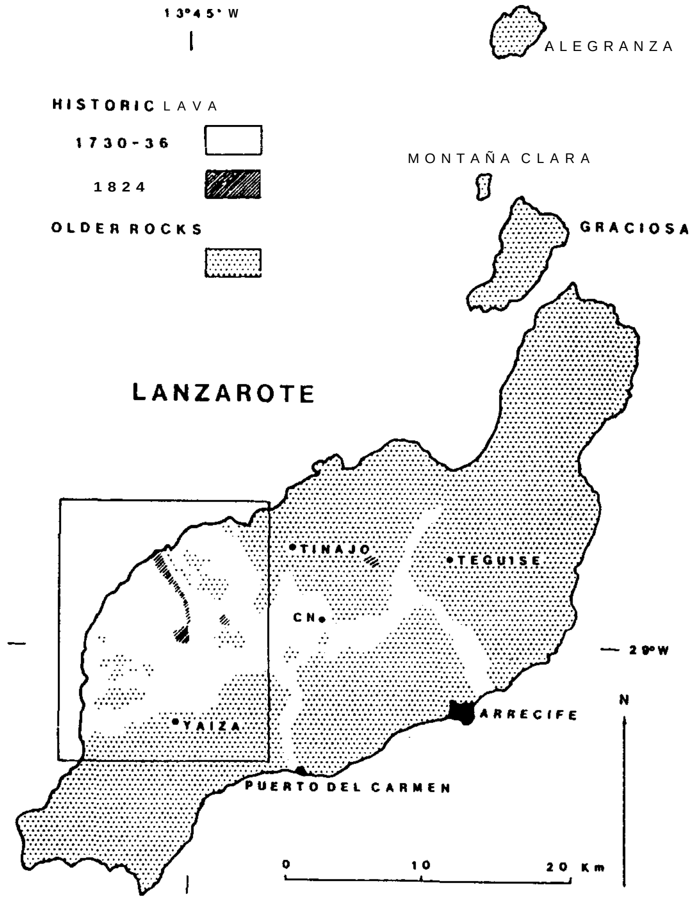


Figure 1. Map of Lanzarote showing the approximate extent of the historic lava flows (Based on Atlas Básico de Canarias). CN: Cueva de los Naturalistas.

SAMPLING SITES

Sampling in 1984 was at three sites (Lago de Lava. Malpals interior and Malpaís costero). In 1985 we made systematic collections at eight new sltes (including one cave) and put out a íew iraps at a ninth (Pleitito); we also returned to Lago de Lava to put traps iii deep cracks. The 1984 sites are inentioned oiily briefly since they are fully described iii ASHMOLE & ASHMOLE (1987). Some English names íor sites that were used in that papcr or iii correspondeiice with specialists are given in parenthesis.

It is possible that the lava at one or more oí our sampling sites dates from the 1824 eruption rather than the 1730-36 eruptions (compare Figs. 1 and 2); unfortunately we could not determine the precise bouiidaries oí the 1824 flows (see HAUSEN, 1959) and have thereíore not indicated them on tlie large-scale map (Fig. 2).

Lago de lava (Lava lake) 1984 and 1985
UTM reí. FT232088, 350 m a.s.l. More than 7 km from tlie sea. A shallow basin oí historic lava oí relatively smooth "pahoehoe" type, but with crevasse-iike cracks. Lichen coverage about 10%. In 1985 tlie purpose oí tlie sampling here was inainly to see whether tlie coniposition oí tlie fauna in the cracks was different from that found on the surface iii the previous year. We did not use pitfall iraps or make a visual search, but used strings to lower six bottles witli Turquin's liquid and six witli cheese into the cracks (max. depih 5.3 m).

Malpaís interior (Inland malpaís) 1984
UTM reí. FT214100, 290 m a.s.l. On historic "aa" lava iiearly ti kiii from tlie sea; with lichen coverage avcragiiig around 50%.

Malpals costero (Coastal Malpaís) 1984
UTM reí. FT188158 (incorrectly quoted in ASHMOLE & ASHMOLE, 1987 as FT190150), ca. 18 m a.s.l. Aboui 200 m írom the sea; lava type similar to that at Malpaís interior. but witli hardly any licliciis.

Orilla (Seaside) 1985
UTM reí. FT189152, ºs m a.s.l. All the iraps were less than *20* m írom the sea and within the zone affected by salt spray. The lava reaching the sea here is oí rough "aa" type. with no iichens and hardly any moss.

Posadero (Gullrock) 1985
UTM reí. FT190150, ca. 18 m a.s.l. Aboui 200 ni inland aiid about 500 m northeast oí Malpals costero. No licliciis or mosses seen. With an onshore wind tlie tang oí salt iii the air was very noticeable.

Barranco 1985
UTM ref. FT194150, ca. 20 m a.s.l. About 500 ni inland. A iow-lying area oí very dissected sharp "aa" lava. A few tiny patches oí moss and some small lichens in dcep places. The only vascular plant that we saw was a single Iarge bush oí Launaea arborescens (Batt.) Murb.

Esquina (Corner) 1985
UTM reí. FT216120, 180 ni a.s.l. This site is 4 km inland on tlie park boundary southeast oí Caldera Bermeja. It is a very dissecied area oí lava, but with no deep cracks. Lichens. inainly Stereocaulon vesuvianum Pers., are abundant on the north sides oí tlie rocks. with a total cover oí about 15%. There is a little moss and along ihe side of tlic nearby track are a few Launaea arborescens.

Islote Halcones 1985
UTM reí. FT153090, 108 m a.s.l. A remote kipuka in the southwest oí the national park. It is a boonierang-shaped ridge oí old volcanic rock, about 0.7 km long, around which the 1730-36 lava flowed, enclosing it on all sites and isolating it thoroughly írom otlier vegetated areas. We doubled our trapping sample here, putting one set of traps on tlie east aiid onc on ihe west of tlie ridge; visual searching was increased from the normal 1.5 hr to 2.5 hr. There are only scattered plants on tlie ridge, giving about 1-5 % cover, but on some parts oí the sides Euphorbia balsamifera Aiton is well established; a variety oí other plants have been recorded by KUNKEL (1981). Lizards are fairly abundant and we saw evidence oí rabbits; a pair oí ravens (Corvus corax) apparently nest on the islote.

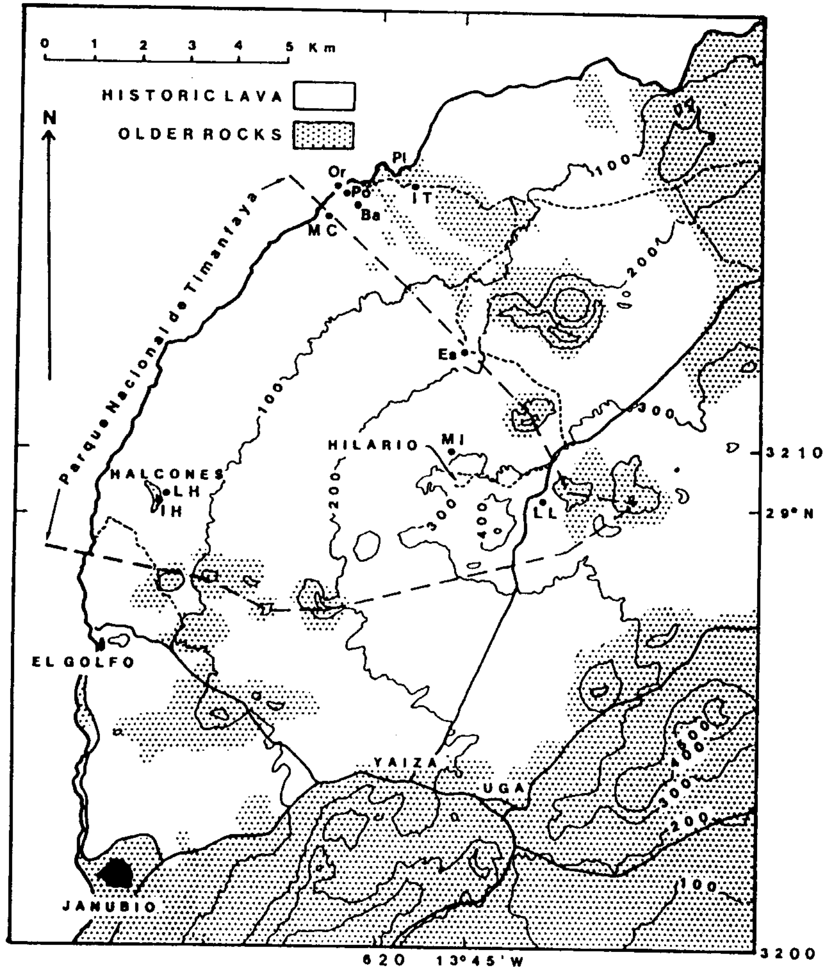


Figure 2. Map oí the Parque Nacional de Timanfaya and surrounding area. Contours are at 100 m intervals. For clarity, only principal roads and selected tracks are shown. Stippling indicates aproxiiiiatcly the arcas that were *not* covered by new volcanic deposits during tlic historie eruptions. From various sources. Lava flows of 1824 are not shown because their boundaries are not established.

Abbreviatioiis: LL: Lago de Lava; Mi: Malpaís interior; MC: Malpaís costero; Or: Orilla; Po: Posadero; Da: Barranco; Es: Esquina; IH: Islote Halcones; LH: Lava Halcones; IT: Islote Tabaibas; Pl: Pleitito; CN: Cueva de los Naturalistas.

Lava Halcones 1985

UI'M reí. FT154090, 66 m a.s.l. This site is about 100 ni írom the northeast edge oí Islote Halcones, in tlie historic lava ílow. It is very rough "aa" lava, with some deep cracks. Lichen (Stereocaulon vesuvianum) is patcliy but abundant and covers up to 50% oí ihc rock surfacc in a fcw small arcas. There are some small accumulations oí dust, in which moss grows. We put out a double set oí traps here. to provide a fair comparison with Islote Halcones, but two bottle traps with Turquin's liquid were lost dowii deep cracks; visual searching was for 2.5 lir.

Islote **Tabaibas** 1985

UTM reí. FT204154, ca. 30 m a.s.l. This site is about 400 m inland and in a large, irregular and relatively flat islote just nortli of tlie iiiain expanse oí recent lava in the national park; it extends íroin Caldera Blanca, 4 km inland, down to thc shore. The site includes a low rocky ridge and a bowl-shaped arca witli loose rocks and ac-cumulated dust. There is about 40% covcr oí shrubs, dominated by Euphorbia spp., but there are virtually no herbs. Rabbit droppings are numerous. Sampling was carried out here in order to provide a comperison wiih tlie transect on the historie lava nearby; unfortunately we did not have time to do visual searching at this site.

Cueva dc los Naturalistas 1985

UTM reí. FT3010, 325 m a.s.l. A volcanic tube situated in the Malpaís de Tizalaya, between Masdache aiid Lo Vegucta (Fig. 1). The lava was formed during tlie eruption oí 1730-36. Tlie lava is of typical pahoehoe type, now covered by a dcnsc growth oí lichens niainly Stereocaulon sp., Parmelia sp. and Xanthoria sp. aiid by some higher plants typical oí rocky habitats such as Aeonium sp. The cave, with a total length oí about 1640 m, has two entrances, both communicating with a large main tube; a narrower secondary blind tube branches olí tliis and is rather more difficult oí access (see MARTIN & DIAZ, 1985). It is vcry near the surface and witli frequent small openings which allow the penetration oí some light írom outside, and the temperature is liigh (around 23 °C) in comparison witli other caves. Our standard set oí traps was split between two stations, both iii tlic secondary tube; the first was in twilight and the secoiid further iiito the cave in a totally dark zone. Only a few niinutes searching was done in tlie cave, at the first station.

Pleitito 1985

UTM reí. FT203157, ca. 10 m a.s.l. This site was on a steep slope oí old rocks just above the intertidal zone, north-northwest o(Islote Tabaibas. We put out a few traps at tliis site, but there werc various problems and wc therefore do not present tlie data systeiiiatically. Ilowever, a few specics found here are mentioned in the taxonoinic section.

RESULTS

The general coinposition oí tlie samples is sliown in Table I, mainly at tlie ordinal level but with some orders divided where tliis seemed appropriate. A summary oí the data íor each site is givcn in Table II. The sites are most readily compared. however. by reference to Figs. 3 and 4, whicli show the relationship between the nuniber oí individuals and tlie number oí species íouiid at cach site. In this analysis we have included tlic samples obtained by scarcliiiig, since these were important in adding extra specics, especially oí spiders; wc have also included in Lago de Lava the animals caught in extra trapping in cracks in 1985, since these cracks are an inportaiit part oí the habitat that was not sampled in 1984. Fig. 3A includes all the data, while Fig. 3B shows tlie picturc after elimination of the Collembola; these were extremely numerous at Posadero, Orilla. aiid Malpaís costero, three sites which form a clear group in Fig. 3A, with liigh abundance but low species richness. Islote Tabaibas and Islote lialcones, tlic two sitcs on older rocks, are linked by their high species richness, and in Fig. 3A also by high abundance; however, this is caused by large niinibers oí Diptero in Islote Tabaibas but oí Collembola iii Islote Halcones. The Figs. 3A aiid 3B data show the low diversity oí the recent lava sites and the generally higher abundances closcr to tlie sea (see below). The relatively liigh number oí species at Lago de Lava probably reflects the greater structural coiiiplexity oí this habitat and perhaps also its closeness to larger areas of older substrates (see Fig. 2); tlie extra sampling at tliis site may also have liad some effect.

Table I. Total nuinher oí individuals and (in parenthesis) species oí arthropods obtained in all sampling at each site. For Lago de Lava data íor 1984 and 1985 are combined. No searching was done at Islote Tabaibas and oiily a little at Cueva de los Naturalistas (see text).

Nos. including search	Lago de lava	Malpaís interior	Malpaís costero	Orilla	Posadero	Barranco	Esquina	Lava Halcones	Islote Halcones	Islote Tabaibas	Cueva de los Naturalistas
Preudorcorpionei	-	-	-	-	-	-	1 (1)	-	-	-	1 (1)
Opiliones	-	-	-	-	-	-	-	-	-	2 (1)	-
Araneae	5 (3)	-	-	4 (1)	1 (1)	2 (2)	2 (2)	-	10 (3)	4 (2)	7 (2)
Acari	4 (1+)	1 (1)	-	-	-	2 (1+)	2 (1+)	3 (1+)	24 (1+)	13 (1+)	-
Isopoda	1 (1)	1 (1)	-	30 (3)	-	1 (1)	7 (1)	2 (1)	1 (1)	5 (1)	3 (1)
Diplopoda	-	-	-	1 (1)	-	-	-	-	-	-	-
Collembola	ca.58(4)	ca.31(3)	329(1)	871 (2)	1566 (4)	15 (1)	ca.30(3)	ca.84 (5)	ca.268(5)	24 (1)	13 (1)
Thyianura (Microc.)	-	-	-	2 (1)	-	-	-	-	-	-	-
Thysanura (Zygent.)	15 (1)	4 (1)	59 (1)	-	12 (1)	23 (1)	-	11 (1)	3 (1)	1 (3)	-
Orthoptera	6 (1)	-	9 (1)	33 (1)	3 (1)	15 (1)	-	6 (1)	3 (2)	1 (1)	9 (1)
Procoplera	1 (1)	-	-	-	-	1 (1)	2 (1+)	1 (1)	-	3 (2+)	-
Homoptera	-	-	-	-	-	-	-	-	4 (2)	6 (2)	-
Heieropiera	1 (1)	-	-	-	-	-	-	-	-	-	-
Coleoptera	10 (3+)	17 (3)	14 (1)	53 (2)	20 (2)	16 (1)	8 (4)	2 (2)	23 (10)	69 (11+)	-
Lepidoptera	1 (1)	-	-	-	-	-	-	-	3 (2+)	9 (4)	-
Diptera (Nematocera)	-	1 (1)	-					-	1 (2+)	10 (2+)	1 (1)
Diptera (Brach./Cycl.)	7 (4+)	-	2 (2)	-	1 (1)	2 (2)	7 (2+)	8 (2+9	17 (4+)	300 (16+)	71 (1)
ilymenoplera (Formic.)	-	-						-	10 (3)	5 (39)	-
Hymenoplera (other)	-	-						-	2 W	5 (3+)	-

Table II shows tlic high dcgrec oí dominance of Collciiibola in tlie receiit lava sitcs close Io the sea. At most sitcs secoiid place in tlic ordinal rankings is held by Coleoptera or Thysanura, with Diptera, Acari, Orthoptera (Gryllidae) and Isopoda also rcpreseiited in the top tliree places. At all but three of tlie sites more than four-íifths oí the animals collected belong to three orders or less.

A quantitative picture of relationships aniong the sites on a broad taxonomic basis is provided by Table III, which gives a matrix oí values of Kendall's "Tau" index oí rank correlation. GHENT (1963) drew attention to tlic usefulness of this index in comniunity comparisons, and its use is discussed by HUHTA (1979) and ASHMOLE & ASHMOLE (1987). In tlie present study thc analysis wiis based on all animals obtained by trapping aiid searching and was carried out at tlic ordinal level (with a few exceptions). Taxa absent from both members oí a pair of sites werc omitted from that comparisoii. No corrcction lor tics was applied since most tics were at zero abundance in one oí a pair of sitcs: the correction for tics givcs inflated similarity values in this situation.

Tlie highest value of thc indcx is that between Malpaís costero and Posadero, two sitcs only a few hundred metres apart at the same distance from the sea, but sampled at diílcrcni seasons and in different years. These two sites are also linked by high index values to Barranco (a silc in tlie same area but 300 m lurther inland), Lava Halcones (also on rcccnt aa lava fairly closc to the sea), and especially to Lago de Lava (on a rather different typc of lava aiid much íurther inland). Malpaís interior also shows moderate similarity with ihe incnibers oí this group. The only othcr high index value links ihc two older lava sites, Islote Halcones and Islote Tabaibas. The latter site naturally shows vcry little similarity to the rccent lava sites, especially those close to tlie sea. Orilla, right on tlie shore, shows strikingly low index values in coniparisons witli all the other sites, including Posadero only 200 m inland lrom it. Esquina also stands out by its ratlicr low similarity to most other sites: its closest relationship is to Malpais interior, another site lar from the sea where we caught very few animals.

Table II. Suiiiniary of data on diversity aiid dominant taxa for tlie samples from cach site. Sites as in Table I, abbrcviatcd as in Figs. 1 and 2.

SITE	LL	MI	MC	Or	Po	Ba	Es	LH	IH	IT	CN
No. of orderr	12	6	5	7	6	9	8 8	1	1	13	6
No. oí individuals (total)	ca.111	ca.55	413	994	1603	77	ca.59	ca.117	ca.371	459	105
No. of species (total)	23+	10	6	11	10	11+	15+	14+	38+	51+	8
No. indivs. (minus Coll.)	51	24	84	123	37	62	29	13	103	415	92
No. of spp. (minus Coll.)	19+	7	5	9	6	10+	12+	9+	31+	50+	7
Dominance by order:											
First	Collem.	C d h	C d h	Cdlen	Collem.	Thysan.	Collem.	Collem.	Collem.	Dipt.	Dipt.
Second	Thysan.	Coleop.	Thysan.	Coleop.	Coleop.	Coleop.	Coleop.	Thysan.	Acari	Coleop.	Cdlen
Third	Coleop.	Thysan.	Coleop.	Orthop.	Thysan.	Colem./ Orthop.	Isopoda/ Diptera	Diptera	Coleop.	Cdlen	Orthop.
% domin. oí 1st rank	ca.52	ca.56	80	88	98	30	ca.50	ca.72	ca.73	80	68
% dom. oí 1st-3rd rank	ca.75	ca.95	97	96	>99	(70)	(ca.75)	ca.88	ca.86	86	89

Some íurther insights can be obtained by looking at the taxonomic composition oí the samples in more detail (Table I and the Appendix). It is clear that the community at Orilla is distinct from all the others. It is rich in individuals but not in taxa, and although it shares abundance of Collembola with Posadero and Malpaís costero, whicli are 200 m inland, it differs íroni them in the abscnce oí lepismatid Thysanura (but the presence oí some machilids), thc prcsence oí isopods and in the abundance of crickets and two kiiids oí unusual flightless melyrid beetles, Gietella fortunata and Ifnidius petricola. Barranco, which is a little íurther inland than Posadero and Malpaís costero but still in the zone that is virtually lacking in lichens, differed from them inaiiily in the dramatically lower abundance of Collembola.

Table III. Matrix of similarity values for comparisons among the surface sites using Kendall's "tau" rank correlation coefficient. Based on data in Table I.

SITE	LL	MI	MC	Or	Po	Ba	Es	LH	IH	IT
Lava Lake	---	.50	.65	.20	.70	.61	.27	.58	.42	.31
Malpais interior	.50	—	.48	.13	.46	.28	.44	.19	.33	.15
Malpais costero	.65	.48	—	.25	.80	.53	.16	.57	.20	.12
Orilla	.20	.13	.25	---	.36	.22	.24	.05	.05	-.02
Posadero	.70	.46	.80	.36	—	.56	.18	.42	.24	.09
Barranco	.61	.28	.53	.22	.56	---	-.02	.28	.17	.03
Esquina	.27	.44	.16	.24	.18	-.02	—	.13	.29	.36
Lava Halcones	.58	.39	.57	.05	.42	.28	.13	—	.21	.15
Islote Halcones	.42	.33	.20	.05	.24	.17	.29	.21	—	.60
Islote Tabaibas	.31	.15	.12	-.02	.09	.03	.36	.15	.60	—

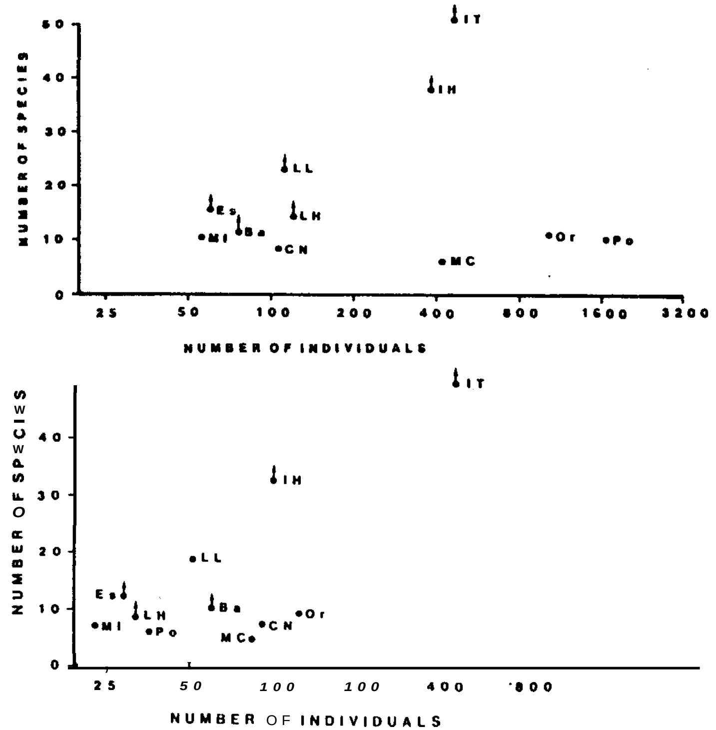


Figure 3. A: Relationship between the number of individuals aiid the number of species of arthropods (including Collembola) recorded from each site. Upward-pointing arrows indicate that numbers of species at these sites were minima, since not all taxa could be worked out to the species level. Abbreviations as in Figs.1 and 2. B: The same as Fig. 3A, but wiih Collembola omitted.

Esquina and Malpaís interior, which are both several kilometres inland and have been colonized by lichens, both seem to have few animals; we did not catch Gryllidae at either and Lepismatidae were absent at Esquina and scarce at Malpaís interior. Lava Halcones had moderate numbers of Collembola, but very few beetles. Lago de Lava, relatively far inland and fairly close to large islotes, had much the most diverse fauna of the recent lava sites. Islote Halcones and Islote Tabaibas, the two sites on much older rocks, differed in that Halcones was an isolated steep ridge with sparse vegetation, while Tabaibas was a gully with a fairly rich Euphorbia community, forming part of a more extensive area of older rocks. Both had few Lepismatidae and Gryllidae, but good representation of a number of groups (such as Acari, Homoptera, Lepidoptera, various Coleoptera and Diptera, and Formicidae) that were hardly present on the historic lava sites.

In 1984 we were intrigued by the fact that our site near the coast (Malpaís costero), in an area where lichens were virtually absent, produced strikingly higher numbers of arthropods than the two sampling sites further inland (Malpaís interior and Lago de Lava), where there was a heavy growth of lichens. In 1985 the four sites Orilla, Posadero, Barranco and Esquina were therefore chosen to investigate the phenomenon further: they formed a transect from the shore to a point 4 km inland, and were all on aa lava. Fig. 5 shows that the 1985 data are in general agreement with those of 1984. Numbers of both Collembola and macro-arthropod scavengers such as isopods, lepismatids, gryllids and beetles are strikingly low at the inland sites in comparison with those near the coast. On this transect there was a dramatic reduction in numbers of Collembola between Posadero, 200 m inland, and Barranco, 500 m inland. Furthermore Seira n. sp., which was so abundant near the coast, was replaced at Barranco by much smaller numbers of its congener, Seira ferrari, which occurred only at inland historic lava sites.

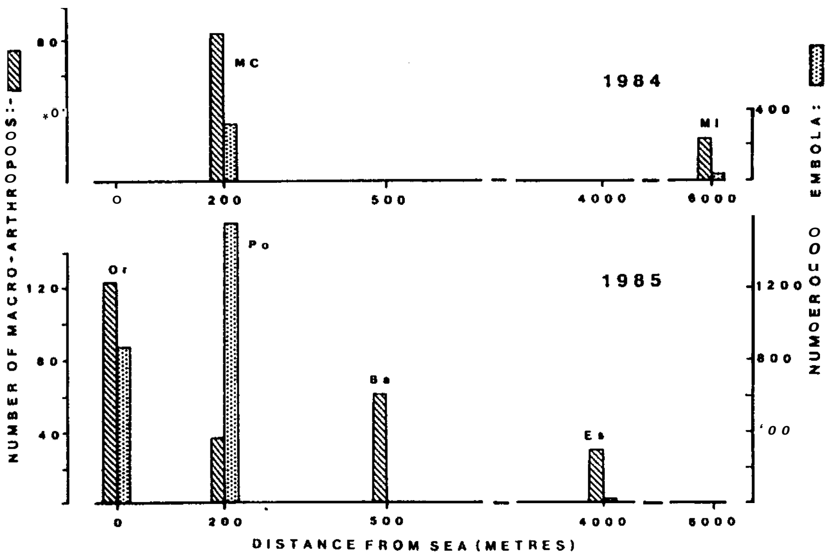


Figure 4. Numbers of Collembola (right-hand scale) and of larger arthropods (left-hand scale) obtained at a series of sites on historic lava differing in their distance from the sea.

COMMENTS ON TAXA OF SPECIAL INTEREST

Only selected taxa are discussed here: a summary of all the invertebrates foun at each site is given in Table 1 and details at the species level are in the Appendix.

ISOPODA: ARMADILLIDAE

Armadillo n.sp. Five individuals found at Orilla are being described by Dr Berndt Hoese as a new species. The occurrence of this species only at this site i somewhat surprising, since its relative A. ausseli Dollfus, which is restricted to th more westerly Canary Islands, is never found near the sea (HOESE, 1984 and pers comm.).

COLLEMBOLA: ENTOMOBRYIDAE

Seira dinizi Gama. This species, recently described by M.M. GAMA (1988) dominates the collembolan communities near the coast, on both the historic lava an the older rocks.

Pseudosinella trioculata Gama. This recently discovered (GAMA, 1988) was re presented by two individuals at Posadero and two at Lava Halcones.

COLLEMBOLA: BOURLETIELLIDAE

Prorastriopes canariensis Paclt. A few individuals were obtained on old rocks a Pleitito.

COLEOPTERA: MELYRIDAE

Gietella fortunata Constantin & Menier, 1987. A new subfamily (Gietellinae) wa established for this species, which has been found also on Hierro and La Palma. O Lanzarote we found adults only at Orilla, but larvae referred to this species als occurred at Posadero (CONSTANTIN & MENIER, in prep.). No Gietella were caught i the few traps set on the coastal old lava at Pleitito, suggesting that this beetle ma be adapted to life near the sea in the species-poor communities on recent lava; i seems to occupy similar habitats on the islands of Hierro and La Palma (MARTIN OROMI & IZQUIERDO, 1987).

Ifnidius petricola Plata-Negrache. This species, originally recorded from E Golfo, Lanzarote (PLATA-NEGRACHE & EVERS, 1987) has not yet been found o other islands in the Canaries, though the genus is represented in Morocco and on th Salvage Islands (EVERS, 1981). Like Gietella, this brachypterous species seems to b well adapted to life on the recent lava, but it is probably not so restricted to th coast. In 1985 adults were found at all three transect stations from Orilla t Barranco; no adults were obtained in 1984, but in both years we trapped substantia numbers of melyrid larvae different from those of Gietella at several sites on th recent lava, including some well inland (see Appendix), and it is likely that these ar referable to Ifnidius. The absence of this species from the islotes of Tabaibas an Halcones suggests that it is a true "lavicole". However, a few individuals were trappe among much larger numbers of Anthicidae on the coast at Pleitito, which is on olde lava but with very few plants.

DISCUSSION

KUNKEL (1981), in his discussion of vegetational succession in the Parqu Nacional de Timanfaya, stated that in areas far from islotes even the initial stage o plant succession, involving establishment of an association of lichens dominated b Stereocaulon vesuvianum, was not apparent in the zone within about 2 km of th coast. KUNKEL also suggested that the first mosses were to be seen between 3 and km inland. In general our observations conform to this pattern, although we did find few lichens and scattered tiny patches of moss relatively close to the coast.

Our sampling of the animals, however, showed a very different situation. Recen lava away from the coast proved to be poor in numbers of individuals and of specie (Table 1 and Figs. 3, 4 and 5). In contrast, very close to the coast there wer abundant Collembola, together with an array of larger arthropod scavengers, dominate by flightless melyrid beetles, flightless gryllids and isopod crustaceans. Our dat suggest that reduction in numbers of Collembola occurs between 200 and 500 m i from the coast (Fig. 5). The community existing close to the coast evidently cannot b supported by primary production of macroscopic terrestrial plants, but there ar several other possibilities.

At present tliere is hardly any iníormation on the microorganisms involved in successional processes on historic lava oí Lanzarote. Studies on the nitrogeii cycie oí the recent volcanic island oí Surtsey, off Iceland (e.g. HENRIKSSON & RODGEIIS. 1978). demonstratc substancial nitrogen fixation by blue-green algae, but this process is unlikely to be so important on Lanzarote since it depends on high humidity. We have, however, demonstrated bacterial activity on the Lanzarote lava: cellulose sticky tape iiiipressioiis, transferred to "marine agar" (DIFCO Laboratories, Detroit, Michigan) and subsequently incubated at 20 "C by Dr. W.D. Grant, sliowed that Posadero and Barranco had significant populations of heterotrophic bacteria.

ASHMOLE & ASHMOLE (1987) suggested that the coastal parts of tlie historic lava on Lanzarotc might rcccive significant quantities oí organic material in the íorni oí marine bacteria concentrated in bursting bubbles at sea and carried over the land in the "sea-salt aerosol" (BLANCHARD, 1983). In 1985 wc aitenipted to find out whetlier input oí tliis kiiid was greater close to the coast. by exposing marine agar plates on small posts at tlie four sites on our sampling transect from Orilla inland to Esquina. Two scrics oí experiments were spoiled respectively by rain aiid intense sun, but single plates exposed for about an hour on the last day of our field work at Orilla. Posadero aiid Barranco each produced a varicty oí bacterial colonies on incubation (W.D. GRANT, pers.comm.). It therefore seems possible that input oí marine bacteria plays a significant role in the maintenance of tlic lava ecosysieni close to tlic sea.

As indicated earlier, wc suppose that in most barren lava íiows on the Canaries the niain resource of the arthropod communities is biological fallout, mainly comprising aerially dispersing arthropods. In 1984 we used water iraps on Latizarote to confirm that some fallout occurred at Lago de Lava (ASIIMOLE & ASIIMOLE, unpublished). It seems unlikely, however, that the recent lava iiear tlie coast rcccives much arthropod fallout, since it is an arca wiili prevalent onshore northerly winds, although there are sometimes pcriods with easterly winds from the Satiara.

Arioiher possibility is simply that high biological activity in the intertidal zone, couplcd with the mobility of individual animals, leads to transfer oí organic material up to a íew hundred metres inland: tliis input could in principle suppori populations of microorganisms and a coiiiiiiuiiity oí arthropods.

At present wc have no basis for judging which oí these processes is most important on tlie historie lava on Lanzarote, and it is clear that much more work is needed before the nutritional basis oí tliis unusual ecosystem is fully understood.

The sampling on Lanzarote in 1984 provided the basis for a comparison between the fauna oí historic lava flows on Teneriíe and Lanzarote (ASHMOLE & ASHMOLE, 1987), aiid the ncw data do not change that picture significantly. In a subsequent study of a recent lava ílow near tlie coast on Hierro Island, MARTIN, OROMI & IZQUIERDO (1987) found that at tlic trapping station closest to the sea ihe most abundant arthropod was the melyrid beetle Gietella fortunata, wliich also occurs on recent lava near the sea on Lanzarote. Oii the Hierro lava ílow Collembola were relatively scarce, the community slightly íurthcr froin tlic sea being dominated by the dermapteran Anataelia lavicola Martín & Oromí; another specics oí Anataelia is typical oí coastal habitats on Tenerife (GANGWERE et al., 1972) aiid is also known íroin Goniera. but ihc genus has not been recordcd from Gran Canaria, Fuerteventura or Lanzarote.

ACKNOWLEDGEMENTS

This work was carried out with grants from thc Nuffield Foundation, tlie British Council aiid Edinburgh University, whose help is gratefully acknowledged. N.P.A. aiid M.J.A. wish to thank tlie Director and staff oí tlie Departamento de Biología Animal (Zoología), Universidad de La Laguna, for their welcome and for tlic provision oí laboratory facilities. Sr. Luis Pascual, who was üirector Conservador del Parque Nacioiial de Timanfaya, kindly gave permission for work in the park, while Sr. Antonio Fernández de Tejada, current Uirector-Conservador of tlic park, provided us with up-to-date details of the park bouiidary. Sr. Esteban Robayna gavc niucli practical help aiid also assisted with the field work. W.D. Grant kindly gave advice and hclp with microbiological techniques.

We are niucli indebted to tlie following people íor identification of specimeiis: M.A. Alonso Zarazaga (Curculionidae); R.R. Askew (Hymenoptera); C. Bach (Thysanura); J. Barquín (Formicidae); K. Bland (Lepidoptera); R. Constantin (Melyridae); R.H.L. Disney (Phoridae); M.M. da Gama (Collembola); G. Gilleríors (Coleoptera); J.M. González (Bryophyta); B. Hoese (Isopoda); M. Ibáñez (Gastropoda); D.K.McE. Kevan (Orthoptera); D. MacFarlane (Acari); A. Machado (Isopoda, Coleoptere); M. Meinander (Psocoptera); J.J. Menier (Melyridae); J.A. Murphy (Gnaphosidae); M. Ranibla (Opiliones); J. Ribes (Heteroptera); L. Sánchez-Pinto (Lichens); G. Schmidt (Araneae); J. Wünderlich (Araneae). Reference material is being kept in the Departamento de Biología Animal (Zoología), Universidad dc La Laguna; type spccimens will be deposited in ihc Museo Insular de Ciencias Naturales de Santa Cruz de Tenerife.

REFERENCES

ASIHMOLE, M.J. & N.P. ASIIMOLE. 1987. Arthropod communities supported by biological fallout on recent lava flows in the Canary Islands. Ent.Scand.Suppl., 32: 67-88.

ASHMOLE, N.P. & M.J. ASIHMOLC. 1988. Insect dispersal on Tenerife, Canary Islands: high altitude íallout aiid seaward driii. Arctic & Alpine Res., 20 (1): 1-12.

BLANCHARD, D.C. 1983. The production, distribution aiid enrichment oí the sea-salt aerosol. In W.G.N. Slinn and P.S. Liss (Eds.) Airsea exchange of gases and particles. U. Reidel Publ.Co., Dordrecht.

CONSTANTIN, R. & J.J. MENIEII. 1987. Étude d'un remarquable Melyridae aptere des iles Canaries: Gietella fortunata, n.gen., n.sp., type d'une sous-famille nouvelle Gietellinae (Coleoptera, Cleroidea). Rev.fr.Ent., (N.S.), 9 (2): 53-63.

DISNEY, R.H.L. 1989. Tliree new specics oí scuttle fly (Diptera, Phoridae) from tlie Canary Islands. Vieraea, 18.

DISNEY, R.H.L. In press. The palaearctic species resembling Megaselia pygmaea (Diptera. Phoridae) including two new spccics. Ann.Entom.Fennici.

DISNEY, R.H.L., M. BAEZ & N.P. ASHMOLE. 1989. A rcviscd list oí Phoridae (Diptera) from ihe Canary Islands. with habitat notes. Vieraea, 18.

EDWARDS, J.S. 1987. Arthropods oí alpinc aeolian ecosystems. Ann.Rev.Entomol., 32: 163-179.

EVERS, A.M.J. 1981. Ifnidius atlanticus n.sp. (Col., Malachiidae) von den Selvagens-Inseln. Entomol.Blätter, 77 (3): 155-157.

GAMA, M.M. da. 1988. Colembolos das Canárias. Act.III Congr.Ibér.Entom., Granada: 73-90.

GANGWEHE, S.K., M. MORALES MARTIN & E. MORALES AGACINO. 1972. Thc distribution oí the Orthoptcroidea in Teneriíc, Canary Islands. Spain. Contr. Amer.Ent.Inst., 18 (1): 1-40.

GHENT, A.W. 1963. Kendall's "Tau" coefficient as an index of similarity in coinparisons oí plant aiid animal communities. Can.Entom., 95: 568-575.

GURNEY, A.B. & D.C. RENTZ. 1978. The cavernicolous fauna of Hawaiian lava tubes. X. Crickets (Orthoptera, Gryllidae). Pacif.Insects,18: 85-103.

HAUSEN, H. 1959. On tlie geology of Lanzarote, Graciosa and the isletas (Canarian Archipelago). Soc.Sci.Fenn., Comm.Phys.Math., 23 (4), 116 pp, 11 pl, map.

HENRIKSSON, L.E. & G.A RODGERS. 1978. Further studies in ihe nitrogeii cycle of Surtsey, 1974-1976. Surtsey Research Progress Report, 8: 30-40.

HOESE, B. 1984. Checkliste der terrestrischen Isopoden dcr Kanarischen Inseln (Crustacea: Isopoda: Oniscoidea). Cour.Forsch. Inst.Senckenberg, 71: 27-37.

HOWARTH, F.G. 1979. Neogeoaeolian habitats on ncw lava flows on Hawaii Island: an ecosysteni supported by windblown debris. Pacif.Insects, 20: 133-144.

HOWARTH, F.G. 1983. Ecology oí cave arihropods. Ann.Rev.Entomol., 28: 365-389.

HUHTA, V. 1979. Evaluation of different similarity indices as measures oí succession in arthropod communities of tlic forest floor after clear-cutting. Oecologia (Berlin), 41: 11-23.

JUBERTHIE, C. 1983. Le milieu souterrain: étendue et composition. Mém.Biospéol., 10: 17-65.

KUNKEL, G. 1981. La vida vegetal del Parque Nacional de Timanfaya, Lanzarote, islas Canarias. 2nd ed. Colección Botánica Canaria, 2. Las Palmas de Gran Canaria. 94 pp.

MacDONALD, G.A. 1953. Pahoehoe. aa, aiid block lava. Am.J.Sci., 251: 169-191.

MARTIN, J.L. & M. DIAZ. 1985. El tubo volcánico de Los Naturalistas (Lanzarote, islas Canarias). Lapiaz, 13: 51-53.

MARTIN, J.L. & P. OROMI. 1989. Dos nuevas especies de Anataelia Bol. (Dermaptera, Pygidicranidae) de cuevas y lavas recientes de El Hierro y La Palma (Islas Canarias). Mém.Biospéol., 15: 49-59.

MARTIN, J.L., P. OROMI & I. IZQUIERDO. 1987. El ecosistema eólico de la colada volcánica de Lomo Negro en la Isla de El Hierro (Is las Canarias). Vieraea, 17: 261-270.

MEINANDEH, M. 1973. The Psocoptera of the Canary Islands. Notulae Ent.. 53: 141-158.

MUELLER-DOMBOIS, D., K.W. URIDGES & H.L CARSON (Eds.). 1981. Island Ecosystems. Biological organization in selected Hawaiian communities. US/IBP Synthesis Scrics no. 15. Hutchinson Ross, Stroudsberg, Pennsylvania, 583 pp.

OKOMI, P., A.L. MEDINA & J.L. MARTIN. in press. Tlie genus Licinopsis Bedel (Col., Caraboidea) in the Canary Islands and its distribution in the underground environment. Mém.Biospéol.

OROMI, P., A.L. MEDINA & M.L. TEJEDOH. 1986. Oii the existence of a superíicial uiiderground compartment iii the Canary Islands. Act.IX Congr.Int.Espeleol. Barcelona, 2: 147-151.

PLATA-NEGRACHE, P. & A.M.J. EVERS. 1987. Revisión del género Ifnidius Escalera con descripción de una especie nueva Ifnidius petricola n.sp. de las Islas Canarias. Ent.Blätter, 83 (2/3): 160-165.

SCHÜTZ, L.. K. JAENICKE & H. PIETREK. 1981. Saharan dust transported over the Norili Atlantic Ocean. Geol.Soc.Amer.Spec.Pap., 186: 87-100.

TURQUIN, M.-J. 1973. Une biocenose cavernicole originale pour le Bugey: le puits de Rappe. C.R.96e Congr.aut.Soc.sav., Toulouse 1971, Sciences, 3: 235-256.

APPENDIX. Systematic list of invertebrates collected on historie lava and adjacent areas on Lanzarote in 1984 and 1985. Main figures indicate the number of individuals caught during scarching.

	Lago de lava 1984	Lago de lava 1985	Malpaís interior	Malpaís costero	Orilla	Posadero	Barranco	Esquina	Lava Halcones	Islote Halcones	Islote Tabaibas	Cueva Naturalistas
GASTROPOOA												
Theba pisana (Müller)	-	-	-	-	-	-	-	-	-	-+1	-	-+1
Canariella *sp.*	-	-	-	-	-	-	-	-	-	-+3	-	-
PSEUDOSCORPIONES												
GARYPIDAE												
Geogarypus canaricnsis (Tullgren)					-	-	-	1	-	-	-	1
OPILIONES												
PHALANGIIDAE												
Bunochelis spinifera (Lucas)		-	-	-	-	-	-	-	-	-	2	-
ARANEAE												
PHOLCIDAE												
Spermophora fuerteventurae Wunderlich	-	-	-	-	-	-	-	-	-	-	-	-+2
Spermophora sp.	-+1	1	-	-	-	-+1	-	-	-	-	-	-
OECOBIIDAE												
Oecobius sp.	2	-	-	-	-	-	-	1	-	7+1	2	-
LINYPHIIDAE												
Indei.	-	-	-	-	-	-		-	-	-	-	-
DYSDERIDAE												
Dysdera sp.	-	-	-	-	4	-	-	-	-	-	-	-
GNAPHOSIDAE												
Scotognapha ? convexa (Simon)	-	-	-	-				-	-	-	2	-
SALTICIDAE												
Phlegra lucasi (Roewer)	-	-	-	-	-	-	-	-+1	-	-	-	-
Pelienes sp.	-	-	-	-	-	-	-+1	-	-	-	-	-
Chalcascyrlus sp.	-+1	-	-	-	-	-	-	-	-	-	-	-
SCYTODIDAE												
Scytodes tenerifensis Wunderlich	-	-	-	-	-	-	-	-	-	-+1	-	-
THERIDIIDAE												
Stealada *grossa* (C.L.Koch)	-	-	-	-	-	-	-	-	-	-	-	-+1
Steatoda sp.	-	-	-	-	-	-	-	-	-	-+1	-	-+4
ACARI												
ANYSTIDAE												
Indei.	2	-	-	-	-	-	2	2	3	22+2	13	-
Fam. indei.	1	1	1	-	-	-	-	-	-	-	-	-
ISOPODA												
PORCELLIONIDAE												
Porcellio laevis Latreille	1	-	1	-	-	-	-	-	-	-	5	-
Porcellionides sexfasciatus (Budde-Lund)	-	-	-	-	-	-	-	-	-	-	-	2+1
ARMADILLIDAE												
Armadillo sp.	-	-	-	-	5	-	-	-	-	-	-	-
HALOPHILOSCIIDAE												
Halophiloscia couchi (Kinahan)	-	-	-	-	6	-	-	-	-	-	-	-
TYLIDAE												
Tylos latreillei Audouin	-	-	-	-	19	-	-	-	-	-	-	-
Fam. indei.	-	-	-	-	-	-	1	7	2	1	-	-
DIPLOPODA												
POLYXENIDAE												
Indet.	-	-	-	-	1	-	-	-	-	-	-	-
COLLEMBOLA												
HYPOGASTRURIDAE												
Xenylla b. brevisimilis Stach	-	-	-	-	-	1	-	-	-	-	-	-
Xenylla sp.	-	-	-	-	-	-	-	-	1	-	-	-
Haloxenylla affiniformis (Stach)	-	-	-	-	2	-	-	-	-	2	-	-
ISOTOMIDAE												
Folsomides angularis (Axelson)	-	-	-	-	-	-	-	-	-	1	-	-

	Lago de lava 1984	Lago de lava 1985	Malpaís interior	Malpaís costero	Orilla	Posadero	Barranco	Esquina	Lava Halcones	Islote Halcones	Islote Tabaibas	Cueva Naturalistas
ENTOMOBRYIDAE												
Seira dinizi Gama	-	-	-	329	869	1561	-	-	-	249	-	-
Seira ferrari Parona	14	-	8	-	-	-	15	2	-	-	-	-
Pseudosinella canariensis Gama	1	-	8	-	-	2	-	13	10	9	-	13
Pseudosinella trioculata Gama	-	-	-	-	-	2	-	-	2	-	-	-
Entomobrya marginata (Tullberg)	14	15	15	-	-	-	-	15	56	-	-	-
Entomobrya multifasciata/nivalis	14	-	-	-	-	-	-	-	15	-	-	-
BOURLETIELLIDAE												
Indet.	-	-	-	-	-	-	-	-	-	7	-	-
THYSANURA												
MICROCORYPHA,MACHILIDAE												
Indet.	-	-	-	-	2	-	-	-	-	-	-	-
ZYGENTOMA,LEPISMATIDAE												
Ctenolepisma longicauda Escherlich	14	-	4	59	-	-	-	-	11	2+1	3	-
Indet.	-	1	-	-	-	12	23	-	-	-	-	-
ORTHOPTERA												
GRYLLIDAE												
Hymenoptila sp.	4	2	-	9	33	3	15	-	6	2	1	9
ACRIDIDAE												
Sphingonotus canariensis Saussure	-	-	-	-	-	-	-	-	-	1	-	-
PSOCOPTERA												
TROGIIDAE												
Lepinotus reticulatus Enderlein	-	-	-	-	-	-	-	-	-	-	1	-
LIPOSCELIDAE												
Liposcelis mendax Pearman	-	-	-	-	-	-	-	1	-	-	-	-
Liposcelis silvarum (Kolbe)	-	-	-	-	-	-	-	-	1	-	1	-
Indet.	-	1	-	-	-	-	-	-	-	-	-	-
Fam. indet.	-	-	-	-	-	-	1	1	-	-	1	-
HOMOPTERA												
CICADELLIDAE												
sp. A	-	-	-	-	-	-	-	-	-	1	-	-
sp. B	-	-	-	-	-	-	-	-	-	-	3	-
sp. C	-	-	-	-	-	-	-	-	-	-	3	-
CERCOPIDAE												
Indet.	-	-	-	-	-	-	-	-	-	3	-	-
HETEROPTERA												
LYGAEIDAE												
Gonianotus barbarus Montandon	1	-	-	-	-	-	-	-	-	-	-	-
COLEOPTERA												
STAPHYLINIDAE												
Atheta vagepunctata Wollaston	-	4	-	-	-	-	-	2	1	1	5	-
Atheta sp.	-	1	-	-	-	-	-	-	-	3	-	4
SCARABAEIDAE												
Pachydema wollastoni Peyerim.	-	-	-	-	-	-	-	-	-	-	1	-
CLAMBIDAE												
Clambus sp.	-	-	-	-	-	-	-	-	-	1	-	-
CLERIDAE												
Canariclerus paivae (Wollaston)	-	-	-	-	-	-	-	-	-	1	-	-
MELYRIDAE												
Gietella fortunata Constantin & Menier	-	-	-	-	21	-	-	-	-	-	-	-
Gietella fortunata larvae	-	-	-	-	-	8	-	-	-	-	-	-
Dasytes lanzarotensis Palm	-	-	1	-	-	-	-	-+3	-	-	-	-
Ifnidius petricola Plata adults	-	-	-	-	17	2	1	-	-	-	-	-
Ifnidius petricola Plata larvae	2	-	15	14	4	9	15	1	1	-	-	-
NITIDULIDAE												
Carpophilus ligneus Murray	-	-	-	-	-	-	-	-	-	-	1	-
CUCUJIDAE												
Laemophloeus ater Olivier	-	-	-	-	-	-	-	-	-	1	2	-
Europs impressicollis Wollaston	-	-	-	-	-	-	-	2	-	-	3	-
COCCINELLIDAE												
Scymnus maculosus Wollaston	-	-	-	-	-	-	-	-	-	1	-	-
TENEBRIONIDAE												
Paivaea hispida (Brullé)	-	-	-	-	-	-	-	-	-	10	3	-
Arthrodeis malleatus Wollaston	-	-	-	-	-	-	-	-	-	-+1	1	-
Hegeter politus Heer	-	-	-	-	-	-	-	-	-	-+2	-	-
Melasmana lineatum (Brullé)	-	-	-	-	-	-	-	-	-	-+1	-	-
ANTHICIDAE												
Anthicus canariensis Wollaston	-	-	1	-	-	-	-	-	-	1	-	-
Anthicus guttifer Wollaston	2	1	-	-	-	-	-	-	-	-	-	-
Anthicus cf. guttifer Woll.	-	-	-	-	-	-	-	-	-	-	13	-
CHRYSOMELIDAE												
Chrysolina gypsophilae grossepunctata HarLindb.	-	-	-	-	-	-	-	-	-	-	-	-+1
CURCULIONIDAE												
Acalles cf. fortunatus Wollaston	-	-	-	-	-	-	-	-	-	-	1	-
Mesites fusiformis Wollaston	-	-	-	-	-	-	-	-	-	-	1	-
SCOLYTIDAE												
Aphanarthrum affine Wollaston	-	-	-	-	-	-	-	-	-	-	37	-
Coleoptera larvae indet.	-	-	-	-	11	1	-	-	-	-	1	-
LEPIDOPTERA												
TORTRICIDAE												
Epinota sp.	-	-	-	-	-	-	-	-	-	-	4	-
GELECHIIDAE												
Syncopacma genistae Wals.	-	-	-	-	-	-	-	-	-	1	-	-
Indet.	-	-	-	-	-	-	-	-	-	1	1	-
SYMMOCIDAE												
Symmoca aegrella Wals.	-	-	-	-	-	-	-	-	-	-	1	-
PYRALIDAE												
Indet.	-	-	-	-	-	-	-	-	-	1	-	-
GEOMETRIDAE												
Scopula guancharia uniformis Pinker	1	-	-	-	-	-	-	-	-	-	-	-
Indet.	-	-	-	-	-	-	-	-	-	-	3	-
DIPTERA												
NEMATOCERA												
Indet.	-	-	1	-	-	-	-	-	-	3	10	1
BRACHYCERA/CYCLORRHAPHA												
Fam. indet.	4	1	-	2	-	1	1+1	3	8	11	99	-
PHORIDAE												
Megaselia abdita Schmitz	2	-	-	-	-	-	-	-	-	-	-	71
Megaselia ashmolei Disney	-	-	-	-	-	-	-	-	-	1	-	-
Megaselia n. sp.	-	-	-	-	-	-	-	2	-	4	201	-
Megaselia indet.	-	-	-	-	-	-	-	2	-	1	-	-
HYMENOPTERA												
Symphita larva indet.	-	-	-	-	-	-	-	-	-	1	-	-
FORMICIDAE												
Camponotus rufoglaucus feai Emery	-	-	-	-	-	-	-	-	-	-	1	-
Camponotus compressus carinatus (Brullé)	-	-	-	-	-	-	-	-	-	3+1	2	-
Crematogaster alluaudi Emery	-	-	-	-	-	-	-	-	-	1	-	-
Plagiolepis barbara canariensis Santchi	-	-	-	-	-	-	-	-	-	2	-	-
Leptothorax canescens Santchi	-	1	-	-	-	-	-	-	-	-	-	-
Leptothorax sp. ?	-	-	-	-	-	-	-	-	-	-	2	-
Tetramorium semilaeve fortunatarum Emery	-	-	-	-	-	-	-	-	-	2+1	-	-
ICHNEUMONIDAE												
Indet.	-	-	-	-	-	-	-	-	-	-	1	-
MYMARIDAE												
Indet.	-	-	-	-	-	-	-	-	-	-	1	-
EULOPHIDAE												
Cirrospilus sp.	-	-	-	-	-	-	-	-	-	1	-	-
Indet.	1	-	-	-	-	-	-	-	-	-	1	-
CERAPHRONTIDAE												
Indet.	-	-	-	-	-	-	-	-	-	-	2	-